

A Review: Plants That Have Activities As Anti-Anemia

Desna Amelliya¹, Helmi Arifin*², Widya Kardela¹

¹ Department of Pharmacology and Clinical Pharmacy, School of Pharmaceutical Sciences STIFARM Padang, Raya Siteba Street, Kurao Pagang, Padang, West Sumatera, Indonesia, 25417

² Department of Pharmacology and Clinical Pharmacy, Faculty of Pharmacy, Andalas University, Limau Manih Campus, Padang 25163, Indonesia

Abstract

Background: Anemia is a condition where the number of red blood cells, the quantity of hemoglobin, and the volume of hematocrit are less than normal. According to WHO criteria anemia is hemoglobin levels below 130 g/L in men and below 120 g/L in women. Factors that influence the low levels of hemoglobin are that the food consumed daily contains little iron, the presence of inhibitors in the absorption of iron that is parasites in the body, and considerable blood loss. This review discusses some plants that are active as anti-anemia.

Methods: This research is a literature review with narrative methods that describe the results of research related to the potential of various plants to increase hemoglobin levels, the number of erythrocytes, and hematocrit percentage in people with anemia through literature searches in the database PubMed and Google Cendikia (Google Scholar).

Result: Based on the results of the article peel obtained 17 species of plants that can increase levels of hemoglobin, erythrocytes, and hematocrit with an average increase in hemoglobin levels of 0.082%, the number of erythrocytes 0.049%, and hematocrit presentation of 0.202%.

Conclusion: From various plants that are efficacious as antianemia, it can be concluded that *Moringa Oleifera* can increase hemoglobin levels, the number of erythrocytes, and a higher percentage of hematocrit compared to other plants. Besides, anemia treatment can also be done by various inductions such as Sodium Nitrite, Pheylhydriderazin, Cyclophosphide, Anilin, Aluminum Sulfate.

Keyword: Antianemia, herbal plants, erythrocytes, hematocrit, hemoglobin

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I. Introduction

Anemia happened when reduced to below normal values of red blood cell count, a quantity of hemoglobin and volume packed red blood cells (hematocrit) per 100 ml of blood. Thus, anemia is not a diagnosis but a reflection of fundamental pathophysiological changes described through careful anamnesis, physical examination, and laboratory confirmation¹. According to WHO criteria anemia is hemoglobin levels below 130 g/L in men and below 120 g/L in women². One of the most commonly associated signs of anemia is pale. This condition is generally caused by reduced blood volume, reduced hemoglobin, and vasoconstriction to maximize the delivery of O₂ to vital organs. Since all organ systems can be affected, anemia can cause extensive clinical assessment, depending on the speed of onset of anemia, individual age, compensation mechanism, activity level, underlying state of the disease, and severity of anemia. As the effective number of red blood cells decreases, the delivery of O₂ to the tissues decreases. Sudden blood loss (30% or more), such as bleeding, results in symptoms of hypovolemia and hypoxia, stressed anxiety, diaphoresis (cold sweats), tachycardia, shortness of breath, and rapid development into circulatory collapse or shock¹. The most common anemia in the world is iron-deficiency anemia³. Treatment of iron deficiency anemia is utilizing blood transfuse and the use of supplements containing iron⁴. Iron supplements have side effects if used continuously, namely the occurrence of constipation that will cause disturbing comfort and will subsequently cause hemorrhoids. Plants can be used as a good alternative treatment at a cheaper cost. Anemia could be prevented by expanding the science of how to prevent this disease⁵.

Anemia can be classified based on 2 factors. The first, based on morphological factors of red blood cells and their indexes, and the second is based on etiology. Based on the morphological approach, anemia is classified into 3, among others; Normoromic normoxic anemia, macrocytic normochromic anemia, and macrobiotic hypochromic anemia. Normoromic normoxic anemia is a condition where red blood cells have normal size and shape and contain normal amounts of hemoglobin (*mean corpuscular volume* [MCV] and *mean corpuscular hemoglobin concentration* [MCHC] normal or low normal) e.g. Aplastic Anemia. Macrocytic neurodynamic anemia is anemia that has red blood cells larger than normal but normochromic due to normal hemoglobin concentration (MCV increases; Normal MCHC) e.g. Megaloblastic Anemia. Then microcytic

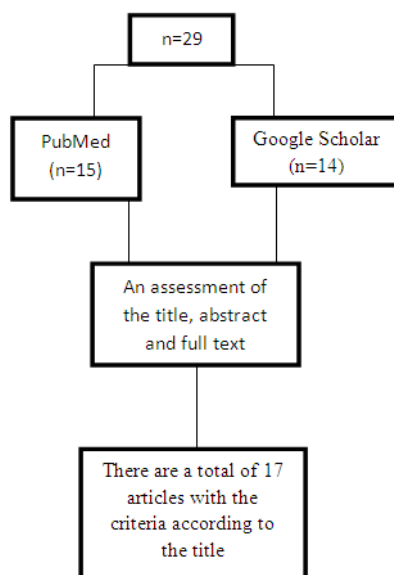
hypochromic anemia is a condition where red blood cells are small and hemoglobin in less than normal amounts (MCV and MCHC decrease) for example iron deficiency anemia. Anemia based on etiology is caused by the increased loss of red blood cells and decreased or abnormality of cell formation. Anemia based on increased red blood cell loss can be caused by blood loss or by cell destruction. Destruction of red blood cells in circulation is known as hemolysis. Then the second classification of etiology is the decrease or disruption of the production of red blood cells (dyserythropoietic). Any circumstances that affect bone marrow function fall into this category¹. The method used to measure hematological levels in the blood is various including cyanmethemoglobin, Tallqvist, Sahli, Hematin Alkali, Oksihemoglobin, Dacie and Lewis, Baker, and Silver, Atomic Absorption Spectrophotometer, Median Test, and Ochei Method.

II. Method

This research is a literature review with narrative methods that describe the results of research related to the potential of various plants to increase hemoglobin levels, the number of erythrocytes, and hematocrit percentage in people with anemia through literature searches in the database PubMed and Google Cendikia (Google Scholar). The initial stage of article search with the range of 2010 – 2020, obtained 2.004.526 articles for the keyword "pharmacology", 91 articles for the keyword "antianemia", 46 articles for the keyword "Pharmacology and antianemia" and 15 articles for the keyword "Pharmacology and antianemia and extract". Of these, only 3 articles are relevant to the title of the database search through PubMed. Then followed by a database search through Google Scholar by entering the keyword "Extract plants antianemia" obtained 1,120 articles and only 14 articles relevant to the purpose of the meaning of this review is to find out the potential antianemia of various. The libraries that have been obtained are then arranged by the framework, plant data with antianemia activities arranged in the form of tables, as well as writing reviews under the format that has been given.

III. Search Result

Diagram of search



IV. Discussion

In the world, there are 1.62 billion people affected by anemia, of which there are 33% of schoolchildren, in men 40.2%, and in women 73.5%. The prevalence of anemia according to WHO is still around 48.8%²³. According to the Household Health Survey, the prevalence of school-age and adolescent anemia is about 26.5%. The prevalence of anemia nationally according to the publication of Basic Health Research (RISKESDAS) in 2018 is 48.9% where the proportion of anemia is in the age group 15 - 24 years and 25 - 34 years²⁴. Herbal plants become an alternative option that can be chosen to overcome anemia. Many studies have been done to find out the active substances in a plant and prove anti-anemia activities. Some of these plants are as follows.

1. *Allium tricoccum*

Research proved that hydroalcoholic extract from *Allium Tricoccum* fruit significantly increased hemoglobin, red blood cells, and hematocrit percentage rate which concluded that *Allium Tricoccum* fruit showed anti-anemia activity. This observation was carried out for approximately 30 days. Induction dose used

Phenylhydrazine 60mg/kg BB, hydro-alcoholic extract dosage *Allium tricoccum* given 100 mg/kg and 200 mg/kg and Vitamin B12 as a comparison drug. All tests are administered for 28 days each day via the oral route. On the 29th day, blood is taken, through a puncture of the tail and gets the results of the value of erythrocytes, hemoglobin, and hematocrit percentages. The administration of *Allium tricoccum* fruit extract at a dose of 100 mg/kg obtained the value of the number of erythrocytes ($8.32 \times 10^6 \mu\text{L}$), hemoglobin (13.24 g/dL), and hematocrit (46.57%) slightly smaller than vitamin B12 which has erythrocyte values ($8.34 \times 10^6 \mu\text{L}$), hemoglobin (13.19 g/dL), and hematocrit (47.33%). The administration of *Allium tricoccum* fruit extract at a dose of 100 mg/kg still has not reached the normal control values of erythrocytes ($8.81 \times 10^6 \mu\text{L}$), hemoglobin (13.72 g/dL), and hematocrit (48.78). In the administration of *Allium tricoccum* extract at a dose of 200 mg/kg obtained a greater amount of erythrocytes ($8.53 \times 10^6 \mu\text{L}$), hemoglobin (13.41 g/dL), hematocrit (49.82%) which is slightly higher compared to the administration of Vitamin B12 but still has not achieved normal control values. There was a significant increase ($P < 0.001$) in red blood cells and hemoglobin from vitamin B12 and *Allium tricoccum* fruit extract against phenylhydrazine provocations. A significant increase ($P < 0.01$) is also found in hematocrit percentages⁸.

2. *Amaranthus cruentus*

The anti-anemia potential in *Amaranthus cruentus* has been tested by Chaudhary B *et. al*(2016) to significantly increase red blood cells and hemoglobin. The plant also contains a lot of protein, calcium, iron, vitamins A, E, C, and folic acid. The part of the plant used is the leaf. Test animals induced with Phenylhydrazine 60 mg/kg injected intraperitoneally for three consecutive days. This observation was carried out for approximately 25 days. The dose of phenylhydrazine used is 60 mg/kg used as induction, the dose of *Amaranthus cruentus* extract used is 200 mg/kg and the dose is 400 mg/kg and as a comparison of test animals given the drug Ferritop-Z. Dacie and Lewis's method (1984) was used in this treatment. After the experiments have been obtained a significant increase ($P < 0.01$) the number of red blood cells ($6.99 \times 10^6/\text{mm}^3$, ($P < 0.001$) white blood cells ($7.65 \times 10^3/\text{mm}^3$), ($P < 0.001$) hemoglobin (9.87 g/dL) by Baker and Silverton method (1985) and ($P < 0.01$) hematocrit (38.78%) microhematocrit method from Baker and Silverton (1985). In group 3 (Ferritop-Z) as a comparison showing the number of erythrocytes ($7.23 \times 10^6/\text{mm}^3$) and hemoglobin (10.65 g/dL), of which it can be concluded that *Amaranthus cruentus* extract at a dose of 400 mg/kg is comparable to Ferritop-Z as an alternative treatment of anemia⁹.

3. *Amaranthus tricolor* L.

The article written¹⁰ showed that the dose of water extract of red spinach leaves affected the number of erythrocytes and hemoglobin levels in white mice. In this study, the plant part used was the leaf of *Amaranthus tricolor* L with various doses for 20 days. The doses used were 0.125 g/kgBB, 0.25 g/kgBB, 0.5 g/kgBB, and 1 g/kgBB. The tool used to read data from the five test groups was a hemocyte analyzer, wherefrom the results it can be concluded that a dose of 1 g / kgBB most influential increase the number of erythrocytes and hemoglobin levels. The conclusions that can be drawn from the data obtained are with doses of 0.5 g/kgBB and 1 g/kgBB most influential to achieve normal amounts of erythrocytes and hemoglobin levels of white mice (erythrocytes $7.2 - 9.6 \times 10^6 \mu\text{L}$; hemoglobin 15-16 g/dL). In the ANOVA results it was seen that with different doses giving rise to different amounts of erythrocytes and hemoglobin, proven by calculated F values ($88969.508 > F$ Table (3.48) for erythrocytes and calculated F values ($135,895 > F$ Tables (3.48) on hemoglobin. To find out which groups have real differences, then continue with the LSD test to find out the signification between groups. From the results of LSD in erythrocytes, the group was not extracted and group A (1.25%) no real difference, while in group B (2.15%), C (5%), and D (10%) can be seen there is a real difference. LSD results in a hemoglobin control group, group A (1.25%), B (2.5%), C (5%), and D (10%) There's a real difference.

4. *Asparagus racemosus*

Asparagus racemosus can be used as an anti-anemia alternative, this can be seen from the research that has been done by¹¹ shows that *Asparagus racemosus* extract at 750 mg / kg increases the number of red blood cells, Hb significantly and significantly lowers MCH and leukocytes when compared to anemia group. In anti-thrombocytopenic studies, extracts at 750 mg/kg decreased bleeding time and freezing time significantly compared to the heparin group. The dosage of the extracts given starts from 250 mg/kg, 500 mg/kg, and 750 mg/kg. In the data obtained, it was seen that by administering *Asparagus racemosus* extract dose of 250 mg/kgBB has been able to increase erythrocyte levels (4.46×10^{12}) and hemoglobin (8.57 g/dL) from group 2 induced phenylhydrazine, there was a significant increase ($P < 0.01$) in group 5 at a dose of 750 mg/kgBB with erythrocytes (7.42×10^{12}) and hemoglobin (12.64 g/dL), this increase was more than that of the administration of iron sulfate erythrocyte tablets (6.66×10^{12}) and hemoglobin (11.63 g/dL). The search results of erythrocyte, hemoglobin, KIA, and leukocyte values were obtained using the duke method¹¹.

5. *Curcuma Longa* Linn

Plants that efficacious as antianemia were also studied¹² which stated that the squeeze of turmeric with a dose of 200 mg / kg BB and turmeric ethanol extract with a dose of 200 mg / kgBB showed increased levels of hemoglobin and erythrocytes in the test of antianemia activity of mice strain Wistar. Ethanol extract and turmeric rhizome juice contain polar compounds that are efficacious as anti-anemia studied to increase hemoglobin and erythrocyte levels. The turmeric squeeze group of 200 mg/kg BB and turmeric ethanol extract of 200 mg/kgBB showed an increase in hemoglobin and erythrocytes. After testing antianemia activity obtained the results of turmeric squeeze with a dose of 200 mg / KgBB has an increased effect of hemoglobin, erythrocytes, and hematocrit are highest compared to other doses of turmeric with hemoglobin values (12.62 g/dL), erythrocytes (7.32 x 10⁶), and hematocrit (40.26%), while in extracts Turmeric ethanol increased the highest also at a dose of 200 mg/kgBB with values of hemoglobin (13.92 g/dL), erythrocytes (7,842 x10⁶) and hematocrit (45.24 %) the increase of turmeric ethanol extract is greater than the squeeze of turmeric, but it still has not reached a positive control value¹².

6. *Cnidoscolus aconitifolius*

The *Cnidoscolus aconitifolius* leaf extract at a dose of 500 mg/kgBB had a high repair effect on hematological parameters of cyclophosphide-induced anemia in mice. The treatment lasted for two weeks, blood samples were collected from each mouse for hematological analysis. The results showed that hematological parameters increased in groups of 2, 3 and 5 mice treated with 100 mg / kg and 500 mg / kg BB of ethanol extract *Cnidoscolus aconitifolius* and chemiron. Ethanol leaf extract from *Cnidoscolus aconitifolius* in group 3 at a dose of 500 mg/kg weight significantly ($P < 0.05$) increased in hematological parameters of cyclophosphamide-induced anemia in mice with hemoglobin values (14 g/dL) and erythrocyte values (8 x 10¹²/L) this value was higher compared to the standard control group 5 which had only hemoglobin values (12 g/dL) and erythrocyte (5 x 10¹²/L)¹³.

7. *Falcaria Vulgaris*

According to research conducted by¹⁴ improve that there are anti-anemia properties of water extract that leaves *Falcaria Vulgaris*. Parts of plants used are leaves and used as water extracts by the soxhletation method. Data analyzed with SPSS-21 software. All doses of *F. Vulgaris* leaf water extract (especially at doses of 200 mg/kgBB) significantly ($p \leq 0.05$) increased weight levels, leukocytes, neutrophils, platelets, erythrocytes, hemoglobin, PCV, MCV, MCH, MCHC, compared to the untreated group. At a dose of 200 mg/kgBB obtained erythrocyte value of (7.4 x 10¹²) but could not reach the erythrocyte value of the control group (8.1 x 10¹²). The administration of *Falcaria Vulgaris* water extract at several doses significantly ($p \leq 0.05$) increased the number of erythrocytes compared to the unspecified group.

8. *Glycyrrhiza glabra*

Glycyrrhiza glabra showed hepatoprotective effects against anemia in¹⁵ studies. In this experiment, researchers evaluated the anti-anemia potential of *Glycyrrhiza glabra* water extract in Phenylhydrazine-induced anemia mice. The part of the plant used is the leaf. After one day induced with Phenylhidrazin, the mice were divided into five subgroups, among them negative healthy control, untreated negative control, and three groups received *Glycyrrhiza glabra* at concentrations of 30, 60, and 120 mg/kg. At the end of the 15th day of treatment, animals from all groups were sacrificed, and blood samples were taken to analyze the parameters of biochemistry, hematology, and immunology. At a dose of 120 *Glycyrrhiza glabra* significantly ($P < 0.05$) increased levels of erythrocyte (7.4 x 10¹²) and hemoglobin (13 g/dL). All three doses of *Glycyrrhiza glabra* can increase levels of erythrocytes, hemoglobin, PVC, and MCV from controls that are not treated, but still have not reached the value of the control group. In conclusion, the results obtained reveal the potential anti-anemia of water extract *Glycyrrhiza glabra*¹⁵.

9. *Justicia carnea* Vahl

Justicia carnea is a medicinal plant that reportedly has a variety of pharmacological functions, including potential blood enhancers. In this studies it has been revealed that *justicia carnea* leaves not only have antianemic properties, but *justicia carnea* leaves also do not cause toxicity in vital organs such as the liver and kidneys at high concentrations. Serums collected for biochemical and organ analysis are taken for histopathological analysis. The quantitative phytochemical analysis shows the presence of secondary metabolites such as saponins (2.50 mg / 100g), tannins (2.16 mg / 100g), alkaloids (1.88 mg / 100g). The hematological component increase is with hemoglobin value for dose 500 mg/kgBB (15.10 g/dL) and dose 1000 mg/kgBB (14.30 g/dL) compared to

the four doses given both doses are rated the most in increasing hemoglobin levels. And significantly ($p < 0.05$) increases hemoglobin and PVC levels¹⁶.

10. *Moringa Oleifera* Sial

This research showed that by increasing the dose of moringa leaves (*Moringa Oleifera* Sial), levels of hemoglobin, erythrocytes, hematocrit, and total iron levels in the blood of mice also increased. Besides, moringa leaf extract at a dose of 792 mg / 200 g bb/day can increase erythrocyte morphology and increase levels of hemoglobin and mouse erythrocytes significantly. The results showed that moringa leaf extract increases hemoglobin levels, red blood cell count, hematocrit, and total iron content in the blood. Moringa leaf extract with a dose of 792 mg / 200 g bb increases hematocrit (40.32%), increases hemoglobin levels (34.97%), and the number of red blood cells (60.38%) significantly ($p < 0.05$) compared to other doses. In this study, it can be concluded that ethanol extract of moringa leaves showed anti-anemia activity in aniline-induced mice¹⁷.

11. *Parkia speciosa* Hassk

¹⁸ in his research showed that petai seed extract (*Parkia speciosa* Hassk.) had an influence on the elevated levels of Hemoglobin (Hb) in the blood of white mice (*Rattus norvegicus*). The test animals had induced NaNO₂ at a dose of 187.5 mg/kgBB before being given *Parkia speciosa* Hassk extract. The next treatment is the administration of petai seed extract at a dose of 400 mg/kgBb, 550 mg/kgBb, 700 mg/kgBb for 14 days. This result is then calculated statistically and compared with normal hemoglobin values (12.48gr/dl – 14.63gr/dl). The increase in hemoglobin levels is most common in extracts with a dose of 700 mg/kgBB with an average difference of 0.82 g/dL levels compared to other doses. Statistically, however, the difference is not meaningful enough with the level of trust ($p > 0.05$), so it can be said that all three doses have the same pharmacological effect. This means that there is no correlation between the increase in the dose of the extract and the pharmacological effect, and the optimum dose between the three doses cannot be determined.

12. *Parquetina nigrescens*

Antianemia activity in *Parquetina nigrescens* extract can be confirmed and validated through research conducted by ¹⁹ that *Parquetina nigrescens* at doses of 2000 mg/g/bb and 2500 mg/kg/bb significantly increased the amount of hemoglobin and red blood cells on day 7. Phytochemical analysis revealed the presence of alkaloids, tannins, flavonoids, polyphenols, and polyterpenes, and iron. Mice that received *Parquetina nigrescens* Afzel water extract almost fully recovered on the 7th day for both doses and a dose of 2500 mg/kg / bb allowing faster recovery. In mice without untreated anemia (ANT), the decrease in hemoglobin was very significant ($p < 0.001$), which is 13.15%. After being induced with phenylhydrazine, there was a decrease in red blood cells in three lots (22.92% \pm 2.35) on the 5th day. An increase in the number of red blood cells is observed after treatment in the following days. The results showed that mice with a dose of 2000 mg/gBB extract almost recovered on day 7 (recovery of 64.91%) and mice with a dose extract of 2500 mg/gBB fully recovered on day 7 (recovery of 99.73%). On the other hand, the recovery rate was only 0.93% in untreated anemia control mice. The results also showed that the extract of 2,500 mg/kg bb provides better recovery compared to the dose of 2000 mg/kg bb. These results confirm and validate the therapeutic indications of *Parquetina nigrescens* in the fight against anemia in traditional medicine.

13. *Sansevieria liberica*

According to ²⁰ water extracts from rhizomes, *Sansevieria liberica* has an effect on hematology, plasma biochemistry, and oxidative stress ocular index in diabetic mice induced by alloxan. The extract is administered orally at 100, 200, and 300 mg / kg (both for normal mice and diabetes), and metformin at 50 mg / kg. Pengobatan significantly ($P < 0.05$) increased cell volume, hemoglobin concentration, the total number of white blood cells, neutrophils and eosinophils, average cell volume. The most effective dosage of the extract was in the LRC 3 group of salt administration and the extract with a dose of 300 mg/kgBB which can increase hemoglobin levels (13.6 g/dL) compared to other doses, the concentration of hemoglobin control test is significantly ($P < 0.05$) lower compared to other groups, except LRC1. This study revealed the presence of pharmacologically active compounds in rhizome extract. It shows the potential of hypoglycemic extracts, hypolipidemic, anti-anemia, immunomodulatory, eye protection, and hepato-renal. All this highlights the cardioprotective and protective capacity of the *Sansevieria liberica* rhizome, and supports its use in traditional health care practices for the management of diabetes mellitus.

14. *Sauropus androgynous*

²¹ study showed that chlorophyll katuk leaves can also be useful in the treatment of hemolytic anemia, which is indicated by its ability to lower the percentage of Schistocytes, as well as increase levels of Hb and ferritin. The part of the plant used is the leaf. Sodium nitrite (NaNO₂) in the blood is highly reactive with

hemoglobin (Hb), thus affecting hematopoiesis and methemoglobinemia induction. The results were reported as average grades \pm SD and statistically analyzed with the One Way Anova test with a significance of 95%. The results of this study showed that blood plasma Hb levels in the induction group NaNO₂ and chlorophyll from leaf katuk (NaNO₂ + katuk) there was a significant increase ($p > 0.05$) 14.54 g / dl and induction of NaNO₂ and Cu-chlorophyllin from K-Liquid TM (NaNO₂ + Cu-chlorophyllin) ($p > 0.05$) 13.99 g / dl, It can be concluded that katuk leaves can increase levels of Hb and ferritin indicates its potential in the treatment of hemolytic anemia, but here researchers do not state how much dose of katuk leaves are given.

15. Solanum Betaceum

The study conducted by ²² showed that there was an influence of dutch eggplant between before the treatment of mice that had been made anemia and after the treatment of eggplant juice dutch. From the control group presented it was seen that hemoglobin levels and the number of mouse erythrocytes tended to be the same or not noticeable different. Where the average value before treatment is: hemoglobin levels 11.52 g / dl and the amount of erythrocytes 6.19x10⁶. After 14 days of dutch eggplant juice obtained test results with hemoglobin levels of 11,233 g / dl, the number of erythrocytes to 6,163x10⁶. Mice were given exposure to NaNO₂ to anemia. Then the mice were treated with dutch eggplant juice. Hemoglobin levels and the number of erythrocytes are measured by auto hematology tools. The results of ANOVA analysis with a p-value of 0.001 < 0.05 showed that there was a significant increase in hemoglobin levels and the number of erythrocytes after treatment. LSD test with p=0.001 < 0.05 result showed that there was a difference in hemoglobin levels and the number of erythrocytes between the control group and the treatment group so it can be concluded that dutch eggplant juice was able to increase hemoglobin levels and the number of erythrocytes in anemia mice.

16. Syzygium polyanthum (Wight) Walp

The hemoglobin levels in the group of mice given bay leaf extract with various doses were comparable to the administration of blood-added tablets. It can be said that the giving of bay leaf gives an effect comparable to standard treatment, namely blood-added tablets. This treatment lasts for 1 month. Hemoglobin levels were measured using the Sysmex auto hematology analyzer. Median test analysis showed a significant increase in different hemoglobin levels in K2, P1, P2, and P3 ($p < 0.05$). LSD test results showed that hemoglobin levels in all treatment groups, namely the group of mice given bay leaf extract of various doses (2.2 mg, 4.4 mg, and 6.6 mg) differed significantly compared to hemoglobin levels in the control group (-), i.e. the group that was not given intervention, and hemoglobin levels in all treatment groups given various doses of extract did not differ significantly compared to hemoglobin levels in the control group (+), i.e. the group given the blood-added tablets. The highest increase in hemoglobin was found in treatment group 3 (bay leaf extract with a dose of 6.6), which was 2.65 g%, followed by treatment group 1 (bay leaf extract dose of 2.2) of 2.4 g%, and treatment group 2, which was 1.55 g%. The increase in hemoglobin in the control group (+) was 0.7 g%²⁵.

17. Trigonella foenum-graecum

Trigonella foenum-graecum has considerable anti-anemia activity as shown in this studies revealing that Trigonella foenum-graecum seeds have the potential for the treatment of anemia in mouse models of phenylhydrazine-induced mice. Hydroalcoholic extract from seeds is prepared by soxhletation. All groups are induced with phenylhydrazine except in group 1. Mice were analyzed for hematological parameters such as hemoglobin (Hb), red blood cell count (RBC), and white blood cell count (WBC) on days 2 and 13. Phytochemical screening of the extract indicates the presence of carbohydrates, saponins, sterols, polyphenols, tannins, and flavonoids. Anemia was successfully induced in Groups II, III, IV, and V indicated by an average decrease in the number of erythrocytes by 51.6%; hemoglobin 52.85%, and leukocytes 54.9%. Analysis of hematological parameters on day 13 showed that the extract significantly ($p < 0.05$) increased the amount of hemoglobin, erythrocytes, and leukocytes at a dose of 400 mg/kg body weight. This study, not only supports the use of folklore from T. foenum-graecum seeds but also suggests the inclusion in the treatment of anemia because it shows significant anti-anemia activity²².

Table 1. The result of an examination of parameters

No	Plant Name	Erythrocytes (10 ⁶ μ L)			Hemoglobin (dL)			Hematocrit (%)		
		CA	CT	in	CA	CT	in	CA	CT	in
1	Allium tricoccum	4,71	8,53	3,82	6,42	13,41	6,99	27,44	49,82	22,38
2	Amaranthus cruentus	5,5	6,99	1,49	7,2	9,87	2,67	17	38,78	21,78
3	Amaranthus tricolor	6,04	9,32	3,28	12,34	16,63	4,29	-	-	-
4	Asparagus racemosus	3,56	7,42	3,86	7,9	12,63	4,73	-	-	-
5	Curcuma Longa	6,96	7,84	0,88	11,06	13,92	2,86	32,9	45,24	12,34

6	Cnidoscclus aconitifolius	3,00	6,00	3,00	7,00	16,00	9,00	20,00	48,00	28,00
7	Falcaria vulgaris	3,4	7,5	4,1	-	-	-	29,00	44,00	15,00
8	Glycyrrhiza glabra	2,7	6,3	3,6	-	-	-	20,00	43,00	23,00
9	Justicia carnea	-	-	-	10,20	14,30	4,1	30,67	42,33	11,66
10	Moringa Oleifera	8,48	40,32	31,84	8,78	34,97	26,19	18,75	60,38	41,63
11	Parkia speciosa	-	-	-	10,66	11,48	0,82	-	-	-
12	Parquetina nigrescens	3,8	7,3	3,5	13,15	63,0	49,84	-	-	-
13	Sansevieria liberica	1,0	0,8	0,2	12,0	13,6	1,6	34,4	40,0	5,6
14	Sauropus androgynous	-	-	-	11,83	14,54	2,71	-	-	-
15	Solanum Betaceum	6,16	7,6	1,44	11,23	14,36	3,13	-	-	-
16	Syzygium Polyanthum	-	-	-	11,85	15,27	3,42	-	-	-
17	Trigonella Foenum-graecum	4,37	8,31	3,94	12,2	14,04	1,84	-	-	-
Average				4,99			8,22			20,15

Explanation:

CA : Control Anemia

CT : Control Test

In: Increase

V. Conclusion

From the research that has been described in the discussion can be concluded that many plants that have anti-anemia activities include *Allium tricoccum*, *Amaranthus cruentus*, *Amaranthus tricolor* L, *Asparagus racemosus*, *Cnidoscclus aconitifolius*, *Curcuma Longa*, *Falcaria vulgaris*, *Glycyrrhiza glabra*, *Justicia carnea*, *Moringa Oleifera*, *Parkia speciosa* Hassk, *Parquetina nigrescens*, *Syzygium polyanthum*, *Solanum Betaceum*, *Sauropus androgynous*, *Sansevieria liberica*, and *Trigonella Foenum-graecum* which can increase hemoglobin levels by 0.082%, the number of erythrocytes 0.049% and hematocrit presentation 0.202%. From various plants that are efficacious as antianemia, it can be concluded that *Moringa Oleifera* can increase hemoglobin levels, the number of erythrocytes, and a higher percentage of hematocrit compared to other plants. Also, anemia treatment can also be done by various inductions such as Sodium Nitrite, Pheylhydriderazin, Cyclophosphide, Anilin, Aluminum Sulfate.

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