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Faculty of Tropical AgriSciences

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Ethnobotanical inventory of medicinal plants in province of Orellana, Ecuador

Bachelor thesis

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Thesis supervisor:

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences

BACHELOR THESIS ASSIGNMENT

Anna Dvořáková

Agriculture in Tropics and Subtropics

Thesis title

Ethnobotanical inventory of medicinal plants in province of Orellana, Ecuador

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Objectives of thesis

The aim of the thesis is ethnobotany study of medicinal plants in province of Orellana, Ecuador.

Methodology

The data will be obtained through a questionnaire from the local people and subsequently processed in a tabular format. Main data of the questionnaire will be local names of individual plants utilized part of the plant, methods of use and dosing plants.Their summary, plant species, orders, families, used parts, uses, fidelity levels and dissease categories.

The proposed extent of the thesis

30

Keywords

Ethnobotany, Medicinal plants, Traditional medicine, Indigenous knowledge, Ecuador, Orellana,

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Recommended information sources

DUKE, J A. – VASQUEZ, R. *Amazonian ethnobotanical dictionary.* Boca Raton, Fla.: CRC Press, 1994. ISBN 0849336643.

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VLKOVÁ, M. – ČESKÁ ZEMĚDĚLSKÁ UNIVERZITA V PRAZE. FAKULTA TROPICKÉHO ZEMĚDĚLSTVÍ, – KOHOUT, V. *Traditional ethnobotanical knowledge and its transmission within Czech diaspora living in Romanian Banat : dissertation thesis.* Disertační práce. Praha: 2014.

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Prague on 20. 04. 2017

Declaration

I declare that I elaborated this bachelor thesis "Ethnobotanical inventory of medicinal plants in province of Orellana, Ecuador" alone, and that I have used only literature quoted and mentioned in references.

This study could not arise without the cooperation between the Faculty of Tropical AgriSciences, CULS in Prague and the Universidad Técnica del Norte in Ibarra ("UTN“), in Ecuador.

Students from the Universidad "UTN" showed me market places, where speak to people and helped me with filling out the questionnaire.

I also agree with placing this work in the library of CULS Prague and make it accessible for study purposes.

In Prague …….

I wish to express my special gratitude to my supervisor (doc. Dr. Ing. Eloy Fernández Cusimamani) for the cooperation, valuable suggestions and advice. I would also like to thank him for all the things, which he handled in Ecuador (accommodation, cooperation with local university and securing his friend).

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Finally, I thank to my parents for all the help and support during my study, my brothers, who drove me to the train to get to school and helping during troubles with studies.

The last persons I want to thank are my friend from the United Kingdom, who checked my thesis because of potential mistakes in my English and my boyfriend, who supported me during the writing and provided a peaceful space.

Abstract

Introduction: In Ecuador, over 65 percent of people use medicinal plants instead of drugs to treat themselves. Therefore medicinal plants play a significant role there. Traditional knowledge of medicinal plants and their use by indigenous healers is very important for drug development and health care.

The aim of the study: The aim of the thesis is an inventory of medicinal plants and finding their healing effects in the province of Orellana in Ecuador.

Methods: Ethnobotanical data was collected by free listing interviews with randomly selected informants of different ages. The questionnaires were based mainly on issues relating to medicinal plants, their acquisition and use by the local population. The data was tabulated and analysed using four quantitative ethnobotanical indices: Medicinal use value (MUV), Use value (UV), Use reports (UR) and family importance value (FIV).

Results: A total of 68 medicinal plant species belonging to 66 genera, 27 order and 42 botanical families of 66 angiosperms, 1 fern and 1 equisetophyta were reported to be used for treating human ailments in study area. Families Annonaceae (6 species, 8.82 %) and Boraginaceae (5 species, 7.35 %) were found to be best represented in area. A total of 43 people (65 % women, 35 % men) have the highest knowledge about medicinal plants people in the age group 41-50 years. The vast majority of people use traditional medicine more than 10 years. There were mentioned more than 50 diseases belong to 22 categories, according to FAO (mostly mentioned Disease of digestive system and Disease of the skin and subcutaneous tissue). About 29 % of preparations were reported to be obtained from leaves. The best represented application was oral (over 85 %). Highest UR and FC has *Ilex guayusa Loes*., which means, that it is the most useful plant in province of Orellana.

Conclusion: The study revealed that province of Orellana is rich in medicinal plant diversity and associated indigenous knowledge. People in rural areas have more knowledge than people in the city. Younger generation is less interested in knowledge about medicinal plants.

Keywords: Ethnobotany, Medicinal plants, Traditional medicine, Indigenous knowledge, Ecuador, province of Orellana

Abstrakt

Úvod: V Ekvádoru, více než 65 procent lidí užívá léčivé rostliny místo léků k jejich léčbě. Proto zde léčivé rostliny hrají velikou roli. Tradiční znalost o léčivých rostlinách a jejich využití domorodými léčiteli je velmi důležitá pro rozvoj léčiv a zdravotní péče.

Cíl práce: Cílem práce je inventarizace léčivých rostlin a zjištění jejich léčivých účinků v oblasti Orellana v Ekvádoru.

Metodika: Etnobotanické údaje byly sbírány pomocí rozhovorů s náhodně vybranými lidmi různých věkových kategorií. Dotazníky byly založeny zejména na otázkách týkajících se léčivých rostlin, jejich získávání a využívání místními lidmi. Získaná data byla zpracována do tabulek a analyzována kvantitativními etnobotanickými indexy (MUV, UV, UR, FIV).

Výsledky: Z 68 léčivých rostlinných druhů spadajících do 66 rodů, 27 druhů a 42 čeledí bylo 66 krytosemenných, 1 kapradina a 1 přeslička. Tyto rostliny se ve studované oblasti užívají jako léčivé. Nejvíce zastoupenými čeleděmi byly Annonaceae (6, 8.82 %) a Boraginaceae (5, 7.35 %). Z celkového počtu 43 lidí (65 % žen, 35 % mužů) mají největší znalost o využívání léčivých rostlin lidé ve věkové kategorii 41-50 let. Drtivá většina lidí využívá tradičního léčitelství více než 10 let. Ve výzkumu bylo zmíněno více než 50 nemocí spadajících do 22 kategorií podle organizace FAO (nejčastěji zmíněné Onemocnění zažívacího systému a Nemoci kůže a podkožní tkáně). Okolo 29 procent ze způsobů přípravy léčivých rostlin bylo pomocí listů. Největší UR a FC má *Ilex guayusa Loes*. (cesmína), který je nejvíce užívanou a prospěšnou rostlinou ve studované oblasti.

Závěr: Studie nám ukázala, že provincie Orellana je bohatá na rozmanitost léčivých rostlin a je spojená s domorodými znalostmi. Lidé žijící na vesnici mají o mnoho více znalostí než lidé ve městech. Mladá generace se méně zajímá o znalosti tradiční medicíny.

Klíčová slova: Etnobotanika, Léčivé rostliny, Tradiční medicína, Znalosti domorodců, Ekvádor, provincie Orellana

Contents

List of tables and figures

1. Introduction

Ethnobotany is the study of the interaction between people and plants, with a particular emphasis on traditional tribal cultures (Kuipers, 2016). Natural medicine includes traditional healing practices focused on healing people and animals (Hong *et al.*, 2015). Ethnobotany study naming admission control plants from the perspective of people (Ríos, 2007). It was first coined in 1896 by the American botanist John Harshberger; however, the history of ethnobotany began much longer before that (Campbell *et al.*, 2002). According to the World Health Organization (WHO) about 65-80 % of the world's population in developing countries depends essentially on plants for their primary healthcare. It is because of poverty and lack of access to modern medicine (Awoyemi *et al.*, 2012). From antiquity until fairly recent times, most physicians were also botanists. Previously, they determined healing effects randomly. It is possible some people who longed for understanding about the effect that it cost them their lives. The same is true in Ecuador, where medicinal plants play a significant role in supporting the countries healthcare system.

Ethnobotanical research can help in the discovery of crude drugs (Vlková, 2014). Medicinal plants have been used in countless years. Certain level of familiarity health science was part of normal household, but with more serious or less common problems people went to see experts- healers. Healing traditions are inherited usually within their families (Niederle and Chotek, 1922). Traditional medicine is evolving for years, and its development does not stop there. They are still discovering a new species of plants and their effects. Therefore it is necessary to maintain the traditional medicine.

In these days it is a big problem, that people are not interested in traditional medicine. For them it is easier to go to a pharmacy and buy synthetically produced drugs for their problems. And thus knowledge about the use of medicinal plants falls into the blind. As mentioned, population in developing countries depends essentially on plants for their primary healthcare. That's why, this knowledge should be maintained. There are some

ways how we can keep it. The most widespread way is from family. Another ways are from healers, books and from the internet.

During the transmission of information, we are faced with various problems. This data might not be entirely complete, plants cannot be known or we are not able to discern them. That's why it is really necessary to not neglect the knowledge of our ancestors.

It is needed to people know, that in our world, there are a lot of plants, which can be very useful for us. Especially for our health. Therefore it is needed to people learn about these effects. Population in developing countries does not require the following information publicly reported. They are inherited in generations and perhaps even do not know that other population has no idea about their “riches”.

Collection of information about plants and their effects is very important. When it does not serve the people of today for treatment, it might be necessary in other generations. The preservation of this data is necessary. Perhaps one day mankind will decide to use the knowledge of our ancestors, because this method is best for our health.

Traditional knowledge of medicinal plants and their use by drug development and indigenous healers in the present are not only useful for biodiversity and conservation of cultural tradition but also for drug development and community health care in the local people (Emiru *et al.*, 2011).

2. **The aim of the study**

The aim of the thesis is an inventory of medicinal plants and finding their healing effects mainly in small towns Loreto and El Coca in province of Orellana in Ecuador.

The targets were set based on the following hypothesis:

I. Knowledge about the use of medicinal plants in traditional medicine in Ecuador, in the province of Orellana falls. Young generation is not interested in carrying this information.

II. People living outside the city have more information about traditional medicine, the use of plants for the treatment compared to people who are in the cities and have a chance to go to the pharmacy.

3. Materials and methods

3.1. Study area and ethnographic background

This study was conducted in a landlocked province of Ecuador, in Orellana (Figure 1). Its capital city is El Coca, also known as Puerto Francisco de Orellana. Most of the area is jungle (Attachment 2, photograph A). El Coca is located in the Amazon rainforest. The main advantage of this place is nature, endowed with a high biodiversity, in a variety of ecosystems that extend in an area with a high index of endemic species, considered by environmental scientists as a laboratory for the world genetic research (PLAN DE DESARROLLO DE LA PROVINCIA DE ORELLANA, 2011). The province is situated 173 km north of Quito, the Ecuadorian capital at 0°28'0.001"S and 76°58'0.120"W. Its altitude is 299 m (Celý svět, 2016). Orellana is bordered in the north by Sucumbíos, south by Pastaza and west by Napo. The eastern part shares its border with Peru (Celý svět, 2016). Shuars are the indigenous people, who inhabit the area. They speak the Shuar language and live between the upper mountains of the Andes and the tropical rainforests. The connection between them and nature is huge. It gives them everything they need to live. Most Shuars men are hunters and women take care of the children. They have knowledge of healing with herbs. These old traditions are still transmitted orally, in many years of learning (Katz, 1989).

The province has long been inhabited by people who have a long tradition of using plants and much of the land has now been converted in to cropland including the very steep slopes where cultivation is being undertaken by terracing the cliffs. Another source of plants is from the Amazon rainforest. Use of plants continued over generations to the present time.

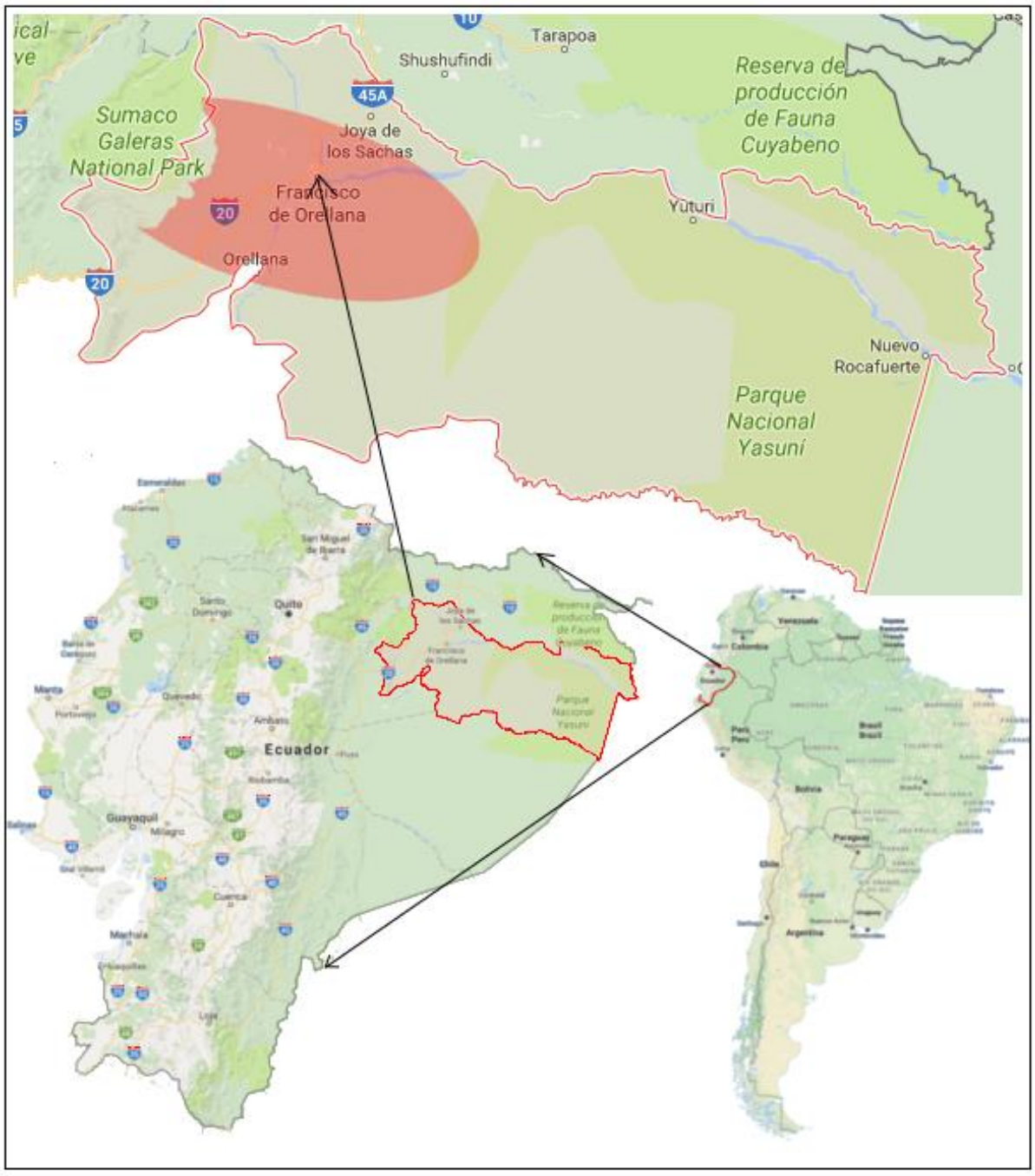

Figure 1 Map of the study area: Community El Coca (Puerto Francisco de Orellana) in Province of Orellana, Ecuador

3.2. **Informant and data collection**

The information was collected through free listing interviews with randomly selected informants and field interviews with key informants selected after free listing (Attachment 1). People were of different ages (5 were less than 20, 9 were between 21-30 years). Most people involved were in the age group of 41-50 (Table 1). The questionnaires were based mainly on issues relating to medicinal plants, their acquisition and use by the local population. The interviews were conducted using the local language (Spanish). There were two friends with us who interacted with the local people and helped us with filling in forms. They are shown in the photograph F, in attachment 2. In my study area in Orellana, 43 people were willing to provide me with information about their relationship to medicinal plants (15 men and 28 women). They were mainly from El Coca or Loreto which lies near the provincial capital. One part of the questionnaire was focused on questions such as local names of medicinal plants, used part of the plant and in what form (fresh, dried), ailments treated, a form of exploitation (tea, oil, juice, digest, extract, vaporization). In the second part informants were asked about location, zone, occupation, sex, age, using medicinal plants, preference of traditional medicine, why use this type of medicine, number of years of service as traditional healer and source of knowledge.

All semi-structured interviews were followed for example purchase of fruits, vegetables or plants in the market (Attachment 2, photographs C and D). A market survey of medicinal plants of the Orellana province was conducted at seven major places i.e., namely El Coca, Loreto, Machangara, Chalguaycu, Pascocachi, Payamino and Carachupa Pakcha.

3.3. **Data analysis**

The data was tabulated and analysed using four quantitative ethnobotanical indices: Medicinal use value (MUV), Use value (UV), Use reports (UR) and family importance value (FIV). All this indices were processed by three sources. The first of them is from authors: Bibi, Ahmad and Mohammad (Bibi *et al.*, 2015). Another one is written by

Vitaliny and the last is from the author Lulekal (Lulekal *et al.*, 2008). Research from Orellana was entered in Excel spreadsheet software (Microsoft Corporation, 2007) and organized for statistical analysis. Traditional knowledge dynamics on use of medicinal plants by men and women, elderly (41-50) using medicinal plants more than 10 years, the knowledge passed down from generation to generation.

In Latin American countries, herbal medicine is deeply rooted, practiced extensively by indigenous groups, and frequently used by a broad cross-section of the larger society. Often it is an economically inevitable alternative to expensive Western medicine (Bussman and Sharon, 2006).

3.3.1. Medicinal use value (MUV)

MUV is actually modification of the Use Value (UV). The medicinal use value was calculated with little modification. It is a good measure to estimate all the possible uses of a plant species without considering its RFC. It gives us the relative importance of a species, considering the number of uses mentioned by an informant for a particular wild medicinal plant species. It was calculated using the following formula:

$$MUV = \sum \frac{MU_i}{N}$$

Where "MU" is the number of mentioned medicinal uses cited by each informant for a given plant species and "N" is the total number of informants included in the survey. MUV does not provide any information on the single or multiple uses of species. While use report (UR) is the use recorded for every species.

3.3.2. Frequency of citation (FC), relative frequency of citation (RFC) and family importance value index (FIV)

FIV and FRC were calculated to quantitatively determine the consensus between the informants on the use of endemic medicinal plants in the region.

It was calculated using the following formula proposed by:

$$RFC = \frac{FC}{N} \ (0 < RFC < 1)$$

Where, RFC is the relative frequency citation: FC is the number of informants who mentioned the species while N is the total number of informants participating in the study. The value of FRC for species and families of medicinal plants is based on the citing percentage of informants for that particular species and family.

Family importance value (FIV) gives the local importance of the families of wild species. It was calculated by taking the percentage of informants mentioning the family.

$$FIV = \frac{F(family)}{N} \times 100$$

Where, FC is the number of informants mentioning the family, while N is the total number of informants participating in the study.

3.3.3. **Fidelity level (FL)**

Fidelity level index is used to determine the most preferred species used in the treatment of a particular ailment as more than one plant species are used in the treatment in the same category. High FL value indicates high frequency of use of the plant species for treating a particular ailment category by the informants of the study area. Fidelity level is calculated by using the following formula.

$$FL\ (\%) = \frac{Ip}{Iu} \times 100$$

Where Ip is the number of informants who independently indicated the use of a species for the same major ailment and Iu is the total number of informants who mentioned the plant for any major ailment.

4. Results and Discussion

4.1. Diversity of reported medicinal plant

A total of 68 medicinal plant species belonging to 66 genera and 42 botanical families of 66 angiosperms, 1 fern and 1 equisetophyta were reported to be used for treating human ailments in province of Orellana (Table 4). All names of the plants were treated by The International Plant Names Index (Plant Names, 2004). The family Annonaceae was represented by the highest number of species (6, 8.82 %) followed by Boraginaceae (5, 7.35 %), Malphigiaceae (4, 5.88 %), Phyllanthaceae (4, 5.88 %), Amaranthaceae (3, 4.41 %). Asteraceae, Convallariaceae, Euphorbiaceae, Lauraceae, Moraceae, Piperaceae, Plantaginaceae and Tropaeolaceae were presented by two species each. Each of the remaining 28 families had single species representation. These include for example Acanthaceae, Cactaceae, Equisetaceae and Malvaceae. Thus, 58.8 % of families were represented by more than one medicinal plant species (Figure 4).

All the families can be found in the book: Amazonian Ethnobotanical Dictionary (Duke and Martinez, 1994).

In the research, there were mentioned 68 different plants, which belong to 27 different orders. The most common order was *Lamiales* (8, 11.76 %). Other orders were *Caryophyalles* and *Solanales* (5, 7.35 %), *Asparagales, Rosales* and *Sapindales* (4, 5.88 %). Other orders were mentioned only one (16.18 %). They are for example *Boraginales, Malyales, Celastrales, etc.* (Table 4).

On the earth, number of vascular plants depending on different estimates is varied between 260.000 and 320.000 species (Prance, 2000). The vast majority of them are angiosperms or flowering plants, which appeared in the *Cretaceous* 145 million years ago (Judd *et al.* 2002). In Ecuador, there are located more than 17,000 kinds of vascular plants (Jørgensen and León, 1999).

Province of Orellana, is the area, where medicinal plants are mostly used in Ecuador (Torre *et al.,* 2008).

According to Ecuadorian encyclopedia: “Enciclopedia de las Plantas Útiles del Ecuador” (in translation Encyclopedia of crops in Ecuador), in this country, there are five main families. Those families include most of medicinal plants. They are namely: Asteraceae, Fabaceae, Rubiaceae, Solanaceae and Araceae (Torre *et al.,* 2008).

4.2. **Indigenous knowledge of the community**

More than half of the respondents were women. From 43 people, 28 women responded (65 %). Remaining 15 percent were men. The most frequent age category was age range 41-50 years, which includes 14 people, correspondents to 32.4 %. The same number of people were in the ages 21-30 and 31-40 (9, 21 %). Least people were in age group 61+ (only 5 percent).

People also were asked whether they live in the countryside or in the city.Fewer people of the respondents live rural 67 % live urbanal.

Another question in research was: “How long do you use this style of treatment?” None of the respondents said less than one year, or 2-3 years. One person answered 4-6 years and one answered 7-10 years. The vast majority of people use traditional medicine for more than 10 years. It was specifically, 95 percent.

All this data is mentioned in Table 2.

According to the Internet source, Food and Agriculture Organization of United Nations (FAO), in Ecuador lives 15.74 million of people. Of this population, according to statistics, there are 49.94 % women and 50.06 % men. Theirs age categories are as follows: 0-14 years, there is 32.1 % of population, 15-64 years 62.7 % and more than 65 years, there is 5.2 % of people (FAO, 2017).

Although, in Ecuador there is more men than women, in the research responded more women than men. Maybe this is a fact that this work is more feminine.

Voucher number from Table 1 means plant numbers, which are stored in the herbarium at the Universidad Técnica del Norte.

A study from Ethiopia says that most people who answered questionnaires were men. More medicinal plants were reported by people older than 40 years living urbanal (Lulekal *et al.*, 2008).

A different study from Pakistan says, that in this country more people, who are interested in medicinal plants are women aged over 60 years (Bibi *et al.*, 2015).
Every study shows something else, but the results are quite similar.

4.3. **Disease types and treatment methods**

Respondent to each plant named disease, which can the plant heal. Every disease was assigned to a certain category, which was declared by a World Health Organization (WHO) in 2015. There are 22 categories, into which includes all diseases. The categories are for example: Diseases of the nervous system, Diseases of the eye and adnexa, Diseases of the ear and mastoid process and Diseases of the circulatory system. Every category is mentioned in Table 3.
In the research, there were named more than 50 diseases. Diarrhea, stomach ache, gastritis and ulcers were the most frequently reported health problems under the Diseases of the digestive system, whereas healing wounds was most frequent reported under the Diseases of the skin and subcutaneous tissue.
People in Ecuador have several ways to treat themselves. Most of them have knowledge from their families. One of the respondents has attainments from healer.
We also asked them, if they are asking healer for advices. More than half (6, 46 %) are not asking the haler for advices. Therest of the respondents (17) were asked.
If they treat themselves, acquire plants by auto production (15, 35.7 %), importation (3, 7.14 %), collection (12, 28.58 %) or by trade (13, 30.23 %) (Table 7).
If the person wants to be treated with spiritual healing, the effectiveness depends entirely on their own. Their spirituality and what they expect. It's worth bearing in mind that many Western drugs such as curare, cocaine, and quinine come from plants that local healers know well and have used in their remedies for hundreds of years (Wys, 2014).

4.4. **Plant species treating certain diseases**

Of 68 plants 4 were the most common in Ecuador, which had the highest MUV. Ecuador is known to have over 500 different species of medicinal plants. About 228 of the most common plants are endangered (Torre *et al.*, 2008).

The first plant, which has the highest Medicinal use value is *Urtica dioica* L. This plant is good for blood circulation, convulsion and hair care. Other study says, that *"Urtica"* is useful for treating neutrophil function deficiency and chronic granulomatous diseases (Akbay *et al.,* 2003). Different author says that is great antioxidant, has analgesic properties and it is also antimicrobial and antiulcer (GÜLÇIN *et al.*, 2004).

The second plant is Citrus limon (L.) Osbeck. It is used for problems with diarrhea and stomach ache. Generally this plant is used as prevention of diseases (Del Río *et al.*, 2003).

The third plant with highest MUV (0.114) is *Zingiber officinale Roscoe*. According to research in cities Loreto and El Coca, this plant is used against cough, detoxification, defatting and depressurization. Other study says, that this plant is good for arthritis, rheumatism, muscular aches, sore throats, fever, vomiting and infectious diseases (Ali *et al.*, 2007). From another study we can see, that "*Zingiber"* is used as an cholesterol-lowering, antithrombotic and anti-inflammatory agent (Thomson *et al.*, 2002).

The last medicinal plant is *Dysphania ambrosioides (L.) Mosyakin & Clemants*is. This plant has MUV 0.114. It is good for purge of intestinal and parasite colic. Other study from author Kliks says that this plant can be used for treatment of intestinal worms (Kliks, 1985). Study from Cuba shows, that this plant cures leishmaniasis (Monzote *et al.*, 2006).

4.5. **Plant parts used for remedy preparation**

Despite mentioning different plant parts used for remedy preparation, the majority (29 %) of preparations were leaves followed by stem (24 %) and mixtures whole plant (22 %) (Figure 2). Plants in which roots and leaves are utilized as medicine either as sole or mixed with other plant parts were most frequent in the medicinal flora of the

province. Freshly harvested plant parts were the dominant ones (88.24 %) used in remedy preparation whereas dried parts were used least (11.76 %) (Figure 5).

The Ecuadorian encyclopedia says, that in this country plant parts, which are most frequently used are the leaves (30 %), whole plant (10 %) flowers or inflorescence (6 %) (Torre *et al.*, 2008). My research with Ecuadorian encyclopedia is fairly consistent.

In Gabon, the most common plant parts, which are used as medicinal are stem and bark (Betti *et al.*, 2013).

4.6. **Modes of remedy preparation and application**

In traditional medicine in study area people follow various ways of remedy preparation. The major mode of remedy preparation list was tea (45.1 %). Cream/oil, crushed/juice from plants was mentioned five times, which corresponds to 7 %.

Direct application and vaporization have 4.23 % and extract has 2.82 %. The remaining options have only 1.41 %. It including for example bath, tincture or boiled (Figure 3).

In traditional herbal medicine systems, herbal remedies are prepared in several rather standardized ways which usually vary based upon the plant utilized, and sometimes, what condition is being treated. These methods include: infusions, decoctions, tinctures, macerations, hot baths, inhalation and aromatherapy, which is used usually in indigenous Indian system (Methods of Preparing Herbal Remedies, 2013).

There are not many more methods, which can be used in the treatment of medicinal plants.

The reasons that highlight deeply rooted and widespread use medicinal plants among Ecuadorians are low purchasing power of the majority, which does not allow access drugs, lack of formal health care system cash and above all the fact that medical knowledge ancestry is huge (Buitron, 1999).

Study from Romania shows, that the most popular preparations are infusions and decoctions (TIŢĂ *et al.*, 2006).

The most common application of medicinal plants in Bolivia, Qampaya is infusion (Hoffová, 2015).

4.7. **Routes of administration and dosages**

Medicinal plant preparations were administered through different ways. Oral application (85.3 %) was the best represented and most commonly used route of administration followed by topical (11.76 %) or fume (2.94 %).

In study from Ethiopia, the most represented application of medicinal plant is oral (Mesfin *et al.,* 2013).

A few people added to plants some recipes. For example flower *Ilex guayusa Loes*. We should make a tea from 6 leaves in 1 decilitre of water 3 times a day. So long as is needed.

Another plant is *Croton eluteria (L.) W. Wright*. In manual are 3 drops of tincture daily. *Dracaena draco (L.)* L. is good with lemon to enhance the effect. Local people also mentioned, that *Artemisia absinthium L*., we should take 1 sprig of 8 times a day. *Urticadioica L.* for a period of one week, three times a day. 5 drops of extract of *Brosimum utile (Kunth) Oken* for appropriate. *Curcuma longa L.* and *Eucalyptus globulus Labill.* are taken 2 times a day, every morning and evening. *Carica papay L.* is used at night. *Dysphania ambrosioides (L.) Mosyakin & Clemants*is used for three days.

Most of the medicinal plants are not a contraindicated and can be used with other herbs.

Plants such as medicinal plants are used for the needs of people with problems.

The people of Ecuador have learned from the stimulating properties of plants. This is the case for example with plants *Ilex guayusa Loes.*, which may lead to altered state of consciousness. One important tree in Ecuador is *Croton eluteria (L.) W. Wright*., which today are disappearing due to deforestation. Locals use it for refreshment and healing.

All these data was processed according to Enciclopedia de las Plantas Útiles del Ecuador (Torre *et al.*, 2008).

4.8. **Marketability of medicinal plants**

All the plants mentioned in the questionnaires, vendors offered in their markets, along with other products such as fruits, vegetables, legumes and various snacks. This can be

seen in attachment 2, photographs B and E. Most of them have a place in a market, where they have their stand. But in Ecuador we often find women (alternatively men) who do not have a possibility to have a stand and they have to sell their products on the street. Most of them are very old women who sit all day on the street preparing packages with peeled peas or beans. Behind them are medicinal plants, which we can find in free nature, such as *Plantago major L., Urtica dioica L., Artemisia absinthium L*. or *Taraxacum officinale F. H. Wigg.*

Price of medicinal plants is mostly contractual. Or we can say we would like to have this plant in the amount for one dollar.

Most of the vendors tell you how use the plant and for how long. Another option is to go to a dealer and tell him your problems. They are able to hear you and advise you how to combine herbs and how to use them.

Eucalyptus globules Labill. has several varieties in Ecuador. It depends on the place, humidity and types of soil. It can be found on the slopes, chasm and wet valleys.

It is not customary for people in Ecuador to grow the plants in the fields (Sheldon and Alexidales, 1996).

4.9. **The most useful plant in the monitored area**

According to UR and FL (Table 1), the most useful plant in province of Orellana is *Ilex guayusa Loes*. This plant treats many diseases. They are for example: fever, diabetes, detoxification, rheumatism, energy, stomach ache, headache, snakebites, fertility. It is a source of energy, also it is a good source of vitamin C.

In comparison with other research, from the authors Innerhofer and Bernhardt: Ethnobotanic garden design in the Ecuadorian Amazon, results are the same (Innerhofer and Bernhardt, 2011).

Other study says, that *Ilex guayusa Loes*. is used as stimulant and has been shown to be rich in caffeine (Prance *et al.*, 1994).

4.10. **Relative healing potential of medicinal plants**

Highest fidelity level (100 %) was recorded for *Copaifera officinalis L., Eucalyptus globulus Labill.*, and *Origanum vulgare L.* (Table 5). Actually 58.82 % of studied plants have fidelity level 100 %. It means that those plants are the most preferred species used in the treatment of a particular ailment as more than one plant species are used in the treatment in the same category.

This may be due to their greater efficiency in alleviating symptoms and the persistence of ancestral wisdom beliefs in the local population. These two species have considerable agreement amongst market vendors on their particular use and credibility and therefore could be further analysed for developing pharmaceutical products (Tinitana *et al.*, 2016).

Plants with lower FL were *Dracaena draco (L.) L.* (76.92 %), *Aloe vera (L.) Burm. f.* and *Sambucus ebulus L.* (75 %). The lowest fidelity level has *Plantago major L.* (25 %) (Table 1). These plants in the study area are not often mentioned.

4.11. **Medicinal use value**

The MUV were scattered between 0.023 and 0.136 (Table 1). It is a good measure to estimate all the possible uses of a plant species. The highest value have only two plants. They are *Urtica dioica* L. and Citrus limon (L.) Osbeck.

The second highest value (0.114) has also 2 plants (Dysphania ambrosioides (L.) Mosyakin & Clemants and *Zingiber officinale Roscoe*). Others value are 0.091, which have 8 plants (for example *Urtica dioica L.* and *Winterocereus colademononis (Diers & Krahn) Metzing & R. Kiesling*), 0.068 which have 11 plants (such as *Brosimum utile (Kunth) Oken* and *Buddleja globosa Hope*). Value 0.045 has 15 plants. The lowest value has 30 plants.

4.12. **Frequency of citation**

Determine the consensus between the informants on the use of endemic medicinal plants in the region. Frequency of citation ranges from 1-15. The highest FC has

Ilex guayusa Loes. It means, that it has been mentioned by 15 people in the research. *Dracaena draco (L.) L.*has been mentioned only 13 times. The most researches mention plants only once or twice. Once study mentions plants in 31 cases, *Calendula officinalis L., Campyloneurum angustifolium (Sw.) Fée, Capsicum annuum L.*, 15 plants, for example *Mentha spicata L., Nicotiana tabacum L., Oenocarpus bataua Mart.* have been mentioned twice. FC value number 3 have 7 plants, 4 six plants, 5 three plants, 6, 9, 10 and 11 has one plant.

4.13. **Relative frequency of citation**

RFC determine the consensus between the informants on the use of endemic medicinal plants in the region. This value is in the interval of 0.023 – 0.341.

The lowest value appears most frequently (exactly 31 times). They are plants such as *Annona cherimola Mill., Artemisia absinthium L., Bactris gasipaes Kunth*. The second lowest is value 0.045, which appears 13 times (*Mentha spicata L., Nicotiana tabacum L.* and *Oenocarpus bataua Mart*). Other values are 0.068 (7 times), 0.091 (6 times), 0.114 (3 times). The rest of the values are mentioned once. The highest (0.341) has plant *Ilex guayusa Loes.*

5. **Conclusions**

Traditional medicine in Ecuador plays a big role, especially in the indigenous province of Orellana. It is the same in cities Loreto and El Coca. We can see, that local population, mostly in rural areas are using traditional medicine as a source of health and medicinal facilities. These medicinal plants have been used as alternative solutions for thousands of years, when there was no other solution.

People continue to use traditional medicine by consuming particular medicinal plant species sold at local markets. It is more than a habit, that this activity is performed by women.

Unfortunately, nowadays it is not so widespread as before. The most information about traditional medicine has people aged between of 41-50. Younger generation is not interested in carrying this information. The biggest problem is a lack of knowledge in the cities. Most people rely on the generation of grandparents, where asking for advice, but most knowledge is not kept.

During the research, there was found out 68 medicinal plants, which can heal more than 50 diseases. These medicinal plants are used in the various ways of using. Mostly used as teas, in fresh form.

Most respondents have used traditional medicine more than ten years.

Retention of knowledge about medicinal plants is very important. Taking herbs is healthier than chemically manufactured drugs.

We never know when this information will be vital for us. Whether, today or in a hundred years.

From the answers that we received from local people and other studies, we can say, that people who have this information about medicinal plants are using it well.

According to study from Ecuador, we can confirm earlier hypothesis. Tradition medicine and knowledge about it falls, because of young generation. Nowadays people are not interested in carrying this information thus, in addition to people living urbanal.

6. Graphs and tables

Table1All plants from the research, Preparation, MUV, FL

Species	Local name	Family	Voucher number	Used part	Fresh/dry	Uses	Preparation	Oral/topical	MUV	FL
Allium sativum L.	Ajo	Amaryllidaceae	Ecu. Amary 01	bulb	fresh	1, 10, 13, 21	powder	oral	0,091	100
Aloe vera (L.) Burm.f.	Sábila	Xanthorrhoeaceae	Ecu. Xa 01	whole plant	fresh	11, 19, 15	raw leaves	oral	0,091	75
Amaranthus hybridus subsp. quitensis (Kunth) Costea & Carretero	ataco	Amaranthaceae	Ecu. Amara 01	whole plant	fresh	3,12, 19	raw leaves	topical	0,045	50
Annona cherimola Mill.	cascara de chirimoya	Annonaceae	Ecu. An 01	fruit	fresh	11	fruit	oral	0,023	100
Artemisia absinthium L.	ajenjo	Asteraceae	Ecu. As 01	blossom	fresh	11	decoction	oral	0,023	100
Bactris gasipaes Kunth	chonta	Arecaceae	Ecu. Ar 01	root	fresh	11	decoction	oral	0,023	100
Banisteriopsis caapi (Spruce ex Griseb.) Morton	ayahuasca	Malpighiaceae	Ecu. Ma 01	leaf	fresh	22	decoction	oral	0,023	100
Bauhinia forficata Link	Pata de vaca	Fabaceae (Caesalpinioideae)	Ecu. Fa 01	leaf	dry	3	powder	oral	0,023	100
Borago officinalis L.	borraja	Boraginaceae	Ecu. Bo 01	whole plant	fresh	15	decoction	oral	0,023	100
Brosimum utile (Kunth) Oken	Leche de sandi	Moraceae	Ecu. Mo 01	stem	fresh	3,11	powder	oral	0,068	66,67
Brugmansia arborea (L.) Steud.	Guando	Solanaceae	Ecu. So 01	leaf	fresh	6, 19	decoction	oral	0,045	50
Bryophyllum pinnatum (Lam.) Oken	Churiyuyo	Crassulaceae	Ecu. Cr 01	leaf	fresh	11, 12, 13	decoction	oral	0,068	66,67
Buddleja globosa Hope	Matico	Scrophulariaceae	Ecu. Sc 01	whole plant	fresh	12, 19	cream	topical	0,068	33,33
Calendula officinalis L.	calendula	Asteraceae	Ecu. As 02	blossom	fresh	11, 19	cream	topical	0,045	100
Campyloneurum angustifolium (Sw.) Fée	calaguala	Polypodiaceae	Ecu. Po 01	stem	dry	12, 19	powder	oral	0,023	100
Capsicum annuum L.	Limo	Solanaceae	Ecu. So 02	fruit	fresh	11	powder	oral	0,023	100
Carica papaya L.	papaya	Caricaceae	Ecu. Car 01	fruit	fresh	11, 22	fruit	topical	0,045	100
Wintercereus colademononis (Diers & Krahn) Metzing & R. Kiesling	Cola de mono	Cactaceae	Ecu. Cac 01	stem	dry	14	powder	oral	0,091	66,67
Convallaria majalis L.	Flor de Mayo	Convallariaceae	Ecu. Co 01	cortex	fresh	15, 19	powder	oral	0,045	50
Copaifera officinalis L.	Copaico	Fabaceae (Caesalpinioideae)	Ecu. Fa 02	stem	dry	6	cream	topical	0,023	100
Croton eluteria (L.) W.Wright	Cascarilla	Euphorbiaceae	Ecu. Eu 01	stem	dry	21	cream	oral	0,045	100
Curcuma longa L.	curcuma	Zingiberaceae	Ecu. Zi 01	root	fresh	2, 3, 14	powder	oral	0,068	66,67
Dracaena draco (L.) L.	Sangre de drago	Asparagaceae	Ecu. Asp 01	stem	fresh	1	decoction	topical	0,114	76,92
Dysphania ambrosioides (L.) Mosyakin & Clemants	Paico	Amaranthaceae	Ecu. Amara 02	leaf	fresh	11, 19	powder	oral	0,045	100
Equisetum arvense L.	Cola de caballo	Equisetaceae	Ecu. Eq 01	stem	dry	11, 14	powder	oral	0,091	33,33
Eucalyptus globulus Labill.	Eucalipto	Myrtaceae	Ecu. My 01	whole plant	fresh	1	decoction	fume	0,068	100
Ficus carica L.	Higueron	Moraceae	Ecu. Mo 02	root	fresh	1	decoction	oral	0,023	100
Hibiscus sabdariffa L.	Flor de jamaica	Malvaceae	Ecu. Mal 01	blossom	fresh	11	powder	oral	0,023	100

Species	Local name	Family	Voucher number	Used part	Fresh/dry	Uses	Preparation	Oral/topical	MUV	FL
Hylocereus sp.	pitahaya	Cactaceae	Ecu. Cac 02	fruit	fresh	11	fruit	oral	0,045	50
Chamaemelum nobile (L.) All.	Manzanilla	Asteraceae	Ecu. As 03	whole plant	fresh	11, 12	powder	oral	0,091	80
Chenopodium album L.	Luztinga	Amaranthaceae	Ecu. Amara 03	stem	fresh	2	fruit	oral	0,023	100
Ilex guayusa Loes.	Guayusa	Aquifoliaceae	Ecu. Aq 01	leaf	fresh	21	powder	oral	0,136	73,33
Citrus limon (L.) Osbeck	Limon	Rutaceae	Ecu. Ru 01	fruit	fresh	1	powder	oral	0,045	100
Ludwigia repens J.R. Forst.	ludwigia	Onagraceae	Ecu. On 01	leaf	fresh	2	fruit	oral	0,023	100
Malva sylvestris L.	Malva	Malvaceae	Ecu. Mal 02	whole plant	fresh	11, 21	powder	oral	0,045	50
Maytenus laevis Reissek	Chuchuhuasi	Celastraceae	Ecu. Ce 01	leaf	fresh	11, 13	powder	oral	0,068	33,33
Mentha spicata L.	Hierbabuena	Lamiaceae	Ecu. La 01	whole plant	fresh	15	powder	oral	0,068	50
Nicotiana tabacum L.	tabaco	Solanaceae	Ecu. So 03	leaf	fresh	1	raw leaves	fume	0,045	100
Oenocarpus bataua Mart	Ungurahua	Arecaceae	Ecu. Ar 02	stem	fresh	21	cream	topical	0,023	100
Origanum vulgare L.	Oregano	Lamiaceae	Ecu. La 02	whole plant	fresh	11	powder	oral	0,023	100
Peperomia congona Sodiro	pataconyuyo	Piperaceae	Ecu. Pi 01	leaf	fresh	11	powder	oral	0,023	100
Persea americana Mill.	aguacate	Lauraceae	Ecu. Lau 01	fruit	fresh	11	powder	oral	0,023	100
Phyllanthus niruri L.	Chanca piedra	Phyllanthaceae	Ecu. Ph 01	leaf	fresh	11	powder	oral	0,045	50
Plantago major L.	llanten	Plantaginaceae	Ecu. Pl 01	whole plant	fresh	1, 10, 11	powder	oral	0,091	25
Plectranthus verticillatus (L.f.) Druce	Millonaria	Lamiaceae	Ecu. La 03	leaf	fresh	1	powder	oral	0,023	100
Piper umbellatum L.	Maria Panga	Piperaceae	Ecu. Pi 02	leaf	fresh	2	fruit	oral	0,023	100
Protium copal (Schltdl. & Cham.) Engl.	Copal	Burseraceae	Ecu. Bu 01	leaf	dry	19	powder	oral	0,023	100
Prunus salicifolia Kunth	Capuli	Rosaceae	Ecu. Ro 01	leaf	fresh	1	powder	oral	0,023	100
Psidium guajava L.	Cascara de guayaba	Myrtaceae	Ecu. My 02	fruit	fresh	11	powder	oral	0,023	100
Quassia amara L.	guabo	Simaroubaceae	Ecu. Si 01	leaf	fresh	11	powder	oral	0,023	100
Rosmarinus officinalis L.	Romery	Lamiaceae	Ecu. La 04	whole plant	fresh	1	raw leaves	oral	0,068	50
Ruellia tuberosa L.	Yuquilla	Acanthaceae	Ecu. Ac 01	stem	fresh	3	powder	oral	0,023	100
Ruta graveolens L.	Ruda	Rutaceae	Ecu. Ru 02	whole plant	fresh	11	cream	topical	0,068	33,33
Sambucus ebulus L.	Zaragoza	Adoxaceae	Ecu. Ad 01	whole plant	dry	11	powder	oral	0,068	75
Smilax aspera L.	Zarzaparilla	Smilacaceae	Ecu. Sm 01	leaf	fresh	11	powder	oral	0,023	100
Smilax ornata Lem.	sarsaparilla	Smilacaceae	Ecu. Sm 02	stem	fresh	11, 14	powder	oral	0,091	40
Socratea exorrhiza (Mart.) H.Wendl.	Palma caminante	Arecaceae	Ecu. Ar 03	stem	fresh	19	powder	oral	0,023	100
Solanum betaceum Cav.	Tamartillo	Solanaceae	Ecu. So 04	bulb	fresh	11	powder	oral	0,023	100
Solanum dulcamara L.	dulcamara	Solanaceae	Ecu. So 05	leaf	fresh	21	powder	oral	0,045	50
Taraxacum officinale F.H.Wigg.	dente leon	Asteraceae	Ecu. As 04	whole plant	fresh	11	powder	oral	0,023	100
Theobroma cacao L.	Cacao blanco	Malvaceae	Ecu. Mal 03	stem	fresh	11	powder	oral	0,045	50
Tilia americana L.	Tilo	Malvaceae	Ecu. Mal 04	leaf	fresh	1	raw leaves	oral	0,023	100
Tithonia diversifolia (Hemsl.) A.Gray	Yaguareté	Asteraceae	Ecu. As 05	stem	fresh	1	powder	oral	0,023	100
Tropaeolum tuberosum Ruiz & Pav.	Mashua	Tropaeolaceae	Ecu. Tr 01	leaf	fresh	14	powder	oral	0,045	100
Uncaria tomentosa (Willd. ex Schult.) DC.	Una de gato	Rubiaceae	Ecu. Ru 01	stem	fresh	11, 14	powder	oral	0,136	63,64
Urtica dioica L.	ortiga loriente	Urticaceae	Ecu. Ur 01	leaf	fresh	5	powder	oral	0,091	40
Verbena officinalis L.	Verbena	Verbenaceae	Ecu. Ve 01	whole plant	fresh	10, 11, 12	powder	oral	0,068	100
Zingiber officinale Roscoe	Jengibre	Zingiberaceae	Ecu. Zi 02	root	fresh	1, 3, 11, 21	powder	oral	0,114	33,33

Table 2 Demographic data of participants in the province of Orellana, Ecuador

Variable	Demographic categories	Number of informants	Percentages
Gender	Female	28	65
	Male	15	35
Age groups	<20	5	11.6
	21-30	9	21
	31-40	9	21
	41-50	14	32.4
	51-60	4	9
	61+	2	5
Age of treatment	> 1 years	0	0
	2-3 years	0	0
	4-6 years	1	2.5
	7-10 years	1	2.5
	< 10 years	41	95
Residence	Rural	14	33
	Urbanal	29	67

Table 3 Disease category

S.no	Disease category
1	Certain infectious and parasitic diseases
2	Neoplasms
3	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism
4	Endocrine, nutritional and metabolic diseases
5	Mental and behavioural disorders
6	Diseases of the nervous system
7	Diseases of the eye and adnexa
8	Diseases of the ear and mastoid process
9	Diseases of the circulatory system
10	Diseases of the respiratory system
11	Diseases of the digestive system
12	Diseases of the skin and subcutaneous tissue
13	Diseases of the musculoskeletal system and connective tissue
14	Diseases of the genitourinary system
15	Pregnancy, childbirth and the puerperium
16	Certain conditions originating in the perinatal period
17	Congenital malformations, deformations and chromosomal abnormalities

18 Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified
19 Injury, poisoning and certain other consequences of external causes
20 External causes of morbidity and mortality
21 Factors influencing health status and contact with health services
22 Codes for special purposes

Table 4 Plants Family, Genus, Order and Divisio in province of Orellana

Species	Family	Genus	Order	Divisio
Allium sativum L.	Amaryllidaceae	*Allium*	*Asparagales*	angiosperms
Aloe vera (L.) Burm.f.	Xanthorrhoeaceae	*Aloe*	*Asparagales*	angiosperms
Amaranthushybridus subsp. quitensis (Kunth) Costea&Carretero	Amaranthaceae	*Amaranthus*	*Caryophyllales*	angiosperms
Annona cherimola Mill.	Annonaceae	*Annona*	*Magnoliales*	angiosperms
Artemisia absinthium L.	Asteraceae	*Artemisia*	*Asterales*	angiosperms
Bactris gasipaes Kunth	Arecaceae	*Bactirs*	*Arecales*	angiosperms
Banisteriopsiscaapi (Spruce ex Griseb.) Morton	Malpighiaceae	*Banisteriopsis*	*Malphigales*	angiosperms
Bauhinia forficata Link	Fabaceae (Caesalpinioideae)	*Banisteriopsis*	*Fabales*	angiosperms
Boragoofficinalis L.	Boraginaceae	*Borago*	*Boraginales*	angiosperms
Brosimum utile (Kunth) Oken	Moraceae	*Brosimum*	*Rosales*	angiosperms
Brugmansia arborea (L.) Steud.	Solanaceae	*Brugmansia*	*Solanales*	angiosperms
Bryophyllumpinnatum (Lam.) Oken	Crassulaceae	*Bryophyllum*	*Saxifragales*	angiosperms
Buddleja globosa Hope	Scrophulariaceae	*Buddleja*	*Lamiales*	angiosperms
Calendula officinalis L.	Asteraceae	*Calendula*	*Asterales*	angiosperms
Campyloneurumangustifolium (Sw.) Fée	Polypodiaceae	*Campyloneurum*	*Polypodiales*	fern
Capsicum annuum L.	Solanaceae	*Capsium*	*Solanales*	angiosperms
Carica papaya L.	Caricaceae	*Carica*	*Brassicales*	angiosperms
Winterocereuscolademononis (Diers&Krahn) Metzing& R. Kiesling	Cactaceae	*Cleistocactus*	*Caryophyllales*	angiosperms
Convallaria majalis L.	Convallariaceae	*Convallaria*	*Asparagales*	angiosperms
Copaifera officinalis L.	Fabaceae (Caesalpinioideae)	*Copaifera*	*Fabales*	angiosperms
Croton eluteria (L.) W.Wright	Euphorbiaceae	*Croton*	*Malphigales*	angiosperms
Curcuma longa L.	Zingiberaceae	*Curcuma*	*Zingiberales*	angiosperms
Dracaena draco (L.) L.	Asparagaceae	*Dracena*	*Asparagales*	angiosperms
Dysphania ambrosioides (L.) Mosyakin&Clemants	Amaranthaceae	*Dysphania*	*Caryophyllales*	angiosperms
Equisetum arvense L.	Equisetaceae	*Equisetum*	*Equisetales*	Eqiusetophyta
Eucalyptus globulusLabill.	Myrtaceae	*Eucalyptus*	*Myrtales*	angiosperms
Ficus carica L.	Moraceae	*Ficus*	*Rosales*	angiosperms
Hibiscus sabdariffa L.	Malvaceae	*Hibiscus*	*Malvales*	angiosperms
Hylocereus sp.	Cactaceae	*Hylocereus*	*Caryophyllales*	angiosperms
Chamaemelum nobile (L.) All.	Asteraceae	*Chamaemelum*	*Asterales*	angiosperms

Chenopodium album L.	Amaranthaceae	*Chenopodium*	*Caryophyllales*	angiosperms
Ilex guayusa Loes.	Aquifoliaceae	*Ilex*	*Aquifoiales*	angiosperms
Citrus limon (L.) Osbeck	Rutaceae	*Citrus*	*Sapindales*	angiosperms
Ludwigiarepens J.R. Forst.	Onagraceae	*Ludwigia*	*Myrtales*	angiosperms
Malvasylvestris L.	Malvaceae	*Malva*	*Malyales*	angiosperms
Maytenus laevis Reissek	Celastraceae	*Maytenus*	*Celastrales*	angiosperms
Mentha spicata L.	Lamiaceae	*Mentha*	*Lamiales*	angiosperms
Nicotianatabacum L.	Solanaceae	*Nicotiana*	*Solanales*	angiosperms
Oenocarpusbataua Mart	Arecaceae	*Jessenia*	*Arecales*	angiosperms
Origanum vulgare L.	Lamiaceae	*Origanum*	*Lamiales*	angiosperms
PeperomiacongonaSodiro	Piperaceae	*Peperomia*	*Piperales*	angiosperms
Persea americana Mill.	Lauraceae	*Persea*	*Laurales*	angiosperms
Phyllanthus niruri L.	Phyllanthaceae	*Phyllanthus*	*Malphigales*	angiosperms
Plantago major L.	Plantaginaceae	*Plantago*	*Lamiales*	angiosperms
Plectranthusverticillatus (L.f.) Druce	Lamiaceae	*Plectranthus*	*Lamiales*	angiosperms
Piper umbellatum L.	Piperaceae	*Pothomorphe*	*Piperales*	angiosperms
Protium copal (Schltdl. & Cham.) Engl.	Burseraceae	*Protium*	*Sapindales*	angiosperms
Prunus salicifolia Kunth	Rosaceae	*Prunus*	*Rosales*	angiosperms
Psidiumguajava L.	Myrtaceae	*Psidium*	*Myrtales*	angiosperms
Quassia amara L.	Simaroubaceae	*Quassia*	*Sapindales*	angiosperms
Rosmarinus officinalis L.	Lamiaceae	*Rosmarinus*	*Lamiales*	angiosperms
Ruellia tuberosa L.	Acanthaceae	*Ruellia*	*Lamiales*	angiosperms
Rutagraveolens L.	Rutaceae	*Ruta*	*Sapindales*	angiosperms
Sambucus ebulus L.	Adoxaceae	*Sambucus*	*Dipsacales*	angiosperms
Smilax aspera L.	Smilacaceae	*Smilax*	*Liliales*	angiosperms
Smilax ornata Lem.	Smilacaceae	*Smilax*	*Liliales*	angiosperms
Socrateaexorrhiza (Mart.) H.Wendl.	Arecaceae	*Socratea*	*Arecales*	angiosperms
Solanum betaceum Cav.	Solanaceae	*Solanum*	*Solanales*	angiosperms
Solanum dulcamara L.	Solanaceae	*Solanum*	*Solanales*	angiosperms
Taraxacum officinale F.H.Wigg.	Asteraceae	*Taraxacum*	*Asterales*	angiosperms
Theobroma cacao L.	Malvaceae	*Theobroma*	*Malvales*	angiosperms
Tiliaamericana L.	Malvaceae	*Tilia*	*Malvales*	angiosperms
Tithoniadiversifolia (Hemsl.) A.Gray	Asteraceae	*Tithonia*	*Asterales*	angiosperms
Tropaeolum tuberosum Ruiz &Pav.	Tropaeolaceae	*Tropaeolum*	*Brassicales*	angiosperms
Uncaria tomentosa (Willd. ex Schult.) DC.	Rubiaceae	*Uncaria*	*Gentianales*	angiosperms
Urticadioica L.	Urticaceae	*Urtica*	*Rosales*	angiosperms
Verbena officinalis L.	Verbenaceae	*Verbena*	*Lamiales*	angiosperms
Zingiber officinale Roscoe	Zingiberaceae	*Zingiber*	*Zingiberales*	angiosperms

Table 5 Fidelity level value of medicinal palnts commonly reported agains a given ailment category

No	Medicinal plant	Therapeutic category	Iu	Ip	FL value (%)
4	Copaifera officinalis L.	Nervous system	4	4	100
6	*Eucalyptus globulus* Labill.	Infections and parasites	5	5	100
9	*Origanum vulgare* L.	Digestive system	4	4	100
7	*Chamaemelum nobile* (L.) All.	Digestive system and metabolic disseases	10	8	80
5	*Dracaena draco* (L.) L.	Infections and parasites	13	10	76.92
1	*Aloe vera* (L.) Burm.f.	Pregnancy, digestive system and injuries	4	3	75
10	Sambucus ebulus L.	Digestive system	4	3	75
8	Ilex guayusa Loes.	Health services	15	11	73.33
2	Brosimum utile (Kunth) Oken	Imunne mechanism and digestive system	6	4	66.67
3	Winterocereus colademononis (Diers&Krahn) Metzing& R. Kiesling	Genitourinary system	9	6	66.67
11	*Uncaria tomentosa* (Willd. ex Schult.) DC.	Digestive system and genitourinary system	11	7	63.64

Table 6 Information from the questionnaires

age of treatment	where knowledge	use	% of reduction?	asking healer for advice?	Gaining plans?	distance from healer?
>10 years	family	no	not at all	Yes	autoproduction	close
>10 years	family/ healer	no	not at all	Yes	autoproduction	close
>10 years	family	no	not at all	Yes	autoproduction	close
>10 years	family	yes	more or less	No	importation	far
>10 years	family	no	not at all	No	importation	far
>10 years	family	yes	more or less	Yes	collection	close
>10 years	family	yes	more or less	Yes	importation	close
>10 years	family	yes	more or less	Yes	autoproduction	close
>10 years	family	yes	more or less	No	collection	close
>10 years	family	no	not at all	No	collection	close
>10 years	family	no	not at all	No	autoproduction	close
>10 years	family	no	not at all	No	trade	close
>10 years	family	no	not at all	Yes	collection	far
>10 years	family	no	not at all	No	trade	far
>10 years	family	no	not at all	No	autoproduction	close
>10 years	family	yes	more or less	No	trade	far
>10 years	family	no	not at all	Yes	trade	far
>10 years	family	yes	more or less	No	trade	far

>10 years	family	no	not at all	No	trade	far
>10 years	family	no	not at all	No	collection	close
>10 years	family	no	not at all	Yes	collection	close
>10 years	family	no	not at all	Yes	autoproduction	close
>10 years	family	no	not at all	Yes	autoproduction	close
>10 years	family	yes	hardly at all	No	autoproduction	close
>10 years	family	no	not at all	Yes	collection	close
>10 years	family	no	not at all	Yes	autoproduction	close
>10 years	family	no	not at all	Yes	collection	close
>10 years	family	no	not at all	No	trade	far
>10 years	family	no	not at all	No	autoproduction	close
>10 years	family	yes	more or less	No	collection	far
>10 years	family	yes	more or less	No	trade	close
>10 years	family	yes	more or less	No	trade	close
>10 years	family	yes	a lot	No	trade	close
>10 years	family	no	not at all	Yes	autoproduction	close
>10 years	family	no	not at all	No	collection	far
>10 years	family	no	not at all	No	autoproduction	close
>10 years	family	n	not at all	No	autoproduction	close
>10 years	family	yes	more or less	No	collection	far
>10 years	family	no	not at all	Yes	collection	far
7-10 years	family	yes	a little	Yes	autoproduction	close
>10 years	family	no	not at all	No	trade	far
>10 years	family	yes	more or less	No	trade	far
4-6 years	family	yes	more or less	No	trade	far

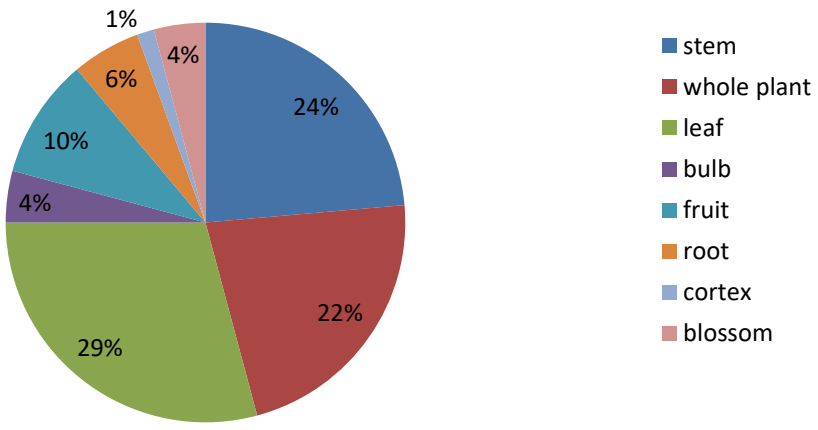

Figure 2 Plant parts used for remedy preparation in province of Orellana

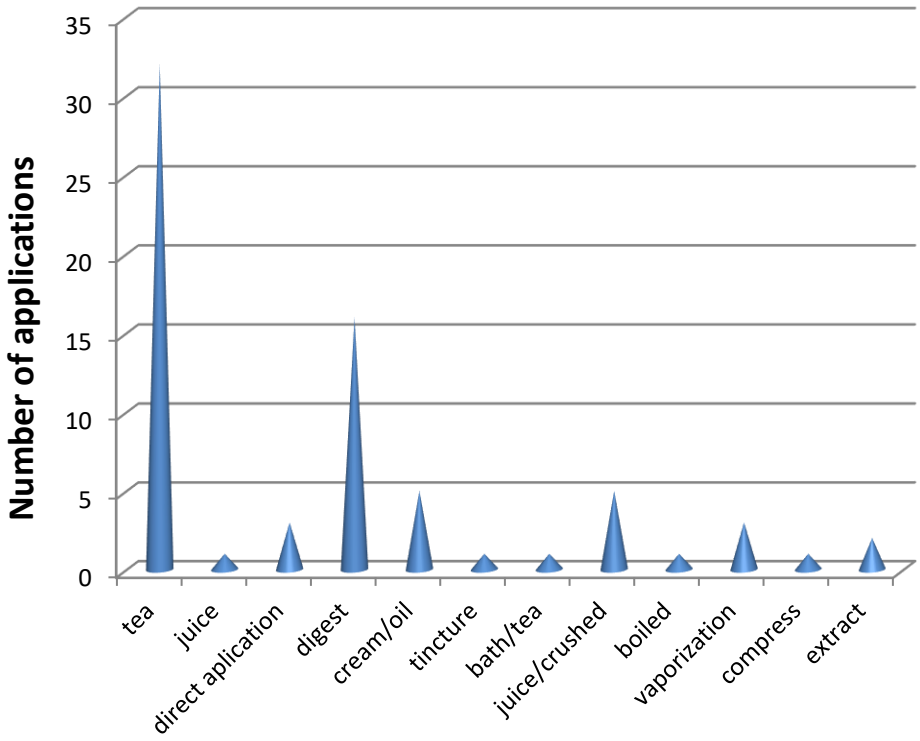

Figure 3 Methods of remedy preparation in province of Orellana

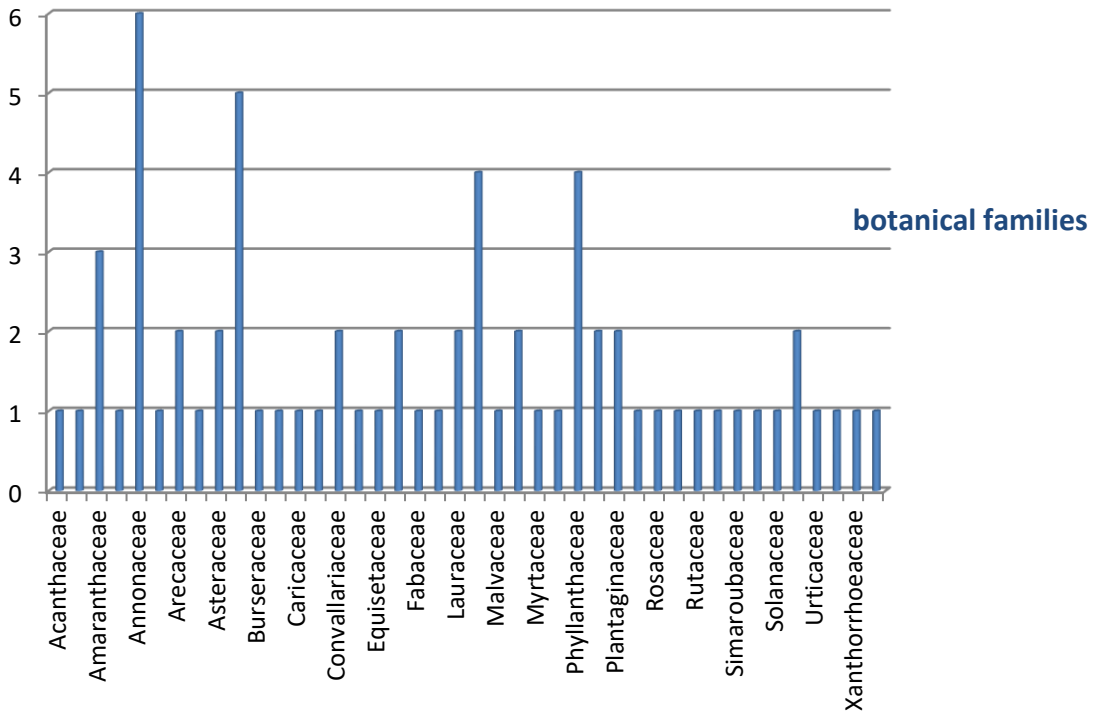

Figure 4The variety of plants families which are used in study area

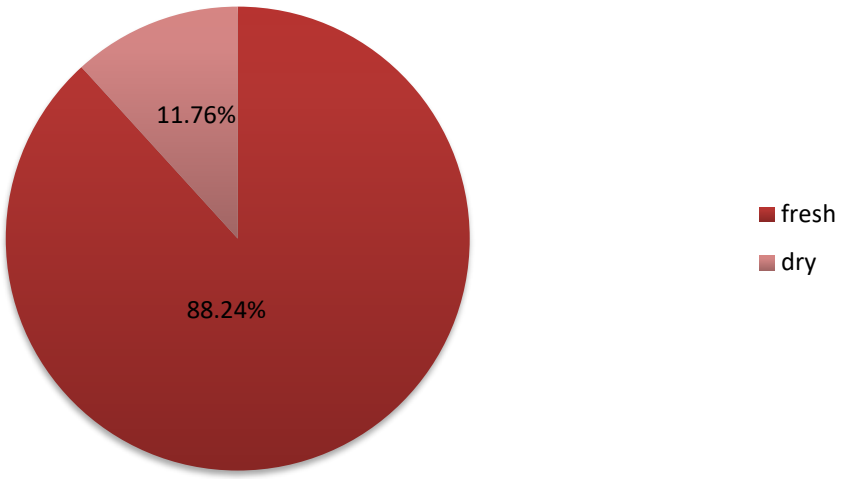

Figure 5 Percentage of preparing plants (fresh/dry)

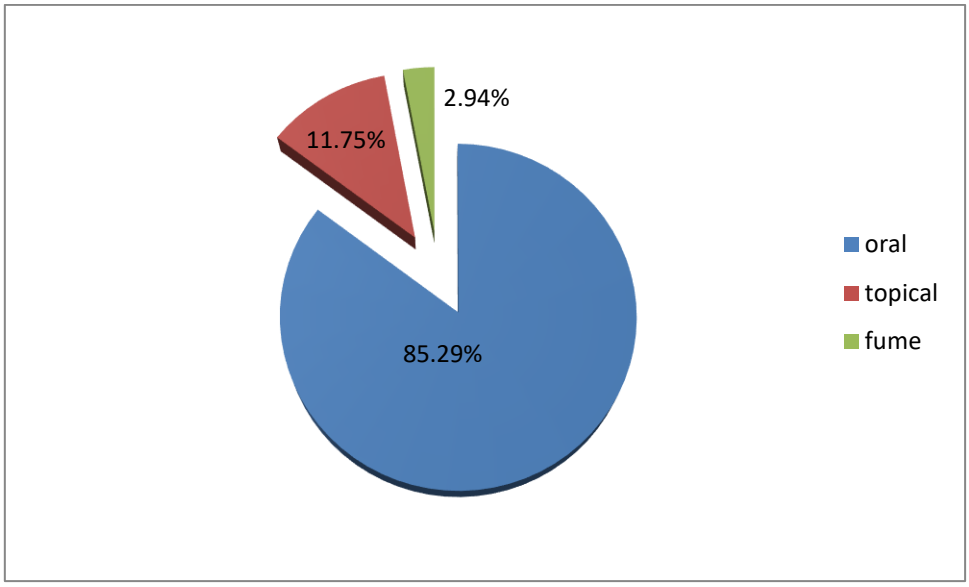

Figure 6 Forms of using plants

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8. **Attachments**

Attachment 1: The questionnaire

This questionnaire was used in the research in province of Orellana.

Universidad Checa de Ciencias de la Vida — Encuesta a Usuarios de Plantas Medicinales — Investigador Responsable: Eduardo Alberto Lara
Reimers Doctorado en Desarrollo Rural Sostenible — Trabajo de investigación sobre
medicina tradicional

Favor de responder a las siguientes preguntas, que servirán para conocer en que medida se conservan las tradiciones de las comunidades indígenas, en especial en lo que se refiere al uso de las plantas medicinales.

I. Datos Generales

1. Localidad: _____ 2. zona: _urbana _rural 3. Ocupación principal: _____

Sexo: Masculino__ Femenino__ 5. Edad: ->20 21-30 31-40 41-50 51-60 61<+

II. Uso de Plantas medicinales:

1.-¿Utiliza plantas medicinales para resolver problemas de salud?: si____ no____
2.- ¿Usted utiliza plantas medicinales como primera medida para tratar las enfermedades? si____ no____
3.- ¿Por qué razón utiliza la medicina tradicional? Marcar una o mas

a) es barato b) es tradición familiar c) tiene alta efectividad d) no cuenta con centros de salud cercano e) no tiene seguro médico f) otro_____

5.- ¿Cuánto tiempo tiene consumiendo plantas medicinales o haciendo uso de ellas?

>1 año 2-3 años 4-6 años 7-10 años +10 años

6.- ¿Cuál fue la principal forma de obtención del conocimiento? Tradición familiar ___ comunidad ___ curandero ___ mercado ___ escuela ___ otro _____

7.-¿según su conocimiento o percepción cree que existe una reducción del número de plantas usadas actualmente? Si___ no___

7.1.- si es sí, ¿Qué porcentaje considera que se ha perdido? * 0 es nada 100 es mucho: _____%

8.- ¿visita al curandero para determinar el uso de las plantas? si____ no____, en este último caso, ¿Cómo determinó el uso?_____

8.- ¿Cómo consigue las plantas? las recolecta____ autoproducción en su huerta de traspatio_____ las compra_____ Otra forma_____

8.1.- ¿Si las compra en qué lugar lo hace?: farmacia _____ herbolaria _____ Mercados _____ otros (tiendas, súper) _____

9.-¿Qué tan lejos y accesible se encuentra el lugar de recolección de las plantas de su comunidad?_____

Attachment 2: Photodocumentation from research

Photograph A: This photo shows the nature of study area.

Photograph B: Traditional market in Loreto.

Photograph C: Children selling not only medicinal plants among the road.

Photograph D: Me with typical woman vendedor in Coca.

Photograph E: Other typical market from Ecuador.

Photograph F: My friends from Ibarra helping me with research in province of Orellana.