

Black Garlic (*Allium sativum* L.) as Alternative Treatments for Increasing Hb and Decreasing Glucose Blood Level

Funsu Andiarna¹, Nova Lusiana¹, Eva Agustina², Risa Purnamasari², Arini Mayang Fa'uni², Raihana Frika Nafisah², Irul Hidayati²

¹*Faculty of Psychology and Health, Universitas Islam Negeri Sunan Ampel, Surabaya, Indonesia*

²*Faculty of Science and Technology, Universitas Islam Negeri Sunan Ampel, Surabaya, Indonesia*
irulhidayati.alfatawi@gmail.com

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Abstract: Diabetes and anemia's treatment with modern technology were still not affordable for some people. Therefore, cheaper and easily to get alternative treatments needs to be provided. Black garlic could be used as alternative treatments due to antioxidant activity from active compounds like flavonoids, tanin, saponin, and sterol. Compared to garlic, black garlic contains more active compounds so that it is expected to be able to work optimally for treatment. This study aims to determine the effect of black garlic extract on Hb and glucose levels. The method used in this study was experimental using a completely randomized design with the extract administered orally for 14 days at a dose of 150mg/Kg BW. The results showed that black garlic extract could increase hemoglobin levels up to 2.15% and reduce glucose levels up to 0.67%. From this experiment, we could know that black garlic extract can be used for increasing Hb levels and lowering glucose levels.

1 INTRODUCTION

Based on data from the World Health Organization (WHO), Indonesia is ranked the fourth largest in the world with a population suffering from diabetes mellitus. Supported by health research data in 2013 which showed an increase from 1.1% of people with diabetes mellitus to 2.4% (Rasdianah et al., 2016). In addition to diabetes mellitus, Indonesian people also suffer from anemia, especially women with a proportion of 27.2% compared to 20.3% for men. This condition is also supported by data from the Ministry of Health of the Republic of Indonesia in 2018, which is as many as 32% of adolescents aged 15-24 years experiencing anemia (Kusnadi, 2021).

Synthetic insulin and blood-boosting tablets are commonly used in the treatment of diabetes and anemia. However, long-term consumption of chemical drugs can cause side effects, high drug resistance, accumulation of residual substances in the body, as well as large costs required for treatment (Chusniasih et al., 2019). Therefore, alternative treatments that are cheaper and easily

available need to be developed as an effort to overcome the problems caused.

Traditional medicine has been widely developed as herbal therapy using the availability of ingredients in nature. One example is the use of garlic (*Allium sativum*).

Along with the development of medical science, garlic can be processed into black garlic. The processing aims to increase polyphenol compounds so that black garlic has stronger antioxidants than garlic (Azhar and Yuliawati, 2021). Black garlic has a higher antioxidant content than garlic (Dampati and Veronica, 2020) which is twelve times higher after heating for 24 days (Rochmah, 2017). It is hoped that the use of black garlic as a medicine can work more optimally in increasing Hb levels and lowering glucose levels in the blood.

The purpose of this study was to determine the ability of black garlic to increase Hb levels and reduce blood glucose levels.

2 METHODS

This study used a completely randomized design experimental method by giving black garlic extract at a dose of 150mg/kg BW mice orally for 14 days. The mice used in this study were aged 2-3 months with a body weight of 20-30 grams. Analysis of Hb and glucose levels was carried out by taking blood directly from the heart of mice and then putting it into an eppendorf tube that had been given 0.05 ml of EDTA. Then tested using Easy Touch with Hb and glucose test strips. The results obtained were then compared with the control group to determine the difference in Hb and glucose levels in mice that were treated with black garlic and those that were not.

3 RESULTS

Based on the test results, the hemoglobin level of mice increased from 11.4 g/dl to 36 g/dl. The initial level of hemoglobin was obtained from the control group and the final level was obtained from the average results of the treatment group. These results indicate that the use of black garlic extract can increase Hb levels in the blood and has the potential to be used as an anemia drug. The hemoglobin level of the control group was the same as the glucose level of normal mice as a result of research by Benkovic et al. (2012) which states that the normal hemoglobin level in mice is 12.79 g/dl. In addition, the study by Osanaiye et al. (2015) stated that the normal hemoglobin level of mice was 15.90 g/dl (Sitaswi & Isdadiyanto, 2017).

Based on the test results, it was found that the decrease in blood glucose levels in mice was from 108 mg/dl to the lowest was 35 mg/dl. The initial level of glucose was obtained from the control group and the final level was obtained from the average results of the treatment group. These results indicate that the use of black garlic extract can reduce blood glucose levels and has the potential to be used as a diabetes drug. The glucose level of the control group is the same as that of normal mice, the results of research by Nugrahani (2012) which states that the normal level of glucose in mice is 62.8 mg/dl-176 mg/dl.

4 DISCUSSIONS

Anemia is caused by iron deficiency or deficiency. Anemia is a condition in which the body's tissues lack oxygen because the erythrocyte mass or

hemoglobin cannot fulfill its function (Maulina and Sitepu, 2015). The content of iron can be found in black onions. In addition, black garlic also contains carbohydrates, protein, amino acids, and vitamin K (Resende et al., 2018; Nurhasanah et al., 2021). Black garlic extract contains active compounds such as flavonoids, tannins, saponins, and sterols that have the potential as antioxidants so as to stabilize free radicals.

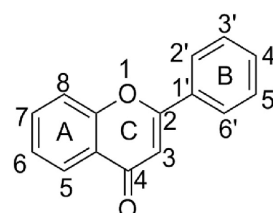
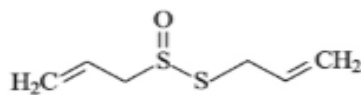


Figure 1: Flavonoid
Course: Badshah et al. (2021)

Flavonoids are classified as phenolic compounds with a -OH hydroxyl group (Agustina et al., 2020). Flavonoids have antioxidant properties that can increase erythropoiesis (the process of erythrocyte formation) in the bone marrow. When there is a ferryl form of Hb, it is thought to prevent half of the oxyHb molecule from being oxidized to metHb in the presence of flavonoids. This causes hemoglobin to remain in the form of oxyHb so that hemoglobin can still carry out its function to bind oxygen (Sundaryono, 2011; Restuti et al., 2020).

Flavonoids cause free radicals to become stable and non-destructive because flavonoids donate hydrogen atoms (H+) to free radicals. This causes the lipid membrane of red blood cells to be protected from free radicals and oxidation attacks (Muhtadi et al., 2014; Aini et al., 2022). In addition, flavonoids can protect against free radicals because flavonoids are lipophilic so they can bind to erythrocyte cell membranes. Flavonoids in the blood circulation will increase the work of the kidneys on plasma globulin cells to secrete the hormone erythropoietin. Erythropoietin is a glycoprotein hormone circulating in the blood vessels that functions to stimulate the bone marrow to increase erythrocyte formation (Aini et al., 2022).

Diabetes or what is often called diabetes is a disease in which the body cannot produce enough insulin due to high blood glucose levels (Elfaladonna and Rahmadani, 2019). Black garlic is one of the natural ingredients that are widely used for diabetics.



Allicin

Figure 2. Allicin
Course: Wedhasari (2014)

Garlic contains allicin which is able to stimulate pancreatic cells to produce more insulin so that glucose in the blood will enter the body's tissues in the presence of insulin. Black garlic contains twice as much allicin as garlic. Allisin compounds are turned into antioxidant compounds such as flavonoids. Flavonoids are thought to be able to increase the activity of antioxidant enzymes and be able to overcome insulin deficiency because damaged pancreatic cells have been regenerated (Yuliasri et al., 2020).

The use of black garlic as a medicine has been widely studied. As a diabetes drug, research conducted by Latifah (2020) states that giving black garlic to rats with diabetes can reduce total blood cholesterol levels in rats from 186.44 mg/dl to 100.23 mg/dl. Setyawan and Pangestu (2020) in their research also stated that black garlic was able to reduce blood sugar levels in patients with diabetes mellitus as indicated by a decrease in blood sugar levels from 300.87 mg/dl to 251.47 mg/dl. As for the drug for anemia, black garlic is still not much researched. However, the use of garlic has been shown to increase the number of red blood cells in the use of garlic powder by 5% (Al-Jowari, 2014). So that this study can be used as a preliminary test related to the use of black garlic as a drug that can increase hemoglobin levels in the blood.

5 CONCLUSIONS

Based on this study, it can be concluded that the use of black garlic extract can increase hemoglobin levels by 2.15%, from 11 g/dl to 36 g/dl and reduce

glucose levels by 0.67%, from 108 mg/dl to 35 mg/dl.

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