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# Traditional use and qualitative chemical composition of medicinal plants in the communities of Sardinata and Cúcuta in Norte de Santander - Colombia

## Uso tradicional y composición química cualitativa de plantas medicinales en las comunidades de Sardinata y Cúcuta en Norte de Santander - Colombia

**Aromatic treasures: Medicinal plants at the market square.**

Photo: G. Chaves-Bedoya

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## ABSTRACT

Traditional medicine is part of the culture of the people, it is an expression of intangible cultural heritage that combines different traditional knowledge and practices. Medicinal plants have been used as an alternative method to conventional medicine, and their use in developing countries has been inherited generationally. The aim of this study was to determine the prevalence of use in traditional medicine and preliminary identification of secondary metabolites present in medicinal plants used for the treatment of ailments in two municipalities from Norte de Santander-Colombia. The research method used for the development of the project is qualitative and experimental. Interviews were conducted with 40 herbalists in the markets of the municipalities of Sardinata and Cúcuta. Experimentally, the ethanolic extract of 17 medicinal plants was obtained to identify the secondary metabolites present using the technique of thin layer chromatography (TLC). The results suggests that the secondary metabolites of higher prevalence in the most used medicinal plants are flavonoids and terpenes. Information gained from traditional and medicinal plants maintains an important cultural value and represents an alternative use for the management of ailments at low cost, highlighting the importance of phytotherapy for communities. The results of the study not only confirm the relevance of medicinal plants in the region, but also highlight the importance of continuing to research and document the applications and benefits of these plants in traditional and modern medicine.

**Additional keywords**: traditional medicine; ethnobotanic; herbalist; secondary metabolites; thin layer chromatography.

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[2] Corresponding author: luzyinethor@ufps.edu.co

## RESUMEN

La medicina tradicional forma parte de la cultura del pueblo, es una expresión del patrimonio cultural inmaterial que combina diferentes saberes y prácticas tradicionales. Las plantas medicinales se han utilizado como método alternativo a la medicina convencional, y su uso en los países en desarrollo se ha heredado generacionalmente. El objetivo de este estudio fue determinar la prevalencia de uso en medicina tradicional y la identificación preliminar de metabolitos secundarios presentes en plantas medicinales utilizadas para el tratamiento de dolencias en los municipios de Sardinata y Cúcuta, Norte de Santander-Colombia. El método de investigación utilizado para el desarrollo del proyecto es cualitativo y experimental. Se realizaron entrevistas a 40 herbolarios en los mercados de los municipios de Sardinata y Cúcuta. Experimentalmente, se obtuvo el extracto etanólico de plantas medicinales con el fin de identificar los metabolitos secundarios presentes mediante la técnica de cromatografía de capa delgada (TLC). Los resultados sugieren que los metabolitos secundarios de mayor prevalencia en las plantas medicinales más utilizadas son los flavonoides y los terpenos. La información obtenida de plantas tradicionales y medicinales mantiene un importante valor cultural y representa una alternativa de uso para el manejo de dolencias a bajo costo, destacando la importancia de la fitoterapia para las comunidades. Los resultados del estudio no solo confirman la relevancia de las plantas medicinales en la región, sino que también destacan la importancia de continuar investigando y documentando las aplicaciones y beneficios de estas plantas en la medicina tradicional y moderna.



**Palabras clave adicionales:** medicina tradicional; etnobotánica; herbolario; metabolitos secundarios; cromatografía de capa fina.

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## INTRODUCTION

Traditional medicine is part of the culture of the people, it is an expression of intangible cultural heritage that combines different traditional knowledge and practices. Medicinal plants have been used as an alternative method to conventional medicine, and their use in developing countries has been inherited generationally. Medicinal plants are the first therapeutic strategy in 80% of developing countries and approximately 88% of the global population bases the treatment of diseases with the use of herbal medicine. The use of herbal medicine has been booming and continues to expand for the treatment of different health problems (Sánchez *et al.*, 2020). Traditional medicine can be defined as knowledge, skills and practices based on theories, beliefs and experiences from different cultures that may or may not be explained and is used to diagnose, treat or improve physical or mental health problems and is an important component of health care in low-income countries with a prevalence between 40 and 71% (Maldonado-Miranda, 2021). In Colombia, the healing of diseases based on medicinal plants has evolved since the European conquest and is practiced mostly by rural populations. In Latin America, three distinct categories are usually used to refer to rural populations: half-bloods, indigenous and African-American peasants. In all three categories there are systems of traditional medicine built and in force in each culture, so the concept of traditional medicine is the most appropriate (Granados *et al.*, 2005). The study of natural plant products in Colombia dates back to 1,752 with the expedition of Nicolas Baron de Joaquim, although the best work in plants was elaborated by José Celestino Mutis (González, 1980).

Traditional medicine in Colombia is divided into two branches: the magical-religious system and "curanderismo" (the art of healers). The first is based on the healing power of the supernatural. On the other hand, "curanderismo" is basically the result of combining ancient healing practices and Western medicine. "curanderismo" is practiced by midwives, herbalists, masseurs and traditional faith-healing doctors (Alvarez, 2007). A masseur acquires his empirical knowledge and not due to formal education who through massage using his hands and ointments based on mixture of certain plants and menthol treats problems of tears, sprains and strains. This treatment may or may not be accompanied by prayers. Herbalists are practitioners of traditional medicine who learn empirically those who use or prescribe medicinal plants to solve health problems (Alvarez, 2007).

Colombia has a diversity of climates and environmental conditions, which favor the growth and dispersion of different varieties and species of plants. The department of Norte de Santander has a tropical dry forest with a floristic diversity that has not been studied ethnobotanically and very little in terms of its phytochemical characterization, contrary to the existence of botanical classification reports (Carrillo-Fajardo *et al.*, 2007). The importance of knowing the uses of medicinal plants in a region leads us to botanical knowledge, management of traditional alternative medicine and studies of phytochemical profiles that lie in possible bioactivities that can be generated from a secondary metabolite. In the absence of health centers or the lack of medical care due to the costs, plants are an alternative use for the treatment of diseases at low cost and easy preparation. The World Health Organization (WHO) recognizes the importance of the use and utilization of medicinal plants in "Primary Health Care". WHO recommends and supports their integration into national health systems and estimates that over 90% of traditional medicine recipes/remedies contain medicinal plants (Sofowora *et al.*, 2013).

Since the origin of humanity, human beings have been concerned about their health in search of their well-being and have largely found it in nature. The knowledge to treat diseases with the use of plants is inherited in a generational way. In this way, the aim of this work is to rescue the importance of traditional knowledge in the use of plants for medicinal purposes in Norte de Santander, specifically in the Municipalities of Sardinata and Cúcuta and to report the chromatographic profile by thin layer chromatography of the medicinal plants most recommended by herbalists in this region.

## MATERIALS AND METHODS

The present study was carried out in the Municipality of Sardinata (8°04´59´´ N, 72°48¨01´´ W) located 78 km from the capital of the department of Norte de Santander-Colombia, and the municipality of Cúcuta (7°55´36´´N, 72°29¨49´´W), capital of the Department. The plant material was obtained in the markets directly from the herbalists. The identification of the studied plant species has the following identification: *Kalanchoe daigremontiana* Raym.-Hamet (National Herbarium of Colombia, COL 36971), *Origanum vulgare* L. (National Herbarium of Colombia, COL-259613), *Cymbopogon citratus* (DC.) Stapf (National Herbarium of Colombia, COL-257113), *Dysphania ambrosioides* L. (National Herbarium of Colombia, COL-208783), *Parietaria officinalis* L. (National Herbarium of Colombia, COL-144990), *Coriandrum sativum* L. (National Herbarium of Colombia, COL-133893), *Camellia sinensis* (L.) Kuntze (National Herbarium of Colombia, COL 164027), *Plantago major* L. (National Herbarium of Colombia, COL-247970), *Mentha spicata* L. (National Herbarium of Colombia, COL-354351), *Catharanthus roseus* (L) G. Don (National Herbarium of Colombia COL-229746), *Aloe vera* (L.) Burm. f. (National Herbarium of Colombia COL 333430), *Ruta graveolens* L. (National Herbarium of Colombia COL-131535), *Prunus domestica* (Suckow) Borkh. (National Herbarium of Colombia COL-542850), *Ocimum basilicum* L. (National Herbarium of Colombia COL-151575), *Chamaemelum nobile* (L.) All. (National Herbarium of Colombia COL-29999), *Melissa officinalis* L. (National Herbarium of Colombia COL-293254).

Information on plants used or recommended for different ailments was collected using a face-to-face interview technique. The information was collected directly from sellers of medicinal plants in the municipalities of Sardinata and Cúcuta. The survey was designed to have a better understanding of the knowledge and use of plants for medicinal purposes in this region of the department of Norte de Santander, to obtain demographic data including age, gender, level of education and the medicinal plants of more widespread use in these municipalities. The number of respondents was 40 people who are engaged in the sale of plants in traditional medicine.

### Ethanolic extract from plant samples

100 g of plant material powder-free vegetable material was mixed in ethanol (Merck, Germany). Ethanol allows the identification of polar compounds. The mixture was left 72 h in total darkness on a shaker (MAXQ 4450, Thermo ScientificTM. Marieta, United States), 35°C and 100 rpm. The extract was filtered under vacuum with filter paper (Qual. Dia. 125 mm, BOECO, Germany) using a vacuum pump (DOSIVAC, Buenos Aires, Argentina). The ethanolic extract was concentrated at reduced pressure using a rotary evaporator (IKA®RV10, Wilmington, United States) at 50 rpm, 150 mbar and 40°C. The concentrated extract was stored in amber bottles at 4°C for further analysis (Ortega-Buitrago *et al.*, 2021).

### Cromatografía de capa fina (TLC)

To determine the best separation eluent, thin layer chromatography runs of the extract were performed using different mobile phases: Ethyl hexane-acetate (95:5 v/v), ethyl-propanol acetate (9:1) and ethyl petroleum-acetate ether (7:3). All chemical reactants were from Merck, Germany the plates were run with the extract and revealed with ultraviolet light at a wavelength of 254 and 365 nm respectively to determine by fluorescence the presence of secondary metabolites (Chaves-Bedoya *et al.*, 2022).

## RESULTS

The use of medicinal plants is common in the population, although many properties, use and form of application are unknown. To acquire knowledge in the traditional management of natural resources of plant origin and its relationship with healing applications, it is important to obtain this type of information, which is part of ethnobotany and traditional folk knowledge.

Regarding the sociodemographic characteristics, the results of this study coincide with preliminary studies in which it is evident that the people who are most dedicated to traditional medicine are mostly women with low levels of education and over 50 years (Chali *et al.*, 2021). Figure 1 shows information on the age range, sex and education level of the respondents. The information obtained clearly indicates that the elderly plays an important role in traditional medicine due to the empirical knowledge acquired in the use and preparation of different plants in the treatment of ailments and diseases. This knowledge is transmitted generationally preserving it and in turn maintaining a mode of family sustenance. However, this empirical knowledge must be verified in order to contribute to the improvement and safety in the use of phytotherapics in communities (Escalona *et al.*, 2015).

In Mesoamerica, traditional medicine is also used mainly by rural and indigenous communities (Geck *et al.*, 2020). In Colombia, traditional plant-based remedies are considered an integral part of culture and the country has approximately 10% of the world's biodiversity with approximately 50,000 plant species (Gómez-Estrada *et al.*, 2011). In the municipalities of Sardinata and Cúcuta in Norte de Santander the plants most recommended by herbalists or the most sought after by consumers are *Kalanchoe daigremontiana, Origanum vulgare, Cymbopogon citratus, Dysphania ambrosioides, Begonia erythrophylla, Parietaria officinalis, Coriandrum sativum, Camellia sinensis, Plantago major, Mentha spicata, Catharanthus roseus, Aloe vera, Ruta graveolens, Prunus domestica, Ocimum basilicum, Chamaemelum nobile*, and *Melissa officinalis.* These plants are consumed mainly in infusion. The most recommended plant for consumption is Kalanchoe (*Kalanchoe daigremontiana)* popularly known as a bad mother or mother of thousands. Kalanchoe species are succulents with anti-inflammatory, antioxidant, and analgesic properties, as well as cytotoxic activity (Stefanowicz-Hajduk *et al.*, 2022). *Kalanchoe* species are well-known medicinal plants used in traditional medicine (Stefanowicz-Hajduk *et al.*, 2020).

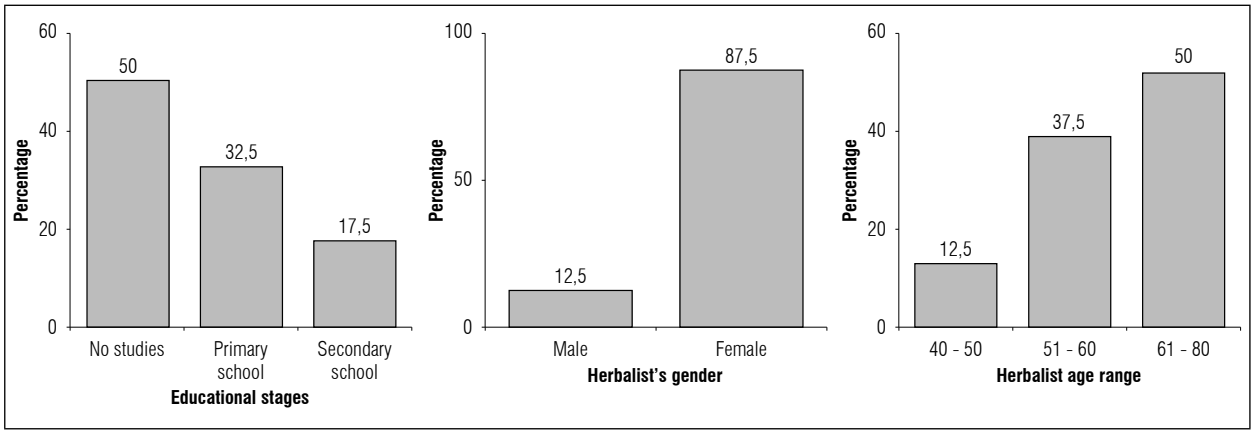



**Figure. 1. Basic information of the herbalaries from Sardinata and Cúcuta in Norte de Santander.**

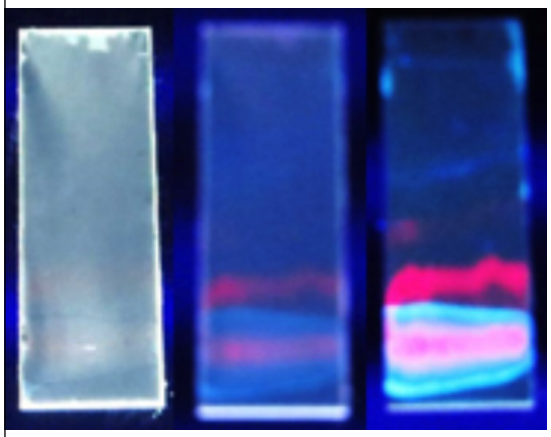
According to herbalists, the health ailments for which people in Sardinata and Cúcuta seek help from folk medicine are stomach cramps, cancer, ear pain, cough, flu, fever, kidney problems, gastritis, skin spots, nausea, headache, wound healing, anxiety or nerves, muscle aches, anemia, uterine problems, liver problems, and eye infection. When reviewing the existing literature it is found that the above are similar ailments for which people from other countries or continents seek help from herbalists (Oyebode *et al.*, 2016; Chali *et al.*, 2021).

## Thin layer chromatography of ethanolic extracts of medicinal plants

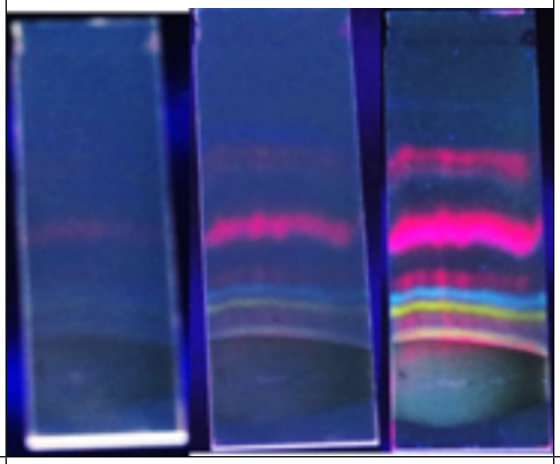
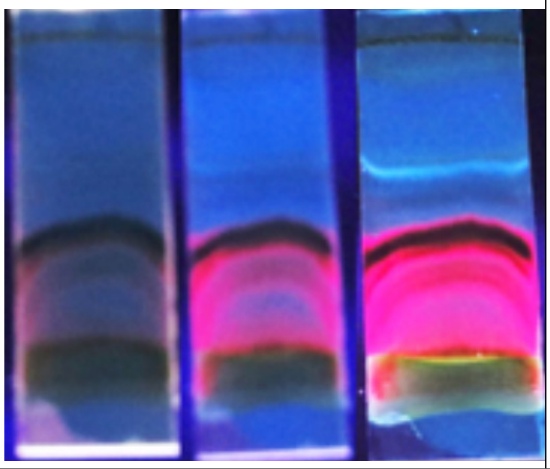
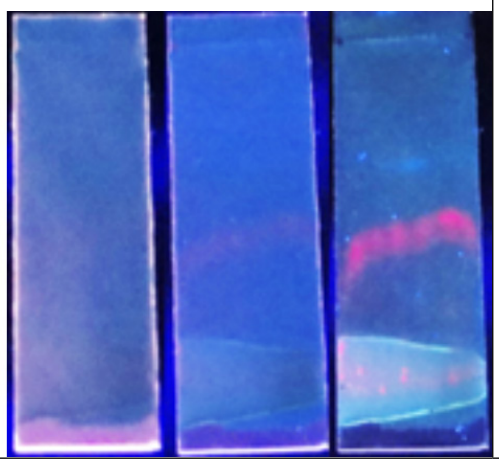
The medicinal plants recommended by herbalists were used to obtain the ethanolic extracts in order to determine the group of secondary metabolites present in each plant material. The medicinal or healing properties of a plant depend on its secondary metabolites (Twaij and Hasan, 2022). Ethanol has the ability to extract compounds with a wide range of polarities, as well as being less expensive and toxic than other organic solvents. Recognition of secondary metabolites was performed based on reported qualitative tests (Martínez *et al.*, 2008).

Once the extract of each plant was concentrated, the chromatographic profile was performed by thin layer chromatography. The observation under UV light at different wavelengths allowed to show different colorations. For example, a fluorescent yellow and light blue color indicate the presence of flavones, isoflavones, certain coumarins and alkaloids, a red and fuchsia color are indicative of the presence of sesquiterpenes and terpenoids, etc. (Reich and Schibli, 2006). In Table 1, TLC results are indicated for each medicinal plant recommended in Sardinata and Cúcuta.

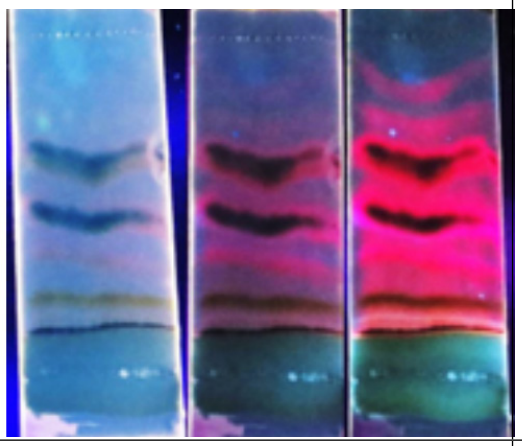
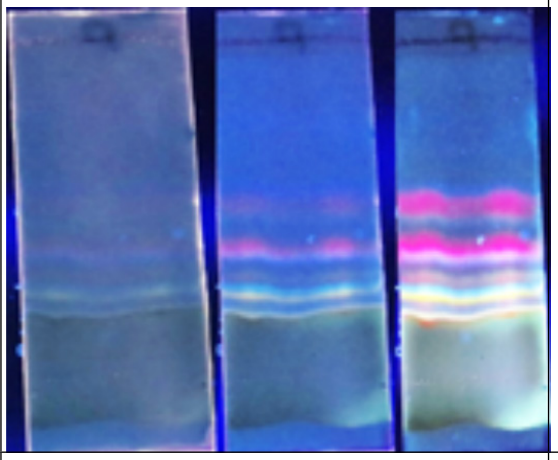
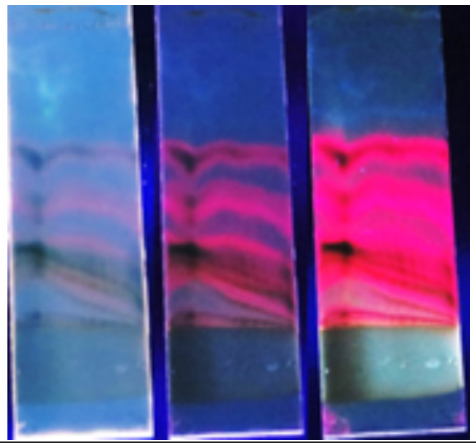
**Table 1. Qualitative analysis by TLC of ethanolic extracts of medicinal plants.**

| Plant family/specie/ common name | Chromatographic profile of secondary metabolites at 254, 302 and 365 nm | Secondary metabolites/ ailment |
|---|---|---|
| Family: Agavaceae<br>Scientific name: Kalanchoe daigremontiana Raym.-Hamet.<br>Common name: Bad mother<br>  |  | Presence of flavones, flavanones, isoflavones, certain coumarins and alkaloids (fluorescent blue). Fuchsia coloration indicates the presence of sesquiterpenes and terpenoids.<br>It is used as an adjuvant in the treatment of cancer, and stomach cramps |

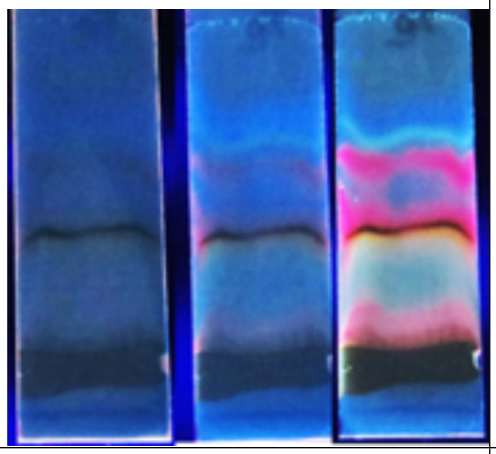
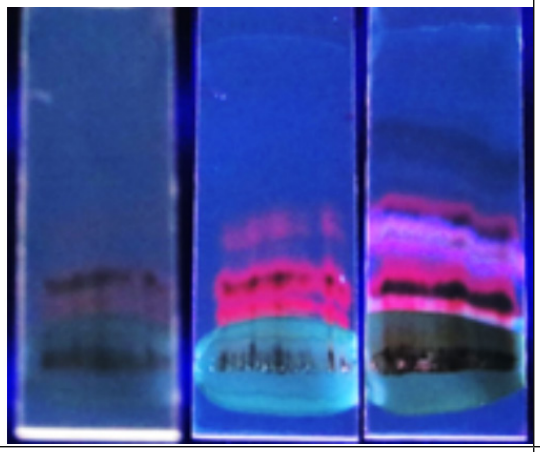
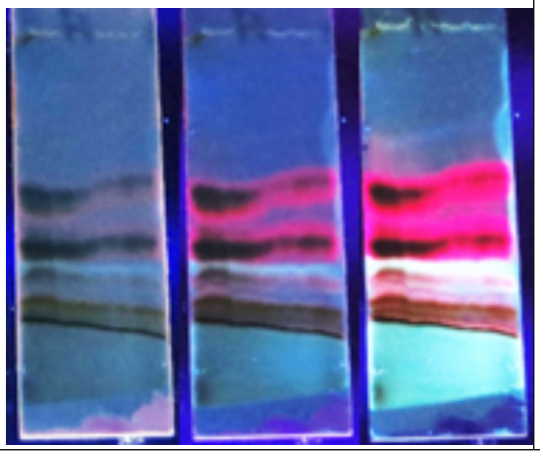
*Continued*

| Plant family/specie/ common name | Chromatographic profile of secondary metabolites at 254, 302 and 365 nm | Secondary metabolites/ailment |
|---|---|---|
| Family: Lamiaceae<br>Scientific name: *Origanum vulgare* L.<br>Common name: Oregano<br>  |  | Presence of flavones, flavonones, isoflavones, coumarins and alkaloids (yellow and fluorescent blue). Fuchsia coloration indicates the presence of sesquiterpenes and terpenoids.<br>Is used to decrease ear pain and cough |
| Family: Poaceae<br>Scientific name: *Cymbopogon citratus* (DC.) Stapf<br>Common name: Limonaria<br>  |  | The fuchsia coloration suggests the presence of sesquiterpenes and terpenoids and the yellow and sky-blue coloration the presence of flavones, flavonones, isoflavones, coumarins and alkaloids. Recommend it to reduce fever, flu and cough |
| Family: Begoniaceae<br>Scientific name: *Begonia erythrophylla*<br>Common name: Riñonera<br>  |  | Presence of sesquiterpenes and terpenoids due to fuchsia coloration and by the sky-blue coloration the possible presence of flavones, flavanones, isoflavones, coumarins and alkaloids. Eliminate kidney inflammation |

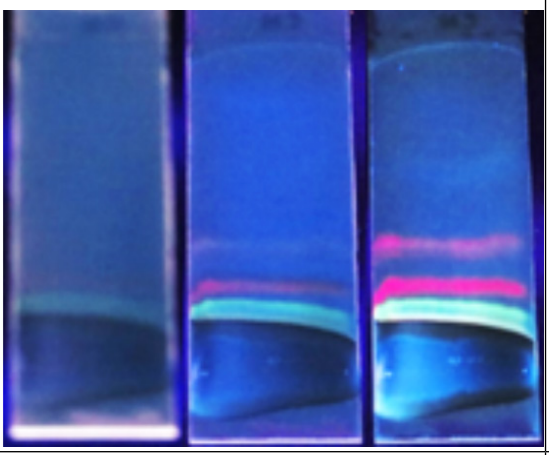
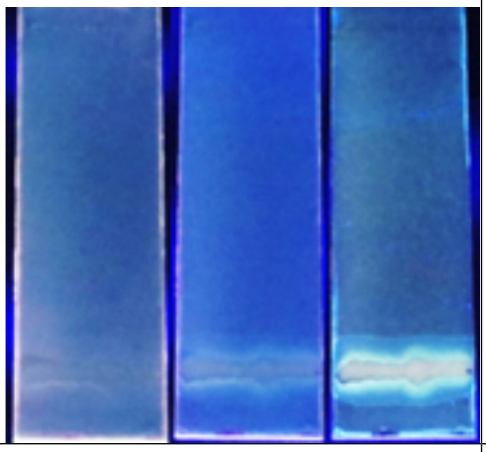
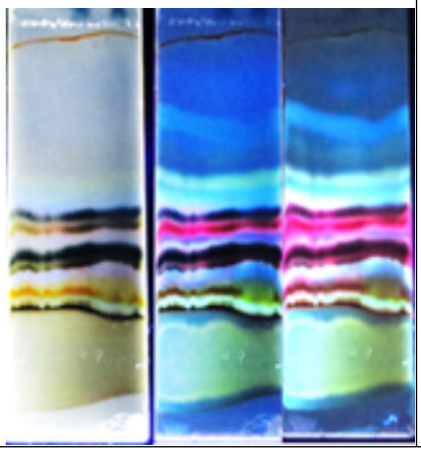
*Continued*

| Plant family/specie/ common name | Chromatographic profile of secondary metabolites at 254, 302 and 365 nm | Secondary metabolites/ailment |
|---|---|---|
| Family: Amaranthaceae<br>Scientific name: *Dysphania ambrosioides* L.<br>Common name: Paico<br>  |  | The fuchsia and red tones show the presence of sesquiterpenes and terpenoids.<br>Is recommended to reduce stomach cramps |
| Family: Urticaceae<br>Scientific name: *Parietaria officinalis* L.<br>Common name: Palitaria<br>  |  | Due to the yellow and light blue coloration it is possible to find flavones, flavonones, isoflavones, coumarins and alkaloids and the fuchsia coloration the presence of sesquiterpenes and terpenoids.<br>Is recommended to treat skin spots and gastritis |
| Family: Apiaceae<br>Scientific name: *Coriandrum sativum* L.<br>Common name: Cilantro<br>  |  | Due to its fuchsia coloration the presence of sesquiterpenes and terpenoids.<br>Is recommended for stomach ulcers. It is also a spice |

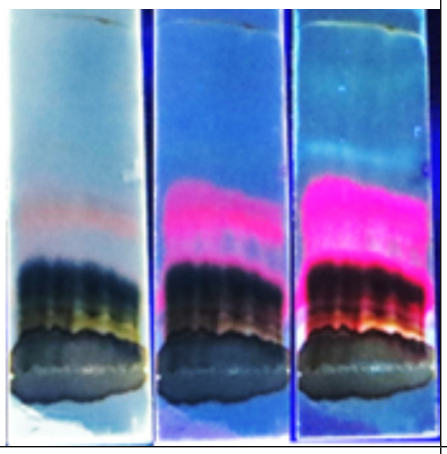
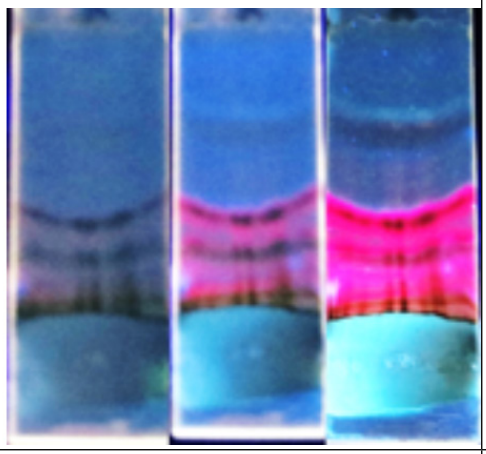
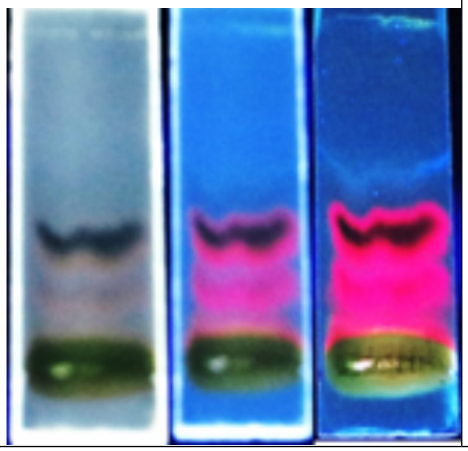
*Continued*

| Plant family/specie/ common name | Chromatographic profile of secondary metabolites at 254, 302 and 365 nm | Secondary metabolites/ailment |
|---|---|---|
| Family: Theaceae<br>Scientific name: *Camellia sinensis* (L.) Kuntze<br>Common name: Té<br>  |  | There is evidence of possible presence of sesquiterpenes and terpenoids due to their fuchsia coloration, and by the sky-blue coloration it is possible to find flavones, flavonones, isoflavones, certain coumarins and alkaloids.<br>Recommended for headache and vomiting problems |
| Family: Plantaginaceae<br>Scientific name: *Plantago major* L.<br>Common name: Yanten<br>  |  | The presence of sesquiterpenes and terpenoids is sighted due to their fuchsia coloration, and due to the light blue coloration it is possible to find flavones, flavonoids, isoflavones, coumarins and alkaloids.<br>Helps wound healing and healing |
| Family: Lamiaceae<br>Scientific name: *Mentha spicata* L.<br>Common name: Hierba buena<br>  |  | Presence of sesquiterpenes and terpenoids due to their fuchsia coloration, and because of the sky blue coloration it is possible to find flavones, flavonones, isoflavones, certain coumarins and alkaloids.<br>It is recommended for nervous breakdowns and muscle aches |

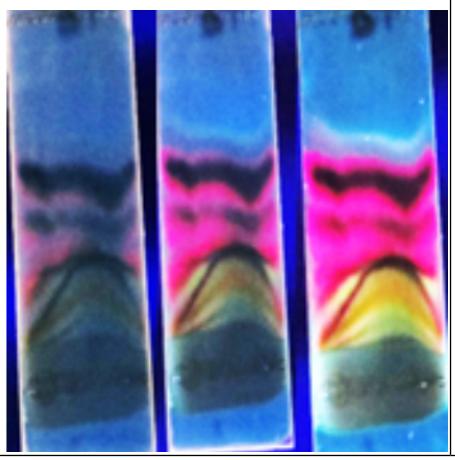
*Continued*

| Plant family/specie/ common name | Chromatographic profile of secondary metabolites at 254, 302 and 365 nm | Secondary metabolites/ailment |
|---|---|---|
| Family: Apocynaceaea<br>Scientific name: *Catharanthus roseus* (L) G. Don<br>Common name: Chocolata<br>  |  | Presence of flavones, flavanones, isoflavones, certain coumarins and alkaloids (fluorescent sky blue). Fuchsia coloration the presence of sesquiterpenes and terpenoids. It is recommended for anemia, raise defenses. It is highlighted that the white flower is recommended for men and the purple flower for women |
| Family: Asphodelaceae<br>Scientific name: Aloe vera (L.) Burm. f.<br>Common name: Sábila<br>  |  | Presence of flavones, flavonones, isoflavones, coumarins and alkaloids (fluorescent light blue). Is recommended for liver problems, for hair vitality, cleanse the skin, helps heal wounds |
| Family: Rutaceae<br>Scientific name: *Ruta graveolens* L.<br>Common name: Ruda<br>  |  | It is the most colorful chromatogram. The yellow and light blue coloration indicates the presence of flavones, flavonones, isoflavones, coumarins and alkaloids and the fuchsia sesquiterpenes and terpenoids coloration.<br>Is recommended to keep the womb and ovaries healthy |

*Continued*

| Plant family/specie/ common name | Chromatographic profile of secondary metabolites at 254, 302 and 365 nm | Secondary metabolites/ailment |
|---|---|---|
| Family: Rosaceae<br>Scientific name: *Prunus domestica* (Suckow) Borkh. Common name: Ciruelo<br>  |  | Chromatography shows the possible presence of sesquiterpenes and terpenoids due to their fuchsia coloration. Recommended to treat flu and cough |
| Family: Lamiaceae<br>Scientific name: *Ocimum basilicum* L.<br>Common name: Albahaca<br>  |  | Chromatography shows the possible presence of sesquiterpenes and terpenoids due to their fuchsia coloration and the sky-blue coloration it is possible to find flavones, flavonones, isoflavones, certain coumarins and alkaloids.<br>Recommend it to treat nervous breakdowns and raise defenses |
| Family: Asteraceae<br>Scientific name: *Chamaemelum nobile* (L.) All.<br>Common name: Manzanilla<br>  |  | Chromatography shows the possible presence of sesquiterpenes and terpenoids due to their fuchsia coloration.<br>Is recommended to treat eye infection and calm menstrual cramps. |

*Continued*

| Plant family/specie/ common name | Chromatographic profile of secondary metabolites at 254, 302 and 365 nm | Secondary metabolites/ailment |
|---|---|---|
| Family: Lamiaceae<br>Scientific name: *Melissa officinalis* L.<br>Common name: Toronjil<br>  |  | Chromatography shows the possible presence of sesquiterpenes and terpenoids due to their fuchsia coloration and the sky blue and yellow coloration it is possible to find flavones, flavonones, isoflavones, coumarins and alkaloids.<br>It is taken as aromatic to control the nerves. |

The results of the analysis by TLC show that in families Agavaceae, Lamiaceae, Poaceae, Begoniaceae, Urticaceae, Theaceae, Plantaginaceae, Apocynaceae and Rutaceae there is presence of flavones, flavonones, isoflavones, coumarins and alkaloids, sesquiterpenes and terpenoids, in the species *Chlorophytum comosum, Origanum vulgare, Cymbopogon citratus, Begonia erythrophylla, Parietaria officinalis, Camellia sinensis, Plantago major, Mentha spicata, Catharanthus roseus, Ocimum basilicum* and *Ruta graveolens.* The presence of sesquiterpenes and terpenoids was observed in families Amaranthaceae, Apiaceae, Rosaceae and Asteraceae in the species *Dysphania ambrosioides, Coriandrum sativum, Chamaemelum nobile* and *Prunus domestica*.

## DISCUSSION

The results of the qualitative chemical composition analysis of the medicinal plants studied revealed an abundance of flavoins, flavonoids, isoflavones, coumarins and alkaloids which correspond to the main groups of secondary metabolites with medicinal effects (Twaij and Hasan, 2022) corroborating their medicinal and traditional applications in the region. The review of the existing scientific literature on plants used in this research, demonstrates biological and therapeutic properties. These properties include anti-inflammatory, antioxidant, antimicrobial, anticancer and anxiolytic effects, among others, which are attributable to the presence of the metabolites detected (Supratman *et al.*, 2001; Leyva-López *et al.*, 2016; Jafari *et al.*, 2022; Petrisor *et al.*, 2022). In example, terpenes, also known as isoprenoids or terpenoids, constitute the most diverse group of natural compounds. Terpenes as natural compounds have various medical properties among which are anti-inflammatory, antioxidant, anti-carcinogenic, antiseptic, astringent, digestive, diuretic activities among others (Cox-Georgian *et al*., 2019). Finally, it is known that alkaloids play a fundamental role in human medicine, as well as in the natural defense of an organism. Therapeutically, alkaloids are known as anesthetics, cardioprotective, and anti-inflammatory (Heinrich *et al*., 2021).

It has been described that flavonoids are the chemical compounds of greater presence in the medicinal plants studied. These phytochemicals are secondary metabolites with potential applications in medicinal chemistry. The different medicinal benefits of flavonoids include anti-cancer, anti-inflammatory, antioxidant, anti-viral, anti-aging, anti-diabetic and heart-healthy activity (Wang *et al.*, 2018). However, research is required to determine the biological target and activity of these compounds. The modes of action of flavonoids as therapeutic agents have recently been described (Ullah *et al.*, 2020).

Understanding knowledge of medicinal plants provides valuable insight into the cultural significance of plant resources, i.e., which species are recognized as

effective and valued in a community (de Albuquerque *et al.*, 2007). In addition, this knowledge can provide information on the various ways in which populations use medicinal plants to treat different ailments and maintain their well-being (Pardo-De-Santayana *et al.*, 2005). Studies carried out in the region of Sardinata and Cúcuta, in Norte de Santander, have demonstrated the wealth of traditional knowledge on the use of medicinal plants, reflecting the close relationship between local communities and their natural resources. These investigations allow a synergistic learning regarding the idiosyncrasy of the population of a region and the use of plants and other natural resources, exalting the importance of these in the life of a community for their diverse therapeutic and cultural uses (González *et al.*, 2010).

Despite the therapeutic benefits of medicinal plants in the region, it is necessary to approach self-medication with caution, since it can lead to poisoning and even death due to ignorance of the adverse effects, contraindications and adequate doses of these plants (Bennett and Brown, 2000). Medicinal plants contain active ingredients, substances with pharmacotherapeutic properties that can target and alleviate various diseases or ailments. While these substances can benefit the body, excessive consumption can lead to adverse effects. Traditional medicine users who prepare their remedies without proper guidance from herbalists may inadvertently cause harm to their bodies due to the complex phytochemical composition of the plants (Mensah *et al.*, 2019). Self-medication can aggravate health problems rather than improve them, so it is essential to promote education and awareness about the correct use of medicinal plants in local communities (Alonso-Castro *et al.*, 2017).

For example, although *Kalanchoe daigremontiana*, the medicinal plant most recommended by herbalists in Sardinata and Cúcuta, has been shown to possess antioxidant properties and anticancer activity (Stefanowicz-Hajduk *et al.*, 2022), It is crucial to consider the proper dosage. Excessive consumption of this plant could cause poisoning or unwanted side effects (Posadzki *et al.*, 2013). Therefore, it is essential to foster collaboration between health professionals, herbalists and community members to ensure safe and effective use of medicinal plants. This could include training programs, workshops and educational materials that promote knowledge about the properties, dosages and contraindications of medicinal plants used in the region.

The study of the traditional practices of using medicinal plants also contributes to the conservation of this ancestral knowledge, which may be endangered due to globalization and biodiversity loss. Likewise, the documentation and analysis of this knowledge can serve as a basis for future scientific research, which seeks to validate the effectiveness of medicinal plants in the prevention and treatment of diseases, as well as the discovery of new bioactive compounds (Cámara-Leret *et al.*, 2014).

By deepening traditional knowledge on the use of medicinal plants it is possible not only to strengthen the relationship between communities and their natural environment, but also to promote the sustainable use and conservation of biodiversity in these areas (Molares and Ladio, 2014). Ethnobotanical studies can also contribute to the generation of public policies aimed at protecting and promoting traditional medicine, as well as recognizing and valuing the role of ancestral knowledge in the health care of local communities (Bussmann *et al.*, 2007).

## CONCLUSION

Traditional medicine represents a crucial aspect of ancestral knowledge within communities, utilizing a variety of plant species for treating diseases and ailments. This enduring knowledge, passed down through generations and rooted in experience, provides relief for health issues, particularly for those with limited resources who cannot afford costly medications. In the municipalities of Sardinata and Cúcuta, women over the age of 60 primarily engage in the sale and recommendation of medicinal plants, which encompass 17 botanical species across 14 families. Medicinal plants maintain cultural significance as they are perceived as natural, affordable remedies.

TLC analyses have qualitatively identified the presence of diverse secondary metabolites, including flavones, flavonones, isoflavones, coumarins, alkaloids, sesquiterpenes, and terpenoids. These metabolites are essential for human health and form the structural basis for numerous pharmaceutical drugs. In addition to preserving and sustaining communities' ancestral knowledge, this type of research serves as a strategic approach for new drug discovery by selecting candidates containing metabolites known for their therapeutic properties. Lately, there has been a renewed interest in bioactive natural products, fueled

by traditional medicines and their potential for drug discovery.

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## Conflict of Interest

The manuscript was prepared and reviewed with the participation of the authors, who declare that there exists no conflict of interest that puts at risk the validity of the presented results.

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