

ARTÍCULO DE REVISIÓN

The importance of plants and their medicinal properties in the Andean World

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RESUMEN

La presente revisión bibliográfica reúne información esencial sobre las plantas medicinales y su contribución a la mejora de la salud y el bienestar de las personas. Desde el pasado, cuando la gente solía dedicar su vida a la agricultura y la ganadería, las plantas han sido parte esencial de su crecimiento y desarrollo, ya que la gente antigua realmente confiaba en sus beneficios y aprovechaba las propiedades medicinales que las plantas tienen y contribuyen a mejorar la calidad de vida de las personas. En este sentido, el presente estudio pretende resaltar la importancia, propiedades medicinales y beneficios que las plantas brindan a las personas, no solo en la región andina sino en Ecuador. La metodología de investigación involucra un enfoque multidisciplinario, que

incluye la perspectiva biológica, botánica y socio cultural. El resultado principal indica que a pesar de que las investigaciones se han dedicado a indagar sobre las plantas medicinales, existe cierta falta de información actualizada que permita identificar plantas específicas y sus beneficios científicos en casos particulares.

Palabras Clave: andina, medicina, plantas, propiedades.

ABSTRACT

The present bibliographic review gathers essential information about medicinal plants and their contribution to improve people's health and welfare. Since the past, when people used to dedicate their lives to agriculture and farming, plants have been essential part of their growing and development, since ancient people really trusted in their benefits and took advantage of the medicinal properties that plants have and contribute to improve people's quality of live. In this sense, the present study aims to highlight the importance, medicinal properties and benefits those plants provide to people, not only in the Andean region but in Ecuador. The research methodology involves a multidisciplinary approach, which includes biological, botanic and socio-cultural perspective. The main result indicates that even though researches have dedicated to investigate about medicinal plants, there is some lack of updated information that permits to identify specific plants and their scientific benefits in particular cases.

Keywords: Andean, medical, plants, properties

INTRODUCTION

The Andean region, with its varied and rich ecosystems and with tremendous variety of flora, has been a source of traditional and ancestral knowledge about the therapeutic uses of local plants. This bibliographic review explores the diverse range of plant-based treatments used by different people in the Andes, attempting to identify and value the ecological, historical, and cultural factors that each plant contains, which at the same time contribute to improve the health and quality of life of people who are involved or consume those plants. In this way, the present research is driven by the pressing need to file and comprehend the complex

interactions that exist between the Andean people and the variety of plants that grow and flourish in different environments, especially with regard to the use of their medicinal properties.

Indigenous Andean cultures have long relied on a wide variety of plant species to treat a range of health issues, establishing a strong link between nature and people's wellbeing. The preservation of this old knowledge has become really important as modernity progresses. However, and unfortunately, not many people know about specific benefits that each plant contains and their contribution to keep a healthy lifestyle. That is why, this bibliographical review seeks to provide light on the dynamic interaction between cultural practices and a variety of plant species that inhabit in this unique and exceptional geographical environment. This review article will also keep a record of the most common Andean medicinal plants. This research aims to support the preservation of indigenous knowledge, the sustainable use of biodiversity, and the possible integration of traditional practices into modern healthcare frameworks by clarifying the ecological and historical background of plant-based treatments. From this perspective, Monigatti et al. (1) assert that there is a complex and beneficial link between the Andean people and a great variety of plants that have been essential to their well-being, which at the same time have been adopted from their ancient relatives. In addition, De La Cruz et al. (2) highlight the importance of identifying the unique qualities and benefits that cold and warm plants provide to improve people's health, the authors also include that each plant contains specific characteristics that comes from a rich healing background.

METHODOLOGY

The present article contains a systematic literature review that synthesizes plenty of works related to plants and their medicinal properties in the Andean region and the Ecuadorian territory. This article review also includes a variety of relevant and reliable information taken from books, journals and scientific articles which come from important and well-known databases. It is essential to highlight that meaningful information was methodically taken out of the chosen researches, including relevant conclusions, the techniques used, and original contributions related to the topic. The goal of this procedure was to present various

contributions that support the development of the topic. Moreover, a focus on correct citation and acknowledging the contributions of the original authors was placed on ethical issues, keeping in mind that every source that was used for the review is properly cited in the body of the article and in the references section.

By following this process, the review intends to offer a thorough and rigorous synthesis of the body of knowledge on plants and their medicinal properties in the Andean region, generating a significant contribution to the field and people who are involved in this important area.

RESULTS AND DISCUSSION

Classification of herbs in the Andean world

In regards to the research based on reliable sources; it should be highlighted the importance of plants classification. In this concern, Bussmann and Sharon (3) agree that in the Andean world, herbs have been traditionally used for medicinal, culinary and ritual purposes. These herbs can be classified in different ways according to their use and characteristics.

Medicinal herbs: In the Andean world, numerous herbs are used to treat various ailments and diseases. Some common medicinal herbs include coca (*Erythroxylum coca*), used as a stimulant and analgesic; muña (*Minthostachys* spp.), which is used for digestive and respiratory problems; and rue (*Ruta graveolens*), used as an anti-parasitic and digestive. It is important to remark that according to Balarezo (4), 80% of the Ecuadorian population use medicinal plants as a natural healing alternative.

Ritual herbs: In Andean traditions, herbs are used in ceremonies and rituals to connect with the sacred and purify the environment. A common ritual herb is copal (*Protium* spp.), which is burned to ward off evil spirits and cleanse negative energies. Palo santo (*Bursera graveolens*) is also used in rituals to purify and attract good energies. In addition, Anconatani (5) asserts that ceremonial plants such as coca, wachuma, achakana, sayri, and maize – used in the production of chicha, are Andean plants that have been used for rituals and ceremonies.

Culinary herbs: Berdonces (6) argues that since the beginning of humanity, plants and aromatic spices have been used to preserve food and make it healthier, in addition to their culinary use to enhance flavors. Besides imparting a wide range of tastes to dishes, most of them aid in digestion and improve health. Many Andean herbs are used in cooking to give flavor and aroma to food. Some typical culinary herbs are cilantro (*Coriandrum sativum*), parsley (*Petroselinum crispum*), huacatay (*Tagetes minuta*) and chincho (*Tagetes* spp.). These herbs are used to season traditional dishes such as ceviche, soups and stews.

From another perspective, Ramirez (7) claims that the plants are classified in cold and warm herbs. Similarly, De La Cruz et al. (2) detail a vast list of plants that contribute to help and heal different parts of the body.

Cold and warm plants that are cultivated in Ecuador

The Andean world is known for its diversity of plants adapted to cold climates due to the high altitudes and low temperatures in the region. These are just some of the many cold plants found in the Andean world. Each of them has unique adaptations to survive in cold climates and provides significant benefits to local communities in terms of food, medicine, and culture. In this sense, De la Cruz et al. (2) include a vast list of plants that belong to the Andean region, and they can be found in the Ecuadorian highland region. It is necessary to add that according to Moraes et al. (8) there isn't a complete list of medicinal plants in the Ecuadorian Andes, but they're all useful for treating illnesses and inflammations. Some of the most common are the following:

Quinoa (*Chenopodium quinoa*): An ancestral Andean crop with edible seeds rich in proteins and nutrients. **Native Potatoes (*Solanum* spp.):** Andean potatoes are diverse and resilient to cold climates, with a wide variety of shapes, colors, and flavors. **Maca (*Lepidium meyenii*):** A root plant cultivated in the Peruvian Andes, prized for its energizing and adaptogenic properties. **Chocho (*Lupinus mutabilis*):** An Andean legume that produces edible seeds rich in proteins and nutrients. **Royal Quinoa (*Chenopodium quinoa* var. *melanospermum*):** A quinoa variant that grows at high elevations in the Andes and is appreciated for its high nutrient content. **Oca (*Oxalis tuberosa*):** An Andean tuber similar to potatoes, with a wide variety of colors and flavors.

Cañihua (*Chenopodium pallidicaule*): A plant from the same family as quinoa, producing small edible seeds and resistant to adverse weather conditions. **Muña (*Minthostachys spp.*):** A genus of Andean aromatic plants used in infusions, known for their digestive and analgesic properties. **Ishpingo (*Amburana cearensis*):** An Andean tree whose bark is used in medicinal infusions and essential oil production. **Tumbo (*Passiflora tarminiana*):** An Andean passion fruit species cultivated at high altitudes and appreciated for its unique flavor. **Chicory (*Cichorium intybus*):** A perennial herbaceous plant that grows in the Andes and is used as food and in medicinal infusions. **Achupalla (*Puya spp.*):** A genus of bromeliad plants adapted to the high altitudes and cold climates of the Andes. **Muña muña (*Minthostachys mollis*):** An Andean aromatic plant used in infusions to treat respiratory and digestive issues. **Tarwi (*Lupinus mutabilis*):** An Andean legume with high protein content. **Ají (*Capsicum spp.*):** Various chili pepper varieties grow in the Andes, adding flavor and heat to traditional regional cuisine. **Cantuta Flower (*Cantua buxifolia*):** An Andean ornamental plant that produces trumpet-shaped flowers in vibrant colors. **Muñuna (*Polylepis spp.*):** A genus of Andean trees that grow at high altitudes and are important for the conservation of fragile ecosystems. **Achachairú (*Garcinia humilis*):** An Andean tree that produces sweet and refreshing fruits. **Capulí (*Prunus serotina*):** A cherry tree native to the Andes, known for its small and dark fruits. **Kaniwa (*Chenopodium pallidicaule*):** An Andean pseudocereal similar to quinoa, cultivated at high altitudes and appreciated for its nutritional value.

Other warm plants that contribute to the Ecuadorian welfare.

Coca (*Erythroxylum coca*): Native plant of the Andes known for its stimulant properties. Traditionally used in infusions and in the production of cocaine. **Achira (*Canna edulis*):** Plant cultivated for its edible tuber and ornamental leaves. **Papaya (*Carica papaya*):** Fruit tree native to Central America but extensively cultivated in the Andes. Its fruits are sweet and rich in vitamin C. **Cacao (*Theobroma cacao*):** Tropical tree cultivated for its seeds, used in chocolate production. The "Criollo" variety is native to the Andes. **Guava (*Psidium guajava*):** Shrub or small tree with sweet and fragrant edible fruits. Widely cultivated in the Andes. **Pepper (*Capsicum annuum*):** Plant cultivated

for its spicy or sweet fruits, depending on the variety. Widely used in Andean cuisine. **Mashua (*Tropaeolum tuberosum*):** Tuberos plant native to the Andes, cultivated for its spicy-flavored edible tubers. **Aji (*Capsicum baccatum*):** Pepper variety native to South America, widely used in Andean cuisine. Its fruits are spicy and aromatic. **Cherimoya (*Annona cherimola*):** Fruit tree native to the Andes, with sweet and aromatic pulp. **Lucuma (*Pouteria lucuma*):** Tree native to the Andes, cultivated for its sweet and starchy fruits. Used in desserts and ice creams. **Sugarcane (*Saccharum officinarum*):** Perennial plant cultivated for its sweet juice, used to produce sugar and other derived products. **Mango (*Mangifera indica*):** Fruit tree extensively cultivated in the Andes, known for its juicy and sweet fruits. **Passion Fruit (*Passiflora edulis*):** Climbing plant cultivated for its tropical fruit with acidic and aromatic flavor. Widely used in beverages and desserts. **Uvilla (*Physalis peruviana*):** Perennial plant native to the Andes, cultivated for its sweet and acidic berries, also known as "aguaymanto." **Soursop (*Annona muricata*):** Tropical tree cultivated for its large fruits with white and sweet pulp. Also known for its medicinal properties. **Tara (*Caesalpinia spinosa*):** Tree native to the Andes, whose pods contain a gum used in the food and textile industry. **Granadilla (*Passiflora ligularis*):** Climbing plant cultivated for its round and sweet fruits with juicy pulp. Also known as "parcha" in some Andean countries. **Achiotillo (*Bixa orellana*):** Shrub native to the Andes, whose seeds contain a red dye used in cooking and the cosmetic industry. **Pineapple (*Ananas comosus*):** Tropical plant cultivated for its juicy and sweet fruit, with a characteristic acidic taste. Algarrobo (*Prosopis pallida*): Tree native to the Andes, whose fruits and seeds are edible, also used in traditional medicine.

At this point, it is important to highlight that Tinitana et al. (9) argue that there are 160 species of medicinal plants in Ecuador. The authors focus their research on the South of the country, especially in Loja province, it is evident that there is lack of information about other provinces and some important plants are not included. On the other hand, there is some contradictory information published in another research conducted in Loja province. In this concern, Bussmann, and Sharon (3) mention that there are 215 species of plants identified in the south of Ecuador, mainly in Loja province. Additionally, Tene et al. (10) agree that there are 275

medicinal and hallucinogenic plants that are used for different purposes in Loja and Zamora Chinchipe provinces, both located at the south of Ecuador.

It is observed that three similar articles researched at the same places contain contrasting data, which can confuse readers and make the information unreliable.

A COMPLEX AND INTERESTING PROCESS

It is also essential to know about the complex process of preparing the land for planting, rituals for cultivation, harvesting, collection, drying process, and preservation of medicinal plants as follows:

1. How to prepare the land for a successful planting of a medicinal plant.

Land preparation for obtaining a good yield of medicinal plants is crucial and should follow a careful process. In this sense, Acosta de la luz (11) claims that the selection of the land should be based on environmental conditions. The soil is moved and adjusted according to the size of the plant, taking into account various ecological, physiological, and morphological aspects. It is important to keep in mind that planting should be done in a suitable space corresponding to the plant's size. It is also necessary to check the lighting and humidity of the land, as well as the sunlight and shade that neighboring objects may provide. Additionally, plants should be protected from contaminated areas, and their proximity to a readily available water source for irrigation should be ensured.

2. Rituals used for the planting, cultivation, and harvest of medicinal plants

Beyond the use and knowledge about medicinal plants, it is also necessary to understand the unique and relevant process of cultivation. In this sense, Chicaiza Yasaca (12) reports that the rituals used for the planting, cultivation, and harvest of medicinal plants are related to the beliefs of the Andean cosmovision and are part of the culture of the Andean people. For instance, it can be said that the Inti Raymi is a ritual through which the population expresses gratitude to Pacha Mama. This ritual is performed through dances, offerings, and chants. Moreover, the Jahuay is another ritual that uses verses to express the feelings and anecdotes of people dedicated to this activity.

3. How to harvest plants

Several steps should be considered for the collection of medicinal plants. That is why, Bermudez et al. (13) highlights that it is crucial to ensure that the medicinal plant is the one needed or appropriate, avoiding confusion with similar ones. Being responsible with the quantity of plants needed is essential to protect the environment and avoid waste. It is advised to cut or harvest up to 50% of the medicinal plant, using appropriate tools such as pruning shears to extract the required part. For personal protection, it is recommended to use gloves. Regarding storage, paper bags or wicker baskets are recommended.

4. How plants are dried

Within the process of collecting and drying plants, Sánchez-González et al. (14) claim that it is advisable to store them in paper bags to ensure proper drying and prevent them from rotting or spoiling. This step is crucial, and we should avoid them breaking or rotting. For this purpose, the authors recommend the use of a wooden frame with a covering.

5. Plants conservation

Medicinal plants are highly valuable, and their conservation is essential for the development of communities. That's why Akerele (15) proposes the creation of botanical gardens as indispensable and mandatory for their care, as well as the conscious distribution and planting of their seeds. Additionally, the author considers that the support of local governments is necessary to protect the plants in a technical and secure way.

There are plenty of articles about the process of obtaining and taking care of medicinal plants. However, none mentions details about specific plants in Ecuador.

It is important to mention specific plants and researches that nowadays are very useful to treat and help to improve respiratory conditions. In this way, Rodriguez et al. (16) write an article about Covid 19 and report that *Aloe barbadensis* (sábila), *Plectranthus amboinicus* (orégano francés), *Citrus aurantium* (naranja) and *Allium cepa* (cebolla) have been used as medicinal plants that support the health conditions to prevent Covid 19 disease. In another study conducted by

Maldonado et al. (17), it is mentioned that Oregano (*Origanum vulgare*), European sage (*Salvia officinalis*), basil (*Ocimum basilicum*), rosemary (*Salvia rosmarinus*), thyme (*Thymus vulgaris*) and echinacea (*Echinacea angustifolia*) have antiviral or antiviral properties; nevertheless, these plants will not help much against coronavirus. The authors remark that another very common case today is to drink the infusions of Eucalyptus (*Eucalyptus globulus*), Willa Huilla (*Achyrocline alata*, *A. satureioides*, *A. venosa*, *Gnapharium cheilantifolium*, *Gamochaeta* spp) and Chamomile (*Matricaria chamomilla*). In the case of these plants, their compounds are known to have useful properties in the treatment of respiratory diseases caused by influenza viruses and the common cold. However, there is no scientific evidence that they can prevent or treat the infection of Corona virus.

Moreover, Ortega et al. (18) agree that preparing infusions of *Sambucus nigra* (elderberry), *Sambucus racemosa* (red elderberry) and *Sambucus ebulus* (dwarf elderberry) help to support and improve conditions related to breathing. Once again, they do not represent a cure against the Covid 19. Furthermore, Paz y Miño and Leone (19) in relation to their research conducted in Ecuador, also mention alternative medicine through the use of plants to contrast and prevent the effects of Corona virus. In this regard, the authors highly recommend vaporizations with eucalyptus and chamomile mainly, they consider that infusions of garlic and onion, garlic, lemon and cinnamon, ginger and honey, ginger and lemon also help to decrease infections and support respiratory conditions. It is essential to recall that there is no evidence that the vaporizations or infusions have the properties to cure definitively serious sicknesses.

CONCLUSIONS

- The lack of updated information about medicinal plants in Ecuador highlights a possible documentation and research gap. This insufficient knowledge could impede the proper use and care of efficient medicinal plans and the preservation and sustainable use of important plant resources.
- Inadequate knowledge of the basic principles of using medicinal plants is essential for maintaining public health. In this concern, to guarantee the safe

and efficient use of medicinal herbs, education regarding their proper identification, preparation, and application is essential.

- It is indispensable to understand that the prevalence of particular medicinal plants in Ecuador offers important information into the people's cultural customs and priorities for health. In this sense, recognizing these plants and encouraging their use can help preserve traditional medical knowledge and generate a variety of medicinal solutions.
- The present bibliographic review related to medicinal plants in Ecuador highlights the relationship between traditional knowledge, biodiversity, and the need for finding alternative medicine useful. Overcoming information gaps, raising awareness of fundamental usage guidelines, and appreciating the value of commonly used medicinal plants work together to support a holistic approach to healthcare that combines traditional knowledge with modern scientific understanding.

Contribución del autor (s)

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