CZECH UNIVERSITY OF LIFE SCIENCE IN PRAGUE

Faculty of Tropical AgriSciences

Ethnobotanical inventory of medicinal plants in province Imbabura, Ecuador

Bachelor thesis

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BACHELOR THESIS ASSIGNMENT

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Agriculture in Tropics and Subtropics

Thesis title

Ethnobotanical inventory of medicinal plants in province Imbabura, Ecuador

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Objectives of thesis

The aim of the thesis will be inventory of medicinal plants use in traditional medicine in province Imbabura (Ecuador), specifically in Ibarra and Cahuasqui.

Methodology

The information will be acquired in the form of questionnaire from local people and subsequently process in a table forms. In the first survey, questions will focuse on local names of medicinal plants, plant parts, which are used for trating diseases, methods of use and dosage.The second questionnaire will focuse primarily on demographic datas like place of residence, age, profession and personal opinion of the current traditional medicine.

The proposed extent of the thesis

30

Keywords

Ecuador, Ethnobotany, Medicinal plants, Traditional medicine

Recommended information sources

Buitrón CX. 1999. Uso y comercio de plantas medicinales, situación actual y aspectos importantes para su conservación. Quito:TRAFFIC international. 134 p. ISBN 9978-40-934-3

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Escaleras N, Escaleras P, Escaleras R. 1995. La medicina tradicional en el Ecuador: memorias de las Primeras Jornadas Ecuatorianas de Etnomedicina Andina. Quito: Universidad Andina Simón Bolívar/Corporación Editora Nacional. 192p. ISBN: 9978-84-218-7

Morales MR, Øllgaard B, Kvist LP, Borchsenius F, Balslev H. 2006. Botánica Económica De Los Andes Centrales. La Paz: UMSA. 557 p. ISBN-13: 978-9995401214

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Prague on 20. 04. 2017

“I hereby declare that this thesis entitled Ethnobotanical inventory of medicinal plants in province Imbabura, Ecuador is my own work and all the sources have been quoted and acknowledged by means of complete references.”

In Prague, 21. 4. 2017

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Lucie Dostalíková

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Abstract

Traditional medicine could be defined as a summary of knowledge, skills and practices, which are built on many experiences and theories. These practices and knowledges are unique for each culture and state, but due to many reasons there is a loss of these traditions in Ecuador.

Ethnobotanical and socio-demographical data were collected using semi-structured interviews with 34 local informants from Ibarra and Cahuasquí. In addition, quantitative approaches were used to determine medicinal use value (MUV), use report (UR), fidelity level (FL), frequency of citation (FC), relative frequency of citation (RFC) and informant consensus factor (ICF).

A total of 72 medicinal plant species belonging to 38 botanical families were reported to treat diseases in the study areas. The most common families of medicinal plant species as depicted by its number of species (8 species) were Lamiaceae and Asteraceae as the dominant families. The highest number of species was used in the treatment of gastrointestinal diseases (29 species), this category also had the highest ICF (63.75). The main route of administration was oral (83 %) and the most commonly applied methods of preparation was infusion (74 %). Highest use report was calculated for Urtica dioica L. - 8 UR, the highest value of relative frequency of citation (RFC) and medicinal use value (MUV) were calculated for *Marticaria chamomilla* L. The most important medicinal plants were evaluated *Marticaria chamomilla* L., *Ruta graveolens* L., *Origanum vulgare* L. and *Urtica dioica* L. One of the widely used endemitic and native species in Ecuador was *Aristeguietia glutinosa* (Lam.) R.M.King & H.Rob.

According to comparison of place of residence and age of respondents, population in rural areas had more knowledge than the urban population and also older generations in both study areas had more knowledge than younger generations.

The study area is rich in medicinal plant diversity and associated indigenous knowledge, but still needs more exploration and study. Thus, it is important to document and save all the practices which exist in Imbabura, whole Ecuador and other areas of the world, and preserve this knowledge for future generations.

Keywords: Ecuador, Ethnobotany, Medicinal plants, Traditional medicine

Contents

List of figures, tables and graphs

1 Introduction

From ancient times, medicinal plants have been used for many different purposes - shamans' rituals, medicines and also as food and spices. These plants are an important part of traditional medicine and amount of them is quite large- more than 50,000 plant species are being used in different human cultures all around the world for treating health problems (Schippmann *et al*., 2002).

Traditional medicine could be simply defined as a summary of knowledge, skills and practices which are built on many experiences and theories used for maintenance of health, prevention, diagnosis or healing mental and physical diseases (Zhang, 2015). Traditional medicine mainly uses not just plants, but also animal and mineral based medicines, special exercises or spiritual therapies for treating illnesses. These practices and knowledge are unique for each culture and state (WHO, 2004).

According to the World Health Organization (WHO, 2002) 80% of the population in developing countries use traditional medicine as their primary health care, but the number is decreasing. Nowadays there is a loss of indigenous knowledge, because the information about medicinal plants and their use is passed on from mouth to mouth and sometimes there are no records or documentations about it (Cox, 2000; Djoghlaf, 2008). This could make big trouble in the future, because 25% of current modern medicines are made from plants first used in traditional medicine (WHO, 2004). In this respect, Ecuador has big potential, because there exist about 3000 medicinal plants, which could be used for different therapeutic purposes. Expressed in percentage, about 60 % of all useful plants in Ecuador have a big importance in traditional medicine (de la Torre *et al*. 2008).

The present situation in Ecuador is not very positive. Still, there is about 80 % of the population which is being treated using traditional medicine (Buitrón, 1999), but the current problem is that the younger generation has no interest in traditions of their country and also a migration of the people from rural to urban areas causes the loss of knowledge. The information of medicinal plants may by forgotten this way, therefore it is really important to document all these traditional knowledge for future generations before it becomes lost in the acculturation processes (Nakashizuka, 2007; Cunningham, 2001).

2 Aims of the thesis

The aim of the study was inventory of medicinal plants and recording the indigenous knowledge of medicinal plants by the inhabitants from communities Ibarra and Cahusquí in province Imbabura, Ecuador.

Hypothesis:

I. The younger generation has very little knowledge of using medicinal plants in traditional medicine and sphere of research.

II. Inhabitants of rural zones (Cahuasqui) have more knowledge about medicinal plants usage than inhabitants of urban zones (Ibarra).

3 Methodology

3.1. Geographical data

The Republic of Ecuador lies in north-western South America exactly on the equator. With its area (283.561km²), Ecuador is the 74th biggest country in the world (CIA, 2009). From the north to the south, the country is crossed by the Andes mountain range and its weather is mainly determined by dry and cold Humboldt stream. The combination of these factors implicates a real wide variety of climate and vegetation types (de la Torre *et al*., 2008).

Ecuador is split into four main geographic regions – the coast (La Costa), highlands (La Sierra), the east – Amazonian rain forest (La Amazonia) and Galápagos Islands. Each of these regions is different – different flora, fauna, climate and also different medicinal plants and ways of healing in traditional medicine (de la Torre *et al*., 2008).

Our survey was made in two places in province Imbabura, which is situated between 0°09'51.5"N to 0°52'02.7"N latitude and 78°22'22.3"W to 78°25'00.5"W longitude and occupies 4.599 km², so it's the eighth biggest province in Ecuador (INEC, 2010). According to the Köppen climate classification, the study area lies in the subtropical highland variety. Mild summer and cool winter seasons are typical for this kind of climate (McKnight, 2000).

The first chosen study area –San Miguel de Ibarra (or simply Ibarra) - is the capital city of the province Imbabura and lies in the north of Ecuador in canton Ibarra in sub region Tropical Andes. The next chosen area was Cahuasquí, which lies 23 kilometres north of Ibarra in province Imbabura as the crow flies, located in canton San Miguel de Urcuquí. The reason, why we chose these two places is clear – San Miguel de Ibarra is the urban zone and Cahuasquí is the rural zone, so there could be some differences in knowledge of medicinal plants and the use of them.

Map of Ecuador with highlighted province Imbabura

Map of province Imabura with marked communities, where the research was realized

Figure 1: Map of study area

3. 2. Demographical data

According to Instituto Nacional de Esradísticas y Censos, Ecuador (INEC, 2010), the province Imbabura has approximately 398 244 inhabitants, from which 57.8 % live in urban zone and 42.2 % in rural zones.

In province Imbabura are also some ethnical groups, the biggest one are mestizos (65.7 %), the next are indigenous people (25.8 %), afroecuatorians (5.4 %) and others (3.1 %). The main economical activities in province Imbabura are agriculture, forestry and fishing (22.2 %), manufacturing industry (18.7 %) and trade (18.4 %).

3. 3. Field interviews

The survey was realized from July to August 2016. The information was collected through semi- structured interviews with sellers on marketplaces and randomly selected people in different age categories, gender or education. The interviews were made in the official language – Spanish.

In urban zones, the survey was carried out of places, where a large concentration of people is, mainly at marketplaces. The research was made on three of them -

Mercado Amazonas, Mercado Mayorista de Ibarra and Mercado Santo Domingo de Ibarra.

In the second chosen area- Cahuasqui- there aren´t any marketplaces, so the interviews were made by visiting people in their houses.

The questionnaire was mainly focused on ethnobotanical information – which plants do respondents use, for which reason and how to prepare them. All plants were selected by the International plant index. The survey also included personal data and opinions about current usages of medicinal plants in Ecuador.

3. 4. Quantitative analysis of data

Collected data was tabulated and analyzed by quantitative ethnobotanical indices: Use report (UR), frequency of citation (FC), relative frequency of citation (RFC), medicinal use value (MUV), fidelity level (FL) and informant consensus factor (ICF).

Use report (UR)

The UR means the number of uses for each plant species.

Frequency of citation (FC), relative frequency of citation (RFC)

The RFC is important for quantitative determining of well-known and most useful species in the area. This index could be calculated using this formula proposed by Tardio and Santayana (2008)

$$RFC = FC / N,$$

while FC is the number of informants, who mentioned the same plant species and N means number of all people participating in the survey.

Medicinal use value (MUV)

The MUV is modification of UV (use value) and it was calculated to demonstrate the relative importance of the species for medicinal purposes. MUV was calculated using following formula suggested by Šavikina *el al.*(2013)

$$MUV = \sum MU / N$$

Where MU is number of medicinal uses mentioned by each informant for a given plant species and N is number of all people participating in the survey.

Fidelity level (FL)

The FL shows the proportion in percentage of informants claiming the use of a plant species for the same major ailment to the total number of informants who mention the plant for any use. FL is used to determine the most preferred species used for treating particular ailment category (Bibi, 2015). It is calculated using this formula (Alexiades, 1996)

$$Fl = (Ip / lu) * 100$$

Ip....number of respondents, who independently mentioned given plant species for treating the same category of disease.

lu....number or all informants who mentioned the plant species for any use

Informant Consensus Factor (ICF)

The ICF is calculated for each category of medicinal uses to show the homogenity of knowledge about using the species in each diseases category among the populations. The ICF was calculated using following formula proposed by Heinrich *et al*. (1998)

$$ICF = (nur - nt) / (nur – 1)$$

Where, "nur" is the number of use report in each category of diseases, and "nt" is the number of species used for particular category by all informants.

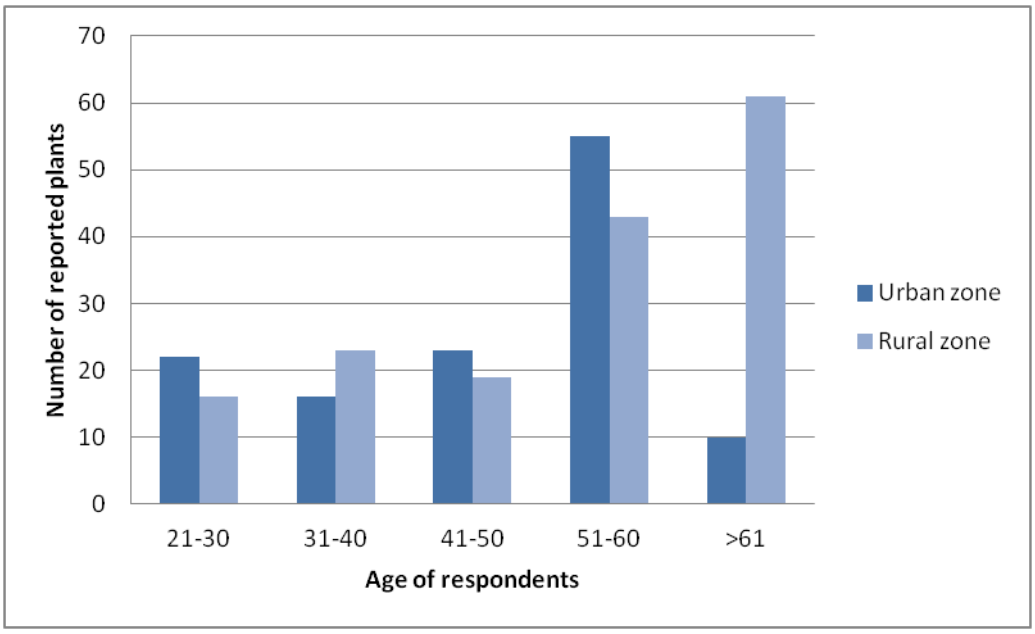
High value of ICF (close to number one) indicates that there is a well-known group of species used for healing particular ailment categories and the knowledge about the use of medicinal plants is exchanged well among populations of the study area, whereas a low value (close to zero) indicates disagreements over which plant to use. The reason for this could be random choosing or an inadequate exchange of information among the populations (Gazzaneo, 2005).

4 Results and discussion

4.1 Socio- demographical data of respondents

A total of 35 respondents (82 % female, 18 % male) were interviewed from two different areas – rural zone (38 % informants) and urban zone (62 % informants). Large number of respondents were in the age group between "51 -60 years" (38 %), followed by "21-30 years" (23 %), than "31-40 years" (15 %), "45-50" and "above 61 years" both 12 %. The biggest amounts of informants were employed as sellers (47%), workers (15 %) and nurses (9 %). Only one respondent of all was a student and one a pensioner, both 3 %. 23 % of all respondents were housewives with no other employment.

According to age of respondents and place of residence, the research points out some differences in knowledge of medicinal plants between young and old generation and also between urban and rural zone (Graph 1). The graph shows, that older people, in particular at the age of 51+ (regardless of their place of residence), have much more knowledge of medicinal plants unlike people up to 30 years old. After the division of knowledge by age categories turns out, that people in some age categories living in urban areas have more knowledge than the population of rural areas, but the total sum of all reported medicinal plants in each area clearly specifies, that rural population knows 12 % more medicinal plants than urban populations.



Graph 1: Comparison of quantities used medicinal plants in terms of age and place of residence

The loss of knowledge is current issue affecting not only Ecuador. Benz *et al.* (2000) contends in his research that the loss of knowledge among the younger generations contributes extinction of the native language and the modernization. Also Tuxill and Nabhan (2001) state, that traditional knowledge isn´t transmitted through generations as it used to be and young generation often leaves traditions of their elders in exchange for modern lifestyle, however, the family still plays a key role in traditional knowledge transfer. Toral *el al*. (2014) in his research points out, that many older people have much more knowledge than the young generation, while confirming the lack of interest among young people due to easier access to modern medicaments.

Traditional medicine is mainly practiced in rural areas, but also to a lesser extent by urban population of all social classes because on all markets in Ecuador, there is possible and quite easy to find wide variety of plants with medicinal purposes (Bussmann and Sharon, 2006; Cerón, 2003).

4.2. Usage of medicinal plants in traditional medicine by respondents

The survey shows, that 100 % of respondents use medicinal plants for treating their illnesses. This result wasn´t surprise, because similar results were confirmed in research by Ansaloni *et al*. (2010). He pointed out that 80% of the population in Ecuador use traditional medicine. Vandebroek *et al*. (2008) also confirmed these results in his research. He claims that 90% of the population in developing countries and 60% in developed countries primarily use traditional medicine for treatment. The causes that emphasize the widespread use of medicinal plants among Ecuadorians are the low purchasing power of the majority, who don´t have access to modern medicine, the lack of official systems of effective healthcare, but also large amounts of old traditional medicinal knowledge (Buitrón, 1999).

The reason of using traditional medicine is mainly because of family traditions (65 %), and low prices (3 %), but 11 of all respondents (32 %) cite more than 1 reason of using medicinal plants, predominantly because of family tradition, low price and higher efficiency. Almost all interviewees (97 %) use tradition medicine for more than 10 years; just one respondent (3 %) use it less than 1 year. The knowledge is mainly transmitted in family among family members (92 %), just 2 of the respondents (5 %) got their knowledge on marketplaces and 1 (3 %) in a special workshop

and at university. With this finding also cohere, that 91% interviewees don´t visit a healer because all of them have enough experiences and knowledge for healing themselves. These results confirm the hypothesis of other authors, that knowledge is predominantly acquired through parents and grandparents, or through social interactions with other elderly members of the family (Toledo and Kutschkerv, 2012; Toral *et al.*, 2014).

People participating in the survey mentioned buying medicinal plants on marketplaces (44 %), while 96 % of them prefer purchasing plants in the town Ambato (in the province Tungurahua, 186 kilometres south as the crow flies from Ibarra). Some respondents grow medicinal plants in their gardens (20 %) and just a small amount of respondents (15 %) collect plants in the countryside. 21 % of respondents grow their own medicinal plants and also buy some in marketplaces.

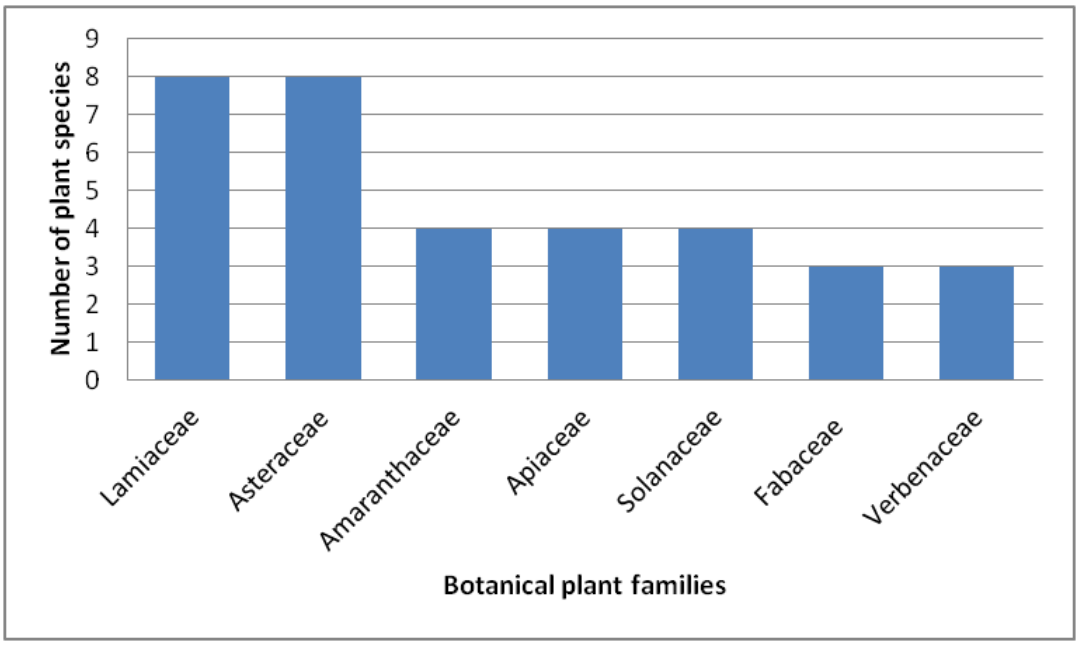
The possibility of obtaining medicinal plants near the place of residence is available for 53 % of respondents; the rest of them have no possibilities of collecting/growing plants or it´s too far from their places of residence (47 %). When comparing urban and rural zones, 92 % of people in rural areas grow or collect their own plants; just 1 respondent had to buy them on local markets. By contrast, 67 % people in urban areas are able to grow some medicinal plants, but all of them also buy some other medicinal plants on local markets. In the city, it´s much easier to buy some medicinal plants, but still there are exceptions that can grow their own ones; they are mostly people over 60 years old. Purchases plants generally prefer people between 25 – 60 years of age (Toral *et al*., 2014).

4.3. Diversity of medicinal plants

A total of 71 plant species belonging to 38 botanical families were reported to be used for healing by local inhabitants in Cahuasquí and Ibarra. The five most used plant families in our study area were family Lamiaceae and Asteraceae (8 species), followed by Amarathaceae, Apiaceae and Solanaceae - each 4 species (Graph 2).

This finding agree with many other studies, which present families Lamiaceae and Asteraceae as the most dominant plant families, for example in the study of Bennett and Prance (2000), these two families together represented 21 % of the 216 species surveyed in the north of South America or in study of de la Torre *et al.* (2008) realized in Ecuador, Asteracea is botanical family with the highest number of species

used for their healing effects, followed by Fabaceae, Rubiaceae, Solanaceae and others. Lamiaceae are a dominant botanical family because the species of this family contain a lot of terpen oils in their epidermal cells, which have antioxidant and antimicrobial properties (Kuhnt *et al*. 1995). Thanks to these features, Lamiaceae is often used in different parts of the world in traditional medicine (Heinrich, 1992).

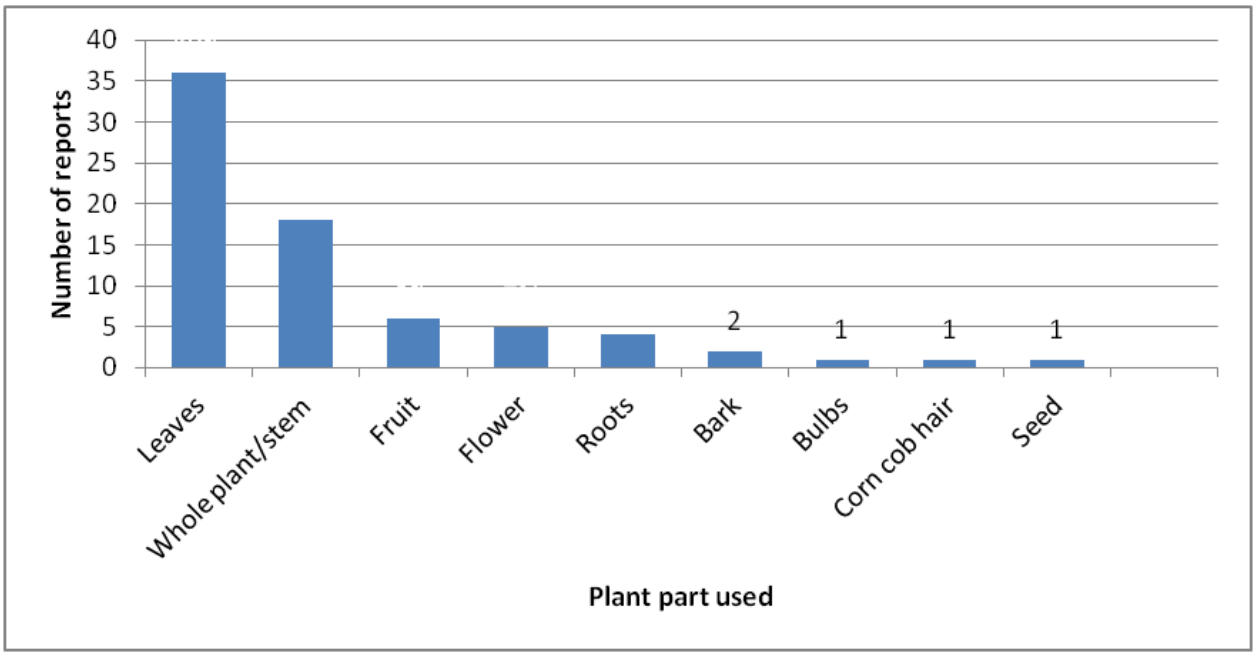


Graph 2: The most cited botanical plant families in study area

4.4. Plant part used, methods of preparation

Leaves (49 %) were the most commonly used parts of plants, followed by whole plant (23 %), fruit (8 %), flower (7 %), roots (6 %), bark (3 %), bulbs, corn cob hair and seeds, each 1 % (Graph 3). Our finding is in line with de la Torre *et al*. (2008), who reported using leaves and whole plant as the most used part of plant in Ecuador and also with study of Toral *et al*. (2014), realized in Santa Ana de los Ríos de Cuenca, Ecuador, who also indicated leaves and whole plant as the most used plant parts in their study area, followed by flower, roots, stem and fruit.

According to Angulo *et al*. (2012), in many communities in tropical areas, leaves are the most preferred plant parts because they are continually available. The next reason of their large use is because a lot of plants store chemical compounds in the form of secondary metabolites with biological activities mainly in their leaves.



Graph 3: Plant part used

The main route of administration is oral (83 %), followed by external application (17 %). The most common methods of preparation are infusion (74 %), followed by dermal application (12 %), eating fresh plant or leaves/fruit/bulbs/ roots (5 %), extracts, inhalation, bath and drinking juice from fruit (each 2%) and poultice 1 %. Most of the plants are consumed or applied raw (95 %) and only 5 % of plants are used dried. Some of the ethnobotanical researches mention, that bioactive compounds in plants could be lost on drying therefore fresh material could have higher efficiency in healing (Leukal *et al*., 2013). The forms of preparation of the medicinal plants are carried out in a specific manner according to the particular condition to be treated; but the most common way to prepare the medicine is infusion as it provides optimal results in disease treatments (Zambrano-Intriago *et al*., 2015), because heating enables main chemical compounds to dissolve easily and this way makes it easier available to the body (Song *et al*., 2004)

4.5. Medicinal use, ICF

The survey involves 52 different diseases, which were divided into 14 categories according to International Classification of Diseases (ICD) by The World Health Organization (WHO, 2016). According to Informant Consensus Factor (ICF) – Table 1, diseases of digestive problems have the highest ICF value (63.75), followed by wound

treatments (59.68) and respiratory diseases (55.17) – Table 1. These three main categories will be described in detail. The least agreement between the informants and therefore the lowest ICF was calculated for categories of Body detox, weight loss and antioxidants (14.29). Neoplasm, diuretic and musculoskeletal diseases have the zero ICF and therefore they aren ´t mentioned in Table 1.

According to Ministerio de Salud Pública (MSP, 2015), the top 6 cases of morbidity in cantons Ibarra and San Miguel de Urcuquí are mainly pharyngitis and tonsillitis (together 16.19 % of the population in these two cantons), followed by infections of urinary tract (3.82 %), intestinal parasitosis (3.8 %), acute vaginitis (3.78 %), diarrhoea and gastroenteritis with infectious origin (2.72 %).

From comparison of these results could be deduced, that people in this study don´t often attend hospitals in the case of not very serious problems (stomach ache, diarrhoea, halitosis, wounds treating etc.), because there exist vast knowledge as well as plenty of medicinal plants used for treating this problems. In contrast, infectious diseases are treated by modern medicine more often.

Table 1: Informant consensus factor

Category of diseases	nur	nt	ICF
1. Diseases of digestive system	81	30	63.75
2. Wounds, anti-inflammatory effects, stop bleeding	63	26	59.68
3. Respiratory diseases	30	14	55.17
4. Infectious and viral diseases	11	6	50.00
5. Diseases of the circulatory system and blood	15	8	50.00
6. Diseases of the genitourinary system	18	10	47.06
7. Skin diseases	12	7	45,45
8. Mental diseases	16	10	40.00
9. Endocrine System diseases	9	6	37.50
10. Diseases of the nervous system	7	6	16.67
11. Body detox, weight loss, antioxidant	8	7	14.29

4.5.1. Diseases of digestive system

The highest number of plants and also the highest ICF in our research was detected for treating diseases of digestive systems (29 botanical species). This category includes stomach ache (65 %), ulcers, diarrhoea (each 8 %), halitosis (5 %), gastritis (4 %), enteritis (3 %), flatulence (2 %), constipation, vomiting, deworming, gallstones and pancreatitis (each of them 1 %).

The botanical families with the highest number of reports were Lamiaceae and Asteraceae and mainly used species were Oregano (*Origanum vulgare* L.), Manzanilla (*Matricaria chamomilla* L). and Menta (*Mentha longifolia* (L.) L.). Main route of administration was definitely infusion.

Many studies focusing on using medicinal plants confirm, that the highest number of medicinal plants among different communities in Ecuador is generally used for the treatment of gastrointestinal problems, for instance Zipfel (2010), who described usage of medicinal plants by three communities in southern Ecuador – Shuar, Saraguros and Mestizos.

Zambrano-Intriago *et al*. (2015) in his study realized in San Carlos, Ecuador, presents the same results. This study also states that people in study area mostly use Hierba luisa (*Aloysia triphylla* Britton), Oregano (*Origanum vulgare* L.), Hierba buena (*Mentha spicata L.*), Menta (*Mentha longifolia* (L.) L.) for treating gastrointestinal diseases. Also, study by Paredes *et al.* (2015) realized in Los Ríos analyzed gastrointestinal diseases as the most treated problem by medicinal plants in Ecuador.

4.5.2. Wounds

For treating symptoms in this category, people in Ibarra and Cahuasquí use generally 24 plant species, the most frequently reported were Matico (*Aristeguietia glutinosa* (Lam.) R.M.King & H.Rob.), Llanten (*Plantago major* L.), Manzanilla (*Matricaria chamomilla* L.) and Choclo (*Zea mays* L.). Used species come mainly from families Plantaginaceae, Asteraceae and Poaceae. These plants are predominantly used as an infusion; poultice or applied directly on a wound. Application of these medicinal plants helps against inflammation, stops bleeding and speeds up healing.

As pointed by de la Torre *et al.* (2008), this group includes 17 % of all medicinal plants in Ecuador, which means about 536 plant species, while the most used specie

is Matico (*Aristeguietia glutinosa* (Lam.) R.M.King & H.Rob.) in mountain region and Sangre de drago (*Croton lechleri* Müll.Arg.) in Amazonian region.

4.5.3. Respiratory diseases

In this category, mostly reported diseases were caught, cold and sore throat. For treating this ailments, respondents use 12 plant species, mostly Eucalipto (*Eucalyptus globulus* Labill.), Borraja (*Borago officinalis* L.) and Tilo (*Tilia americana* L.), main plant families were therefore Myrtaceae, Boraginaceae and Malvaceae. These plants are used in a form of infusion or they are utilized and inhaled.

Bussmann and Sharon (2006) pointed out, that many houses at higher altitudes are often wet and cold due to poor insolation, which can cause higher indices of respiratory problems. Their results are closely related to the study by Zipfel (2010), which shows using higher numbers of medicinal plants against respiratory diseases in mountain regions than in Amazonian regions.

4. 6. Quantitative analysis of data

4.6.1. Use report (UR)

The high UR number shows, how broad portfolio of usage given plant may have. The highest use report was calculated for Ortiga (Urtica dioica L.) - 8 UR, followed by Manzanilla (Matricaria chamomilla L), Ruda (Ruta graveolens L.) – both 7 UR, Torongil (Melissa officinalis L.) – 6 UR, Eucalipto (Eucalyptus globulus Labill.) and Llanten (Plantago major L.) – both 5 UR (Table 2).

4.6.2. Frequency of citation (FC), relative frequency of citation (RFC)

The highest RFC was calculated for Manzanilla (*Matricaria chamomilla L*) – 0.68 RFC, Orégano (*Origanum vulgare* L.)- 0.50 RFC, Ruda (*Ruta graveolens* L.) – 0.38 RFC, Matico (*Aristeguletia glutinosa* (Lam.) R.M.King & H.Rob.) – 0.38 RFC and Ortiga (*Urtica dioica* L), – 0.26 RFC (Table 2).

Older studies realized in mountain regions reported 62 different plant species (approximately 120 plant families), from those widely used are Menta (*Mentha piperita* L.), Matico (*Aristeguletia glutinosa*), Hierba luisa (*Cymbopogon citrates* L.), Tipo (*Symphytum officinalis* L.), Sunfo (*Micromeria nubigena* Benth.)

and others (Muñoz, 1996). Current researches from other mountain regions have quite different upshots. Paredes *et al*. (2015) indicate Sábila (*Aloe vera* (L.) Burm.f.*)*, Hoje de aire (*Kalanchoe pinnata* (Lam.) Pers.), Ruda (*Ruta graveolens* L), Torongil (*Melissa officinalis* L.), Valeriana (*Valeriana officinalis* L.) and others as the most used plant species according to number of reports in rural area of San Jacinto in province Los Ríos, Ecuador. According to Fernández (2017), the most cited plant species in selected cantons of province Imbabura are Manzanilla (*Matricaria chamomilla L*), Cedrón (*Aloysia citrodora* Paláu), Llantén (*Plantago major* L.), Orégano (*Origanum vulgare* L.) and Hierba luisa (*Cymbopogon citratus* L.).

4.6.3. Medicinal use value (MUV)

Medicinal use values of the recorded plant species have been calculated with the highest number of value for Manzanilla (*Matricaria chamomilla* L.) – 0.91 MUV, Orégano (*Origanum vulgare* L.) – 0.56 MUV, Ruda (*Ruta graveolens* L.) – 0.50 MUV, Matico (*Aristeguietia glutinosa* (Lam.) R.M.King & H.Rob.) – 0.44 MUV, Ortiga (*Urtica dioica* L.) – 0.41 MUV and Torongil (*Melissa officinalis* L.) – 0.35 MUV (Table 2).

Matico (*Aristeguietia glutinosa* (Lam.) R.M.King & H.Rob.) is the only specie, which has origin in Ecuador (Montúfar and Pitman, 2003), while the other mentioned plants come mainly from Europe and they were introduced to Ecuador thanks to Spanish colonization (Buitrón, 1999). In contrast, the lowest MUV have in particular plant species, which aren´t typical for mountain region but rather for Amazonian region or the plant species, which don´t have large variety of use and also aren´t well-known among local populations.

4.6.4. Fidelity level (FL)

In this survey, there is a large number of medicinal plants with 100% FL (Table 2), but maybe there could be a mistake because of the low number of respondents and obtained information. 100% FL value have also plants, which didn´t have high FC and respondents didn ´t agreed with usage of the plants.

Plant species with high FL value have high healing potential (Leucal *et al*., 2013) and could be used for further phytochemical investigation to prove the bioactive components that are responsible for their ability to heal particular diseases (Heinrich *et al*., 1998).

Table 2: Quantitative analysis of data

Species	UR	FC	RFC	MUV	No. of use *	FL
***Aerva sanguinolenta* (L.) Blume**	1	1	0.03	0.03	1	100.00
***Agave americana* L.**	2	1	0.03	0.06	1	100.00
***Allium sativum* L.**	2	3	0.09	0.09	2	66.67
***Aloe vera* (L.) Burm.f.**	4	8	0.24	0.32	5	62.50
***Aloysia citrodora* Paláu**	4	4	0.12	0.15	2	50.00
***Aloysia triphylla* Britton**	2	5	0.15	0.15	4	80.00
***Amaranthus hybridus subsp. quitensis* (Kunth) Costea & Carretero**	4	3	0.09	0.15	1	33.33
***Annona cherimola* Mill.**	1	1	0.03	0.03	1	100.00
***Aristeguietia glutinosa* (Lam.) R.M.King & H.Rob.**	4	13	0.38	0.44	11	84.62
***Baccharis salicina* Torr. & A.Gray**	1	1	0.03	0.03	1	100.00
***Bauhinia forficata* Link**	1	2	0.06	0.06	2	100.00
***Borago officinalis* L.**	3	5	0.15	0.18	3	60.00
***Bougainvillea peruviana* Bonpl.**	2	1	0.03	0.06	1	100.00
***Brugmansia arborea* (L.) Steud.**	1	1	0.03	0.03	1	100.00
***Campyloneurum angustifolium* (Sw.) Fée**	1	1	0.03	0.03	1	100.00
***Cichorium intybus* L.**	1	1	0.03	0.03	1	100.00
***Citrus aurantifolia* (Christm.) Swingle**	1	1	0.03	0.03	1	100.00
***Coriandrum sativum* L.**	2	1	0.03	0.03	1	100.00
***Cuminum cyminum* L.**	1	1	0.03	0.03	1	100.00
***Cynara scolymus* L.**	3	3	0.09	0.12	2	66.67
***Dalea coerulea* (L.f.) Schinz & Thell.**	1	2	0.06	0.06	2	100.00
***Daucus carota* L.**	1	1	0.03	0.03	1	100.00
***Dittrichia viscosa* (L.) Greuter**	4	5	0.15	0.24	4	80.00

***Dracaena draco* (L.) L.**	3	2	0.06	0.09	2	100.00
***Equisetum arvense* L.**	4	6	0.18	0.18	4	66.67
***Eriobotrya japonica* (Thunb.) Lindl.**	2	4	0.12	0.12	3	75.00
***Eucalyptus globulus* Labill.**	5	6	0.18	0.26	5	83.33
***Ficus carica* L.**	2	4	0.12	0.18	4	100.00
***Geranium sanguineum* L.**	1	1	0.03	0.03	1	100.00
***Hibiscus sabdariffa* L.**	1	1	0.03	0.03	1	100.00
***Hordeum vulgare* L.**	1	1	0.03	0.06	1	100.00
***Chenopodium ambrosioides* L.**	1	2	0.06	0.06	2	100.00
***Chenopodium quinoa* Willd.**	1	1	0.03	0.03	1	100.00
***Linum usitatissimum* L.**	1	1	0.03	0.03	1	100.00
Lobularia maritima (L.) Desv.	2	2	0.06	0.03	1	50.00
***Mangifera indica* L.**	1	1	0.03	0.03	1	100.00
Matricaria chamomilla L.	7	23	0.68	0.91	15	65.22
***Melissa officinalis* L.**	6	8	0.24	0.35	6	75.00
***Mentha longifolia* (L.) L.**	4	6	0.18	0.21	5	83.33
***Mentha spicata* L.**	2	2	0.06	0.09	1	50.00
***Nasturtium officinale* W.T.Aiton**	2	1	0.03	0.03	1	100.00
***Ocimum basilicum* L.**	2	2	0,06	0.06	1	50.00
***Oenocarpus bataua* Mart.**	1	1	0.03	0.03	1	100.00
***Origanum vulgare* L.**	3	17	0.50	0.56	17	100.00
***Pachyrhizus erosus* (L.) Urb.**	4	4	0.12	0.15	4	100.00
***Passiflora ligularis* Juss.**	2	1	0.03	0.06	1	10000
***Peperomia congona* Sodiro**	1	2	0.06	0.06	2	100.00
***Petroselinum crispum* (Mill.) Fuss**	2	2	0.06	0.06	1	50.00
***Pinus heldreichii* Christ**	2	2	0.06	0.06	1	50.00

***Plantago major* L.**	5	8	0.24	0.29	6	75.00
***Psidium guajava* L.**	1	2	0.06	0.06	2	100.00
***Retrophyllum rospigliosii* (Pilg.) C.N.Page**	3	1	0.03	0.09	1	100.00
***Rosmarinus officinalis* L.**	1	6	0.18	0.18	6	100.00
***Ruta graveolens* L.**	7	13	0.38	0.50	6	46.15
***Salvia officinalis* L.**	1	1	0.03	0.03	1	100.00
Smallanthus sonchifolius* (Poepp.) *H.Rob.	2	1	0.03	0.06	1	100.00
***Solanum melongena* L.**	1	1	0.03	0.03	1	100.00
***Solanum americanum* Mill.**	2	2	0.06	0.06	1	50.00
***Solanum dulcamara* L.**	2	1	0.03	0.06	1	100.00
***Taraxacum officinale* F.H.Wigg.**	2	2	0.06	0.06	1	50.00
***Thymus vulgaris* L.**	1	1	0.03	0.03	1	100.00
***Tilia americana* L.**	2	3	0.09	0.12	3	100.00
***Tropaeolum tuberosum* Ruiz & Pav.**	3	2	0.06	0.09	2	100.00
***Typha domingensis* Pers.**	1	1	0.03	0.03	1	100.00
***Uncaria tomentosa* (Willd. ex Schult.) DC.**	2	1	0.03	0.06	1	100.00
***Urtica dioica* L.**	8	9	0.26	0.41	6	66.67
***Valeriana officinalis* L. & Maillefer**	1	2	0.06	0.06	2	100.00
***Verbena officinalis* L.**	3	3	0.09	0.09	1	33.33
***Viola suavis* M.Bieb.**	2	2	0.06	0.06	1	50.00
***Zea mays* L.**	2	6	0.18	0.18	5	83.33
***Zingiber officinale* Roscoe**	5	4	0.12	0.21	3	75.00

* Number of use most frequently determined by informant

4.7. Description of the most important medicinal plants in study area

The most important plants in study area were chosen according to highest values of ethno botanical indexes, calculated in chapter 4.6. (except FL).

Manzanilla (*Matricaria chamomilla* L.)

In this thesis, Manzanilla was evaluated as the medicinal plant with the highest value of MUV and RFC and the second highest value of UR. Manzanilla is traditionally used for treating gastrointestinal diseases (stomach ache, ulcers, colic etc.), wounds treatment (anti-inflammatory effect) and blood circulation (edemas). It is used particularly as an infusion made from fresh whole plants.

This species is a worldwide, well-known medicinal plant with multiple uses. It contains more than 120 chemical compounds as secondary metabolites, for example terpenoids, flavonoids etc. with potential for pharmacological activity (Singh *et al*., 2011). Some scientific studies confirm using Manzanilla as plant medicament against diarrhoea and stomach aches (Mehmood *et al*., 2015). It also has positive effect on prevention of hyperglycemia and diabetes (Kato *el at*., 2008).

Ruda (*Ruta graveolens* L.)

Ruda is used in study areas for treating many different problems– it helps against stress, anxiety, tiredness and menstrual pains. Ruda also supports blood circulation; it is used against stomach ache and cold. Fresh stems and/or leaves are used as an infusion, bath or applied directly. It comprise more than 120 compounds, mainly alkaloids, coumarones, essential oils, flavonoids and fluoroquinolones, so it has been widely used in traditional medicine in different countries for the treatment of a wide range of disorders including infectious and inflammatory processes, digestive problems, muscular pathologies, tumor control (Preethi *et al*., 2006), antihelminting, antimicrobial, anti-rheumatic, antiulcers and anti-diabetics properties (Yamashita *et al*., 2009; Mejri *et al*., 2010). Current scientific studies shows also a big potential of Ruda, because it has antiproliferative activities which could be used against human adult T-cell leukemia/lymphoma (Nakano *et al*., 2017)

Orégano (*Origanum vulgare* L.)

Orégano is solely used for treating gastrointestinal diseases (stomach ache, diarrhoea and flatulence) as an infusion from fresh leaves and/or stems. This medicinal plant has the second highest value of MUV and RFC value but doesn´t have wide range of uses in this research. According to other studies, Orégano is also used for treating nervous system diseases and pains of various origins (joints ache, headaches, sore throat etc.) (Shokrzadeh et al., 2014). It is rich in antioxidants, which could neutralize free radicals and reduce the secretion of nitric oxide NO (Faleiro *et al*., 2005). Extracts from *O. vulgare* contain many important chemical compounds like rosmarinic acid, flavonoids, thymols etc. (Burt *et al*., 2007), which cloud be responsible for their antibacterial (Licina et al., 2013), antifungal (Sivropoulou *et al*., 1996), anti-carcinogenic (Teissedre and Waterhouse, 2000) and antimicrobial activities (Kursat *et al*., 2011).

Ortiga (*Urtica dioica* L.)

Ortiga is the plant with the highest UR value – it is used for better blood circulation, against rheumatism, hair loss, ulcers, stomach ache, pneumonia and it also supports the nervous system. Ortiga is used fresh as an infusion, bath or applied directly. Whole plants or just leaves could be used. Ortiga contains a wide variety of chemical compounds like lecithin, acetophenone, acetylcholines, formic acid, histamines, terpenes, carotenes, vitamins, antioxidants etc (Otles *et al*., 2012). Therefore Ortiga has been known and used in traditional medicine in the whole world (Mejri *et al*., 2011) for many different purposes - traditionally its used for gout, hair loss and to stop mild bleeding (Semalty et al., 2010) and currently is effective in the treatment of diabetes, anemia, kidney and urinary problems (Vavilova, 1994), join pains, inflamation treatment, viral and parasitic diseases etc (Lopatkin *et al*., 2007).

Matico (*Aristeguietia glutinosa*)

Matico is used for wonds treatment, skin allergies, for better sleeping and againt wound inflammation. It is appliend directly or prepared as an infusion, according to research. Matico is the only plant with high index values, which is native and endemitic in Ecuador and it mainly occures in mountain region. These days, this plant is endangered due to deforestation (Montúfar and Pitman, 2003). Therefore is currently on the Red List of Threatened Species by organisation International Union for Conservation of Nature, (IUCN) and must be protected. It is really important to save this plant and knowledge about it, because according to many studies, it has a big potential thanks to wide variety of uses. Matico is used as astringent, antirheumatic, antimicrobial, antifungal, anti-stomach ulcers and to treat diarrhea and headaches (Acosta-Solis *et al*, 1992; Valencia *et al*. 2000; Molina *et al*., 2015). In mountain region, the plant is traditionaly used also against psoriasis (de la Torre *et al*, 2008).

Table 3: Table of inventory of medicinal plants used in Ibarra and Cahuasquí, Ecuador

Species	Local name	Voucher number	Family	Part use	Therapeutic use	Preparation, usage
***Aerva sanguinolenta* (L.) Blume**	Escance	Ec. Am01	Amaranthaceae	Leaves	12	infusion
***Agave americana* L.**	Cabuya	Ec. As01	Asparagaceae	Whole plant	7, 12	direct application
***Allium sativum* L.**	Ajo	Ec.Ama01	Amaryllidaceae	Fruit	1, 4	infusion, eating raw fruit
***Aloe vera* (L.) Burm.f.**	Sábila	Ec. Xa01	Xanthorrhoeaceae	Whole plant	3, 5, 8, 12, 14	direct application, raw plant
***Aloysia citrodora* Paláu**	Cedrón	Ec. Ve01	Verbenaceae	Leaves	2, 5, 13	infusion
***Aloysia triphylla* Britton**	Hierba luisa	Ec. Ve02	Verbenaceae	Whole plant	3, 10	infusion
***Amaranthus hybridus subsp. quitensis* (Kunth) Costea & Carretero**	Ataco	Ec. Am02	Amaranthaceae	Whole plant	3, 10, 12, 14	infusion
***Annona cherimola* Mill.**	Chirimoya	Ec. An01	Annonaceae	Leaves	3	direct applocation
***Aristeguietia glutinosa* (Lam.) R.M.King & H.Rob.**	Matico	Ec. As06	Asteraceae	Leaves	2, 8, 12	Infusion, direct application
***Baccharis salicina* Torr. & A.Gray**	Chilca	Ec. As01	Asteraceae	Leaves	4	infusion
***Bauhinia forficata* Link**	Pata de vaca	Ec. Fa01	Fabaceae (Caesalpinioideae)	Leaves	6	infusion
***Borago officinalis* L.**	Borraja	Ec. Bo01	Boraginaceae	Leaves	4, 9	infusion
***Bougainvillea peruviana* Bonpl.**	Trinitaria	Ec. Ny01	Nyctaginaceae	Whole plant	5, 4	infusion
***Brugmansia arborea* (L.) Steud.**	Floripondio	Ec. So01	Solanaceae	Flower	2	infusion

***Campyloneurum angustifolium* (Sw.) Fée**	Calahuala	Ec. Po01	Polypodiaceae	Whole plant	6	infusion
***Cichorium intybus* L.**	Achicorija	Ec. As02	Asteraceae	Leaves	6	infusion
***Citrus aurantifolia* (Christm.) Swingle**	Limon sutil	Ec. Ru01	Rutaceae	Fruis	10	eating raw fruit
***Coriandrum sativum* L.**	Cebolla cilantro	Ec. Ap01	Apiaceae	Fruit	5	infusion
***Cuminum cyminum* L.**	Comino	Ec. Ap02	Apiaceae	Fruit	5	infusion
***Cynara scolymus* L.**	Alcachofa	Ec. As03	Asteraceae	Leaves, fruit	10, 11, 13	infusion
***Dalea coerulea* (L.f.) Schinz & Thell.**	Iso	Ec. Fa02	Fabaceae (Faboideae)	Leaves, flower	4	infusion
***Daucus carota* L.**	Zanahorija	Ec. Ap03	Apiaceae	Roots	5	raw roots
***Dittrichia viscosa* (L.) Greuter**	Mosquera	Ec. As 04	Asteraceae	Leaves	5, 12	infusion, direct application
***Dracaena draco* (L.) L.**	Sangre de drago	Ec. As02	Asparagaceae	Bark	5, 12	direct application, extract
***Equisetum arvense* L.**	Caballo chupa/ Cola de caballo	Ec. Eq01	Equisetaceae	Whole plant	5, 12	infusion
***Eriobotrya japonica* (Thunb.) Lindl.**	Nispero	Ec. Ro01	Rosaceae	Leaves	1, 12	infusion
***Eucalyptus globulus* Labill.**	Eucalipto	Ec. My01	Myrtaceae	Leaves	4, 9	inhalation, infusion
***Ficus carica* L.**	Higo	Ec. Mo01	Moraceae	Leaves, flower	1	Infusion
***Geranium sanguineum* L.**	Geranijo	Ec. Ge01	Geraniaceae	Leaves	12	direct application
***Hibiscus sabdariffa* L.**	Rosa de jamaica	Ec. Ma01	Malvaceae	Flower	12	Infusion
***Hordeum vulgare* L.**	Arroz de cebada	Ec. Poa01	Poaceae	Leaves	5	Infusion
***Chenopodium ambrosioides* L.**	Paico	Ec.Am03	Amaranthaceae	Leaves	2	Infusion

***Chenopodium quinoa* Willd.**	Quinoa de castilla	Ec.Am04	Amaranthaceae	Leaves	1	Infusion
***Linum usitatissimum* L.**	Linaza	Ec. Li01	Linaceae	Seeds	14	Infusion
Lobularia maritima (L.) Desv.	Aliso	Ec. Br01	Brassicaceae	Leaves	1, 12	direct application
***Mangifera indica* L.**	Mango	Ec. Ana01	Anacardiaceae	Leaves	10	direct application
Matricaria chamomilla L.	Manzanilla	Ec. As05	Asteraceae	Whole plant	5, 9, 10, 12	Infusion
***Melissa officinalis* L.**	Torongil	Ec. La01	Lamiaceae	Whole plant	3, 5, 10, 12	Infusion
***Mentha longifolia* (L.) L.**	Menta	Ec. La02	Lamiaceae	Whole plant	5, 12	Infusion
***Mentha spicata* L.**	Hierba buena	Ec. La03	Lamiaceae	Whole plant	5	eating raw plant
***Nasturtium officinale* W.T.Aiton**	Berro	Ec. Br02	Brassicaceae	Leaves	5, 12	direct application, raw plant
***Ocimum basilicum* L.**	Albahaca	Ec. La04	Lamiaceae	Whole plant	1, 5	Infusion
***Oenocarpus bataua* Mart.**	Hungurahua	Ec. Ar01	Arecaceae	Leaves	8	oil
***Origanum vulgare* L.**	Oregano	Ec. La05	Lamiaceae	Whole plant	5	Infusion
***Pachyrhizus erosus* (L.) Urb.**	Jicama	Ec. Fa03	Fabaceae (Faboideae)	Roots	6, 10, 12	eating raw roots
***Passiflora ligularis* Juss.**	Granadilla	Ec. Pa01	Passifloraceae	Leaves	5	eating raw leaves
***Peperomia congona* Sodiro**	Congona	Ec. Pi01	Piperaceae	Leaves	5	Infusion
***Petroselinum crispum* (Mill.) Fuss**	Perejil	Ec. Ap04	Apiaceae	Leaves	5, 13	Infusion

***Pinus heldreichii* Christ**	Pino	Ec. Pin01	Pinaceae	Bark, leaves	1, 12	Infusion, extract
***Plantago major* L.**	Llanten	Ec. Pl01	Plantaginaceae	Leaves	5, 12, 13, 14	Infusion
***Psidium guajava* L.**	Guayaba	Ec. My02	Myrtaceae	Leaves	5	Infusion
***Retrophyllum rospigliosii* (Pilg.) C.N.Page**	Diablo fuerte	Ec. Pod01	Podocarpaceae	Leaves	5, 12	Infusion
***Rosmarinus officinalis* L.**	Romero	Ec. La06	Lamiaceae	Whole plant	8	Infusion, bath
***Ruta graveolens* L.**	Ruda	Ec. Ru02	Rutaceae	Whole plant	1, 2, 5, 10	Infusion, bath, eating raw plant
***Salvia officinalis* L.**	Salva real	Ec. La07	Lamiaceae	Leaves	3	Infusion
Smallanthus sonchifolius* (Poepp.) *H.Rob.	Yacón	Ec. As07	Asteraceae	Bulbs	6, 10	eating boiled bulbs
***Solanum melongena* L.**	Berenjena	Ec. So02	Solanaceae	Fruit	13	juice prom fruit
***Solanum americanum* Mill.**	Hierba mora	Ec. So04	Solanaceae	Leaves	5, 12	Infusion
***Solanum dulcamara* L.**	Dulcamara	Ec. So03	Solanaceae	Leaves	5	Infusion
***Taraxacum officinale* F.H.Wigg.**	Taraxaco	Ec. As08	Asteraceae	Leaves	1, 12	Infusion
***Thymus vulgaris* L.**	Tomillo	Ec. La08	Lamiaceae	Whole plant	9	Infusion
***Tilia americana* L.**	Tilo	Ec. Ma02	Malvaceae	Leaves	4, 9	Infusion
***Tropaeolum tuberosum* Ruiz & Pav.**	Mashua	Ec. Tr01	Tropaeolaceae	Roots	1, 14	Infusion
***Typha domingensis* Pers.**	Typha	Ec. Ty01	Typhaceae	Leaves	4	Infusion
***Uncaria tomentosa* (Willd. ex Schult.) DC.**	Uña de gato	Ec. Rub01	Rubiaceae	stem	5, 12	Infusion
***Urtica dioica* L.**	Ortiga	Ec. Ur01	Urticaceae	Whole plant	3, 4, 5, 7, 8, 13	Infusion, bath
***Valeriana officinalis* L. & Maillefer**	Valeriana	Ec. Ca01	Caprifoliaceae	Leaves	3	Infusion
***Verbena officinalis* L.**	Verbena	Ec. Ve 03	Verbenaceae	Leaves	8, 12, 13	Infusion, direct application

***Viola suavis* M.Bieb.**	Violeta	Ec. Vi01	Violaceae	Flower	4, 9	Infusion
***Zea mays* L.**	Choclo	Ec. Poa02	Poaceae	Corn cob hair	5, 12	Infusion
***Zingiber officinale* Roscoe**	Jengebre	Ec. Zi01	Zingiberaceae	Roots	4, 6, 10	Infusion

Explanation (Table 3):

1 - Diseases of the genitourinary system - urinary problems, gynaecological problems, dysmenorrhoea, birth pangs, impotence, kidney diseases, prostate problems

2- Mental diseases - sleeping disorder, improving memory, energy, depression treatment

3- Diseases of the nervous system - epilepsy, headache, facial nerve paralysis

4- Respiratory diseases - caught, cold, pneumonia, sore throat

5- Diseases of the digestive system – Stomach ache, constipation, halitosis, gastritis, ulcers, enteritis, diarrhoea, vomiting, gallstones, flatulence, deworming

6. Endocrine system diseases - diabetes, thyroid problems, pancreas problems

7. Musculoskeletal diseases - rheumatism

8- Skin diseases - Hair loss, skin problems, hair growth, fleas (Siphonaptera)

9- Infectious and viral diseases - flu, fever

10- Diseases of the circulatory system and blood - hypertension, heart diseases, blood circulation, purification, high blood cholesterol, swellings

11- Neoplasm - leukaemia

12- Wounds, anti- inflammatory effects, stop bleeding

13- Body detox, weight loss, antioxidant

14- Diuretic

5 Conclusion

The main objectives of this study were to document the use of medicinal plants in traditional medicine by local people in San Miguel de Ibarra and Cahuasquí; to describe, how traditionally were plant processed, applied and to analyze, which plants were mostly used and which diseases were mostly treated.

According to results, the study area is rich in medicinal plants diversity and associated indigenous knowledge, but still needs more exploration and study. The knowledge in study area is conserved, thanks to family traditions, and transmission all the information from old to young generations, but the real problem is that the younger generation has unfortunately no interest in traditions and thus they have less knowledge than their parents and grandparents, which confirms the first hypothesis. Some differences exist also between rural and urban populations, in absolute numbers the superiority of knowledge is in rural areas, which confirms the second hypothesis.

In conclusion we can say that although the interest in indigenous traditions is declining, populations in study areas still has some knowledge, which should be preserved for future generations and also could be used as a source of information for pharmaceutical industries developing new drugs.

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