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Potential of moringa leaves as antianemia for iron deficiency in white rat experiments

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ABSTRACT

Iron deficiency anemiaa type of anemia that occurs due to the body lacking iron which results in a decrease in the number of red blood cells or hemoglobin in the blood which is insufficient for the body's physiological needs. In Indonesia, the prevalence of iron deficiency anemia is greatest in non-pregnant adult women, around 25-48% and pregnant women around 46-92%. According to several studies, Moringa leaves (Moringa oliefera) are a source of iron. Moringa leaves (moringa oliefera) are known to have various nutritional contents. one of which is iron, protein, vitamin A, Vitamin C, potassium and calcium. Moringa leaves are a plant that has quite a high iron content. The iron content in the body can help form hemoglobin and bind oxygen. This research aims to determine the potential of Moringa leaves as an anti-anemia. The reference search was carried out in the process of reviewing this article using the internet network via Pubmed, Sciencedirect and Google Scholar. National and international journals were obtained as primary data sources.From the data collected, Moringa leaves have the potential to increase hemoglobin levels in experimental white mice. The high amount of iron contained in Moringa leaves (Moringa oleifera) affects the increase in hemoglobin in the blood. This can be used as a reference for the use of Moringa leaves as an anti-anemia, both for prevention and treatment.

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INTRODUCTION

Anemia is a decrease in the blood's ability to carry oxygen. This occurs due to decreased production of erythrocyte cells and decreased hemoglobin levels in the blood (Nugraha & Pratama, 2022). Anemia is also defined as a decrease in hemoglobin levels in the blood below the normal limit of 13.5 grams/dl (men), 11.5 grams/dl (women) and 11.0g/dl (children). Anemia during pregnancy is defined as a condition where the mother has hemoglobin levels below 11 grams/dl in the first trimester and third trimester(Soleha et al., 2020)(Fury, 2021)(Qomariyah, 2021)(WINDARYANTI, 2022).

Iron deficiency anemia occurs when the supply of iron in the bone marrow decreases,

causing a decrease in serum ferritin levels. This occurs due to increased absorption of iron by the intestinal mucosa (Sulasmi et al., 2023). When erythrocytes cannot grow normally and there is a decrease in iron reserves and transport, causing microcytic and hypochromic conditions(Sari et al., 2020)(Sari et al., 2020)(Wahyuni, 2021)(Prayogi & Ananto, 2022)(Ramadhan, 2023). These signs and symptoms are the phase where the patient will experience anemia (Nursavitri, 2020).

Proteins that are rich in iron in the blood can be found in hemoglobin(VINNY et al., 2020)(Thamrin & Masnilawati, 2021)(Wati et al., 2022). Moringa leaves are a food that is a rich source of iron, the iron contained in Moringa leaves is 28.29 mg/100 gr of Moringa leaves (Fahira Lubis et al., 2023). In red blood cells there is iron, so consuming Moringa leaves has the potential to increase hemoglobin levels, anemia will not occur if hemoglobin levels in the body are sufficient (Sulasmi et al., 2023).

Moringa leaves (Moringa oleivera L) are a plant that has benefits as a natural medicinal ingredient(Rivai, 2020)(Marhaeni, 2021)(Febriyanti & Najib, 2022)(Anjani, 2022). Moringa leaves are rich in iron, even much higher than spinach and almonds(Maryani & Suryadarma, 2019)(Elfine, 2020)(Kustiani et al., 2022)(Hijrawati, 2022)(Hasan, 2023)(Wijaya, 2023). Usually the problem with anemia medicine preparations, especially those from plants, is the absorption of iron because it includes non-heme iron, vitamin C is needed to increase iron absorption. However, because Moringa contains quite a lot of vitamin C, iron absorption is effective without having to combine it with vitamin C (Ayu et al., 2022).

Based on the background above, the potential of Moringa leaves as an anti-anemia is enormous. So researchers are interested in conducting a review of studies that discuss the potential of Moringa leaves as an anti-anemia.

RESEARCH METHOD

The article review process is carried out through internet searches via Pubmed, Sciencedirect, Scientific Research and Google Scholar. National and international journals were used as primary data sources, then these journals were screened. The inclusion criteria for articles are that they were published in the last 5 years, can be accessed in full, discuss the potential of Moringa leaves as anti-anemia in white mice, in Indonesian and English, experimental and quasi-experimental research types. Article exclusion criteria, using articles over five years old, citing unpublished scientific manuscripts such as papers, theses, theses or dissertations including newspaper reports and the like. The keywords used in the literature are Antianemia AND Moringa Leaves AND Hemoglobin AND Iron. The data obtained was analyzed using JBI analysis.

RESULTS AND DISCUSSIONS

The potential of Moringa leaves as antianemia in white mice can be seen in Table 1.

Table 1. Potential of moringa leaves as antianemia in white rats

Researcher & Year	Research Title	Publication Journal	Results
(YE et al., 2019)	Effects of Graded Levels of Moringa Oleifera Leaf-Meal In Albino Rat Diet on Some Hematological Parameters	Journal of Analysis and Research Techniques	The results showed an increase in the amount of hemoglobin (Hb) in animals fed only 37.5 grams of M. oleifera
(Dadi, 2020)	Test the effect of Moringa leaf ethanol extract on Hemoglobin levels in white Wistar rats induced by aluminum chloride	Cendana Medical Journal	The results of the parametric statistical test Paired T Test have a significance of 0.012 ($p < 0.05$) which shows the effect of giving ethanol extract of Moringa leaves on increasing hemoglobin levels in mice.
(Nurmalasari,	The Effect of Giving Moringa	Malahayati	There was an effect of giving

Researcher & Year	Research Title	Publication Journal	Results
2021)	(Moringa oleifera) Leaf Extract on Hemoglobin Levels in Male Wistar White Rats (Rattus norvegicus)	Medical Journal	Moringa leaf extract on the hemoglobin levels of white rats in treatment group 2 (KP2) at a dose of 450 mg/kg BW and in the Positive Group (KP) at a dose of 5.4 ml/kg BW.
(Pagadala, 2022)	Effect of Moringa oleifera leaves on hematological profile of fluorosis affected rats	Bioinformation	Data shows that Moringa leaf powder is effective in reducing plasma fluoride content. It also helps in increasing Hb % & red blood cell count in mice affected by fluorosis.
(Akorede et al., 2022)	Mitigative potentials of methanol leaf extract of Moringa oleifera on chronic carbamazepine-induced haemo-biochemical and thyrotoxicity in male Wistar rats	Pharmacological Research - Modern Chinese Medicine	High contentvitamin A, β-carotene and iron found in high quantities in Moringa leaves contribute to a considerable reduction in anemia
(Javed et al.,2024)	Protein extracted from Moringa oleifera Lam. Leaves: Bio-evaluation and characterization as suitable plant-based meat-protein alternative	Regulatory Toxicology and Pharmacology	The hematological profile of the mice showed an increase in Hemoglobin (Hb) (7.9–14.0%), White Blood Cells (WBC) (35.9–51.5%), Red Blood Cells (RBC) (17.1–22, 2%), Hematocrit (HCT) (13.1–22.9%), and platelet levels (36.5–40.6%) from day 1.

Research conducted by YE et al., (2019) aimed to determine the effect of Moringa leaf flour on several hematological parameters in male albino mice. Sixteen (16) albino mice were randomly selected into four (4) groups; one control group (group A) and three experimental groups (group B, group C, and group D) contained four (4) animals per group. Group A was given normal food, groups B, C, and D were given Moringa leaves, 37.5 grams, 56 grams, and 75 grams respectively. The results showed that there were significant differences ($P<0.05$) in the number of hemoglobin, red blood cells, and solid cell volume in group B, while there were significant differences ($p<0.05$) in the number of animal lymphocytes in groups C and D. although all groups were within the normal range while no significant difference ($P>0.05$) was shown in white blood cell count when compared with the control group.

Research conducted by Dadi (2020) The aim of this research was to test the effect of ethanol extract of Moringa oleifera leaves on hemoglobin levels in Wistar white rats induced by aluminum chloride. True experimental research methodology - randomized pretest and posttest with control group with 30 samples divided into 6 groups using random probability sampling technique. Data was tested parametrically using Paired T Test. The results of the parametric statistical test Paired T Test have a significance of 0.012 ($p < 0.05$) which shows the influence of giving ethanol extract of Moringa oleifera leaves on increasing hemoglobin levels in mice. So it can be concluded that in this study there was an effect of giving ethanol extract of Moringa oleifera leaves on increasing hemoglobin levels in Wistar strain rats induced by aluminum chloride.

Research conducted by Nurmalasari (2021) with the aim of determining the effect of administering Moringa oleifera leaf extract on hemoglobin levels in male Wistar white rats (Rattus norvegicus). The samples were 28 male Wistar white rats (Rattus norvegicus) aged 1-4 weeks weighing 100-150 grams. The samples were divided into four groups, including the pure group (KM), the group that was not given Moringa leaf extract, Treatment Group 1 (KP1), the group that was given Moringa leaf extract at a dose of 150 mg/kgBW, Treatment Group 2 (KP2), the group that was given Moringa leaf extract at a dose of 450 mg/kgBW. mg/kg BW, and the Positive Group

(KP) group that was given a vitamin supplement dose of 5.4 ml/kgBW. It is known that the results of the study showed that hemoglobin levels had a mean of 12.1 ± SD 0.5 and 11.2 ± SD 1.3 in male Wistar white rats (Rattus norvegicus) that were not given Moringa leaf extract and vitamin supplements.

Research conducted by Pagadala (2022) The aim of the research was to determine the effect of Moringa leaves on the hematological profile of mice affected by fluorosis. Twenty-four Sprague Dawley rats were housed two per cage in a room with a 12-hour light cycle and a 12-hour dark cycle. Mice were allowed to acclimate to the laboratory environment for about one to two weeks before the study began. This research revealed that MO leaves were effective in reducing plasma fluoride content. It also helps in increasing Hb% and red blood cell count in mice affected by fluorosis. Data shows that Moringa leaf powder is effective in reducing plasma fluoride content. It also helps in increasing the hemoglobin percentage and red blood cell count in mice affected by fluorosis.

Research conducted byAkorada (2022) This study was conducted to evaluate the potential improvement of M. oleifera leaf methanol extract against CBZ-induced chronic hemotoxicity and thyrotoxicosis in male Wistar rats. Thirty-two (32) male Wistar rats (150-250 g). Rats were randomly divided into four groups of 8 animals each and given the following regimen: Group I (DW) was given distilled water (2 ml/kg); group II (MO) was exposed to M. oleifera (200 mg/kg); group III (CBZ) was given carbamazepine at a dose of 20 mg/kg, while group IV (CBZ +MO) was given carbamazepine (20 mg/kg) followed by M. oleifera (200 mg/kg) 30 minutes later. The regimen was administered once daily for 15 weeks via gavages. Mice were weighed once a week for dose adjustment and at the end of the treatment period using digital scales (Sensor Disc Exclusive Tech, USA). Mice were then sacrificed via the jugular vein after ether anesthesia, and blood was collected into containers containing anticoagulant (EDTA) and plain for serum. This study showed a significant decrease in PCV in the CBZ group. The increase in PCV observed in the MO+CBZ group indicates that M. oleifera leaves can increase blood formation in anemia patients. The high content of vitamin A, β-carotene and iron found in high quantities in M. oleifera contributes to a considerable reduction in anemia.

Research conducted byJaved et al., (2024) This research aims to isolate and characterize leaf proteinsMoringa(MLP) via HPLC and evaluate the impact of its consumption via a mouse model.Four groupsAlbino Wistar rat(n = 25 each) and control groups (n = 25) were acclimatized. Isolated MLPs were added to the basal diet (casein; control) in various percentages (25, 50, 75, 100%) for the 21-day experimental period. At three intervals (days 1, 11, 21), blood samples were collected and hematological examination was performed. The hematological profile of the mice showed an increase in Hemoglobin (Hb) (7.9–14.0%), White Blood Cells (WBC) (35.9–51.5%), Red Blood Cells (RBC) (17.1–22, 2%), Hematocrit (HCT) (13.1–22.9%), and platelet levels (36.5–40.6%).

CONCLUSION

BVarious studies involving Moringa leaves*(Moringa oleifera)*revealed its potential in increasing hemoglobin levels in white mice experiments. Moringa leaves contain high levels of iron*(Moringa oleifera)*affects the increase in hemoglobin in the blood. In several studies that conducted hematological tests, Moringa leaves can also affect several blood components such as red blood cells, hematocrit, platelets and white blood cells. This can be used as a reference for the use of Moringa leaves as an anti-anemia, both for prevention and treatment.

References

Akorede, G. J., Ambali, S. F., Olatunji, A. O., Aremu, A., Basiru, A., Ahmed, A. O., Azeez, M. O., Abdulmajeed, I., & Kadir, R. A. (2022). Mitigative potentials of methanol leaf extract of Moringa oleifera on chronic carbamazepine-induced haemo-biochemical and thyrotoxicity in male Wistar rats.

Pharmacological Research - Modern Chinese Medicine, *2*(January), 100055. https://doi.org/10.1016/j.prmcm.2022.100055

Anjani, R. S. (2022). *Pengembangan Produk Sediaan Salep Ekstrak Daun Kelor (Moringa oleifera L.) Sebagai Antibakteri Penyebab Jerawat Staphylococcus epidermidis*. Universitas Nahdlatul Ulama Sunan Giri.

Dadi, A. K. (2020). Uji efek ekstrak etanol daun kelor (moringa oleifera) terhadap kadar hemoglobin pada tikus putih galur wistar yang diinduksi aluminium klorida. *Cendana Medical Journal*, *20*(2), 185–190.

Elfine, M. (2020). *Pengaruh Pemberian Ekstrak Masker Daun Kelor (Moringa Oleifera) Terhadap Pemulihan Jerawat (Acne) Pada Remaja Usia 13-19 Tahun*. STIKes Insan Cendekia Medika Jombang.

Febriyanti, A., & Najib, Z. S. (2022). Aktivitas Antibakteri Ekstrak Etanol Daun Kelor (Moringa oleifera L) dari Kabupaten Bangkalan terhadap Bakteri Staphylococcus aureus. *Indones. J. Pharm. Herb. Med*, *2*(1), 55–59.

Fury, W. A. R. (2021). *FAKTOR-FAKTOR YANG MEMENGARUHI KEJADIAN ANEMIA PADA IBU HAMIL TRIMESTER III DI PUSKESMAS SEWON 2 KABUPATEN BANTUL TAHUN 2020*. Poltekkes Kemenkes Yogyakarta.

Hasan, M. S. (2023). *Peran Daun Kelor dan Madu terhadap Kebugaran Fisik*. Penerbit NEM.

Hijrawati, H. (2022). *EFEK PEMBERIAN EKSTRAK DAUN KELOR (Moringa oleifera) TERHADAP KADAR KORTISOL WANITA PRAKONSEPSI DI KECAMATAN POLONGBANGKENG UTARA TAKALAR 2021*. Universitas Hasanuddin.

Javed, M. S., Alvi, S. Q., Amjad, A., Sardar, H., Anwar, M. J., Javid, A., Abou Fayssal, S., Kumar, P., Abou Fayssal, T., Wabaidur, S. M., Okla, M. K., Saleh, I. A., & AbdElgawad, H. (2024). Protein extracted from Moringa oleifera Lam. Leaves: Bio-evaluation and characterization as suitable plant-based meat-protein alternative. *Regulatory Toxicology and Pharmacology*, *146*(December 2023), 105536. https://doi.org/10.1016/j.yrtph.2023.105536

Kustiani, A., Adyas, A., Nurdin, S. U., & Indriani, Y. (2022). *Potensi Tepung Daun Kelor untuk Pencegahan Stunting Sejak Dini*. Penerbit NEM.

Marhaeni, L. S. (2021). Daun Kelor (Moringa oleifera) sebagai Sumber Pangan Fungsional dan Antioksidan. *AGRISIA-Jurnal Ilmu-Ilmu Pertanian*, *13*(2).

Maryani, I., & Suryadarma, I. G. P. (2019). *Tak Selebar Daun Kelor: Moringa oleifera Lam*. Ika Maryani.

Nurmalasari, Y. (2021). *Pengaruh Pemberian Ekstrak Daun Kelor (Moringa oleifera) Terhadap Kadar Hemoglobin Pada Tikus Putih (Rattus norvegicus) Galur Wistar Jantan*. *5*, 91–101.

Pagadala, P. (2022). Effect of Moringa oleifera leaves on hematological profile of fluorosis affected rats. *Bioinformation*, *18*(1), 14–18. https://doi.org/10.6026/97320630018014

Prayogi, M. D., & Ananto, M. (2022). Seorang Pria 78 Tahun Dengan Anemia Hipokromik-Mikrositik Karena Infeksi Cacing Di RSUD DR. Sayidiman Magetan. *Proceeding Book Call for Papers Fakultas Kedokteran Universitas Muhammadiyah Surakarta*, 1087–1096.

Ramadhan, F. (2023). Pendekatan Diagnostik, Tatalaksana dan Pencegahan Anemia Defisiensi Besi. *Jurnal Kedokteran Nanggroe Medika*, *6*(4), 27–36.

Rivai, A. T. O. (2020). Identifikasi senyawa yang terkandung pada ekstrak daun kelor (Moringa oleifera). *Indonesian Journal of Fundamental Sciences*, *6*(2).

Sari, L. A., Nurmisih, N., & Sartika, D. (2020). Pengaruh Konsumsi SF dan Jus Jambu Biji Merah terhadap Perubahan Kadar Hemoglobin pada Remaja Puteri yang Mendapat Suplementasi Tablet SF di SMP Negeri 19 Kota Jambi Tahun 2019. *Jurnal Ilmiah Universitas Batanghari Jambi*, *20*(3), 952–960.

Soleha, N., Astriana, A., & Amirus, K. (2020). Pemberian jus buah naga mempengaruhi kadar hemoglobin pada ibu hamil. *Jurnal Kebidanan Malahayati*, *6*(3), 335–341.

Thamrin, H., & Masnilawati, A. (2021). Hubungan antara Pengetahuan, Tingkat Konsumsi Protein, Zat Besi, dan Vitamin C dengan Kadar Hemoglobin pada Mahasiswi Kebidanan. *Jurnal Penelitian Kesehatan Suara Forikes*, *12*(1), 30–33.

VINNY, N., Haya, M., Suryani, D., Rizal, A., & Wuryani, W. (2020). *Hubungan asupan protein, zat besi, vitamin C dan zink dengan kadar hemoglobin pada komunitas vegetarian dewasa di vihara rukun maitreya kota bengkulu tahun 2020*. Poltekkes Kemenkes Bengkulu.

Wahyuni, E. S. (2021). Pengaruh suplementasi Fe dan vitamin C terhadap hemoglobin dan indeks eritrosit remaja putri. *Jurnal Kesehatan*, *12*(2), 162–172.

Wati, S. W., Sulistiani, R. P., & Ayuningtyas, R. A. (2022). Hubungan Asupan Zat Besi, Protein, Vitamin C dan Status Gizi dengan Kadar Hemoglobin pada Mahasiswi Universitas Muhammadiyah Semarang. *Prosiding Seminar Nasional UNIMUS*, *5*.

WINDARYANTI, W. (2022). *Hubungan Usia Perkawinan Dan Status Gizi Ibu Dengan Kejadian Anemia Kehamilan pada Primipara Di Puskesmas Kalasan*. Poltekkes Kemenkes Yogyakarta.

YE, A., PF, A., & OM, O. (2019). Effects of Graded Levels of Moringa Oleifera Leaf-Meal In Albino Rat Diet on Some Hematological Parameters. *Journal of Analytical Techniques and Research*, *01*(01), 37–46. https://doi.org/10.26502/jatri.006