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Benefits of *Moringa oleifera* Lam. leaves as a healthy drink

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Abstract: Apart from being used as a food ingredient, water purifier or cosmetic ingredient, the moringa plant can also be used as a health drink in the form of moringa tea. Other benefits of moringa leaves are as a chemopreventive, increasing the body's endurance, nutrition for the eyes and brain, eliminating signs of wrinkles on the face, and as an antioxidant. However, unfortunately not all people know about the benefits of the moringa plant as a nutritious plant. This article is a literature review to analyze the benefits of moringa leaves as a health drink. The results of the literature analysis that has been carried out show that the moringa plant contains a number of important nutrients that are needed for body health. The nutrients in moringa include vitamin C which is equivalent to seven times that of oranges, calcium equivalent to four times and protein equivalent to twice that of milk, vitamin A equivalent to four times that of carrots, and potassium equivalent to three times that of bananas. Apart from that, it also contains high levels of antioxidants, so the Moringa plant is very important for warding off free radicals. Several research results have found that moringa leaf extract can reduce blood glucose levels in white mice. People can be encouraged to use the moringa plant in their daily lives. Based on the explanation in this article, people can cultivate the use of moringa leaves as a drink to overcome health problems. Through the development of moringa plants as a typical plant and raw material for herbal tea in the Central Sulawesi area, communities can be empowered to utilize empty land to plant Moringa.

Keywords: Health drink, *Moringa oleifera* Lam.**,** vitamin C

Abstrak: Selain digunakan sebagai bahan pangan, penjernih air maupun bahan kosmetik, tanaman kelor juga dapat dimanfaatkan sebagai minuman kesehatan dalam bentuk teh kelor. Manfaat lain dari daun kelor adalah sebagai kemopreventif, meningkatkan daya tahan tubuh, nutrisi untuk mata dan otak, menghilangkan tanda keriput di wajah, dan sebagai antioksidan. Namun sayangnya belum semua masyarakat mengetahui tentang manfaat dari tanaman kelor sebagai tanaman yang berkhasiat. Artikel ini merupakan suatu tinjauan pustaka untuk menganalisis manfaat daun kelor sebagai minuman kesehatan. Hasil analisis kepustakaan yang telah dilakukan, menunjukkan bahwa tanaman kelor mengandung sejumlah nutrisi penting yang sangat dibutuhkan untuk kesehatan tubuh. Nutrisi pada kelor meliputi vitamin C yang setara dengan tujuh kali pada jeruk, kalsium setara empat kali maupun protein setara dua kali pada susu, vitamin A setara empat kali pada wortel, serta potassium setara tiga kali pada pisang. Selain itu, juga mengandung antioksidan yang tinggi, sehingga tanaman kelor sangat penting untuk menangkal radikal bebas. Beberapa hasil penelitian menemukan bahwa ekstrak daun kelor dapat menurunkan kadar glukosa darah pada tikus putih. Masyarakat dapat diupayakan untuk memanfaatkan tanaman kelor dalam kehidupan sehari-hari. Berdasarkan pemaparan dalam artikel ini, masyarakat dapat membudayakan pemanfaatan daun kelor sebagai minuman dalam mengatasi masalah kesehatan. Melalui pengembangan tanaman kelor sebagai tanaman khas dan bahan baku teh herbal di daerah Sulawesi Tengah, masyarakat dapat diberdayakan untuk memanfaatkan lahan kosong untuk ditanami kelor.

Kata kunci: Minuman kesehatan, *Moringa oleifera* Lam., vitamin C

INTRODUCTION

Moringa is a typical plant that grows in Central Sulawesi, so that people have used this moringa plant for generations to be used as a vegetable, known as uta kelo (moringa vegetable) and toli uve kelo (moringa clear vegetable). Public knowledge about the benefits of moringa other than as a food ingredient in the form of vegetables is still very lacking, including the use of moringa leaves as a health drink has not been developed by the community, including the community in Central Sulawesi. One effort that needs to be made is to empower the community to utilize parts of the moringa plant in the form of leaves as moringa tea which has properties and functions in overcoming public health problems.

The use of moringa leaves as a health drink, which is packaged and mixed in the form of pure moringa tea powder, or a combination of moringa tea with other ingredients such as ginger powder, cinnamon and other ingredients that are efficacious and have a very good aroma. Changes that occur in the health sector require human creativity to face new approaches in health services in the community, especially the use of moringa plants that can be used to overcome dangerous diseases in the community, including diabetes mellitus.

The nutritional content of the moringa plant is something that is very important to know. Bialangi et al (2020) research showed a decrease in blood glucose levels in white mice injected with artificial sweeteners. Another study explains the role of moringa tea in reducing uric acid levels in adult women. This role is closely related to the alkaloid content, namely cholisin (Karuniawati, 2019).

This article describes the other benefits of the moringa plant as a drink in the form of moringa tea which is efficacious for health and the content and chemical properties of moringa. Simple efforts in empowering the community to utilize moringa as a health drink are also described, so that the community is motivated to plant moringa in a planned and programmed manner. This information is expected to be an alternative solution to health problems, and as a useful solution to increase community income, and can be used as a reference in relevant research.

METHOD

This study uses a literature study method or library research, by reviewing books and scientific articles according to the topic being studied, namely the benefits of moringa leaves as a health drink. In analyzing all sources of literature studied, sources from Mendeley and Google scholar or other sources considered compatible were used. The literature studied concerns the use of moringa leaves as a health drink, the content of moringa leaves that are beneficial for health, techniques for processing moringa leaves as a health drink and efforts that can be made to empower the community in cultivating moringa plants and processing moringa leaves as a health drink.

RESULTS AND DISCUSSION

Content and chemical properties of moringa

Moringa has many benefits due to its content and chemical properties. González-Romero et al (2020) explained that moringa leaves contain several important compounds including phenolics, carotenoids, flavonoids and chlorophyll. Moringa is one of 10 plants that can be used for skin health, because it contains several important compounds including alkaloids, terpenoids, phenolics, flavonoids, carotenoids, polyphenols, tannins, steroids, triterpenoids, vitamin-C, vitamin-B, niacinamide, lycopene, glabridin, saponins and anthraquinones (Gunarti et al., 2022).

The nutritional content of moringa leaves according to Mahmood et al (2010), consists of vitamin C containing vitamin C equivalent to 7 oranges, vitamin A equivalent to 4 carrots, calcium equivalent to 4 glasses of milk, potassium equivalent to 3 bananas, and protein equivalent to 2 yogurts. Another opinion was expressed by Wahyudi et al (2019); Rahmawati & Kusumawati (2015), that moringa contains high antioxidants, which from the results of phytochemical tests by Nweze & Nwafor (2014) natural antioxidants in moringa leaves consist of several compounds, namely flavonoids, alkaloids, saponins, tannins and carotenoids.

Krisnadi (2015) revealed that antioxidants in moringa leaves can regenerate body cells, reduce the effects of oxidized cholesterol in the blood and inhibit the process of molecular degeneration. The nutritional content of moringa, according to Misra & Misra (2014), includes calcium, iron, and protein as well as vitamins A, B C. Moringa leaves are believed to have a higher iron content than other vegetables (Yuandry & Yuniarti, 2023). In addition, moringa leaves also contain various amino acids consisting of aspartic acid, glutamic acid, alanine, valine, leucine, isoleucine, histidine, lysine, arginine, venylalanine, tryptophan, cysteine and methionine (Aminah et al., 2015).

All parts of the moringa plant can be utilized, including the roots, stems, leaves, stems, flowers and seeds. Moringa is known as a plant that has functional properties for health and can also overcome malnutrition, because of its high nutrient content. Its functional properties and benefits in overcoming the problem of malnutrition make the moringa plant known as the miracle Tree & mother's best friend (Aminah et al., 2015).

The potential of moringa leaves as raw material for tea

Moringa can be used as a probiotic drink for health or can be added to other foods. The many functions and benefits of moringa as a food ingredient, medicine, and the environment, it is very necessary to develop and process chemicals to produce competitive products with high sales value (Aminah et al., 2015). Moringa leaves can be processed into health drinks in the form of powdered tea.

According to research by Aini et al (2024), in 100 grams of fragrant moringa leaf tea powder brewed with 100 ml of water, contains 26.48% protein, 39.45% iron, 1815 mg

calcium, 101.11 mg carotene and 101.17 mg ascorbic acid and also alkaloids. Moringa leaves can be processed into moringa leaf herbal tea, to make it easier for people to use and also to increase shelf life.

Indonesian tea is divided into three categories based on its processing method, namely black tea (fermented tea), green tea (unfermented tea) and fragrant tea which is commonly called jasmine tea. Black tea is made by enzymatic oxidation process, while green tea is processed without enzymatic oxidation. Fragrant tea is obtained from processing green tea mixed with fragrance ingredients such as jasmine flowers to produce a distinctive taste and aroma. Jasmine flowers are an ingredient in making fragrant tea, because of its strong aroma and are generally liked by the public.

Moringa tea is a drink made from green moringa leaves, which in its manufacture can be mixed with other ingredients such as jasmine, ginger or galangal. This explanation is in line with the opinion of Fatima et al (2020), that to make moringa tea, other ingredients such as ginger and galangal can be added. Adding ginger to moringa leaf tea can increase its antioxidant content. Another opinion states that by combining moringa leaves and starfruit leaves, it can produce a tea drink that contains flavonoids, tannins and saponins which are antioxidants (Pariawan, 2017).

To prevent the growth of fungus, the raw material of moringa leaf tea needs to be dried to reduce the water content, so that it is not easily damaged during storage and has a longer shelf life. Moringa leaves can be dried in three ways, namely indoors, in the sun or with a drying machine. The technique of drying moringa leaves as raw material for herbal tea for health drinks affects the quality and chemical content of the tea produced.

Rahmi & Susanti (2023) explained that the chemical content of herbal plants, especially compounds that are useful as antioxidants, is influenced by the drying process. Another opinion emphasizes that it is highly recommended to use convective drying at relatively low temperatures to maintain the bioactive content of plants (ElGamal et al., 2023). Warnis et al., (2020) explained that the oven drying method has advantages, namely stabilization of the drying temperature, with an optimum temperature that can produce flavonoid levels of up to 57.62% at an optimum temperature of 50-550C. Dried leaves can be easily processed into moringa tea flour/powder using a mortar or by grinding.

Benefits of moringa leaves as a health drink

Moringa leaves, in addition to being rich in nutrients, also have functional properties because they have benefits for human health. The nutritional content and various active substances of this plant can be beneficial for living things, especially humans and the environment (Marhaeni, 2021). Moringa is classified as a functional plant, because in addition to being rich in nutrients, which are used as a source of nutrients, it is also used as a medicinal plant because it contains antioxidants (Irwan, 2020). The benefits of moringa as a medicine

including health drinks are not yet widely known by the public. However, research and clinical trials on its function as a medicine are starting to develop (Aminah et al., 2015).

Aminah et al (2015) explained that moringa leaves contain micronutrients that are very important for pregnant women, including vitamin B1 (thiamine), vitamin B12 (riboflavin), vitamin B3 (niacin), vitamin C, calcium, iron, phosphorus, magnesium, zinc. Pharmacologically, moringa leaves have analgesic, antimicrobial, antifungal, antihypertensive, antitumor, anticancer, anti-inflammatory, anticonvulsant, antiallergic and prevent intestinal inflammation and protect the liver (hepatoprotective) properties (Mishra et al., 2011). Other studies explain that with an oral dose of 300 mg/kg body weight, moringa leaf extract can function as an antidiarrheal (antidiarrheal activity) (Misra et al., 2014; Aminah et al., 2015).

Moringa plants have many medical (herbal) and non-medical benefits. Non-medically, moringa can be used as food, hedges, or water purifiers and other benefits. As for medically as a herb, all parts of the moringa plant can be utilized. Research by Susanti & Nurman (2022) revealed the benefits of moringa, namely: leaves that can be used as medicine for wounds, inflammatory wounds, headaches, fever, canker sores, sore throats, scabies and can control blood sugar levels. The moringa stem can be used as a medicine for irritation, cancer, tumors and stomach. Meanwhile, moringa fruit and seeds can be used as a medicine for rheumatism. While moringa flowers treat cholesterol, stomach problems, tumors and cancer. In addition, moringa roots can be used as a medicine for rheumatism, constipation, inflammation and blood circulation problems.

Nutritional content in moringa leaves

Moringa leaves (Moringa oleifera Lam.) have many benefits, one of which is to meet the body's nutritional needs. Irwan (2020) explains that moringa leaves are a plant rich in nutrients that can be used as a source of nutrition. To determine the right consumption dose, it is very important to get the right information about the content and nutritional levels of moringa leaves.

Moringa has a number of important compounds such as more iron than spinach, 15 times more potassium than bananas, 17 times more calcium than milk, 10 times more vitamin A than carrots, 7 times more vitamin C than oranges and 25 times more iron than yogurt (Silalahi, 2020). Another study conducted by (Irwan, 2020) through drying techniques using the blanching method obtained a protein content of moringa leaves of 28.66 gr%, Zn (2.32mr%) and 715.32 mg% phosphorus, and contains 11.41 mg% iron (Fe) and 1014.81 mg% calcium (Ca).

Another study conducted by Manggara & Shofi (2018) found that there are at least 15 types of minerals contained in moringa leaves, both macro and micro minerals, with levels in mg/100g of moringa leaves tested. The types and levels of minerals in moringa leaves are presented in Table 1.

Table 1. Types and contents of minerals in moringa leaves (mg/100 g)

Mineral	Content (mg/100g)
Calcium (Ca)	603.77
Potassium (K)	264.96
Sulfur (S)	23.45
Nickel (Ni)	22.6
Iron (Fe)	20.49
Strontium (Sr)	14.52
Rhenium (Re)	13.62
Phosphorus (P)	12.84
Molybdenum (Mo)	11.69
Barium (Ba)	10.04
Copper (Cu)	7.59
Zinc (Zn)	2.87
Manganese (Mn)	2.68
Chromium (Cr)	1.52
Titanium (Ti)	1.05

(Source: Manggara & Shofi, 2018).

The data from these studies show that moringa has a high and complex nutritional content. This can be the basis of information in efforts to develop the cultivation and utilization of moringa both as a health supplement and as a source of nutrition for the community.

How to empower communities to utilize empty land to plant moringa

Plant-based food development to encourage community empowerment is very important to do. Community understanding and increasing the potential for moringa utilization can be done through various activities ranging from sustainable cultivation to the use of moringa both as a food ingredient and as an alternative medicine. In almost every country that has developed the moringa industry, farmers use moringa as their main source of income. Moringa is usually planted to be used as an ingredient for food, medicine, dye, animal feed or wastewater treatment.

Plant-based food development to encourage community empowerment is very important to do. Community understanding and increasing the potential for moringa utilization can be done through various activities ranging from sustainable cultivation to the use of moringa both as a food ingredient and as an alternative medicine. In almost every country that has developed the moringa industry, farmers use moringa as their main source of income. Moringa is usually planted to be used as an ingredient for food, medicine, dye, animal feed or wastewater treatment.

Moringa planting can provide benefits where the moringa tree can be a windbreak, hedge, ornamental plant, prevent soil erosion, or as a tumpeng sari with other plants that do not require direct sunlight. As an important plant for people in developing countries such as Africa, moringa has been proven effective and can help reduce poverty and sustainable growth. Moringa is a very important food commodity as a source of natural nutrition (Irwan, 2020). Several community empowerment activities in the development and utilization of moringa have been carried out. Wijayanti et al. (2023) reported that community knowledge and insight have increased in moringa cultivation and business potential. The method used in community empowerment is through the introduction, utilization and planting of moringa both generatively and vegetatively. Moringa is quite easy to grow both through seeds generatively and stem cuttings vegetatively. Moringa's adaptive ability is quite high in various types of land/soil.

Another effort that can be made to encourage and empower communities to cultivate moringa plants is:

1. Provide education to the public about the use of moringa leaves in the health sector, which can be used as herbs to treat various diseases including degenerative diseases.
2. Conduct socialization and dissemination of information to the public that the processing of moringa leaves as a health drink in the form of herbal tea can add other ingredients such as cinnamon, ginger or cloves, both to add flavor and chemical content.
3. Conduct training and mentoring to the public about good techniques in drying moringa leaves as raw materials for herbal tea to maintain the quality and quality of the natural substance content in moringa.
4. Educate the public about the differences in tea processing methods for chemical components and the level of public preference, the best quality of moringa leaf herbal tea, information about the chemical composition of moringa leaves, the process of making moringa leaf herbal tea that is most affordable and easy for the public, and increase the selling value of moringa leaves.

CONCLUSION

Based on the discussion, the conclusions of this paper include the following:

1. The use of moringa tea as a health drink is an alternative in overcoming health problems. Variations in moringa tea processing are important to develop to obtain a quality moringa tea taste. Moringa tea processing is not only used as a nutritious drink, but also as a chemopreventive, increasing endurance, nutrition for the eyes and brain, eliminating signs of wrinkles on the face, and as an antioxidant.
2. Development of a business utilizing empty land as a place to plant moringa plants can be used as a means to increase community income. Among others, through a cooperation program between the community, NGOs and youth organizations in rural areas.

Based on the presentation in this paper, the use of moringa leaves as a drink that is efficacious to overcome health problems, it is suggested to the community to cultivate its use

in overcoming health problems. The use of empty land for planting and developing moringa plants as typical plants in the Central Sulawesi region, is expected to attract the attention of the community, so that it can increase their income, especially those in rural areas.

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