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Environmental Sustainability And Family Economy: Uses And Pharmacological Properties Of Moringa Oleifera And Mentha Spicata

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Abstract:
The objective of the study is to highlight the potential of Moringa oleifera and Mentha spicata in contributing to environmental sustainability and family economy. By exploring the sustainable uses of these plants, particularly in agribusiness and family-based economic activities, the research advocates for policies and practices that support small producers and solidarity enterprises. To this end, a literature review was conducted using Google Scholar as the main research tool. The results showed that Moringa oleifera has various uses, including phytotherapeutic, larvicidal, and water treatment applications, due to its rich composition of nutrients, antioxidants, and medicinal compounds. Regarding Mentha spicata, commonly known as spearmint, it possesses analgesic, antimicrobial, and antioxidant properties, making it versatile in culinary, therapeutic, and cosmetic applications. The study highlighted the potential of these plants as wound-healing agents in various plant species, proposing innovative approaches in agriculture and horticulture. It is concluded that harnessing the healing potential of Moringa oleifera and Mentha spicata could improve plant health, ecosystem resilience, and well-being, promoting sustainable agricultural practices and economic growth.

Keywords: *Moringa Oleifera; Mentha Spicata; Environmental Sustainability; Family Economy; Agricultural Practices.*

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I. Introduction

Contemporarily, the possibilities of using Moringa oleifera lam in various fields are increasingly being discussed and presented to the scientific community. This plant has piqued the interest of researchers due to its diverse sustainable uses, especially in agroindustry and family economy. It has been used as a larvicide, fuel, among other applications.

Supported by the innovative potential of Moringa oleifera Lam, known for its diverse nutritional, medicinal, and environmental protection properties, combined with the remarkable pharmacological potential of mint, there has been a growing interest in deepening studies to better understand the mechanisms of plant photoprotection in other plant species. Moringa oleifera, with its rich antioxidant compounds, and mint, with its anti-inflammatory and soothing properties, represent a promising source of research in the quest for natural and effective solutions for protection against damage caused by solar radiation. By exploring the synergy between these plants, scientists hope to uncover new insights into how plants can be more efficiently protected against ultraviolet radiation, promoting not only plant health but also potentially contributing to the development of natural photoprotective products for human use. This field of study can open doors to innovations in agribusiness, the pharmaceutical industry, and cosmetics, enhancing the sustainable and beneficial use of plant resources.

Throughout history, humanity has always been concerned with ensuring the protection of plants to obtain quality fruits, seeds, or vegetables. Farmers seek this protection to ensure good agro-industrial performance. Considering the simplicity of pesticide application, predictability, and the minimal knowledge required of basic agro-ecosystem processes, this method is still prevalent today in various plant cultures

The objective the study aims to highlight the potential of Moringa oleifera and Mentha spicata to contribute to environmental sustainability and family economy. By exploring the sustainable uses of these

plants, particularly in agroindustry and family-based economic activities, the research advocates for policies and practices that support small producers and solidarity enterprises.

Additionally, the investigation into the pharmacological properties and innovative applications of these plants for enhancing plant health and resilience directly supports the notion of providing small-scale farmers with viable, sustainable alternatives. This can help democratize access to resources and technologies, ensuring that the benefits of agricultural advancements are equitably distributed. The study's focus on essential nutrients and plant immunity further underscores the need for inclusive economic policies that empower small producers, aligning with the principles of solidarity and equity discussed in the citation.

II. Materials And Methods

The methodology adopted in this work is based on a literature review, using Google Scholar as the primary research tool. The survey will include scientific articles, monographs, dissertations, and theses published by researchers and experts in the field. The search will encompass a broad spectrum of publications, without time restrictions, in order to ensure the comprehensiveness and timeliness of the analyzed information. The critical analysis of the selected documents will allow for an in-depth understanding of the potential of Moringa oleifera and Mentha spicata."

In addition to utilizing Google Scholar for the literature review, other reputable academic databases and journals will also be consulted to ensure a comprehensive review of the relevant literature. The search strategy will employ a combination of keywords related to Moringa oleifera, Mentha spicata, environmental sustainability, pharmacological properties, agricultural practices, and related topics. This will help capture a wide range of perspectives and research findings on the subject matter.

Furthermore, the inclusion criteria for selecting relevant literature will prioritize studies that provide detailed insights into the sustainable uses, pharmacological properties, and innovative applications of Moringa oleifera and Mentha spicata. Only peer-reviewed publications and scholarly works authored by recognized experts in the field will be considered to ensure the reliability and credibility of the information gathered.

Once the relevant literature has been identified, a systematic approach will be employed to critically analyze and synthesize the findings. This will involve categorizing the literature based on key themes and concepts related to the research objectives. The critical analysis will enable the researchers to evaluate the strengths, limitations, and implications of the existing literature, thereby providing a robust foundation for understanding the potential of Moringa oleifera and Mentha spicata in promoting environmental sustainability and family economy.

III. Results And Discussions

Regarding the uses of Moringa Oleifera, phytotherapeutic use is mentioned through the utilization of leaves, seeds, roots, flowers, and stem. It is also used for the production of products such as oil, which can generate new by-products; for human and animal consumption; as organic fertilizer; and, not least, in water treatment due to its coagulant property and capacity for sedimentation of residues through the seed.

There are also other forms of utilization: they are used as larvicides in combating Dengue; as fuel through the utilization of wood; as a means of intercalation between crops in the addition of Nitrogen (N) to the soil, among many others (Ferreira, 2021). According to Franco et al. (2015), the utilization of Moringa oleifera for water treatment comprises an economic alternative, as it purifies water, making it suitable for consumption.

As various studies point out, Moringa (Moringa oleifera) has attracted researchers' attention for its components presenting high biological impact. According to Srivastava (2023), its composition includes: Vital Nutrients: Calcium (Ca), Iron (Fe), and Magnesium (Mg); Vitamins (A, C, E) and proteins. It is also rich in Antioxidants, combating Free Radicals, protecting cells from oxidative stress, reducing the risk of chronic diseases, and possessing anti-inflammatory properties; Anticancer Potential; Antibacterial Qualities; Sustainability and Responsible Agriculture. It has multifaceted use.

In his study on the toxicology and nutrition of Moringa oleifera leaves, Trigueiro et al. (2019) conducted a detailed analysis. He found that fresh leaves contain 73.38 g/100 g of water, while dried leaves have only 5.49 g/100 g. Additionally, fresh leaves had an ash content of 2.53 g/100 g, which increased to 8.14 g/100 g in dried leaves. Lipid content increased from 1.27% in fresh leaves to 6.87% in dried leaves. Vitamin C content decreased from 1036.323 mg/100 g in fresh leaves to 365.26 mg/100 g in dried leaves.

Moringa oleifera is known for its nutritional benefits, containing vital nutrients such as calcium, iron, magnesium, vitamins A, C, E, proteins, and antioxidants. Srivastava (2023) highlights its high vitamin C content, with 164 mg per 100 g of fresh leaves. Studies have shown that Moringa extracts have antioxidant properties attributed to carotenoids rather than phenolic compounds.

The methanolic extract of Moringa leaves showed antioxidant activity, but this was not attributed to phenolic compounds. Larosa, Rossato, and Lopes (2011) suggested that it may be associated with carotenoids.

However, compared to standards like ellagic acid, gallic acid, BHT, and rutin, the antioxidant activity of Moringa extract was relatively low (Sousa; Oliveira; Silva, 2010).

In relation to Spearmint (Mentha Spicata), much is empirically spoken about its pharmacological properties, especially regarding the presence of vitamin C and other components for herbal use, even though empirically by some individuals. Its uses vary with respect to its parts.

Freitas (2023) conceptualizes Spearmint (Mentha spicata) as a widely used plant, whose essential compounds present rich essential oils in menthol, menthone, and other volatile compounds. These components ensure the following properties: Analgesic and antispasmodic; Digestive and relief of digestive problems; Treatment of respiratory symptoms; among others for pharmacological and herbal use.

Spearmint (Mentha spicata) is a plant native to Europe and Northern Asia, belonging to the Lamiaceae family. It has a wide variety of varieties and is cultivated worldwide. Its most commonly known varieties are Mentha arvensis and the hybrid Mentha x piperita and present the following characteristics:

Leaves and aroma: They are oval and serrated, with a color ranging from green to purplish, have a characteristic aroma, with refreshment as the main associated characteristic, and are widely known for having many empirical and proven uses and applications. It also has its uses in cooking and in the flavoring industry (Oliveira et al., 2023).

Flowers and coloration: They have an abundance of flowers with greenish and purplish coloration. However, the flowers not only contribute to the beauty of the plant but can also be used in infusions and teas.

Spearmint has application in the Pharmaceutical Industry; Cosmetics; and as flavorings and in cooking. The essential oils present in the leaves and flowers attribute to spearmint its typically characteristic flavor and aroma, being, therefore, a plant of many uses and applications, recognized worldwide for its properties.

Oliveira et al. (2023) addresses the Mentha genus, which belongs to the Tubiflorae family (Lamiales), encompassing approximately 25 species, with many hybrids. Menthol comprises an alcohol, which can be extracted from the mint plant (Mentha) and is used in various products. Its chemical structure consists of the molecular formula C10H20O and is known as 2-Isopropyl-5-methylcyclohexan-1-ol. Let's see Figure 3 with the chemical composition of menthol and menthone.

Some studies indicate that moringa provides seven times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, nine times more protein than yogurt, 15 times more potassium than bananas, and 25 times more iron than spinach, and these characteristics have led to moringa being named a 'superfood' (Medeiros, 2021). Let's see Table 1 for the nutritional characteristics of Moringa, its items and components, and percentages.

Table 1 - Nutritional characteristics of Moringa.

Item	Quantity
Protein	28%
Lipids	7 %
Ash	10 %
Carbohydrates	44%
Minerals	mg. 100 g -1
Calcium	2,97
Magnesium	1,9
Zinc	1,58
Potassium	4,16
Iron	103,12
Copper	3,38

Fonte: Teixeira et al. (2013)

El-Hack et al. (2022) discussed the antioxidant property of Moringa oleifera and pointed out that Moringa oleifera leaves are rich in natural antioxidants, including Flavonoids (Quercetin and Kaempferol): Quercetin and Kaempferol, which are more potent as antioxidants than vitamin C itself. Other antioxidants were also identified, such as: Ascorbate (Vitamin C): Levels ranging from 70 to 100 mol/g dry weight; Phenolics: Ranging from 74 to 210 mol/g dry weight; α-Tocopherol (Vitamin E): Ranging between 0.7 and 1.1 mmol/g; and β-Carotene: Ranging from 1.1 to 2.8 mol/g.

In comparison with other foods, Moringa oleifera leaves have much higher antioxidant levels than many fruits and vegetables. While strawberries have 190 mol/g of gallic acid (GA)/g and carrots have 1.8 mol/g of β-carotene, M. oleifera leaves surpass these values. Hence, it provides a high amount of natural antioxidants.

Mentha spicata, commonly known as spearmint, is a widely used plant with a composition that includes chemical compounds responsible for its medicinal properties such as menthol, a monocyclic alcohol found in the plant's essential oils. Menthol gives spearmint a refreshing aroma and possesses analgesic, antispasmodic, and carminative properties. Being an herbaceous plant widely cultivated worldwide due to its aromatic essences and characteristics of providing freshness and vitality, it offers various benefits, including:

• Natural Repellent: Acts by repelling a wide variety of insects and rodents, as well as Lepidoptera: The cabbage butterfly, are deterred by the scent of spearmint. It also acts in controlling ants and rats. Some researchers advise cultivation on the edges of crops, as it helps protect plantations by repelling insects and pests. It also has culinary, therapeutic, pharmacological, aromatic, and skincare uses due to its astringent and refreshing properties. It also helps relieve pain.

• It also contains menthone, limonene, and pulegone, which are volatile compounds with antifungal, antibacterial, and antiviral properties, helping to combat oral, respiratory, and gastrointestinal infections, contributing to the improvement of the immune system and the relief of symptoms related to these conditions.

Furthermore, concerning its composition, it contains phenolic compounds: Rosmarinic acid and flavonoids, which are responsible for antioxidant activity, helping to combat free radicals, reduce inflammation, and protect cells from oxidative stress. Despite its many qualities, caution is necessary because pulegone, one of the compounds present in spearmint, is obtained from the essential oils of peppermint (Mentha piperita) and others. It represents a monoterpene with the following characteristics: Appearance of a colorless oily liquid; Pleasant odor reminiscent of pennyroyal, peppermint, and camphor. Uses: In the perfumery industry and in cosmetics due to its characteristic aroma, and it is also used in aromatherapy. Toxicity: Toxic to rats in large quantities. It presents a wide variety of phytochemicals such as tannins, sterols, terpenoids, flavonoids, saponins, anthraquinones, alkaloids, and reducing sugars, along with anticancer agents such as glucosinolates, isothiocyanates, glycoside compounds, and glycerol-1-9-octadecanoate, among others.

IV. Conclusion

The exploration of Moringa oleifera and Mentha spicata reveals their potential as agents of environmental sustainability and contributors to family economies. These plants offer diverse pharmacological properties that extend beyond their own species, presenting opportunities for their utilization as healing agents for the leaves of other plant species.

Moringa oleifera, with its rich nutrient content, antioxidants, and medicinal compounds, holds promise as a healing agent for wounds and injuries in various plant species. Similarly, Mentha spicata's medicinal attributes, including its analgesic and antimicrobial properties, suggest its potential for promoting healing in other plant leaves.

By recognizing the healing potential of these plants, we can explore innovative applications in agriculture and horticulture. Integrating Moringa oleifera and Mentha spicata extracts into plant wound treatments could enhance plant health and resilience, contributing to sustainable agricultural practices and ecosystem well-being.

In essence, the pharmacological properties of Moringa oleifera and Mentha spicata extend beyond their traditional uses, offering opportunities for innovative applications in plant care and agriculture. Harnessing their healing potential for the leaves of other plant species could open new avenues for sustainable farming and ecosystem management.

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