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POTENTIAL IRON AND VITAMIN C FROM MORINGA LEAVES AS A FOOD PRODUCT TO OVERCOME ANEMIA: SYSTEMATIC REVIEW

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Abstract

Anemia is a significant global health problem, especially in developing countries, with a high prevalence among adolescents and pregnant women. This study explores the potential of Moringa (Moringa oleifera) leaves as a nutrient source rich in iron and vitamin C to address anemia. Moringa leaves contain iron up to 7 mg per 100 g and vitamin C as much as 1,89 mg/g, which plays an important role in increasing hemoglobin levels and absorption of non-heme iron. The method used was a literature study with information analysis from various relevant literature sources. The results show that consumption of moringa leaves in the form of food products, such as biscuits and flour, can significantly increase hemoglobin levels, especially in anemic adolescent girls and pregnant women. The interaction between iron and vitamin C in Moringa leaves supports hemoglobin formation and overall health. Therefore, the integration of moringa into the daily diet can be an effective strategy in preventing and overcoming anemia and improving public health.

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INTRODUCTION

Anemia is a worldwide health problem, especially in developing countries. This condition is characterized by low levels of hemoglobin in the blood, which can result in various symptoms such as easy fatigue, shortness of breath, dizziness, headaches, and pale skin (Mathias et al., 2020). In Indonesia, the prevalence of anemia among the population aged 15-24 years reached 15.5%, while among pregnant women it was 27.7% (SKI, 2023). These figures show that anemia is a significant health problem, especially among adolescents and pregnant women. Without sufficient iron intake, the body is unable to produce red blood cells, which will cause symptoms of anemia. Iron deficiency can occur due to various factors, including nutritional deficiencies, genetic disorders, pregnancy and lactation, and others (Kusumawati et al., 2016; Nuraina & Sulistyoningsih, 2023). Especially in adolescent girls, they have a higher risk of anemia due to blood loss during menstruation (Millenia & Rahmadyanti, 2024).

Efforts to overcome the problem of anemia require a source of nutrients that can meet iron needs and improve overall health. One solution is the utilization of Moringa leaves (Moringa Oleifera). This plant has been used in traditional medicine in various cultures and has great potential as a nutritious food source. Moringa leaves are known as a food source rich in nutrients, including iron. The iron content in Moringa leaves can help increase hemoglobin levels in the blood (Ariendha et al., 2023).

Moringa leaves also contain vitamin C, which can help iron (Fe) absorption. Vitamin C can increase the absorption of non-heme iron fourfold (Siagian et al., 2023). Thus, adding moringa leaves to the daily diet can be an effective step in preventing and overcoming iron deficiency anemia in adolescent girls. In addition, moringa is easily accessible and can be grown in various environmental conditions, making it a sustainable food source.

METHODS

The method used in writing this journal review is a literature study, which includes the collection, analysis, and conclusion of information from various relevant literature sources regarding the potential of iron and vitamin C from moringa leaves as food products to overcome anemia. The literature sources used were scientific journals, reports, and online articles on moringa, iron, vitamin C, and anemia. The literature search was limited to the year of publication, namely the last 10 years (2014 - 2024). The literature search process used the keywords “Moringa leaves”, “iron”, Vitamin C”, and ‘anemia’. The literature sources used were then summarized, classified, and synthesized to form the framework of this journal review.

RESULTS AND DISCUSSION

Moringa leaves (Moringa oleifera) are a very rich source of nutrients, especially iron (Fe) and vitamin C content. Iron (Fe) is a micromineral that is very important to form hemoglobin (Hb), a color substance contained in red blood that is useful for transporting oxygen (O_2) and carbon dioxide (CO_2) in the body. Iron levels in moringa leaves can reach 7 mg per 100 g when ground to 28.9 mg (Sari & Adi, 2017). Moringa leaves also contain vitamin C reaching 1.89 mg/g (Viona et al., 2023). Vitamin C not only functions as an antioxidant but also increases iron absorption in the body.

Moringa leaves (Moringa oleifera) have potential as raw material for functional food products due to their high iron and vitamin C content. Moringa leaf-based product development aims to increase nutritional value and provide an easily accessible alternative to prevent and treat anemia. Processed products such as moringa flour, biscuits, and herbal drinks can provide significant health benefits to consumers.

Table 1. Iron and vitamin C content in food products

Product Name	Iron (mg/100gr)	Vit C (mg/100gr)	References
Almond Crispy	1,5	-	(Aprilia & Oktafiani, 2023)
Coklat kelor	33,5	187,8	(Hidayah, 2022)
Crackers	3,05	-	(Mazidah et al., 2018)
Cokelat	9,44	0,47	(Lenin et al., 2021)
Dawet	5,4	-	(Kumalasari et al., 2023)
Tempe	-	355,99	(Sabarudin et al., 2023)
Bikelor	6,46	-	(Nua et al., 2021)

Moringa leaves (Moringa oleifera) have significant potential in increasing nutrient intake, especially iron and vitamin C content. In addition, the provision of moringa leaves in food products can provide attractive colors and flavors. Moringa leaves can serve as an effective vegetable source to increase hemoglobin levels in the blood. This is supported by research by Nua et al (2021), which states that there is an increase in Hb in most pregnant women after being given the Bikelor intervention. In this study, Bikelor given to pregnant women as many as four to five pieces per day (100 grams) containing Fe 6.46 mg, the Fe requirement of 4-7 mg will be met. Based on the results of the analysis, the lowest Hb level value before being given Bikelor was 7.8 gr/dl, included in the moderate anemia category, and most pregnant women who experienced anemia were in the second trimester of pregnancy. After being given the intervention, there was a change in Hb levels from the previous 7.8 gr/dl to 8.6 to 11.6 gr/dl. This means that after being given Bikelor, Hb levels in pregnant women with anemia increased by 0.8-1.4 gr/dl.

The content of vitamin C in moringa leaves can also increase hemoglobin levels. plays a role in facilitating the absorption of non-heme iron. Based on research conducted by Siallagan et al (2016) with the title of The effect of Fe, vitamin A, B_{12}, and C intake on hemoglobin levels in vegan adolescents that every 1 mg increase in Fe intake will increase adolescent Hb levels at the Maitreyawira Buddhist Training Center by 0.013 g/dl and every additional 1 mg of vitamin C intake will increase adolescent Hb levels by 0.002 g/dl, thus showing the results that iron and vitamin

C intake are significantly related to the incidence of anemia in adolescents.

Based on research conducted by Nurmalasari et al (2021), shows that the administration of moringa leaf extract to white rats can increase hemoglobin levels. In the second treatment group (KP2) which received a dose of 450 mg / kgBB, the average hemoglobin level increased to 17.4 ± 4.6 and 18.2 ± 4.5, with the paired t-test results showing p = 0.014, which means there is a significant difference. This indicates that moringa leaf extract is effective in improving hemoglobin levels in white rats. This study indicates that Moringa leaves can be a natural solution to improve anemia conditions, especially through increasing hemoglobin levels to normal levels.

Iron and Vit C content in the formation of hemoglobin

Iron is capable of both oxidation and reduction reactions, making it a highly reactive element capable of interacting with oxygen. In the reduction process, iron loses two electrons, forming ferrous ions (Fe^{2+}) with two positive charges. Conversely, when oxidized, iron loses three electrons and becomes a ferric ion (Fe^{3+}) with three positive charges. The availability of these two ionic forms makes iron important in the cellular respiration process (Krisnanda, 2020).

Vitamin C is a nutrient that functions as an enhancer of iron absorption, especially from non-heme sources found in plant foods (Putri & Fauzia, 2022). Vitamin C plays an important

role in increasing iron absorption by reducing Fe^{3+} to Fe^{2} into a form that is more easily absorbed. After absorption through intestinal mucosal cells, iron will be bound by apoferitin to form ferritin. In the blood serum, this bond will be released and ferrous iron will be transported by transferrin (a protein containing 3-4 mg of Fe) to various parts of the body to be stored in the liver, lymph, and bone marrow (Ayupir, 2021; Meliyani et al., 2022).

The interaction between iron and vitamin C is crucial to ensure adequate iron availability to the body, supporting hemoglobin formation and overall health.

CONCLUSION

Moringa (*Moringa oleifera*) leaves have significant potential as a source of nutrients to treat anemia, especially among adolescent girls and pregnant women. The high iron and vitamin C content in Moringa leaves contributes to increased hemoglobin levels in the blood, where vitamin C also plays a role in improving iron absorption. Research shows that consumption of moringa, both in the form of semi-finished food products such as flour and finished food products such as biscuits, can effectively increase hemoglobin levels and prevent anemia. Therefore, the integration of moringa into the daily diet is a strategic step to improve public health and address the problem of anemia.

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