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THE FUTURE OF PRODUCTS OF THE ANDEAN HIGH PLATEAU AND CENTRAL VALLEYS

ANDEAN PRODUCTS
High Plateau and Central Valleys

REPORT

MEDICINAL PLANTS ORIGINATING IN THE ANDEAN HIGH PLATEAU AND CENTRAL VALLEYS REGION OF BOLIVIA, ECUADOR AND PERU

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REPORT

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BOLIVIA

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EXECUTIVE SUMMARY

This report is state of art information on different aspects of medicinal plants in the country. Sources of raw material of medicinal plants are grouped by families containing medicinal properties, geographic location and farming. Inventory of the already processed medicinal plants, identification of possible future products, list of producers by economic sector and economic location are provided

This report also provides an overview of the productive chain of medicinal and aromatic plants for herbal medicinal products, nutraceuticals, cosmetics and pharmaceutical aids. Information on companies engaged in different aspects of medicinal plants industry is provided.

It briefly describes current tendencies of the market, distribution channels, social, legal and commercialization ways of medicinal plant based products.

Based on critical evaluation and industrial potential, the most promising plants of Bolivia are *Acanthostyles buniifolius* (Hook. ex Arn.) R.M. King & H. Rob., *Achyrocline satureioides* (Lam.) DC., *Artemisia absinthium* L., *Baccharis dracunculifolia* DC., *Baccharis trimera* (Less.) DC., *Bertholletia excelsa* Bonpl., *Peumus boldus* Bitter, *Cinchona calisaya* Wedd., *Citrus aurantium* L., *Croton lechleri* Müll. Arg., *Cymbopogon citratus* (DC.) Stapf, *Chenopodium ambrosioides* L., *Eucalyptus citriodora* Hook., *Foeniculum vulgare* Mill., *Galipea longiflora* K. Krause, *Satureja boliviana* (Benth.) Briq., *Juglans boliviana* (C. DC.) Dode, *Marrubium vulgare* L., *Matricaria chamomilla* L.,

Mentha aquatica L., *Minthostachys mollis* (Kunth) Griseb., *Ocimum micranthum* Willd, *Pera benensis* Rusby, *Plantago major* L., *Porophyllum ruderale* (Jacq.) Cass., *Rubus boliviensis* Focke, *Schinus molle* L., *Sida rhombifolia* L., *Smilax campestris* Griseb., *Solanum lorentzii* Bitter, *Tagetes terniflora* Kunth, *Taraxacum officinale* F.H. Wigg, *Theobroma grandiflorum* (Willd. ex Spreng.) K. Schum., *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC., *Uncaria guianensis* (Aubl.) J.F. Gmel.

Bolivia has 43 enterprises related to several stages in the industrialization of medicinal plants in the Andean region, of which 63% are concentrated on production of herbal medicinal products, 30% on farming, collection and processing of medicinal plants. The rest of the companies are either dedicated to cosmetics or food industry. Among herbal medicinal products' industry, exploitation of the following plants was noteworthy: *Uncaria tomentosa* (Willd.) D.C., *Cynara scolymus* L., *Lepdium meyenii* Walp, *Baccharis genistelloides* (Lam.) Pers., *Matricaria chamomilla* L., *Valeriana officinalis* L.

It ends with a SWOT analysis and recommendations on industrialization of medicinal plants.

INTRODUCTION

Bolivia is a country, which is characterized by a great biological richness. Bolivia not only has a higher number of plants and animals species but also boasts diversity of environment and ecosystems. It has around 20,000 species of higher plants in deserts and humid tropics in life zones from 150 to 6,500 m above sea level and annual rainfall from 0 to 6,000 mm.

The knowledge about medicinal plants in Bolivia comes from ancient cultures from Andean and Amazon regions and has lasted through time. Nowadays it is even common to see Kallawayas, natural physicians of Aymará origin.

According to studies performed by Institutions such as Institute of Pharmacobiology, Universidad Mayor de San Andres and National Herbarium, it is estimated that there are at least 1,000 species of medicinal plants in Bolivia. Two hundred sixteen medicinal plants are officially accepted[1] (Table 1).

Within the frame work of existing health policies, a Basic Health Insurance has been created (Decree D.S. 25265, 3/12/1998), and later a Basic Health Insurance of Indigenous Health SBS-IO, D.S. 26330, 22/09/2001, which promotes the study and application of traditional pharmacopoeia in Chapter IV, Article 9 (of providers), which indicates that providers of indigenous health care will be traditional doctors (Amautas, Kolliris, Huatos, Chamans, Qhacodosos, Jampinis, Kakoris, Aysiris, Ipayas), and who are recognized by the

[1] Ministerio de Salud y Previsión Social. 2001. *Normas para Medicamentos Naturales, Tradicionales y Homeopáticos*. Resolución Ministerial 0013 del 16 de Enero.

Bolivian Society of Traditional Medicine (SOBOMETRA), according to the Ministry of Health's resolution No 231187.

The main causes of mortality in Bolivia are circulatory diseases, transmissible diseases, external causes, neoplasms, perinatal diseases. Data on the main causes of morbidity are diarrhea in children < 5 year old, acute respiratory infections, pneumonia, malnutrition in < 5 year old and high-risk pregnancy.

Within the framework of Drugs Act (Law No 1737 of December 1996), there is an expressed need to regulate the market offers of natural products, homeopathic products, among others. Through a Ministerial Resolution No. 0013 of 16 January 2001, the Norms of Natural, Traditional and Homeopathic Drugs have been implemented. However, the SOBOMETRA, is a recognized society which has plans to prepare guidelines for the production registration, and control of natural medicine and to train, prepare traditional medicine professionals and control their profession. It is currently working towards creating a National Public University dedicated to the study of Traditional Medicine/Complimentary and Alternative Medicine (TM/CAM). The research is carried out at the Major University (UMSA) of San Andres, La Paz and Universidad Mayo de San Simon (UMSS).

Since Bolivia has mainly indigenous population, the TM is very much in use. According to SOBOMETRA, 80% of the national population uses TM/CAM, and it is estimated that during the recent years, this number has increased because of the introduction of

acupuncture and other alternative therapies. Total number of TM/CAM providers within and outside the conventional health system is 1,600[2].

In the whole area of Aymara, with the exception of provinces that include capital cities of the Departments (Murrillo en La Paz y Cercado in Oruro), over 10% of the population depends on the TM; in Tamayo, Camacho, Muecas and Arome de La Paz and San Pedro de Totora, Litorl, Norcarangas de Oruro, this figure increases to over 30%. The Quechue Population is the most marginal and thus relies heavily on TM. The preference for TM in Bolivia is very high, especially in the province of the north Potosi, 85% in Charcas, 70% in Ibañez, 69% in Bilbao, and 50% in Chayanta. Similar figures are estimated for the southern periphery of Cochamba in the Bolivar and Arque provinces, where 55% of the population opts for traditional medicine.

1. ABOUT THE PRODUCT

1.1. Raw material

The important medicinal plants (277) and their properties appear in Table 1. Among the Bolivian medicinal plants reported, the most common medical uses in decreasing order are: pain, fever and inflammation, central nervous system diseases, gastrointestinal problems respiratory tract and skin affections. An analysis of Table 1 indicates that most of the plants are found in Departments of La Paz, Santa Cruz and Amazons. Two hundred sixteen medicinal plants out of 277 are registered by the Bolivian Ministry of Health.

[2] WHO. 2005. *WHO Global Atlas of Traditional, Complementary and Alternative Medicine.* Text Volume. Kobe, Japan. 216 p.

Additional medicinal plants and ethnomedical uses are compiled in the following four books:

- The book "*Kallawaya Guerisseurs Itinerantes des Andes*" written by Louis Girault (1987)[3] comprises information on medicinal uses of 868 plant species belonging to 8 different ecological regions as follows: Highlands and fist (18 species, 4.000-4.600 m asl), Plateau (92 species, 3.800-3-900 m asl), High valleys (386 species, 3.200-3.700 m asl), Andean valleys (65 species, 1.900-2.700 m asl), Hills (62 species, 1.800-2.200 m asl), Subtropical valleys (124 species, 1.200-1.700 m asl), Tropical regions (116 species, 500-1.100 m asl), Savannahs (5 species, until 500 m asl).

- Moreover, there is an ethnobotanical information collected during the period 1995-1997 in Tacaná communities of Santa Fé, Buena Vista, Macahua, San Pedro, Ixiamas, Carmen Pecha, Alta Marani y Santa Rosa de Maravillas. In this book, 238 are reported for their medicinal and economic uses[4].

[3] Girault, L. 1987. *Kallawaya Guerisseurs Itinerantes des Andes*. UNICEF-OPS-OMS-PL-480-ORSTOM. Translated to Spanish by Carmen Bustillos / René Alcocer. Editorial Quipus, La Paz, Bolivia.

[4] Bourdy, G., Gimenez, A., Quenevo, C. et al. 1999. *Tacana: Ecuanasha Aquí, Ecuanasha Idírene Cuana, Me Schanapaque. Tacana: Conozcan nuestros plantas, nuestras hierbas.* 1era Edición. Editores: USMA: IIFB-IIQ-IBBA, FONAMA-EIA, IRD (ex Orstom), Ediciones Plural, La Paz, Bolivia. 497 pp.

- *Plantas del Chaco II. Usos tradicionales Izoceño-Guaraní* by Bourdy and Combes (2002)[5] comprises ethnobotanical information of 247 plants collected during the period 1997-2000 in Guaraní communities of the Izozog at the Bolivian Chaco (Province Cordillera and Department Santa Cruz).

- The second edition of the book written by Gupta in 1995[6], which is *in press*, has 23 monographs on Bolivian medicinal plants, authored by Alberto Giménez. Model monographs are appended in Annex 1.

Most of the medicinal plants reported herein are distributed in Amazon, Interandean valleys, Yungas region, High plateau and Gran Chaco region. Information on farming of these plants was not available but it is assumed that most of them are wild.

After evaluation of Table 1, thirty-five plants have been selected as promising based on their pharmaceutical, nutritional and industrialization potential (Table 2).

CYTED monographs, similar to ESCOP Monographs, on *Croton lechleri*, *Uncaria tomentosa, Achyrocline satureioides, Baccharis sp.*, are under preparation at this moment. There are monographs on *Uncaria tomentosa*, *Matricaria chamomilla, Valeriana officinalis* in the US Pharmacopeia 28/National Formulary 23 (2005).

[5] Bourdy, G., Combes, I. 2002. *Plantas del Chaco II. Usos tradicionales Izoceño-Guaraní* Editores: UMSA, Fundación KAA IYA, IRD, WCS Bolivia, HNB, CYTED, OEA, Ediciones Sirena color, Santa Cruz, Bolivia. 441 p.
[6] Gupta, M.P. 1995. *270 Plantas Medicinales Iberoamericanas*. 1st Ed. CYTED-Convenio Andrés Bello. Bogotá, Colombia. 617 p.

Table 2. List of most promising Bolivian plants

Plant	Common name	Medical use(s)
Acanthostyles buniifolius (Hook. ex Arn.) R.M. King & H. Rob.	Romerillo	Source of essential oil
Achyrocline satureioides (Lam.) DC.	Vira vira, wira wira	Coughs and lung problems
Artemisia absinthium L.	Ajenjo	Stomachache, memory, melancholia, wound healer, insomnia, parasites.
Baccharis dracunculifolia DC. = *Parastrephia lepidophylla* (Wedd.) Cabrera	T'ola, Thola, Pachataya	Laxative, digestive, aromatic, eupeptic, febrifuge, rheumatism
Baccharis trimera (Less.) DC.	Carqueja	Bile stones, feminine sterility, sexual impotence, rheumatism
Bertholletia excelsa Bonpl.	Brazil nut oil	Antioxidant, emollient
Cinchona calisaya Wedd.	Quina, Cascarilla	Fever, blood purifier, antiseptic, paludism, anemia
Citrus aurantium L.	Petit grain, Kurisi, Laranku	To sweat, to regulate menstruation, epilepsy
Croton lechleri Müll. Arg.	Sangre de drago, Llausa Mora	Purgative
Cymbopogon citratus (DC.) Stapf	Japanese mint, Pasto de cedron, Paja cedron, Jichu cederrón, Jichu sokkos, Hierba Luisa	Digestive
Chenopodium ambrosioides L.	Paico	Hepatic functions, vermifuge
Eucalyptus citriodora Hook.	Eucaliptus (eucalipto)	Cough, antiseptic, bronchitis
Foeniculum vulgare Mill.	Fennel (Hinojo), Jinuchchu	Stomachache, milk production, eyes wash.
Galipea longiflora K. Krause	Yuruma huana, evanta,evanta hembra, evanta macho	Leishmaniasis, diarrhea
Hedeoma mandoniana Wedd. = *Satureja boliviana* (Benth.) Briq.	Muña, Khoa	Antiparasitic, migraine, food preservative, insecticide, burns, disinfectant
Juglans boliviana (C. DC.) Dode	Nogal, black walnut, bolivian walnut	Skin problems (eczema, herpes, psoriasis, parasites, wounds), tonic, laxative
Marrubium vulgare L.	Toronjil del monte	Expectorant, choleretic, coughs
Matricaria chamomilla L.	Manzanilla	Stomachache, somniferous, anti-

Plant	Common name	Medical use(s)
		inflammatory, conjunctivitis.
Mentha aquatica L.	Menta	Stomach pain, nauseas, cardiac palpitations, vertigo, stomach parasites, uterine washings.
Minthostachys mollis (Kunth) Griseb.	Peperina, peperita, matin muña	Antimicrobial, eupectic, antispasmodic, diarrea
Ocimum micranthum Willd	Albahaca del monte	Bronchitis, anemia, otitis, milk production
Pera benensis Rusby	Apainichij, apainiki	Leishmaniasis
Plantago major L.	Llanten	Throat, diarrhoea, hepatic functions, wounds healing
Peumus boldus Molina	Boldo, añas keru	Digestive, migraine, rheumatism
Porophyllum ruderale (Jacq.) Cass.	Quilquiña, mexican cilantro	Flavouring agent
Rubus boliviensis Focke	Zarzamora silvestre, mora	Astringent, diarrhea, sore throat, varicose veins, hemorrhoids, skin problems
Schinus molle L.	Molle, mulli	Hepaprotector, antibacterial, antimycotic, antiinflammatory, regulator of heart, blood pressure, bowels movement, uterine stimulators, wounds healing
Sida rhombifolia L.	Malva, escobilla	Antibacterial, kidney inflammations, diarrhea, fever
Smilax campestris Griseb.	Sarsaparrilla, kajahuatana,	Antiseptic, to sweat, venereal diseases
Solanum lorentzii Bitter	Guirakillo	Antimycotic, fever, food
Tagetes terniflora Kunth	Huacataya, suico-suico	Nervous shivering, stomachache, digestive, flatulence, appetite loss
Taraxacum officinale F.H. Wigg	Amargen, diente de leon	Flatulence, diuretic, blood purifier, hemorrhoids
Theobroma grandiflorum (Willd. ex Spreng.) K. Schum.	Cupuazu	Pharmaceutical aid for suppositories, pills, etc.
Uncaria tomentosa (Willd. ex Roem. & Schult.) DC., *Uncaria guianensis* (Aubl.) J.F. Gmel.	Uña de gato, bereu quid'a	Vomiting, rheumatism, menstrual regulation, intestinal, kidney and liver functions

Source: Material data sheet. *www.biocomerciobolivia.org.bo*; Dr. Alberto Giménez. Institute of Pharmacobiology, Universidad Mayor San Andres, La Paz, Bolivia; *Personal Evaluation*.

1.2. Products

An analysis of the inventory of already processed medicinal plants in Bolivia (Table 3) showed that 27 companies are engaged in production and commerce of herbal medicinal products. Most of the products are based on the following plants: *Uncaria tomentosa* (Willd.) D.C., *Cynara scolymus* L., *Lepidium meyenii* Walp, *Baccharis genistelloides* (Lam.) Pers., *Matricaria chamomilla* L., *Valeriana officinalis* L. Thirteen entities among companies, associations and communities commercialize 32 plants.

Moreover "Asociación de exportadores de aceites esenciales" (Association of Essential oils Exporters) is leading the production of essential oils particularly Romerillo and Muña negra. Another group involves in cosmetics industry is LABORATORIOS ALEPH. Two associations ("Asociación de productores Multiactiva" (Association of Multiactiva Producers) and "Fundación para la Promoción e Investigación de Productos Andinos" (Foundation for the Promotion and Research on Andean Products) (PROINPA)) are leading the production of *Amaranthus caudatus* L., Andean tubercles, Quinua, Amaranth, Millmi, Maca, Ajipa, Chira for food industry.

In Bolivia, three species are produced and used to extract natural colorants: red brick from Anatto seeds (*Bixa orellana*), red purple from Cochinilla (*Dactylopius coccus* Costa) and yellow from curcuma (*Curcuma longa* L.). To date, there is no company with large-scale processing capacity of these raw materials. One of the factors that produces loss of incentive in the investments and production of this sector is the lowering of prices in the international market as well as strong fluctuations in prices and demand.

In the Annato's case, the prices dropped from US$ 2,500 per metric ton in 1995 to US$ 500 per metric ton in 1999, Bolivian FBO prices. Regarding Cochinilla, the prices are more in function of the production in Chile and Peru. Both supply about 85% of the total demand of international market. At the present time, these products have limitations as raw material for export to the European Union. The extracts of bixin and nor-bixin produced by Laboratorios Valencia could have good access to the international markets.

The production of essential oils in Bolivia show potential due to the implementation of various projects including some by UNIDO, which offer products used in cosmetics, pharmaceutical and food industries. There are various enterprises involved in the small-scale production like Laboratories Valencia. In public research, the Agrochemical program of Universidad Mayor de San Simon has been very active in essential oils sector.

Among the developed products from native plants for national commercialization, there are essential oils of: molle (*Schinus molle*), which is used as natural repellent and ointment for muscle pain and wound healing; romerillo (*Acanthostyles buniifolius*), which is an aromatic component of perfume industry exported to Japan; muña negra (*Hedeoma mandoniana*) with potential uses of natural insecticides and flavouring agent; native mints (*Minthostachis andina* and *Satureja boliviana*) commercialized as flavouring agents nationally and internationally; pampanis or wild anis (*Tagetes pusilla*) and resins of *Eucaluptus globulus* for artisan preparation of waxes for floor cleaning.

1.3. Producers

The economic sectors have been classified in the following fashion:

- Herbal medicinal products (phytomedicines)
- Perfumes and cosmetics (essential oils and colorants)
- Nutraceuticals and allies (herbal teas, food supplements and others)
- Pharmaceutical aids (gum, resins, extracts, medicinal and aromatic plants as raw material)

The Bolivian producers by economic sector and economic location are presented in Table 4. An analysis of Table 4 indicates that products of four sectors: herbal medicinal products (24), Perfumes and cosmetics (4), nutraceuticals and allies (16) and pharmaceutical aids (16) are located mainly La Paz and Cochabamba.

The medicinal plants sector is controlled by activities of small enterprises and Domestic Artisan Laboratories (LAD), which are grouped in the Bolivian Society of Traditional Medicine (SOBOMETRA) supply the local and national demand of plant extracts and products processed in artisan way. These micro-enterprises are taking advantage of 300 species of native medicinal plants. Most of them are not cultivated but that they are collected from the forest. In spite of that there are laboratories and companies dedicated to research and processing of medicinal plants and sale of herbal medicinal products and dietary supplements for the national and international markets. Before the evidence of limited availability of medicinal plants, certain initiatives to protect medicinal plants used in Traditional medicine have been started by SOBOMETRA. Despite this, plans are concentrated on conservation through Botanical Gardens of Kallawayas.

Another example is the Project of Laboratories Valencia and CABI, which try to cultivate and domesticate certain species of wild medicinal plants and cooperate with local communities in the development of herbal medicinal products. CABI is the "Capitanía de Alto y Bajo Izozog", which comprises 21 communities of Guaraní-Izoceñas in the Department of Santa Cruz with financial support of USAID and WCS to elaborate an integral plan for management of the National Park Gran Chaco. Laboratories Valencia is providing financial support of herbal medicinal products.

For the National Program of Biocommerce, these producers grow a variety of promising plants and have a wide ancestral knowledge of traditional healers and a well-established indigenous Pharmacopoeia (particularly Kallawayas). The main challenges of these producers are the development of sustainable productive system of raw material, monitoring systems, certification, and development of mechanism of access to national and international markets with semi-processed and processed products.

2. ABOUT PRODUCTION

The development of products and services of the biodiversity with added value is fundamental as an alternative to allow Bolivia to use its biodiversity to satisfy medium to long-term needs of the population.

2.1. Productive chain

2.1.1. Farming

In the organic agriculture, groups of Andean grains are highlighted such as quinua (*Chenopodium quinua*) and amaranto (*Amaranthus caudatus*). Additionally, there are producers and processors of chestnuts (*Bertholletia excelsa*), tarwi (*Lipunus mutabilis*), local varieties of corn (*Zea mays*) and various aromatic plants and items in which there are commercial activities that include criteria of environmental and social management.

It should be highlighted that cultivation of medicinal plants is in small scale or like secondary cultures within local communities. An interesting example is the management of different ecological zones by Aymaras and Quechuas to cultivate different medicinal plants in parallel or complementary way during the whole year without limiting them to a specific weather season and particular zone. A positive aspect of this is the synchronization of cultivation areas, which allows stepwise production increasing the period of harvest or supplies zones as well as diversity of species, which is important for food and pharmaceutical industries.

2.1.2. Collection

The collection of a majority of medicinal plants is characterized by direct collection from the forest and few come from cultivation.

2.1.3. Transformation

Processes such as cleaning, grinding and packaging of medicinal plants for food processing, pharmaceutical industry and distribution centers of supermarkets characterize this segment

of the productive chain. On the other hand, there is a small group of specialized companies, which process and market herbal medicines.

2.1.4. Commercialization

In all Bolivian cities there exist specific places for the commercialization of medicinal plants, such as Calle Las Brujas or San Francisco Market in La Paz, La Ramada Market in Santa Cruz and La Paz Market in Cochabamba. In these places, permanent and specialized sales centers function regularly. In addition to them, there are stores including commercial areas, whose offers are displayed in better hygienic conditions and presentation, even with brand names.

On the other hand, artisan laboratories also supply plant extracts, derivatives and natural medicines elaborated on the basis of homemade formulations. These enterprises are officially recognized by the Ministry of Public Health as Domestic Artisan Laboratories (LAD). Although these artisan laboratories work within a frame of informality due to their small-scale production, they are legal. On the other hand, all these microcompanies are affiliated with the Bolivian Society of Traditional Medicine (SOBOMETRA). SOBOMETRA has a wide knowledge of the use of around 500 native plants and their applications. Each LAD supplies an average of about 70 natural medicines between tinctures, ointments and syrups, some even with patent and legal registration at the Ministry of Health.

Moreover, there are 15 medicinal plants based laboratories specialized in medicinal products from traditional medicine such as TERBOL, ALPEH, Laboratorios Valencia,

INTI, Project of Natural Medicine (PROMENAT), FITOBOL, whose products are part of prescriptions of Western Medicine and they are commercialized in established pharmacies.

2.1.5. Technologies

There is an evident limitation in technology used for medicinal plant industrialization. For instance, there exist 5 research centers in Bolivia devoted to investigation and systematization of the information on medicinal plants with financial and economical limitations, which restrict their capacity of action. This is a disadvantage of Bolivia in terms of competitiveness versus other Latin American countries.

The University Mayor de San Andrés (UMSA) through its Colleges of Sciences and Pharmacy and Biochemistry recently started to help the pharmaceutical industry in terms of technology, formulations, standards and tests, but no in terms of packaging, raw material like most of the Latin American countries, where chemical synthesis is not developed.

2.1.6. Agents implied

2.1.6.1. Public sector

Ministerio de Salud

It is responsible for promoting and solving health issues in the country. Besides, it has *inter alia* the task to guarantee a safe use of medicinal plants by the population.

Ministerio de Desarrollo Sostenible y Planificación-Viceministerio de Medio Ambiente, Recursos Naturales y Desarrollo Forestal.

Its main tasks are: (a) Propose policies and norms for the sustainable development in accordance with economical, social and technological growth with sustainability of natural resources, environmental conservation and biodiversity; (b). Propose technical norms and reference terms for control and sustainable use of renewable natural resources. (c) Control protected areas with an objective of sustainable use of natural resources and preservation of biodiversity.

SERNAP – Servicio Nacional de Áreas Protegidas.

It was created in 1997 by the Bolivian Government to coordinate the functioning of the National System of Protected Areas (SNAP) and to guarantee the long-term management and sustainability of the protected areas of national interest and their corresponding buffer zones in Bolivia.

C-PROBOL (Centro de Promoción Bolivia).

It is a public institution of the Ministry of International Commerce and Investment, which aims to promote investment of non-traditional products and Investments in the country. Moreover, it offers programs and services to national and international entrepreneurs that could be compatible with BIOTRADE Initiative.

Instituto de Ecología, Universidad Mayor de San Andrés.

Its research interests are conservation, biodiversity, agro-ecology and environment quality. Moreover, it promotes the formulation of policies and strategies of conservation and management of renewable natural resources in Andean and Amazon regions.

Institute of Pharmacobiology, Universidad Mayor de San Andrés

It is devoted to chemical, biological and pharmacological studies of Bolivian medicinal plants. Dr. Alberto Giménez, Director of the Institute has instituted a systematic study of Bolivian Flora, an is currently leading clinical trials of a herbal product for Leishmaniasis.

Universidad Mayor de San Simón

It has been helping in various research projects related to the production of essential oils with collaboration of International cooperation agencies.

2.1.6.2. Private Organizations

Fundación para el Desarrollo de la Ecología (FUND-ECO).

Its main objectives are protection, conservation and environmental restoration through joint activities with Institute of Ecology (IE) such as diverse projects, research consultantship, training, advising including planning, evaluation, environmental monitoring, inventory of renewable natural resources formulation and execution of technical assistance programs related to the use and management of natural resources, training and conscientization in topics of human ecology.

Tierras Comunitarias de Origen (TCO).

The indigenous groups own 17 millions of hectares of a collective property, which includes the use and management of natural resources. In order to increase the volume of production, the organization of community small enterprises are being organized to apply a management plan and adequate use of the territories.

Asociaciones Sociales del Lugar (ASL).

Groups of 20 farmers and locals, who are concesionary of Municipal Forestry Reserve, which should be managed in sustainable way through plans of forestry management and annual operative plans.

Fundación Amigos de la Naturaleza (FAN).

It is an NGO devoted to management of protected areas, looking for ways to implement the Biological Diversity Convention. Within of this framework, FAN offers alternatives of sustainable production to locals in protected areas, including financial assistance Health system and education support.

Fundación BOLINVEST/Bolsa Amazonia Bolivia.

It is aimed to stimulate job opportunities at all levels through the promotion of exportation of non-traditional products and investment in the country. Their principal areas are technical assistance in production, technical assistance in marketing and training.

Fundación para la Producción (FUNDA-PRO)

It supports, fosters and strengthens economy of the private sector through actions to facilitate and expand the credit in favour of social and regional segments.

Fundación Bolivia Exporta

It invests in producing and exporting enterprises of agriculture and agroindustrial sectors in the country in order to increase the exportations of non-traditional products.

PROMETA (Protección del Medio Ambiente – Tarija)

It is oriented towards conservation and sustainable use of natural resources of the biodiversity from the Department of Tarija in the southern part of Bolivia.

Cámara de la Industria Farmacéutica de Bolivia (CIFABOL).

An association of companies devoted to the production in the pharmaceutical sector.

Programa Nacional de Biocomercio Sostenible (National Program of Sustainable Biotrade)

This 5-year National program of sustainable Biotrade has the following objectives:

- Stimulate the production and commerce of goods and services of the biodiversity under criteria of ecological, social and economical sustainability.
- Strengthen value chain, local economies related to biodiversity and establish links with national and international market.

2.2. List of companies

There are 43 enterprises among laboratories, foundations, community associations and others related to industrialization of medicinal and aromatic plants. Detailed information on their contacts, phones, faxes, websites and addresses are given in Table 5.

3. ABOUT MARKET

3.1. Internal and external demand

3.1.1. Internal demand

The demand for medicinal and aromatic plants is stimulated by recent tendencies towards the use of the traditional medicine and an increasing awareness of the use of natural remedies, with special emphasis on Traditional Chinese Medicine. In Bolivia, the use of medicinal plants by the population is not only prevalent in the indigenous population and/or rural area, but is also widespread in all the urban centers, including middle and high-middle income population.

3.1.2. External demand

In general alternative medicines using spices, herbs and essential oils of tropical origin have increased in popularity in most EU countries over the last few years. It represents a growing niche-market and in general, the market for herbal medicines is growing at a faster rate than that for conventional drugs.

Increasingly, companies seek high quality, reliable supplies of cultivated material, although wild-collected/wild-harvested material continues to play a significant role in the industry. In this market segment, exporters in developing countries will find opportunities in the trade of ingredients with known properties and activity, which are not patented and which can be traded freely. Since the herbal products of huacata (*Tagestes terniflora*), quiquiña *Porophyllum ruderale*), *zarza mora* (*Rubus boliviensis*) and *nogal* (*Juglans boliviana*) are known in the country of origin and no direct trade restrictions exist, these selected herbal

products find most opportunities in the pharmaceutical market segment. The market segment of herbal medicines, produced directly from whole plant material, is of particular interest to exporters in developing countries.

Moreover, exporters in developing countries will find more opportunities in the trade of essential oils with known properties and activity, which are not patented and which can be traded freely.

In Bolivia, Agroindustrial cooperative of essential oils (COAACE) in Cochabamba introduced cultivation of :

Cymbopogon citratus	Japanese Mint or Pasto de Cedron
Cymbopogon winterianum	Citronella
Cymbopogon martini	Palma Rosa
Citrus aurantium	Petit grain

This Cooperative closed in 1987. However, *Eucalyptus globulus* cultivation was started in Pairumani (30 Kms from Cochabamba). In 1991, Agrochemical Program of Cochabamba was initiated to start work on the following native Bolivian species of plants for production of essential oils:

Acanthostyles buniifolium	Romerillo
Schinus molle	Molle
Hedeoma mandoniana	Muña
Baccharis dracunlifolia	Tóla

and the following introduced species:

Eucalyptus citriodora	Eucaliptus (Eucalipto)
Foeniculum vulgare	Fennel (Hinojo)
Veitveria zizanoides	Vetiver

For this program the Universidad Mayor de San Simón, IDRC, GRET (France), National Fund for Environment (FONAMA), private sector, farmers, and Regional institutes provided the necessary infrastructure for research.

A UNIDO Project – Desarrollo Agroindustrial de Chaparé – AD/Bol/93-818, was started at the end of 1993.

Table 6. Production of essential oils in Chaparé

Species	**PRODUCTION (Kg)**		
	1992	**1993**	**1994**
Mentha Japonesa	225	54	70
Pasto Cedron	344	410	213

The Consultants indicated that the production of essential oils in the region of Chaparé may be economically feasible with the existing cultivation[7]. It is necessary that the communities diversify their products and not depend upon only on one crop.

[7] Bandoni, A. 2000. Perspectiva para el desarrollo de una agroindustria de productos aromáticos en Cochabamba. In: A. Bandoni (eds): *Los Recursos Vegetales Aromáticos en Latinoamerica, Su aprovechamiento industrial para la producción de aromas y sabores*. CYTED, La Plata, Argentina, 263-284.

Table 7. Production of essential oils from Native species

Species	PRODUCTION (Kg)		
	1996	1997	1998
Romerillo	85.7	168.3	190
Molle	34	2	90
Muña Negra	-	39.5	40
T'ola	4	10	15

Based on preliminary market analysis following species were chosen:

Mentha arvensis

Eucalyptus citriodora

Vetiveria zizanoides

Citrus aurantifolia (Patchouli)

Cymbopogom naartinii

Cymbopogom winterianus

Some factors that have an important impact in the commerce of this sector are:

The trend of concentration of the processing industry on certain medicinal plants, standardization of the plants and their extracts and solution of technological problems in the processing of natural extracts in foods and natural remedies without undesirable collateral effects or lack of homogeneity of qualities. The concentration of the pharmaceutical industry on particular plants is due to introduction of new methodologies for monitoring

and the need to run expensive clinical trials to introduce new products and ingredients in the market. The extracts of Andean and Amazon plants more frequently used in industrialized countries are: boldo (*Peumus boldus*), quina quina (*Cinchona calisaya*), carqueja (*Bacharis trimera* or *Baccharis* spp.), sangre de drago (*Croton* sp.), uña de gato (*Uncaria tomentosa*, *U. guianensis*), vira vira (*Achyrocline saturoides*) and Sarsaparrilla (*Smilax campestris*).

3.2. Demand: Buyer profile and factors influencing the demand

Health trends

The ever-escalating costs of medical care, the negative media reports about the possible side effects and adverse reactions of synthetic drugs, as well as the trend toward preferring only natural substances instead of chemicals, have exerted a consumer push toward alternative medicine in general, and herbal medicine in particular.

Health food

Health foods, which are thought to make a positive contribution to good health and which are not harmful to the environment, are growing in importance. Food manufacturers are using herbs as natural preservatives and anti-oxidants.

Environment-consciousness

Moreover, waste, including packaging waste, should be avoided or at least reduced with subsequently increase environment consciousness.

3.2. Distribution channels

Typically the main parties involved in the distribution of herbs are:

Agents / brokers

These are independent companies which negotiate and settle business on the instructions of their principals and which act as intermediary between the buyer and the seller. They do not buy and sell on their own account.

Traders/importers

These specialized traders import on their own account and sell to grinders/processors and to major end users. They mainly buy bulk quantities of unground herbs and resell them at an increased price. The importer is responsible for all costs associated with the importation, such as duty, terminal fees, unloading charges, local delivery and warehouse costs. Larger importers clean and grind herbs before exporting them to other EU and North American markets. Smaller traders import some herbs directly, but they also buy from larger traders who can offer them better conditions and delivery terms on small quantities of more specialized items. These smaller traders distribute herbs to blenders, packers and end users in the food and pharmaceutical trade.

Grinders/processors

They purchase the raw herbs and perform cleaning, grinding and packaging. They have central warehouses for distribution throughout a specific area or they deliver directly to the distribution centers. Large blenders and packers are increasing their direct purchases of herbs from producers/exporters, but purchasing through importers/traders is also very

significant. This latter channel ensures that they can buy and receive supplies of specific herbs throughout the year. They tend to hold only small stocks and, although they place orders covering their requirements over a long period, they expect deliveries against these orders to be spread over short and frequent intervals. Purchasing from an intermediary reduces the risk of late deliveries, poor harvest/supply from individual sources and quality problems. In addition, the services of specialized traders are important for obtaining small consignments of very special requirements at short notice and at competitive prices.

End users

The largest user group is the industrial sector in which pharmaceutical companies take the largest volumes. Requirements are purchased either from blenders and packers or directly from importing/trading companies. Some industries have joint arrangements with producers to ensure regular supplies and maintain quality standards and specifications of herbs concerned.

3.4. Legislation

3.4.1. General norms on use of renewable and nonrenewable natural resources

Law No 33 of Environment and its Regulation.

It indicates that the national policy of environment must contribute to improve the quality of life of the population, on the basis of the incorporation of the environmental dimension in the processes of the national development

Law INRA.

Its objective is to guarantee the proprietary right on the Earth in favor of Bolivians, so that they exercise their right in the conditions established by the agrarian legislation. This law helps to establish objective conditions in Biotrade.

Forestry Law and its reglamentation.

This law intends to regulate the sustainable use, protection of the forest and earth in benefit of the present and future generations, harmonizing the social interest, economic and ecological interests of the country.

3.4.2. Norms on use of Genetic Resources

Regulation of Decision 391 of the Commission in the Agreement of Cartagena and the regulation on Biosafety.

This regulation establishes the conditions for contracts of access to genetic resources in the Andean countries, and thus in Bolivia.

3.4.3. Norms on promotion of the competitiveness

Law of Investments No. 1182 of 1990 and legislative Compendium of Investments (1999). It is meant to stimulate and guarantee the national and foreign investment to promote the growth and economic and social development of Bolivia, by means of a system that governs national and foreign investments.

Norms on the Foreign trade

Law of Exports (Law No 1489 of 1993) and Legislative compendium of Exports

This law guarantees the freedom of import and export of merchandise and services. It is included all the merchandise and services of the universe tariff except for those with specific legislation like products of biocommerce.

Ministerial Resolution No. 0013, 16 January 2001. Normas para medicamentos naturales tradicionales y Homeopáticos. La Paz, Bolivia.

These norms set forth the guidelines and requirements for registration of traditional natural products. This gives a list of 216 plants, which are accepted by the Ministry of Health.

Ley de Medicamentos (Ley No. 1737 del 17 de diciembre de 1996) and Decreto Supremo Reglamentario No. 25235 del 30 de Noviembre de 1998.

It regulates the guidelines and registration of medicines in Bolivia.

3.4.4. International Legal Framework

CITES

Known as CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, entered into force on 1 July 1975 and now has a membership of 160 countries. These countries act by banning commercial international trade in an agreed list of endangered species (including plants) and by regulating and monitoring trade in others which might become endangered. More than 230 medicinal plants species have been added

to CITES appendices. The lists of species are available through CITES Internet-site at *www.cites.org*.

European Union Council Regulation EC/338/97, Commission Regulation EC/938/97 and EC/2307/97

They are the legislative instruments regulating the trade in wild fauna and flora at EU level. These regulations fully implement the provisions of CITES and include a number of stricter measures.

3.5. Commercialization ways

For export of wild species or derivatives, the authorization of the Vice Ministry of Envionment and Sustainable Development and compliance with CITES are required. The procedure for exportation is simple, and the interested must submit:

- proforma invoices
- certificate of origin
- phyto or zoosanitary certificate
- bromatologic analysis by accredited laboratory
- packing guide

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5. SWOT Analysis

STRENGTHS

- Bolivia is recognized worldwide as a supplying country of natural ingredients. The different microclimates of several inter-Andean valleys provide unique seasonal crops. Upon processing, they allow us to be the only suppliers in some market segments.
- State-of-the-art technology in natural colorants.
- High-quality products recognized worldwide.
- Stocks of endemic natural ingredients and available information on ethnobotanicals.
- Ancestral knowledge in the handling of these resources.
- High development observed by organic farmers.
- Widely available land extensions for production.
- Preliminary pharmacological research of aqueous and/or ethanol extracts.
- Appropriate legislation governing conservation and sustainable use.
- Native Bolivian communities have ancestral knowledge about the utilization of medicinal plants with specific objectives. In fact, the traditional uses of more than 1,500 species are known (4,000 with uses medicinal, cosmetics, colorant, food and others).
- Biodiversity, Bolivia is one of the megadiverse countries.
- Medicinal plants and native natural products could be source of innovation for the development of new products.

- North American and European companies are beginning to have interest to establish cultures in the country.
- High acceptability by population of natural ingredients.
- National Commitment and high priority to this sector.

WEAKNESSES

- The difficulty facing such new natural ingredients is that they are unknown in Europe and therefore companies will be reluctant to use such ingredients without detailed safety assessments. One approach here is to develop mutually beneficial relationships with companies dealing in natural ingredients that may be able to support and guide the supplying company through the legislative requirements.
- The low demand for herbs, which are processed and packed in the country of origin.
- Lack of research, specially in agrotechnology and process technologies.

OPPORTUNITIES

- The trade channels for the bulk sale of non-ground herbs to importers/traders is relevant to new exporters.
- The selected herbs as an ingredient for pharmaceutical products offer more opportunities for Bolivia.
- Local producers can add value by drying and cleaning and by offering a high-quality product.

- As the major developed markets have reached maturity and have a limited scope for volume growth, a focus on value-added products, such as organic products offers opportunities.
- Marketing ingredients as organic may also be interesting in the case that producers can only supply small quantities of natural ingredients like Bolivia in the case of the natural ingredients discussed since amounts traded in the organic market are usually smaller than in the regular market.
- One advantage that producers/exporters in developing countries have is that many of the new ingredients that companies are looking for could originate in those parts of the world where there is a tradition of using natural ingredients for skin, hair care and food products.
- Important markets for new product development in the cosmetics industry are especially products for ageing consumers, products for-on-the-go, products that communicate science to the consumers (therapeutic products such as cosmeceuticals), products with natural ingredients and crossover products (products, which have a number of benefits such as color cosmetics with skin-tightening properties and tinted moisturers).

THREATS

- The prospects for exporting processed consumer packed herbs directly from the countries of origin are low due to the following reasons: Local importers, processors and packers have long-established links with their customers and are in a better position than distant processors to know the requirements and fluctuations of the

local market and the needs of end users and they supply supermarket chains directly and are financially able to support exclusive contracts and advertising campaigns or to service in store racks and stock control for herbs.

- The easy adaptability to different microclimates from species like the mint, manzanilla or mint provokes over offers in the national market, giving as results very low prices in relation to the international prices, thus it is necessary to diversify towards species with international demand.
- It is necessary to think about a sustainable development, analyzing the potential use of the reserves without causing threat of destruction of the biogenetic resources.
- It is very common in Latin America to subutilize the natural forest, exploitation of very few species in intensive form, and not considering many other species that could be exploited appropriately.
- There exists a change of attitude in the user: search for safe and natural products but these concepts could be confused, which are not necessarily related.
- Medicinal products of Colombia and Peru have more competitive prices and large volume of offers at this moment.
- Countries like China and India have a great history and experience in production of medicinal and aromatic plants.
- High requirements in the targeted markets
    - High requirements of buyer.
    - Non-tariffs barriers like novel foods and novel ingredients law.
- Stringent legislation which limits bioprospection contracts

6. RECOMMENDATIONS

- One approach here is to develop mutually beneficial relationships with companies dealing in natural ingredients that may be able to support and guide the supplying company through the legislative requirements.
- Creation of Research and Commercialization networks
- Promotion of certification of quality
- Integration between State and Private sector
- Promote Bioprospection for development of a sustainable industry based on medicinal plants, thus avoiding export of raw material with added value.
- Promote creation of enterprises based on ecological and social sustainability like Organic agriculture through incentives: reduced costs to assure the availability of raw materials, concrete exigency of the market to request documentation about sustainable management to access the market, concrete condition of support from third parties (NGO's, international cooperation and others), direct participation of the benefits given by the markets through more attractive prices due to environmental and social awards.
- Research sector should create ways of close cooperation with private and productive sectors identifying the needs of the industry and offering services, infrastructure and experience to develop practical concepts of sustainability to achieve complementation with commercial sector.

To the Government:

- Set up a National Multidisciplinary Committee to assist the Government to formulate policies concerning all aspects of medicinal plants utilization.

- Establish a national policy to include the use of phytopharmaceutical products in health care.

- Approval, by the Ministries of Health, of a priority list of medicinal plants to be used for the manufacture of phytopharmaceutical products.

- Facilitate and simplify the mechanisms for the registration of phytopharmaceutical products, taking into consideration the WHO guidelines and European models.

- Establish quality control standards for medicinal plants and phytopharmaceutical products.

- Explore the possibilities of creating a National Institute for the study and utilization of medicinal plants.

- Support universities, research centers and institutions including agricultural institutes, for carrying out comprehensive studies on industrial utilization of medicinal plants.

- Promote systematic cultivation and industrialization of medicinal plants and provide incentives for stimulating national plant-based industries.

- Set up banks of germplasms, seeds and propagable materials of medicinal plants.

- Offer preferential financial terms to farmers, cooperatives and business enterprises interested in establishing cultivation and industrialization of medicinal plants.

- Include monographs on selected medicinal plants and their extracts in the national pharmacopoeia.

- Implement measures for the conservation of medicinal flora, as set forth in the Agenda 21 of United Nations' Conference on Environment and Development.

- Take measures to collect detailed statistics, under a separated entity, on the figures of import, export and local production of medicinal plants and their products.

- Foster international cooperation.

- Take measures to protect patent rights of the whole phytogeographic region by signing contractual agreements with industrial groups in major pharmaceutical manufacturing countries to whom the medicinal plants are supplied.

To the Universities and Research Institutions:

- Emphasize the importance of medicinal plants and phytopharmaceutical products in the training of physicians, pharmacists and other related health professionals.

- Stimulate the creation of specialized centers and support multidisciplinary research aimed at exploring the medicinal and economic potential of the national flora.

- Initiate postgraduate programs in the field of medicinal plants to prepare qualified personnel in areas related to the industrial utilization of medicinal plants, with emphasis on agrotechnology, process technology, quality assessment, phytotherapy and handling of multifunctional pilot plants.

- Prepare computerized national inventories of medicinal plant resources which allow exchange of information at a regional and interregional level.

- Assist the Governments on establishing quality control standards and on legal aspects of registration of phytopharmaceutical products.

- Promote exchange of scientific and technological information at regional and interregional level.

- Establish links with the industry to provide technical assistance on different aspects of industrialization of medicinal plants.

- Improve awareness of the public on the usage of medicinal plants and their products and disseminate the information on industrialization of medicinal plants.

- Encourage a business outlook among the academicians to facilitate their participation in productive activities and in the industrial utilization of the local medicinal flora.

- Conduct research on promising lead compounds obtained from medicinal plants for the development of new drugs.

To the Private Sector:

- Establish links with universities and research centers for industrial utilization of medicinal plants.

- Call on the National Chambers of Commerce and Industries to promote industrialization of medicinal plants.

- Form Associations of entrepreneurs and companies interested in the industrialization of medicinal plants, in order to orient them towards the market.

This organization should establish contacts with principal foreign markets, as well as have access to modern technology for the production of phytopharmaceutical and natural products.

- Promote joint-venture agreements between firms which have technology and the knowledge of the market and those that have an access to the traditional knowledge and medicinal plant resources and/or phytopoharmaceutical products.

To the International Organizations:

- Coordinate the efforts of international organizations like UNIDO, FAO, OAS, UNESCO, IDRC, EEC, UNDP, PAHO/WHO, CEPAL, etc. which support technical cooperation programs in different aspects of medicinal plants.

- Organize training programs for human resource development through workshops, courses, seminars, etc.

- Support national research centers on medicinal plants and natural products, which have well defined goals and relationship with the industrial sector.

- Facilitate access to updated information, preferably through computerized data bases on international markets of medicinal plants and the possibilities of industrial investments in this field.

- Promote cooperation between the research and development laboratories of industrialized and developing countries and among the ones in the developing countries. This can take the following forms: exchange of germplasms and seeds, exchange of information on crops, process technology, formulation of products and marketing practices, and exchange of personnel between R & D institutions for specialized training of personnel.

TABLES

Table 1. List of Accepted Medicinal Plants of Bolivia

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
ALGAE	*Spirulina platensis*	Maxima	Spirulina	Whole plant	Source of vitamins and proteins (nutraceutical)			
AMARANTHACEAE	*Amaranthus hybridus var. paniculatus*	(L.) Uline & W.L. Bray	Icapachaqui, quinua de valle, trigo inca (Argentina), Aroma, coime, coyo, illancuma cuimi, millmi, yuyo (Bolivia), Airampo, ata	Aerial parts, whole plant leaves	Diuretic, bronchitis, tenia (Taenia saginata), abortion		Temperate zones in Argentina, Ecuador, Guatemala, Méxic, Peru	
	Gomphrena globosa	L.	Siempre viva	Leaves, flowers	Antispasmodic, sedative, diuretic, astringent			
ANACARDIACEAE	*Anacardium occidentale*	L.	Acaya Acayu	Bark	Diarrhea, Antispasmodic, digestive tonic, antiseptic, antiinflammatory	Amazones		
	Astronium urundeuva	(Allemano) Engl.	Aroeira, aroeira do sertao (Brazil); Cuchi, mudíudíuqui, tadíe (Bolivia).	Bark, resin	Diarrhea, gastric ulcers, fractures, trauma, vaginal bleeding		Tropical America	
	Rhus toxicodendron	L.	Zumaque Venenoso	Leaves	Rheumatic diathesis, typhus fever, skin swelling and scorching			
	Spondias mombin	L.	Cedrillo	Bark	Astringent, antiseptic, vulnerary, antiinflammatory, antispasmodic			
APIACEAE	*Anethum graveolens*	Loes	Eneldo	Seeds	Antiflatulence, antispamodic, carminative, galactogogue, antihemorroidal			
	Apium graveolens	L.	Apio	Seed	Pneumonia, lungs, blood purifier, venereal diseases, women sterility, antiseptic, antiinflammatory, mild diuretic	Inter-andean valleys		
	Conium sp.		Cicuta Oficial	Whole plant	Pernicious effects of celibacy, poison			
	Coriandrum sativum	L.	Culantro - Cilantro	Fruits	Hypnotic, aromatic, carminative			
	Daucus carota	L.	Zanahoria	Aerial part	Mild diuretic, source of vitamin A			
	Ferula assa-foetida	L.	Goma asafetida	Roots, rhizome	Ingredient of sauces, CNS stimulant, veterinary use, nervous hysteric conditions			
	Foeniculum officinale	All.	Hinojo – anís dulce	Roots, fruits	Antiflatulence, antispasmodic, carminative, diuretic, galactogogue,			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
					stomachic			
	Petroselinum crispum	(Mill.) Nyman	Perejil	Roots, aerial parts	Antispasmodic, antiflatulence, halitosis			
	Pimpinella anisum	L.	Anis	Fruits	Flavouring agent, carminative, source of mevalonic acid for synthesis of Tamiflu (bird flu virus medication)			
APOCYNACEAE	*Aspidosperma sp.*		Quebracho	Stems	Asthma			
	Tabernaemontana rimulosa	Woodson ex R.E. Schult.	Sanano	Leaves, bark, roots	Febrifuge, emetic, diuretic, antiinflammatory, antiseptic			
ARACEAE	*Amorphophallus konjac*	K.Koch	Glucomanan	Whole plant				
ARALIACEAE	*Eleutherococcus senticosus*	(Rupr. & Maxim.) Maxim.	Ginseng siberiano	Roots, rhizome	Adaptogen, immunomodulator			
	Panax ginseng	C.A.Mey.	Ginseng koreano	Roots	Adaptogen, stimulant, tonic			
ARECACEAE	*Euterpe oleracea*	Mart.	Arrayan	Leaves	Antiinflammatory			
	Oenocarpus bataua	Mart.	Majo	Fruits, roots	Stimulant, antiinflammatory, tonic			
	Serenoa repens	(W. Bartram) Small	Sabal Serrulata	Fruits	Antiinflammatory for urinary tract, benign prostata hyperplasy			
ASCLEPIADACEAE	*Gonolobus condurango*							
ASTERACEAE	*Abrotanum sp.*		Abrotanum	Leaves	Digestive disorders, antiinflammatory			
	Achillea millefolium	L.	Milenrama	Aerial parts, flowers	Antispasmodic, antiinflammatory, carminative, digestive stimulant			
	Achyrocline satureioides	(Lam.) DC.	Macela do campo (Brazil), Mirabira, suso, vira-vira, wira-wira, yatey-caa, yerba de chivo (Bolivia), Birabira, marcela (Uruguay	Whole plant, aerial part, flowers	Expectorant, antiviral		Uruguay, Brazil, Argentina.	
	Arctium lappa	L.	Raíz de lappa	Roots	Mild diuretic, depurative			
	Arctostaphylos uva-ursi	(L.) Spreng.	Uva ursi (gayuba)	Leaves	Antiseptic			
	Arnica montana	L.	Arnica	Flowers	Treatment of wounds and contusions			
	Artemisia absinthium	L.	Ajenjo	Flowers & leaves	Stomachaches, to improve memory, intestinal parasites, cicatrization of wounds, headaches, appetite stimulant, eupeptic	High valleys (3600m)		
	Baccharis genistelloides	(Lam.) Pers.	Carqueja	Leaves	Diuretic			
	Baccharis paniculata	DC.	Carqueja	Leaves	Diuretic			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
	Baccharis trinervis	(Lam.) Pers.	Carqueja	Leaves	Diuretic			
	Calendula officinalis	L.	Calendula	Flowers	Wound healing			
	Carduus mariae	Crantz	Cardo Mariano	Fruits	Hepatoprotector, antidiarrhoeic			
	Chamaemelum nobile	(L.) All.	Chamonilla romana	Flowers	Aromatic, bitter, spasmolytic, mild sedative			
	Chamomilla recutita	(L.) Rauschert	Manzanilla - Camomilia, matricaria flor	Flowers	Antiinflammatory, antispasmodic, mild sedative			
	Cnicus benedictus L.	L.	Cnicus	Aerial parts	Bitter, carminative, antidiarrhoeic			
	Culcitium canescens	Bonpl.						
	Cynara scolymus L.	L.	Alcachofa	Leaves, fruits	Liver diseases, diuretic, scorbutic, choleretic-cholagogue	Warm inter-andean valleys (2500m)		
	Echinacea angustifolia	DC.	Echinacea	Rhizome, roots	Immunostimulant, antiinflammatory			
	Epicus benedictus	L.	Fucus	Leaves, aerial parts	Antiinflammatory, migrane			
	Grindelia robusta Nutt.	Nutt.	Grindelia	Whole plant				
	Helianthus annus	L.	Girasol	Oil plant	Halitosis			
	Inula helenium	L.	Inula	Roots, rhizomes	Expectorant, antitussive, antihelminthic			
	Lactuca sativa	L.	Lechuga	Leaves in flowering stage	Hypnotic			
	Lactuca virosa	L.	Lactuca (lechuga salvaje)	Leaves	Antitussive, mild sedative			
	Taraxacum dens-leonis	Desf.	Diente de León	Leaves, roots	Diuretic			
	Taraxacum officinale	Weber ex F.H. Wigg.	Hoja taraxacum, raíz taraxacum	Leaves, roots, rhizomes	Diuretic, bitter, cholagogue, gentle laxative, choleretic			
	Tussilago sp.		Yerba de los Tiñosos	Whole plant	Acute blenorrhagia			
	Xanthium spinosum	L.	Amor seco	Fruits, leaves, roots	Tooth aches, throat anti-inflammatory, liver affections	High valleys (3700m)		
BERBERIDACEAE	*Berberis vulgaris*	L.	Agracillo	Fresh root bark	Fever, typhus, diuretic	Yungas region (2200m)		
	Podophyllum peltatum	L.	Podofila	Rhizomes, Roots	Laxative, cathartic, caustic			
BIGNONIACEAE	*Jacaranda copaia*	(Aubl.) D. Don	Cheperequi	Bark, leaves	Wound Healing, antidiarrheic, antiinfective, desinfectant			
	Jacaranda mimosifolia	D.Don	Cheperequi	Bark, leaves	Syphilis, diaphoretic, emetic, anticonceptive			
	Tanaecium nocturnum	(Barb. Rodr.) Bureau & K. Schum.	Bihua junu	Leaves, stems	Urticaria, hallucinogen, skin eruptions, migraine, wound healing, migraine, dysentery, bloody diarrhea, antiparasitic		Central America, Amazones of Brazil, Noreast Colombia	
BIXACEAE	*Bixa orellana*	L.	Achiote	Seeds	Antinflammatory			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
BORAGINACEAE	*Borago officinalis*	L.	Borraja	Flowers, leaves	Expectorant			
	Symphytum officinale	L.	Consuela	Roots, rhizomes	Vulnerary, demulcent			
BRASSICACEAE	*Brassica oigraelae*		Col	Leaves	Antiflatulence			
	Capsella bursa-pastoris	(L.) Medik.	Bolsa bolsa	Leaves	Antihemorragic			
BURSERACEAE	*Commiphora molmol*	Engl. ex Tschirch	Myrra	Sap	Astringent, antiseptic, antiinflammatory			
	Protium glabrescens	Swart	Copal del monte, Yarita	Resin of bark	Headache (inhalation), bond pain and reumathism (topical application)		México to Southern Brazil	
CACTACEAE	*Cactus grandiflorus L.*	L.	Cereus abre de noche	Young stems, flowers	Muscular relaxant			
	Opuntia ficus-indica	(L.) Mill.	Nopal	Leaves, fruit, flowers	Diuretic, laxative			
CAMPANULACEAE	*Lobelia inflata*	L.	Tabaco de la India	Aerial parts	Spasmolytic, expectorant, emetic, respiratory stimulant			
CANNABACEAE	*Humulus lupulus*	L.	Lupulus	Flowers	Sedative, hypnotic, spasmolytic, aromatic bitter			
CAPRIFOLIACEAE	*Sambucus nigra*	L.	Sambucus - Sauco	Flowers, fruits	Diaphoretic, diuretic, expectorant, cold, febrifuge			
CARICACEAE	*Carica papaya*	L.	Papaya	Fruits	Anticoagulant, digestive, vermifuge, pancreatic enzymes producer			
	Jacaratia spinosa	(Aubl.) A. DC.	Capaloi, gargatea, pajajaja; papaguillo; papaya del monte; papayllo	Bark, roots	Lower back pain, fever, appendicitis, liver inflammation, gall bladder, stomach and abdominal pains, antiemetic		Northern Argentina to Central America, West of Ecuador, Panama, Costa Rica, Nicaragua, southeast Brazil	
CELASTRACEAE	*Euonymus atropurpureus*	Jacq.	Euonymus	Roots	Laxative, cholagogue, mild cardiotonic			
CHENOPODIACEAE	*Chenopodium ambrosioides*	L.	Limoncillo, paico	Leaves	Antiflatulence, anthelmintic			
CLUSIACEAE	*Garcinia hanburyi*	Hook.f.	Gambogia (gomo resina, guta) - Garcinia	Sap	Purgative			
	Garcinia morella	Desr.			Purgative			
	Hypericum elatum	Aiton	Hipericum	Flowers, seeds	Insect bites, stomachache			
	Hypericum perforatum	L.	Yerba de San Juan (Hiperico)	Whole plant	Mild antidepressive, menopausic neurosis, diuretic			
COMPOSITAE (ASTERACEAE)	*Tessaria integrifolia*	Ruiz & Pav.	Bobo, cahuara, pájaro loco, pajajobobo (Bolivia), Callacaso (Peru)	Whole plant, leaves	Asthma, diuretic, liver disease, kidney and gallbladder stones, hepatitis, renal failure, diuretic, coughs, skin ulcers, snakebites		Tropical and subtropical South America	
CRASSULACEAE	*Kalanchöe pinnata*	(Lam.) Pers.	Nadhudhu, Fortuna, Linaza, Eina pamu (Bolivia)	Leaves	Headache, fever, inflammation, ear pain, otitis, paperas		Tropical and subtropical countries	

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
	Sedum acre	L.	Pam pajarito	Leaves	Wound healing			
CUCURBITACEAE	*Bryonia alba*	L.	Brionia Vera	Roots	Antiinflammatory, antiemetic			
	Citrullus colocynthis	(L.) Schrad.	Naranja (fenchona)	Whole plant	Hypnotic, carminative			
CUPRESSACEAE	*Juniperus communis*	L.	Enebro	Whole plant	Diuretic, rheumatism			
	Thuja occidentalis	L.	Arbol de la Vida	Leaves	Skin infections, genitourinary affections			
DROSERACEAE	*Drosera longifolia*	L.	Drosera	Leaves, Flowers	Antitussive			
EQUISETACEAE	*Equisetum arvense*	L.	Cola de caballo	Spores	Mild stimulant			
ERICACEAE	*Kalmia sp.*		Laurel de la montaña	Leaves	Antirrheumatic, gout pains			
	Ledum palustre	L.	Rosa Marina	Fresh plant	Diathesis, gout			
	Rhododendron sp.		Rosa de Siberia	Leaves	Chronic rheumatism, gout			
ERYTHROXYLACEAE	*Erythroxylum coca*	Lam.	Coca	Leaves	Analgesic, stimulant and digestive, local anesthetic			
EUPHORBIACEAE	*Croton lechleri*	Mull. Arg.	Sangre de draco	Sap	Wound healing, antiinflammatory, antiviral, vulnerary			
	Jatropha curcas	L.	Pinon	Leaves, seeds	Emetic, vermifuge, strong purgative, rubesfacient, antiinflammatory, toxic plant			
	Pera benensis	Rusby	Apainichij, apainiki	Bark	Leishmaniasis		Tropical America	
FABACEAE	*Astragalus spp*		Astragalus	Fruits, Leaves, flowers	Sweating, abortion, skin infections, rheumatism, Bboken bones, insecticide, soap for washing, allergies, thread-worms, dandruff	High plateau (3900m)		
	Cassia fistuloides	Collad.	Ramillo	Seeds	Laxative			
	Dipteryx odorata	(Aubl.) Willd.	Almendro	Seeds	Antiseptic, skin infections, antiinflammatory, antiseptic	Amazones		
	Glycine hispida	Maxim.	Soja (Lecitina)	Whole plant	Inferior extremities' arthrosis			
	Glycyrrhiza glabra	L.	Raíz de licorice (Regalis)	Roots, stolons	Antiinflammatory, spasmolytic, expectorant, demulcent, adrenocorticotropic effect			
	Hymenaea courbaril	L.	Paquio	Bark, fruit	Vermifuge,antiseptic, antiinflammatory, antispasmodic, wound healing			
	Medicago sativa	L.	Alfalfa	Flowers & leaves	Haemostatic, liver affections, antiseptic	High valleys (3600m)		
	Myroxylon balsamum	(L.) Harms	Tolú	Fruit	Hypnotic agent, expectorant			
	Piscidia piscipula	(L.) Sarg.	Piscidia	Seeds, root bark	Sedative, antitussive, spasmolytic, antiinflammatory			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
	Psoralea mutisii	Kunth	Willa-wallikhaya	Leaves, flowers	Digestive sedant			
	Rhynchosia pyramidalis	(Lam.) Urb.	Raíces amargas (Orosus)	Leaves, flowers, roots	Febrifuge, digestive			
	Senna alexandrina	Mill.	Cassia, Sen	Whole plant, fruit	Laxative			
	Senna alexandrina	Mill.	Cassia	Whole plant	Laxative			
	Sophora japonica L.	L.	Sofora	Leaves, flowers	Antihemorrhagic			
	Tamarindus indica	L.	Tamarindo	Seeds, fruits	Laxative, hepatoprotector			
	Trifolium pratense	L.	Flor de clavo rojo	Flowers	Dermatologic agent, mild antispasmodic, expectorant			
FAGACEAE	*Quercus stenophylla*	Makino	Quercus	Bark	Antidiarrheic, diuretic, antipyretic, urolithiasis			
GENTIANACEAE	*Gentiana lutea*	L.	Genciana	roots	Bitter, digestive stimulant, hemostatic, antiinflammatory, wound healing			
GERANIACEAE	*Erodium cicutarium*	(L.) L'Hér. ex Aiton	Aguja Aguja	Flowers & leaves	Fever, antiseptic, venereal diseases, antiinflammatory, food supplement	High plateau in La Paz		
GINKGOACEAE	*Ginkgo biloba*	L.	Gynkgo biloba	Leaves	Antioxidant			
HAMAMELIDACEAE	*Hamamelis virginiana*	L.	Hamamelis	Leaves	Cosmetic astringent, antiinflammatory, action on veins			
HIPPOCASTANACEAE	*Aesculus hippocastanum*	L.	Castaña de Indias	Seeds	Antiinflammatory, antiedema, vasoconstrictor			
HIPPOCRATACEAE	*Salacia impressifolia*	(Miers) A. C. Smith	Chuchuhuasu, guapomo, panu	bark, roots	Rheumatism, colds, impotence, kidney pain, fever, bruises, foruncles, trauma, body tonic		From Panama to the Caribbean then to Southern Brazil	
ICACINACEAE	*Leretia cordata*	Vell.	Curarina, doctorina	Roots	Snakebite, purgative, emetic		Peru, Colombia, Guyanas, Brazil	
IRIDACEAE	*Iris versicolor*	L.	Bandera morada	Rhizome	Somniferous, emetic, yellow fever	High valleys (3700m)		
JUGLANDACEAE	*Juglans cinerea*	L.	Nogal blanco	Leaves	Antidiarrhoeic			
KRAMERIACEAE	*Krameria triandra*	Ruiz & Pav.	Raíz de ratania	Roots	Astringent, antidiarrheic, antimicrobial			
LAMIACEAE	*Glechoma hederacea*	L.	Ground Ivy	Aerial parts				
	Hyptis mutabilis	(Rich.) Briq.	Albahaca	Leaves	Fever, Skin wounds, antiseptic, antiinflammatory, antiespasmodic, antiflatulence, febrifuge	Amazones		
	Hyssopus officinalis	L.	Hisopo	Leaves, flowers	Expectorant, antiseptic			
	Lavandula spicata	L.	Lavandula, Lavanda Espliego	Whole plant	Aromatic			
	Lavandula vera	DC.			Aromatic			
	Leonurus cardiaca	L.	Leonorus	Aerial part	Sedative, hypotenssive,			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
					cardiotonic			
	Marrubium vulgare	L.	Marrubio	Leaves, fruits	Expectorant, bitter tonic			
	Melissa officinalis	L.	Toronjil, Melissa	Stems, leaves	Sedative, choleretic, antispasmodic			
	Mentha piperita L.	L.	Menta (mentol-mentona)	Leaves	Antispasmodic, antiflatulence, choleretic, halitosis			
	Mentha spicata L.	L.	Yerbabuena	Stems, leaves	Antiflatulence			
	Ocimum basilicum	L.	Albahaca	Leaves	Fever, general body discomfort, tonic, antiseptic, antiinflammatory, antispasmodic, antiflatulence, febrifuge	Amazones		
	Origanum majorana	L.	Mejorana	Leaves, flowers	Antispasmodic			
	Origanum vulgare	L.	Mejorana	Leaves, flowers	Antispasmodic			
	Rosmarinus officinalis	L.	Romero	Leaves, flowers	Antispasmodic, carminative			
	Salvia officinalis	L.	Salvia	Leaves	Digestive, antiflatulence, oral hygiene			
	Thymus vulgaris	L.	Tomillo	Whole plant	Digestive, vagolytic, carminative, rheumatism			
LAURACEAE	*Aniba canelilla*	(Kunth) Mez	Canelón, canelón colorado, casca preciosa, preciosa, yuruma	Bark, leaves	Analgesic, antirrheumatic, gastric stimulant, sedative, elimination of residual blood after delivery, regulator of physiological functions in newly borns			
	Aniba duckei	Kosterm.	Palo de rosa	Stem wood, leaves	Analgesic, antirrheumatic			
	Cinnamomum camphora	(L.) J. Presl	Alcanfor	Leaves	Expectorant, migraine, toothache, asthma, antipruritic, antiinfective	Occidental planes Department of Santa Cruz		
	Cinnamomum zeylanicum	Blume	Canela	Bark	Antiespasmodic, antiflatulence			
	Persea americana	Mill.	Palta (palto, aguacate)	Bark, fruit, leaves	Diuretic, aphrodisiac, astringent			
LEGUMINOSAE (FABACEAE)	*Dipteryx odorata*	(Aubl.) Willd.	Almendrillo, mahui (Bolivia), Cumaru, tonea, tonka, tonka bean (Brazil), Charpilla del murciélago, sarrapia, shihuaco (Venezuela)	Seeds, stems, bark	Emmenagogue, otitis, fever, energizing bath, snakebite, rheumatism, coughs		Guyanas, Brazil, Peru	
	Erythrina dominguezii	Hassl.	Epagalate (Argentina), Cacho de gallo, cosorio, cuatírui, iba aquí, iba schascha	Bark	Coughs, hemorrhages, wound healing, hematomas			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
LILIACEAE	*Allium sativum*	L.	Ajo	Bulb	Herpes, skin infections, toothaches, intestinal parasites, poisonous insects bites, skin fungi, colds, hypotensive, triglycerid	Inter-andean valleys		
	Aloe ferox Mill.	Mill.	Aloe	Leaves	Cicatrization, migraines, purging, toothaches, coughs, laxative	Found between 2400 y 3500m above sea level		
	Aloe vera	(L.) Burm. f.	Aloe vera	Leaves	Laxative, emollient for burns			
	Chamaelirium luteum	A.Gray	Unicornio falso	Roots, rhizomes	Uterinetonic, emmenagogue			
	Colchicum spp		Azafrán de los prados	Fresh bulbs	Antiinflammatory			
	Convallaria majalis	L.	Covalaria	Leaves	Cardiotonic			
	Drimia indica	(Roxb.) Jessop	Urginea	Bulbs	Expectorant			
	Drimia maritima	(L.) Stearn	Squill blanco	Bulbs	Expectorant			
LINACEAE	*Linum usitatissimum L.*	L.	Lino (Linaza)	Seeds	Antidiarrhoeic, antispamolitic			
LOGANIACEAE	*Gelsemium sp.*		Jazmín Silvestre	Roots	Hysteria, neurasthenia			
	Ignatia amara	L.f.	Habas de San Ignacio, Semilla de San Ignacio	Seeds	Hysteria, neurasthenia, analgesic, colds			
	Strychnos nux-vomica	L.	Nuez vomica	Seeds	Gastritis, antiflatulence, dyspepsia			
LYCOPODIACEAE	*Lycopodium sp.*		Pie de lobo	Spores	Urinary and hepatic affections			
MAGNOLIACEAE	*Illicium anisatum L.*	L.	Anís estrella	Fruit	Antiflatulence, antiespasmodic, digestive stimulant, galactogogue			
	Illicium verum	Hook. f.	Badiana (anetol)	Fruit	Antiespasmodic			
MALVACEAE	*Althaea officinalis*	L.	Raíz de altea	Roots	Demulcent, emollient			
	Malva sylvestris	L.	Raíz de altea	Roots	Demulcent, emollient			
MELIACEAE	*Cedrela fissilis*	Vell.	Cedro, cedro blanco, cuabadíu	Bark	Urinary astringent, abortive, diarrhea, fever, bleeding, postpartum hemorrhage, scabies, hematomas		Tropical America from México to Argentina	
	Cedrela odorata	L.	Cedro	Bark	Astringent, analgesic, febrifugue, emetic			
	Guarea guidonia	(L) Sleumer	Buinapaqui, huapi, huapisillo, trompillo de monte (Bolivia), Canjarana (Brazil), Cocillana	Fruit peel, bark, seeds	Diarrhea, stomach-cramps, intestinal parasitosis, fever, abortion, rheumatism, expectorant, emetic in large dosis		The Antilles (Cuba), Costa Rica and Panama in America Central to tropical region in South America including Paraguay Northern A	
MENISPERMACEAE	*Jateorhiza palmata*	Miers	Raíz de colombo	Roots	Dyspepsia			
MENYANTHACEAE	*Menyanthes trifoliata*	L.	Meniantes	Leaves	Laxative			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
MONIMIACEAE	*Boldoa fragrans*	(Pers.) Endl.	Boldo	Leaves	Digestive			
	Peumus boldus	Molina	Boldo	Leaves	Digestive			
MORACEAE	*Brosimum alicastrum*	Sw.	Murure	Sap, bark, fruit	Antiasthmatic, antirrheumatic, tonic, aphrodisiac			
	Ficus anthelminthica	Rich.	Bibosi	Sap, latex	Anthelmintic, purgative, stimulant, caustic			
MORACEAE	*Pseudolmedia laevis*	(Ruiz & Pav.) J.F. Macbride	Inaubú, nui, ojoso colorado, palo pichi, pamma	Latex	Insect bites		Tropical America, north, south and East of Andes mountain system	
MYRISTICACEAE	*Myristica fragrans*	Houtt.	Nuez moscada	Seeds	Hypnotic, antidiarrhoeic, carminative, antispasmodic			
	Otoba parvifolia	(Markgraf) A.H Gentry	Aguanillo, cumala colorada, gabu, mamilla, naiqui, sangre toro, turu sha ami	Resin of bark	Scabies, mycosis, insect bites, cold, reumathism, skin infections		Brazil, Colombia, Ecuador, Guyanas, Peru, Venezuela.	
MYRTACEAE	*Eucalyptus globulus*	Labill.	Eucalipto	Leaves, bark	Coughs, colds, asthma, fever			
	Eugenia caryophyllus	Bull. & Harr.	Clavo de olor (eugenol)	Young flowers	Hypnotic, carminative, local anesthetic			
	Myrteola microphylla	O. Berg	Arrayan	Leaves	Antiinflammatory			
	Psidium guajava	L.	Guayabo	Leaves, young sprout, bark	Diarrhea			
	Syzygium aromaticum	(L.) Merr. & (L.M. Perry	Eugenol	Whole plant	Local anesthesic			
OLEACEAE	*Olea europaea L.*	L.	Olivo	Fruit, leaves	Obesity, diuretic, vasodilatator, hypotensive, mouth wash			
PAPAVERACEAE	*Chelidonium sp.*		Hierba de la Golondrina	Whole plant	Liver and gastric affections			
	Fumaria officinalis	L.	Fumaria	Aerial parts	Smooth muscle relaxant, diuretic, laxative, choleretic			
	Sanguinaria	L.	Raíz roja	Fresh rhizomes	Headache, pulmonar congestion, pneumonia			
PASSIFLORACEAE	*Passiflora edulis*	L.	Maracuja	Leaves, fruits	Sedative, antispasmodic			
	Passiflora incarnata	L.	Passiflora	Aerial parts	Sedative, ansiolytic, antispasmodic			
PEDALIACEAE	*Harpagophytum procumbens*	D.C.	Harpago	Stems	Antiinflammatory, analgesic, digestive stimulant			
PHYTOLACCACEAE	*Phytolacca dioica*	L.	Yerba Carmín	Roots	Obesity, rheumatism			
PINACEAE	*Pinus palustris*	Mill.	Trementina, Pino	Plant extract	Analgesic, antirrheumatic, disinfectant, deodorant			
	Pinus sp.		Pineno, canfeno, borneol	Whole plant	Diuretic, antispasmodic			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
PIPERACEAE	*Piper peltatum*	L.	Fey a, fey a ke, hoja santamaría, ibabi ina, ke, piquina, richi ina, santamaría, sipu sipu, ugudi bagasu	Leaves, aerial parts	Skin ulcers, liver problems, antiinflammatory, appetite stimulant, indigestion, fever, childbirth, anticonceptive, stomachaches		Mexico, Central America, Antilles, South america	
PLANTAGINACEAE	*Plantago major*	L.	Llanten	Leaves	Wound healing, antiinflammatory			
	Plantago ovata	Forssk.	Ispaghula Husk – Psyllium Husk	Whole plant, seeds	Laxative, antidiarrhoeic			
POACEAE	*Avena sativa*	L.	Avena	Flowers, leaves, seeds	Adjuvant in the treatment of symptomatic relief of aching joints			
	Cina sp.		Semen cina, semen santo	Whole plant	Antihelminthic			
	Cymbopogon citratus	(DC.) Stapf	Limoncillo	Leaves	Antiflatulence			
	Hordeum vulgare	L.	Cebada	Seed extract	Laxative			
	Triticum aestivum	L.	Trigo (Salvado de Trigo)	Seeds	Constipation			
	Zea mays	L.	Seda de maiz	Stamens, pistil	Mild diuretic, demulcent			
POLYGALACEAE	*Polygala senega L.*	L.	Seneca	Roots	Expectorant, emetic in large dosis			
	Senega officinalis	Spach	Poligala de Virginia	Roots	Chronical bronchitis, antiinflammatory			
POLYGONACEAE	*Fagopyrum esculentum*	Moench	Trigo Sarraceno	Flowers	Capillary fragility			
	Rheum palmatum	L.	Ruibarbo	Underground plant parts	Laxative, astringent			
	Triplaris americana	L.	Tangarana (Peru), anani pai, palo diablo, palo santo,	Bark	Hemilthiasis, ulcers, leishmaniasis		from Panama to Peru, Southeastern Brazil	
PORTULACACEAE	*Portulaca oleracea*	L.	Verdolaga	Leaves	Tonic and food			
RANUNCULACEAE	*Aconitum napellus*	L.	Aconito napelo	Whole plant	Antipyretic, antiinflammatory, diaphoretic, diuretic			
	Cimicifuga racemosa	(L.) Nutt.	Cimicifuga	Roots, rhizomes	Antirrheumatic, emmenagogue			
	Hydrastis canadensis	L.	Hydrastis	Rhizomes	Antihemorrhagic, antimicrobial, choleretic			
	Paeonia sp.		Rosa Benedicta	roots	Anal and rectal ulcers			
	Pulsatilla pratensis	(L.) Mil(L.	Pulsatillae herba	Aerial parts	Antispasmodic, sedative, CNS depressant			
	Ranunculus sp.		Centella asiatica	Whole plant	Cellulitis			
RHAMNACEAE	*Frangula purshiana*	Cooper	Cascara sagrada	Bark	Laxative, increases peristaltic movement and restores intestinal tonicity			
	Rhamnus frangula	L.	Cascara sagrada	Bark	Laxative, increases peristaltic movement and restores intestinal tonicity			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
	Rhamnus purshiana	DC.			Laxative			
	Ziziphus mistol	Griseb.	Yuai	Bark, leaves	Disinfectant, diarrhea			
ROSACEAE	*Amarus cerasus*		Cereza	Fruit peduncle	Digestive, antiinflammatory			
	Crataegus oxyacantha	L.	Espino albar	Leaves	Cardiotonic, sedative, hypnotic			
	Filipendula ulmaria	Maxim.	Filipendula/rosácea	Aerial part	Antiinflammatory, diuretic, stomachic, astringent			
	Fragaria chiloensis	(L.) Duchesne	Frutilla	Fruits	Billiary antiinflammatory, food supplement			
	Malus pumila	Mill.	Manzana	Fruit	Anemia, obesity, sedative			
	Prunus amygdalus	Stokes	Almendra	Fruit (oil)	Emollient			
	Prunus avium	(L.) L.	Almendra, cerezo	Fruit (oil), Fruit peduncle	Emollient, diuretic			
	Pygeum africanum	Hook. f.	Pygeum Africanum	Bark	Antiinflammatory			
	Rosa		Rosas	Flowers	Aromatic			
	Rosa canina	L.		Flowers				
	Spiraea ulmaria	L.	Reina de los prados	Flowers	Diuretic			
RUBIACEAE	*Calycophyllum spruceanum*	(Benth.) Hook. f. ex K. Schum.	Guayabochi	Bark				
	Cinchona calisaya	Wedd.	Quina	Bark	Febrifuge, antidiarrhoeic, tonic, eupeptic, antimalarial, cardiac antiarrhytmic			
	Cinchona succirubra	Pav.	Quina	Bark	Febrifuge, antidiarrhoeic, tonic, eupeptic, antimalarial, cardiac antiarrhytmic			
	Coffea arabica	L.	Café	Fruits	Stimulant, vasodilatator			
	Genipa americana	L.	Nané	Bark, fruit	Diuretic, stimulant, antidiarrhoeic, vulnerary			
	Psychotria ipecacuanha	(Brot.) Stokes	Ipeca	Bulb	Expectorant, emetic, antiamoebic, antidiarrhoeic, migraine			
	Uncaria gambier	Roxb.	Catechu	Leaves	Cosmetic, astringent, antiinflammatory			
	Uncaria guianensis	(Aubl.) J.F. Gmel.	Uña de gato, ontaepome, eigahuen, cashahuasca (Quichua), eigahuen (Huaorani), mulupo pashca, ontaepome, soga espinosa, uña de gato (Ecuador), gara	Stems, bark	Coughs, colds, stomachic, antiinflammatory, antitumoral, rheumatism, prostate cancer, anticonceptive, prostate cancer, arthritis, diabetes, cirrhosis, bond diseases, conjuntivitis, gastric ulcers		Bolivia, Colombia, Peru, Suriname, Venezuela, Guyana	Wild

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
	Uncaria tomentosa	(Willd. ex Roem. & Schult.) DC.	Uña de gato	Roots	Antinflammatory, anticonceptive, anticancer			
RUTACEAE	*Barosma crenulata*	Hook.	Buchu (Agatosma)	Leaves	Urinary antiseptic, diuretic			
	Citrus aurantium L.	L.	Naranja (fenchona)	Whole plant	Hypnotic, carminative			
	Citrus limonum	Risso	Limón	Bark	Hypnotic, carminative, stomachic			
	Galipea longiflora	K.Krause	Ivanta hembra	Bark	Antiparasitic, antileishmaniasis			
	Ruta graveolens	L.	Ruda	Flowers, leaves	Antiparasitic, rheumatism			
	Zanthoxylum clava-herculis	L.	Zantoxyli corteza	Bark	Diaphoretic, circulatory stimulant			
SALICACEAE	*Populus nigra*	L.	Alamo	Leaves, flowers	Digestive, hemorrhoids, lungs, diuretic, expectorant, antiseptic, antiinflammatory	High valleys (3700m)		
	Salix alba	L.	Sauce - Salix	Bark	Antiinflammatory, analgesic, antipyretic, antirrheumatic, astringent			
SAPINDACEAE	*Dodonaea L.*	L.	Chacataya	Leaves, fruits	Antiinflammatory			
	Paullinia cupana	Kunth	Guarana	Seeds	Source of caffeine, beverage industries, stimulant, dysenteria			
SCROPHULARIACEAE	*Digitalis sp.*		Digitalis	Leaves	Arrhythmias, tachycardia, cardiotonic			
	Euphrasia pratensis	Reichb.	Eufrasia	Whole plant	Acute ophthalmic disorders			
SIMAROUBACEAE	*Picrasma excelsa*	(Sw.) Planch.	Quassiae lignum	Stems	Bitter, anthelmintic			
SMILACACEAE	*Smilax ornata*	Lem.	Sarsaparrilla	Roots, rhizomes	Antiinflammatory, antirrheumatic, diuretic			
SOLANACEAE	*Atropa belladonna*	L.	Belladona	Leaves, flowers, fruits	Spasmolytic, narcotic, mydriatic, sedative			
	Capsicum annum L.	L.	Aji (Pimiento rojo)	Leaves, fruits, seeds	Throat inflammations, anti-inflammatory, anti-rheumatic, digestive, carminative, antiseptic, hemostatic, rubefacient	Cultivated at around 1700m above sea level		
	Datura stramonium L.	L.	Estramonio folio	Leaves, Fruits	Antispasmodic, antiasthmatic			
	Dulcamara flexuosa	Moench	Dulce Amargo	Stems	Bronchial flu, asthma, rheumatism			
	Hyoscyamus niger	L.	Henbano	Leaves, flowers, fruits	Antispasmodic			
	Solanum albidum	Dunal	Espino blanco	Bark, stems	Wound healing			
	Solanum sisymbrifolium	Lam.	Espino blanco	Bark, stems	Wound healing			
	Tabacum sp.		Yerba de la Reina	Leaves	Antinausea			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
STERCULIACEAE	*Cola acuminata*	(P. Beauv.) Schott & Endl.	Cola	Seeds	CNS stimulant			
	Theobroma cacao	L.	Cacao	Leaves, seeds	Astringent, cardiotonic, febrifuge, emollient, diuretic, vulnerary			
STYRACACEAE	*Styrax parallelloneurus*	Perkins	Benjui	Sap	Anthelmintic, purgative, stimulant, caustic			
THEACEAE	*Camellia sinensis*	(L.) Kuntze	Te verde, te yunnan	Leaves	Insomnia, dyspepsia			
THYMELAEACEAE	*Mezereum officinarum*	C.A.Mey.	Mezereon	Bark	Laxative, diuretic, cholagogue			
TILIACEAE	*Heliocarpus americanus*	L.	Tiliac	Whole plant	Laxative			
	Tilia platyphyllos	Scop.	Tilo	Flowers	Antispasmodic, diaphoretic, sedative, hypotensor, emolient, mild astringent			
	Triumfetta semitriloba	Jacq.	Cadilo prieto (Brazil), Cepa caballo, pega pega, rid'a rid'ay	Leaves, roots, stems	Stomachache, gastrointestinal pain, constipation, dysentery, urinary problems, fever, coughs, spontaneous abortion, child delivery, gastritis, diarrhea, uterine problems, kidney pain		Mexico to Northern Argentina	
TURNERACEAE	*Turnera diffusa*	Willd. ex Schult.	Damiana	Leaves, stamens	Stimulant, mild diuretic, gentle laxative			
ULMACEAE	*Ulmus rubra Muh*	L.	Ulmus	Bark	Demulcent, emollient			
URTICACEAE	*Urtica cerasum*		Ortiga picante	Leaves				
	Urtica dioica	L.	Ortiga mayor	Leaves	Rubefacient, diuretic			
	Urtica urens	L.	Orégano	Leaves, flowers	Antiinflammatory			
VALERIANACEAE	*Valeriana officinalis*	L.	Valeriana	Roots, rhizomes	Sedative, relaxant, spasmolytic			
VERBENACEAE	*Lippia citriodora*	(Lam.) Kunth	Cedrón – Verbena olorosa	Leaves	Antiflatulence, gastric stimulant, vagomimetic			
VIOLACEAE	*Viola odorata*	L.	Violeta	Leaves, flowers	Antitussive			
	Viola tricolor	L.	Pensamiento	Leaves, flowers	Antitussive			
VITACEAE	*Vitis vinifera*	L.	Vid	Leaves	Vasodilatator			
ZINGIBERACEAE	*Costus scaber*	Ruiz & Pav.	Budhubudhuy, caña agria (Bolivia), canagre (Peru)	Stems	Vaginal baths, stomachache, liver problems, intestinal parasites, snakebite, back pain, fever, diuretic		South America, Central America, Mexico, West India.	
	Elettaria cardamomum	Maton	Cardamomo	Seeds	Appetitive stimulant, halitosis, antiflatulence			
	Zingiber officinale	Roscoe	Jenjibre	Rhizomes	Expectorant, antiflatulence, antiemetic			
ZYGOPHYLLACEAE	*Guaiacum officinale*	L.	Goma de Guayaco	Heart wood	Stimulant, diaphoretic and alterative			

Source: García González, M. Cáceres, A. (eds) 2000. *Legislación en Iberoamérica sobre Fitofármacos y Productos Naturales.* CYTED, LEBI, A.S.A.C. PHARMA, IMSS. EU. Editorial de la Universidad de Costa Rica. San José, Costa Rica. 394 p.; Dr. Alberto Giménez. Institute of Pharmacobiology, Universidad Mayor San Andres, La Paz, Bolivia; *Personal Evaluation*.

Table 3. Inventory of already processed medicinal plants from Bolivia

Company	Product	Plant	Type of product
Asociacion de exportadores de aceites esenciales	Romerillo	*Acanthostyles buniifolius* (Hook. ex Arn.) R.M. King & H. Rob.	Cosmetics
	Muña negra	*Hedeoma mandoniana* Wedd.	Cosmetics
Asociacion de productores Multiactiva	Amaranto	*Amaranthus caudatus* L.	Food
Bolicert, Certificadora	Medicinal and aromatic plants	Not reported	Medicinal and aromatic plants
CAMPO CHICO/Chapare	Native species: Tejeyeque, Almendrillo, Verdolago, Mara	*Centrolobium ochroxylum* Rose ex Rudd (tejeyeque), *Dipteryx odorata* (Aubl.) Willd. (almendrillo) *Terminalia amazonia* (J.F. Gmel.) Exell (verdolago), *Swietenia macrophylla* King (mara)	Medicinal and aromatic plants
CANOPY BOTANICALS	Investments on enterprises developing biocommerce projects	Not reported	
CARE	Aromatic and medicinal plants and derivatives	Not reported	Medicinal and aromatic plants
CARE Programa MADIDI	Motacu oil, Cat's claw, Sangre de grado, Maca, medicinal plants	*Attalea princeps* Mart. (motacu), *Uncaria tomentosa* (Willd.) D.C. (cat´s claw), *Croton lechleri* Muell. Arg (sangre de grado), *Lepidium meyenii* Walp (maca)	Medicinal and aromatic plants
Centro de Tecnologia Agroindustrial	Plant extract and derivatives	*Schinus molle* L., *Acanthostyles buniifolius* (Hook. ex Arn.) R.M. King & H. Rob., *Eucalyptus globulus* Labill.	Medicinal and aromatic plants
	Insecticidal extract of piretro 25%	*Chrysanthemum cinerariaefolium*	Medicinal and aromatic plants
COINCOCA	Processing of medicinal plants	280 native plants	Medicinal and aromatic plants
Confederacion de Pueblos Indigenas de Boliva Unidos y Organizados (CIDOD)	Medicinal plants	Not reported	Medicinal and aromatic plants
CORACA PROTAL	Plant extract and derivatives	Not reported	Herbal medicinal products
C-PROBOL	Commercialization of products	Not reported	Herbal medicinal products
CRESPAL S.A.	Gastro Digest, elixir	*Cynara scolymus* L. (alcachofa), *Erythroxylon coca* Lam. (coca), *Mentha piperita* L. (menta), *Peumus boldus* Molina (boldo), *Pimpinella anisum* L. (anis), *Matricaria chamomilla* L. (manzanilla)	Herbal medicinal products
	Huira Huira, syrup	*Achyrocline satureioides* (Lam.) DC. (huira huira), *Thymus vulgaris* L. (tomillo), *Polygala vulgaris* L. (poligala), *Eucalyptus globulus* Labill. (eucalipto), *Cephaelis ipecacuanha* (Brot.) A. Rich. (ipecacuana)	Herbal medicinal products
	Impaltos, elixir	*Achyrocline satureioides* (Lam.) DC. (huira huira), *Eucalyptus globulus* Labill. (eucalipto), *Atropa belladonna* L. (belladona)	Herbal medicinal products
	Mentol Inhalante, solution for vaporization	*Eucalyptus globulus* Labill. (eucaliptus), *Myroxylon toluiferum* A. Rich. (tintura de tolú), Styrax benzoin Dryand. (benjui), Gomenol	Herbal medicinal products

Company	Product	Plant	Type of product
FARCOS LTDA.	Digestone, drops	*Cynara scolymus* L. (alcachofa), *Peumus boldus* Molina (boldo), *Baccharis trimera* (Less.) DC. (carqueja), *Rosmarinus officinalis* L. (romero), *Mentha piperita* L. (menta), *Lippia turbinata* Griseb. (poleo)	Herbal medicinal products
Fundacion para la Promocion e Investigacion de Productos Andinos (PROINPA)	Andean tubercule, Quinua, Amaranth, Millmi, Maca, Ajipa, Chira	*Solanum andigenum* Juz. & Bukasov (andean tubercule), *Chenopodium quinoa* Willd. (quinua), *Amaranthus caudatus* L. (amaranth,millmi), *Lepidium meyenii* Walp. (maca), *Helianthus tuberosus* L. (ajipa)	Food
Fundacion Uñatatawi	Tomillo	*Thymus vulgaris* L.	Medicinal and aromatic plants
	Agracejo	*Berberis vulgaris* L.	Medicinal and aromatic plants
	Ajedrea	*Satureja montana* L.	Medicinal and aromatic plants
	Manzanilla	*Matricaria chamomilla* L.	Medicinal and aromatic plants
	Menta	*Mentha piperita* L.	Medicinal and aromatic plants
	Mejorana	*Origanum majorana* L.	Medicinal and aromatic plants
	Mora, Zarzamora silvestre	*Rubus ulmifolius* Schott	Medicinal and aromatic plants
	Alhucema	*Lavandula vera* DC.	Medicinal and aromatic plants
	Salvia	*Salvia officinalis* L.	Medicinal and aromatic plants
	Llanten	*Plantago major L.*	Medicinal and aromatic plants
	Diente de Leon	*Taraxacum officinale* F.H. Wigg.	Medicinal and aromatic plants
	Romero	*Rosmarinus officinalis* L.	Medicinal and aromatic plants
	Albaca	*Ocimum basilicum* L.	Medicinal and aromatic plants
	Albaca del Monte	*Ocimum micranthum* Willd.	Medicinal and aromatic plants
	Ajenjo	*Artemisia absinthium* L.	Medicinal and aromatic plants
	Toronjil	*Melissa officinalis* L.	Medicinal and aromatic plants
	Toronjil del Monte	*Marrubium vulgare* L.	Medicinal and aromatic plants
	Nogal	*Juglans regia* L.	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Hierba Buena	*Mentha spicata* L.	Medicinal and aromatic plants
	Quilquiña, Huacataya	*Porophyllum ruderale* (Jacq.) Cass.	Medicinal and aromatic plants
	Kirkiña, hortalizas, medicinal plants		Food
GRUPO ALCOS	Uña de gato, nutraceuticals	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
	Maca, nutraceuticals	*Lepdium meyenii* Walp	Herbal medicinal products
	Maca Forte, tablets	*Lepdium meyenii* Walp	Herbal medicinal products
	Maca Forte, capsules 500mg	*Lepdium meyenii* Walp	Herbal medicinal products
	Maca Spirit, capsules 750mg	*Lepdium meyenii* Walp	Herbal medicinal products
	Tosalcos Balsamico, ointment	*Eucalyptus globulus* Labill. (eucaliptus), *Pinus silvestris* L. (trementina), *Cinnamomum camphora* (L.) J. Presl (alcanfor)	Herbal medicinal products
	Nutragen, capsules	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
GRUPO URIACH (URIACH OTC, S.L.)	Lipograsil, tablets	*Cynara scolymus* L., *Rhamnus purshiana* DC.	Herbal medicinal products
HAHNEMANN S.A.	Echinacea, oral drops	*Echinacea purpurea* (L.) Moench	Herbal medicinal products
	Maca, tablets 500mg	*Lepdium meyenii* Walp	Herbal medicinal products
	Saint Jhon Wort, tablets 300mg	*Hypericum perforatum* L.	Herbal medicinal products
	Saint Jhon Wort Complex, tablets	*Hypericum perforatum* L., *Valeriana officinalis* L.	Herbal medicinal products
	Sedaneurin, tablets	*Valeriana officinalis* L., *Passiflora incarnata* L.	Herbal medicinal products
	Sedativol, covered tablets	*Valeriana officinalis* L., *Passiflora incarnata* L., *Matricaria chamomilla* L.	Herbal medicinal products
	Sedativol, solution	*Valeriana officinalis* L., *Passiflora incarnata* L., *Matricaria chamomilla* L.	Herbal medicinal products
	Sedativol Forte, tablets	*Valeriana officinalis* L., *Passiflora incarnata* L., *Matricaria chamomilla* L.	Herbal medicinal products
	Siluetin, gel	*Fucus vesiculosus* L., *Centella asiatica* (L.) Urb.	Herbal medicinal products
	Siluetin, tablets	*Fucus vesiculosus* L., *Centella asiatica* (L.) Urb., *Cassia angustifolia* Vahl	Herbal medicinal products

Company	Product	Plant	Type of product
	Maca, nutraceuticals	*Lepdium meyenii* Walp	Herbal medicinal products
	Total Digest	*Chelidonium majus* L.(celidonium), *Baccharis trimera* (Less.) DC. (carqueja), *Mentha piperita* L. (menta), *Peumus boldus* Molina (boldo)	Herbal medicinal products
	Uña de gato, tablets 300mg	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
INDUSTRIAS TORRICO ANTELO (ITA)	Belladona 2,5%, plant extract	*Atropa belladonna* L.	Herbal medicinal products
Irupana Andean Organic Food	Satureja boliviana, essential oil and plant extrac	*Satureja boliviana* (Benth.) Briq.	Medicinal and aromatic plants
	Lycopodium sp., essential oil and plant extrac	*Lycopodium* sp	Medicinal and aromatic plants
	Anamu, essential oil and plant extrac	*Petiveria alliacea* L.	Medicinal and aromatic plants
	Romero, essential oil and plant extrac	*Rosmarinus officinalis* L.	Medicinal and aromatic plants
	Medicinal plants	*Chenopodium quinoa* Willd., *Amaranthus caudatus* L.	Medicinal and aromatic plants
Julio Sanjines	Stevia	*Stevia rebaudiana* (Bertoni) Bertoni	Medicinal and aromatic plants
LAB. INDUSTRIALES FARMACEUTICOS VITA S.A.	Nuevo Galactogeno, powder	*Chenopodium quinoa* Willd., *Pimpinella anisum* L.	Herbal medicinal products
LABORATORIOS ALEPH	Cosmetics, natural remedies, medicinal plants	Not reported	Cosmetics, herbal medicinal products, medicinal and aromatic plants
LABORATORIOS ALFA LTDA.	Amancay Anis, herbal teas	*Pimpinella anisum* L. (anis)	Herbal medicinal products
	Amancay Antigripal, powder for infusion	*Mentha piperita* L. (menta), *Salix alba* L. (sauce), *Sambucus nigra* L. (sauco), *Tilia cordata* Mill. (tilo)	Herbal medicinal products
	Amancay Antirreumatico, herbal teas	*Matricaria chamomilla* L. (manzanilla), *Salix alba* L. (sauce), *Pimpinella anisum* L. (anis), *Harpagophytum procumbens* (harpago)	Herbal medicinal products
	Amancay Boldo, herbal teas	*Peumus boldus* Molina (boldo)	Herbal medicinal products
	Amancay Cardiaco, herbal teas	*Convallaria majalis* L. (convalaria), *Crataegus monogyna* Jacq. (espino albar), *Tilia cordata* Mill. (tilo), *Valeriana officinalis* L. (valeriana), *Prunus avium* (L.) L. (cerezo)	Herbal medicinal products
	Amancay Carminativo, herbal teas	*Mentha piperita* L. (menta), *Pimpinella anisum* L. (anis), *Matricaria chamomilla* L. (manzanilla), *Lippia citriodora* (Lam.) Kunth (cedron), *Tilia cordata* Mill. (tilo)	Herbal medicinal products
	Amancay Circulatorio, powder for infusion	*Sophora japonica* L. (sofora), *Hamamelis virginiana* L. (hammamelis), *Mentha piperita* L. (menta)	Herbal medicinal products
	Amancay Coca, herbal teas	*Erythroxylon coca* Lam. (coca)	Herbal medicinal products

Company	Product	Plant	Type of product
	Amancay Diuretico, powder for infusion	*Arctostaphylos uva-ursi* (L.) Spreng. (gayuba), *Prunus avium* (L.) L. (cerezo), *Equisetum arvense* L. (cola de caballo)	Herbal medicinal products
	Amancay Estomacal, herbal teas	*Matricaria chamomilla* L. (manzanilla), *Mentha piperita* L. (menta), *Lippia citriodora* (Lam.) Kunth (cedron), *Tilia cordata* Mill. (tilo), *Pimpinella anisum* L. (anis)	Herbal medicinal products
	Amancay Hepatico, herbal teas	*Silybum marianum* (L.) Gaertn. (cardo mariano), *Peumus boldus* Molina (boldo), *Cynara scolymus* L. (alcachofa), *Mentha piperita* L. (menta)	Herbal medicinal products
	Amancay Laxante, herbal teas	*Cassia angustifolia* Vahl (sen), *Malva sylvestris* L. (malva), *Peumus boldus* Molina (boldo), *Matricaria chamomilla* L. (manzanilla), *Tilia cordata* Mill. (tilo), *Pimpinella anisum* L. (anis)	Herbal medicinal products
	Amancay Manzanilla, herbal teas	*Matricaria chamomilla* L. (manzanilla)	Herbal medicinal products
	Amancay Menta, herbal teas	*Mentha piperita* L. (menta)	Herbal medicinal products
	Amancay Sedante, herbal teas	*Valeriana officinalis* L (valeriana), *Tilia cordata* Mill. (tilo), *Passiflora incarnata* L. (pasiflora), *Matricaria chamomilla* L. (manzanilla), *Lippia citriodora* (Lam.) Kunth (cedron), *Pimpinella anisum* L. (anis)	Herbal medicinal products
	Amancay Triple Mate, herbal teas	*Erythroxylon coca* Lam. (coca), *Pimpinella anisum* L. (anis), *Matricaria chamomilla* L. (manzanilla)	Herbal medicinal products
LABORATORIOS DROGUERIA INTI S.A.	Mentisan N, syrup	*Salvia officinalis* L. (aceite de salvia), *Thymus vulgaris* L. (tomillo), *Cephaelis ipecacuanha* (Brot.) A. Rich. (ipecacuana), *Myroxylon toluiferum* A. Rich. (tolu)	Herbal medicinal products
	Carqueja Medica, oral drops	*Baccharis genistelloides* (Lam.) Pers. (carqueja), *Artemisia absinthium* L. (ajenjo), *Mentha piperita* L. (menta)	Herbal medicinal products
	Potente Maca, tablets 600mg	*Lepdium meyenii* Walp	Herbal medicinal products
	Potente Maca Suspension (Infantil)	*Lepdium meyenii* Walp	Herbal medicinal products
	Transpulmin, balsamo	*Cinnamomum camphora* (L.) J. Presl (alcanfor), *Eucalyptus globulus* Labill. (eucaliptol), *Mentha piperita* L. (mentol), *Salvia officinalis* L. (aceite de salvia)	Herbal medicinal products
LABORATORIOS IFARBO LTDA.	Tintura de Arnica, topic solution	*Arnica montana* L.	Herbal medicinal products
	Tintura de Valeriana, solution	*Valeriana officinalis* L	Herbal medicinal products
LABORATORIOS VALENCIA	Guirakillo, antimycotic cream, vaginal suppositories	*Solanum lorentzii* Bitter	Herbal medicinal products
	Arocarbol, plant extract	*Cynara scolymus* L. (alcachofa), *Rosmarinus officinalis* L. (romero), *Baccharis genistelloides* (Lam.) Pers. (carqueja), *Peumus boldus* Molina (boldo)	Herbal medicinal products
	Arocarbol Instantaneo, plant extract	*Cynara scolymus* L. (alcachofa), *Rosmarinus officinalis* L. (romero), *Baccharis genistelloides* (Lam.) Pers. (carqueja), *Peumus boldus* Molina (boldo)	Herbal medicinal products
LABORATORIOS VITA S.A.	Pastillas Pectorales, tablets	*Cinnamomum camphora* (L.) J. Presl (alcanfor), *Eucalyptus globulus* Labill. (eucaliptol), *Mentha piperita* L. (mentol)	Herbal medicinal products

Company	Product	Plant	Type of product
LAFAR S.A.	Guarana, capsules	*Paullinia cupana* Kunth	Herbal medicinal products
	Nutrimac, capsules	*Lepdium meyenii* Walp	Herbal medicinal products
	Uña de gato, capsules 350mg	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
	Aceite de almendras, solution, topic solution	*Prunus amygdalus* Batsch	Herbal medicinal products
Madre Tierra Amazonia		Not reported	
MALENA	Phitorelax, capsules 500mg	*Valeriana officinalis* L	Herbal medicinal products
Naturaleza S.R.L.	Fruit and herbal teas		Herbal medicinal products
	Paico, medicinal plants	*Chenopodium ambrosioides* L.	Medicinal and aromatic plants
NATUREX	Plant extract and derivatives	Not reported	Herbal medicinal products
Planeta de Luz, Eco-Spa y Clinica	Aromatheraphy, medicinal plants	Not reported	Medicinal and aromatic plants, herbal medicinal products
PLANTA MEDICA	Carqueja, plant extract	*Baccharis genistelloides* (Lam.) Pers.	Herbal medicinal products
	Uña de gato, plant extract	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
	Sangre de Grado, plant extract	*Croton lechleri* Muell. Arg	Herbal medicinal products
	Quinua, plant extract	*Chenopodium quinoa* Willd.	Herbal medicinal products
	Carqueja Medica, hydroalcoholic solution	*Baccharis genistelloides* (Lam.) Pers. (carqueja), *Artemisia absinthium* L. (ajenjo), *Mentha piperita* L. (menta)	Herbal medicinal products
	Echinacea Medica, solution	*Echinacea purpurea* (L.) Moench	Herbal medicinal products
	Manzanilla Medica, solution	Aceites volátiles, Oxido de bisabolol	Herbal medicinal products
Productos Naturales San Agustin (PRONASA)	Medicinal teas	Not reported	Herbal medicinal products
REMENTBOL		Not reported	
Servicio de Desarrollo Rural y Medio Ambiente	Willea, herbal teas	Not reported	Herbal medicinal products
	Nencia, herbal teas	*Gentiana galanderi* Hieron.	Herbal medicinal products
	Alfilerillo,	*Erodium moschatum* (L.) L'Hér. ex Aiton	Herbal medicinal

Company	Product	Plant	Type of product
	herbal teas		products
	Martin Muña, herbal teas	*Minthostachys mollis* (Kunth) Griseb.	Herbal medicinal products
	Kiswara, herbal teas	*Buddleja coriacea* Remy	Herbal medicinal products
	Cola de caballo, herbal teas	*Equisetum arvense* L.	Herbal medicinal products
	Calahuala, herbal teas	*Polypodium decumanum* Willd.	Herbal medicinal products
	Raiz de la China, herbal teas	Not reported	Herbal medicinal products
	Acedera, herbal teas	*Rumex acetosa* L.	Herbal medicinal products
	Valeriana, herbal teas	*Valeriana officinalis* L	Herbal medicinal products
Sociedad Boliviana de Medicina Tradicional (SOBOMETRA)	Ointments, syrups, infusions	Not reported	Herbal medicinal products
Tecnologico Agropecuario Canada (TAC)	Aromatic plants	Not reported	Medicinal and aromatic plants
TENATUR	Medicinal plants and teas	*Chenopodium pallidicaule* Aellen, *Amaranthus caudatus* L.	Herbal medicinal products
TERBOL S.A.(LAB.TERAPEUTICA BOLIVIANA SA)	Ginkgo biloba, capsules 400mg	*Ginkgo biloba* L.	Herbal medicinal products
	Korean Ginseng, capsules 520mg	*Panax ginseng* C.A. Mey.	Herbal medicinal products
	Noni Juice	*Morinda citrifolia* L.	Herbal medicinal products
	Soy Lecithin, capsules 1200mg	*Glycine max* (L.) Merr.	Herbal medicinal products

Source: Data was retrieved from each corresponding company's websites (Table 5).

Table 4. List of Bolivian producers by economic sector and economic location

Economic sector	Producers	Geographic location
Herbal Medical Products	CORACA PROTAL	Cochabamba
	C-PROBOL	La Paz
	CRESPAL S.A.	La Paz
	FARCOS LTDA.	Cochabamba
	Grupo Alcos	La Paz
	GRUPO URIACH (URIACH OTC, S.L.)	not reported
	HAHNEMANN S.A.	La Paz
	INDUSTRIAS TORRICO ANTELO (ITA)	
	LABORATORIOS ALFA LTDA.	La Paz
	LABORATORIOS DROGUERIA INTI S.A.	La Paz
	LABORATORIOS IFARBO LTDA.	Cochabamba
	Laboratorios Valencia	Cochabamba
	LAB. INDUSTRIALES FARMACEUTICOS VITA S.A	La Paz
	LAFAR S.A.	La Paz
	MALENA	Cochabamba
	Naturaleza S.R.L.	Cochabamba
	NATUREX	Cochabamba
	Planeta de Luz, Eco-Spa y Clinica	Cochabamba
	PLANTA MEDICA	La Paz-Coroico
	Productos Naturales San Agustin (PRONASA)	Potosi
	Servicio de Desarrollo Rural y Medio Ambiente	La Paz
	Sociedad Boliviana de Medicina Tradicional (SOBOMETRA)	La Paz
	TENATUR	Cochabamba
	TERBOL S.A.(LAB.TERAPEUTICA BOLIVIANA SA)	Santa Cruz
Perfumes and cosmetics	Asociacion de exportadores de aceites esenciales	Cochabamba
	Irupana Andean Organic Food	La Paz
	Laboratorios ALEPH	Cochabamba
	Planeta de Luz, Eco-Spa y Clinica	Cochabamba
Nutraceuticals and allies	CARE Programa MADIDI	Beni
	Centro de Tecnologia Agroindustrial	Cochabamba
	CORACA PROTAL	Cochabamba
	Grupo Alcos	La Paz
	HAHNEMANN S.A.	La Paz
	LAB. INDUSTRIALES FARMACEUTICOS VITA S.A.	La Paz
	LABORATORIOS ALFA LTDA.	La Paz
	LAFAR S.A.	La Paz
	Naturaleza	Cochabamba
	NATUREX	Cochabamba
	PLANTA MEDICA	La Paz-Coroico
	Productos Naturales San Agustin (PRONASA)	Potosi

Economic sector	Producers	Geographic location
	Servicio de Desarrollo Rural y Medio Ambiente	La Paz
	Sociedad Boliviana de Medicina Tradicional (SOBOMETRA)	La Paz
	TENATUR	Cochabamba
	TERBOL S.A.(LAB.TERAPEUTICA BOLIVIANA SA)	Santa Cruz
Pharmaceutical aids	Asociacion de productores Multiactiva	La Paz
	Bolicert, Certificadora	La Paz
	CAMPO CHICO/Chapare	Cochabamba
	CARE	La Paz
	CARE Programa MADIDI	Beni
	Centro de Tecnologia Agroindustrial	Cochabamba
	COINCOCA	Cochabamba
	Confederacion de Pueblos Indigenas de Boliva Unidos y Organizados (CIDOD)	Santa Cruz
	Fundacion para la Promocion e Investigacion de Productos Andinos (PROINPA)	La Paz
	Fundacion Uñatatawi	La Paz-Oruro
	Irupana Andean Organic Food	La Paz
	Julio Sanjines	La Paz
	Laboratorios ALEPH	Cochabamba
	Planeta de Luz, Eco-Spa y Clinica	Cochabamba
	Tecnologico Agropecuario Canada (TAC)	Cochabamba
	TENATUR	Cochabamba

Source: Analysis of Tables 3 and 5.

Table 5. List of Bolivian companies

Company	Contact	Phone	Fax	E-mail	Web	Address
Asociacion de exportadores de aceites esenciales						Cochabamba, Bolivia
Asociacion de productores Multiactiva						La Paz, Bolivia
Bolicert, Certificadora	Grover Bustillo	249-0747		bolicert@mail.megalink.com		Calle General Gonzalez No. 1314, La Paz
CAMPO CHICO/Chapare	Agustin Ferrel					Central Nuevo Chapare, Distrito 4 Villa Tunari, Cochabamba
CANOPY BOTANICALS	Mark Meador	333-7476	354-7383	bds@scbbs.com.bo	www.noelkempff.com	Casilla 2241, Santa Cruz
CARE	Jan Schollaert	249-2957	249-4342	care@carebolivia.org		Calle Heroes del Acre No. 1725 (San Pedro), La Paz
CARE Programa MADIDI	Wilfredo Peñafiel	8922394	8922395	wilpero@yahoo.com		Esquina Palacio y Mariscal Sucre, Beni
Centro de Tecnologia Agroindustrial	Eduardo Zambrano	4232548	4233648	centrote@pino.cbb.entelnet.bo		Facultad de Ciencias y Tecnologia, UMSS, Cochabamba
COINCOCA	Melvi Paz	424-4014		coincoca@supernet.com		Calle Libertad No. 2925, Zona Norte (entre Av Callapampa y Melchor Perez), Cochabamba
Confederacion de Pueblos Indigenas de Boliva Unidos y Organizados (CIDOD)	Robert Cartagena	3460714	3477050	cidobpi@roble.scz.entelnet.bo		Casilla 6135, Santa Cruz
CORACA PROTAL	Sandro Zalabria	4252421				Junin entre Santanañis, Cochabamba
C-PROBOL	Jorge Gothret	233-6886	233-6996	jgottret@ceprobol.gov.bo	www.ceprobol.gov.bo	Mariscal Ballivian, Piso 18, La Paz
CRESPAL S.A.	Raul Crespo	(591-2) 2491134	(591-2) 2488748	crespal@ibis.cnb.net	www.crespal.com	Calle Nicolas Acosta No. 784, La Paz, Bolivia

Company	Contact	Phone	Fax	E-mail	Web	Address
FARCOS LTDA.	Prudencio Velasco Orlando	4259393	4259394	argebolc@entelnet.bo		Z.Totorkahua Canton el Paso (Quillacollo), Cochabamba, Bolivia
Fundacion para la Promocion e Investigacion de Productos Andinos (PROINPA)	Victor Iriarte Sejas	241-6966	241-6966	v.iriarte@proinpalp.org		Fernando Guachulla y Abdon San Saavedra No.820, Edificio Marconi Piso 2, La Paz
Fundacion Uñatatawi	Domingo de Guzman	2333979	2333979	fundawi@ceibo.entelnte.bo		Prolongacion La Paz-Oruro, Bolivia
GRUPO ALCOS	Alberto Liendo	591-2-2223866	591-2-2222456	natural@alcos.com.bo	www.alcos.com.bo	Calle Hugo Estrada No. 87, La Paz, Bolivia
GRUPO URIACH (URIACH OTC, S.L.)						
HAHNEMANN S.A.	Ronald Gumucio	(591-2) 2415442	(591-2) 2415444	rgumucio@unete.com		Calle Pedro Salazar, No. 692, Esq. Ecuador, La Paz, Bolivia
INDUSTRIAS TORRICO ANTELO (ITA)		4254200	4254209	torricoantelo@gmail.com		Dirección Adm. Belzu Nº 174 - dirección Ind. Colombia Nº 1059
Irupana Andean Organic Food	Javier Hurtado	221-1938	221-5805	irupana@ceibo.entelnet.bo		Av. Costanera No. 36, Villa Merced, La Paz, Bolivia
Julio Sanjines						La Paz, Bolivia
LAB. INDUSTRIALES FARMACEUTICOS VITA S.A.	Kieffer Herrada Carlos/Montero	2455888-2455770 2455759-2455863	2455973	labvita@caoba.entelnet.bo		Av. Manco Kapac Nº 494, La Paz, Bolivia
LABORATORIOS ALEPH	Jaime Mendez	4501767	4501767			Calle España No. 148, Cochabamba
LABORATORIOS ALFA LTDA.	Juan Jose Ferrer	2224237/2227910	2224217	alfa@pharmalabalfa.com.bo		Plaza Uyuni No. 115, Miraflores, La Paz, Bolivia
LABORATORIOS DROGUERIA INTI S.A.	Dieter Schilling	2408282	24006540	doria@inti.com.bo	www.inti.com.bo	Calle Socabaya 142-160, La Paz, Bolivia
LABORATORIOS IFARBO LTDA.	Walter Alvarez	226001	(591-4) 255407	ifarbo@supernet.com.bo		Calle Lanza s/n, Cochabamba, Bolivia
LABORATORIOS VALENCIA	Valencia Illanes Alejandro/ Ramiro Valencia	4265641/4241968	4260265	valenr@pino.cbb.entelnet.bo		Junin 197 y Colombia, Casilla 3171, Carretera Qillocollo-Confital Km 18.5,

Company	Contact	Phone	Fax	E-mail	Web	Address
						Cochabamba, Bolivia
LABORATORIOS VITA S.A.	Ivonne Montero	2455973	2455973	labvita@caoba.entelnet.bo.		Av. Manco Kapac N° 494, La Paz, Bolivia
LAFAR S.A.	Jaime Ocampo	(591-2) 2410411	(591-2) 2227041	lafar@datacom.bo.net		Cresp No. 2213, La Paz, Bolivia
Madre Tierra Amazonia						Beni, Bolivia
MALENA	Yañez Eid, Dante Abraham	4221516-4226847	4523200	malena@supernet.com.bo		Av. Salamanca Nº 917, Cochabamba , Bolivia
Naturaleza S.R.L.	Adolfo Mier	4258775	4258775	frutte@pino.cbb.entelnet.bo		Calle 25 de mayo Nº 393, Cochabamba
NATUREX	Filiberto Ugalde	4256806	4115205	simexsrl@pino.cbb.entelnet.bo		Calle Jordan E-0382, Cochabamba
Planeta de Luz, Eco-Spa y Clinica	Luis Espinoza	4261234	4291031	saluz@albatros.cnb.net	www.planetadeluz.com	casilla 318, Cochababamba
PLANTA MEDICA	Pauki Strohmkurt Adolf	022133-6015	8116015	plantmed@mail.entelnet.bo		Apanto - Coroico Nor Yungas S/N Quinta Uchumachi, La Paz - Coroico
Productos Naturales San Agustin (PRONASA)		8139594				San Agustin, Provincia Baldivieso, Potosi
REMENTBOL	Huallpa Quinta Juan					Pastor Diaz Nº168, Santa Cruz
Servicio de Desarrollo Rural y Medio Ambiente						La Paz, Bolivia
Sociedad Boliviana de Medicina Tradicional (SOBOMETRA)	Walter Alvarez	231-3783/233-1724	79972944	alvarezkallawaya@hotmail.com		Calle Pasaje Gonzalez Nº 140 casi esq. Prolongacion Illampu, Zona de San Pedro, La Paz
Tecnologico Agropecuario Canada (TAC)	Karl Hoffmann	4134321	4134321	teccanad@pino.cbb.entelnet.bo		Av. Abecedario s/n Chimore, Cochabamba
TENATUR	Diomedes Herrera	4257715/4257716/4239930	4257717	camcom@pino.cbb.entelnet.bo		F Sabtivañez Nº 0616, Cochabamba

Company	Contact	Phone	Fax	E-mail	Web	Address
TERBOL S.A.(LAB.TERAPEUTICA BOLIVIANA SA)		3426767	3426767	terbol@terbol.com		Barrio Hamacas Calle 2 Este Nº 3205, Santa Cruz

Source: Data was retrieved from each corresponding company's websites;
Dirección de Medicamentos y Tecnología en Salud: www.sns.gov.bo;
Dr. Alberto Giménez. Institute of Pharmacobiology, Universidad Mayor San Andres, La Paz, Bolivia.

ANNEX 1

A Model Monograph

Achyrocline satureioides (Lam.) DC.
Prodromus Systematis Naturalis Regni Vegetabilis 6: 220. 1837.
FAMILIA: Compositae (Asteraceae)

FIGURA 1. ***Achyrocline satureioides*** (Lam.) DC.
Fotografía: Name to be included

SINÓNIMOS

Gnaphalium satureioides Lam.
Achyrocline candicans (Kunth) DC.
Gnaphalium candicans Kunth

NOMBRES COMUNES EN LOS PAÍSES IBEROAMERICANOS

Macela do campo (BRASIL)
Mirabira, suso, vira-vira, wira-wira, yatey-caa, yerba de chivo (BOLIVIA)
Birabira, marcela (URUGUAY), marcela hembra (URUGUAY, ARGENTINA)

DESCRIPCIÓN BOTÁNICA

Sub arbusto de hasta 80cm de altura, ramoso, erecto, cubierto de pelos cortos y lanosos que le dan una coloración blanquecina. Hojas alternas, sésiles hasta 5 cm de largo y hasta 4 mm de ancho. Produce tres a cuatro flores pistiladas marginales y una o dos flores centrales perfectas (fide HNB-LPB, 2000: pág.).

DISTRIBUCIÓN GEOGRÁFICA Y HÁBITAT

Es una planta común en los arenales, cerros, sierra y campos pedregosos. Se da en todo el Uruguay, Brasil, Bolivia y Argentina.

USOS ETNOMÉDICOS Y MODO DE EMPLEO

En Argentina la planta entera en infusión es utilizada como digestivo y antidiabético (GARCIA ET AL., 1990). En Brasil, la infusión de las partes aéreas secadas a la sombra, son utilizadas como antiespasmódico, antiinflamatorio y antibacteriano (ZANI ET AL., 1995). En Colombia se utiliza para el tratamiento de tumores(GARCIA-BARRIGA, 1975). En Paraguay se usa contra las infecciones (HIRSCHMANN, 1984) y en Venezuela es utilizada contra la diabetes (MORTON, 1974). La decocción de esta planta es también utilizada como emenagogo y para superar la impotencia. En diversos países Sudamericanos las flores son utilizadas como antiespasmódico (GONZALEZ ET AL., 1993), analgésico, antiinflamatorio (SIMOES, 1988), emenagogo, contra la diarrea, como sedativo, hipoglicemiante y en disturbios gastrointestinales(ROCHA ET AL., 1994; VARGAS ET AL., 1991).

En Argentina como tratamiento para el asma (SAGGESE, 1959). En Bolivia, las flores son utilizadas en la medicina tradicional Tacana contra la diarrea. Un puñado de flores se hacen hervir en agua, durante cinco minutos y se toma cuando se tiene sed. Esta preparación se administra también a los bebés, no es tóxica. Esta misma preparación

endulzada con miel de abeja se utiliza para el tratamiento de la tos (BOURDY ET AL., 1999).

ACTIVIDAD FARMACOLÓGICA Y BIOLÓGICA

El residuo soluble en diclorometano de los extractos hidroalcoholicos de la planta entera estudiada en Bolivia, no presenta actividad tóxica contra ***Artemia salina***, (TICONA, 1997). Extractos de plantas colectadas en Brasil (ZANI ET AL., 1995) en Uruguay (GONZALEZ ET AL., 1993) y en Paraguay (ROJAS DE ARIAS ET. AL., 1995) reportan toxicidad contra el camarón salino. La fracción de los polisacáridos obtenidos de la planta entera seca, presentan una marcada actividad inmuno estimulante (WAGNER, 1985). No se reporta actividad contra ***Neurospora crassa*** (PINAYA, 1997). Tampoco presenta actividad contra bacterias gram negativas, pero si contra ***Staphylococcus aure*****us** a la concentración de 1.0 mg/ml (PONCE, 1997). La planta entera presenta una leve actividad antioxidante (DESMACHELIER ET AL., 1997). Se ha demostrado actividad genotóxica utilizando ***Salmonella typhimurium*** y contra ***Escherichia coli*** (VARGAS, 1990). Los niveles de actividad molusquicida, contra ***Biomphalaria glabrata***, se detallan en el trabajo de DE SOUZA ET AL. (1984). Las infusiones de flores presentan actividad antiviral contra HIV (ABDEL-MALEK ET AL., 1996) y actividad citotóxica conta células KB (ARISAWA, 1994). Los extractos presentan débil actividad contra ***Trypanozoma cruzi*** (ROJAS DE ARIAS ET. AL., 1995).

TOXICIDAD Y ESTUDIOS CLÍNICOS

Las actividades de toxicidad general, analgésica, antiinflamatoria, relajante sobre músculo liso e inhibición de la motilidad intestinal, han sido determinadas en modelos in vivo *(SIMOES ET. AL., 1988), pero no se han reportado estudios clínicos.*

QUÍMICA

De la planta entera se han obtenido los polisacaridos As-3 y As-4 (PUHLMANN ET. AL., 1992); además se reportan sesquiterpenos (SENNA ET AL., 1997) y derivados de la fenilpirona; 23-metil-6-0-desmetilauricepirona e italdipirona; delta-cadineno; ácidos polifenólicos; cumarinas (HIRSCHMANN, 1984); diversos flavonoides derivados de la galangina y quercetina (BROUSSALIS ET AL., 1988; PETROVICK & KNORST, 1991). Los principales monoterpenos presentes en el aceite esencial obtenidos de las hojas son: cineol,1-8; cis β-ocimeno y *trans* β-ocimeno, α-pineno (LAMATY ET AL., 1991). De los extractos de las hojas y de las infloresencias se han identificado diversas flavonas y flavonoides (FERRARO ET AL., 1981).

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ECUADOR

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EXECUTIVE SUMMARY

This report is state of art information on different aspects of medicinal plants in the country. Sources of raw material of medicinal plants are grouped by families containing medicinal properties, geographic location and farming. Inventory of the already processed medicinal plants, identification of possible future products, list of producers by economic sector and economic location are provided

This report also provides an overview of the productive chain of medicinal and aromatic plants for herbal medicinal products, nutraceuticals, cosmetics and pharmaceutical aids. Information on companies engaged in different aspects of medicinal plants industry is provided.

It briefly describes current tendencies of the market, distribution channels, social, legal and commercialization ways of medicinal plant based products.

Based on critical evaluation and industrial potential, the most promising plants of Ecuador are *Amaranthus caudatus* L., *Amaranthus hybridus* L., *Aristeguietia glutinosa* (Lam.) R.M. King & H. Rob., *Bactris gasipaes* Kunth, *Bixa orellana* L., *Bursera graveolens* (Kunth) Triana & Planch., *Chenopodium ambrosioides* L., *Chuquiraga jussieui* J.F. Gmel., *Cinchona pubescens* (Vahl.), *Clinopodium nubigenum* (Kunth) Kuntze, *Copaifera paupera* (Herzog) Dwyer, *Croton lechleri* Mull. Arg., *Cynara scolymus* L., *Equisetum bogotense* Kunth, *Eryngium foetidum* L., *Grias neuberthii* J.F. Macbr., *Ilex guayusa* Loes, *Marsdenia*

cundurango Rchb. f., *Maytenus laveis* Reissek, *Ocotea quixos* (Lam.) Kosterm., *Oenacarpus bataua* var. *bataua* Mart., *Paullinia yoco* R.E. Schult. & Killip, *Peumus boldus* Molina, *Phlebodium aureum* (L.) J. Sm., *Phyllanthus niruri* L., *Physalis peruviana* L., *Plantago australis* Lam., *Smallanthus sonchifolius* (Poepp.) H. Rob. = *Polymnia sonchifolia* Poepp., *Smilax lundellii* Killip & C.V. Morton, *Spondias mombin* L., *Stevia rebaudiana* (Bertoni) Bertoni, *Taraxacum officinale* F.H. Wigg., *Tropaeolum tuberosum* Ruiz & Pav., *Uncaria guianensis* (Aubl.) J.F. Gmel., *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC., *Vaccinium floribundum* Kunth.

Ecuador has 62 enterprises related to several stages in the industrialization of medicinal plants in the Andean region, of which 42% are concentrated on production of herbal medicinal products, 42% on farming, collection and processing of medicinal plants. The rest of the companies are either dedicated to cosmetics or spices production. Among herbal medicinal products' industry, exploitation of the following plants was noteworthy: *Lepidium meyenii*, *Uncaria tomentosa*, *Croton lechleri*, *Aristeguietia glutinosa*, *Phyllanthus niruri*, *Cymbopogon citratus*.

It ends with a SWOT analysis and recommendations on industrialization of medicinal plants.

INTRODUCTION

Ecuador is a megadiverse country and is a global power house in terms of biodiversity and natural resources. If we consider Ecuador's status as a member of the megadiverse group and the inventory of known plant species, we can easily conclude that the country should promote the natural ingredient sector. Ecuador has 10% of the world species of plants. Of the 15,306 vascular plants in Ecuador, 4,173 (27.3%) are endemic. The country's biodiversity resources must be turned into real benefits and quality of life improvement for the general population. If the Ecuador's future is to be related to innovative products from biodiversity, then the proper identification of promising products from available information and further research is vital.

A survey of background indicators in Ecuador reveals the ten main causes of mortality in Ecuador are neoplasms, acute respiratory disease, cerebrovascular disease, hypertension, ischaemic heart diseases, traffic accidents, homicides, urinary tract diseases, intestinal infection, cirrhosis and other hepatic diseases. However, the main causes of morbidity are acute respiratory infections, diarrheal diseases and malaria.

Ecuador is in the process of formulating National policy on Traditional Complimentary and Alternative Medicine (TCAM)[8]. There is no registry of traditional medicine practitioners in Ecuador and no licensing procedure for practitioners of traditional medicine. There is no official institution in charge of regulating traditional medical practice[9]. There is, however, the National Division of Indigenous Health, which was created by a ministerial resolution

[8] WHO. 2005. *WHO Global Atlas of Traditional, Complementary and Alternative Medicine.* Text Volume. Kobe, Japan. 216 p.
[9] Supreme Decree no. 188 of 4 February 1971 embodying the health code. International digest of health legislation, 1973, 24:130.

to promote the development of traditional medicine[10]. In Ecuador, there are no specific programmes linking traditional medicine with allopathic medicine. But, with increasing interest in traditional medicine, particularly Quichua medicine, the State is focusing more attention on official linkages. Some efforts have been made to coordinate with institutions and organizations affiliated with traditional medicine in Ecuador[2].

Currently, it is estimated that only 34% of the providers of Traditional and Alternative Medicine are legally constituted and recognized, according to the data of Ministry of Health. In the majority of the cases, they have training as a technologist in alternative medicine and cosmetics.

Ecuador could develop a competitive edge, positioning itself as a reliable supplier of biodiversity based products with a system of sustainable supply chains organized around networks of small businesses or community based enterprises as long as they reach sustainable and fair trade certification and work with global quality standards.

[10] Pan American Health Organization/World Health Organization, 1999. *Report of the working group of OPS/OMS on traditional, complementary and alternative medicines and therapies*, Washington DC, 15-16 November 1999. Washington DC.

1. ABOUT THE PRODUCT

1.1. Raw material

There are about 500 known species of medicinal plants, of which 228 are registered as most used and approximately 125 of them are commercialized[11]. A complete list of 244 medicinal plants of Ecuador according to family, common names, parts used, medicinal uses, geographic location, international distribution and farming appear in Table 1. The most representative medicinal uses in decreasing order are: pain, fever and inflammation, gastrointestinal problems, respiratory tract affections and skin affections.

An analysis of Table 1 indicates that the number of species per region as follows: higland (166/68.0%); orient (22/9.0%); coast (7/2.8%); highland, coast and orient (25/10.2%); orient and highlands (22/9.0%); coast and highlands (6/2.4%); coast and orient (7/2.8%); coast, highland and Galapagos (3/1.2%); coast, highland, orient and Galapagos (3/1.2%). Morover, only 96 (39.3%)species are reported as wild, 2 endemic and 24 (9.7%) introduced. Twenty-six wild species are cultivated and 20 introduced plants are cultivated.

Based on the pharmaceutical, nutraceutical and industrial potential the most promising plants for industrialization appear in Table 2. A second edition of a book on Iberoamerican Medicinal Plants edited by Gupta (1995)[12] has 26 monographs on Ecuadorian medicinal plants written by Drs. Plutarco Naranjo and Ximena

[11] Buitrón, C.X. 1999. *Ecuador: uso y comercio de plantas medicinales, situación actual y aspectos importantes para su conservación.* TRAFFIC International. Cambridge. 101 p.

Chiriboga. This updated version of the book is currently *in press*. A model monograph is appended (Annex 1).

Table 2. The Most Promising Ecuadorian plants

Plant	**Common name**	**Medical use(s)**
Amaranthus caudatus L.	Amaranto	Food
Amaranthus hybridus L. = *Amaranthus quitensis* Kunth	Ataco/Sangorache	Blood purgative, acne, skin spots
Aristeguietia glutinosa (Lam.) R.M. King & H. Rob.	Matico	Antiinflammatory, scar healing, gastric ulcers
Bactris gasipaes Kunth	Chontaduro	Food
Bixa orellana L.	Achiote	Skin infections, vaginal antiseptic, wound healing, hepatitis
Bursera graveolens (Kunth) Triana & Planch.	Palo santo	Rheumatism, diaphoretic, expectorant, analgesic, stomachaches
	Papaya	Digestive, antiinflammatory, antiparasitic
Chenopodium ambrosioides L.	Paico	Anthelmintic
Chuquiraga jussieui J.F. Gmel.	Chuquiragua	Liver and kidney inflammation
Cinchona pubescens (Vahl.)	Cascarilla	Febrifuge, antimalarial, diarrhea, pneumonia
Clinopodium nubigenum (Kunth) Kuntze	Tipo	Cough, colds, stomachic
Copaifera paupera (Herzog) Dwyer	Copaiba	Wound healing, anti-inflammatory, throat problems, stomach ulcers
Croton lechleri Mull. Arg.	Sangre de drago	Scar healing, antimycotic,

[12] Gupta, M.P. 1995. *270 Plantas Medicinales Iberoamericanas*. 1st Ed. CYTED-Convenio Andrés Bello. Bogotá, Colombia. 617 p.

Plant	Common name	Medical use(s)
		energizer
Cynara scolymus L.	Alcachofa	Liver ailments
Equisetum bogotense Kunth	Cola de caballo/Caballo chupa	Anti-inflammatory, scars healing
Eryngium foetidum L.	Culantrillo	Headache, dry cough, skin abscesses, antidiarreic
Grias neuberthii J.F. Macbr.	Piton	Vomiting, diarrea
Ilex guayusa Loes	Guayusa	Kidney inflammation
Marsdenia cundurango Rchb. f.	Condurango	Cancer, stomach problems, vomiting, bleeding, pain
Maytenus laveis Reissek	Chuchuguaso	Rheumatism, arthritis, diarrhea, vermifuge
Ocotea quixos (Lam.) Kosterm.	Ishpingo/Canelo	Rheumatism, fever, malaria, bronchitis, snakebite
Oenacarpus bataua var. *bataua* Mart.	Ungurahua	Antiseptic, antibiotic, menstrual problems
Paullinia yoco R.E. Schult. & Killip	Yoco	Anxiety, antiparasitic, purgative, stimulant
Peumus boldus Molina	Boldo	Sedative, laxative
Phlebodium aureum (L.) J. Sm.	Calaguala	Psoriasis
Phyllanthus niruri L.	Chancapiedra	Diuretic, hypoglycemic, antiseptic, stomachic, cytostatic
Physalis peruviana L.	Uvilla	Food, diuretic, vermifuge
Plantago australis Lam.	Llanten	Antiinflammatory
Smallanthus sonchifolius (Poepp.) H. Rob. = *Polymnia sonchifolia* Poepp.	Jicama, yacuma	Food, digestive, hypoglicemic, hypocholesterolemic
Smilax lundellii Killip & C.V. Morton	Sarsaparrilla	Digestive, diuretic, depurative, diaphoretic, tonic

Plant	Common name	Medical use(s)
Spondias mombin L.	Ovo de monte	Wound healing, vaginal antiseptic, snakebites
Stevia rebaudiana (Bertoni) Bertoni	Hoja dulce	Edulcorant, cough
Taraxacum officinale F.H. Wigg.	Taraxaco	Diuretic and liver depurative
Tropaeolum tuberosum Ruiz & Pav.	Mashua	Food, anaphrodisiac, repellent
Uncaria guianensis (Aubl.) J.F. Gmel., *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Uña de gato	Antiviral, inmune system stimulant
Vaccinium floribundum Kunth	Mortiño	Food

Source: Buitrón, X., M. Argüello (Editors). 2004. *Promising Species of Ecuador for Natural Ingredients: Minutes of the First National Workshop*, 3-4 de febrero de 2005. MAE, CORPEI y EcoCiencia. Quito, Ecuador; Buitrón, X., Arguello, M. 2005. *Selección de especies promisorias nativas del Ecuador para ingrediente naturales. Una iniciativa de Biocomercio Sostenible*. EcoCiencia. Boletín de UICN. Quito, Ecuador. 3 p.; *Personal Evaluation*.

Three CYTED monographs, similar to ESCOP monographs, on *Croton lechleri, Smilax regelii, Uncaria tomentosa* are in preparation at this moment. There are monographs on *Uncaria tomentosa, Matricaria chamomilla, Valeriana officinalis, turmeric* in the US Pharmacopeia 28/National Formulary 23 (2005).

A list of native species of native species more commonly utilized and commercialized per region[4] is provided below.

Coast

Banisteriopsis caapi *(Spruce ex Griseb.) C.V. Morton*
Cinchona pubescens *Vahl*
Cordia alliodora (Ruiz & Pav.) Oken
Gossypium barbadense L.
Manihot esculenta Crantz

Marsdenia cundurango *Rchb. f.*
Psidium guajava L.
Solanum quitoense Lam.
Uncaria tomentosa (Willd. ex Roem. & Schult.) DC.
Pseudoelephantopus spicatus (B. Juss. ex Aubl.) Rohr ex Gleason
Catsetum sp.
Tillandsia usneoides (L.) L.

Higlands

Aristeguietia glutinosa (Lam.) R.M. King & H. Rob.
Banisteriopsis caapi (Spruce ex Griseb.) C.V. Morton
Brugmansia aurea Lagerh.
Cestrum peruvianum Willd. ex Roem. & Schult.
Chuquiraga jussieui J.F. Gmel.
Cinchona pubescens Vahl
Croton spp.
Espeletia pycnophylla Cuatrec.
Gossypium barbadense L.
Hesperomeles obtusifolia (Pers.) Lindl.
Juglans neotropica Diels
Lasiocephalus ovatus Schltdl.
Manihot esculenta Crantz
Marsdenia cundurango Rchb. f.
Mimosa albida Humb. & Bonpl. ex Willd.
Minthostachys mollis (Kunth) Griseb.
Oreocallis grandiflora (Lam.) R. Br.
Otholobium mexicanum (L. f.) J.W. Grimes
Piper aduncum L.
Psidium guajava L.
Sedum quitense Kunth
Senna multiglandulosa (Jacq.) H.S. Irwin & Barneby
Solanum quitoense Lam.
Uncaria tomentosa (Willd. ex Roem. & Schult.) DC.
Valeriana spp.

Amazon

Banisteriopsis caapi *(Spruce ex Griseb.) C.V. Morton*
Chlorocardium venenosum (Kosterm. & Pinkley) Rohwer, H.G. Richt. & van der Werff
Cinchona pubescens Vahl
Cordia alliodora *(Ruiz & Pav.) Oken*
Croton spp.
Gossypium barbadense L.
Juglans neotropica Diels

Manihot esculenta Crantz
Psidium guajava L.
Solanum quitoense Lam.
Uncaria guianensis (Aubl.) J.F. Gmel.
Uncaria tomentosa (Willd. ex Roem. & Schult.) DC.

Galápagos

Chenopodium ambrosioides L.
Cinchona pubescens Vahl
Gossypium barbadense L.
Plantago major L.

1.2. Products

An inventory of already processed medicinal plants is presented in Table 3. This Table shows that 26 entities are producing herbal medicinal product based basically on the following plants: *Lepidium meyenii* Walp., *Phyllanthus niruri* L., *Uncaria tomentosa* (Willd.) D.C., *Aristeguietia glutinosa* Lam (matico), *Croton lechleri* Müll. Arg., *Cymbopogon citratus* (DC.) Stapf. There are 27 groups among companies and associations dedicate their efforts on farming, recollection and processing of medicinal and aromatic plants. There are 4 companies (Arcolands, Bio Pro, Inexa S.A., renase, Fundación Familia Salesiana Salinas), which concentrate in the production of cosmetics. These products are based mainly on *Zingiber officinale* Roscoe, *Lavandula angustifolia* Mill., *Citrus aurantium* L., *Matricaria recutita* L. (manzanilla). The Industria Lojana de Especerias (ILE) and GEOACUATICA are dedicated to the production of spices such as cumin, pepper, turmeric and garlic.

Based on their pharmaceutical, nutraceutical and industrial potential, future possible products based on promising medicinal plants are shown in Table 4. Companies such as Chankuap, Jambi Kiwa, Renase, Masterplant, INIAP, Unorcacht, Salinerito, Lapronag and CTM Altro Mercato (Italia) may be interested in developing the listed products in Table 4.

Table 4. Some examples of possible products based on promising plants

Common name	Scientific name	Possible product
Ungurahua	*Oenocarpus bataua*	Cosmetic. Oil and shampoo. Respiratory system, hair loss
Sangre de drago	*Croton lechleri*	Drops, shampoo, ointments, creams. Wounds healing products.
Cola de caballo/Caballo chupa	*Equisetum bogotense*	Tea bags for infusion, syrup, juice, creams, topical lotion, fluid and dried. Diuretic
Ataco/Sangorache	*Amaranthus hybridus*	Dietary supplement, colorant Digestive
Jícama	*Smallanthus sonchifolius*	Edulcorant, antidiabetic, sugar substitute. syrup
Mashua	*Tropaeolum tuberosum*	Antiseptic. Prostate
Uña de gato	*Uncaria tomentosa*	Osteoarticular inflammation, arthritis, ulcers, antidiabetic, immunostimulant. Tinctures, capsules, syrup
Chancapiedra	*Phyllanthus niruri*	Kidney stones, antidiabetic, cramps, hepatitis B, HIV. Capsules, tablets, solutions, galenic preparation in powder, liquid extracts.
Chuchuhuaso	*Maytenus laevis*	Arthritis, repelent, pain, inflammations. Liquid or powdered extract, capsules, tablets, solutions
Cascarilla	*Cinchona pubescens*	Analgesic, antibacterial, antimalarial, appetite loss, indigestion. Drinks
Ishpingo/ Canelo	*Ocotea quixos*	Oil as ingredient for food, cosmetic, aromatizer.

Source: Buitrón, X., M. Argüello (Editors). 2004. *Promising Species of Ecuador for Natural Ingredients: Minutes of the First National Workshop*, 3-4 de febrero de 2005. MAE, CORPEI y EcoCiencia. Quito, Ecuador.

1.3. Producers

The economic sectors have been classified in the following fashion:

- Herbal medicinal products (phytomedicines)
- Perfumes and cosmetics (essential oils and colorants)
- Nutraceuticals and allies (herbal teas, food supplements and others)
- Pharmaceutical aids (gum, resins, extracts, medicinal and aromatic plants as raw material)

A list of producers by economic sector and economic location has been compiled and presented in Table 5. An analysis of Table 5 indicates that most of the producers are in the following sectors: herbal medicinal products (27), perfumes and cosmetics (15), nutraceuticals and allies (18), pharmaceutical aids (35) are located in Quito.

2. ABOUT PRODUCTION

2.1. Productive Chain

2.1.1. The value chain of Medicinal and Aromatic Plants (MAP)

It comprises three actors:

Producers of raw material

This link of the chain, which constitutes the productive base and the ancestral knowledge, is constituted mainly by Associations of producers and foundations, especially of indigenous communities, that cultivate diverse medicinal, aromatic and condiment plants. Their main offer is the fresh or dried raw material, and some finished or half-finished products like the aromatic and medicinal infusions and essential oils, respectively. Within this segment approximately 2300 families, mainly of the regions from mountain range and East of the country, are involved.

Producers of natural ingredients

In Ecuador there are 27 natural ingredients producing companies or products derived from medicinal and aromatic plants. These are used as raw materials for the elaboration of finished products, be it for food, pharmaceutical or cosmetic industry. CORPEI (*www.hierbasdelecuador.com*).

Transformers of finished products

Within this segment of the chain, 4 type of finished products can be mentioned: aromatic infusions and/or medicinal, phytomedicines, natural cosmetics and condiments.

- For the aromatic and/or medicinal infusions, in Ecuador, there are 13 companies that are dedicated to the transformation and commercialization of this type of product.
- For the elaboration of phytomedicines, it is estimated that Ecuador has 26 laboratories.
- The natural cosmetics are elaborated and commercialized by 5 companies and laboratories.
- For the elaboration of condiments, there are 3 companies in Ecuador that produce and commercialize this type of products.

The majority of the companies refuse to provide figures and data on imports and exports of their medicinal plants based products.

Suppliers of services

Even though these actors are not the main ones for the elaboration of medicinal and aromatic plants, their activity is of great importance for the development of the sector in the enterpreneurial, social and environmental context.

2.1.2. Farming and collection

The wild exploitation with commercial interest is carried out in three manners: unrenewable extraction, sustainable collection and commercial cultivation in the forest.

The existing systems of utilization of wild flora causes serious and progressive difficulties caused by confusion and mixture of species, previous ignorance on the yield and the quality of the species, the insufficient amounts of material in some zones, lack of homogeneity due to different origins, the shortage of rural manual labor and the consequent waste of the partial or total resource at local level and for the industry.

From the point of view of some technical entrepreneurs, for phytomedicines prepared ethically and effectively, value must be produced with optimal quality and in large amounts without causing damage to the nature, which implies that they are only elaborated from organically grown cultivated plants. Even though controlled wild extraction is carried out, it is more profitable to do it through cultivation to assure a better quality of product. Therefore, the possibility of cultivation should be encouraged.

Cultivation has not been done because serious agrotechnological limitations such as technical problems (inappropriate soils, erosion, lack of raw material, lack of qualification, information and agroforestry experience), social problems (agrarian reform, governmental policy, conflicting interests and divorce between universities and productive sector, legislation, cultural problems (lack of knowledge and rescues of popular medicine, public order) and market problems at local, regional and international level.

While for some researchers and experts on medicinal plants, many plants loose part of their active principles and therapeutic properties when they are extracted from natural environment or cultivated *ex-situ*. Conversely, other technical experts think that selection,

suitable study and treatments provide higher quality and yield then these harvested from the wild plant. The cultivation prevents mixtures and falsifications of collected material, and provides homogenous, abundant and good quality raw material. This facilitates harvesting and promotes incentives to the farmers who can get together and form cooperatives, acquire machinery, establish industries and equip themselves to reduce the costs of cultivation and transport. The use of dry and poor land for agriculture to cultivate selected plants could solve great problems of the industry and promote the export of native species and its derivatives.

Currently, companies or organizations that develop a forest inventory and work with designs of productivity estimation are very few. Moreover, costs of harvesting and values in the market are factors that must be taken into account to estimate the net income per hectare. The companies buy plants through a supplier of dried plant material. Companies select the suppliers according to prices and demand.

2.1.3. Commercialization

In Ecuador, there exist approximately 500 species of aromatic, medicinal and spice plants, of which 45.6% are the most utilized and 25% most commercialized[4].

An 80% of Ecuadorian population depends on Traditional Medicine and consequently on medicinal plants and natural products to improve health and wellness[4]. This trend has been increasing due to the difficult access of the population to medical assistance and medicines through Social Security. Therefore, the recollection of wild medicinal plants or their cultivation is complementary income to thousand of families in the countryside. As an example of this case is “the Association of Producers of Chimborazo”, which groups 610 families of 63

communities. Moreover, ninety per cent of commerce in medicinal plants and herbs is represented by small producers.

The models of harvesting and utilization of medicinal plants are divided as follows[13]:

- Indigenous model: auto consumption, handling multiple products, high values of conservation

- Farmer model: handling of smaller amount of products, but specialized, more for sale, with more tendencies of over exploitation.

- Industrial model: industrial utilization, focused in a single product, from forest or plantations, sometimes sustainable and not sustainable.

The sale products include whole wild plants (medicinal and aromatic plants (fresh and dried); spices and culinary herbs (fresh or dried)) or their parts in gross, active extracts and compounds, half-finished products (essential and vegetal oils), combinations of several plants (aromatic and medicinal infusions) and/or herbal products (syrup, capsules elaborated 100% based on medicinal and aromatic plants) and natural cosmetics (shampoos, soaps, creams, dental toothpaste).

Large part of the commerce of natural products in Ecuador is undertaken with imported products[14], mainly from USA, Japan, Europe, Peru and Colombia. In most cases, these

[13] Wunder, S. 1994. Resumen de Consulta de expertos Latinoamericanos sobre productos foresales no maderables. PROBONA, UICN-SUR. Quito.

products are not registered by the Ministry of Health. What is known comes from the list of laboratories, alternative medicine stores or interviews with retailers, physician and consumers. Plants and products sold in the country and exported from the country are Uña de Gato (*Uncaria tomentosa*), Sangre de Drago (*Croton lechleri*), Chancapiedra (*Phyllantus niruri*), Sábila (*Aloe vera*), Valeriana (*Valeriana offinalis*), Chuchuhuasca (*Maytenus laevis*) and Llantén (*Plantago australis*).

A recent study[15] indicated that the main consumer of medicinal plants and derivatives in Ecuador is the nutraceutical industry. The plant species more utilized are paico (*Chenopodium ambrosoides*), cola de caballo (*Equisetum bogotense*), aloe vera (*Aloe barbadensis*), ortiga negra (*Urtica urens*).

Medicinal plants and their derived products are sold in local markets for consumers in small towns and cities to less or more specialized industrial markets. The majority of the commercialized medicinal plants are wildcrafted in the Highlands and Amazon regions and are distributed towards Pastaza, Puyo, Sucumbios, Ambato and Riobamba. From there they are channeled to ports and market. Ambato is the city of storage and distribution of medicinal plants. Medicinal plants of the Coast are mainly distributed to the market from Cuenca.

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[14] Naranjo, P. 1997. *Comunicación personal*. Area de Salud. Universidad Andina Simón Bolivar. Prospecto 1998-1999. Quito, Ecuador.

[15] UTPL - Universidad Técnica Particular de Loja (CADES-CETTIA). 2000. Investigación de especies vegetales de interés medicinal y producción de Fitofarmacos como una alternativa de desarrollo agrícola y agroindustrial, Loja.

Although there are no official data on exports and imports of medicinal plants and natural products, it is known that these products are exported in small and large scale by aerial, marine and terrestrial route to the United States and Europe and paying customs duty[4]. Not only national products, but that Peruvian, Colombian, Argentinean, European and North American products are re-exported in small and large scale without official documentation.

2.1.4. Technologies

There is some local knowledge regarding medicinal plants and natural products for cosmetics and pharmaceutical sectors and all the industrial processes related to value addition. There is also important local knowledge related to promising plants and other species from local biodiversity; however, the following limitations are identified:

- Information is not widely available and many actors do not feel motivated to share or exchange information and knowledge.
- Small actors and communities are the least prepared in terms of technology and do not have the resources to pay for it.
- There is no financing for the acquisition of knowledge and technology.
- New research must be done to increase the number of domesticated promising plants.
- Since this is not a running cluster, it is more difficult to find quality supplies and equipment for the sector.

- Appropriate, applied and adapted technologies are not widely available. It is important to promote appropriate technologies, consistent with financial capacity, cost of energy, human skills and other elements in Ecuador. For example solar dryers.

One of the key services that should be available to actors in the medicinal plants and natural products for cosmetics and pharmaceutical sectors should be the offer of technology and knowledge. This sector is one of change and new technologies; if the local actors are not aware of it, they will never be able to export successfully.

2.1.5. Agents implied

2.1.5.1. International participants

BID-FOMIN Project: Private Centers of Export Services: Services to exporters, possible source of financing for services and specialized funds to support networks of small businesses.

CBI- Centre for the Promotion of Imports from Developing Countries. Project: Natural Ingredients for Pharmaceuticals and Cosmetics Program (*www.cbi.nl*). Provides and promotes technical assistance, including trade fair participation and market access information.

Centro Canadiense de Estudios y Cooperación Internacional CECI (Canadian Center for International Cooperation) - Jambi-Kiwa Project: A medicinal plants production network

of rural producers that is described as a case example for future projects in ACAN publication. Moreover, it can provide assistance in terms of organizational structures and community- based production.

Fondo Ecuatoriano Canadiense de Desarrollo-FECD. Potential source of funding for productive projects, services and experience related to community- based organization.

GTZ-German Technical Cooperation: Project "User oriented strategies related to agricultural research" GTZ-INIAP. Provides technical assistance, links with commercial aspects, some financing of services. Experience with public private partnerships and possible alliances with EU companies and services.

GTZ-IICA: Manages the Regional Fund of Appropriate Technology for Conservation and sustainable managing of natural resources-FOMRENA. Financing of projects with emphasis on technology assets and transfer. FOMRENA is an excellent partner not only for providing funding but also for technical expertise to projects in related fields such as extraction of essential oils.

Fundación Rescate del Bosque Tropical. Provides assistance with forest products trade. Can provide assistance with agroecological and agroforestry products and practices. Experience with biodiversity products and commercial ventures such as Forest Garden Products.

FAO: Communitarian Forest Development Project. Provides criteria and methodology for market development of non- timber forest products and market information/development.

Biotrade Initiative: Ecuador, UNCTAD, CORPEI, ECOCIENCIA. Provides services to sustainable use projects at the commercial, technical and organizational levels. The Biotrade office inside CORPEI, along with the BTFP and the EDP of CBI/CORPEI should lead the implementation and coordination of the sector strategy. (*www.biotrade.org*).

CYTED: Programa Iberoamericano de Ciencia y tecnología para el desarrollo. Subprogram X. Fine Pharmaceutical Chemistry. RIPROFITO: Red Iberoamericana de Productos Fitoterapéuticos. Provides technological assistance and training in identification of promising MAP in the Iberoamerican region. Provides technical assistance and training on quality, assurance and services on industrialization of medicinal plants. (*www.cyted.org*).

Convenio Andrés Bello (SECAB). Provides funding for research on MAP and publication of books on MAP.

EcoCiencia- The local partner of CORPEI under the Biotrade Initiative of Ecuador, has important information on about promissory products of Ecuadorian biodiversity, however this information needs to be tested in terms of commercial potential.

INIAP-DENAREF: National Resources of Phytogenetics and Biotechnology Department. Provides technical assistance and information about phytogenetic resources.

TRAFFIC: América del Sur (UICN-WWF). Provides technical assistance, information on international trade and restrictions. Market information and regulatory information.

*2.1.5.2. **National participants***

The Export and Investment Promotion Corporation (CORPEI). It is a private non-profit institution with its own assets and funds recognized by the state as the official body in charge of the promotion of exports and investments of Ecuador. Its aim is to promote exports and investments of productive sectors, through the provision of quality technical services, contributing to enhance the image and competitive development of the country. (*www.corpei.org*).

Bolsa Amazonia, Ambiente y Sociedad. Provides technical assistance on production and processing of MAP in Amazon region. Assistance with commercial aspects.

ASOPROFIT. Provides technical assistance and services. Links several small producers of natural products. Emphasis on quality issues and legislation compliance.

Fundación desde el Surco: Training on the cultivation and drying aromatic and medicinal plants.

2.1.5.3. Government sector

Three Goverment ministries and institutions with activities related to the industrialization of MAP are:

- Ministerio del Medio Ambiente (MMA)

- Ministerio de Comercio Exterior, Industrialización y Pesca
- Ministerio de Relaciones Exteriores
- Instituto Ecuatoriano Forestal y de Áreas Naturales y vida Silvestre (INEFAN).
- Secretaría Nacional de Ciencia y Tecnología e Innovación (SENACYT)

2.1.5.4. Academic sector

Universidad Técnica Particular de Loja. Medicinal species and phytopharmaceutical production. Technical assistance and knowledge about promising products and extraction processes. Laboratory analysis and quality issues.

Universidad San Francisco de Quito. Technical assistance: active principles, quality issues and evaluation, laboratories, information about biodiversity.

Universidad Politécnica Salesiana. Technical assistance: active principles, quality issues and evaluation, laboratories, information about biodiversity.

Universidad de Cuenca. Technical assistance: active principles, quality issues and evaluation, laboratories, information about biodiversity.

Escuela Politécnica de Chimborazo. Promotes organic cultivation of medicinal plants and production of herbal teas and plant extracts for phytopharmaceutical companies.

Universidad Central de Venezuela (Venezuela), Facultad de Farmacia. It is undertaking research on Ecuadorian medicinal plants with emphasis on chemical and biological aspects

2.1.5.5. Medicinal plants producer associations

Asociaciones de pequeños productores agrícolas con influencia regional (Sierra Central): Fundación Centro de Desarrollo Indígena, CEDEIN, Asociación de Productores de Plantas Medicinales de Chimborazo, Jimba Kiwa, Asociación de pequeños productores ecológicos de Chimborazo, ERPE, Movimiento Guamampoma, FUNORSAL de Salines de Guarnada.

Asociaciones de procesadores en Ecuador: Asociación de Laboratorios Fitoterápicos del Ecuador (ALAFIT).

Asociación de tiendas naturistas: ASONATURA.

2.2. List of Ecuadorian companies

Table 6 enlists the Ecuadorian Companies active in this sector with detailed information on their contact, phone, fax, website and address. There are 62 enterprises among laboratories, foundations, community associations and others related to industrialization of medicinal and aromatic plants.

3. ABOUT MARKET

3.1. Internal and external demand

3.1.1. Internal demand

The higher demand of medicinal plants and natural products is local by general population.

In the Highlands, as well as in Amazonia, the greater demand of medicinal plants is from the Highlands, mainly those species that are both aromatic and medicinal. The demand of plants of the Amazonia also is great from the Highlands, permitting a strong exchange between the two regions, nevertheless, the plants of the Amazonia are less known.

The species of greater demand in the mountainous range are Calahuala (*Phlebodium aureum*), Valeriana (*Valeriana officinalis*), chugriyuyo or siempre viva (*Sedum quitense*), Sarsaparrilla (*Smilax lundelii*), cola de caballo or caballo chupa (*Equisetum bogotense*), saragosa (*Aristolochia guentheri*), Uña de gato (*Uncaria tomentosa*) and Dragon's blood (*Croton lechleri*), among others. The native species and most demanded products at local and international levels are dragon blood (*Croton lechleri*), cat's claw (*Uncaria tomentosa*) and cascarilla (*Cinchona pubescens*).

The supply of medicinal plants is limited due to their rudimentary systems of harvesting and transport. Therefore many plants are damaged before or until arriving at their destiny. The competition is great at internal level between the different local markets. On the other hand, sufficient amounts of species in demand are no longer available[7].

The increasing demand of phytomedicines in the public has caused considerable increase in the commerce, as reflected by the increase in the income of the three main manufacturing laboratories in Quito. In 1994, Mundo Naturista sold 1000 million of sucres (US$ 57,471.26), Fitoterapia 600 million (US$ 34,482.76) and Renase 360 million (US$ 20,689.66), having increased the number of centers of distribution in all the country[16].

[16] Anon. 1996. El registro no llega a los remedies verdes. *Diario El Comercio*, 15 de julio de 1996.

3.1.2. External demand

A study[17] projected the world market for herbal medicines at USD 19.4 billion for the year 2005, with the following major components: Europe USD 6.7 billion, Asia USD 5.1 billion, North America USD 4.0 billion, Japan USD 2.2 billion.

In countries such as the Netherlands, buyers are not interested in plant material, but in plant extracts. There are only a few developing countries that are able to supply extracts conforming to the requirements of the western industry. In order to promote new products, significant research and regulatory requirements make sense for strategic alliances between international companies and local suppliers.

The exports of medicinal plants in Ecuador have tripled in the last years, going from 275 tons in 1995 to 927 tons in 2000; whereas it was registered, an increase of FOB value of US$ 153.000 in 1995 to US$ 315.000 in 2000[18]. Unfortunately, the commerce of medicinal plants and derivatives is informal and there is no exact registered number of exporters by the Central Bank of Ecuador (BCE). The exporters recognized by CORPEI are AGROTRADING (essential oils), Aromas del Tungurahua (powdered herbs), CASTOR ECUATORIANA (ricine and jojoba oils), Jambi Kiwa (dehydrated medicinal plants), Industria Lojana de Especierías (mixtures of herbs and herbal teas), INEXA S.A. (essential oils, natural colorants), AGROALEGRE C.A. (dehydrated vegetables, essential oils).

Ecuador has not played an important role in the worldwide commerce of aromatic herbs. The official numbers are less than 1 million US$.

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[17] Laird, S.A., Pierce, A.R., 2002. Promoting sustainable and ethical botanicals. Strategies to improve commercial raw material sourcing. Results from the sustainable botanicals pilot project. Industry surveys, case studies and standards collection. – New York, Rainforest Alliance. (*www.rainforest-alliance.org/news/archives/news/news44.html*, viewed 24.08.2006).

[18] SGCAN. 2002. *Biocomercio en la subregión andina: Oportunidades para el desarrollo*. CAF, UNCTAD. Lima, Peru. 46 p.

The principal consumers markets of medicinal and aromatic plants are European Union and United States. Definitively, EU is the biggest market because in addition to buying from different countries in the world, it also buys from the USA good part of the total imports.

However, USA is an actor of great importance in the international market and particularly for Ecuadorian exports. Its demands regarding requirements for introduction in the market are less stringent that those of the EU, which facilitates the access of medicinal plants and derivatives. Moreover, it should be kept in mind that in the USA market, there is a larger part of Ecuadorian immigrant population, which makes this market very interesting.

Additionally, Ecuador exports medicinal plants and natural products to Colombia and Peru, which is a type of commercial exchange[19].

3.2. Demand: Buyer profile and factors influencing the demand

3.2.1. Buyer profile

3.2.1.1. Consumers

The major interests of consumers from developed countries are:

- Interest in consuming natural products
- Major concern about health, premature aging and safety of products
- Interest in new products, flavours, aromas.
- Interest in organic and exotic products
- Interest in sustainable production of medicinal plants and herbal remedies

[19] Delgado, A. 1997. OPS/OMS Ecuador. *www.salud.org.ec*.

In Ecuador, some consumers of low educational and marginal sector strongly believe in curative and magic properties of medicinal plants and their derived products. They are oriented by product prices.

3.2..1.2. Processors

These companies are related to utilization of medicinal plants and their derivative products for aromatherapy, therapeutic massage and others. In general, there are people of higher educational and cultural level, who select the products according to cost-benefit ratio.

3.2.2. Factors influencing the demand

- A health-aware population
- Nutrition as a consumer priority
- Aging population boosts sales
- Natural products seen as alternative to conventional medicine
- Growing interest in vegetarianism
- Organics on the rise
- FDA ruling increases awareness of organics (not applicable in EU)
- High prices for organics not impediment
- Positive studies boosts sales growth
- Younger generation has growing interest
- Products more user-friendly
- Consumers willing to spend more

- Mainstream media have positive impact on sales
- Growth of health and natural products in conventional channels
- Herbals moving to mass market
- Supermarkets learn how to merchandise natural products
- New products increasingly available in conventional outlets

3.3. Distribution channels

The distribution channels are well explained in Table 7.

Table 7. Detailed explanation about distribution channels

Concept of products	Distribution channels	Consumers
Fair trade • Aromatic and medicinal plants as condiments, teas, infusions • Cosmetics and others (shampoo, soap, oils for aromatherapy)	• Fair trade stores (Camari) • Small-scale retailers (supermarket, pharmacies, drugstores, perfumery), which get products from just commerce. • Stores of e-commerce with Fair trade focus. • Distributors/importers of products of Fair trade • Processors of tea and coffe	Consumers, who like products originating from fair trade and look for exotic products of quality
Cosmetics and natural drugs • Pills and syrup • Herbs or plant extract for final consumption • Medicinal infusions • Cosmoceutics	• Naturists stores • Health stores • small-scale retailers (supermarkets, pharmacies, drugstores)	Consumers, who are interested in health, products based on natural products and alternative healing

Concept of products	Distribution channels	Consumers
Aromatic infusions • Individual plant infusion • Mixture of plants infusion	• Distributors, large-scale retailers, specialized stores	Consumers, who like tea and look for new varieties. They give importance to health and natural products.
Natural ingredients • Essential oils • Aromatic and medicinal herbs, spices • Extracts • Vegetal alkaloids	• Cosmetics processors • Phytomedicine processors • Functional food processors medicinal and healthy food • Importers of raw material	Consumers, who give importance to health and natural and organic products (with ingredients)
Exotic ingredients • Herbs and condiments • Essential oils • Extracts	• Processors of herbs and food processors of tea • Processors of certain food that require herbs and spices (e.i. meat, fast food service)	Consumers, who give importance to exotic products of quality and sustainable production.

Source: CORPEI (2004). *Estrategia para la comercialización de plantas medicinales, aromáticas y productos derivados del Ecuador: Biodiversidad desde el centro del Mundo*. Quito, Ecuador. 30 pp.

3.4. Legislation

In order to analyze the legal aspects involved in the natural ingredients sector, we should review many of the legal bodies related to sustainable use of biodiversity, access to biological resources, phytosanitary legislation, *ex-situ* and *in-situ* conservation and research, agricultural practices, organic agriculture and control, among others. In general, the legal environment is not adverse to the development of these sectors. Most elements have been properly legislated, although some bureaucracy may be involved. Nevertheless, the most sensitive issues are related to the wild harvesting of local species and especially to the rights to access biological and genetic resources.

According to the Ecuadorian Constitution, biodiversity must be considered a public asset of common use. Therefore all the related legislation has been issued around that concept. As already mentioned, the application of access contracts and other bilateral negotiations have been avoided in Ecuador due to the non-implementation since 1996 of the 391 Decision issued by the Andean Community (CAN). The difficult implementation and the absence of a local norm have limited the subscription of access contracts. At the same time, there have been continuous extractions by different users, who have unlimited access to the country owing to poor controls and sanctions.

In December 2002, CAN issued Decision 486, which links the concession of a patent to the issuance of an access contract. Unfortunately, it is applicable only in the Andean region and therefore researchers from abroad can be held liable only if local controls work and demonstrate flagrant crime. It is worthless for future complaints.

Another important legal consideration is related to health and sanitary legislation. The authorized regulatory health institution in Ecuador is the "Instituto Nacional de Higiene Izquieta Pérez". In the past, many local actors have complained about the paperwork and time spent dealing with these permits. However, recent legislation and organizational improvements of the Izquieta Pérez have shortened the transaction time from one year to 2-3 months. Also, the National Institute of Accreditation, Normalization and Certifications (MNAC) has established a third- party laboratory system offering the possibility of running required laboratory tests outside the Izquieta Pérez.

The main regulation for natural products of medicinal use was issued by the Ministry of Commerce on May 7, 1999 (No. 1281), with several amendments in 2001 and 2002. All natural products must now display a phytosanitary permit for local trade or export. For

cosmetics, the main ruling was based on Ministerial Decree N° 4142 of 10 August 1996 and Decree N° 1583 of 18 June 2001.

Forestry law about Protected areas and Wild life (Law 74, 1981), Law of Biodiversity (Law No. 3, 1996) and Law of Facilitation of Exportations (Law 147, 1994) are International conventions ratified by Ecuador, which have a mandatory character are considered by law and have major relationship with conservation of wild life.

The convention of protection of flora and fauna and the Natural scenic beauties of the countries of America (Unión Panamericana, 1940), CITES (Convention about International of Endangered wild species of fauna and flora, 1975) and the CDB (Biological Diversity Convention, 1992).

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5. SWOT Analysis

STRENGTH

- Megadiverse country, with high biodiversity.
- Capacity of organic production, which gives an added value to the product and ways of sustainable work.
- Part of the regions of the country with smaller non-usable area (arid and semi-arid zones) for agriculture, which indicates climatic wealth.
- Existence of Associations of small organized producers of organic herbs production.
- Existence of agriculturists experienced in cultures for the exportation with projects or interest of working in the production of aromatic and medicinal plants.
- Availability of manual labor for culture and processing.
- Appropriate agroecological zones for the culture with the possibility of good yields.
- Culture alternative of small producers that can be oriented for the national market or a precise buyer in the international market, and as the experience and the development of the business justify it, for international market.
- Projects and programs of international donors in favor of the development of small producers, incl. Biocommerce initiative
- Communitary production of different regions of the country, mainly women with ancestral knowledge of medicinal and aromatic plants.
- Potential quality of products.

- Conscience of associated work in the sector.
- Natural resources: good climatic and soil conditions and a great variety of species, forest resources and wild zones.
- Legal framework in place.
- National commitments and high priority assigned to this sector.

WEAKENESS

- In relation to its potentiality, there are few published reports about curative value or genetic variability of the regional native flora.
- The wild species usually are difficult to handle under traditional culture conditions.
- Lack of awareness of the small producer of the importance to offer an international quality
- Limited access to market information, preferences and access conditions.
- Lack of a system of quality standardization and innocuouity of the product.
- Low prices in the internal market.
- Lack of production capacity of many enterprises and organizations.
- Lack of adequate and well documented quality control systems.
- Lack of business plans, marketing sales and production in the enterprises and organizations.
- Lack of knowledge of sales techniques and strategies like how to make offers and to find new potential clients.
- Lack of enterprise administration and professionalism in general.

- Some products do not fulfill legal dispositions for the market, lack of sanitary registration, bar codes, patents, registered trade names, restraining the possibility of extending their sales
- Lack of knowledge and information on Phytochemistry.
- There is no positioning of the Ecuadorian product in the Internationl market.
- There is no research and development of new products.
- There are no sufficient volumes.
- There is no technology for production and processing related to:
    - Yield per hectare
    - Technology of processing
- There is research in private sector and limited in public sector (Universities-INIAP).
- The ecollection, use and trade of medicinal plants is not regulated
- There is no adequate quality control with good laboratory and good manufacturing practices
- Lack of access by industrial sector to the information about research on medicinal plants, application of appropriate technologies and information on existing legislation. This provokes the obtaining process of raw material in non-sustainable way and informal trade.

OPPORTUNITIES

- To take advantage of the biodiversity and to find new natural products with potential in the market.

- It is desirable to find new natural products and there is a world-wide interest for their use.
- Ideal item for economies based on rumors, where the improvement of the productivity of traditional cultures would not allow to fix the rural economic problem, due to the deficiency of minimum resources from earth necessary for auto-sustainability.
- If the suitable species are chosen, their cultures applicable to marginal zones, such as arid and semi-arid regions, semi-arid, of mountains or from difficult agricultural mechanization, with impossibility to make intensive cultures.
- Agroindustry that adapts to farmer sectors with low educative level. The non qualified manual labor can be valorized in rural zones by means of the implementation of simple technologies.
- Opportunity to contribute to the regional and international industries with new raw materials, without competing with the traditional ones.
- Non traditional alternative, especially for native species.
- There is an opportunity for specialized and differentiated products in market niches (national and international).
- Development and impulse of national market (commercial relationships established among actors of the sector).
- Low tariffs
- World-wide consumption in increase.
    - Interest in natural and organic products
    - Interest in natural medicines and ancestral knowledge

- Preoccupation for health
- More use of natural cosmetics
- Interest in exotic products and variety
- Market of fair trade in growth
- Interest of mainstream enterprises in natural products (big chain of supermarkets and enterprises)
- The trend of establishing direct relationships among producer, processor and dealer.

THREATS

- The easy adaptability to different microclimates from species like the mint, manzanilla or mint provokes over offers in the national market, giving as results very low prices in relation to the international prices, thus it is necessary to diversify towards species with international demand.
- It is necessary to think about a sustainable development, analyzing the potential use of the reserves without causing threat of destruction of the biogenetic resources.
- It is very common in Latin America to subutilize the natural forest, exploitation of very few species in intensive form, and not considering many other species that could be exploited appropriately.
- There exists a change of attitude in the user: search for safe and natural products but these concepts could be confused, which are not necessarily related.

- Medicinal products of Colombia and Peru have more competitive prices and large volume of offers at this moment.
- Countries like China and India have a great history and experience in production of medicinal and aromatic plants.
- High requirements in the targeted markets
    - High requirements of buyer.
    - Non-tariffs barriers like novel foods and novel ingredients law.
- Stringent legislation which limits bioprospection contracts

6. RECOMMENDATIONS

- Establish a National Program of Bioprospection, in collaboration with private sector.
- Modify laws to facilitate access to genetic resources
- Initiate research program on agrotechnology and cultivation of promision plants.
- Promote punctual research projects related to the lack of information in the areas of biology, socioeconomic, legislation and commerce.
- Involve various national and international specialists in the selection process of promising plants.
- Promote a collaborative process at interinstitutional, multidisciplinary and intersectorial levels

Ecuador needs to develop its exports as part of the country's development strategy. History shows that this small nation has always depended on the external sector for a great part of its income. Today, the Ecuadorian economy is dependent on oil and a few traditional exports such as bananas, shrimps, canned tuna, flowers, cocoa and coffee. Under the current economic model, the cost of business operations in Ecuador has increased significantly. Therefore, the country cannot continue with an export strategy oriented towards commodities with little value addition or differentiation. In the past years, the macroeconomic indicators have improved, but the situation at the microeconomic level is different and the socioeconomic conditions of the general population (quality of life) have not improved. Employment is low and there is a severe recession. Ecuador needs to find a new productive vocation and in this connection CORPEI defined medicinal plants, natural products and derivatives as promising products.

Our search demonstrates that there are scattered efforts in Ecuador reflected in relatively low levels of exports, especially when compared with the total external sector of the country. However, the medicinal and aromatic plants is a sector identified by CORPEI/CBI as a potential one for future exports and that is confirmed in the context of this report. The rationale behind the potential is based on the size of the market in developed countries such as those of the EU, the United States and Japan. Traditional exports in this sector have been related to products that suffer intense competition, such as castor oil, cacao butter, annatto (bixin), ginger oil and cardamom oil. The cost of operating in Ecuador has increased significantly since 2000 for multiple reasons and it is therefore difficult to compete with a price-based strategy. Ecuador must compete with quality and differentiated products. In this connection, the country´s strategy must be based on positioning itself as a supplier of biodiversity- based products that are innovative either for their applications or for the marketing behind the structure and efficiency of sustainable supply chains composed of small business networks or community-

based networks working with global standards of efficiency, logistics, quality and sustainability criteria. This will result in: poverty alleviation, economic development and sustainable use of resources supporting biodiversity conservation.

To the Government:

- Set up a National Multidisciplinary Committee to assist the Government to formulate policies concerning all aspects of medicinal plants utilization.

- Establish a national policy to include the use of phytopharmaceutical products in health care.

- Approval, by the Ministries of Health, of a priority list of medicinal plants to be used for the manufacture of phytopharmaceutical products.

- Facilitate and simplify the mechanisms for the registration of phytopharmaceutical products, taking into consideration the WHO guidelines and European models.

- Establish quality control standards for medicinal plants and phytopharmaceutical products.

- Explore the possibilities of creating a National Institute for the study and utilization of medicinal plants.

- Support universities, research centers and institutions including agricultural institutes, for carrying out comprehensive studies on industrial utilization of medicinal plants.

- Promote systematic cultivation and industrialization of medicinal plants and provide incentives for stimulating national plant-based industries.

- Set up banks of germplasms, seeds and propagable materials of medicinal plants.

- Offer preferential financial terms to farmers, cooperatives and business enterprises interested in establishing cultivation and industrialization of medicinal plants.

- Include monographs on selected medicinal plants and their extracts in the national pharmacopoeia.

- Implement measures for the conservation of medicinal flora, as set forth in the Agenda 21 of United Nations' Conference on Environment and Development.

- Take measures to collect detailed statistics, under a separated entity, on the figures of import, export and local production of medicinal plants and their products.

- Foster international cooperation.

- Take measures to protect patent rights of the whole phytogeographic region by signing contractual agreements with industrial groups in major pharmaceutical manufacturing countries to whom the medicinal plants are supplied.

To the Universities and Research Institutions:

- Emphasize the importance of medicinal plants and phytopharmaceutical products in the training of physicians, pharmacists and other related health professionals.

- Stimulate the creation of specialized centers and support multidisciplinary research aimed at exploring the medicinal and economic potential of the national flora.

- Initiate postgraduate programs in the field of medicinal plants to prepare qualified personnel in areas related to the industrial utilization of medicinal plants, with emphasis on agrotechnology, process technology, quality assessment, phytotherapy and handling of multifunctional pilot plants.

- Prepare computerized national inventories of medicinal plant resources which allow exchange of information at a regional and interregional level.

- Assist the Governments on establishing quality control standards and on legal aspects of registration of phytopharmaceutical products.

- Promote exchange of scientific and technological information at regional and interregional level.

- Establish links with the industry to provide technical assistance on different aspects of industrialization of medicinal plants.

- Improve awareness of the public on the usage of medicinal plants and their products and disseminate the information on industrialization of medicinal plants.

- Encourage a business outlook among the academicians to facilitate their participation in productive activities and in the industrial utilization of the local medicinal flora.

- Conduct research on promising lead compounds obtained from medicinal plants for the development of new drugs.

To the Private Sector:

- Establish links with universities and research centers for industrial utilization of medicinal plants.

- Call on the National Chambers of Commerce and Industries to promote industrialization of medicinal plants.

- Form Associations of entrepreneurs and companies interested in the industrialization of medicinal plants, in order to orient them towards the market. This organization should establish contacts with principal foreign markets, as well as have access to modern technology for the production of phytopharmaceutical and natural products.

- Promote joint-venture agreements between firms which have technology and the knowledge of the market and those that have an access to the traditional knowledge and medicinal plant resources and/or phytopoharmaceutical products.

To the International Organizations:

- Coordinate the efforts of international organizations like UNIDO, FAO, OAS, UNESCO, IDRC, EEC, UNDP, PAHO/WHO, CEPAL, etc. which support technical cooperation programs in different aspects of medicinal plants.

- Organize training programs for human resource development through workshops, courses, seminars, etc.

- Support national research centers on medicinal plants and natural products, which have well defined goals and relationship with the industrial sector.

- Facilitate access to updated information, preferably through computerized data bases on international markets of medicinal plants and the possibilities of industrial investments in this field.

- Promote cooperation between the research and development laboratories of industrialized and developing countries and among the ones in the developing countries. This can take the following forms: exchange of germplasms and seeds, exchange of information on crops, process technology, formulation of products and marketing practices, and exchange of personnel between R & D institutions for specialized training of personnel.

TABLES

Table 1. List of Medicinal Plants of Ecuador

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
AGAVACEAE	*Agave americana*	L.	Penco, cabuyo negro	Roots, leaves, sap	Siphilis, ulcers, dysentery, cold	Highland	Bolivia, Peru, USA, Guatemala	Wild, cultivated
AMARANTHACEAE	*Alternanthera porrigens*	(Jacq.) Kuntze	Moradilla	Whole plant	Diabetes, antiinflammatory, blood regulator	Coast, highland, orient	Bolivia, Colombia, Peru	Wild
	Amaranthus caudatus	L.	Sangorada	Inflorescence	Blood purgative, acne, skin spots	Highland	USA, Peru	Introduced, cultivated
	Iresine celosoides	L.	Escancel	Leaves and stems	Pneumonia, cold, fever	Highland		Introduced, cultivated
ANACARDIACEAE	*Schinopsis haenkeana*	Engl.				Highland	Argentina, Bolivia	Wild
	Schinus molle	L.	Molle	Leaves	Hot baths and postpartum hemorrhage	Highland	USA, El Salvador, Mexico, Nicaragua, Bolivia, Brazil, Chile, Colombia, Peru	Wild, cultivated
APIACEAE	*Apium graveolens*	L.	Apio	Leaves	Antiinflammatory, emollient	Highland	USA, Paraguay, Peru	Cultivated
	Coriandrum sativum	L.	Culantro	Leaves	Digestive, postpartum reconstituent for women	Highland	Bolivia, Paraguay, USA, Costa Rica	Introduced, cultivated
	Foeniculum vulgare	P. Miller	Hinojo	Leaves, flowers, seeds	Digestive, antiflatulent, antispamodic	Highland	Bolivia, USA, Costa Rica	Wild, cultivated
	Petroselium crispium	Mill.	Perejil	Leaves, roots	Antiseptic, antibiotic, menstrual problems	Highland	Colombia, Equador, Peru	Cultivated
	Pimpinella anisum	L.	Anis	Seeds	Sedative, antispasmodic	Highland	USA	Wild, cultivated
APOCYNACEAE	*Aspidosperma pyrifolium*	Mart.	Naranjo de monte, sambuia			Highland	Argentina, Bolivia, Brazil, Paraguay	Wild
	Tabernaemontana markgrafiana	J.F. Macbr.	Huevo de verraco (Español), jaen sananho, penoncahue (Huaorani), sananho, sanangillo, sickta (Quichua), teteccu'cho tsettuco	Leaves, bark	Skin infections, cold, diarrhea, fever, emetic, diuretic, insomnia, stomachache, diarrhea	Highland, orient	Colombia (Leticia), Perú (Iquitos), Venezuela (San Felipe, Negro river)	
	Tabernaemontana sananho	Ruiz & Pav.	Jaen sananho, kunapipi (Shuar), penoncahue (Huaorani), sananho, sanangillo, tsatú'co (Cofán), tsickta, yacu sanango	Stembark	Hypnotic, disinfectant, abscesses, abdominal pain, amoebiasis, diuretic, emetic, fever, sedative, rheumatism, anticonceptive	Orient	West Brasil; Colombia: Antioquia, Chocó, Valle, Panama: Bocas del Toro, Cocle; Peru: San Martín, Huaco, Cuchero, Tocachey Tinga	
AQUIFOLIACEAE	*Ilex guayusa*	Loes	Guayusa	Leaves	Kidney inflammation	Orient	Peru	Cultivated
ARALIACEAE	*Oreopanax mucronulatus*	Harms	Pumamaqui	Leaves	Postpartum hot baths	Highland		Wild, cultivated
ARISTOLACACEAE	*Aristolochia guentheri*	O.C. Schmidt	Zaragosa, Ttombusicho	Stems	Purgative, toothache, headache and	Orient	Peru, Colombia	Wild, cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
					stomachache			
ASCLEPIADACEAE	*Marsdenia cundurango*	Rchb. F.	Condurango	Bark	Cancer, stomach troubles, vomiting, bleeding, pain	Coast, highland	Peru, Colombia	Wild
ASTERACEAE	*Ambrosia arborescens*	Miller	Marco, altamiso	Leaves	Furuncles, bad foot smell, antiperspiration	Highland	Bolivia, Peru	Wild
	Aristeguietia glutinosa	(Lam.) King & Robinson	Matico, migia	Leaves	Antiinflammatory of bruises, scar healing, gastric ulcers	Highland		Wild
	Artemisia absinthium	L.	Ajenjo	Whole plant	Digestive problems, parasites, menstruation, nervousness	Highland	USA, Bolivia	Wild, cultivated
	Baccharis dracunculifolia	DC.	Chilca	Aerial part	Tonic, eupeptic, febrifuge, antidyspeptic	Highland	Bolivia, Brazil, Paraguay, Peru	
	Baccharis genistifolia	DC.	Tres filos	Aerial part			Brazil	Wild
	Baccharis latifolia	(Ruiz & Pavon) Pers.	Chilca negra	Leaves	Antirheumatic, bronchitis, antiinflammatory, hypoglicemiant	Highland, Orient	Bolivia, Colombia, Peru	Wild
	Baccharis salicifolia	(Ruiz & Pav.) Pers.	Chilca	Leaves	Antiinflammatory	Highland, Orient	Belize, Honduras, Mexico, Argentina, Bolivia, Paraguay, Peru	Wild
	Baccharis tricuneata	(L.f.) Pers.	Chilca	Leaves	Antiinflammatory	Highland	USA, Bolivia, Colombia, Peru	Wild
	Calendula officinalis	L.	Calendula	Leaves, flowers	Antiseptic, scars healing, emollient, antiinflammatory	Highland	USA, Bolivia	Introduced, cultivated
	Chuquiraga jussieui	Gmel.	Chuquiragua	Whole plant	Liver and kidney inflammation	Highland	Bolivia, Peru	Wild
	Cynara scolymus	L.	Alcachofa	Leaves	Liver and kidney inflammation	Highland		Cultivated
	Espeletia pycnophylla	Cuatrec.	Frailejon	Leaves	Antirheumatic, bronchitis, asthma	Highland	Colombia, Venezuela	Wild
	Lasiocephalus ovatus	Schldl.	Arquitecta	Whole plant	Ovary inflammation, white vaginal discharge, prostate	Highland		Wild
	Matricaria chamomilla	L.	Manzanilla	Flowers, stems, leaves	Menstrual cramps, stomachache, migraine, constipation, dyspepsia	Highland	Bolivia, USA	Introduced, cultivated
	Perezia multiflora	(Bonpl.) Less	Excorzonera	Branches, leaves, flowers	Diaphoretic, antipyretic, diuretic, emmenagogue	Highland, orient	Bolivia, Peru	Wild
	Pollalesta discolor	(Kunth) Aristeg	Pigue	Leaves	Diarrhea	Orient	Costa Rica, Colombia, Peru	Wild
	Pseudelephantopus spicatus	(B. Juss. exAubl.) C.F. Baker	Suelda con suelda, escoba real	Whole plant	Luxation, fractures	Coast	Costa Rica, Mexico, Nicaragua, Caribeean	Wild
	Sonchus oleraceus	L.	Cacha-serraja, Canayuyu	Roots	Jaundice, nervousness, vomiting	Highland	USA, Costa Rica, Salvador, Mexico, Nicargua, Panama, Bolivia	Wild, introduced

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
							Panama, Bolivia, Colombia, Paraguay, Peru, Venezuela, Madagascar, South Africa, Tanzania	
	Spilanthes americana	Hieron	Botoncillo	Whole plant	Toothache, diabetes, liver problems, leukemia	Highland	USA, Guatemala, Colombia, Venezuela	Wild
	Tagetes pusilla	Kunth	Aspha anis	Leaves	Nematicide		Bolivia, Venezuela	Wild
	Taraxacum officinale	Wiggers	Diente de leon, taraxaco	Whole plant	Diuretic, liver depurative	Highland	Bolivia, peru, USA, Uganda	Wild, introduced
	Xanthium catharticum	Kunth	Casha-marucha	Whole plant	Kidney, urinary ailment	Highland	Bolivia	Wild
BERBERIDACEAE	*Berberis andeana*	Job	Chinia	Bark	Liver and kidney problems	Highland		Wild
BETULACEAE	*Alnus acuminata subsp. Acuminata*	Kunth	Aliso	Leaves	fractures healing, postpartum baths	Highland, Orient, coast	Costa rica, Salvador, Panama, Bolivia, Peru	Wild, cultivated
BIGNONIACEAE	*Jacaranda copaia*	(Abubl.) D. Don.	Arabisco, Copayura	Leaves	Veneral diseases	Orient, coast	Costa Rica, Honduras, Panama, Bolivia, Brazil, Colombia, French Guyana, Peru, Surimame, Venezuela	Wild, cultivated
	Jacaranda mimosifolia	D.Don	Jacaranda	Bark, leaves, roots	Diaphoretic, emetic, contraceptive, syphilis	Orient, coast	USA, Costa Rica, Mexico, Honduras, Nicaragua, Panama, Argentina, Bolivia, Brazil, Colombia, Paraguay, Peru, Uruguay, Venezuela, Caribeean, Madagascar, Ethiopia, Ghana, Kenya, Malawi, South Africa, Tanzania, Zaire, Zimbabwe, Hawaii Islands	Cultivated
	Tecoma stans	(L.) Juss.ex Kunth	Fresno, cholan	Leaves, bark	Diuretic, antidiabetic, antispasmodic	Highland	USA, Costa Rica, Salvador, Mexico, Panama, Nicaragua, Bolivia, Brazil, Colombia, Peru, Venezuela, Caribe, Camerun, Ghana, Madagascar, Tanzania, India, Marquesas	Wild, cultivated
BODDLEJACEAE	*Borago officinalis*	L.	Borraja	Leaves, flowers	Emolient, emmenagogue, diaphoretic	Highland	Bolivia, Brazil, Peru	Introduced, cultivated
	Buddleja incana	Ruiz & Pav.	Quihuar			Highland	Colombia, Peru	Wild, cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
BORAGINACEAE	*Cordia allioidora*	(Ruiz & Pavon) Oken	Laurel, araña caspi, muruchi numi			Coast, orient	Bolivia, Colombia, Paraguay, Peru, Surinam, USA, Nicaragua, Caribe, Belice, Costa Rica, Salvador, Guatemala, Mexico	Wild
BRASSICACEAE	*Rorippa nasturtium-aquaticum*	(L.) Hayek	Berro	Whole plant	Reconstituent, depurative	Highland	Bolivia, USA, Nicaragua, Papua, New Guinea, Costa Rica	Introduced, cultivated
BROMELIACEAE	*Puya eryngioides*	Andre	Achupalla	Scales	Scar healing	Highland		
	Tillandsia usneoides	(L.) L.	Salvaje, barba de viejo		Rheumatic pain, hemorrhoids	Highland, coast	USA, Belize, Costa Rica, Salvador, Honduras, Mexico, Nicaragua, Bolivia, Brazil, Colombia, Peru, Venezuela, Caribeean	
BURSERACEAE	*Bursea graveolens*	(Kunth) Triana & Planchon	Palo Santo	Bark, leaves, stem	Rheumatic pain, diaphoretic, expectorant, analgesic, stomachache	Coast, highland, Galapagos	Costa Rica, Honduras, Nicaragua, Colombia	Wild
	Dacryodes spp.		Copal	Leaves	trementine			Wild
CAESALPINACEAE	*Caesalpinia spinosa*	(Molina) Kuntze	Guarango			Highland	Bolivia, Chile, Peru	Wild, cultivated
	Senna multiglandulosa	(Jacq.) H. Irwin & Barneby	Chinchin	Leaves	furuncles, kidney inflammation	Highland	Bolivia, Peru	Wild, cultivated
CAPPARACEAE	*Capparis sp.*	L.						
CAPRIFOLIACEAE	*Sambucus nigra*	L.	Sauco, tilo	Leaves, flores	Diaphoretic, cold, expectorant, emolient, antiinflammatory	Highland	Bolivia	Cultivated
	Sambucus peruviana	Kunth				Highland, orient	Panama, Bolivia, Peru	
CARICACEAE	*Carica papaya*	L.	Papaya	Leaves, fruit, seeds	Digestive, antiinflammatory, antiparasitary	Highland, coast	Costa Rica, Honduras, Nicaragua, Panama, Bolivia, Colombia, Peru, Caribeean, Burundi, Nigeria, Tanzania	Cultivated
CARIOPHYLLACEAE	*Agrostema insignis*		Oreja de burro					Cultivated
CELASTRACEAE	*Maytenus krukovii*	A.C. Sm.	Chuchuhuaso	Leaves	General weakness			Wild
	Maytenus laevis	Reissek	Chuchuhuaso	Bark	Rheumatism, arthritis, diarrheas, vermifuge	Orient	Colombia, Peru, Venezuela	
CHENOPODIACEAE	*Chenopodium ambrosoides*	L.	Paico	Whole plant	Antiparasitic, stomachache, menstrual problems	Coast, highland, Galapagos	Bolivia, Colombia, Paraguay, Peru, Venezuela, USA, Belize, Costa Rica, Guatemala, Honduras, Mexico,	Wild

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
							Nicaragua, Burundi, Madagascar, Tanzania	
CHLORANTHACEAE	*Hedyosmum luteynii*	Todzia	Pururug colorado, borracho, tarqui, cashco, guayusa andina, granizo, granecillo, y majagua (Colombia), Canela, borracho, congo	Leaves, bark	Abdominal pain, diuretic, diaphoretic, digestive, aphrodisiac, antiseptic, neuralgia, rheumatism, stomach cramps, abdominal pain	Highland	Colombia, Peru	
	Hedyosmum recemosum	(Ruiz & Pavon) Don.	Sacha guayasa	Leaves	Stomaquic, digestive	Highland, orient	Bolivia, Colombia, Peru, Venezuela	Wild
CLUSIACEAE	*Clusia columnaris*	Engl.	Matapalo				Bolivia, Colombia, Peru, Venezuela	Wild
	Clusia mocoensis	Cuatrec.	Incienso	Resin	Incense	Highland, orient	Colombia	Wild
	Hypericum sp.		Ciprecillo	Whole plant	Mild antidepressive, menoapausic neurosis, diuretic	Highland		Wild
	Symphonia microphylla	(Hils. & Bojer ex Cambess.) Benth. & Hook. F. Ex Vesque					Madagascar	
COMMELINACEAE	*Commelina diffusa*	Brum. F.	Churu yuyu	Flowers	Emollient, pectoral, hemostatic, back pain	Coast, highland, orient, Galapagos	USA, Belize, Costa Rica, Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Bolivia, Brazil, Paraguay, Peru, Caribeean, Camerun, Ethiopia, Gabon, Tanzania	Wild
COMPOSITAE	*Barnadesia arborea*	Kunth	Chiñan	Flowers	Coughs	Highland	Colombia	Wild
	Bidens pilosa	L.	Pacunga	Leaves, flowers	Wound disinfectant	Coast, highland, orient, Galapagos	Costa Rica, Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Bolivia, Colombia, Paraguay, Peru, Venezuela, Caribeean, Burundi, Camerun, Kenya, Madagascar, Tanzania, Zambia, Phillipines	Wild

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
COMPOSITAE (ASTERACEAE)	*Aristeguietia lamiifolia*	(Kunth) R.M. King & H. Rob.	Pega, pegajosa, salvia macho, (Chile), Matico, salvia	Aerial part	Antiinflammatory, rheumatism, antispasmodic, bile regulator, stimulant, fever	Highland	Northern Colombia, Chile, South Peru	
	Baccharis teindalensis	Kunth	Chilca, tola (Bolivia), Chilca, ciro, gurrubo (Colombia), Chilca, tola (Peru), Chilca, puliz	Leaves	Bruises, skin problems, reumathism, antiinflammatory, contusions, diarrhea	Highland	Colombia, Peru, Bolivia	
CORIARIACEAE	*Coriaria ruscifolia subsp. microphylla*	L.	Shanshi	Fruit	Hallucinogen	Highland	Peru	Wild
CRASSULACEAE	*Sedum quitense*	Kunth	Chugriyuyo, siempre viva	Leaves	Resolutive, diaphoretic	Highland		Cultivated
CUCURBITACEAE	*Cucurbita maxima*	Duchesne ex Lam.	Zapallo	Seeds	Purgative	Highland	Chile, Phillipines	Cultivated
CUNONIACEAE	*Weinmannia fagaroides*	Kunth	Palo de rosa, encino	Bark		Highland, orient	Costa rica, Bolivia, Colombia, Guyana, Peru, Venezuela	Wild
EQUISETACEAE	*Equisetum giganteum*	L.	Cola de caballo, caballo chupa	Stems, leaves	Antiinflammatory, scars healing	Coast, highland, orient	Argentina, Bolivia, Colombia, Paraguay, Peru, Venezuela, Costa Rica, Salvador, Guatemala, Honduras, Nicaragua, Panama	Wild
ERICACEAE	*Vaccinium floribundum*	Kunth	Mortiño		Reconstituent	Highland, orient	Costa rica, Panama, Bolivia, Colombia, Peru, Venezuela	Wild
EUPHORBIACEAE	*Alchornea triplinervia*	(Spreng.) Mull. Arg.	Pulgoso			Coast, highland, orient	Nicaragua, Panama, Bolivia, Brazil, Colombia, Paraguay, Peru, Venezuela	Wild
	Caryodendron orinocense	Karsten	Mani de arbol, huanchasi, nampi, queguino, casepciho, inchi	Sap of bark	Cauterization of the umbilical cord	Orient	Bolivia, Colombia, Peru, Venezuela	Wild, cultivated
	Croton elegans	Kunth.	Mosquera, puga	Leaves, sap	furuncles, scars healing, scabies	Highland	Valles interandinos secos	Wild
	Croton gossypifolius	Vahl	Sangre de drago, lan, uruchmas	Sap	Skin and ulcer healing	Highland	Colombia, Venezuela	Wild
	Croton lechleri	Mull. Arg.	Sangre de drago	Sap	Scar healing, antimycotic, tonic	Coast, highland, orient	Bolivia, Peru	Wild
	Croton menthodorus	Benth.	Chala, cucharilla, mosquero, mosquera, purga	Seeds, leaves	Irritant, rubefacient, constipation, skin inflammation, rheumatism, gout, neuralgia, toothache, warts, bleeding gums, vaginal discharge	Highland, orient	Colombia, Peru	
	Euphorbia splendens	Bojer ex Hook.	Lechero	Leaves	Headache, intoxication, warts	Highland	Nicaragua	Cultivated
	Manihot esculenta	Crantz	Yuca, lumu, yurumak, caenae, mandioca	Leaves	Abundant menstruation	Coast, highland, orient	Colombia, Paraguay, Peru, Costa Rica,	Cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
							Nicaragua, Cameroun, Tanzania	
	Phyllanthus niruri	L.	Chancapiedra	Plant without roots	Diuretic, hypoglycemic, antiseptic, stomachic, cytostatic	Coast, highland	Bolivia, Colombia, Peru, Venezuela, Paraguay, Guatemala, Nicaragua, Honduras	Wild
	Ricinus communis	L.	Higuerilla	Leaves, seeds	Purgative, antiinflammatory	Coast, highland, orient	Bolivia, Colombia, Peru, Paraguay, Guatemala, Nicaragua, Honduras, USA, Costa rica, Mexico, Panama, Caribeean, Ethiopia, Madagascar, Nigeria, Tanzania, Uganda, Saudi Arabia	Wild, cultivated
FABACEAE	*Desmodium intortum*	(Mill.) Urb.	Hierba angel	Leaves	Wound healing	Coast, highland, orient	Belize, Costa Rica, Honduras, Mexico, Nicaragua, Colombia, Peru, Tanzania	Wild
	Diplotropis purpurea var. leptophylla	(Kleinhoonte) Arnshoff				Orient	Peru	Wild
	Eperua leucantha	Benth.					Colombia, Venezuela	
	Eperua purpurea	Benth.					Venezuela	
	Mucuna pruriens	L.	Uña de gato, ojo de vaca	Vellosity, which covers the legume	Vermifuge, source of L-DOPA, antiparkinson	Coast	Mexico, Nicaragua, Panama, Burundi, Madagascar, Uganda	Wild
	Myroxylon balsamun	(L.) Harms.	Árbol de bálsamo, bálsamo, bálsamo del Perú, bálsamo de tolú, estoraque, guararo	Trunk	Expectorant, bronchitis, chronic cold, asthma, venereal diseases, cholera, tuberculosis, edema, skin diseases, wound healing	Highland	Costa Rica, Mexico, Nicaragua, Panama, Bolivia, Colombia, Peru, Venezuela, Brazil	
	Myroxylon peruiferum L.f.	L.f.	Balsamo	Leaves, balsam	Antiseptic, antitussive, expectorant	Coast, highland	Argentina, Bolivia, Brazil, Peru	Wild
	Piscidia carthagenensis	Jacq.	Barbasco	Roots	Antimycotic	Coast, highland, Galapagos	Costa Rica, Mexico, Nicaragua, Caribeean	
	Tamarindus indica	L.	Tamarindo	Aril of seeds	Jaundice	Coast	Bolivia, Colombia, Paraguay, Peru, USA, Belize, Nicaragua, Caribeean, Burundi, Cameroun, Republic of	Cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
							Central Africa, Ethiopia, Nigeria, Madagascar, Tanzania, Zambia	
	Tipuana tipo	(Benth.) Kuntze				Highland	USA, Argentina, Bolivia	Wild
GERANIACEAE	*Pelargonium odoratissimum L.*	L.	Malva olorosa	Leaves, flowers	Stomachache	Highland	USA	Introduced, cultivated
JUGLANDACEAE	*Juglans neotropica*	Diels	Nogal, tocte	Stems, fruit, leaves	Vitamin, arthritis, bond pain	Highland, orient		Wild, cultivated
KRAMERIACEAE	*Krameria lappacea*	(Dombey) Burdet & B.B. Simpson		Root	Astringent, tonic, diarhoea, gonorrhoea, haemorrhage	Highland	Bolivia, Peru	
	Krameria triandra	Ruiz & Pav.	Latania	Roots	Astringent, diuretic		Bolivia, Peru	
LAMIACEAE	*Marrubium vulgare*	L.	Ortiga muerta	Leaves, flowers	Diaphoretic, diuretic, expectorant, stimulant	Highland	USA, Bolivia, Peru	Wild
	Melissa officinalis L.	L.	Toronjil	Whole plant	Aromatic, stomachic	Highland	USA	Cultivated
	Mentha aquatica	L.	Hierba buena		Carminative, digestive, rheumatism	Highland	USA, Bolivia, Zambia, Uganda	
	Mentha piperita	L.	Yerbabuena, menta	Leaves	Rheumatism, antiparasitic, antiemetic, stomachache, diarrhea, vomits	Highland	Nicaragua	Introduced, cultivated
	Mentha viridis	L.	Hierba buena	Leaves	Prostate, stomachic, antiparasitic	Highland	Andes	Introduced
	Micromeria nubigena	(Kunth) Benth.	Sunfo	Leaves	Colds, stomachache, burns	Highland		Wild
	Minthostachys mollis	Kunth) Griseb.	Tipo, poleo, guarmi	Leaves, flowers	Coughing, cold, stomachic	Highland	Peru, Venezuela	Wild
	Ocimum basilicum	L.	Albahaca, Aarpaj	Leaves, flowers	Carminative, stomachic, antispasmodic	Highland	Colombia, USA, Salvador, Nicaragua, Panama, Burundi, Tanzania, Uganda, Malasya, Sarawak, Saudis Arabia	Introduced, cultivated
	Origanum vulgare	L.	Oregano	Leaves	Stimulant, carminative, diaphoretic, tonic, sedative	Coast, highland	USA, Colombia, China, Kazakstan	Cultivated
	Rosmarinus officinalis	L.	Romero	Leaves, stems	Tonic, depurative, antiseptic, digestive, hair tonic	Highland	USA, Bolivia, Peru	Introduced, cultivated
	Salvia phoenicea	Kunth	Salvia	Leaves	Stimulant, tonic, antispasmodic	Highland		
	Satureja nubigena	(Kunth) Briq.	Sunfillo	Leaves	Stomachic	Coast, highland, orient	Colombia, Peru	Wild
	Satureja parvifolia	(Phil.) Epling			Stomachic, stimulant, emmenagogue			
	Thymus vulgaris	L.	Tomillo	Whole plant	Aromatic, stomachache in	Highland	USA	Introduced, cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
					children			
LAURACEAE	*Aniba riparia*	(Nees) Mez	Suche	Stems, bark		Highland		Wild
	Chlorocardium venenosum	(Kostermans & Pinkley) Rohwer, Ritcher & Van der Werff	Para el curare, grungureicco, canelo, ishpingo	Fruit, bark, leaves	Convulsions caused by tetanus, eye surgery, diarrhea	Orient	Colombia, Peru	Wild
	Cinnamomum zeylanicum	Breyn	Canela	Bark	Spasms, stomachache, menstrual cramps, diarrhea, vomiting		USA, Uganda	Introduced
	Licaria canella	(Meissner) Kostermans	Alcanfor, canilao, moena (Cofán), muena, ocatoe (Huaorani), tsampisu	Leaves	Digestive, chronic diarrhea, diabetes	Highland, orient		
	Ocotea aciphylla	(Nees) Mez	Canela, canela muena, canelo, moena negra, muena amarilla, palo de aceite, socu´jin		Rheumatism, fever, malaria, bronchitis, snakebites	Highland	Colombia, Venezuela, Brazil	
	Persea americana	Miller	Aguacate	Leaves, fruits	Antiparasitic, diabetes, menstrual alterations, hypoglycemic, varicose veins	Coast, highland, orient	Bolivia, Brazil, Colombia, Peru, USA, Costa Rica, Salvador, Honduras, Mexico, Nicaragua, Panama, Caribeean, Cameroun, Gabon, Phillipines	Cultivated
LECYTHIDACEAE	*Eschweilera amara*	(Aubl.) Nied.					Peru	Wild
LEGUMINOSAE (FABACEAE)	*Acacia aroma*	Gillies ex Hook. & Arn.	Aromo	Flowers, stems, leaves, roots, fruit	Eupeptic, diaphoretic, antiseptic, astringent, antitussive, depurative	Coast, highland	Argentina, Bolivia, Brasil, Paraguay, Peru	Wild
	Acacia weberbaueri	Harms				Highland	Peru	Wild
	Otholobium mexicanum	(L.f.) Grim.	Trinitaria, tarta, albaquilla, chinitaria, clén, culín, huallua, hucalhua, trinitaria, yanasingue	Leaves, flowers, bark	Diarrhea, digestive, stomach upset, intestinal infections, antidiarrheic, astringent, hemostatic, carminative, emmenagogue	Highland	Venezuela, Peru	Wild
	Swartzia simplex	(Sw.) Spreng.	Laranjinha, laranjeira do mato, macutayba (Brazil), Caballo caspi, negro caspi, palo de caballo, porotillo, pusilde	Leaves, fruits, stembark	Headache, stomachache, throat sore, cold, amenorrhea, abortive, tonic, wound healing, bloody diarrhea, vermifuge, liver inflammation	Highland, orient	Colombia, Peru, Brazil, Martinique, Mexico, Panama, Dominican Republic, Trinidad, Venezuela	
LILIACEAE	*Aloe vera*	L.	Sabila	Sap	Kidney and liver inflammation, laxative, emollient, cosmetic	Highland	Costa Rica, Mexico, Nicaragua, Saudis Arabia	Introduced
	Dracaena draco	L.	Sangre de Drago, lengua de suegra	Latex	Astringent, hemostatic		USA	Introduced, cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
LINACEAE	*Linum usitatissimum*	L.	Linaza	Seeds, leaves	Gastrointestinal and kidney inflammation	Highland	Bolivia, USA, Salvador, Mexico, Nicaragua	Cultivated
LOGANIACEAE	*Strychnos peckii*	B.L. Rob.	Para el curare, curarina	Stems	Cardiovascular problems	Orient	Belize, Costa Rica, Honduras,Panama, Brazil, Colombia, Peru, Venezuela	Cultivated
LORANTHACEAE	*Phrygilanthus sp.*		Suelda con suelda					
MALPIGHIACEAE	*Banisteriopsis caapi*	(Spruce ex Grisebach) Morton	Ayahuasca, nepe, napi, natema, yaje	Stems, leaves	Hallucinogen, fright baths, antibacterial	Coast, highland, orient	Bolivia, Colombia, Peru, Costa Rica, Panama	Cultivated
	Bunchosia armeniaca	(Cav.) DC	Ciruelo			Coast, orient	USA, Bolivia, Colombia	Cultivated
MALVACEAE	*Gossypium barbadense*	L.	Algodón	Leaves, flowers, seeds	Cleaner	Coast, highland, orient, Galapagos	Bolivia, Colombia, Peru, Panama, Nicaragua, Caribeean, Gabon, Nigeria, Phillipines	
	Lavatera arborea	L.	Malva blanca	Leaves, flowers	Kidney, ovary and liver inflammation, leucorrhea, prostate hyperplasy	Highland	Bolivia	Cultivated
MARANTACEAE	*Calathea loeseneri*	(J.F.) Macbr.				Orient	Bolivia, Colombia, Peru	
MELIACEAE	*Cedrela odorata*	L.	Cedro	Bark	Muscular pain	Coast, orient	Belize, Costa Rica, Honduras, Mexico, Nicaragua, Bolivia, Colombia, Paraguay, Peru, Venezuela	Wild
MENISPERMACEAE	*Abuta grandifolia*	(Mart.) Sandwith	Abota, abuta, abuta branca, perreicra brava bramca (Brazil), ancabesux, mirsimarika, taquecurauqe,vibuajeiria (Colombia), ajiji	Leaves, bark, stems, roots,	Headache, toothache, fever, diarrhea, bleeding, reumathism, aphrodisiac, malaria, liver diseases, gastric ulcers	Orient	Guyana, Suriname, French Guyana, Venezuela, Colombia, Perú, Bolivia, Brazil	Wild
	Chondrodendron tomentosum	Ruiz & Pav.	Para el curare	Stems	Muscular relaxant, anesthetic	Orient	Panama, Bolivia, Colombia, Peru	Wild
MIMOSACEAE	*Mimosa albida*	H & B ex Willd.	Uña de gato	Leaves, flowers	Liver and kidney problems, coughs	Highland	Costa Rica, Honduras, Mexico, Nicaragua, Bolivia, Colombia, Peru	Wild
	Prosopis Laevigata var. andicola	Burkart	Algarrobo					
MONIMIACEAE	*Peumus boldus*	Molina	Boldo	Leaves	Laxative, purgative		Chile	
	Siparuna echinata	(Kunth) A. DC.	Amapá, capitiú (Brazil), Ashnapanga, Guayusa, huairamamalli, huairapanga, limoncillo, malagre, nuanapechanapanga,	Bark, leaves, fruits	Herpes, headache, stomachache, insect bites, indigestion, fever, emetic, antiinflammatory,	Highland	Colombia, Bolivia, Brazil, Peru	

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
			raposapanga		rheumatism, nasal descongestionant			
MORACEAE	*Brosimum lactescens*	(S. Moore) C.C. Berg.	Sande	Latex		Orient	Costa Rica, Nicaragua, Panama, Bolivia, Brazil, Colombia, French Guayana, Peru, Venezuela	Wild
	Brosimum rubescens	Taub.	Sande			Orient	Brazil, Colombia, Peru, Venezuela	Wild
	Brosimum utile	(Kunth) Pittier	Sande	Latex	Antipyretic, asthma, astringent	Orient, Coast	Costa Rica, Panama, Bolivia, Colombia, Peru, Venezuela	
	Ficus carica	L.	Higo	Leaves, fruits	Liver irritation	Highland	USA, Nicaragua	Cultivated
	Ficus insipida	Willd.	Bibosi, cocoba, ficus, gomelero, higueroncillo, ira, ojé, sacha ojé (Bolivia), Apuí, Casinguaba, guaxinguba, lombriguerira, leche de oje	Bark, leaves, fruits, roots, latex	Herpes, headache, stomachache, insect bites, indigestion, fever, emetic, source of antihelmintic	Coast, Highland, Orient	Belize, Costa Rica, Salvador, Honduras, Mexico, Nicaragua, Panama, Bolivia, Colombia, Peru, Venezuela, Brazil	
MUSACEAE	*Heliconia sp.*		Platanillo	Rhizome, leaves	Diuretic, stomachache	Coast		Wild
	Musa x paradisiaca	L.	Platanillo	Fruits, latex	Digestive, chronic lung infections, tuberculosis, skin mycosis	Coast, Orient		Cultivated
MYRISTICACEAE	*Virola carinata*	(Benth.) Warb.	Sangre de gallina	Resin	Antimycotic	Coast	Bolivia, Colombia	
	Virola duckei	A.C. Sm.	Ucuúba, dogonpapohue, dogonpapoe, dunpahue, ipe-be, dryopapue (Huaorani)	Sap, bark	Wound healing, erysipelas, cramps, dyspepsia, dental caries, mouth ulcers, hallucinogen	Orient	Brazilian and Colombian Amazon	
	Virola flexuosa	A.C. Sm.	Sangre de gallina	Resin	Antimycotic	Orient	Bolivia, Colombia, Peru	Wild
	Virola pavonis	(A. DC.) A.C. Sm.	aguano cumala (Quichua), Caupuri del bajo, dishaccocho (Cofán) guhue (Huarani), ihue, intindicuña, ipebe, ipehue, ive	Sap, bark	Wounds healing, mouth ulcers, dental caries, erysipelas, cutaneous mycosis, vitiligo	Orient	Brazilian Amazon, Peru	
	Virola peruviana	(A.DC.) Warb.	Sangre de gallina	Resin	Antimycotic	Orient	Bolivia, Colombia, Peru	Wild
	Virola theidora	(Spruce ex Benth.) Warb.	Sangre de gallina	Resin	Antimycotic	Orient, coast	Peru	Wild
MYRSINACEAE	*Rapanea dependens*	(Ruiz & Pavon) Mez	Chamuelan			Highland		
MYRTACEAE	*Blepharocalyx salicifolius*	(Kunth) O. Berg		Leaves	Dyspepsia, diarrhea, liver problems, antitussive, throat pain	Highland	Bolivia, Paraguay	
	Eucalyptus citriodora	Hook.	Eucalipto aromatico	Leaves	Postpartum hot baths, cold, coughs	Highland	USA, Paraguay	Cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
	Eucalyptus globulus	Labillardiere	Eucalipto	Leaves	Antiseptic, hypoglycemic, antiinflammatory, diabetes	Highland	Bolivia, Peru, USA	Introduced
	Myrcianthus hallii	Kunth	Arrayan	Leaves	Antiinflammatory, diabetes, cholesterol lower, wound healing	Highland		Introduced, cultivated
	Psidium guajava L.	L.	Guayaba, guayagas, yuranwayap	Fruits, cortex of fruits	Diarrhea, intestinal antiinflammatory	Coast, highland, orient	Bolivia, Colombia, Paraguay, Peru, USA, Belize, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, Panama, Caribeean, Burundi, Cameroun, Central Africa Republic, Ghana, Madagascar, Nigeria, Tanzania	Cultivated
NYCTAGINACEAE	*Pisonia aculeata*	L.	Uña de gato, uña de tigre	Leaves	Arthritis	Coast	USA, Belize, Costa Rica, Honduras, Mexico, Nicaragua, Panama, Bolivia, Colombia, Paraguay, Peru, Caribbean, Ghana, Taiwan	
OCHNACEAE	*Cespedesia spathuñata*	(Ruiz & Pavon) Planchon	Amarun caspi		Postpartum baths	Orient		Wild
OLACAEAE	*Heisteria acuminata*	(Humb. & Bonpl.) Engl.	Cafetillo, chonta, caspi chonta, caspisipida, tsofeccocho (Cofán), buenhue, chailloa caspi, (Huaorani), tinchi (Shuar)	Leaves, bark	Headache, nasal bleeding, scabies, cold, bacterial skin infections, skin mycosis, herpes labialis, eyes burning and pain	Highland, orient		
	Minquartia guanensis	Aublet	Huambula, guayacan pechiche, guambula	Bark	Antihelmintic, antimycotic, purgative	Coast, highland, orient	Costa Rica, Nicaragua, Panama, Bolivia, Brazil, Colombia, Peru, Surimane, Venezuela	Wild
ORCHIDACEAE	*Catasetum sp.*		Suelda con suelda	Pseudobulb	Liver and kidney antiinflammatory	coast		Wild
PALMAE	*Oenocarpus bataua var. bataua*	Mart.	Ungurahua, chapil, colaboca, shimpi, sigua	Roots, fruit, fruit oil	Diarrhea, antidysenteric, vermifuge, hair loss	Coast, highland, orient	Bolivia, Colombia, Peru, Panama	Wild
PAPAVERACEAE	*Argemone mexicana*	L.	Cardo santo	Flowers	Coughs, prostate	Highland	USA, Belize, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, Bolivia	Wild
	Papaver rhoes	L.	Amapola	Flowers	Blood purifier, headache,	Highland	USA	Wild, cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
					purgative			
PAPILIONACEAE	*Spartium junceum*	L.	Retama	Flowers	Liver and kidney inflammations	Highland		Wild, cultivated
PASSIFLORACEAE	*Passiflora edulis*	Sims	Maracuya, granadilla comun	Leaves, flowers sumidades, fruit	Sedative, antispasmodic	Coast, highland, orient	Argentina, Bolivia, Brazil, Paraguay, Peru, USA, Costa Rica, Honduras, Mexico, Nicaragua, Caribbean, Cameroun, Madagascar, Tanzania	Cultivated
	Passiflora tetragona	M. Roem.	Badea	Roots	Emetic	Coast, highland, orient	Bolvia, Brazil, Colombia, Peru, USA, Costa Rica, Nicaragua, Panama, Islas Sociedad	Cultivated
PHYTOLACCAEAE	*Phytolacca bogotensis*	Kunth	Cargamanta, guaba (COLOMBIA), atuczara, atug chogllo, atug-sara, maíz de lobo	Flowers, leaves, branch, fruits, roots	rheumatism, bone diseases, skin diseases, antiparasitic, blood depurative, siphilis, hypotensor, pharyngitis, antiinflammatory	Highland	Colombia	
PIPERACEAE	*Peperomia congona*	Ruiz & Pav.	Congona	Leaves	Ear pain	Highland		Cultivated
	Peperomia peltigera	Sodiro	Pata con yuyo	Inflorescence	Heart pain	Highland		Cultivated
	Piper aduncum	L.	Pimienta de fruto ganchoso, pimienta de macaco, tapa hueco (Brazil), hierba del soldado, matico, (Colombia), matico, matico lojano, cordocillo	Leaves	Gastric ulcers, stomach problems, intestinal cramps, external wounds, external bleeding, wound healing, traumatism, astringent	Highland, orient	Brazil, Colombia, Peru, Central America (Major Antilles, San Vicente, Granada, Barbados, Trinidad Tobago) to Mexico	Wild
	Piper angustifolium	Lam.	Matico peruano, yerba del soldado	Leaves	Ulcers, antiinflammatory	Highland	Bolivia, Colombia, Peru, Costa rica, Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Brazil, Venezuela, Caribbean	Wild
	Piper hispidum	Sw.	Lutu, cordoncillo	Leaves	Menstrual regulator, dental caries, mouth ulcers, astringent, wound healing, insect bites, antiinflammatory	Highland	Nicaragua, Panama, Peru	Wild
	Piper nigrum	L.	Black pepper				USA, Costa Rica, Venezuela, Comoros	Cultivated
PLANTAGINACEAE	*Plantago major*	L.	Llanten	Whole plant	Antiinflammatory	Highland, coast, Galapagos	Boliva, Peru, USA, Costa Rica, Honduras,	Wild, cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
							Nicaragua	
POACEAE	*Cymbopogon citratus*	DC. Stapf.	Hierba luisa, chirichiri muka	Stems, leaves	Antihypertensive, digestive, aromatic	Coast, highland, orient	Brazil, Peru, Venezuela, USA, Mexico, Nicaragua	Introduced, cultivated
	Paspalum humboldtianum	Flugge	Grama	Stems	Ovary, liver and kidney inflammations	Highland	Salvador, Honduras, Mexico, Nicaragua, Bolivia, Colombia, Peru, Venezuela	Wild
	Sacharum officinarum	L.	Caña de azucar, huiru, paat	Juice	Laxative	Coast, highland, orient	Peru, Salvador, Mexico, Australia	Cultivated
	Zea mays	L.	Pelo de choclo, maiz	Hairs	Liver and colon inflammations	Highland	USA, Mexico, Belize, Salvador, Guatemala, Nicaragua, Bolivia, Brazil, Peru	Cultivated
PODOCARPACEAE	*Podocarpus glomerulatus*	D.Don	Romerillo, sinsin,			Highland		
POLEMONIACEAE	*Cantua buxifolia*	Juss.				Highland	Bolivia Peru	Wild, cultivated
POLYGALACEAE	*Monnina obtusifolia*	Kunth	Eguielin, iguilan, iguilan phytolacca	Roots, leaves, stems	Tonic, purgative, rheumatism, chronic cold, eyes diseases, expectorant, diaphoretic, skin infections, snakebites	Highland	Colombia, Bolivia, Peru	
POLYPODIACEAE	*Campyloneurum sp.*		Calaguala	Rhizomes	Antiinflammatory			Wild
	Niphidium crassifolium	(L.) Lellinger	Calaguala	Rhizomes	Purgative	Highland	Belize, Costa Rica, Salvador	Wild
PORTULACACEAE	*Portulaca oleracea*	L.	Verdolaga	Whole plant	Antiinflammatory, antiparasitic	Coast, highland, orient	Bolivia, Chile, Colombia, Peru, Venezuela, USA, Costa Rica, Guatemala, Nicaragua, Panama, Caribbean, Burundi, Cameroun, Central Africa Republic, Ghana, Madagascar, Nigeria, Tanzania, Zambia	Wild
PROTEACEAE	*Oreocallis grandiflora*	(Lam.) R. Br.	Cucharilla	Inflorescence	Liver and kidney inflammations	Highland	Peru	Wild
RHAMNACEAE	*Colletia spinosissima*	J.F. Gmel.				Highland	USA, Bolivia, Peru	
ROSACEAE	*Hesperomeles cuneata*	Lindl.	Cerote	Fruits	Liver and kidney inflammations	Highland, orient	Boliva, Peru	Wild
	Hesperomeles obtusifolia	(Pers.) Lindl.	Cerote, pujin	Leaves, fruit	Liver and kidney inflammations	Highland	Peru	Wild
	Margyricarpus pinnatus	(Lam.) kuntze	Nigua, pikiyuyo, manzan silvestre	Whole plant, fruits	Blood purifier, antipyretic, eruptive diseases, chicken pox, small pox	Highland	Argentina, Bolivia, Peru	Wild, cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
	Polylepis incana	Kunth	Yaguai, Quinoa, Quishuar, pantza	Leaves	Postpartum hot baths	Highland, orient	Boliva, Peru	Wild
	Poterium sanguisorba	L.	Pimpinella	Leaves	Heart, liver and kidney inflammations	Highland	Bolivia	Cultivated
	Prunus serotina	Ehrh.	Capuli	Leaves	Jaundice	Highland, orient	USA, Bolivia,	Wild, cultivated
	Rubus bogotensis	Kunth	Zarzamora, mora	Roots, leaves, fruits, flowers	Laxative, pectoral, astringent, cold, coughing	Highland	Bolivia, Peru, Venezuela	Cultivated
RUBIACEAE	*Cinchona pubescens*	(Vahl.)	Quina, cascarilla	Bark	Frebrifuge, antimalarial, diarrhea, pneumonia	Coast, highland, orient, Galapagos	Costa Rica, Panama, Bolivia, Colombia, Peru, Venezuela	Wild
	Coffea arabica	L.	Café	Leaves, seeds	Digestive, stimulant, headache	Coast, highland, orient	Boliva, Brazil, Paraguay, Peru, Venezuela, USA, Costa Rica, Nicaragua, Panama, Caribbean, Cameroun, Congo, Ghana, Libia, Nigeria	Introduced, cultivated
	Coussarea macrophylla	Müll. Arg.	Namentamo (Huaorany), pai heko"cho (Cofán)		Antiparasitic	Highland, orient		
	Uncaria guianensis	(Aubl.) J.F. Gmel.	Uña de gato, ontaepome, eigahuen, Cashahuasca (Quichua), eigahuen (Huaorani), mulupo pashca, ontaepome, soga espinosa, uña de gato	Stems, bark	Coughs, colds, stomachic, antiinflammatory, antitumoral, rheumatism, prostate cancer, anticonceptive, prostate cancer, arthriti	Orient	Bolivia, Colombia, Peru, Suriname, Venezuela, Guyana	Wild
	Uncaria tomentosa	(Willd. ex Roem. & Schult.) DC.	Uña de gato, rinricasha, kenkuk	Bark	Antiviral, inmune system stimulant	Coast, orient	Bolivia, Brazil, colombia, Peru, Venzuela, Costa rica, Guatemala, Nicaragua	Wild
RUTACEAE	*Amyris macrocarpa*	Gereau	Chalma tacu			orient	colombia, Peru	Wild
	Citrus limon	(L.) Burm. f.	Limon	Fruit, leaves	Digestive, colds, wound healing	Highland	Bolivia, Peru	Introduced, cultivated
	Citrus aurantium	L.	Naranja agria	Fruit, leaves	Digestive, colds	Highland	Nicaragua, Paraguay, Caribbean, Madagascar	Introduced, cultivated
	Citrus paradisi	Macfad.	Toronja	Fruit	Weight loss	orient	Caribbean	Cultivated
	Fagara coco	(Gilles ex Hook f. & Arn.)Engl						
	Ruta graveolens	L.	Ruda	Leaves	Circulatory and uterine tonic, sedative, analgesic, stomachache	Highland	Bolivia, Colombia, USA	Introduced, cultivated
SABIACEAE	*Meliosma arenosa*	Idrobo & Cuatrec.	Aguacatillo pedroso, níspero de la montaña pedroso	Leaves, stems	Skin infections, cutaneous infections	Highland	Peru	
SALICACEAE	*Salix humboldtiana*	Humboldt	Sauce	Bark, leaves	Febrifuge, rheumatism, arthritic pain	Highland	Argentina, Bolivia, Colombia, Paraguay, Peru,	Wild,cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
							Salvador	
SAPINDACEAE	*Dodonaea viscosa*	Jacq.	Chamana	Leaves	Bruises and wound antiinflammatory	Highland	USA, Belize, Costa Rica, Mexico, Bolivia, Colombia, Peru, Venezuela, Caribbean, Burundi, Comoros, Madagascar, Malwi, Reunion, Tanzania, Uganda, Zambia, Sulawesi, Saudis Arabia, Lesser Sunda	Wild
SAPOTACEAE	*Chrysophyllum amazonicum*	T.D. Penn.	Abiu da mata, abiurana (Brazil), Puirasado, pun-nashau (Colombia), Caimitillo, caimitillo amarillo, quini	Leaves	Abscesses, cutaneous mycosis, cold, herpes labialis	Highland	Brazilian Amazonia to East Pery, East Colombia to South Venezuela	
	Pouteria caimito	(Ruiz & Pavon) Radlk.	Caimito, apiu, yaas, meñigka, cijica	Latex	Wound healing	Coast, highland, orient	Bolivia, Colombia, Peru, Venezuela, Nicaragua, Panama	Cultivated
SIMAROUBACEAE	*Simarouba amara*	Aubl.	Capuli	Fruits	Antimalarial	Coast, highland, orient	Costa Rica, Honduras, Nicaragua, Panama, bolivia, Brazil, Colombia, Peru, Suriname, Venezuela	Wild
SMILACACEAE	*Smilax spp.*		Zarzaparrilla	Bulb	Digestive, diuretic, depurative, diaphoretic, tonic	Coast, orient		Wild
SOLANACEAE	*Brugmansia aurea*	Lagerheim	Floripondio	Flowers	Face and gums swelling due to tooth ache	Highland	Colombia	Wild, cultivated
	Cestrum auriculatum	L'Her				Highland	Peru	
	Cestrum peruvianum	Willd. Ex Roem. Schult.	Sauco	Leaves	Cold baths, to fortified bond	Highland	Peru	Wild
	Lycopersicon esculentum	Miller	Tomate	Fruit	Internal and antiinflammatory, pharingitis, amygdalitis, peptic ulcers, colitis	Coast, highland	Venezuela	Cultivated
	Nicotiana tabacum	L.	Tabaco, tsaank	Leaves, flowers	Antiinflammatory, analgesic, sedative, wide spectrum fungicide	Coast, highland, orient	Bolivia, Colombia, Peru, Honduras, Nicaragua, Cameroun, Phillipines	Cultivated
	Solanum altissimum	Benítez	Dabué (Huaorani)	Fruit, seeds, bark	Cold, antipyretic, diuretic, cutaneous mycosis, chicken pox, scabies	Highland	Peru	
	Solanum nigrescens	Mart. Galeotti	Hierba mora	Leaves, flowers, fruit	Fever, antiinflammatory, furuncles	Highland	USA, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua,	Wild

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
							Bolivia, colombia	
	Solanum quitoense	Lamarck	Naranjilla, laranca, apach cucuch, daboka	Fruits	Demulcent, diuretic, antihypertensive	Coast, highland, orient	Colombia, Costa Rica, Nicaragua, Panama	Cultivated
	Solanum tuberosum	L.	Papa	Peel, starch	Antiinflammatory, digestive, gastritis, peptic ulcer	Highland, orient	Bolivia, Peru, Nicaragua	Cultivated
STERCULIACEAE	*Guazuma ulmifolia*	Lam.	Guacimo, guasmo	Fruit	Coughs, colds	Coast, orient	USA, Costa Rica, Honduras, Mexico, Nicaragua, Panama, Bolivia, Colombia, Paraguay, Peru, Caribbean	Wild, cultivated
	Theobroma cacao	L.	Cacao	Seeds	Tonic, diuretic, cardiotonic	Coast, highland, orient	bolivia, Brazil, Colombia, Peru, USA, Belize, Costa Rica, Salvador, Guatemala, Honduras, Nicaragua, Panama, Caribbean, Cameroun	Cultivated
THEOPHRASTACEAE	*Clavija ornata*	D. Don		Seeds, leaves	Antispasmodic, emetic, rheumatism			
ULMACEAE	*Celtis spinosa*	Spreng.	Uña de gato	Leaves	Diarrhea, digestive	Highland	Bolivia, Paraguay	
URTICACEAE	*Urtica dioica*	L.	Ortiga negra	Whole plant	renal ailments, nervousness, heart problems	Highland	USA, Argentina	Wild
VALERIANACEAE	*Valeriana sp.*		Valeriana	Rhizomes	Antispasmodic, stimulant	Highland		Wild
VERBENACEAE	*Aegiphila ferruginea*	Hayek & Spruce				Highland, orient		Wild, cultivated
	Verbena litoralis	Kunth	Verbena	Whole plant	Fever, arthritis	Coast, highland, orient		Wild, cultivated
	Verbena microphylla	Kunth	Verbena	Whole plant	Fever	Highland	Bolivia, Peru	Wild, cultivated
VIOLACEAE	*Viola odorata*	L.	Violeta	Flowers	diaphoretic, colds	Highland	Boliva, Honduras, Mexico	Introduced, cultivated
VOCHYSIACEAE	*Erisma bracteasum*	Ducke						Wild
	Erisma splendens	Stafleu						Wild
ZINGIBERACEAE	*Costus scaber*	Ruiz & Pav.	Caña agria	Stems	Kidney pain	Coast,highland, orient	Costa Rica, Honduras, Nicaragua, Panama, Bolivia, Brazil, Colombia, Peru, Venezuela	Wild
	Zingiber officinale	Roscoe	Jenjibre, ajirini, ajej, afifimbi	Rhizomes	Stomachache, weakness, menstrual cramps	Highland, orient	Peru, Costa Rica, Salvador, Mexico, Nicaragua	Cultivated

Source: Buitrón, C.X. 1999. *Ecuador: uso y comercio de plantas medicinales, situación actual y aspectos importantes para su conservación.* TRAFFIC International. Cambridge. 101 p.; Material data sheet, *www.biocomercioecuador.org*; *Personal Evaluation.*

Table 3. Inventory of the already processed medicinal plants from Ecuador

Company	Product	Plant	Type of product
Ab. Wilson Echeverria	Aromatic herbs crop project	Not reported	Medicinal and aromatic plants
ACUARELA	Herbs and essential oils project	Not reported	Medicinal and aromatic plants
Agro Trading	Black pepper, essential oils	*Piper nigrum* L.	Medicinal and aromatic plants
	Lemon grass, essential oils	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Ginger, essential oils	*Zingiber officinale* Roscoe	Medicinal and aromatic plants
	Cardamom, essential oils	*Elettaria cardamomum* (L.) Maton	Medicinal and aromatic plants
	Turmeric, essential oils	*Curcuma longa* L.	Medicinal and aromatic plants
	Dried: Cardamom, Ginger, Black pepper, Turmeric, spices	*Elettaria cardamomum* (L.) Maton (cardamom), *Zingiber officinale* Roscoe (ginger), *Piper nigrum* L. (black pepper), *Curcuma longa* L. (turmeric)	Medicinal and aromatic plants
AGROALEGRE	Anise, essential oils	*Pimpinella anisum* L.	Medicinal and aromatic plants
	Marjoram, essential oils	*Majorana hortensis* Moench	Medicinal and aromatic plants
	Oregano, essential oils	*Origanum vulgare* L.	Medicinal and aromatic plants
	Parsley, essential oils	*Petroselinum sativum* Hoffm.	Medicinal and aromatic plants
	Black pepper, essential oils	*Piper nigrum* L.	Medicinal and aromatic plants
	Schinus molle, essential oils	*Schinus molle* L.	Medicinal and aromatic plants
	Lemon verbena, essential oils	*Aloysia triphylla* Royle	Medicinal and aromatic plants
	Eucalyptus, essential oils	*Eucalyptus globulus* Labill.	Medicinal and aromatic plants
	Dried Vegetables		Food
	Chili, Lucerne, Celery leaves and powder, Coriander leaves, seeds and powder, Turmeric, Ginger, Parsley leaves and powder, Red pepper, White and green leek, powder, Carrots	*Capsicum frutescens* L. (chili), *Medicago sativa* L. (lucerne), *Apium graveolens* L.(celery), *Coriandrum sativum* L. (coriander), *Curcuma longa* L. (turmeric), *Zingiber officinale* Roscoe (ginger), *Petroselinum sativum* Hoffm. (parsley), *Capsicum annuum* L. (red pepper), *Daucus carota* L. (carrot)	Medicinal and aromatic plants
	Dried Aromatic and Medicinal Herbs		Medicinal and aromatic plants
	Sangorache	*Amaranthus quitensis* Kunth	Medicinal and aromatic

Company	Product	Plant	Type of product
			plants
	Dill	*Anethum graveolens* L.	Medicinal and aromatic plants
	Camomile	*Matricaria recutita* L.	Medicinal and aromatic plants
	Lemon balm	*Melissa officinalis* L.	Medicinal and aromatic plants
	Borage	*Borago officinalis* L.	Medicinal and aromatic plants
	Chuquiragua	*Chuquiraga jussieui* J.F. Gmel.	Medicinal and aromatic plants
	Lemon grass	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Lemon verbena	*Aloysia triphylla* Royle	Medicinal and aromatic plants
	Mint	*Mentha sativa* L.	Medicinal and aromatic plants
	Matico	*Piper angustifolium* Lam.	Medicinal and aromatic plants
	Dandelion	*Taraxacum officinale* F.H. Wigg.	Medicinal and aromatic plants
	Verbena	*Verbena litoralis* Kunth	Medicinal and aromatic plants
	Wormseed	*Chenopodium ambrosioides* L.	Medicinal and aromatic plants
	Parsley	*Petroselinum sativum*	Medicinal and aromatic plants
	Rosemary	*Rosmarinus officinalis* L.	Medicinal and aromatic plants
	Thyme	*Thymus vulgaris* L.	Medicinal and aromatic plants
AMAZON AROMA	Lemon grass, herbal tea	*Cymbopogon citratus* (DC.) Stapf	Herbal medicinal products
	Cats claw, herbal tea	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Chuchuasi, herbal tea	*Maytenus laevis* Reissek	Herbal medicinal products
	Guayusa, herbal tea	*Ilex guayusa* Loes.	Herbal medicinal products
	Mejorana, herbal tea	*Origanum majorana* L.	Herbal medicinal products
	Dragon´s blood, herbal tea	*Croton lechleri* Müll. Arg.	Herbal medicinal products
	Cinnamon, essential oils	*Cinnamomum verum* J. Presl	Medicinal and aromatic

Company	Product	Plant	Type of product
			plants
	Cardamom, essential oils	*Elettaria cardamomum* (L.) Maton	Medicinal and aromatic plants
	Lemon Grass, essential oils	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Eucalyptus, essential oils	*Eucalyptus globulus* Labill.	Medicinal and aromatic plants
	Ginger, essential oils	*Zingiber officinale* Roscoe	Medicinal and aromatic plants
	Lemon, essential oils	*Citrus limonum* Risso	Medicinal and aromatic plants
	Orange, essential oils	*Citrus aurantium* L.	Medicinal and aromatic plants
	Pepper, essential oils	*Piper nigrum* L.	Medicinal and aromatic plants
	Lavander, essential oils	*Lavandula angustifolia* Mill.	Medicinal and aromatic plants
	Passion Massage, massage oils	*Zingiber officinale* Roscoe, *Elettaria cardamomum* (L.) Maton, *Piper nigrum* L.	Cosmetics
	Relaxing Massage, massage oils	*Lavandula angustifolia* Mill., *Citrus limonum* Risso	Cosmetics
	Stresscalm Masaje, massage oils	*Citrus limonum* Risso, *Citrus aurantium* L., *Tilia* spp.	Cosmetics
ARCOLANDS	Essential oils, Colorants		Cosmetics
	Pepper	*Piper nigrum* L.	Medicinal and aromatic plants
Aromas del Tungurahua	Avena, Trigo, Cebada, materia prima	*Avena sativa* L. (avena), *Triticum sativum* Lam. (trigo), *Hordeum sativum* Pers. (cebada)	Medicinal and aromatic plants
	Cats claw	*Uncaria tomentosa* (Willd.) D.C.	Medicinal and aromatic plants
	Condurango bark	*Marsdenia cundurango* Rchb. f.	Medicinal and aromatic plants
	Ortiga	*Urtica urens* L.	Medicinal and aromatic plants
	Alfalfa	*Medicago sativa* L.	Medicinal and aromatic plants
	Valeriana	*Valeriana officinalis* L	Medicinal and aromatic plants
	Mango, Mora, Frutilla, Papaya, Uva, Manzana, frutas deshidratadas pulverizadas	*Mangifera indica* L. (mango), *Rubus glaucus* Benth. (mora), *Fragaria ananassa* (Weston) Decne. & Naudin (frutilla), *Carica papaya* L. (papaya), *Vitis vinifera* L. (uva), *Malus sylvestris* Mill. (manzana)	Medicinal and aromatic plants
	Productos fitofarmacéuticos: Extractos, jarabes, comprimidos		Herbal medicinal products

Company	Product	Plant	Type of product
Aroma Melis	Teas and medicinal teas		Herbal medicinal products
Asociacion Agroartesanal de Productores de Plantas Secas Medicinales del Ecuador	Horchata Lojana, herbal tea	28 dried medicinal plants, not reported	Herbal medicinal products
	Camomile	*Matricaria recutita* L.	Medicinal and aromatic plants
	Rue	*Ruta graveolens* L.	Medicinal and aromatic plants
	Lime tree	*Tilia* spp.	Medicinal and aromatic plants
	Mallow essence	*Malva parviflora* L.	Medicinal and aromatic plants
	Lemon grass	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Borage	*Borago officinalis* L.	Medicinal and aromatic plants
	Rosemary	*Rosmarinus officinalis* L.	Medicinal and aromatic plants
	Gañal		Medicinal and aromatic plants
	Orange leaf	*Citrus aurantium* L.	Medicinal and aromatic plants
Asociacion de Pequeños Productores de Plantas Medicinales (Nueva Semilla)	Lemon grass	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Wild marjoram	*Origanum majorana* L.	Medicinal and aromatic plants
	Lemon balm	*Melissa officinalis* L.	Medicinal and aromatic plants
	Basil	*Ocimum basilicum* L.	Medicinal and aromatic plants
	Ambrette seed	*Abelmoschus moschatus* (L.) Medik.	Medicinal and aromatic plants
BIOLCOM	Sábila, dried leaves	*Aloe vera* (L.) Burm. f.	Medicinal and aromatic plants
	Anis, dried herbs	*Pimpinella anisum* L.	Medicinal and aromatic plants
	Achiote, dried leaves	*Bixa orellana* L.	Medicinal and aromatic plants
	Manzanilla, dried herbs	*Matricaria chamomilla* L.	Medicinal and aromatic plants
	Flor de tilo, dried herbs	*Sambucus nigra* L.	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Cordoncillo, dried leaves	*Piper hispidum* Sw.	Medicinal and aromatic plants
	Flor de maracuyá, dried herbs	*Passiflora incarnata* L.	Medicinal and aromatic plants
	Ginger, essential oils	*Zingiber officinale* Roscoe	Medicinal and aromatic plants
	Cardamom, essential oils	*Elettaria cardamomum* (L.) Maton	Medicinal and aromatic plants
	Black pepper, essential oils	*Piper nigrum* L.	Medicinal and aromatic plants
	Cypress, essential oils	*Cupressus sempervirens* L.	Medicinal and aromatic plants
	Calendula, essential oils	*Calendula officinalis* L.	Medicinal and aromatic plants
	Molle, essential oils	*Schinus molle* L.	Medicinal and aromatic plants
	Brocoli, dried vegetable	*Brassica oleracea* L.	Medicinal and aromatic plants
	Zanahoria, dried vegetable	*Daucus carota* L.	Medicinal and aromatic plants
	Palmito, dried palm hearts	*Bactris gasipaes* Kunth	Medicinal and aromatic plants
	Frambuesa, dried fruit	*Rubus idaeus* L.	Medicinal and aromatic plants
	Mango, dried fruit	*Mangifera indica* L.	Medicinal and aromatic plants
	Orito, dried fruit	*Musa acuminata* Colla	Medicinal and aromatic plants
	Mortiño, dried fruit	*Vaccinium floribundum* Kunth	Medicinal and aromatic plants
	Carambola, dried fruit	*Averrhoa carambola* L.	Medicinal and aromatic plants
	Fruta pan, dried fruit	*Artocarpus altilis* (Parkinson) Fosberg	Medicinal and aromatic plants
	Uvilla, dried fruit	*Physalis peruviana* L.	Medicinal and aromatic plants
BIO PRO	Essential oils		Cosmetics
CARABOTIJA	Oregano	*Origanum vulgare* L.	Medicinal and aromatic plants
	Lemon balm	*Melissa officinalis* L.	Medicinal and aromatic plants
	Camomile	*Matricaria recutita* L.	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Spearmint	*Mentha crispa* L.	Medicinal and aromatic plants
	Garden rue	*Ruta graveolens* L.	Medicinal and aromatic plants
	Rosemary	*Rosmarinus officinalis* L.	Medicinal and aromatic plants
	Dandelion	*Taraxacum officinale* F.H. Wigg.	Medicinal and aromatic plants
	Peppermint	*Mentha piperita* L.	Medicinal and aromatic plants
	Plantain	*Plantago major* L.	Medicinal and aromatic plants
	Linden	*Tilia europaea* L.	Medicinal and aromatic plants
	Matico	*Piper angustifolium* Lam.	Medicinal and aromatic plants
Casa Cayambe, Asociación de Productores Campesinos de Olmedo	Teas and medicinal teas		Herbal medicinal products
CASTOR ECUATORIANA S.A.	Castor oil	*Ricinus communis* L.	Medicinal and aromatic plants
	Sesame oil	*Sesamum indicum* L.	Medicinal and aromatic plants
	Palm kernel oil	*Elaeis guineensis* Jacq.	Medicinal and aromatic plants
CEDEIN/ HUERTOS EDEN	Camomile	*Matricaria chamomilla* L	Medicinal and aromatic plant
	Lemon balm	*Melissa officinalis* L.	Medicinal and aromatic plants
	Peppermint	*Mentha piperita* L.	Medicinal and aromatic plants
	Spearmint	*Mentha crispa* L.	Medicinal and aromatic plants
	Oregano	*Origanum vulgare* L.	Medicinal and aromatic plants
COMPANIA ECUATORIANA DEL TE (CETCA)	Chamomile, herbal tea	*Matricaria recutita* L.	Herbal medicinal products
	Lemon grass, herbal tea	*Cymbopogon citratus* (DC.) Stapf	Herbal medicinal products
	Matico pepper, herbal tea	*Piper angustifolium* Lam., *Plantago major* L.	Herbal medicinal products
	Mint, herbal tea	*Mentha piperita* L.	Herbal medicinal products
	Lemon verbena, herbal tea	*Aloysia triphylla* Royle	Herbal medicinal products

Company	Product	Plant	Type of product
	Peppermint, herbal tea	*Mentha piperita* L.	Herbal medicinal products
	Lemon balm, herbal tea	*Melissa officinalis* L.	Herbal medicinal products
	Weight loss formula, herbal tea	Not reported	Herbal medicinal products
	Diuretic formula, herbal tea	Not reported	Herbal medicinal products
	Antiparasitic formula, herbal tea	Not reported	Herbal medicinal products
	Liver formula, herbal tea	Not reported	Herbal medicinal products
	Bile formula, herbal tea	Not reported	Herbal medicinal products
	Nerve formula, herbal tea	Not reported	Herbal medicinal products
	Desinfectant formula, herbal tea	Not reported	Herbal medicinal products
	Horchata, herbal tea	Not reported	Herbal medicinal products
	Black and flavoured teas	Not reported	Herbal medicinal products
CHANKUAP	Guayusa, Lemon grass, Ishipingo, herbal tea	*Ilex guayusa* Loes., *Cymbopogon citratus* (DC.) Stapf, *Ocotea quixos* (Lam.) Kosterm.	Herbal medicinal products
	Ishipingo, Lemon grass, herbal tea	*Ocotea quixos* (Lam.) Kosterm., *Cymbopogon citratus* (DC.) Stapf	Herbal medicinal products
	Lemon grass, Ginger, herbal tea	*Cymbopogon citratus* (DC.) *Stapf, Zingiber officinale* Roscoe	Herbal medicinal products
	Ishipingo, Lemon grass, Guayusa, Ginger, herbal tea	*Ocotea quixos* (Lam.) Kosterm., *Cymbopogon citratus* (DC.) Stapf, *Ilex guayusa* Loes., *Zingiber officinale* Roscoe	Herbal medicinal products
	Turmeric, essential oils	*Curcuma longa* L.	Medicinal and aromatic plants
	Lemon, essential oils	*Citrus limonum* Risso	Medicinal and aromatic plants
	Tangerine, essential oils	*Citrus reticulata* Blanco	Medicinal and aromatic plants
	Ishpink, essential oils	*Ocotea quixos* (Lam.) Kosterm.	Medicinal and aromatic plants
	Ginger, essential oils	*Zingiber officinale* Roscoe	Medicinal and aromatic plants
	Orange, essential oils	*Citrus aurantium* L.	Medicinal and aromatic plants
	Lemon grass, essential oils	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Turmeric, spices	*Curcuma longa* L.	Medicinal and aromatic plants
	Ginger, spices	*Zingiber officinale* Roscoe	Medicinal and aromatic plants
	Chili, spices	*Capsicum frutescens* L.	Medicinal and aromatic plants
	Annatto, spices	*Bixa orellana* L.	Medicinal and aromatic plants
	Basil, spices	*Ocimum basilicum* L.	Medicinal and aromatic plants
	Dragon's blood	*Croton lechleri* Müll. Arg.	Herbal medicinal products
	Batava oil	*Oenocarpus bataua* Mart.	Cosmetics
Cultivos Orgánicos del Ecuador S.A.	Vegetables and oragnic aromatic herbs	Not reported	Medicinal and aromatic plants
ECUANATU	Phytomedicines	Not reported	Herbal medicinal products
Escuelas radiofonicas populares del Ecuador (ERPE)	Oregano	*Origanum vulgare* L.	Medicinal and aromatic plants
	Chamomile	*Matricaria recutita* L.	Medicinal and aromatic plants
	Marigold	*Calendula officinalis* L.	Medicinal and aromatic plants
	Celery	*Apium graveolens* L.	Medicinal and aromatic plants
	Nettle	*Urtica urens* L.	Medicinal and aromatic plants
	Dill	*Anethum graveolens* L.	Medicinal and aromatic plants
	Parsley	*Petroselinum sativum* Hoffm.	Medicinal and aromatic plants
	Sage	*Salvia officinalis* L.	Medicinal and aromatic plants
	Dandelion	*Taraxacum officinale* F.H. Wigg.	Medicinal and aromatic plants
	Peppermint	*Mentha piperita* L.	Medicinal and aromatic plants
	Thyme	*Thymus vulgaris* L.	Medicinal and aromatic plants
	Lemon balm	*Melissa officinalis* L.	Medicinal and aromatic plants
	Aloe	*Aloe vera* (L.) Burm. f.	Medicinal and aromatic plants

Company	Product	Plant	Type of product
EXPOAROM	Dry and pulverized aromatic spices and herbs	Not reported	Medicinal and aromatic plants
FARMAVIDA	Phytomedicines	Not reported	Herbal medicinal products
FITOTERAPIA	Lipo klb6, tablets	*Baccharis tricuneata* (L. f.) Pers. (chilca), *Cynara scolymus* L. (artichoke)	Herbal medicinal products
	Antiacne + Zinc, tablets	*Urtica dioica* L. (nesttle), *Peumus boldus* Molina (boldo), *Taraxacum officinale* F.H. Wigg. (dandelion)	Herbal medicinal products
	Antigas, tablets	*Zingiber officinale* Roscoe (ginger), Activated charcoal	Herbal medicinal products
	Chancapiedra Remalcha, tablets	*Phyllanthus niruri* L.	Herbal medicinal products
	Higasan Plus, syrup, tablets	*Peumus boldus* Molina (boldo), *Taraxacum officinale* F.H. Wigg. (dandelion), *Cynara scolymus* L. (artichoke)	Herbal medicinal products
	Riñosan Complex, syrup, tablets	*Equisetum arvense* L. (horsetail), *Plantago major* L. (plantain)	Herbal medicinal products
	Sabil Aloe vera, liquid	*Aloe vera* (L.) Burm. f.	Herbal medicinal products
	Ulcerfit 600, syrup, tablets	*Croton lechleri* Müll. Arg. (dragon´s blood), *Plantago major* L. (plantain)	Herbal medicinal products
	Relaxe, extract, tablets	*Valeriana decussata* Ruiz & Pav.	Herbal medicinal products
	Achin, tablets	*Momordica charantia* L.	Herbal medicinal products
	CTH, tablets	*Cynara scolymus* L. (artichoke), *Allium sativum* L. (garlic)	Herbal medicinal products
	Puj puj	*Cassia angustifolia* Vahl (sen), *Peumus boldus* Molina (boldo), *Anethum graveolens* L. (eneldo), *Triticum aestivum* L. (salvado trigo)	Herbal medicinal products
	45 plus	*Medicago sativa* L. (alfalfa), Smilax officinalis Kunth (zarzaparrilla), *Glycine max* (L.) Merr. (proteína soya), levadura	Herbal medicinal products
	Sadra	*Croton lechleri* Müll. Arg.	Herbal medicinal products
	Lipoescultura	*Glycine max* (L.) Merr. (proteína soya), *Cynara scolymus* L. (alcachofa), algas marinas	Herbal medicinal products
	Acneloss	*Urtica urens* L. (ortiga), levadura cerveza, *Peumus boldus* Molina (boldo), *Taraxacum officinale* F.H. Wigg. (taraxaco)	Herbal medicinal products
FUNDACION FAMILIA SALESIANA SALINAS	Cypress, essential oils	*Cupressus sempervirens* L.	Medicinal and aromatic plants
	Pine, essential oils	*Pinus sylvestris* L.	Medicinal and aromatic plants
	Eucalyptus, essential oils	*Eucalyptus globulus* Labill.	Medicinal and aromatic plants
	Mashua, herbal tea	*Tropaeolum tuberosum* Ruiz & Pav.	Herbal medicinal

Company	Product	Plant	Type of product
			products
	Pumin, herbal tea	Not reported	Herbal medicinal products
	Andean, herbal tea	Not reported	Herbal medicinal products
	Guaviduca, herbal tea	*Piper pallidirameum* C. DC.	Herbal medicinal products
	Nettle, herbal tea	*Urtica urens* L.	Herbal medicinal products
	Camomile, herbal tea	*Matricaria chamomilla* L	Herbal medicinal products
	Chuquiragua, herbal tea	*Chuquiraga jussieui* J.F. Gmel.	Herbal medicinal products
	Peppermint, herbal tea	*Mentha piperita* L.	Herbal medicinal products
	Rosemary, shampoo	*Rosmarinus officinalis* L.	Cosmetics
	Ointments for medicinal and cosmetic use (curapres, curapino, curalipto, cura vena), vegetable oil, bees wax, plant-based essential oils	Not reported	Medicinal and aromatic plants
	Arquitecto	*Lasiocephalus ovatus* Schltdl.	Medicinal and aromatic plants
	Ataco	*Amaranthus caudatus* L.	Medicinal and aromatic plants
	Guaviduca	*Piper pallidirameum* C. DC.	Medicinal and aromatic plants
	Mashua	*Tropaeolum tuberosum* Ruiz & Pav.	Medicinal and aromatic plants
	Linaza	*Linum usitatissimum* L.	Medicinal and aromatic plants
	Manzanilla	*Matricaria recutita* L.	Medicinal and aromatic plants
	Ortiga	*Urtica urens* L.	Medicinal and aromatic plants
	Chuquiragua	*Chuquiraga jussieui* J.F. Gmel.	Medicinal and aromatic plants
	Menta	*Mentha piperita* L.	Medicinal and aromatic plants
	Oregano	*Origanum vulgare* L.	Medicinal and aromatic plants
	Hierba Luisa	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Cola de Caballo	*Equisetum arvense* L.	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Retama	*Sarothamnus scoparius* (L.) W.D.J. Koch	Medicinal and aromatic plants
Fundacion Promocion Humana de Guaranda	Tea of live	Not reported	Herbal medicinal products
	Chamomile	*Matricaria recutita* L.	Medicinal and aromatic plants
	Lemon verbena	*Aloysia triphylla* Royle	Medicinal and aromatic plants
	Lemon balm	*Melissa officinalis* L.	Medicinal and aromatic plants
	Escancel	*Aerva sanguinolenta* (L.) Blume	Medicinal and aromatic plants
	Borage	*Borago officinalis* L.	Medicinal and aromatic plants
	Linden	*Tilia europaea* L.	Medicinal and aromatic plants
	Congona	*Brosimum acutifolium* Huber	Medicinal and aromatic plants
	Horsetail	*Equisetum arvense* L.	Medicinal and aromatic plants
	Flor de arete	*Fuchsia* spp.	Medicinal and aromatic plants
	Malva olorosa	*Malva parviflora* L.	Medicinal and aromatic plants
	Amaranth	*Amaranthus quitensis* Kunth	Medicinal and aromatic plants
	Plantain	*Plantago major* L.	Medicinal and aromatic plants
	Lungwort	*Pulmonaria officinalis* L.	Medicinal and aromatic plants
	Lemon grass	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Flor de gañal	*Oreocallis grandiflora* (Lam.) R. Br.	Medicinal and aromatic plants
	White oak	*Talauma* spp.	Medicinal and aromatic plants
	Linseed	*Linum usitatissimum* L.	Medicinal and aromatic plants
	Rosemary	*Rosmarinus officinalis* L.	Medicinal and aromatic plants
	Guaviduca	*Piper pallidirameum* C. DC.	Medicinal and aromatic plants
	Basil	*Ocimum basilicum* L.	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Rose essence	*Rosa gallica* L.	Medicinal and aromatic plants
	Matico	*Piper angustifolium* Lam.	Medicinal and aromatic plants
	Nettle	*Urtica urens* L.	Medicinal and aromatic plants
	Dandelion	*Taraxacum officinale* F.H. Wigg.	Medicinal and aromatic plants
	Peppermint	*Mentha piperita* L.	Medicinal and aromatic plants
	Verbena	*Verbena litoralis* Kunth	Medicinal and aromatic plants
	Spearmint	*Mentha crispa* L.	Medicinal and aromatic plants
	Valerian	*Valeriana officinalis* L	Medicinal and aromatic plants
	Peppermint, essential oils	*Mentha piperita* L.	Medicinal and aromatic plants
	Eucalyptus, essential oils	*Eucalyptus globulus* Labill.	Medicinal and aromatic plants
	Cypress, essential oils	*Cupressus sempervirens* L.	Medicinal and aromatic plants
GENESIS	Hierba de San Juan	*Hypericum perforatum* L.	Medicinal and aromatic plants
GEOACUATICA	Food and supplements on a medicinal plants extracts basis, for aquiculture	Not reported	Food
GREENAQUA	Barbascus extract for aquiculture	Not reported	Herbal medicinal products
Hierbas naturales y medicinales de Pusuqui, S.A.	Chamomile, Pepermint, Lemon verbena, Anise, Lemon balm, Mint, herbal tea	*Matricaria recutita* L. (chamomile), *Mentha piperita* L. (pepermint), *Aloysia triphylla* Royle (lemon verbena), *Pimpinella anisum* L. (anis), *Melissa officinalis* L. (lemon balm), *Mentha sativa* L (mint)	Herbal medicinal products
	English tea, apple and cinnamon tea, vanilla tea, black and flavored tea	Not reported	Herbal medicinal products
	Chamomile with honey, herbal tea	*Matricaria recutita* L.	Herbal medicinal products
	Lemon balm with valerian, herbal tea	*Melissa officinalis* L. (lemon balm), *Valeriana officinalis* L (valerian)	Herbal medicinal products
	Vida sana herbal infusions (slimming, digestive, relaxing)	Not reported	Herbal medicinal products
	Wild cherries, fruits from forest and tropical fruits, flavoured teas	Not reported	Herbal medicinal products

Company	Product	Plant	Type of product
Huiñana			
IMAGRO	Aromatic herbs project	Not reported	Medicinal and aromatic plants
Industria Lojana de Especerias (ILE)	Horchata, herbal tea	Not reported	Herbal medicinal products
	Mint, herbal tea	*Mentha sativa* L	Herbal medicinal products
	Lemon grass, herbal tea	*Cymbopogon citratus* (DC.) Stapf	Herbal medicinal products
	Lemon balm, herbal tea	*Melissa officinalis* L.	Herbal medicinal products
	Chamomile, herbal tea	*Matricaria recutita* L.	Herbal medicinal products
	Lemon verbena, herbal tea	*Aloysia triphylla* Royle	Herbal medicinal products
	Cumin, powdered condiments	*Cuminum cyminum* L.	Food
	Pepper, powdered condiments	*Piper nigrum* L.	Food
	Garlic, powdered condiments	*Allium sativum* L.	Food
	Turmeric, powdered condiments	*Curcuma longa* L.	Food
	Chili pepper, powdered condiments	*Capsicum frutescens* L.	Food
INEXA S.A.	Essential oils and natural colorants	Not reported	Cosmetics
JAMBI KIWA	Weigh loss formula, herbal tea	Not reported	Herbal medicinal products
	Diuretic formula, herbal tea	Not reported	Herbal medicinal products
	Expectorant formula, herbal tea	Not reported	Herbal medicinal products
	Antiparasitic formula, herbal tea	Not reported	Herbal medicinal products
	Liver formula, herbal tea	Not reported	Herbal medicinal products
	Bile formula, herbal tea	Not reported	Herbal medicinal products
	Nerve formula, herbal tea	Not reported	Herbal medicinal products
	Disinfectant formula, herbal tea	Not reported	Herbal medicinal products
	Herbal shampoos, oils, ointments	Not reported	Cosmetics
	Valerian Extract and Dragon's blood	*Valeriana officinalis* L , *Croton lechleri* Muell. Arg	Herbal medicinal products
	Achogchilla	*Momordica charantia* L.	Medicinal and aromatic

Company	Product	Plant	Type of product
			plants
	Albahaca	*Ocimum basilicum* L.	Medicinal and aromatic plants
	Alcachofa	*Cynara scolymus* L.	Medicinal and aromatic plants
	Alfalfa	*Medicago sativa* L.	Medicinal and aromatic plants
	Borraja	*Borago officinalis* L.	Medicinal and aromatic plants
	Calendula	*Calendula officinalis* L.	Medicinal and aromatic plants
	Eneldo	*Anethum graveolens* L.	Medicinal and aromatic plants
	Escancel	*Aerva sanguinolenta* (L.) Blume	Medicinal and aromatic plants
	Escorzonera	*Scorzonera hispanica* L.	Medicinal and aromatic plants
	Falso tilo	Not reported	Medicinal and aromatic plants
	Grama	*Paspalum humboldtianum* Flüggé	Medicinal and aromatic plants
	Hierba Buena	*Mentha sativa* L	Medicinal and aromatic plants
	Hierba Luisa	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Hoja de Aguacate	*Persea americana* Mill.	Medicinal and aromatic plants
	Hoja de Higo	*Ficus carica* L.	Medicinal and aromatic plants
	Hoja Naranja	*Citrus aurantium* L.	Medicinal and aromatic plants
	Menta Piperita	*Mentha piperita* L.	Medicinal and aromatic plants
	Moradilla	*Alternanthera porrigens* (Jacq.) Kuntze	Medicinal and aromatic plants
	Oregano	*Origanum vulgare* L.	Medicinal and aromatic plants
	Ortiga sin tallo	*Urtica urens* L.	Medicinal and aromatic plants
	Perejil	*Petroselinum sativum* Hoffm.	Medicinal and aromatic plants
	Romero	*Rosmarinus officinalis* L.	Medicinal and aromatic plants
	Taraxaco	*Taraxacum officinale* F.H. Wigg.	Medicinal and aromatic

Company	Product	Plant	Type of product
			plants
	Toronjil	*Melissa officinalis* L.	Medicinal and aromatic plants
	Caballo Chupa	*Equisetum myriochaetum* Schltdl. & Cham.	Medicinal and aromatic plants
	Calaguala	*Phlebodium aureum* John Smith	Medicinal and aromatic plants
	Chancapiedra	*Phyllanthus niruri* L.	Medicinal and aromatic plants
	Chilca	*Baccharis tricuneata* (L. f.) Pers.	Medicinal and aromatic plants
	Hierba Mora	*Solanum nigrum* L.	Medicinal and aromatic plants
	Marco	*Ambrosia arborescens* Mill.	Medicinal and aromatic plants
	Matico	*Piper angustifolium* Lam.	Medicinal and aromatic plants
	Muelan dulce	Not reported	Medicinal and aromatic plants
	Hoja de Nogal	*Juglans regia* L.	Medicinal and aromatic plants
	Hoja de Zanahoria	*Daucus carota* L.	Medicinal and aromatic plants
	Lengua de Vaca	*Rumex crispus* L.	Medicinal and aromatic plants
	Llanten	*Plantago major* L.	Medicinal and aromatic plants
	Malva Blanca	*Malva parviflora* L.	Medicinal and aromatic plants
	Manzanilla flor-5	*Matricaria recutita* L.	Medicinal and aromatic plants
	Sangorache	*Amaranthus quitensis* Kunth	Medicinal and aromatic plants
	Valeriana	*Valeriana officinalis* L	Medicinal and aromatic plants
	Verbena	*Verbena litoralis* Kunth	Medicinal and aromatic plants
JENKER S.A.	Vegetables, aromatic and medicinal plants	Not reported	Medicinal and aromatic plants
Jose Eguiguren y Cia.	Sábila	*Aloe vera* L.	Medicinal and aromatic plants
Juan Pablo Clavijo	Aromatic herbs project	Not reported	Medicinal and aromatic plants

Company	Product	Plant	Type of product
Laboratorios Albam's			
LAFIP	Vitulcer	Not reported	Herbal medicinal products
	Alfalfa, tablets	*Medicago sativa* L.	Herbal medicinal products
	Aloina	*Aloe vera* (L.) Burm. f.	Herbal medicinal products
	Bacter plus	Not reported	Herbal medicinal products
	Cavola, tablets	Not reported	Herbal medicinal products
	Fatless, tablets	Not reported	Herbal medicinal products
	Garlic plus, tablets	*Allium sativum* L.	Herbal medicinal products
	Quinina	*Cinchona officinalis* L.	Herbal medicinal products
LANDOM	Renaldren	*Smilax lundellii* Killip & Morton (zarzaparrilla), *Taraxacum officinale* Weber (taraxaco), *Plantago australis* Lam. (llantén)	Herbal medicinal products
	Hepanat	*Peumus boldus* Molina (boldo), *Cynara scolymus* L. (alcachofa), *Taraxacum officinale* Weber (taraxaco)	Herbal medicinal products
	Diabetisan	*Allium cepa* L (cebolla), *Cynara scolymus* L. (alcachofa)	Herbal medicinal products
	Reumathyl	*Phlebodium aureum* John Smith (calahuala), *Smilax lundellii* Killip & Morton (zarzaparrilla)	Herbal medicinal products
	Cholesterfix	*Allium sativum* L. (ajo), *Cynara scolymus* L. (alcachofa), *Taraxacum officinale* Weber (taraxaco)	Herbal medicinal products
	Bioneuril	*Valeriana officinalis* L. (valeriana), *Melissa officinalis* L. (toronjil)	Herbal medicinal products
	Ulcerfix	*Aristeguieta glutinosa* LAM *(matico), Rumex cuneifolius* Campd. (lengua de vaca), *Melissa officinalis* L. (toronjil)	Herbal medicinal products
	Chancapiedra	*Phyllanthus niruri* L.	Herbal medicinal products
	Carbolax	*Matricaria recutita* L. (manzanilla), *Origanum vulgare* L. (orégano)	Herbal medicinal products
LAPRONAG	Tossex forte	Not reported	Herbal medicinal products
	Aqua Medix	Not reported	Herbal medicinal products
	Iodized Radish Syrup	*Raphanus sativus* L.	Herbal medicinal products
	Hepaton f-3 Extract	Not reported	Herbal medicinal products

Company	Product	Plant	Type of product
	Valerian Extract	*Valeriana officinalis* L.	Herbal medicinal products
	Maca Reconstituent and Tonic	*Lepidium meyenii* Walp	Herbal medicinal products
	F-Plus Regenerator	Not reported	Herbal medicinal products
	Chancapiedra, syrup	*Phyllanthus niruri* L.	Herbal medicinal products
	Cat's claw, syrup	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
	Antiparasitic T/Tab	Not reported	Herbal medicinal products
MARIANEXAS	Certified organic vegetables and herbs	Not reported	Medicinal and aromatic plants
MASTER PLANT	All-stress	Not reported	Herbal medicinal products
	Liver restoring amargo (bitterwood)	Not reported	Herbal medicinal products
	Dialsis	Not reported	Herbal medicinal products
	Diurex	Not reported	Herbal medicinal products
	Factor U	Not reported	Herbal medicinal products
	Geofit	Not reported	Herbal medicinal products
	Herbalum	Not reported	Herbal medicinal products
	Kelpin-2000	Not reported	Herbal medicinal products
	Laxibil-purgative	Not reported	Herbal medicinal products
	Biobron 240 ml	Not reported	Herbal medicinal products
NATUALFA	Tablets and capsules	Not reported	Herbal medicinal products
NATURISOL			
NATUSIL	Bronquiosil Syrup	Not reported	Herbal medicinal products
	Radish Syrup	*Raphanus sativus* L.	Herbal medicinal products
	Maca Jelly	*Lepidium meyenii* Walp	Herbal medicinal products

Company	Product	Plant	Type of product
NEOFARMACO	Maticonf, drops	*Aristeguietia glutinosa* Lam (matico)	Herbal medicinal products
	Maticonf, tablets	*Aristeguietia glutinosa* Lam (matico)	Herbal medicinal products
NUEVA AMERICA	Guayusa, herbal tea	*Ilex guayusa* Loes.	Herbal medicinal products
	Fern root, herbal tea	*Campyloneurum amphostenon* (Kunze ex Klotzsch) Fée	Herbal medicinal products
	Lungwort, herbal tea	*Pulmonaria officinalis* L.	Herbal medicinal products
	Wild violet, herbal tea	*Anoda cristata* (L.) Schltdl.	Herbal medicinal products
NUKUI	Cat´s claw	*Uncaria tomentosa* (Willd.) D.C.	Medicinal and aromatic plants
	Guayusa	*Ilex guayusa* Loes.	Medicinal and aromatic plants
	Matico pepper	*Piper angustifolium* Lam., *Piper nigrum* L.	Medicinal and aromatic plants
	Plantain	*Plantago major* L.	Medicinal and aromatic plants
	Lemon grass	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Basil	*Ocimum basilicum* L.	Medicinal and aromatic plants
	Pepper Mint	*Mentha piperita* L.	Medicinal and aromatic plants
	Annatto, spices	*Bixa orellana* L.	Medicinal and aromatic plants
	Turmeric, spices	*Curcuma longa* L.	Medicinal and aromatic plants
	Ginger, spices	*Zingiber officinale* Roscoe	Medicinal and aromatic plants
Pharma Brand	Not reported	Not reported	Not reported
PROAJI	Chili paste	*Capsicum frutescens* L.	Medicinal and aromatic plants
PRONAVIT	Matico, ointment	*Piper angustifolium* Lam.	Herbal medicinal products
	Tiatina, ointment	Not reported	Herbal medicinal products
	Bronquiosan infantil	Not reported	Herbal medicinal products
	Uña gato	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products

Company	Product	Plant	Type of product
	Chacapiedra	*Phyllanthus niruri* L.	Herbal medicinal products
	Paicolin	Not reported	Herbal medicinal products
	Bronquiosan forte + propoleo	Not reported	Herbal medicinal products
	Bronquiosan forte + vitamina c	Not reported	Herbal medicinal products
	Cerebrosan	Not reported	Herbal medicinal products
	Nervo stress	Not reported	Herbal medicinal products
	Zarzatonic	Not reported	Herbal medicinal products
	Bronquiosan forte	Not reported	Herbal medicinal products
RENASE	Manzanilla, Matico, Avena, soap	*Matricaria recutita* L. (manzanilla), *Piper angustifolium* Lam. (matico), *Avena sativa* L. (avena)	Cosmetics
	Papaya, Aguacate, Coco, shampoo	*Persea americana* Mill. (aguacate), *Carica papaya* L. (papaya), *Cocos nucifera* L. (coco)	Cosmetics
	Cascara Sagrada, Uña de Gato, Chancapiedra, capsules	*Rhamnus purshiana* DC. (cascara sagrada), *Uncaria tomentosa* (Willd.) D.C. (uña de gato), *Phyllanthus niruri* L. (chancapiedra)	Herbal medicinal products
	Chancapiedra, Uña de Gato, Zarzaparrilla, Calendula, Equinacea, Ginkgobil, Quina, Verbena, syrups	*Uncaria tomentosa* (Willd.) D.C. (uña de gato), *Phyllanthus niruri* L. (chancapiedra), *Smilax lundellii* Killip & Morton (zarzaparrilla), *Calendula officinalis* L. (calendula), *Echinacea purpurea* (L.) Moench (equinacea), *Ginkgo biloba* L. (ginkgobil), *Cinchona officinalis* L. (quina), *Verbena litoralis* Kunth (verbena)	Herbal medicinal products
	Drago's blood products	*Croton lechleri* Muell. Arg	Herbal medicinal products
	Unguragua oil	Not reported	Herbal medicinal products
	Valerian Extract	*Valeriana officinalis* L.	Herbal medicinal products
	Chuchuguazo Syrup	Not reported	Herbal medicinal products
Ricardo Ortiz	Medicinal herbs project, dissemination	Not reported	Medicinal and aromatic plants
Ruben Martinez	Medicinal plants and herbs	Not reported	Medicinal and aromatic plants
SAN JOSE DE LAS PALMAS	Tea of Life, herbal tea	Not reported	Herbal medicinal products
	Chamomile	*Matricaria recutita* L.	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Lemon verbena	*Aloysia triphylla* Royle	Medicinal and aromatic plants
	Lemon balm	*Melissa officinalis* L.	Medicinal and aromatic plants
	Escancel	*Aerva sanguinolenta* (L.) Blume	Medicinal and aromatic plants
	Borage	*Borago officinalis* L.	Medicinal and aromatic plants
	Linden	*Tilia europaea* L.	Medicinal and aromatic plants
	Congona	*Brosimum acutifolium* Huber	Medicinal and aromatic plants
	Horsetail	*Equisetum arvense* L.	Medicinal and aromatic plants
	Flor de arete	*Fuchsia* spp.	Medicinal and aromatic plants
	Malva olorosa	*Malva parviflora* L.	Medicinal and aromatic plants
	Amaranth	*Amaranthus quitensis* Kunth	Medicinal and aromatic plants
	Broad-leaved plantain	*Plantago major* L.	Medicinal and aromatic plants
	Lungwort	*Pulmonaria officinalis* L.	Medicinal and aromatic plants
	Lemon grass	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Flor de gañal	*Oreocallis grandiflora* (Lam.) R. Br.	Medicinal and aromatic plants
	White oak	*Talauma* spp.	Medicinal and aromatic plants
	Linseed	*Linum usitatissimum* L.	Medicinal and aromatic plants
SANTA MARIA DE MILAN	Mixture for the liver, herbal tea	Not reported	Herbal medicinal products
	Mixture for the nerves, herbal tea	Not reported	Herbal medicinal products
	Mixture for the kidneys, herbal tea	Not reported	Herbal medicinal products
	Borraja	*Borago officinalis* L.	Medicinal and aromatic plants
	Cola de Caballo	*Equisetum arvense* L.	Medicinal and aromatic plants
	Eucalipto	*Eucalyptus globulus* Labill.	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Hizo	Not reported	Medicinal and aromatic plants
	Linaza	*Linum usitatissimum* L.	Medicinal and aromatic plants
	Llanten	*Plantago major* L.	Medicinal and aromatic plants
	Hojas Naranja	*Citrus aurantium* L.	Medicinal and aromatic plants
	Taraxaco	*Taraxacum officinale* F.H. Wigg.	Medicinal and aromatic plants
	Valeriana	*Valeriana officinalis* L	Medicinal and aromatic plants
	Toronjil	*Melissa officinalis* L.	Medicinal and aromatic plants
SISACUMA	Holy Wood, essential oils	*Bursera graveolens* (Kunth) Triana & Planch.	Medicinal and aromatic plants
	Guaviduca, essential oils	*Piper pallidirameum* C. DC.	Medicinal and aromatic plants
	Rosemary, essential oils	*Rosmarinus officinalis* L.	Medicinal and aromatic plants
	Pepper, essential oils	*Piper nigrum* L.	Medicinal and aromatic plants
	Ambrette, essential oils	*Abelmoschus moschatus* (L.) Medik.	Medicinal and aromatic plants
	Ginger, essential oils	*Zingiber officinale* Roscoe	Medicinal and aromatic plants
	Cardamom, essential oils	*Elettaria cardamomum* (L.) Maton	Medicinal and aromatic plants
	Anise, essential oils	*Pimpinella anisum* L.	Medicinal and aromatic plants
	Eucalyptus, essential oils	*Eucalyptus globulus* Labill.	Medicinal and aromatic plants
SONFRI	Aromatic and medicinal herbs project, dehydrated vegetables	Not reported	Medicinal and aromatic plants
Universal Plants	Aromatic and medicinal plants, essential oils project, dehydrated	Not reported	Medicinal and aromatic plants
UNORCARCHT	Horchata, herbal tea	Not reported	Herbal medicinal products
	Ambrette	*Abelmoschus moschatus* (L.) Medik.	Medicinal and aromatic plants
	Alfalfa	*Medicago sativa* L.	Medicinal and aromatic plants
	Amaranth	*Amaranthus quitensis* Kunth	Medicinal and aromatic

Company	Product	Plant	Type of product
			plants
	Ambrosia arborescens	*Ambrosia arborescens* Mill.	Medicinal and aromatic plants
	Arquitecto	*Lasiocephalus ovatus* Schltdl.	Medicinal and aromatic plants
	Arrayan	*Myrcianthes hallii* (O. Berg) McVaugh	Medicinal and aromatic plants
	Artichoke	*Cynara scolymus* L.	Medicinal and aromatic plants
	Avocado leaf	*Persea americana* Mill.	Medicinal and aromatic plants
	Basil	*Ocimum basilicum* L.	Medicinal and aromatic plants
	Borage	*Borago officinalis* L.	Medicinal and aromatic plants
	Calaguala	*Campyloneurum amphostenon* (Kunze ex Klotzsch) Fée	Medicinal and aromatic plants
	Capuli leaf	*Prunus serotina* Ehrh.	Medicinal and aromatic plants
	Carrot leaf	*Daucus carota* L.	Medicinal and aromatic plants
	Chamomile flower	*Matricaria recutita* L.	Medicinal and aromatic plants
	Celery	*Apium graveolens* L.	Medicinal and aromatic plants
	Chilca	*Baccharis tricuneata* (L. f.) Pers.	Medicinal and aromatic plants
	Chuquiragua	*Chuquiraga jussieui* J.F. Gmel.	Medicinal and aromatic plants
	Corn silk	*Zea mays* L.	Medicinal and aromatic plants
	Dandelion	*Taraxacum officinale* F.H. Wigg.	Medicinal and aromatic plants
	Dill	*Anethum graveolens* L.	Medicinal and aromatic plants
	Eucalyptus	*Eucalyptus globulus* Labill.	Medicinal and aromatic plants
	Grama	*Paspalum humboldtianum* Flüggé	Medicinal and aromatic plants
	Guaviduca	*Ilex guayusa* Loes.	Medicinal and aromatic plants
	Herb of Grace	*Ruta graveolens* L.	Medicinal and aromatic plants
	Fox glove	*Digitalis purpurea* L.	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Hierba mora	*Solanum nigrescens* M. Martens & Galeotti	Medicinal and aromatic plants
	Horse tail	*Equisetum bogotense* Kunth	Medicinal and aromatic plants
	Stone breaker	*Phyllanthus niruri* L.	Medicinal and aromatic plants
	Lemon balm	*Melissa officinalis* L.	Medicinal and aromatic plants
	Lemon grass	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Lemon verbena	*Aloysia triphylla* Royle	Medicinal and aromatic plants
	Lime tree	*Tilia spp.*	Medicinal and aromatic plants
	Mallow	*Malva parviflora* L.	Medicinal and aromatic plants
	Marigold	*Calendula officinalis* L.	Medicinal and aromatic plants
	Matico pepper	*Piper angustifolium* Lam	Medicinal and aromatic plants
	Mint	*Mentha viridis* (L.) L.	Medicinal and aromatic plants
	Nettle	*Urtica urens* L.	Medicinal and aromatic plants
	Orange leaf	*Citrus aurantium* L.	Medicinal and aromatic plants
	Oregano leaves	*Origanum vulgare* L.	Medicinal and aromatic plants
	Parsley	*Petroselinum sativum* Hoffm.	Medicinal and aromatic plants
	Peppermint	*Mentha piperita* L.	Medicinal and aromatic plants
	Plantain	*Plantago major* L.	Medicinal and aromatic plants
	Rosemary, natural colorants	*Rosmarinus officinalis* L.	Medicinal and aromatic plants
	Round-leaved dock	*Rumex obtusifolius* L.	Medicinal and aromatic plants
	Thyme	*Thymus vulgaris* L.	Medicinal and aromatic plants
	Valerian	*Valeriana officinalis* L	Medicinal and aromatic plants
	Vervain	*Verbena litoralis* Kunth	Medicinal and aromatic

Company	Product	Plant	Type of product
			plants
	Walnut leaf	*Juglans neotropica* Diels	Medicinal and aromatic plants
	Wormseed	*Chenopodium ambrosioides* L.	Medicinal and aromatic plants
	Wormwood	*Artemisia absinthium* L.	Medicinal and aromatic plants
	Wild mint	*Mentha sativa* L.	Medicinal and aromatic plants
	Annatto, prime materials, spices, natural colorants	*Bixa orellana* L.	Medicinal and aromatic plants
	Chilli, prime materials	*Capsicum frutescens* L.	Medicinal and aromatic plants
	Ishpingo, prime materials	*Ocotea quixos* (Lam.) Kosterm.	Medicinal and aromatic plants
	Drago's blood, prime materials	*Croton lechleri* Müll. Arg.	Medicinal and aromatic plants
	Guayusa, prime materials	*Ilex guayusa* Loes.	Medicinal and aromatic plants
	Ginger, prime materials	*Zingiber officinale* Roscoe	Medicinal and aromatic plants
	Lemon Grass, prime materials	*Cymbopogon citratus* (DC.) Stapf	Medicinal and aromatic plants
	Ungurahua, prime materials	*Oenocarpus bataua* Mart.	Medicinal and aromatic plants
	Cardamomo, spices	*Elettaria cardamomum* (L.) Maton	Medicinal and aromatic plants
	Chilli, spices	*Capsicum frutescens* L.	Medicinal and aromatic plants
	Ginger, spices	*Zingiber officinale* Roscoe	Medicinal and aromatic plants
	Ispink, spices	*Ocotea quixos* (Lam.) Kosterm.	Medicinal and aromatic plants
	Pepper, spices	*Piper nigrum* L.	Medicinal and aromatic plants
	Turmeric, spices	*Curcuma longa* L.	Medicinal and aromatic plants
	Amaranth, spices	*Amaranthus quitensis* Kunth	Medicinal and aromatic plants

Source: Data was retrieved from each corresponding company's websites (Table 6); *Biodiversidad desde el centro del mundo: Ingredientes Naturales y Productos Elaborados*. CORPEI. www.hierbasdelecuador.com.

Table 5. List of Ecuadorian producers by economic sector and economic location

Economic sector	Producers	Geographic location
Herbal Medical Products	AMAZON AROMA	Cuenca
	Aroma Melis	Quito
	Asociacion Agroartesanal de Productores de Plantas Secas Medicinales del Ecuador	Loja
	Casa Cayambe, Asociación de Productores Campesinos de Olmedo	Quito
	COMPANIA ECUATORIANA DEL TE (CETCA)	Quito
	CHANKUAP	Macas
	ECUANATU	Quito
	FARMAVIDA	Shyris
	Fundacion Promocion Humana de Guaranda	Bolivar
	GREENAQUA	Quito
	Hierbas naturales y medicinales de Pusuqui, S.A.	Quito
	Industria Lojana de Especerias (ILE)	Loja
	JAMBI KIWA	Riobamba
	Laboratorio FITOTERAPIA	Quito
	Laboratorio LANDOM	Quito
	Laboratorio Neofarmaco	Ambato
	LAFIP	Guayaquil
	LAPRONAG	Machala
	Master plant	Santo Domingo
	Natualfa	Quito
	Natusil	Machala
	NUEVA AMERICA	Pimampiro
	PRONAVIT	Quito
	RENASE	Quito
	SAN JOSE DE LAS PALMAS	Bolivar
	SANTA MARIA DE MILAN	not reported
	UNORCARCHT	Loja
Perfumes and cosmetics	ARCOLANDS	Quito
	AgroAlegre C.A.	Quito
	Agrotrading	Quito
	AMAZON AROMA	Cuenca
	ARCOLANDS	Quito
	Aromas del Tungurahua	Ambato
	BIO PRO	Quito
	BIOLCOM	Quito
	Chankuap	Macas
	Fundacion Promocion Humana de Guaranda	Bolivar
	FUNDACION FAMILIA SALESIANA SALINAS	Salinas
	INEXA S.A.	Quito
	RENASE	Quito

Economic sector	Producers	Geographic location
	SISACUMA	Quito
	Universal Plants	Quito
Nutraceuticals and allies	Acuarela	Quito
	AMAZON AROMA	Cuenca
	Aroma Melis	Quito
	Casa Cayambe, Asociacion de Productores Campesinos de Olmedo	Quito
	Compañía Ecuatoriana del Te (CETCA)	Quito
	Chankuap	Macas
	Fundacion Promocion Humana de Guaranda	Bolivar
	FUNDACION FAMILIA SALESIANA SALINAS	Salinas
	GEOACUATICA	Quito
	GREENAQUA	Bahia de Caraquez
	Hierbas naturales y medicinales de Pusuqui, S.A.	Quito
	Industria Lojana de Especierias (ILE)	Loja
	INEXA S.A.	Quito
	JambiKiwa	Riobamba
	Nueva America	Pimampiro
	San Jose de las Palmas	Bolivar
	Santa Maria de Milan	not reported
	UNORCARCHT	Loja
Pharmaceutical aids	Ab. Wilson Echeverria	Quito
	Acuarela	Quito
	Agro Trading	Quito
	AgroAlegre C.A.	Quito
	ARCOLANDS	Quito
	Aromas del Tungurahua	Ambato
	Asociacion Agroartesanal de Productos de plantas secas medicinales del Ecuador	Loja
	Asociacion de Pequeños Productores de Plantas Medicinales (Nueva Semilla)	Gualea Cruz
	BIOLCOM	Quito
	CARABOTIJA	Cayambe
	CASTOR ECUATORIANA S.A.	Manta
	CEDEIN/Huertos Eden	Riobamba
	Cultivos organicos del Ecuador S.A.	Quito
	Chankuap	Macas
	Escuelas Radiofonicas Populares del Ecuador, ERPE	Riobamba
	EXPOAROM	Quito
	Fundacion Promocion Humana de Guaranda	Bolivar
	FUNDACION FAMILIA SALESIANA SALINAS	Salinas
	GENESIS	Quito
	IMAGRO	Quito
	Industria Lojana de Especierias (ILE)	Loja

Economic sector	Producers	Geographic location
	INEXA S.A.	Quito
	JambiKiwa	Riobamba
	JENKER S.A.	Gye
	Jose Eguiguren y Cia	Quito
	Juan Pablo Clavijo	Quito
	MARIANEXAS	Quito
	Nunkui	Gualaquiza
	PROAJI	Quito
	Ricardo Ortiz	Quito
	Ruben Martinez	Ibarra
	San Jose de las Palmas	Bolivar
	Santa Maria de Milan	not reported
	SONFRI	Guayaquil
	Universal Plants	Quito

Source: Analysis of Tables 3 and 5.

Table 6. List of Ecuadorian companies

Company	Contact	Phone	Fax	E-mail	Web	Address
Ab. Wilson Echeverria	Wilson Echeverria			catalinaech@hotmail.com		Quito
ACUARELA	Thomas Wright, Arnaud Causse	02-2361616		causse@uio.satnet.net		Quito
Agro Trading	Rodrigo Cabrera Noboa	593-2-2401856/2812101	593-2-2401856	agrotrading@hotmail.com		N4781 Rossini and Correlli Street, Quito, Ecuador
AGROALEGRE	David Bermeo	593-2-2675365/ 2673301	593-2-2673401	newbusiness@agroalegre.com	www.agroalegre.com	El Tablon s/n and P.V. Maldonado, Quito, Ecuador
AMAZON AROMA	Tatiana Cisneros	593-7-874157	593-7-874157	info@amazon-aroma.com	www.amazon-aroma.com	Av. F. Astudillo, Edificio Camara de Industria, oficina 1101, Cuenca, Ecuador
ARCOLANDS	Nelson Cañizares, Ruben Guzman	02-2261226		arcos@interactive.net.ec		Quito
Aromas del Tungurahua	Efren Silva, Javier Silva	03-854804	5933 854230	diegos@yupimail.com / aromtun@interactive.net.ec		Panamericana Norte Km 4,5 vía Atahualpa, Sector Malasto San Vicente, Ambato
Aroma Melis		09-9907526 / 09-9593076				Quito
Asociacion Agroartesanal de Productores de Plantas Secas Medicinales del Ecuador	Orlando Cadme Solano, Olivia Chuncho	593-7-2583173		orlandocadme@latinmail.com/ orlandocadme@yahoo.es		Ramon Pinto entre Diez de Agosto y Jose Antonio Eguiguren, Loja, Ecuador
Asociacion de Pequeños Productores de Plantas Medicinales (Nueva Semilla)	Guadalupe Pilapaña	593-2-2864270		nuevasemilla@hotmail.com		El Porvenir de Gualea, Noroccidente de Pichincha, Gualea Cruz frente a la escuela, Ecuador
BIOLCOM	Peter Bachmann	02-447662/663/665	593 (2) 447-664	imocom@uio.satnet.net / info@biolcom.com	www.biolcom.com	Corea E-249 y Nuñez de Vela, Edif. Karolina 2000, Planta Baja. P.O. Box 17-17-292 Quito
BIO PRO	Martha Ortega	543491/09-837182				Quito

Company	Contact	Phone	Fax	E-mail	Web	Address
CARABOTIJA	María Resfa Guatemal	593 2 2115064/ 2362240		jenchala@yahoo.com		No. 1 Barrio Carabotija, Olmedo, Cayambe-Ecuador
Casa Cayambe, Asociación de Productores Campesinos de Olmedo		02-2360516 / 2361234				Quito
CASTOR ECUATORIANA S.A.	David Jervis	05-920043	593 (5) 924-633	bdjervis@castor-ec.com		Km 1 carretera Manta-Montecristi P.O. Box 13-05-0015 Manta, Manabi
CEDEIN/ HUERTOS EDEN	Jose Bueno	593-3-2912015		ventas@huertoseden.com cedein@andinanet.net	www.huertosseden.com	Ave. Unidad Nacional y Calle Antiguo Riobamba, esq. (2do y 3er piso), Cajabamba-Riobamba-Chimborazo-Ecuador
COMPANIA ECUATORIANA DEL TE (CETCA)	Jaime Flores	593-2-2986-709/ 222360	593-2-523-135	cetcauio@uio.satnet.net		Av. 12 de Octubre 2697 y Lincoln Piso 12 Of. 1202
CHANKUAP	Paul Arevalo	593-7-270-1176		chankuap@mo.pro.ec	www.chankuap.com	Calle Soasti y Domingo Comin, Macas, Ecuador
Cultivos Orgánicos del Ecuador S.A.	J. Enrique Espinosa P.	02-893475	02-893476	enrique@uio.satnet.net		Sector Pillagua, Cumbaya, Pichincha, Quito
ECUANATU	Manuel Ruiz	02-2444273/ 09-739425				Eugenio de Santillan 358 Y Maurian, Pichincha, Quito
Escuelas radiofonicas populares del Ecuador (ERPE)	Lina Cuenca	593-3-2961608		lina@erpe.org.ec	www.erpe.org.ec	Juan Velasco 20-60 y Guayaquil, Riobamba-Ecuador
EXPOAROM	Verónica Vallejo	898738/739/746	593 2 2897802 / 2898740	expoarom@andinanet.net		P.O. Box 17-21-859, Quito
FARMAVIDA	Jose Luis Fornell	593-2-2468560		gevans@interactive.net.ec		Republica del Salvador No. 112 y Shyris
FITOTERAPIA	Juan Campuzano/ Juan Vallauri	(593 2) 2483-995/ (593 2) 2479-626		fitoq@interactive.net.ec		Sector Carcelén, Quito - Ecuador
FUNDACION FAMILIA SALESIANA SALINAS	Juan Jose Azogues	593-3-2390045		juanazoque@latinmail.com	www.salinerito.com	Via al Calvario, Salinas Ecuador

Company	Contact	Phone	Fax	E-mail	Web	Address
Fundacion Promocion Humana de Guaranda	John Castillo	593-3-298-0703/ 329982140	593-329-82140	elizjohn22@yahoo.es/phdgda @uio.satnet.net		Guaranda, Plaza Roja, Candido Rada y General Enriquez, Bolivar, Ecuador
GENESIS	Toni Brandauer	895359/ 09-371133/ 891972		brandauer@waccom.net.ec		Quito
GEOACUATICA	Antonio Salazar	02-449545		geoacuatica@attglobal.net		Quito
GREENAQUA	Erika Sosa L.	05-692702/703	(593) 569-1250	greenaqua@uio.satnet.net	www.greenaqua.com	Bahia de Caráquez, Quito
Hierbas naturales y medicinales de Pusuqui, S.A.	Rafael Perez	5932-2350407/ 2350748	5932-2351436	pusuqui@pipro.ec	www.pusuqui.com	Hacienda Pusuqui Grande, Autopista Manuel Cordova Galarza Km 61/2, Quito, Pomasqui, Ecuador
Huiñana						
IMAGRO	Carlos Fuentes	02-2656024/ 2632994		imagro1@hotmail.com		Pedro de Céspedes # 278, Quito
Industria Lojana de Especerias (ILE)	Agustin Godoy/Dario Villamagua	593-7-2540840/ 593-2-2451562	592-4-2280839	info@ile.com.ed/dvillamagua @ile.com.ec		Barrio Consacola Km 1 Via a Cuenca, Loja, Ecuador
INEXA S.A.	Pedro Steiner	234440		inexa@uio.satnet.net		Quito
JAMBI KIWA	Rosa Guaman/Wiliber Ibarra	593-3-296-0678/ 295-1026		jambikiwa@ch.pro.ec	www.jambikiwa.org	Km 1.5 Santa Cruz Parroquia Yaruqui, Riobamba, Ecuador
JENKER S.A.	Mercedes Ríos	04-394050/ 282016/ 290809/ 09-741700				Guayaquil
Jose Eguiguren y Cia.	Jose Eguiguren	02-522904		peguig@hotmail.com		Quito
Juan Pablo Clavijo	Juan Pablo Clavijo	02-2468218		disajpc@uio.satnet.net		Quito
Laboratorios Albam's						
LAFIP	Sixto Pluas Gomez	593-4-228-7525	593-4-269-1062	justosixto@lafip.com.ec	www.lafip.com.ec	Padre Solano 1502 y Jose Mascote, Guayaquil, Ecuador
LANDOM	Leoncio Landivar Dominguez	02-2895661/ 119		jlandom@hotmail.com		Quito
LAPRONAG	Mirta Ordoñez	593-7-293-5296		mgoc2@hotmail.com		Kebler Franco 803 y Colon, Machala, Ecuador

Company	Contact	Phone	Fax	E-mail	Web	Address
MARIANEXAS	Marta Camacho	02-2430777		mcamacho@motransa.com/ lamaria@morisaenz.com		Av. 10 de Agosto 6398 y Juan de Ascaray, Quito
MASTER PLANT	Eva Peña de Morales	593-2-275-4812		gerencia@masterplant.com.ec /ventas@masterplant.com.ec		L. Jacome 109 y Avenida Santa Rosa, Santo Domingo, Ecuador
NATUALFA	Liliana Naranjo	02-2641419				Galo Molina 805, Quito
NATURISOL						
NATUSIL	Angela Genoveva Silva Espinoza	593-7-296-1214		carmitagjj@hotmail.com		Pichincha entre Santa Rosa y Ayacucho, Machala, Ecuador
NEOFARMACO	Walter Peña	03-842628				Atahualpa y Cardinet, Ambato
NUEVA AMERICA	Maria Isabel Juma	593-6-2644785		cedera@andinanet.net/ ecojambisacha@yahoo.com		Nueva America, Pimampiro, Ecuador
NUKUI		0593 2 07 2780776		nukui_mujershuar@hotmail.com		Avenida Luis Casiragui y Sor Consuelo, Gualaquiza, Ecuador
Pharma Brand						
PROAJI	Phillip Baker	02-2891187	593-220-40115	ajiman@accessinter.net	www.spicesolution.com	Sto. Domingo. Quito
PRONAVIT	Angel Puma	593 2 2664 234	593 2 2665 376	pronavit@interactive.net.ec		Huaynapalcon No. 11 36 S 10-10 y Zaruma. Pichancha, Quito
RENASE	Bolivar Rodriguez Rivadeneira	2227113-2507653-2509103	2227113-2507653-2509103	bolrod@uiosatnet.net	www.renase.com	Pasaje Los Angeles E4-02 y Alemania, Quito, Ecuador
Ricardo Ortiz	Ricardo Ortiz	02-2500141		donosogomez@andinanet.net		Quito
Ruben Martinez	Ruben Martinez	02-2244327		rubenmarib@yahoo.com		Ibarra
SAN JOSE DE LAS PALMAS	John Castillo	593-3-298-0703/329982140	593-329-82140	elizjohn22@yahoo.es		35 km al sur de Guaranda, parroquia San Pablo Atenas, Canton San Miguel, Bolivar, Ecuador
SANTA MARIA DE MILAN						

Company	Contact	Phone	Fax	E-mail	Web	Address
SISACUMA	Marta Ortega Jaramillo	593-2-226-1226		maortega@sisacuma.com		4080 Amazonas and Naciones Unidas, Puerta del Sol Building, Office 805, Quito Ecuador
SONFRI	Alejandro Gilabert, Jorge Arias	04-2515961/ 09-9950967		gilabert@interactive.net.ec		Guayaquil
Universal Plants	Hernando Monroy, Sandra Garces	02-2921364/ 65		sgarces48@hotmail.com/ upec_sverde_hm@access.net.ec		Amazonas 45-45 y Pereira, Quito
UNORCARCHT						Loja, Ecuador

Sources: Data was retrieved from each corresponding company's websites, *Biodiversidad desde el centro del mundo: Ingredientes Naturales y Productos Elaborados*. CORPEI. *www.hierbasdelecuador.com*.

ANNEX 1.

A model monograph

Aristeguietia lamiifolia (Kunth) R.M. King & H. Rob.
Phytologia 30: 220. 1975.
FAMILIA: Compositae (Asteraceae)

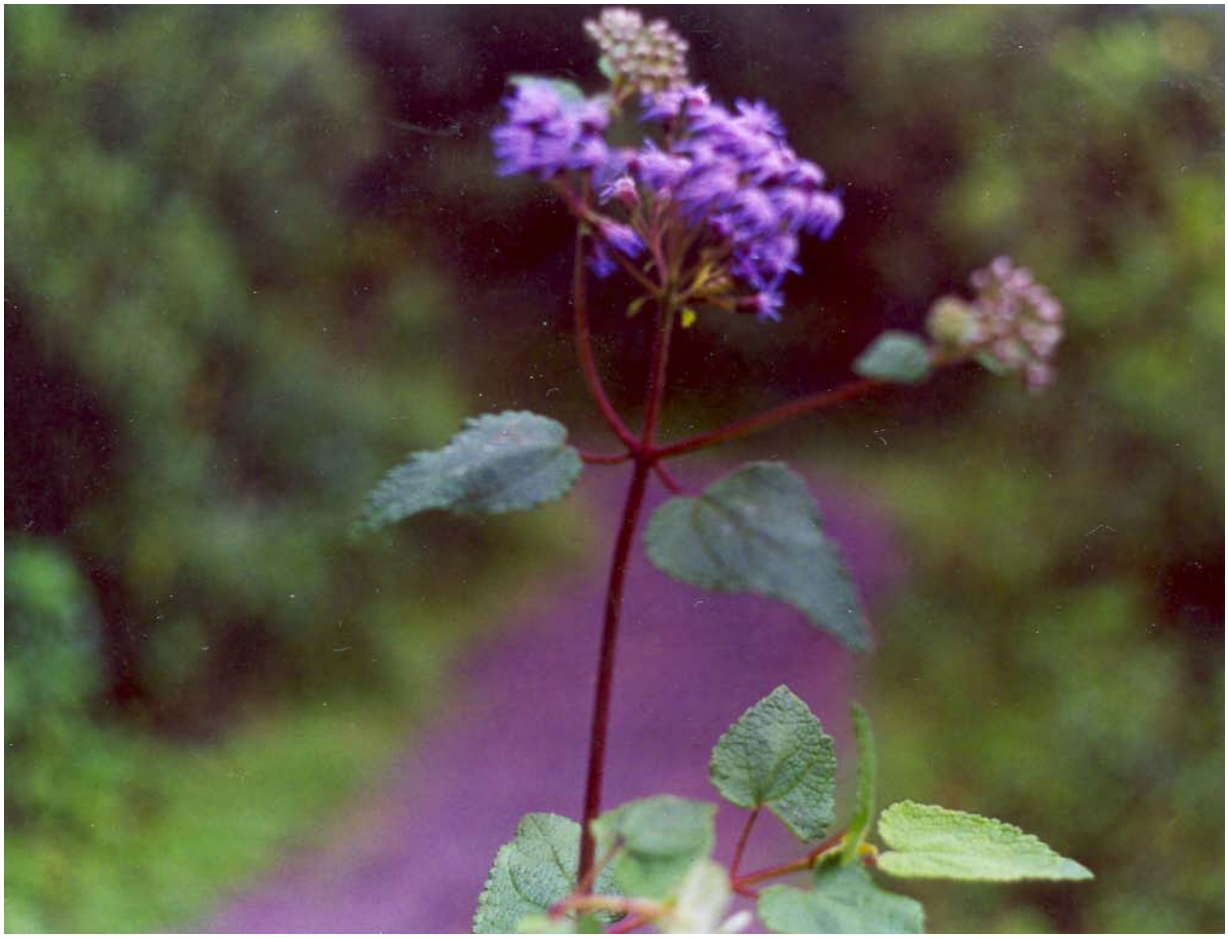

FIGURA 1. ***Aristeguietia lamiifolia*** (Kunth) R.M. King & H. Rob.
Fotografía: Name to be included

SINÓNIMOS

Eupatorium lamiifolium Kunth

NOMBRES COMUNES EN LOS PAÍSES IBEROAMERICANOS

Pega, pegajosa, salvia macho, (CHILE).
Matico, salvia (ECUADOR).

DESCRIPCIÓN BOTÁNICA

Arbusto erecto a inclinado, moderadamente ramificado, de 0.8 a 1.0 m de altura, tallo cilíndrico o angulado de 4 a 6 cm de díametro. Láminas foliares opuestas, pecíolos mayormente cortos, usualmente agudos delimitados, hojas ampliamente ovadas o lineares, algunas veces oblongas o elípticas, base cordiforme o cuneiforme, orillas usualmente dentadas, nervación pinnada o trinervada desde la base, sobre la superficie algunas veces vejigoso o áspero, raramente con pequeñas puntuaciones glandulares, envés sin puntuaciones glandulares evidentes, algunas veces con pequeña estípulas glandulares, tomento. Inflorescencia con pocas o muchas cabezas corimbosas, usualmente con ramificaciones ascendentes, hacia abajo usualmente opuestas, cabezas pediceladas. Brácteas fuertemente subimbricadas, en 4 a 6 series desiguales, mayorrmente persistentes, canales poco profundos, ovadas o lanceoladas, sobre la superficie estriadas, receptáculo ancho o ligeramente convexo. De 13 a 100 flores en cada cabezuela, corolas azuladas, púrpuras o rosadas, estrechamente acanaladas, usualmente en la haz glabroso. Anteras corolares estrechamente cilíndrica, mayormente con células oblongas, paredes celulares con un débil pero ancho anillo anular; anteras largas dependientes, más largas que anchas, cáliz no alargado, glabro, vilano de 30 a 45 mm, erizado, áspero y apretado en 1 a 2 series, escasamente extendido al madurar, células apicales agudas, granos de polen de 22 a 25 μm de diámetro (FALTA CITA BIBLIOGRÁFICA, Ejemplo: fide RODRÍGUEZ ET AL., 1983: 338).

DISTRIBUCIÓN GEOGRÁFICA Y HÁBITAT

Especie ampliamente distribuida en el norte de los Andes, especialmente en bosques de ceja andina oriental, faja altitudinal inferior a la de la región del páramo, región de transición hacia selva subandina, desde los 3000 a 3500 m s.n.m. Habita en áreas disturbadas y bordes de caminos. En el Ecuador la podemos encontrar en la parte norte del país en las zonas septentrionales, en la provincia de Pichincha, en el camino al volcán Guagua Pichincha, pasando Lloa a 3200 m s.n.m. y en la reserva Geobotánica Pululahua, en la provincia de Imbabura en la reserva ecológica Cotacachi-Cayapas, laguna de Cuicocha. En el resto de América se encuentra en el norte de Colombia, Chile y sur del Perú. (FALTA CITA BIBLIOGRÁFICA).

USOS ETNOMÉDICOS Y MODO DE EMPLEO

La parte aérea de esta especie se utiliza como antiinflamatorio, para el tratamiento del reumatismo, se prepara baños calientes con la planta. Como aperitivo, antiespasmódico, antibilioso, anti-inflamatorio, aromático, estimulante, febrífugo, se prepara la infusión con las hojas y se toma (FALTA CITA BIBLIOGRÁFICA).

ACTIVIDAD FARMACOLÓGICA Y BIOLÓGICA

El extracto etanólico total a una concentración de 2000 ppm presenta actividad antibacteriana del % sobre ***Staphylococcus aureus***, ***Staphylococcus epidermidis***, ***Bacillus subtilis***, ***Pseudomonas aeruginosa***, ***Escherichia coli***, ***Salmonella typhy***, ***Proteus vulgaris***. Presenta actividad antimicótica del % sobre ***Micosporum cannis***, ***Tricophytum rubrum***, ***Tricophytum tonsarans***, ***Tricophytum mentagrophytes***. Presenta una actividad antiherpética sobre Herpes simplex tipo 1 (HSV-1) del % a una MCNC de μg/ml El extracto etanólico de las hojas tiene actividad anti-inflamatoria excelente, presenta actividad en la supresión del edema en la fase aguda de 1.2 con respecto a una dosis de 80 mg/kg de fenilbutazona con 1 (FALTA CITA BIBLIOGRÁFICA).

TOXICIDAD Y ESTUDIOS CLÍNICOS

Información no disponible.

QUÍMICA

En la investigación fitoquímica preliminar se identificó: alcaloides, flavonoides, taninos, antocianinas, saponinas, esteroles, sesquiterpenolactonas, cumarinas, glicósidos cardiotónicos (FALTA CITA BIBLIOGRÁFICA).

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EXECUTIVE SUMMARY

This report is state of art information on different aspects of medicinal plants in the country. Sources of raw material of medicinal plants are grouped by families containing medicinal properties, geographic location and farming. Inventory of the already processed medicinal plants, identification of possible future products, list of producers by economic sector and economic location are provided

This report also provides an overview of the productive chain of medicinal and aromatic plants for herbal medicinal products, nutraceuticals, cosmetics and pharmaceutical aids. Information on companies engaged in different aspects of medicinal plants industry is provided.

It briefly describes current tendencies of the market, distribution channels, social, legal and commercialization ways of medicinal plant based products.

Based on critical evaluation and industrial potential, the most promising plants of Peru are *Anonna muricata* L., *Bixa orellana* L., *Caesalpinia spinosa* (Molina) Kuntze, *Chenopodium ambrosoides* L., *Croton lechleri* Muell. Arg., *Cyclanthera pedata* L., *Ficus anthelmintica* Rich, *Genipa americana* L, *Gentianella alborosea* (Gilg) Fabris, *Geranium dielsianum* Kunth, *Krameria triandra* Ruiz & Pav., *Lepidium meyenii* Walp, *Lonchocarpus nicou* L., *Maytenus laevis* Reissek, *Minthostachys mollis* (Kunth) Griseb, *Myrciaria dubia* (Kunth) Mc Vaugh, *Phyllanthus niruri* L., *Plukenetia volubilis* L., *Smallanthus*

sonchifolius (Poepp. et Endl.) H. Rob, *Tabebuia serratifolia* (M. Vahl) Nicholson, *Tagetes erecta* L., *Uncaria tomentosa* (Willd.) DC., *Zea mays* race Kcully.

Peru has 74 enterprises related to the industrialization of medicinal plants, which making it a leader in the Andean region. Most of the plants utilized to elaborate herbal medicinal products are yacón (*Smallanthus sonchifolius*), maca (*Lepidium meyenii*), cat's claw (*Uncaria tomentosa*), tara (*Caesalpinia spinosa*), sangre de grado (*Croton lechleri*), sacha inchi (*Plukenetia volubilis*), purple corn (*Zea mays* race Kcully), pasucha (*Geranium dielsianum*) and hercampuri (*Gentianella alborosea*). Thirty percent of companies are related to the production of herbal medicinal products, 30% to production of nutraceuticals and farming, collection and processing of medicinal plants. The rest are divided between cosmetics, food and others. The large majority of companies involved in this sector are located in Lima.

It ends with a SWOT analysis and recommendations on industrialization of medicinal plants.

INTRODUCTION

Peru is a country with major biological wealth distributed in 11 ecological regions and 84 life zones in the World[20]. There are 22,000 species (8.8 % of the world plants) of higher plants concentrated in 82 million hectares (64% of the national territory) of forests. Peru has a very rich heritage of medicinal plants since the Inca times.

However, environmental considerations have not been institutionalized and they do not reflect the concern for a sustainable use of resources by most of their public administrative and main private entities that cover the demands of the market. The latter ones do not consider the possible consequences of over-exploitation of their biodiversity resources. The efforts to achieve development in harmony with the environment are guided by territorial classification, use of forest resources (by means of forestry concessions), use of bodies of water and their resources and defending the rights of indigenous people.

The major advances to raise public awareness and to regulate the use of biodiversity have been achieved by the CONAM (National Committee of Environment). This is the entity in charge of creating and promoting national environmental policies, combining sectorial efforts and promoting the participation of private sector and INRENA (the control and supervision entity of this policy). It is also necessary to highlight the achievements made by projects and programs of the NGOs that have contributed to the diffusion of environmental

[20] Flores, D. 2006. *Actualización del estudio de Mercado del Sector Farmacéutico y Productos Naturales.* PROMPEX-Peru. Lima, Peru. 126 pp.

awareness, through the development of mechanisms and methodologies that promote the conservation and the good use of environmental resources.

Over 50% of the population in Perú has used herbal medicine for the treatment of their diseases[21]. The main causes of mortality in Peru are transmissible diseases, diseases of the circulatory system, neoplasms, external causes and perinatal diseases. However, the main cause of morbidity is communicable diseases.

In 1997, the Social Security carried out a study of demands in complementary medicine, in a sample of 300 persons in Lima clinics; 86,2 % were in favor of following a treatment with complementary medicine[22]. Due to this issue, the Social Security of Health, through the Resolution No. GG487/IPSS/98 of 7 May 1998, created the National Program of Complementary Medicine, and currently there are 12 centers at the National level, with coverage of over 40,000 patients with chronic ailments such as osteomyoarticular, endocrine-metabolic disorders, anxiety-depression, cardiovascular, neurovegetative degeneration and gastrointestinal problems.

Total number of Traditional Medicine/Complimentary and Alternative Medicine (TM/CAM) providers within and outside the conventional health system is not available. The National Institute of Traditional Medicine provides official training programmes in traditional medicine. Peru has public and private institutions, which promote development of traditional medicine such as National Institute of Traditional Medicine, which has 17

[21] WHO. 2005. *WHO Global Atlas of Traditional, Complementary and Alternative Medicine*. Text Volume. Kobe, Japan. 216 pp.
[22] ESSAUD. 1997. *Demanda de Medicina Complementaria* (Encuesta), Lima, Peru.

affiliated centers in different provinces. The Research Institutions are: National Institute of Traditional Medicine, Peruvian Institute of Traditional Medicine of Social Security. Currently, there is a research program on traditional medicine at the National Institute of Traditional Medicine, called Directorate General of Research and Technology. The Principal programs in progress are: Clinical evaluation, medical anthropology and statistics-demography.

The general Health Law ("La Ley General de Salud") recognizes the traditional health practices but does not develop it further. Currently a Draft Law to incorporate Complementary Medicine into the National Health System is in the National Congress ("Ley No. 1286 de Incorporación de La Medicina Complementaria al Sistema Nacional de Salud"). Moreover, legal regulation of herbal medicinal products has been passed in this country.

1. ABOUT THE PRODUCT

1.1. Raw material

In Peru, there are 22,000 higher plants[23] of which more than 4,000 are classified as medicinal plants and sources of food, dyes, cosmetics, textile and for construction.

One thousand five hundred (37.5%) plant species out of 4,000 are used in Traditional medicine[24]. In the current report, 77 important medicinal plants of Peru are reported

[23] Peruvian BIOTRADE. 2005. *Sector Assessment on Natural Ingredients for cosmetics and pharmaceuticals in Peru*. National Commission for Export Promotions (PROMPEX), United Nations Conference on Trade and Development (UNCTAD) and Center for the Promotion of Imports from Developing countries (CBI). 86 p.

with their corresponding common names, medicinal uses, geographic location, international distribution and farming (Table 1). A second edition of a book on Iberoamerican Medicinal Plants edited by Gupta (1995)[25] has 9 monographs on Peruvian medicinal plants written by Drs. Olga Lock and Eleucy Perez. This updated version of the book is currently* in press *(Annex 1).

More frequent medicinal uses found for Peruvian medicinal plants in Table 1 were pain, fever and inflammation, gastrointestinal problems, respiratory tract affections, skin affections and diabetes. Twenty-nine out of 77 plant species are cultivated in Peru (Table 1). Moreover, 13 plants are from the Amazon region.

According to literature information and pharmaceutical, nutraceutical and industrial potential, the most promising plants are *Anonna muricata* L., *Bixa orellana* L., *Caesalpinia spinosa* (Molina) Kuntze, *Chenopodium ambrosoides* L., *Croton lechleri* Muell. Arg., *Cyclanthera pedata* L., *Ficus anthelmintica* Rich, *Genipa americana* L, *Gentianella alborosea* (Gilg) Fabris, *Geranium dielsianum* Kunth, *Krameria triandra* Ruiz & Pav., *Lepidium meyenii* Walp, *Lonchocarpus nicou* L., *Maytenus laevis* Reissek, *Minthostachys mollis* (Kunth) Griseb, *Myrciaria dubia* (Kunth) Mc Vaugh, *Phyllanthus niruri* L.,

[24] PROMPEX. 2003. *Estudio de Oferta y Demanda del Sector de Productos Naturales*. LATINPHARMA 2003. 67 pp.

[25] Gupta, M.P. 1995. *270 Plantas Medicinales Iberoamericanas.* 1st Ed. CYTED-Convenio Andrés Bello. Bogotá, Colombia. 617 p.

Table 2. Most promising Peruvian plants

Plant	Common names	Medicinal use(s)
Anonna muricata L.	Hojas de guanabana, cohossol	Antitumoral, prostate cancer, antispasmodic
Bixa orellana L.	Hojas de achiote	Urogenital antiinflammatory, prostate growth reducer, cholesterol level reducer
Caesalpinia spinosa (Molina) Kuntze	Tara	Products for diabetics, gargarism for anginas, coughing and cold
Chenopodium ambrosoides L.	Hojas de paico, pozote	Antispasmodic, carminative, digestive problems
Croton lechleri Muell. Arg.	Sangre de Grado, sangre de drago	External wound healing, ulcer healing, astringent, hemostatic
Cyclanthera pedata L.	Caigua, achojcha	Cholesterol level reducer, hypertension, antidiabetic, diuretic
Ficus anthelmintica Rich	Licin, Leche oje, ficina	Anthelmintic, purgative, proteolytic activity
Genipa americana L	Huito, jagua, juito, genipa	Bleeding, anemia, pellagra, digestive
Gentianella alborosea (Gilg) Fabris	Hercampuri	Hepatoprotective, depurative, hypoglicemiant, diuretic
Geranium dielsianum Kunth	Pasuchaca	Antidiabetic, hypoglicemiant, blood depurative, pancreatic problems
Krameria triandra Ruiz & Pav.	Peruvian rhatany	Astringent
Lepidium meyenii Walp = *Lepidium peruvianum* Chacon	Maca	Menstrual cycle and menopause regulator, sexual impotence, improves memory and concentration
Lonchocarpus nicou L.	Barbasco	Source of insecticidal and pesticidal rotenone
Maytenus laevis Reissek	Chuchuhuasi	Tonic, antiarthritic, bones and joints antiinflammatory
Minthostachys mollis (Kunth)	Muña	Carminative, stomachic,

Plant	Common names	Medicinal use(s)
Griseb		digestive, fractures healing, luxations
Myrciaria dubia (Kunth) Mc Vaugh	Camu Camu	Antioxidant, vitamin C deficiency, inmunostimulant, antibacterial
Oxalis tuberosa Molina	Oca	Food
Phyllanthus niruri L.	Chancapiedra,	Kidney stones, liver problems, urinary and biliar muscular relaxant
Plukenetia volubilis L.	Sacha Inchi	Cholesterol level reducer, cardiovascular problems
Smallanthus sonchifolius (Poepp. et Endl.) H. Rob	Yacón	Antidiabetic, gastrointestinal and kidneys problems, skin rejuvenating action
Tabebuia serratifolia (M. Vahl) Nicholson	Tahuari	Colds, coughs, leishmaniasis, diabetes, hepatitis
Tagetes erecta L.	Ayasisa, Rosasisa, Marigold	Bronchitis, colds, muscle cramps, analgesic
Ullucus tuberosus Caldas	Olluco	Food
Uncaria tomentosa (Willd.) DC., *Uncaria guianensis* (Aubl.) Gmelin	Uña de Gato, Cat's Claw	Antiinflammatory, prevention of prostatitis, ulcers, diabetes, diarrheas, analgesic for sciatica and lumbalgia, inmune stimulant
Zea mays race Kcully	Maiz Morado, Purple Corn	Visual acuteness, cholesterol level reducer, night vision, colon cancer preventive, natural colorant

Source: Peruvian BIOTRADE. 2005. *Sector Assessment on Natural Ingredients for cosmetics and pharmaceuticals in Peru*. National Commission for Export Promotions (PROMPEX), United Nations Conference on Trade and Development (UNCTAD) and Center for the Promotion of Imports from Developing countries (CBI). 86 p.; Dr. Olga Lock Sing. Departamento de Química. Pontificia Universidad Católica del Peru. Lima, Peru; Dr. Elena Li. Dirección Técnica, Laboratorios Induquímica S.A. Lima, Peru, *Personal Evaluation*.

Plukenetia volubilis L., *Smallanthus sonchifolius* (Poepp. et Endl.) H. Rob, *Tabebuia serratifolia* (M. Vahl) Nicholson, *Tagetes erecta* L., *Uncaria tomentosa* (Willd.) DC., *Zea mays* race Kcully. Their corresponding common names and medical uses are listed on Table 2.

CYTED monographs, similar to the ESCOP monographs on *Croton lechleri* and *Uncaria tomentosa* are in preparation at this moment. There are monographs on *Uncaria tomentosa*, *Matricaria chamomilla*, *Valeriana officinalis*, *turmeric* in the US Pharmacopeia 28/National Formulary 23 (2005).

Table 3 shows the FOB export values of the natural ingredients sector by product line in 2002. As shown, the main export was the line of natural colorants with a total FOB value of US$ 24,220,360, followed by nutraceutical extracts with a value of US$ 5,249,587. The total FOB values of gums and natural insecticide extracts were U$ 1,509,786 and US$ 77,253, respectively. Natural colorants represent the largest share of natural ingredients exports with 78%, due to the hard work done by Peru over the last 50 years. The nutraceutical extracts grew to a very significant 17% in 2002. This figure will continue to grow due to the current dynamics of the yacón (*Smallanthus sonchifolius*) and maca (*Lepidium peruvianum*) exports.

Table 3. Natural ingredients exports by product line, 2002

Product line	FOB Value (US$)	Percentage (%)
Natural colorants	24,220,360	78.00
Nutraceutical extracts	5,249,587	17.00
Gums	1,509,786	5.00
Insecticide extracts	77,253	0.25

Source: Peruvian Biotrade Committee-Prompex, Peru (2002).

In Table 4, the exports of Peruvian natural ingredients such as yacon (*Smallanthus sonchifolius*), sangre de grado (*Uncaria tomentosa*), maca (*Lepidium peruvianum*) and tara gum (*Caesalpinia spinosa*) have steadily grown. The total exports of cat's claw and anthocyanins of purple corn (*Zea mays* race Kcully) have declined slightly and those of camu camu (*Myrciaria dubia*) are fluctuating.

Yacón, due to its content of inulin and oligofructans, is being used as a food supplement to reduce the risks of diabetes, while sangre de grado (*Croton lechleri*) is used because of its high external and internal healing properties. Both products are consolidating their presence in the international market of nutraceuticals. Maca is one of the most complete foods due to its high content of nutritious elements making it an effective revitalizer and an invigorating food.

Table 4. Natural ingredients sector exports by product, 2002.

No.	Line of products	FOB Value (US$)	Type of ingredients
1	Carmine, Carminic acid, solutions/E-120	10,167,062	Colorant
2	Marigold xanthophylls/E-161b	8,645,385	Colorant
3	Bixin, notrixine, solutions/E-160b	3,136,445	Colorant
4	Maca Extract and Byproducts	3,016,240	Nutraceutical
5	Paprika Saponificated extract/E-160c	2,162,447	Colorant
6	Tara gum/ E-417	1,509,786	Gums
7	Cats claw & Byproducts	1,290,436	Nutraceutical
8	Camu camu extract and Byproducts	610,844	Nutraceutical
9	Sangre de grado extract and Byproducts	179,023	Nutraceutical
10	Yacon Extract and Byproducts	153,044	Nutraceutical
11	Antocyanin purple corn/E-163	98,000	Colorant
12	Rotenone extract	77,253	Natural insecticide
13	Curcumin of curcuma or Palillo/E-100	11,021	Colorant

Source: Peruvian Biotrade Committee-Prompex, Peru (2002).

In spite of the problems of patents in United States and novel foods in Europe, maca continues to be the best product in this field. It is exported in the form of capsules, pills, tablets, sweets, extracts, flour, flakes, liquor, raw material maca and shampoos.

The export levels of cat's claw (*Uncaria tomentosa*) have probably decreased due to the tariff barrier that have been adopted by some countries to restrict its imports, including the policies of novel foods in Europe. The exports of anthocyanins of purple corn have dropped

by limitations of the market since it is only exported to Germany. This product is sold in the United States as a Botanical and has been used in Peru since immemorial times without any toxicity risk. Indeed, there are studies in Japan that indicate that the anthocyanins of the purple corn reduces the risk of colon cancer[26].

The tara gum exports are increasing due to its multiple uses. Tara gum can be used in the same manner as locust bean and guar gums. According to the World of Food Ingredients/ February - March 2001, the total market value of hydrocolloids is almost 3 billion US dollars. The market values of locust bean gum and guar gum are 110.0 and 97.0 million US dollars, respectively. Therefore, we can estimate that the growth of tara gum exports will likely be maintained.

1.2. Products

An analysis of the inventory of already processed medicinal plants in Peru (Table 5) showed that six companies are involved in the farming, recollection or processing of medicinal and aromatic plants like yacón, maca, cat's claw, tara, sangre de grado, sacha inchi, purple corn, pasucha and hercampuri among others; and nineteen companies produce herbal medicinal products based on yacón, maca, cat's claw, tara, sangre de grado, sacha inchi, purple corn, pasucha and hercampuri.

[26] Hagiwara A, Miyashita K, Nakanishi T, Sano M, Tamano S, Kadota T, Koda T, Nakamura M, Imaida K, Ito N, Shirai T. 2001. Pronounced inhibition by a natural anthocyanin, purple corn color, of 2-amino-1-methyl-6-phenylimidazol[4,5-b]pyridine (PhIP)-associated colorectal carcinogenesis in male F344 rats pretreated with 1,2-dimethylhydrazine. *Cancer Lett*. 171:17-25.

Two companies (Natural Life and Quality People Process Products) produce cosmetics and the main plant used was *Aloe vera*. Besides ECOPRO produces food and cosmetics based on *Genipa americana* L.

Moreover, two companies (Aurandina and Hersil SA) focus their production of herbal teas; four companies produce nutraceuticals using as main natural ingredients *Capsicum annuum* L. and *Zea mays* L; two companies, Agroindustrias Backus and Agronaturales produce nutraceuticals and herbal medicinal products based mainly in Camu camu, Yacon root, cat's claw, maca root. One company called Pebani Inversiones produces medicinal and aromatic plants and herbal medicinal products based on *Uncaria tomentosa* (Willd) DC. In addition it also has a line of raw material rotenone and tannins.

1.3. Producers

Four economic sectors (herbal medicinal products, nutraceuticals and allies, perfumes and cosmetics and pharmaceutical aids (gums, raw material, resins and others)) are related to medicinal plants and derivatives. Table 6 presents the producers by previously mentioned economic sector and geographic location. Most of the producers are located in Lima in the following number according to economic sector: herbal medicinal products (37), nutraceuticals and allies (16), perfumes and cosmetics (4) and pharmaceutical aids (29).

2. ABOUT THE PRODUCTION

2.1. Productive chain

Peru has an agricultural production that represents a vast source of supply for the natural ingredients sector. In the coastal and mountainous areas, Peru grows tubers such as maca, arracacha, yam and yacón that are used as nutraceuticals. In addition, Peru produces plants such as muña and eucalyptus for the pharmaceutical and cosmetic industries. Moreover, Peru produces insects such as the cochineal and plants such as marigold, purple corn, cúrcuma, paprika that are used in the industry of the natural colorants. Additionally, plant extracts from the Amazon region like camu camu, cat's claw, barbasco, sangre de grado, chancapiedra, chuchuasi, ojé, copaiba and other leaves, barks and roots are used mainly for medicinal and nutritional purposes. There are no production statistics on the above-mentioned resources.

2.1.1. Collection

There are two main supplying entities: the extractor/collector and the agricultural producer. It should be highlighted that there is a difference between the resources that are "produced" in the coast and highland and those that are "extracted" from the Amazon region. In the jungle, the dominant natural resources are the forest, the rivers and the bodies of water. The condition of the soil and continuous flooding limit the production and there is no control of certain variables that characterize the agriculture that is carried out in the coastal and highland regions.

"Collection" is the dominant form of production of medicinal plants. It is the initial part of the supply chain for the pharmaceutical, chemical and other industries. However, this extractive activity is not organized, or linked formally to other intensive processing stages. The sustainable use of these resources is supported by some initiatives of the State and of the work of environmental NGOs. However, these efforts have not been sufficient. Without any legal basis and social practices that would rule and guide the use of the natural resources and make them sustainable, the extraction will continue to be a practice that is socially accepted and looting is a natural consequence.

The ecological production in Peru has its origins in the beginning of the 80's with the work carried out by the Ecological Agricultural Network, Peru RAE. Moreover, the National Association of Ecological Producers of Peru (ANPE-PERU) was formed during the Third National Encounter of Ecological Producers with the goals of improving the quality of life of families that have chosen sustainable agriculture, to facilitate an appropriate trading process, to help the local leaders and producers that apply ecological practices and to link them in the organic chain formed by producers, trading agents and certifying agents.

A national certifying system has operated since 1994 and is recognized by the main destination markets (the European Union, the United States and Japan). In 1997, a National Commission started to work and created the National Commission of Organic Products (CONAPO), which among other activities is designing a legal framework to support producers as well as consumers of organic products. Currently, this process has certified over 10,000 organic farmers in Peru, which occupies the fifth place in the world with more capacity to use ecological agriculture.

2.1.2 Transformation

There are two types of economic agents transforming natural resources and adding value by certain degree of transformation: collectors/pickers and processors/laboratories.

The collectors and pickers provide only a simple process of transformation performing the following tasks: tree barking, cutting in easy to handle sizes, extracting liquids mechanically, drying and milling, and other things. They are in permanent contact with their suppliers, producers and extractors.

The processors/laboratories are exporting companies with advanced technology and organized processes. However, there are still many companies that carry out simple industrialization processes (physical and mechanical processes) such as drying, milling, powdering and micropulverization which increase the added value of the products.

An important component of transformation is research. This is an important limitation for the sector. There is a shortage of scientific and technological information on natural ingredients. There is also a lack of information on clinical trials which could verify the benefits of national herbal products. Moreover, there are serious research limitations that restrict the accessibility of composition and chemical analysis, therapeutic value, toxicological analysis, among other things. These are the most common demands made by market importers of natural ingredients. The exporters do not have a research center for natural ingredients or an institutional cooperation mechanism to cover these needs.

The exporter community has the difficulty of solving common problems such as finding a reliable laboratory that would carry out required analysis in less than 24 hours. All laboratories and /or institutions that perform these types of analysis need almost 3 working days to issue a certificate of analysis. The decision-making process on purchasing/buying raw materials and its logistics process have become very difficult.

The sector has the complex technology to process these raw materials but it is generally concentrated in Lima. At the provincial level, on the other hand, simple and intermediate technologies are available for the raw material processing.

2.1.3. Commercialization

Commercialization has two economic parties: agents devoted to supplying the national market and the exporting companies that supply the international market. Current market information on this limits the estimation of the market demand. It is known that there is an increasing demand of products from this sector; however, tariff barriers could limit the export offer.

The production scale is reasonably organized and could be commercially attractive. There is even an idle productive capacity and a vast supply source. The natural ingredients are already sold in the markets where standards are high; however, there is a lack of technical norms to guide production and support of those standards.

The main obstacle is the transportation from the production, collection and storage centers towards industrial centers (e.g. problems with the maintenance of highways and lack of access path). Another aspect is the low price offered by intermediaries. In the case of industrialized products, the main problem is the lack of knowledge of the market of the product, provoking a limited internal and external demand.

2.1.4. Agents implied

According to the Ministry of Agriculture, the sectors involved in the development of the productive chain are: producers, goods and services suppliers, pharmaceutical industry, food industry, commercializing agencies, research centers, certifying agencies, SENASA (National Service of Agricultural Health), DIGEMID (Dirección General de Medicamentos, Insumos y Drogas) and Ministry of Agriculture.

2.1.4.1. Institutional Parties of the Public Sector

The following parties have played the most significant role in fostering growth in the sector:

Comisión para la Promoción de Exportaciones (PROMPEX) (Commission for Export Promotions – PROMPEX)

Through the management of the agrarian sector, PROMPEX has been coordinating actions in order to offer technical-commercial assistance to companies in the natural ingredients sector. These actions include advice on topics such as the access to international fairs, participation in international events and seminars of the sector, assistance in the formulation of business plans for exports and diffusion of international regulations.

It is necessary to indicate that the productive chain of the natural ingredients sector is in its basic development phase. Therefore, PROMPEX, is promoting the development of the productive chain of all the involved parties such as producers, suppliers of goods and services, pharmaceutical industry, industry of foods, trading agents, research centers and certifying entities with the purpose of eliminating the serious deficiencies in production (low productivity, faulty post-harvest crop handling, etc.), transformation (adoption of suitable quality standards) and commercialization.

Instituto de Desarrollo Agro-Industrial (INDDA) (The Institute of Agro-industrial Development (INDDA))

The Institute of Agro-industrial Development - INDDA, a part of the Agricultural National

University of La Molina, cooperates with the development of the natural ingredients sector and medicinal plants, by means of research and development of new products or processes and the transfer of technology. The INDDA is qualified to define processes and to formulate a great variety of products. As a result, the interested parties can evaluate their commercial possibilities, as if they themselves had elaborated these studies.

Instituto Nacional de Investigación Agrícola (INIA) (Agricultural Research National Institute (INIA))

The INIA coordinates and promotes the development of activities related to genetic resources, protecting, preserving and handling them in the country. In this framework, and under mandate, the PRONIRGEB (National Program of Research in Genetic Ressources and Biotechnology) is in charge of a network of 9 experimental stations. Currently, as a result of the collections, there are three banks of aromatic and medicinal plants strategically located: 31 coastal species (central headquarters INIA, LaMolina), 40 Andean species (EE Andenes-Cusco) and 19 jungle species (EE Pucallpa). Also, in the framework of the "*in situ*" conservation project of native crops and their wild relatives, the INIA is developing and leading the Research Institute of the Peruvian Amazon (IIAP), whose headquarters are located in Loreto. They are registering plants and natural ingredients in the setting of 48 communities in the three natural regions of Peru.

Instituto de Biotecnología (IBT) (Institute of Biotechnology (IBT))

The Institute of Biotechnology (IBT), as part of the Agrarian National University La Molina, has the mission of carrying out multidisciplinary research programs and integrating areas involved in the use of biotechnology techniques that will improve the education level

and promote the incorporation of these techniques in the agroindustry setting, especially in the sector of natural ingredients and medicinal plants. Its main objective is research and development, technology transfer and production of quality products with proven efficiency for the development of agriculture and pharmaceutical industries in Peru. The IBT has developed new techniques to obtain high quality plants, free of diseases. Examples of the IB's work in the sector natural ingredients include the curcuma or palillo (*Curcuma longa*), maca (*Lepidium peruvianum*), cat's claw (*Uncaria tomentosa*), sangre de grado (*Croton lechleri*), *Stevia* and yacón (*Smallanthus sonchifolius*).

Instituto de Ecología y Plantas Medicinales (IEPLAM) (Institute of Ecology and Medicinal Plants (IEPLAM))

The proposal of the IEPLAM and the committees of growers of medicinal and aromatic plants intend to implement policies that take advantage, in a rational way, of the existent medicinal and aromatic resources of hillside lands, the riverside areas of the creeks and irrigation channels. Since 1991, several activities have been carried out like propagation, reforestation, harvest, transformation and commercialization of essentials oils of the some aromatic shrubs and sub-shrubs species that have a demand in the ecological market. These include the arrayán (*Luma* -Myrtaceae), cedroncillo (*Aloysia herrerae*-Verbenaceae) and chiri-chiri (*Grindelia* -Asteraceae) due to their healing and aromatic values.

Consejo Nacional de Ciencia y Tecnología (CONCYTEC)(Science and Technology National Council (CONCYTEC))

At present, the productive development represents a high-priority component in the operative program of CONCYTEC. This means that more funds will be directed to product

research (giving priority to native products) and to diffuse activities of the productive sectors. The management of the programs of this institution has acknowledged the importance of being involved in development activities of the natural ingredient sector. Recently a 15-year National Plan of Science, Technology, and Innovation (2006-2021), which defines priorities and strategies in Science, Technology and Innovation and with a budget of US$ 25 M[27] has been launched.

Instituto Nacional de Desarrollo (INADE) (National Development Institute – INADE)

It is a decentralized public organization that depends on the Ministry of Housing, Construction and Sanitation with the objective to direct, coordinate and evaluate multisectoral, social development and employment generation projects. These projects are executed directly by the third parties. The INADE, by means of its Unit of Administration of the Sustainable Development Plan of the Amazonia (PDSA), has defined nine geo-economic units based on an assessment that considered the decisive factors for a sustainable development of the Amazon region.

Instituto para la Conservación y Desarrollo Sostenido (CUENCAS) (Preservation and Sustainable Development Institute –CUENCAS)

The Institute Cuencas works in microbasins of impoverished rural areas in the northern highlands of Peru where the erosion of natural resources is advancing dangerously towards a desert-like territory making the survival of rural families very difficult. At the moment, the institute is carrying out actions in the Department of Cajamarca in three pilot micro basins located in the provinces of Cajabamba, San Marcos and Cajamarca.

[27] CONCYTEC. 2006. *SciDev Net*. http://*www.scidev.net*.

Instituto Nacional de Recursos Naturales (INRENA) (Natural National Resources Institute – INRENA)

It is a decentralized public organization of the Ministry of Agriculture whose main objectives are to handle renewable natural resources in a rational and integral way and to protect resources to achieve a sustainable development. *Uncaria tomentosa* and *Uncaria guianensis* (Cat's claws) are the two natural resources that have been promoted under this policy. A manual for the use of the Cat's claws in natural forests was prepared in 1997 in coordination with the National Institute of Traditional Medicine, INMETRA. This serves as a guide to the farmer, technical extractor, extensionist and other interested people, thus, contributing to the best use of these resources in the Amazon forests. An International Conference on Cat's claw was held in Iquitos under auspices of CYTED/Subprogram X[28], coordinated by this Expert.

ESSALUD: Seguridad Social en Salud del Peru

It is a national program for the utilization of traditional medicine in primary health care and uses phytotherapy for the treatments. Dr. Martha Villar was instrumental in lauching this program.

Pontificia Universidad Católica del Peru (Pontific Catholic University of Peru)

The Department of Chemistry of this University has a leading position in the study of Medicinal plants. Dr. Olga Lock has been instrumental in carrying out a systematic study of medicinal plants of Peru from chemical point of view. They work in collaboration with biologists and pharmacologists of Cayetano Heredia University, which has

[28] Lock, O. 2001. *Primera Reunión Internacional del género Uncaria "Uña de Gato*". Iquitos, Peru. August 16-18.

also an active research program and has participated in prestigious Intertational Cooperative Biodiversity Program (ICBG) and has important leads for development of antimalarials.

Universidad Nacional de Amazonia Peruana, Iquitos

A center for antiparasitic evaluation of Amazonian plants has been established with the help of CYTED and advise of this Expert. Dr. Lastenia Ruiz is in charge, who has been evaluating the potential of Peruvian Amazon plants as antiparasitic agents.

2.1.4.2. Institutional Parties of the Private Sector

Instituto Peruano de Productos Naturales (IPPN)(Peruvian Natural Products Peruvian Institute – IPPN)

In 1999, in the premises of Prompex, the first act of the Peruvian Institute of Medicinal Plants (IPPM) was signed. It was registered as a legal institution in 2000. The IPPM is a civil, non-profit association constituted to promote the conservation of the biological diversity, through the development and transformation of natural products with added value and has the following objectives:

- Promote conservation of biodiversity
- Promote medicinal plants research
- Improve the socioeconomic conditions of local communities
- Promote the crop and processing of Peruvian medicinal plants
- Promote exports of medicinal plants with added value
- Promote job creation
- Seek the optimization of the quality of finished products and improvement of the image of Peruvian products

The IPPN is one of the two most important entities in this sector in Peru (the other one is ADEX-Exporters Association). It is a private institution dedicated to promoting productive and commercial activities within the sector of natural products. Its goals are to assist the needs of its partners, through the diffusion of their activities, and to facilitate communication with promotion and trade entities. It groups about 20 export companies that meet to solve structural and relevant problems that affect the sector.

In 2002, this institute changed its name to Peruvian Institute of Natural Products being the first and the only private enterprise that promotes the development of this sector. The Peruvian Institute of National Products-IPPN has a national plan of activities for the development of the market of Peruvian medicinal plants, with a budget of $US 2,565,064.

Asociación Peruana de Fitofarmacia (APF) (Peruvian Phytopharmacology Association (APF))

This Association coordinates *inter alia* the work conducted to meet the norms and regulations.

Asociación de Exportadores (ADEX) Exporters Association (ADEX)

The role that ADEX plays in this sector is highly important since it groups a large number of exporters under the entry of "non-traditional products". This label facilitates the grouping of export companies that are organized in this association. In addition, the sector of agrarian products of this association is, at the moment, part of the coordinating

committee of the association of plants and natural ingredients sector. They have already begun their activities through the formation of technical groups.

2.1.4.3. International Cooperation Organizations

The international organisms that are collaborating in the development of the natural ingredients sector are:

Comité Biocomercio Perú (PBC) (Peruvian Biotrade Committee (PBC))

The PBP has the general objectives of promoting and supporting the consolidation of biotrade in Peru. It concentrates its efforts through two actions: development of productive chains and demonstrative projects, which are strengthened through services such as:

- Information on markets and commercial promotion
- Promotion of the investment in bio-trade
- Technical assistance and environmental culture

UNCTAD-BIOTRADE: Programa de Facilitación al Biocomercio – (BTFP BioTrade Facilitation Programme (BTFP))

The BIOTRADE initiative (*www.biotrade.org*) is a program of the United Nations Conference for Trade and Development (UNCTAD) that stimulates development, trade and investments in biodiversity products and derived services in underdeveloped countries to promote sustainable development, in accordance with the three basic objectives of the Agreement on Biological Diversity. The Biotrade initiative has established national and regional programs that benefit the public, private and academic sectors, the local and the

indigenous communities, the non-governmental organizations (NGOs) and other institutions in the development of sustainable business and services to facilitate trade, promotion of exports and search of capital.

BIOTRADE has created the Biotrade Facilitation Program whose objective is to facilitate a sustainable trade of biodiversity products and services. In the beginning, the BTFP has given priority to groups of products like edible vegetable species, nutritional ingredients, cosmetics and pharmaceutical articles, fibers, latex, resins and gums. Many of these products are the object of a growing demand from national and foreign consumers and have a great potential to generate products with an added value.

Currently, the BTFP program supports the natural ingredients sector through collaboration with the manufacturing and exporting companies of natural ingredients in two areas: commercial information and marketing strategies. Likewise, it facilitates the linkage of parties that promote the development of this sector so that they may work in a cooperative way, thus, saving resources and encouraging a better performance.

Centro de Promoción de Importaciones de los Países Bajos – (CB Netherlands Import Promotion Center (CBI))

The objective of the CBI is to contribute towards economic independence of a group of underdeveloped countries by assisting companies and promotion organisms to develop capacities to improve their exports and introduction in the European Union. Currently, the CBI is supporting three national companies (Agroindustrial Chanchamayo SRL, Ecopro SA and R. Muelle S.A.) to establish their productive chain from the identification of suppliers

of raw materials from biodiversity with a sustainable handling to the participation in events and specialized trade fairs for the promotion and sale of their natural ingredients.

Swiss Agency for Development and Cooperation / COSUDE: Biodiversity Project and PYMAGROS

This Biodiversity Project, aims at conservation and increase in the biodiversity of Andean roots and tubers. The objective of the current phase of the project is to optimize and standardize the quality of the olluco (*Ullucus tuberosus* Caldas), maca (*Lepidium meyenii* Walp), oca (*Oxalis tuberosa*) and yacón (*Smallanthus sonchifolius*).

The PYMAGROS Project, in its current phase, has the objective of improving the linkage between the demand and offer of the highland in three lines of Andean products and their byproducts (Andean grains, fruit-bearing/aromatic plants and medicinal plants) with emphasis in their transformation and commercialization.

Programa Suizo para la Promoción de Importaciones – SIPPO (Swiss Programme for Imports Promotion – SIPPO)

It promotes imports of finished and semi-finished products from underdeveloped countries. SIPPO selects groups of products to be supported by a set of criteria such as readiness of the resource, competitive advantages, existence of export-oriented producers and an identified demand on behalf of the Swiss and European Community importers.

Red Peruana de Productos de Naturales de Uso Medicinal (Peruvian Network of Medicinally Important Natural Products-CYTED, Subprogram X).

This national network of medicinally important natural products was started under the auspices of Subprogram X. Fine Pharmaceutical Chemistry of Iberoamerican Program of Science and Technology for Development (CYTED) and was coordinated by Dr. Olga Lock. It groups research centers, regulators and private sector engaged in the study and utilization of medicinal plants.

2.1. List of companies

There are 74 enterprises among laboratories, foundations, community associations and others related to industrialization of medicinal and aromatic plants. Detailed information on their contacts, phones, faxes, websites and addresses are given in Table 7.

3. ABOUT THE MARKET

3.1. Internal and External demand

In 2005, it was estimated that the Peruvian Pharmaceutical market was US$ 683,000,00, of which 76% was from private sector. The public sector market per institutions is ESSALUD US$ 110 M, Ministry of Health US$ 48.00; Military Hospitals US$ 18M. Peruvian population gets its drugs from approximately 10,000 public and private sector establishments, of which approximately 8000 are private pharmacies. On the other hand, Peruvian exports are destined for South America, Ecuador (28%) in 2005, Argentina (13%) and Venezuela[1].

3.1.1. Internal demand

The internal demand of medicinal plants and natural products is limited and differentiated according to the segment they belong to medicinal plants or natural products.

Medicinal plants: internal demand is reduced and concentrated in the most popular sectors due to their limited economical capacity to bear the cost of drugs obtained by chemical synthesis.

ESSALUD, MINSA and the Sanitary Service of Army and Police are sources of most relevant demand of medicinal plants due to diverse studies, which favor their internal consumption.

Private clinics: the demand of medicinal plants is almost inexistence. Except some exceptional cases, where physicians practice Integral Medicine by incorporation of medicinal plants and phytotherapy.

Health and Food, Alternative Medicine stores: there are very few establishments of this type in Peru.

3.1.2. External demand

External demand is limited because of the lack of more knowledge of the products and their benefits. This is less than the exportable offer (due to the lack of enough research in

specialized scientific journals that produce interest in transnational enterprises to invest in developing and commercialization of new products based on Peruvian medicinal plants and natural products.

External demand is concentrated in developed countries: USA, EU and Japan. Regionally, Chile is the principal market. The demand of dietary supplements by the consumers is fundamentally based on current trends and ethnic concepts.

An important opportunity for business and exports is natural dyes (indigo, cochineal, carmine, cucurma/turmeric, marigold, henna) sometimes used within cosmetic formulations or pharmaceutical preparations. The United States, demand for organic colorants, including dyes and organic pigments, is forecasted to increase by nearly per cent per annum to more than $3 billion in 2003[4]. Larger growth is expected in the natural colorants market for food, drugs and cosmetics (FD&C) where certain dyes, such as carmine and annatto, are used regularly.

In the US and EU import market supply of natural dyes, cochineal (*Dactylopius coccus*) and annatto seeds (*Amaranthus caudatus*) come mainly from Peru. Peru was ranked as number 10th and 4th among the exporters of natural dyes from 1994-1998 in the US and EU market, respectively[29] (Table 7).

[29] Ginatta, G., Jaramillo, L. 2004. *Sector Assessment on Natural Ingredients for cosmetics and pharmaceuticals in Ecuador*. BioTrade National Programme in Ecuador, Export and Investment Promotion Corporation (CORPEI), United Nations Conference on Trade and Development (UNCTAD), Dutch Center for the Promotion of Imports from Developing countries (CBI). 63p.

Table 7. Peruvian exportation of natural dyes 1994-1998

	1994	1995	1996	1997	1998
US imports					
Metric tons	5	73	107	91	48
US$ ' 000	407	1,841	2,867	2,200	1,151
EU imports					
Metric tons	165	327	471	592	761
ECUS$ ' 000	5,093	9,114	12,224	10,303	9,378

Source: *United States Trade HS 3203005000 (1994) HS 3203008000 (1995-98) coloring matter of vegetable or animal origin, nesoi (kg). EUROSTAT HS 320300* Colouring matter of vegetable or animal origin, incl. Dye extracts but excl. animal black, whether or not chemically defined; preparations based on colouring matter of vegetable or animal origin of a kind used to dye fabrics or produce colorant preparations (excl. preparations of headings 3207, 3208, 3210, 3213 and 3215).

3.2. Demand: Buyer profile and factors influencing the demand

The trend among the consumers now appears to be towards natural ingredients and products that meet certain social criteria rather than towards the next superstar botanical (Echinacea herb & root for stimulating immune system). The social criteria to be considered are defined by:

- Ingredients that not only have sufficiently documented evidence of safety and efficacy for conditions associated with aging (e.g. enlarged prostate, hair loss, memory loss, menopause, sexual dysfunction).

- Ingredients that are produced in an ecologically and economically sustainable manner.
- Certified organic or ethically wildcrafted ingredients
- Free of genetically engineered components
- Products characterized by cruelty free or not tested on animals
- Products from companies that actively support cultural ad environmental sustainability through investing some percentage of their profits in organic farms, reserves or community outreach.
- Products made by workers from developing countries that throughout the chain have been paid a living wage (the demand of Fair Trade logos for certified natural products).
- Products from natural products companies that promote the concept of conscious consumerism and that have also developed reciprocally beneficial relationships with their ingredients suppliers in the developing countries are finding that they can effectively market the story behind the product, especially if it involves successful, sustainable support for an indigenous community.

3.3. Distribution channels

The commercial distribution of aromatic and medicinal plants in Peru is proposed in the following fashion:

- Industries of First transformation (large-scale retailers of plants, essential oils manufacturers and plant extracts).
- Industries of Second transformation (conditioning industries)

- Utilization industries (Agriculture and Food industry, para-pharmaceutical industry, pharmaceutical and cosmetic industry).
- Large-scale distributors (exporters, national commercial agents)
- Small-scale distributors (Controlled commerce: pharmacies; non controlled commerce: supermarkets, Health and food store, Alternative Medicine stores, internet sells, direct sales and others).

It is important to point out that in Peru, industries of second and third transformations use very limited technology. With this technology available it is only possible to concentrate the active principles from 5-7% as maximum.

3.4. Legislation

3.4.1. National Legal Framework

Laws concerning the Conservation and Use of Natural Resources

These laws govern the conservation and use of natural resources starting from the environment that produces them. The laws are appropriate and complete because they reflect the most important needs and rule and regulate the way the economic agents should use natural resources in a sustainable way. The capacity to enforce the law is the responsibility of INRENA. However, its capacity to enforce the law should be improved.

Law 26821: Organic Law for the Sustainable Use of Natural Resources. It governs the regime of sustainable use of natural resources setting the conditions and the ways of

granting licences to private entities in compliance with the Political Constitution of Peru, the Environmental Code and ratified international agreements signed by Peru.

Law 26839: Law on the Conservation and Sustainable Use of Biological Diversity. It governs or sets forth the rules for the conservation of biological diversity and sustainable use of their components.

Law 27308: Forest and Wild Fauna Law. It governs, regulates and supervises the sustainable use and the conservation of forest resources and wild fauna in the country.

The Supreme Ordinance Nº 014-2001-AG: Regulations of the Forest and Wild Fauna Law. It regulates the activities related to the management and administration of forest and fauna resources. It emphasizes the functions of INRENA such as granting authorizations to extract forest resources and wild fauna for scientific research or cultural diffusion purposes to people and institutions, safeguarding the rights of the country with respect to its native genetic patrimony.

Law 27300: Law of Sustainable Use of Medicinal Plants (08/07/2000). It appoints the Ministry of Agriculture (through INRENA and INIA) as responsible for formulating strategies, policies, plans and norms for the classification, use and conservation of wild medicinal plant species.

Law 27811: establishes regimen of protection of collective knowledge of the indigenous peoples who deal with biological resources.

Laws Concerning Production

These are laws which are still not sufficiently well known. They are adequate but have a limited scope and they do not efficiently promote the production on a national scale. The entities in charge of these laws do not have enough resources to develop production to levels in accordance with the potential of the sector.

Law 27300: It indicates that the INRENA, in coordination with the IIAP, INIA, Universities and INMETRA (now CENSI), must promote the creation of botanical gardens of medicinal plants, seedlings and nurseries in rural and native communities as well as in marginal urban areas. This is to force the creation of programs for the recovery of well defined ecological areas with species of great demand in the national and international market.

Supreme Ordinance 046 -99-AG: It sets up arrangements to promote plantations of camu camu, as indicated in its first article: "It is of national interest to promote plantations of camu camu (*Myrciaria dubia*), to support sustainable and socioeconomic development of the Amazon region and to contribute with the handling of water resources".

Ministerial Resolution 0021-200-AG: It approves the National Program for the Promotion of Plantations of Camu Camu. This regulation in its second article states: "The Unit for the Development of the Amazonia - UDA of the Ministry of Agriculture, the National Institute of Natural Resources – INRENA and the Agrarian Regional Direction are responsible for the execution, follow-up and advice the program approved in the precedent article".

Law concerning Processing

There is a legal gap in this regard. There is no law regulating the processing of natural ingredients. However, there are lower-level legal norms governing the processing of products for medicinal use. Similarly, there are no norms governing the processing of natural colorants. The principles that guide good processing practices have been standardized by means of manuals.

R.M. 125-2000-SA/DM: Manual of Good Manufacturing Practices of Medicinal Products and Natural Therapeutic Resources. This is a set of minimum norms that guarantee the fulfilment of appropriate procedures for obtaining products of uniform and satisfactory quality. It ensures that all the production lots are manufactured with raw materials that meet suitable quality control standards. In addition, it also makes sure that the production lots are stable during their useful life and properly packed and labeled.

R.M 585-99-SA/DM: Manual of Good Storage Practice. This is a set of mandatory minimum norms that should be met by establishments that store pharmaceutical and similar products with the purpose of guaranteeing that the characteristics and properties of the products are maintained. It establishes norms regarding the facilities, equipment, documentation, personnel, and operating procedures regarding reception, storage, distribution, dealing with claims and withdraw of products from the market.

Law concerning Trading

They are declaratory, well-intentioned and clear laws. However, the awareness of the key economic players has to be raised through diffusion.

Law 27821: Law of Promotion of Nutritional Complements for the Alternative Development. It states that it is of national interest to promote production, processing, commercialization and export activities of products of animal, vegetable and mineral origin for traditional use in nutrition, conservation of health and in the prevention of illnesses.

Law 26842: General Law of Health. The commercialization of medicinal plants and their different presentations (extracts, freeze-dried, distilled, dyed, cooked or any other medical preparation) with therapeutic, diagnostic or preventive purposes is subject to this law. The medicinal plants that are offered without making reference to their therapeutic, diagnostic or preventive properties can be freely marketed.

3.4.2. International Legal Framework

Two international norms that affect the performance of the sector of natural ingredients in Peru are described in the following paragraphs:

The Convention of Biological Diversity (subscribed by Peru in 1975).

It adopted the Global Strategy for the Conservation of Plants (Decision VI/9) with the purpose of implementing a strategy that could contribute towards relieving poverty and favor a sustainable development, to strengthen capacities and to provide an appropriate and timely support, particularly to countries with underdeveloped economies and countries with economies in transition.

Decision 391 (Common Regime on Access to Genetic Resources)

The Andean countries are characterized by their multi-ethnic and pluricultural nature. Moreover, they possess a sizeable biological and genetic heritage that should be preserved and developed on a sustainable basis. Due to the fact that genetic resources have an enormous economic value as a primary source of products and processes for industry, Peru subscribed to the Decision 391 of the 2nd of July, 1996.

CITES (Convention on the International Trade of Endangered Species of Wild Fauna and Flora) (subscribed by Peru in 1992)

It is an international agreement subscribed by the member States. Its aim is to make sure that the international trade of wild animals and plants does not constitute a threat for their survival.

3.5. Commercialization ways

Similarly, the world trend is for certification as a mechanism of allowing access to international markets such as the United States, Europe or Asia. Currently, they are the channels that encourage the companies of natural ingredients to improve their productive practices (manufacturing and processing). Institutions like the INIA, DIGESA (Dirección General de Salud Ambiental) and INDDA are now training future inspectors for the certification of good agricultural practices and processing of foods and medicines.

The most outstanding certifications for the sector are:

• Certifications of the product

• Technical Specifications (registry form) MSDS

• Organic

• Heavy Metals

• Certifications of the process

• Good Manufacturing Practice

• ISO 14001

• ISO 9000

• HACCP

It is also important to highlight the efforts that were put forth by the International Conference on Harmonization (ICH). It is a project in which the regulatory authorities and pharmaceutical experts of Europe, Japan and the United States examine the scientific and technical aspects of the sanitary registration of products. The purpose is to make recommendations to achieve a larger level of harmonization in the interpretation and application of the norms and technical requirements to register products. The idea is to reduce or obviate the need to carry out duplicate tests during research and development of new drugs.

The agreements obtained by this conference are very important for Peru, which is a very well known supplier of natural ingredients for medicinal and nutraceutical uses. The beneficial properties of these natural ingredients have to be demonstrated and accepted by the markets of the countries that participate in this project. Consequently, the agreements that are adopted will affect the future of the natural ingredients trade mainly those that are used for medicinal purposes.

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5. SWOT Analysis

STRENGTHS

- Peru is recognized worldwide as a supplying country of natural ingredients. The different microclimates of several inter-Andean valleys provide unique seasonal crops. Upon processing, they allow us to be the only suppliers in some market segments.
- State-of-the-art technology in natural colorants.
- High-quality products recognized worldwide.
- Stocks of endemic natural ingredients and available information on ethnobotanics.
- Ancestral knowledge in the handling of these resources.
- High development observed by organic farmers.
- Widely available land extensions for production.
- Yearly increase of 10% in natural colorants exports.
- Integration of companies of the sector in one entity (IPPN)
- Preliminary pharmacological research of aqueous and/or ethanol extracts.
- Appropriate legislation governing conservation and sustainable use.
- Native Peruvian communities have ancestral knowledge about the utilization of medicinal plants with specific objectives. Actually, it is known the traditional use of more than 1,500 species (4,000 with uses medicinal, cosmetics, colorant, food and others).
- Biodiversity, Peru is one of the megadiverse countries.

- Medicinal plants and native natural products could be source of innovation for the development of new products.
- North American and European companies are beginning to have interest to establish cultures in the country.
- High acceptability by population of natural ingredients.
- National Commitment and high priority to this sector.

WEAKNESSES

- Lack of national inventory of plants and reliable export statistics.
- Inability to cover demands in large quantities.
- Lack of standardized scientific information.
- There is a lack of a comprehensive research on the use and validation of results.
- The national agricultural production is not properly linked.
- Insufficient and heterogeneous national agricultural production.
- Lack of a national strategy that guides the activities of the main entities of the sector.
- The Peruvian Institute of Natural Ingredients is in an initial growth phase.
- There are few specialized laboratories of chemical composition analysis.
- High production costs making the sector inefficient.
- Most producers have not implemented procedures of Good Manufacturing Practices (GMP), ISO systems and HACCAP.

- Not all the exporters of this sector can certify their products as organic due to the high cost of the certificate.
- There is little commercial information for products under study. The managers need statistical information as a technique to evaluate their markets and to determine if their products can enter into new markets.
- There is a legal gap in the normativity and regulation of natural ingredients processing.
- Very limited capacity of the INRENA, entity in charge of enforcing the legislation that rules sustainable use of natural resources.
- There is no process to identify the main basic productive and economic entities of this sector.
- Deficient creation of an adequate brand-country image in medicinal plants and natural products.
- For certain products, there is a lack of positioning as dietary supplements under the concept of “functional food”.
- Small local market: size and non exigent and extremely sensitive to prices local clients.
- Research at international level about use and validation of therapeutic results almost nule or inexistence.
- Problematic of social organization, land proprietary and culture of locals (campesinos).
- Inadequate state structure for the implementation of competitive strategies.

- Lack of unified politics of the different governmental actors that guarantee the production at optimal levels of quality.
- Juridical insecurity, inefficient imposing system, fiscal and unmet sanitary requirements.
- Legislation: “scientific framework of reference”, supports Western medicine.
- General low level of productive system.
- Deficient transportation infrastructure.
- High costs of transaction among all agents.
- Deficient of information systems.
- Lack of capacity to generate the international specialized demand in Peruvian medicinal plants and natural products.

OPPORTUNITIES

- Widespread worldwide trend towards natural products consumption.
- Consumers are aware of the importance of natural products for health and the environment.
- Possibility of a common position of countries offering natural ingredients in face of international regulations.
- Possibility of implementing modern marketing strategies (origin denomination and collective marks).
- Development of new technologies to overcome phytosanitary barriers in the United States, Japan and other Asian countries.

- Institutional support to optimize quality of products. Prompex supports exporters by mean of Peru Biotrade Committee (Comité biocomercio Perú).
- Formation of commercial and production associations, strategic alliances and joint ventures.
- International cooperation to carry out pharmacological and toxicological studies in standardized extracts.
- Potential of the external market.
- Growth of world demand.
- Increment of world demand for ecological and ethnic products.
- Consumers of developed countries are tired of secondary effects of synthetic chemistry.
- Incorporation of adequate productive zones for the increment of the stock of medicinal plants and natural products.
- Demand tends to products of differentiated quality.
- Enterprises of developed countries are interested in establishing joint ventures of technology transfer to export products with added value (with high concentration of active principles).

THREATS

- There is duplicity of roles and a growing number of efforts that lack coordination.
- Growing competition of other countries producers of natural ingredients.
- Countries under similar conditions “bluff” to have positions in these markets.

- Loss of markets for not complying with the high quality standards.
- Application of the Regulation (CE) No. 258/97 of the European Parliament on new foods and new food ingredients (novel food).
- Approval of the new Regulation on Medicinal Plants (Directive 2004/24/EC).
- Tariff barriers linked to hygiene and quality conditions (HACCP, ISO Standards, GMS).
- Native natural products are sowed and patented in other countries.
- Larger industrialization in the processing of similar products that offered by other countries (acerola vs camu camu, sangre de drago vs sangre de grado).
- The presence of exporters known as “golondrinos” (“swallow”) that enter and leave the market affecting the image of the Peruvian exporter.
- Deficient creation of an adequate brand-country image in medicinal plants and natural products.
- Protectionism of consumer countries.
- Direct competence of other products like “the ginseng”.
- Production in other countries using technological innovation (Example. China).
- Interests of big transnational enterprises.
- There is no regulation on good trading practices and managerial ethics. An example of this is the exports of micropulverized cat's claw and maca flour that have been labeled by some importers as adulterated products with other type of barks and flours.

6. RECOMMENDATIONS

On the basis of the SWOT Analysis, short term and long term strategies are identified to potentiate the true strengths and to neutralize the weaknesses, which are high disadvantages.

The short-term strategies should concentrate efforts in the exportation of medicinal plants and natural products using the ancestral knowledge of the native communities, which constitutes an innovation source of new products. This should be accompanied by foreign investment with the purpose to implement medicinal plant cultures in the country.

This strategy should contemplate the rapid correction of the weaknesses about creation of an brand-country image in medicinal plants and natural products of high quality, positioning products, which are dietary supplements under the concept of "functional food", increasing the internal consumption by establishing an efficient communications system for each one of the actors of the productive chain and doing intensive external promotion campaign to achieve an increase of Word demand (with inclusion of research of international level). These measures should also use the opportunities such as widespread worldwide trend towards natural products consumption, consumers are aware of the importance of natural products for health and the environment, possibility of a common position of countries offering natural ingredients in face of international regulations, enterprises of developed countries are interested in establishing joint ventures of technology transfer to export products with added value.

For long-term strategies, a total process of re-engineering of the productive chain could eliminate the structural weaknesses, which limit significantly the competitiveness. The chief weaknesses to be considered are inexistence research at international level about use and validation of therapeutic results, problematic of social organization, land proprietary and culture of locals, inadequate state structure for the implementation of competitive strategies, juridical insecurity, inefficient imposing system, fiscal and sanitary unmet requirements, current legislation based on scientific framework of Western medicine, general low level of productive system and deficient transportation infrastructure.

Moreover, the following recommendations are suggested to follow:

- In order to establish a National Program that shall allow sustainable use of the resources of the biodiversity and be able to develop the sector of natural ingredients, it will be necessary a strong sectorial association or entity which should be the first Institution to be strengthened with financial resources so that it will work in an independent way and in a close collaboration with Biotrade Initiative through its BTFP program. It shall also have the necessary resources to hire technical personnel to coordinate, manage and execute with its members the first natural ingredients biobusiness plans.
- It is necessary to prepare the market profiles for the 10 selected products including the Material Safety Data Sheet (MSDS) so that interested companies would avoid problems to get access into the European Market.
- It would be advisable to centralize the commercial information, statistics, MSDS from competitors, MSDS of the products that are already in the international

market, websites, specialized magazines or institutions related with nutraceutical products. Then, the information could be available to interested parties. The information could be channeled through the Biotrade Committee / Prompex or the BTFP program.

- Next, there are some recommendations that have been grouped by specific aspects such institutionalism, strengthening the productive chain, technical assistance and fostering a managerial and environmental culture.
- Creation of a research and commercialization network to promote a quality certification (Latinpharma 2004) among Andean countries and MERCOSUR and establishment of an Institute of Natural Products (IPPN).
- Collaboration between State and Private Companies to integrate both sectors in order to achieve certified and accredited companies.
- Promotion of bioprospection of new sources for the development of sustainable industry based on medicinal plants avoiding the loss of raw material without added value.

<u>To the Government</u>:

- Set up a National Multidisciplinary Committee to assist the Government to formulate policies concerning all aspects of medicinal plants utilization.

- Establish a national policy to include the use of phytopharmaceutical products in health care.

- Approval, by the Ministries of Health, of a priority list of medicinal plants to be used for the manufacture of phytopharmaceutical products.

- Facilitate and simplify the mechanisms for the registration of phytopharmaceutical products, taking into consideration the WHO guidelines and European models.

- Establish quality control standards for medicinal plants and phytopharmaceutical products.

- Explore the possibilities of creating a National Institute for the study and utilization of medicinal plants.

- Support universities, research centers and institutions including agricultural institutes, for carrying out comprehensive studies on industrial utilization of medicinal plants.

- Promote systematic cultivation and industrialization of medicinal plants and provide incentives for stimulating national plant-based industries.

- Set up banks of germplasms, seeds and propagable materials of medicinal plants.

- Offer preferential financial terms to farmers, cooperatives and business enterprises interested in establishing cultivation and industrialization of medicinal plants.

- Include monographs on selected medicinal plants and their extracts in the national pharmacopoeia.

- Implement measures for the conservation of medicinal flora, as set forth in the Agenda 21 of United Nations' Conference on Environment and Development.

- Take measures to collect detailed statistics, under a separated entity, on the figures of import, export and local production of medicinal plants and their products.

- Foster international cooperation.

- Take measures to protect patent rights of the whole phytogeographic region by signing contractual agreements with industrial groups in major pharmaceutical manufacturing countries to whom the medicinal plants are supplied.

To the Universities and Research Institutions:

- Emphasize the importance of medicinal plants and phytopharmaceutical products in the training of physicians, pharmacists and other related health professionals.

- Stimulate the creation of specialized centers and support multidisciplinary research aimed at exploring the medicinal and economic potential of the national flora.

- Initiate postgraduate programs in the field of medicinal plants to prepare qualified personnel in areas related to the industrial utilization of medicinal plants, with emphasis on agrotechnology, process technology, quality assessment, phytotherapy and handling of multifunctional pilot plants.

- Prepare computerized national inventories of medicinal plant resources which allow exchange of information at a regional and interregional level.

- Assist the Governments on establishing quality control standards and on legal aspects of registration of phytopharmaceutical products.

- Promote exchange of scientific and technological information at regional and interregional level.

- Establish links with the industry to provide technical assistance on different aspects of industrialization of medicinal plants.

- Improve awareness of the public on the usage of medicinal plants and their products and disseminate the information on industrialization of medicinal plants.

- Encourage a business outlook among the academicians to facilitate their participation in productive activities and in the industrial utilization of the local medicinal flora.

- Conduct research on promising lead compounds obtained from medicinal plants for the development of new drugs.

- To the Private Sector:

- Establish links with universities and research centers for industrial utilization of medicinal plants.

- Call on the National Chambers of Commerce and Industries to promote industrialization of medicinal plants.

- Form Associations of entrepreneurs and companies interested in the industrialization of medicinal plants, in order to orient them towards the market. This organization should establish contacts with principal foreign markets, as well as have access to modern technology for the production of phytopharmaceutical and natural products.

- Promote joint-venture agreements between firms which have technology and the knowledge of the market and those that have an access to the traditional knowledge and medicinal plant resources and/or phytopoharmaceutical products.

To the International Organizations:

- Coordinate the efforts of international organizations like UNIDO, FAO, OAS, UNESCO, IDRC, EEC, UNDP, PAHO/WHO, CEPAL, etc. which support technical cooperation programs in different aspects of medicinal plants.

- Organize training programs for human resource development through workshops, courses, seminars, etc.

- Support national research centers on medicinal plants and natural products, which have well defined goals and relationship with the industrial sector.

- Facilitate access to updated information, preferably through computerized data bases on international markets of medicinal plants and the possibilities of industrial investments in this field.

- Promote cooperation between the research and development laboratories of industrialized and developing countries and among the ones in the developing countries. This can take the following forms: exchange of germplasms and seeds,

exchange of information on crops, process technology, formulation of products and marketing practices, and exchange of personnel between R & D institutions for specialized training of personnel.

TABLES

Table 1. List of Peruvian Medicinal plants

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
AMARANTHACEAE	*Baccharis latifolia*	(Ruiz & Pav.) Pers.	Chilca malva		Aphrodisiac, analgesic, leg numbness, dried nipple surface, arthritis, bronchitis, diarrhea, dysentery, colds, helminths infection	Loreto (tamshiyacu Panguana 1º and 2º zone and indiana, Amazones river, Tahuayo, Tahuayo river: Ushpacaño, Itaya river; Momón	Ecuador	Cultivated
ANACARDIACEAE	*Anacardium occidentale*	L.	Casho, acaju (tupí); acahú, acaya, acayocha y añaaro (ocaina); coa (ticuna); cuya, cajú, cajú do campo, cashu, cashueiro, cajue	Leaves, bark, pseudofruit, fruit, seeds	Diabetes, diarrhea, asthma, diuretic, febrifuge	Northern part of Peru, Loreto, San Martín, Madre de Dios, Piura, Junín, Lambayeque and Ucayali	South and Central America from Northeast Brazil, Ecuador, Peru to Puerto Rico and México. Tropical countries specially in India	Cultivated
	Spondias mombin	L.	Cedrillo, orocorocillo (Bolivia), acajú, cajá, cajarana, teperbá (Brazil), arisco, cancharana, canyarana, ciruelo, ciruelo cale, ubos	Fruits, roots, leaves, bark	Joint inflammation, gum infection, intestinal and bladder problems, fever, colds, wounds, bleeding, anticonceptive, vaginal antiseptic, snakebites	Amazones, Huanuco, Junin, Loreto, Madre de Dios, Pasco, San Martín, Ucayali	Costa Rica, Honduras, Nicaragua, El Salvador, Panama, Bolivia, Colombia, Ecuador, Paraguay, Suriname, Venezuela, Dominican Republic	
ANNONACEAE	*Anonna muricata*	L.	Hojas de guanabana, cohossol, zapote agrio, araticu-penhe, graviola	Leaves, bark	Antitumoral, prostate cancer, antispasmodic, sedative, asthma, hypertension, diabetes, liver problems, diarrhea, lice		Tropical America	Cultivated
	Unonopsis floribunda	Diels	Icoja	Bark	Arthritis, diarrhea, wounds, inflammation, pellagra, rheumatism	Amazones, Loreto, Madre de Dios, San Martin		
APIACEAE	*Anethum graveolens*	L.	Eneldo, dill	Seeds, leaves	Infections, astringent, wound healing			Cultivated
	Eryngium foetidum	L.	Sacha, siuca culantro, suico, cilantro, coriander, gakata (piroyine); ashe(shipiboconibo) ;chicoria (portugués); losawiwiri, kwi	Stems, leaves, fruit	Oxytocic, stomachache, cramps, fever, flatulence, colds, insomnia, emetic	Loreto, Ucayali (Atalaya)	Tropical America	Cultivated
APOCYNACEAE	*Catharanthus roseus*	(L.) G. Don	Isabelita, flor del príncipe, pervenche tropicale, pervenche de madagascar	Roots, leaves	To improve brain circulation, childhood leukemia		Tropical America	
AQUIFOLIACEAE	*Ilex guayusa*	Loes.	Guayusa	Leaves	Tonic, diabetes, digestive, expectorant		Colombia, Ecuador, Peru, Bolivia	

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
ARACEAE	*Dracontium loretense*	Krause	Jergon sacha, fer de lance; hierba de jergón; sacha jergón; hurignpe (amarakaeri); mágoro (machiguenga); caña X (Ecuador); rono	Cones, peciole	Immunomodulator, warts, hernia, snakebite, sting ray bites, bengin and malign tumors, gastric ulcer	Loreto: Tamshiyacu, Valentín (Fernando Lores district); Panguana 1º y 2º zona, Ushpacaño (Itaya river); Padre Cocha (Nanay rive)		Cultivated
ARECACEAE	*Astrocaryum chambira*	Burret	Chambira	Leaves	Rheumatism	Amazones, Loreto, San Martin		
	Euterpe oleracea Mart.	Mart.	Huasai	Roots, fruits, seeds	Renal and hepatic problems, diabetes, bleeding, muscular pain, fever, hepatitis		Brazil	
ASCLEPIADACEAE	*Marsdenia condurango*	Rchb. F.	Condurango, condurango bark	Rootbark	Gastric problems, anorexia, stomachache		Ecuador	Cultivated
ASTERACEAE	*Smallanthus sonchifolius*	(Poepp.) H. Rob.	Hojas de yacon, llacon, lajuash, aricoma o aricona, yacuma (Ecuador), jicama (Colombia), jiquimilla (Venezuela)	Leaves	Antidiabetic, gastrointestinal and kidneys problems, skin rejuvenating action	Andes		
BIGNONIACEAE	*Crescentia cujete*	L.	Huingo	Fruit, leaves	Abortive, laxative, asthma, diarrhea, headache, erysipelas, expectorant, fever, bronchitis, helminthiasis	Loreto, Amazones		Cultivated
	Mansoa alliacea	(Lam.) A. Gentry.	Ajo sacha hembra, ajo sacha, ajos del monte; bo´o-ho y be´ o-ja pusanga (ese eja); boens; niaboens, posatalu (piro, yine); shan	Bark, leaves, stems, roots	Analgesic, tonic, arthritis, headache, epilepsy, fever, reumathism, bronchitis, antihypertensive	Amazones, Huanuco, Loreto (Tamshiyacu, Valentín e Indiana, Amazonas river; Llachapa y Corazón de Jesús, Napo river; Padre Cocha	Costa Rica, Nicaragua, Panama, Bolivia, Brazil, Ecuador, Colombia, French Guyanas, Guyana, Peru, Suriname, Trinidad, Windward Island	Cultivated
	Tynnanthus panurensis	(Bur) Sandw.	Clavo huasca, canela: inejkeu; rabo nishi (shipibo-conibo).	Roots, bark	Tonic, impotence, colds, rheumatism	Ucayali, San Martín and Loreto.		Cultivated
BIXACEAE	*Bixa orellana*	L.	Hojas de achiote, achote, onoto, urucum, rocu	Leaves	Urogenital inflammations, prostate benign hyperplasia, cholesterol lowering, antihypertensive, elimination of uric acid, cystit	Amazones, Cuzco, Huanuco, Junin, Loreto, Madre de Dios, San Martin, Ucayali		Cultivated
CAESALPINACEAE	*Caesalpinia spinosa*	(Molina) Kuntze	Tara, taro, taya, tara espinosa, algarroba-tanino	Endospermun of seeds, leaves, fruits	Diabetes, gargarism for anginas, coughs and colds	Cajamarca, Cuzco, Lima: Chosica, Matucana; Huanaco; Junin: Tarma; Ayacucho: Huanta, Tacna	Ecuador, Colombia, Venezuela, Bolivia, Chile	

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
CARICACEAE	*Carica papaya*	L.	Papaina, Papain	Latex of fruit	Digestive, antihelmintic, esophagus obstruction, difteria, skin lessions (eczema, psoriasis), sterility, wounds, peritoneal adhherences			
CELASTRACEAE	*Maytenus laevis*	Reissek	Chuchuhuasi, chuchuhuasca, chuchuwasa	Bark	Tonic, antiarthritic, bones and joints inflammations, muscle relaxant, analgesic, aphrodisiac, liver problems, kidney inflammation			
CHENOPODIACEAE	*Chenopodium ambrosioides*	L.	Paico, hojas de paico, pozote, te mexicano, yerba santa maria, te de la tercera especie, cashiva, amash, amasamas, paicco, amush, cama	Roots, leaves, stems	Antiemetic, antiseptic, contraceptive, digestive, diuretic, hepatoprotector, contusions, hemorrhoids, acidity, antispasmodic, carminative, gastrointestinal and abdominal cramps, antihelmintic, antiinflammatory	Coast, highlands, jungle. Cajamarca, Cuzco, Huanuco, Loreto, San Martin, Ancash, Recuay, Puno: Azangaro	Chile, Argentina	Cultivated
COMPOSITAE	*Matricaria chamomilla*	L.	Manzanilla, camomille, chamomile flowers	Flowers	Antispasmodic, sedative, stomach cramps, indigestion, gastrointestinal cramps, colitis, loss of appetite, fatigue, painful mens			Cultivated
COMPOSITAE (ASTERACEAE)	*Xenophyllum ciliolatum*	(A. Gray) V.A. Funk	Coñoca, conica	Leaves	Bronchitis, astringent	Junín, Ancash		
	Xenophyllum dactylophyllum	(Sch. Bip.) V.A. Funk	Boton boton, conoca-cunuca, cunucunu	Leaves, roots	Coughs, stomach cramps, fever	Ancash, Junin	Boliva	
CRUCIFERAE	*Lepidium peruvianum*	Chacon	Maca, huto, ginseng peruano, ginseng andino, Dr. Macasi, willku, chichira, maka, maca-maca, makca, maino, ayak chichira, ayak willku	Roots	Menstrual cycle and menopause regulator, sexual impotence, frigidity, sterility, improve intelectual and corporal capacity, memory and concentration, insomnia, respiratory problems, rheumatism, arthritis, appetite loss, calcium loss in bones	Central Andes, Pasco, Junin: Meseta de bombon, Huancavelica: Angaraes, Puno		
CUCURBITACEAE	*Cyclanthera pedata*	(L.) Schrad.	Achoccha, achojcha, caifa, cayhua, caigua, cayhua silvestre, kaikua, pepino hueco, quishiu	Fruits, leaves, seeds	Cholesterol lowering, diabetes, otitis, angina, hypertension, diuretic, antiinflammatory, weight loss, purgative, vermifuge	Ayacucho, Cajamarca, Cusco, Huánuco, Junín, Lima, Loreto, Piura, San Martín, Tumbes	Ecuador, Bolivia, Costa Rica, Nicaragua, United States	
	Momordica charantia	L.	Achogchilla, bitter Melon	Leaves, fruits	Hypoglycemic, antibacterial, anthelmintic			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
EUPHORBIACEAE	*Croton lechleri*	Mull. Arg.	Sangre de grado, sangre de dragon, shawan karo (shipibo), palo grado, pocure, racurana, eshape y jata akui (ese eja); ginmunaji	Latex, bark	Wound healing, stomach and intestinal ulcers, astringent, hemostatic, vaginal antiseptic, depurative, muscular tissue regenerator, kidney stones, urethra, bladder and prostate problems, contraceptive, skin problems, cancer, diarrhea, dental extraction	Loreto (Llachapa, Napo river; Indiana, río Amazonas; Padre Cocha y Momón, Nanay river; San Martín; Huanuco; Cerro de Pasco: Oxapampa, Satipo, Puerto Bermúdez, Iscozacín, Villa Rica; Junín: Chanchamayo), San Martin, Amazonas, Huanuco, Ucayali, Cuzco	Tropical and subtropical America	Cultivated
	Phyllanthus niruri	L.	Chancapiedra, sasha foster, quebra pedra, tamalaka, la coja		Kidney stones, liver problems, urinary and biliarry muscular relaxant, facilitates expulsion of kindney and bladder stones, Hepatitis B, urogenital infections, veneral infections, mouth and throat infections, jaundice, diabetes, dysentery, antioxidant	Peruvian jungle	Bolivia	
	Plukenetia volubilis	L.	Sacha inchi, mani del inca, mani silvestre, inka peanut		Cholesterol level reducer, cardiovascular problems	Jungle		
FABACEAE	*Cassia reticulata*	Willd.	Retama, sapechihua, salpichihua, sapechihuayo, shunashut, basraslabrii (Surinam).	Flower, leaves, roots	Laxative	Loreto, Amazonas, Junín	México to Bolivia	
	Copaifera paupera	(Herz.) Dwyer.	Copaiba, bonshish matisiati y namboman tsacati (shipibo-conibo); bunxix (conibo); capaúba; copal; copa-uva; cupiúba; jatobamiri	Resin	Wound healing, hypotensor, amygdalitis, asthma, cronic bronchitis, cancer, cystitis, ear pain, hemorrhoids, herpes, infections, leucorrhea, dermic mycosis, psoriasis, rheumatism, tetanus, coughing, ulcers, scabies, venereal diseases	Amazones, Ucayali (Tahuania-Atalaya), Madre de Dios and Loreto (Iquitos highway-Nauta km 45 and Huallaga)	Brazilian Amazon, Acre river zone	Cultivated
	Erythrina fusca	Lour.	Gallito, Swamp immortelle, Porotillo (inglés); Poró, Amasisa (Gachite), kasho (amahuaca), oakta (amarakaeri), oakuey	Leaves, bark, roorts, flowers	Ulcers, hemorrhoids, mycosis, antiseptic, urinary infections, prostate inflammation	Loreto, San Martín	Neotropical region, Hawaii (USA), Costa Rica, Honduras, Nicaragua, Panama, Bolivia, Colombia, Ecuador,	Cultivated

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
			(huachipaeri), kuaso (ese eja), gachicho (Piro_Yine), kasho (Shipibo-conibo)				Venezuela, Africa (Comoros, Madagascar)	
	Tamarindus indica	L.	Tamarindo, tamarin, tamarind.	Pulp, leaves, peel, seeds	laxative, hepatic problems			
GENTIANACEAE	*Gentianella alborosea*	(Gilg) Fabris	Hercampuri, hircampuri, hilcampure, te amargo, te de chavin		Hepatoprotective, depurative, hypoglycemic, diuretic, gallbladder, liver and pancreas problems, cholesterol lowering, stomachache, fever in malaria, abortive, aphrodisiac, antiseptic, diuretic, laxative, tonic, emetic, asthma, bronchitis, boldness	Puno, Cuzco, Cerro de Pasco, Ayacucho, Cajamarca		
GERANIACEAE	*Geranium dielsianum*	Kunth	Pasuchaca		Antidiabetic, hypoglicemic, blood depurative, pancreatic problems, astringent, chonic diarrhea, cholera, bleeding, throat inflammation, oral ulcers			
IRIDACEAE	*Eleutherine bulbosa*	(Miller) Urban	Yahuar, piri piri	Bulbs	Bleeding, dysentery, intestinal infection, flatulence, snakebite	Cuzco, Loreto		Cultivated
KRAMERIACEAE	*Krameria triandra*	Ruiz & Pav.	Ratania, rhatany root	Roots	Astringent, hemostatic, supurative process, dysentery, mouth sores			
LAMIACEAE	*Mentha arvensis*	L.	Menta, cornmint	Leaves	Stomachic, antiseptic, carminative, digestive			
	Minthostachys mollis	(Kunth) Griseb	Muña	Leaves, flowers, stems	Carminative, stomachic, digestive, fractures healing, luxations, tumors produced by bruises, maintenance of bones and teeth, to improve the central nervous system, osteoporosis preventive, bone fracture healing, to prevent bones and teeth decalcification			
	Thymus vulgaris	L.	Tomillo, thym, thyme	Flower, leaves	Antiseptic, respiratory, digestive and circulatory stimulant, nerve tonic			
LOGANIACEAE	*Buddleja globosa*	Hope	Matico, matico pepper		Antibacterial, astringent, wound healing			

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
MALPIGHIACEAE	*Banisteriopsis caapi*	(Spruce ex Grisebach) Morton	Ayahuasca, yagé, bejuco bravo; caapi (Brasil); mado, mado bidada y rami-wetsem (culina); ñucñu huasca y shimbaya huasca (quechua): kamalampi (piro); punga huasca; rambi y shuri (sharanahua); ayahuasca amarillo; ayawasca, nishi y oni (shipi-bo)	Stems, seeds	Hallucinogen	Madre de Dios (Tahuamanú river e Iberia); Loreto (Corazón de Jesús, Mazán river; Llachapa, Napo river; Tamshiyacu, Quistococha, Amazones river; Tahuayo, Panguana 1º and 2º zona, Tahuayo river), San Martín; Amazonas and Cajamarca	Tropical region in Ecuador	Cultivated
MARANTHACEAE	*Amaranthus caudatus*	Linnaeus	Sangorache, amaranth	Grains	Anemia, bleeding, ulcers, diarrhea, food			
MELIACEAE	*Cedrela odorata*	L.	Cedro, cedro colorado; cedro de altura; cedro del bajo; atokc; cedro de castilla, puxni (tepehua); santabiri; sedre (Surinam); Manan conshan (shipibo-conibo)	Bark, resins, flowers	Antimalarial	Ucayali (Yarinacocha)	Tropical America	Cultivated
MENISPERMACEAE	*Abuta grandifolia*	(Mart.) Sandwith	Abuta, trompetero sacha; sanango; caimitillo; ancabesux (siona); motelo sanango; soga; oje-ji-ka-ka (andoke); Tanquepuraque (Kubeo); vibua-jeira-mirsimarika (macuna); pancha muca (shipibo-conibo); palo de motelo (Ecuador); bofrusiri (Surimam)	Leaves, roots, bark, stems	Dental analgesic, brain tonic, anemia, cholesterol lowering, menstrual cramps, diabetes, dysmenorrhea, female sterility, fever, post-menstrual and operational bleeding, malaria, rheumatism, thypoid fever, stomach ulcers	Amazones, Loreto, Momón, Nanay river- Iquitos-Nauta highway km 15.5; Corazón de Jesús, río Mazán; Llachapa, Napo river; Panguana –1º y 2º zone- Amazones river; Tahuayo, Tahuayo river, Contamaná; San Martín; Ucayali; Madre de Dios; Cerro de Pasco; Huanuco		Cultivated
	Chondodendron tomentosum	Ruiz & Pav.	Curare	Stems, bark, roots, leaves	Anesthetic, muscular relaxant, to avoid fractures			
MIRTACEAE	*Eucalyptus globulus*	Labillardiere	Eucalipto, eucalyptus leaf, eucalyptus	Leaves	Bronchitis, upper respiratory colds			Cultivated
MONIMIÁCEAS	*Peumus boldus*	Molina	Boldo, boldo leaf	Leaves	Liver and gladbladder stimulant, digestive and renal secretion stimulant		Chile	Cultivated
MORACEAE	*Brosimum acutifolium*	Huber	Tamamuri	Bark	Fever, reumathism, syphilis, aphrodisiac		Brazil	

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
	Ficus anthelmintica	Rich.	Leche de oje, ficina, oje, ficin	Latex	Antihelmintic, purgative, proteolytic activity	Amazones		
	Ficus insipida var. Insípida	Willd.	Oje, doctor ojé, ila, higuerón, hojé huito, huito, jipalo, huitoc, gameleira branca y lombrigueira (portugués); xovin y hoy (amahuaca); renato, pottó (ashaninca); akumboe (amarakaeri); etóna y etsóna (ese aja); merepopa (huachipaeri); pótogo(matsiguenga)	Latex	Hematopoyetic, blood depurative, anemia, tooth pain, fever, helminthiasis, leishmaniasis, snakebites, sting ray bites, ant bites, rheumatism	Amazones	Tropical and subtropical regions	Cultivated
MYRTACEAE	*Myrciaria dubia*	(Kunth) Mc Vaugh	Camu camu, bayberry, rumberry, guavaberry, camuplus	Fruit	Antioxidant, vitamin C deficiency, immunostimulant, antibacterial, teeth and bones malformations,capillary fragility, fatigue, promote the formation of muscles, tendons, ligaments, prevent free radical oxidation in macular degeneration due to age			
OLACACEAE	*Minquartia guianensis*	Aubl.	Huacapu	Whole plant, bark	Hepatitis, malaria, rheumatism	Loreto (Indiana. Tamshiyacu. Panguana 1º y 2º zona, río Amazonas. Ushpacaño, río Itaya; Contamana. Tapiro, distrito Fernando Lores, Corazón de Jesús, distrito Mazán)	From Central America to Amazon of Peru	Cultivated
PALMAE	*Oenocarpus bataua var. bataua*	Mart.	Ungurahui	Seeds and fruit oil	Diarrhea, antidysenteric, vermifuge, hair loss		Bolivia, Ecuador, Colombia, Panama	
PLANTAGINACEAE	*Plantago major L.*	L.	Llanten, llantai, llantén macho; llantén mayor, tanchagem (Portugal); yantín (shipibo-conibo)	Whole plant, leaves, seeds		Coast, highlands, jungle	Native of Eurasia, tropical and subtropical zones of the world	Cultivated
POACEAE	*Zea mays*	L.	Maiz morado	Grains	Visual acuteness, cholesterol lowering, night vision, colon cancer preventive, natural colorant			
POLYPODIACEAE	*Polypodium decumanum*	Willd.	Calaguala, samambia	Roots	Antiinflammatoy, immunomodulator, antitussive			
PORTULACACEAE	*Portulaca oleracea*	L.	Verdolaga	Whole plant,	Diuretic, fever, antihelminthic,	Cuzco, Huanuco,		

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
				leaves	bronchitis	Loreto		
RUBIACEAE	*Calycophyllum spruceanum*	(Benth.) Hook. f. ex Schum.	Capirona, Palo mulato; Kobakedive (waorani)	Bark, sap		Amazones, Loreto (Quebrada de Ushpacaño, Itaya river; Iquitos-Nauta Highwaykm 15,5 and 45; 1 Corazón de Jesús, Mazán river; Yarina, Napo river; Indiana, Panguana 1º and 2º zones, Momón, Nanay; Tamshiyacu and Topiro, Fernando Lores) and Ucayali		Cultivated
	Cephaelis ipecacuanha	(Brot.) A. Rich.	Ipecacuana, ipecacuanhae, ipecac root	Roots	Amoebic dysentery, expectorant			
	Cinchona calisaya	Wedd.	Corteza de quina, quina, ecorce de quinquina	Bark	Malaria, quinidine is antiarrhytmic	Peru	Panama, Rio, Brazil	Cultivated
	Genipa americana	L.	Huito, jagua, juito, genipa	Bark, fruits, seeds roots	Bleeding, anemia, pelagra, digestive, bronchial problems, vaginal inflammation, uterine cancer, wound healing, antimycotic, purgative		Mexico to Costa Rica, Caribbean	
	Uncaria guianensis	(Aubl.) J.F. Gmel.	Uña de gato, ontaepome, eigahuen, Cashahuasca (Quichua), eigahuen (Huaorani), mulupo pashca, ontaepome, soga espinosa, uña de gato (Ecuador), Garabato, unganangi	Stems, bark	Coughs, colds, stomachic, antiinflammatory, antitumoral, rheumatism, prostate cancer, anticonceptive, prostate cancer, arthritis, diabetes, cirrhosis, bond diseases, conjuntivitis, gastric ulcers		Bolivia, Colombia, Peru, Suriname, Venezuela, Guyana	Wild
	Uncaria tomentosa	(Willd. ex Roem. & Schult.) DC.	Uña de gato, zavenna rossa, quitabultos, uncucha, garabato, garabato colorado, garra gavilan, jipotatsa, kug kukjaqui, michomentis, paotati mosha, samento, toron, tsachik, unganangi, gatuna, toront, tambo huasca, diente de buey, willca, cora, casha	Bark, roots	Antiinflammatory, prostatitis, ulcers, diabetes, diarrheas, analgesic for sciatica and lumbalgia, immunostimulant, asthma, allergies, acute and chronic viral infections, prevention of cancer, antiproliferative breast cancer, fever, rheumatism, colds	Chanchamayo, Satipo, Oxapampa, Codo del Pozuzo, Valley of rivers Pichis, Palcazu and Pachitea, National forest Alexander Von Humbolt National Park, San Martín and Madre de Dios, Loreto: alto Amazonas, Pasco: Oxapampa,	Bolivia, Brasil, Guyanas, Colombia, Venezuela, Nicaragua, Panama, Trinidad, Ecuador	

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
						Cuzco: Paucartambo, Quincemil		
SCROPHULARIACEAE	*Scoporia dulcis*	L.	Ñucño pichana, escobilla	Whole plant without roots, leaves	Febrile and respiratory problems, biliary cramps, hemorrhoids, wounds	Amazones, Cajamarca, Cuzco, Huanuco, La Libertad, Loreto, Madre de Dios, San Martin	Panama	
SOLANACEAE	*Brugmansia suaveolens*	(H. & B. Ex Willd.) Bercht. & Presl.	Toe	Leaves	Pyodermitis	Loreto		
	Brunfelsia grandiflora	D. Don. Ssp. Shulttessi Plow	Chiric, sanango, chuchuhuasha	Roots, bark	Rheumatism, leishmaniasis	Cuzco, Loreto, San Martin		
	Cestrum hediodinum	Durn.	Hierba santa, ñucjau, hierba hedionda, hierba del cancer, chamo tundio, tunio, eckuack	Leaves, flowers	Sedative, emmenagogue, bronchitis, dermatitis, diarrhea, dyspepsia, hemorrhoids, stomatitis, antidrandruff	Cuzco: Valle del Urubamba; Huanuco: Tomaiquichua; Junin: Dos de mayo, Pichis; Loreto; Yurimaguas		
	Nicandra physalodes	(L.) Gaertn.	Anores huailla (Aymara), ccara-pamacmara, capuli-cimarrón, corneta jarcha, jarrito, joto-joto, toccoro	Leaves, branches	Disinfectant, antiinflammatory, conjunctivitis	Apurimac, Cajamarca, Cusco, Huánuco, Junín, Lambayeque, Lima, La Libertad, Pasco y Puno	Costa Rica, Nicaragua, Honduras, Ecuador, Venezuela, Comoros, Tanzania, Madagascar	
	Physalis angulata	L.	Bolsa mullaca, mullaca; capulí cimarrón; shimon (shipibo-conibo); camapú, camambú, juapoca, camaru, joa, bucho de ra, jua de capote y mata fome (portugués)	Leaves, fruit, roots	Depurative, intestinal pain, antimalarial	Amazones, Loreto, Piura, La Libertad, San Martín, Lima, Huanuco, Junín		Cultivated
	Solanum mammosum	L.	Teta de vaca	Fruit	Ascaricidal, skin mycosis, breast ulcers		Mexico to Peru and Paraguay, West Indies	Wild, cultivated
ULMACEA	*Trema micrantha*	(L.) Blume	Aisegerina, atadijo, capulin, guilma, huitoto, jordanillo, kaka, toropate, yana caspi	Leaves, bark	Dry coughs, nasal descongestionant	Amazones, Apurimac, Cajamarca, Cuzco, Huánuco, Junín, Lima, Loreto, Madre de Dios, Pasco, Puno, San Martin,	México, Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Dominican Republic, Jamaica, Puerto Rico, Panama, Colombia,	

Family	Scientific Name	Authority	Common Names	Part(s) Used	Medicinal use(s)	Geographic location	International distribution	Farming
						Ucayali	Ecuador, Bolivia, Venezuela, Paraguay	
VALERIANACEAS	*Valeriana officinalis*	L.	Raiz de valeriana, Valeriane, Valerian root	Roots	Tranquilizer, sedative, insomnia, nervous tiredness, excessive intellectual work, excitation, anxiety, nervous cardiac and gast			
VERBENACEAE	*Verbena littoralis*	H.B.K.	Verbena,	Whole plant, leaves	Bronchitis, ulcers, stomach infections, diabetes	Cajamarca, Amazones, San Martin, Ancash, Lima, Huanuco, Junin, Loreto, Arequipa, Cuzco, Tacna		
ZINGIBERACEAE	*Zingiber officinale*	Roscoe	Jengibre, ginger	Roots	cardiac and circulatory stimulant, vasodilatador, digestive, increase in intestinal motility, antiemetic		Tropical America, Caribbean	Cultivated

Source: Material data sheet, Portal agrario, Ministerio de Agricultura, Peru, *www.portalagrario.gob.pe/agricola/pro_medi_fichas.shtml.;* Mejía, K., Reng, E. 1995. *Plantas Medicinales de Uso Popular en la Amazonía Peruana*. AECI, IIAP. Lima, Perú. 249 p.; Dr. Olga Lock Sing. Departamento de Química. Pontificia Universidad Católica del Peru, Lima, Peru; *Personal Evaluation*.

Table 5. Inventory of the already processed medicinal plants from Peru

Company	Product	Plant	Type of product
ACM PERU	Yacon root	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Medicinal and aromatic plants
AGROINDUSTRIAS AMAZONICAS	Sacha Inchi	*Plukenetia volubilis* L.	Medicinal and aromatic plants
AGROINDUSTRIAL CHANCHAMAYO	Flour and extract of maca root, cat's claw	*Lepidium meyenii* Walp.(maca), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw)	Herbal medicinal products
AGROINDUSTRIAS BACKUS	Camu camu fruit (juice, spray dry)	*Myrciaria dubia* (Kunth) McVaugh	Food, Herbal medicinal products
AGROINDUSTRIAS FLORIS	Medicinal plants		Medicinal and aromatic plants
	Natural extract of Maca Santa Natura	*Lepidium meyenii* Walp.	Herbal medicinal products
	Natural extract of cat's claw Santa Natura	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Natural extract of yacon Santa Natura	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Herbal medicinal products
AGRONATURALES	Yacon root, cat's claw, paprika, maca root	*Smallanthus sonchifolius* (Poepp.) H. Rob. (yacon), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw), *Capsicum annuum* L. (paprika), *Lepidium meyenii* Walp.(maca)	Food, Herbal medicinal products
AMAZONIAN NATURAL PRODUCTS	Dragon's blood	*Croton lechleri* Müll. Arg.	Herbal medicinal products
ANDEAN PRODUCTS	Medicinal plants	Not reported	Medicinal and aromatic plants
AURANDINA	Filtrants based on natural ingredients		Herbal tea
	Wawasana digestivo	Not reported	Herbal tea
	Wawasana emoliente	Not reported	Herbal tea
	Wawasana gripal	Not reported	Herbal tea
	Wawasana menta andina	Not reported	Herbal tea
	Wawasana relajante	Not reported	Herbal tea
	Wawasana uña de gato	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal tea
BIONATURISTA	Medicinal plants		Medicinal and aromatic plants
	Achiote, capsules	*Bixa orellana* L.	Herbal medicinal products
	Ajo, capsules	*Allium sativum* L.	Herbal medicinal

Company	Product	Plant	Type of product
			products
	Alcachofa, capsules, extract	*Cynara scolymus* L.	Herbal medicinal products
	Alfalfa, capsules	*Medicago sativa* L.	Herbal medicinal products
	Berenjena, capsules	*Solanum melongena* L.	Herbal medicinal products
	Berros, capsules	*Rorippa nasturtium* var. *aquaticum* L.	Herbal medicinal products
	Biomax, capsules, extract	Medicinal plants mixture	Herbal medicinal products
	Camu camu, capsules	*Myrciaria dubia* (Kunth) McVaugh	Herbal medicinal products
	Chancapiedras, capsules	*Phyllanthus niruri* L.	Herbal medicinal products
	Granada, capsules, extract	*Punica granatum* L.	Herbal medicinal products
	Graviola, capsules, extract	*Annona muricata* L.	Herbal medicinal products
	Hoja de yuca, capsules	*Manihot esculenta* Crantz	Herbal medicinal products
	Lecitina de soya, capsules	*Glycine max* (L.) Merr.	Herbal medicinal products
	Maca, capsules, extract	*Lepidium meyenii* Walp.	Herbal medicinal products
	Olivo, capsules, extract	*Olea europaea* L.	Herbal medicinal products
	Uña de gato, capsules, extract	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Vinagre de frutas, capsules	Exotic fruits	Herbal medicinal products
	Extracts: Ajo sacha, Almendra de zapallo, Cacao, Caigua, Calaguala, Diente de león, Fluído vegetal Melisa, Llanten, Malva real, Matico, Maguey, Mixtura acid, Mixtura art, Mixtura cole, Mixtura Diab, Mixtura, Diar, Mixtura Diu, Mixtura Fem, Mixtura Gast, Mixtura Higa, Mixtura Ins, Mmixtura Lax, Mixtura Mem, Mixtura Pros, Mixtura Relix, Mixtura Ren, Mixtura Sud, Mixtura Ves, Olivo, Parasin, Pasuchaca, Pelo de Choclo, Pulmonaria, Sábila, Salvia real y romero, Yacón	*Allium sativum* L. (ajo), *Cucurbita maxima* Duchesne (zapallo), *Theobroma cacao* L. (cacao), *Cyclanthera pedata* (L.) Schrad. (caigua), *Polypodium decumanum* Willd. (calaguala), *Taraxacum officinale* F.H. Wigg. (diente de león), *Melissa officinalis* L. (melisa), *Plantago major* L. (llanten), *Althaea officinalis* L. (malva real), *Piper acutifolium* Ruiz & Pav. (matico), *Agave americana* L. (maguey), Mixture of medicinal plants, *Olea europaea* L. (olivo), *Geranium dielsianum* R. Knuth (pasuchaca), *Pulmonaria officinalis* L. (pulmonaria), *Aloe vera* (L.) Burm. f. (sabila), *Rosmarinus officinalis* L. (romero), *Smallanthus sonchifolius* (Poepp.) H. Rob. (yacon)	Herbal medicinal products
	Aloe, gel	*Aloe vera* (L.) Burm. f.	Cosmetics
BUPO SAC	Macapunch, powder, capsules,	*Lepidium meyenii* Walp.	Herbal medicinal

Company	Product	Plant	Type of product
	extract		products
	Yacon, syrup	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Herbal medicinal products
	Lukuma, powder	*Lucuma obovata* Kunth	Food
	Purple Corn, capsules	*Zea mays* L.	Herbal medicinal products
	Camu camu, capsules	*Myrciaria dubia* (Kunth) McVaugh	Herbal medicinal products
CABEX	Yacon root, maca root, cat's claw	*Smallanthus sonchifolius* (Poepp.) H. Rob. (yacon), *Lepidium meyenii* Walp. (maca), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw)	Herbal medicinal products
	Yacon root tea, dried extract, honey, dehydrated	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Herbal medicinal products
	Maca root powder, toasted, gelatinized, encapsulated	*Lepidium meyenii* Walp.	Herbal medicinal products
	Purple corn entire, powder, dried extract, encapsulated	*Zea mays* L.	Herbal medicinal products
	Cat's claw cut bark, powder, dried extract, encapsulated	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Medicinal plants	Not reported	Medicinal and aromatic plants
	Andean cereals	Exotic fruits (Quinua, kiwicha, lucuma in powder)	Food
CARBONES Y DERIVADOS	Maca root, yacon root	*Lepidium meyenii* Walp. (maca), *Smallanthus sonchifolius* (Poepp.) H. Rob. (yacon)	Medicinal and aromatic plants
CDEPYMES	Yacon root	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Medicinal and aromatic plants
CHAKARUNAS TRADING	Bio Aging Blast	*Lepidium meyenii* Walp.	Herbal medicinal products
	Bio Maca Blast, capsules	*Lepidium meyenii* Walp.	Herbal medicinal products
	Bio Maca Extract, capsules	*Lepidium meyenii* Walp.	Herbal medicinal products
	Bio Maca Rush, pulverized	*Lepidium meyenii* Walp.	Herbal medicinal products
	Bio Mega Blast	*Lepidium meyenii* Walp.	Herbal medicinal products
	Makaton Harina	*Lepidium meyenii* Walp.	Herbal medicinal products
	Makaton Power	*Lepidium meyenii* Walp.	Herbal medicinal products
CODEPLAN	Medicinal plants in various		Herbal medicinal

Company	Product	Plant	Type of product
	presentations		products
	Aceite de copaiba, capsules	*Copaifera officinalis* (Jacq.) L.	Herbal medicinal products
	Achiote-C, capsules	*Bixa orellana* L.	Herbal medicinal products
	Caigua, capsules	*Cyclanthera pedata* (L.) Schrad.	Herbal medicinal products
	Chanca piedra, capsules	*Phyllanthus niruri* L.	Herbal medicinal products
	Chuchuhuasi, capsules	*Maytenus macrocarpa* (Ruiz & Pav.) Briq.	Herbal medicinal products
	Femanina, capsules	Mixture of medicinal plants	Herbal medicinal products
	Hipocol adelgazante 4 en 1, capsules	Mixture of medicinal plants	Herbal medicinal products
	Maca, capsules	*Lepidium meyenii* Walp.	Herbal medicinal products
	Sangre de grado, capsules	*Croton lechleri* Müll. Arg.	Herbal medicinal products
	Uña de gato, capsules	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Yacon, capsules	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Herbal medicinal products
CORPNATUEFRUIT	Flour and instant preparation of Maca, Lucuma, Yacon root	*Lepidium meyenii* Walp. (maca), *Lucuma obovata* Kunth (lucuma), *Smallanthus sonchifolius* (Poepp.) H. Rob. (yacon)	Food
CORPORACION JOSE R. LINDLEY	Yacon root	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Medicinal and aromatic plants
CPX PERU	Maca root in various presentations	*Lepidium meyenii* Walp.	Herbal medicinal products
DESHIDRATADOS TROPICALES	Maca root in various presentations	*Lepidium meyenii* Walp.	Herbal medicinal products
ECOANDINO	Maca root, Yacon root, Muña, Cacao, Lucuma, Arracacha, Caigua, Ahuaymanto, Yuca, Achiote, Graviola (guanabana), Camu camu, Manayupa, Cat's claw and derivatives (flour, gelatinized, extracts, encapsulated)	*Lepidium meyenii* Walp. (maca), *Smallanthus sonchifolius* (Poepp.) H. Rob. (yacon), *Minthostachys mollis* (Kunth) Griseb. (muña), *Theobroma cacao* L. (cacao), *Lucuma obovata* Kunth (lucuma), *Arracacia xanthorrhiza* Bancr. (arracacha), *Cyclanthera pedata* (L.) Schrad. (caigua), *Physalis peruviana* L. (ahuaymanto), *Manihot esculenta* Crantz (yuca), *Bixa orellana* L. (achiote), *Annona muricata* L. (graviola), *Myrciaria dubia* (Kunth) McVaugh (camu camu), *Desmodium molliculum* (Kunth) DC. (manayupa), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw)	Herbal medicinal products
ECOPRO	Azul de huito, Negro de genipa, colorant	*Genipa americana* L.	Food, cosmetic
	Oleorresina de paprika, colorant	*Capsicum annuum* L.	Food

Company	Product	Plant	Type of product
	Rojo de ratania	*Krameria triandra* Ruiz & Pav.	Food
	Ecoprol 2021, preserver	*Caesalpinia spinosa* (Molina) Kuntze, (Tara)	Food
EMPRESA AGROINDUST. DEL PERU	Camu camu fruit	*Myrciaria dubia* (Kunth) McVaugh	Food
EXPORTACIONES AMAZONICAS NATIVAS	Maca root, Cat's claw in various presentations	*Lepidium meyenii* Walp. (maca), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw)	Herbal medicinal products
EXPORTACIONES DE LA SELVA	Goma de tara	*Caesalpinia spinosa* (Molina) Kuntze	Food
	Achiote, Oregano, Cúrcuma, colorants and species	*Bixa orellana* L.(achiote), *Origanum vulgare* L. (oregano), *Curcuma longa* L. (cúrcuma)	Food
	Aceituna, Maiz gigante, Brazil nuts	*Olea europaea L. (aceituna), Zea mays* L. (maíz grande), *Bertholletia excelsa* Bonpl. (Brazil nuts)	Food
	Medicinal plants: Uña de gato, Maca, Ratania, Hercampuri	*Uncaria tomentosa (Willd. ex Roem. & Schult.) DC. (uña de gato), Lepidium meyenii Walp. (maca), Krameria triandra* Ruiz & Pav. (ratania), *Gentianella alborosea* (Gilg) Fabris (hercampuri)	Herbal medicinal products
FITOFARMA	Dry Extract: Maca, Maíz morado, Chancapiedra, Sangre de Grado, Chuchuhuasi, Pasuchaca, Uña de gato, Achiote, Cipres, Hercampuri	*Lepidium meyenii* Walp. (maca), *Zea mays* L. (maíz morado), *Phyllanthus niruri* L. (chancapiedra), *Croton lechleri* Müll. Arg. (sangre de grado), *Maytenus macrocarpa* (Ruiz & Pav.) Briq. (chuchuhuasi), *Geranium dielsianum* R. Knuth (pasuchaca), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (uña de gato), *Bixa orellana* L.(achiote), *Cupressus sempervirens* L. (cipres), *Gentianella alborosea* (Gilg) Fabris (hercampuri)	Herbal medicinal products
FITOMUNDO	Resina de Oje	Not reported	Herbal medicinal products
	Sangre de Grado (resin)	*Croton lechleri* Müll. Arg.	Herbal medicinal products
	Chancapiedra, leaves and stem	*Phyllanthus niruri* L.	Medicinal and aromatic plants
	Hoja de Graviola, leaves	*Annona muricata* L.	Medicinal and aromatic plants
	Muña	*Minthostachys* spp.	Herbal medicinal products
	Uña de gato, bark	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Medicinal and aromatic plants
FITOVID	Aqueous extracts of medicinal plants	Not reported	Herbal medicinal products
FRUCTUS TERRUM S.A.	Medicinal Plants, natural ingredients		Medicinal and aromatic plants
	Aceite de Copaiba, Maca, Sangre de Grado, Chancapiedra, Uña de gato	*Copaifera officinalis* (Jacq.) L. (copaiba), *Lepidium meyenii* Walp. (maca), *Phyllanthus niruri* L. (chancapiedra), *Croton lechleri* Müll. Arg. (sangre de grado), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (uña de gato)	Herbal medicinal products

Company	Product	Plant	Type of product
GHAL INVESTMENTS	Maca root, Cat's claw, Lucuma	*Lepidium meyenii* Walp. (maca), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw), *Lucuma obovata* Kunth (lucuma)	Medicinal and aromatic plants
GRUPO CONSULTOR	Maca and derivatives	*Lepidium meyenii* Walp.	Herbal medicinal products
GYRISA	Flour and extract of Maca	*Lepidium meyenii* Walp.	Herbal medicinal products
HERSIL SA	Medicinal plants		
	Maca Vibe, tablets	*Lepidium meyenii* Walp.	Herbal medicinal products
	Uña de gato, capsules and tablets	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Chancapiedra Vibe, tablets	*Phyllanthus niruri* L.	Herbal medicinal products
	Hercampuri Vibe, tablets	*Gentianella alborosea* (Gilg) Fabris	Herbal medicinal products
	Pasuchaca, tablets	*Geranium dielsianum* R. Knuth (pasuchaca)	Herbal medicinal products
	Chocolate con Maca Vibe, powder	*Lepidium meyenii* Walp.	Herbal medicinal products
	Sangre de grado, cream and topical suspension	*Croton lechleri* Müll. Arg.	Herbal medicinal products
	Maca gelatinizada La Molina, tablets	*Lepidium meyenii* Walp.	Herbal medicinal products
	Uña de gato La Molina, tablets	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Maca Fresca Schuler	*Lepidium meyenii* Walp.	Herbal tea
	Uña de gato Schuler	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal tea
	Nuevo Hercampuri Schuler	*Gentianella alborosea* (Gilg) Fabris	Herbal tea
	Uña de gato Schuler, cream	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
			Medicinal and aromatic plants
HIRO EXIMPORT	Health foods, tropical fruits, spices.	Not reported	Food
IMPEXCO	Lemon and its essential oil	*Citrus aurantifolia* (Christm.) Swingle	Food
INDUQUIMICA	Natural World's products distributor		Herbal medicinal products
INDUSTRIAL AGROCHALLHUA	Peruvian purple corn, filtrant	*Zea mays* L.	Food
INTERANDINA	Yacon root in various presentations	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Herbal medicinal products

Company	Product	Plant	Type of product
INVERSIONES SAMSARA	Medicinal plants	Not reported	Medicinal and aromatic plants
KESHUA / ASHANINKA	Medicinal plants caramels Maca root, tara, cat's claw, eucalyptus	*Lepidium meyenii* Walp. (maca), *Caesalpinia spinosa* (Molina) Kuntze (tara), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw), *Eucalyptus camaldulensis* Dehnh. (eucalyptus)	Herbal medicinal products
	Maca root flour, encapsulated extracts	*Lepidium meyenii* Walp.	Herbal medicinal products
	Cat's claw encapsulated extracts	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Machote (dietary supplement Maca, cat's claw and achote), capsules	*Lepidium meyenii* Walp. (maca), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw), *Bixa orellana* L. (achote)	Herbal medicinal products
	Kiwimak (cereal of maca, cacao, kiwicha)	*Lepidium meyenii* Walp. (maca), Theobroma cacao L. (cacao), Amaranthus caudatus L. (kiwicha)	Herbal medicinal products
KOKEN DEL PERU	Dehydrated camu camu	*Myrciaria dubia* (Kunth) McVaugh	Herbal medicinal products
	Super Maca Koken flour	*Lepidium meyenii* Walp.	Herbal medicinal products
	Super Maca capsules	*Lepidium meyenii* Walp.	Herbal medicinal products
	Maca juice	*Lepidium meyenii* Walp.	Herbal medicinal products
	Cat's claw extract	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Yacon leaves extract	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Herbal medicinal products
LABORATORIOS PORTUGAL	Cat's claw, tablets	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Maca, tablets	*Lepidium meyenii* Walp.	Herbal medicinal products
	Valeriana, tablets	*Valeriana officinalis* L.	Herbal medicinal products
	Sangre de Grado, tablets	*Croton lechleri* Müll. Arg.	Herbal medicinal products
	Postemax, tablets (Cat's claw and achiote)	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw), *Bixa orellana* L. (achiote)	Herbal medicinal products
	Don Potencio, tablets (aphrodisiac)	Not reported	Herbal medicinal products
LIOFILIZADORA DEL PACIFICO	Lyophilized cat's claw	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
MERIDIAN ENTERPRISE	Filtrants based on natural ingredients	Not reported	Herbal tea

Company	Product	Plant	Type of product
Mi Naturaleza Amazonica (MINA)	Cat's claw, capsules	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Chancapiedra, capsules	*Phyllanthus niruri* L.	Herbal medicinal products
	Achi + Uña, capsules	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (cat's claw), *Bixa orellana* L. (achiote)	Herbal medicinal products
	Guarana, capsules	*Paullinia cupana* Kunth	Herbal medicinal products
	Guanabana, capsules	*Annona muricata* L.	Herbal medicinal products
	Ehxit (Canela sacha, Caña brava, Clavo huasca, Catoaba, Chuchuhuasi), capsules	*Tynanthus panurensis* (Bureau) Sandwith (clavo huasca), *Maytenus macrocarpa* (Ruiz & Pav.) Briq. (chuchuhuasi)	Herbal medicinal products
	Achiote, capsules	*Bixa orellana* L.	Herbal medicinal products
	Noni, capsules	*Morinda citrifolia* L.	Herbal medicinal products
	Abuta	*Abuta grandifolia* (Mart.) Sandwith	Medicinal and aromatic plants
MG NATURA	Medicinal plants	Not reported	Medicinal and aromatic plants
NATERI REPRESENTACIONES	Medicinal plants	Not reported	Medicinal and aromatic plants
NATUMAX	Maca root, Cat's claw	Lepidium meyenii Walp. (maca), Uncaria tomentosa (Willd. ex Roem. & Schult.) DC. (cat's claw)	Herbal medicinal products
NATURAL LIFE	Cosmetics based on medicinal plants: Crema humectante de sábila, Crema para masajes de uña de gato, Jabón de Maca, Jabón de Ruda, Shampoo de manzanilla	*Aloe vera* (L.) Burm. f. (sábila), *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (uña de gato), *Lepidium meyenii* Walp. (maca), *Ruta graveolens* L. (ruda), *Matricaria chamomilla* L. (manzanilla)	Cosmetics
	Ajo, capsules	*Allium sativum* L.	Herbal medicinal products
	Camu camu, capsules	*Myrciaria dubia* (Kunth) McVaugh	Herbal medicinal products
	Graviola, capsules	*Annona muricata* L.	Herbal medicinal products
	Maca Gold, capsules	*Lepidium meyenii* Walp.	Herbal medicinal products
	Maíz morado, capsules	*Zea mays* L.	Herbal medicinal products
	Manayupa, capsules	*Desmodium molliculum* (Kunth) DC.	Herbal medicinal products
	Noni, capsules	*Morinda citrifolia* L.	Herbal medicinal products
	Lurviol, capsules	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC., *Bixa orellana* L.	Herbal medicinal products

Company	Product	Plant	Type of product
	Sanagola, spray	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC., *Mentha piperita* subsp. citrata Briq., *Thymus vulgaris* L.	Herbal medicinal products
	Yacon, capsules	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Herbal medicinal products
	Hoja de yuca, capsules	*Manihot esculenta* Crantz	Herbal medicinal products
NATURAL PERU	Medicinal plants		Medicinal and aromatic plants
	Maca UP, sachets, capsules	*Lepidium meyenii* Walp.	Herbal medicinal products
	Uña de gato - cat's claw, capsules	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC.	Herbal medicinal products
	Jarabe de Yacon	*Smallanthus sonchifolius* (Poepp.) H. Rob.	Herbal medicinal products
	Powder: Abuta, Agracejo, Alenjo, Algarrobo, Asmachilca, Caigua, Cuti cuti, Carqueja, Flor blanca, Flor de arena, Hierba Luisa, Manayupa, Múcura, Paico, Palo Santo, Valeriana, Zarzaparrilla	*Abuta grandifolia* (Mart.) Sandwith (abuta), *Berberis vulgaris* L. (agracejo), *Ambrosia peruviana* Willd. (alenjo), *Prosopis pallida* (Humb. & Bonpl. ex Willd.) Kunth (algarrobo), *Aristeguietia gayana* (Wedd.) R.M. King & H. Rob. (asmachilca), *Cyclanthera pedata* (L.) Schrad. (caigua), *Asplenium fragile* C. Presl (cuti cuti), *Baccharis articulata* (Lam.) Pers. (carqueja), *Buddleja incana* Ruiz & Pav. (flor blanca), *Tiquilia paronychioides* (Phil.) A.T. Richardson (flor de arena), *Cymbopogon citratus* (DC.) Stapf (hierba luisa), *Desmodium adscendens* (Sw.) DC. (manayupa), *Petiveria alliacea* L. (múcura), *Chenopodium ambrosioides* L. (paico), *Bursera graveolens* (Kunth) Triana & Planch. (palo santo), *Valeriana officinalis* L. (valeriana), *Smilax officinalis* Kunth (zarzaparrilla)	Medicinal and aromatic plants
NATURAL WORLD	Dragon's blood extract, capsules	*Croton lechleri* Muell. Arg	Herbal medicinal products
	Cat's claw extract, capsules	*Uncaria tomentosa* (Willd) DC.	Herbal medicinal products
	Graviola, capsules	*Annona muricata* L.	Herbal medicinal products
	Yacon leaf, capsules	*Smallathus sonchifolius* (Poepp. & Endl.) H. Robinson	Herbal medicinal products
	Camu camu, capsules	*Myrciaria dubia* (HBK) Mc Vaugh	Herbal medicinal products
	Maca, capsules	*Lepidium meyenii* Walp	Herbal medicinal products
	Purple corn extract, capsules	*Zea mays* L.	Herbal medicinal products
NATURANDINA	Yacon root and other medicinal plants	*Smallathus sonchifolius* (Poepp. & Endl.) H. Robinson	Medicinal and aromatic plants
NORPAL	Maca root and its flour	*Lepidium meyenii* Walp	Medicinal and aromatic plants

Company	Product	Plant	Type of product
	Paprika Dry Norpal	*Capsicum annuum* L.	Medicinal and aromatic plants
NOVANDINA	Uña de gato, Maca, Caigua, Chancapiedra, Sangre de Grado, Chuchuhuasi	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. (uña de gato), *Cyclanthera pedata* (L.) Schrad. (caigua), *Phyllanthus niruri* L. (chancapiedra), *Croton lechleri* Müll. Arg. (sangre de grado), *Maytenus macrocarpa* (Ruiz & Pav.) Briq. (chuchuhuasi)	Medicinal and aromatic plants
PANPACIFIC CORPORATION	Maca extract	*Lepidium meyenii* Walp	Herbal medicinal products
PEBANI INVERSIONES	Cat's claw, bark fibres, bark powder, micropulverized bark capsules, extracts, solution	*Uncaria tomentosa* (Willd) DC.	Medicinal and aromatic plants, Herbal medicinal products
	Maca, root, flour and extract, capsules and tablets.	*Lepidium meyenii* Walp	Herbal medicinal products
	Grado blood	*Croton lechleri* Muell. Arg	Herbal medicinal products
	Tara, powder	*Caesalpinia spinosa* (Molina) Kuntze	Herbal medicinal products
	Rotenone		Raw material
	Tannins		Raw material
PERU AMAZON EXPORT	Camu camu fruit	*Myrciaria dubia* (HBK) Mc Vaugh	Medicinal and aromatic plants
PERUVIAN HERITAGE	Medicinal plants		Medicinal and aromatic plants
	Camu Camu	*Myrciaria dubia* (HBK) Mc Vaugh	Herbal medicinal products
	Premium standardized extract of purple corn	*Zea mays* L.	Herbal medicinal products
	Premium Maca extract	*Lepidium meyenii* Walp	Herbal medicinal products
	Premium standardized cat's claw extract	*Uncaria tomentosa* (Willd) DC.	Herbal medicinal products
	Yacon, Sacha Inchi, Graviola extracts	*Smallathus sonchifolius* (Poepp. & Endl.) H. Robinson (yacon), *Plukenetia volubilis* L. (sacha inchi), *Annona muricata* L. (graviola)	Herbal medicinal products
PERUVIAN INVESTMENT	Medicinal plants in various presentations	Not reported	Herbal medicinal products
PERUVIAN NATURE	Artichoke, capsules	*Cynara scolymus* L.	Herbal medicinal products
	Garlic, capsules	*Allium sativum* L.	Herbal medicinal products
	Camu Camu, capsules	*Myrciaria dubia* (HBK) Mc Vaugh	Herbal medicinal products

Company	Product	Plant	Type of product
	Purple corn, capsules	*Zea mays* L	Herbal medicinal products
	Maca, capsules	*Lepidium meyenii* Walp	Herbal medicinal products
	Cat's claw, capsule	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
PRODEAGRO	Yacon root filters	*Smallathus sonchifolius* (Poepp. & Endl.) H. Robinson	Herbal medicinal products
PROMPEX	TPO	Not reported	
QUALITY PEOPLE PROCESS PRODUCTS	Natural cosmetic products: Aguaje, Inca Wira	*Mauritia flexuosa* L. f. (aguaje), *Plukenetia volubilis* L. (inca wira)	Cosmetics
	Capuchina, extract	*Tropaeolum majus* L.	Herbal medicinal products
	Horse tail, extract	*Equisetum bogotense* Kunth	Herbal medicinal products
	Jacaranda, extract	*Jacaranda copaia* (Aubl.) D. Don	Herbal medicinal products
	Matico, extract	*Piper angustifolium* Lam.	Herbal medicinal products
	Molle, extract	*Schinus molle* L.	Herbal medicinal products
	Dragon's Blood, extract	*Croton lechleri* Muell. Arg	Herbal medicinal products
	Cat's claw, extract	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
QUIMPER	Maca roots and derivatives	*Lepidium meyenii* Walp	Herbal medicinal products
R. MUELLE	Annatto seeds	*Bixa orellana* L.	Medicinal and aromatic plants
	Peruvian Brazil nut oil	*Bertholletia excelsa* Bonpl.	Medicinal and aromatic plants
	Camu camu, dry extract	*Myrciaria dubia* (HBK) Mc Vaugh	Medicinal and aromatic plants
	Cat's claw, dry extract	*Uncaria tomentosa* (Willd.) D.C.	Medicinal and aromatic plants
	Copaiba, balm	*Copaifera officinalis* (Jacq.) L.	Medicinal and aromatic plants
	Ficin	*Ficus insipida* Willd.	Medicinal and aromatic plants
	Lucuma, flour	*Pouteria lucuma* (Ruiz & Pav.) Kuntze	Medicinal and aromatic plants
	Maca, dry extract	*Lepidium meyenii* Walp	Medicinal and aromatic

Company	Product	Plant	Type of product
			plants
	Tara, fine powder	*Caesalpinia spinosa* (Molina) Kuntze	Medicinal and aromatic plants
RAINLABS	Medicinal plants	Not reported	Medicinal and aromatic plants
RAIS VIDA	Cosmetics and preventive agents based on medicinal plants		Cosmetics
	Cat's claw masaje cream, nail´s gel, talcum powder for feet	*Uncaria tomentosa* (Willd.) D.C.	Cosmetics
	Moisturizing cream dyus, Aloe hydrating gel, soap	*Aloe vera* (L.) Burm. f.	Cosmetics
	Hydrating cream dyus	*Lepidium meyenii* Walp	Cosmetics
	Maca/ Aloe, Cat's claw/ Aloe, Manzanilla/ Toronja/ Aloe, shampoo-conditioner	*Lepidium meyenii* Wal/ *Aloe vera* (L.) Burm. f., *Uncaria tomentosa* (Willd.) D.C./ *Aloe vera* (L.) Burm. f., *Matricaria chamomilla* L/ *Aloe vera* (L.) Burm. f.	Cosmetics
	Rue, soap tonificante	*Ruta graveolens* L.	Cosmetics
	Medicinal plants		Medicinal and aromatic plants
	Cat's claw, extract and micro pulverized	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
	Maca, tablets	*Lepidium meyenii* Walp	Herbal medicinal products
	Hercampuri, capsules	*Gentianella alborosea* (Gilg) Fabris	Herbal medicinal products
	Pasuchaca, capsules	Geranium dielsianum R. Knuth	Herbal medicinal products
	Drago blood, tablets	*Croton lechleri* Muell. Arg	Herbal medicinal products
	Chancapiedra, capsules	*Phyllanthus niruri* L.	Herbal medicinal products
	Prostatin, capsules	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC., *Bixa orellana* L.	Herbal medicinal products
REATEGUI SIETE	Maca root, Cat's claw, Yacon, Lucuma, Purple corn	*Lepidium meyenii* Walp (maca), *Uncaria tomentosa* (Willd.) D.C. (cat´s claw), *Smallathus sonchifolius* (Poepp. & Endl.) H. Robinson (yacon), *Pouteria lucuma* (Ruiz & Pav.) Kuntze (lucuma), *Zea mays* L (purple corn)	Medicinal and aromatic plants
	Paprika	*Capsicum annuum* L.	Food
RF CAR	Maca root and derivatives	*Lepidium meyenii* Walp	Herbal medicinal products
	Sacha Inchi oil	*Plukenetia volubilis* L.	Herbal medicinal products
	Purple corn	*Zea mays* L	Herbal medicinal products
	Rocoto	*Capsicum pubescens* Ruiz & Pav.	Herbal medicinal products

Company	Product	Plant	Type of product
	Cat's claw	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
	Yacon	*Smallathus sonchifolius* (Poepp. & Endl.) H. Robinson	Herbal medicinal products
	Aji Amarillo	*Capsicum baccatum* L.	Food
SOCIEDAD AEROCOMERCIAL DEL PERU	Natural products	Not reported	Herbal medicinal products
TAKIWASI	Ayahuasca	*Banisteriopsis caapi* (Spruce ex Griseb.) C.V. Morton	Medicinal and aromatic plants
	Uña de Gato tint	*Uncaria tomentosa* (Willd.) D.C.	Herbal medicinal products
	Ajo Sacha tint	*Pseudocalymma alliaceum* (Lam.) Sandwith	Herbal medicinal products
	Confrey tint	*Symphytum officinale* L.	Herbal medicinal products
	Copaiba oil	*Copaifera paupera* (Herzog) Dwyer	Herbal medicinal products
	Chuchuhuasha tint	*Maytenus macrocarpa* (Ruiz & Pav.) Briq.	Herbal medicinal products
	Chanca Piedra tint	*Phyllanthus niruri* L.	Herbal medicinal products
	Uña de Gato bark	*Uncaria tomentosa* (Willd.) D.C.	Medicinal and aromatic plants
	Bolsa Mullaca tint	*Physalis angulata* L.	Herbal medicinal products
	Sangre de Grado	*Croton lechleri* Muell. Arg	Herbal medicinal products
	Pampa Orégano tint	*Lippia alba* (Mill.) N.E. Br.	Herbal medicinal products
	Llantén tint	*Plantago hirtella* Kunth	Herbal medicinal products
	Eucaliptus tint	*Eucalyptus globulus* Labill.	Herbal medicinal products
	Natural ointment	*Eucalyptus globulus* Labill., *Pseudocalymma alliaceum* (Lam.) Sandwith, *Ruta graveolens* L., *Eugenia aromatica* O. Berg, *Cinnamomum zeylanicum* Blume	Herbal medicinal products
TURMANYE	Camu camu fruit, yacon, cat's claw, dragon's blood, yacon root	*Myrciaria dubia* (HBK) Mc Vaugh (camu camu), *Smallathus sonchifolius* (Poepp. & Endl.) H. Robinson (yacon), *Uncaria tomentosa* (Willd.) D.C. (cat´s claw), *Croton lechleri* Muell. Arg (dragon´s blood)	Medicinal and aromatic plants
UNIFARM	Medicinal plants in capsules and flasks		Herbal medicinal products

Company	Product	Plant	Type of product
	Alfalfa, Caigua, Cat´s claw, Chancapiedra, Dragon´s blood, Graviola, Hercampuri, Maca, Pasuchaca, Senna, Valerian´s root, Yacon	*Medicago sativa* L. (alfalfa), *Cyclanthera pedata* (L.) Schrad. (caigua), *Uncaria tomentosa* (Willd.) D.C. (cat´s claw), *Phyllanthus niruri* L. (chancapiedra), *Croton lechleri* Muell. Arg (dragon´s blood), *Annona muricata* L. (graviola), *Gentianella alborosea* (Gilg) Fabris (hercampuri), *Lepidium meyenii* Walp (maca), *Geranium dielsianum* R. Knuth (pasuchaca), *Cassia angustifolia* Vahl (senna), *Valeriana officinalis* L. (valeriana), *Smallathus sonchifolius* (Poepp. & Endl.) H. Robinson (yacon)	Herbal medicinal products
	Maca forte, capsules	*Lepidium meyenii* Walp (maca) and mixture of medicinal plants	Herbal medicinal products
	Delga 2, capsules	*Cyclanthera pedata* (L.) Schrad. (caigua), *Gentianella alborosea* (Gilg) Fabris (hercampuri), *Allium sativum* L. (ajo)	Herbal medicinal products
	Hepanatur, capsules	*Taraxacum officinale* F.H. Wigg. (diente de león), *Peumus boldus* Molina (boldo), *Berberis vulgaris* L. (barberry)	Herbal medicinal products
	Prostaflam, tablets	*Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC., *Bixa orellana* L.	Herbal medicinal products
	Variflam, capsules	*Hamamelis virginiana* L. (hamamelis), *Cupressus sempervirens* L. (cipres)	Herbal medicinal products
YACUMAMAN	Ayahuasca	*Banisteriopsis caapi* (Spruce ex Griseb.) C.V. Morton	Medicinal and aromatic plants

Source: Data was retrieved fron each corresponding company's websites at Table 7. Supplied by Dr. Diana Flores (*Personal communication*).

Table 6. List of Peruvian producers by economic sector and economic location

Economic sector	Producers	Geographic location
Herbal Medical Products	AGROINDUSTRIAL CHANCHAMAYO	Lima
	AGROINDUSTRIAS BACKUS	Lima
	AGROINDUSTRIAS FLORIS	Lima
	AGRONATURALES	Ate
	AMAZONIAN NATURAL PRODUCTS	Iquitos
	BIONATURISTA	Arequipa
	BUPO SAC	Lima
	CABEX	Lima
	CHAKARUNAS TRADING	Lima
	CODEPLAN	Lima
	CPX PERU	Lima
	DESHIDRATADOS TROPICALES	Lima
	ECOANDINO	Surco
	EXPORTACIONES AMAZONICAS NATIVAS	Miraflores
	FITOFARMA	San Luis
	FITOMUNDO	Lima
	FITOVID	Lima
	GRUPO CONSULTOR	Lince
	GYRISA	San Isidro
	INDUQUIMICA	Lima
	INTERANDINA	La Molina
	KESHUA / ASHANINKA	Lima
	KOKEN DEL PERU	Lima
	LABORATORIOS PORTUGAL	Arequipa
	LIOFILIZADORA DEL PACIFICO	Miraflores
	Mi Naturaleza Amazonica (MINA)	not reported
	NATUMAX	Lima
	NATURAL WORLD	Lima
	PANPACIFIC CORPORATION	Jesus Maria
	PEBANI INVERSIONES	Lima
	PERUVIAN INVESTMENT	Chucuito - Callao
	PERUVIAN NATURE	Lurin
	PRODEAGRO	Miraflores
	QUIMPER	De Surco
	RF CAR	Lima
	SOCIEDAD AGROCOMERCIAL DEL PERU	not reported
	UNIFARM	Breña
Perfumes and cosmetics	ECOPRO	Callao
	NATURAL LIFE	Lima
	QUALITY PEOPLE PROCESS PRODUCTS	Barranco
	RAIS VIDA	Lima

Nutraceuticals and allies	AGROINDUSTRIAL CHANCHAMAYO	Lima
	AGROINDUSTRIAS BACKUS	Lima
	AGRONATURALES	Ate
	AURANDINA	Lima
	CABEX	Lima
	CORPNATUEFRUIT	Lima
	CPX PERU	Lima
	DESHIDRATADOS TROPICALES	Lima
	ECOANDINO	Surco
	ECOPRO	Callao
	EMPRESA AGROINDUST. DEL PERU	Miraflores
	EXPORTACIONES DE LA SELVA	Lima
	HIRO EXIMPORT	Callao
	IMPEXCO	Lima
	INDUSTRIAL AGROCHALLHUA	Miraflores
	MERIDIAN ENTERPRISE	Nicolas Rodrigo
Pharmaceutical aids	ACM PERU	Ate
	AGROINDUSTRIAS AMAZONICAS	Lima
	AGROINDUSTRIAS FLORIS	Lima
	ANDEAN PRODUCTS	not reported
	BIONATURISTA	Arequipa
	CABEX	Lima
	CARBONES Y DERIVADOS	Miraflores
	CDEPYMES	Huanuco
	CODEPLAN	Lima
	CORPORACION JOSE R. LINDLEY	Lima
	EXPORTACIONES DE LA SELVA	Lima
	FRUCTUS TERRUM S.A.	Surquillo
	GHAL INVESTMENTS	San Borja
	INVERSIONES SAMSARA	Lima
	MG NATURA	Lima
	NATERI REPRESENTACIONES	Lima
	NATURAL PERU	Lima
	NATURANDINA	Lima
	NORPAL	Los Olivos
	NOVANDINA	Lima
	PEBANI INVERSIONES	Lima
	PERU AMAZON EXPORT	Lima
	PERUVIAN HERITAGE	Santiago Surco
	R. MUELLE	Callao
	RAINLABS	Ate
	REATEGUI SIETE	Lima
	TAKIWASI	San Martin
	TURMANYE	Lima
	YACUMAMAN	not reported

Source: Analysis of Tables 5 and 7.

Table 7. List of Peruvian companies

Company	Contact	Phone	Fax	Email	Web	Address
ACM PERU	Emilio Lozano	436-0666	436-9571		www.acmperu.com.pe	Los Frutales 461, Ate
AGROINDUSTRIAS AMAZONICAS	Jose Anaya Yaber	345-2019	345-0462		www.industriasamazonicas.com.pe	Calle C 265, Lima 33
AGROINDUSTRIAL CHANCHAMAYO	Alfonso Higa	533-1569	533-1569	agroindc@ec-red.com		Marcos Farfan 3181, Lima 12
AGROINDUSTRIAS BACKUS	Esteban Liebminger	241-4500	444-5445	contact@agrobackus.com.pe	www.agrobackus.com.pe	Ricardo Palma 894 Miraflores. Lima - Perú
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QUALITY PEOPLE PROCESS PRODUCTS	Cecilia Terry Chaves	461-0693	261-8158	3qp@millicom.com.pe	www.perumarketplaces.com/3qp	Tte. Delucchi No. 80, Barranco
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Source: Dr. Diana Flores, Responsable de Latinpharma Peru. Gerencia de Manufacturas Diversas y Artesanías, Sector Manufacturas Diversas, Comisión para la Promoción de Exportaciones (PROMPEX); Data was retrieved fron each corresponding company's websites.

ANNEX 1.

Spondias mombin L.
Species Plantarum 1: 371. 1753.
FAMILIA: Anacardiaceae

FIGURA 11. ***Spondias mombin*** L.
Fotografía: CIFLORPAN

SINÓNIMOS

Spondias lutea L.
Spondias aurantiaca Schumach. & Thonn.
Spondias axillaris Roxb.
Spondias cythera Tussac
Spondias dubia A. Rich.
Spondias graveolens Macfad.
Spondias lucida Salisb.
Spondias lutea L.
Spondias lutea var. *glabra* Engl.
Spondias lutea var. *maxima* Engl.
Spondias myrobalunus L.
Spondias nigrescens Pittier
Spondias oghigee G. Don
Spondias pseudomyrobalanus Tussac
Spondias purpurea var. *venulosa* Engl.
Spondias radlkoferi Donn. Sm.
Spondias venulosa (Engl.) Engl.
Spondias zanzee G. Don

NOMBRES COMUNES EN LOS PAÍSES IBEROAMERICANOS

Cedrillo, orocorocillo (BOLIVIA)
Acajú, cajá, cajarana, teperbá (BRASIL)
Arisco, Cancharana, Canyarana, Ciruelo, Ciruelo calentano, Ciruelo de Castilla, Ciruelo hobo, Ciruelo de hueso, ciruelo de monte, hobo, jobo, jobo arisco, jobo blanco, jobo colorado, jobo de castilla, jobo del Amazonas (COLOMBIA)
Jobo, obo, roji (Siona) (ECUADOR)
Jobo (PANAMÁ)
Amahuaca (Ubus), dÿí (Ese eja), sheson (Shipibo-conibo), ylopo (Piro_Yine) (PERÚ)
Jobo (VENEZUELA)

DESCRIPCIÓN BOTÁNICA

Arbol de 7–20 m de altura; corteza gris, lisa o con fisuras levantadas, segmentos toscos. Hojas imparipinnadas, 9–19 folioladas; pecíolo 5–6.5 cm, raquis 15–35 cm, ambos teretes, glabros a puberulentos, peciólulos laterales 1–7 mm, glabros a puberulentos, peciólulos terminales hasta 2 cm de longitud, lámina 5–16 x 1.5–7 cm, lanceolada a ovada o elíptica a oblonga, oblícua, cartácea, glabra excepto en la porción terminal, a menudo puberulenta en el envés, base redondeada a cuneada o cortamente atenuada, margen entero o remotamente subcrenado, a menudo subondulado, ápice acuminado con acumen obtuso a agudo o ápice raramente agudo; venación en el haz prominente o subimpresa, en el envés prominente, braquidódroma-pinnada con nervios pequeños arqueados. Inflorescencia terminal, en panícula frondo-bracteosa de 15–40 cm de longitud, ramas laterales perpendiculares a los ejes principales, glabras a pulverulento; brácteas deltoides, 0.5–1 mm, glabras a puberulentas, margen ciliado; pedicelos 1–4 mm glabros a pulverulento, articulados proximalmente. Sépalos 5, 2.5–3.5 x 1–1.5 mm, blanco-amarillentos, angostamente ovados a oblongos u obovados, cóncavos, curvados a extendidos, agudos y subuncinados; estambres (8-) 10, algunos episépalos de

2–3 mm y ligeramente más largos que los otros epipétalos, filamentos subulados, delgados, anteras 0.8-1.2 mm, oblongas, ligeramente curvadas; disco alrededor de 1.5 mm de ancho, ligeramente comprimido lateralmente, 10-crenado a crenulado; pistilo (4) 5 connado, pero claramente definidos los carpelos, ocasionalmente desigual en tamaño; estilos (4) 5, alrededor de 0.5 mm de longitud; estigmas lineares. Infrutescencia con muchos frutos; frutos 2-4 x 1-2.5 cm, verdes a amarillos, oblongos a ovoides, mesocarpo carnoso, jugoso, endocarpo 1.5-3.5 x 0.5-2 cm, cilíndricos (fide, BARFOD, 1987:37).

DISTRIBUCIÓN GEOGRÁFICA Y HÁBITAT

En Perú se encuentra en Amazonas, Huánuco, Junín, Loreto, Madre de Dios, Pasco, San Martín, Ucayali. Crece en las cimas de los cerros, tipo de suelo arcilloso, húmedo (BRAKO Y ZARUCCHI, 1993). Costa Rica, Honduras, Nicaragua, El Salvador, Panamá, Bolivia, Colombia, Ecuador, Paraguay, Suriname, Venezuela, República Dominicana, Puerto Rico, Camerún, Ghana, Nigeria, Gabón. Especie cultivada e introducida.

Spondias mombin L. es un árbol deciduo, de bosque seco tropical (BS-T) y de zonas húmedas (BH-T); es común en terrenos anteriormente cultivados y suelos livianos o medianos. Se distribuye desde México (y toda Centroamérica) hasta Brasil y Perú, y no pasa de los 1,500 m s.n.m.(MOZO, 1972).

Esta especie ha sido introducida y naturalizada en África Tropical y Asia (BLACKWEL Y DODSON, 1968).

USOS ETNOMÉDICOS Y MODO DE EMPLEO

MENDIETA & DEL AMO (1981), indican que los frutos aplicados localmente, curan las inflamaciones de las rodillas. También se utiliza para combatir las infecciones de las encías, las enfermedades del intestino y la vejiga. Sus raíces y hojas, se emplean para reducir la fiebre, resfriados y para limpiar heridas (ANGEHR, ET AL. 1984). Según GARCÍA-BARRIGA (1975), la corteza la usan los indígenas Ticunas del Amazonas para tratar metrorragia y las polimenorreas, para esto, colocan la corteza en agua hirviendo y cuando la preparación está fría la toman frecuentemente; utilizada a diario funciona como anticonceptivo, cuando las mujeres Ticunas dejan de tomar la decocción quedan embarazadas.

Tiene propiedades cicatrizantes, hemostáticas y astringentes. Se usa para el tratamiento de las heridas, diarreas, úlceras intestinales, infecciones de la vagina. En el caso de los lavados hay que hervir la corteza durante dos horas y hacer lavados vaginales (durante 2 días). Para las diarreas, se prepara una infusión con la corteza y se bebe.

La resina extraída de la corteza se aplica, directamente sobre heridas en la piel. Si la corteza ya está seca se muele hasta obtener un polvo fino, se coloca sobre heridas en la piel, una vez se haya lavado.

Para tratar el sarpullido se muelen las hojas y se frota el área afectada (BRACK, 1999).

ACTIVIDAD FARMACOLÓGICA Y BIOLÓGICA

Ensayos *in vitro* en una variedad resistente de ***Neisseria gonorrhoeae*** aislado de pacientes sintomáticos y confirmado por procedimientos bacteriológicos estandarizados, mostró

pequeña actividad con una zona de inhibición de 6,0 mm en el caso de la tintura alcohólica de las hojas y de 7,6 mm en el de la corteza, aplicando 50 µL de la tintura (equivalente a 50 mg del material vegetal inicial) (CÁCERES ET AL., 1995).

De acuerdo con BARROS ET AL. (1970), ***S. mombin*** mostró actividad cardiorespiratoria sobre ratones y pequeños peces de laboratorio.
Los extractos etanólicos al 5% y acuoso al 20% fueron activos contra ***Escherichia***, ***Pseudomonas***, ***Shigella***, ***Streptoccocus***.

El geraniin y galloilgeraniin muestran actividad antiviral contra los virus Coxsackie B_2 y ***Herpex simplex*** tipo 1 a una concentración de 50 µg/mL. Estos resultados confirman la actividad antiherpes previamente encontrados para el geraniin y taninos relacionados por medio del ensayo "formación de placa". Ambos compuestos muestran una débil actividad antibacterial contra ***Enterobacter aeruginosa*** y ***Proteus vulgaris*** a 500 µg/mL; y fueron inactivos contra otros hongos y bacterias a la misma concentración (CORTHOUT ET AL., 1991).

El éster butílico del ácido clorogénico mostró una actividad antiviral contra **Herpes simplex** *1 (dosis 100 µg/mL); el ácido 2-O-cafeoil-(+)-allohidroxicítrico mostró actividad antiviral contra Coxsackie B_2 (dosis 100 µg/mL); y el ácido clorogénico no nostró actividad. La actividad mostrada por los cafeoil ésteres es menos pronunciado que la de los elagitaninos (CORTHOUT ET AL., 1992).*

TOXICIDAD Y ESTUDIOS CLÍNICOS

Puede producir náuseas o vómitos pasajeros. Extractos acuosos de la hojas poseen actividad abortiva (OFFIAH ET AL, 1989).

QUÍMICA

*Las hojas y tallos contienen los elagitaninos geraniin y galoilgeraniin; además, de ácido clorogénico, éster butílico del ácido clorogénico y el ácido 2-*O*-cafeoil-(+)-allohidroxicítrico (CORTHOUT ET AL., 1992).*

Los frutos contienen vitaminas como el ácido ascórbico; bencenoides como benzaldehído, 4-alil-1,2,3-trimetoxibenceno, 5-alil-1,2,3-trimetoxibenceno, ésteres butílico, etílico y metílico del ácido benzoico, éster metílico del ácido salicílico; otros ésteres: acetato y butirato de etilo, ésteres etílico y hexílico del ácido hexanoico, acetato y butirato de hexilo, éster etílico del ácido 3-hidroxihexanoico, éster metílico de eugenol, éster butílico del ácido caproico, éster etílico del ácido caproico y caprílico; sesquiterpenos: óxido de cariofileno, β-cariofileno, α-copaeno, β-cubebeno, cubenol, β y γ-selineno; pentanal, 2-metilpentanal, 2-metilpropanal, 2-metil-1-propanol (ALDELEJI ET AL., 1991).

En el aceite esencial de los frutos aldehídos (butanal); alcoholes (2 y 3-metil-1-butanol, octan-1-ol), cetona (3-metil-2-butanona); ésteres (butanoato de etilo y de hexilo, 3-hidroxibutanoato de etilo, propilo y butilo, acetato de butilo, octanoato de etilo); monoterpenos (linalol, óxido de linalol, nerol, cis y trans-β-ocimeno, α y δ-terpineol, terpinen-4-ol, acetato de geraniol; sesquiterpenos (α y δ-cadinol, δ-cadineno, α-humuleno, curcumeno) (SAGRERO-NIEVES ET AL., 1992).

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