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EFFECT OF LAVANDULA OFFICINALIS HYDROALCOHOLIC EXTRACT ON BLOOD CELLS FACTORS IN MICE

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Abstract:

In this study, the effect of hydroalcoholic extract of lavender plant on the number of blood cells in small laboratory mice was investigated. Due to the medicinal use of lavender and some of its therapeutic effects, its effect on blood cell count is an important indicator in determining its positive and negative effects. In this study, 50 small female laboratory mice were divided into 5 control groups, placebo, 50 mg/kg dose, 100 mg/kg dose and 200 mg/kg dose and were treated with lavender extract for 20 days. After blood sampling and blood cell counting with an auto analyzer, a significant reduction in total white blood cell count was achieved in all three treatment groups, which was more significant with increasing dose. And in doses of 50 mg/kg and 100 mg/kg decreased the number of red blood cells. And hemoglobin levels of red blood cells and MCV and MCH indicators increased significantly. And the number of blood platelets was reduced at a dose of 200 mg/kg.

Keywords: *lavender, white blood cell, hydroalcoholic extract, small laboratory mice, red blood cell*

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INTRODUCTION:

For years, people around the world have been using medicinal plants based on local traditions, regardless of the possible side effects and scientific experiments that have examined other properties. Due to the growing population and the growing need for natural and cheap resources to treat human failures and diseases, the use of plants for treatment will be cost-effective. On the other hand, the increase in liver and gastrointestinal failures due to unsafe and unprincipled use of medicinal plants has increased in recent years. Given the importance of counting blood cells to determine the effects of various substances and diseases on the body, and especially changes in white blood cells in the blood, it can be used as an indicator of the amount and type of effect of unknown matter on the body. Lavender, a plant of the lavender genus, has been used in various civilizations since ancient times. [1, 2]. The plant grows on the Mediterranean coast and in the arid regions of the Alps. An evergreen plant with a violet flower is identified by slender leaves on both sides of the stem [3, 4]. The aerial parts of the plant are used for therapeutic purposes and to produce perfumes and colognes. Its extract is green and bitter and has a pleasant aroma [5, 6]. Ingredients include linalool and linalool acetate (up to 60%), geraniol, coumarin, eucalyptol, camphor, flavonoids, berneol, sterol terpenoid, butyric acid and valeric acid, respectively [7, 8 and 9]. Previous research on the plant has focused on the nervous system, and its effects on the nervous system, pain treatment, stress, depression and sedation have been proven. [10, 11, 12, 13]. But other side effects on blood cells, especially white blood cells, were needed. Testing blood cell counts or CBCs is one of the most important and significant experiments in various diseases as the first test to be prescribed. And it is very effective in diagnosing the nature of failure and primary key diagnoses. Examination of the number of red blood cells (RBCs) that is reduced in cases of severe bleeding and bone marrow problems and lesions that reduce the number of red blood cells. And if you reduce it with an increase in MCH, which is the average weight percentage of hemoglobin in red blood cells, as well as an increase in the percentage of MCV volume in terms of femtoliter, which is the average volume of hemoglobin in blood cells, and an increase in blood hemoglobin (Hgb). The size of the red blood cells is confirmed. Blood hematocrit percentage is another important diagnostic indicator that is one of the measurements of red blood cells and is a percentage of the total volume of blood that red blood cells produce, and by measuring the volume of red blood cells in the test tube to the total height of the blood is measured. Platelets are small cells in the blood that contain enzymes for blood clotting, and their main function is to prevent bleeding in injuries, and in bone marrow failure, spleen enlargement, leukemia, and chemotherapy, the number is reduced compared to the standard number. WBCs are another indicator of a blood test that shows the number of cells responsible for immunity to pathogens, called white blood cells. A total of all five types of white blood cells are reported in one milliliter of blood. And when bone marrow damage and liver damage and foreign substance poisoning and infections, and autoimmune diseases, the amount is reduced. This study was conducted on the lavender plant and according to the obtained results, it can play a key role in the further research of researchers to clarify the role of this plant in all aspects of public health. Due to the role of blood tests in clarifying the nature of the effect of plant extract on vital organs and glands, including the thyroid, liver and other organs, there is a gap of this research.

MATERIALS AND METHODS:

Freshly harvested aerial parts of the plant were collected from the Biotechnology Center of the Central Region of Iran on the Isfahan-Najafabad road. The flowers were dried at 25^{C} in a dark environment with a 12-hour air conditioning system. The resulting plant was ground into a powder. The plant powder was immersed in alcohol and then an aqueous alcoholic solution was obtained from it. As the extract was concentrated, 50, 100, and 200 mg/kg doses of the extract were prepared for intraperitoneal injection in mice.

50 small laboratory mice between 28 and 30 g were obtained from the laboratory animals' section of Isfahan University of Medical Sciences and placed in 5 experimental groups, including control group, placebo group, treatment group 50, treatment group 100, and treatment group 200 mg/kg. One injection was given for 20 days, and then their peripheral blood was taken. The CBC test was performed with the Sismax k1000 device. The changes in the number of white blood cells in mice compared to the placebo and control groups were investigated. And compared with the results of previous research by other researchers. Data were analyzed with SPSS and EXCEL software and t-student test.

RESULTS AND DISCUSSION:

Comparison of the control and placebo groups with the groups treated with lavender hydro-alcoholic extract shows a significant decrease in the number of white blood cells in 50, 100 and 200 mg/kg.

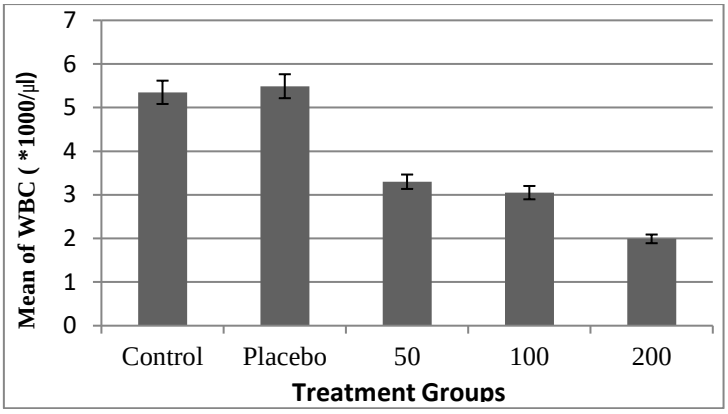

Figure 1: Comparison of the average number of white blood cells in all groups

Comparison of the control and placebo groups with the dose group of 50 and 100 mg/kg shows a significant decrease in the number of red blood cells in these two groups.

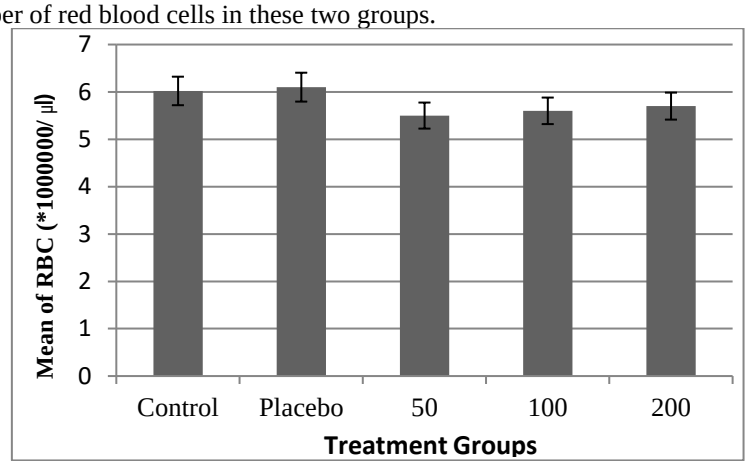

Figure 2. Mean comparison results of red blood cells in all groups

According to Figure 3, comparing the mean blood hematocrit of the control and placebo groups does not show any significant change compared to the treatment groups (Figure 3).

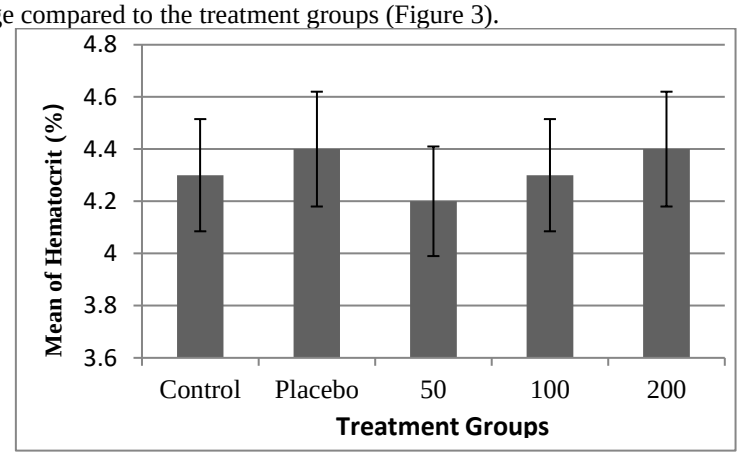

Figure 3. Mean comparison results of percentage of blood hematocrit in all groups

Comparing the average MCV index of the control and placebo group with the treatment groups shows a significant increase in its rate in all three groups compared to the control and placebo group. ($p<0.05$). Figure 4 shows the results:

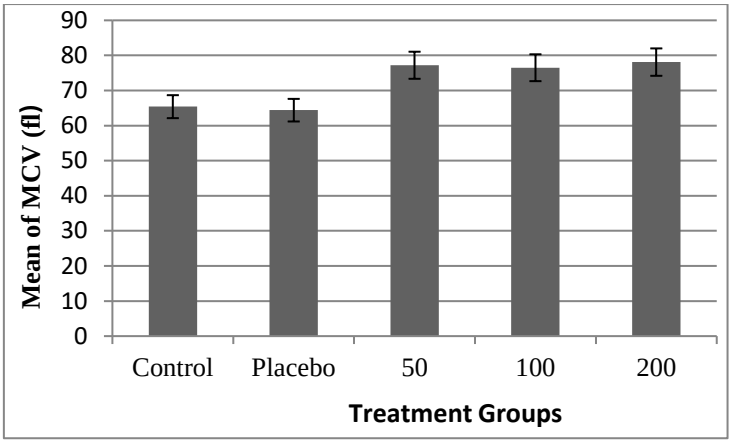

Figure 4. Mean comparison results of MCV index in all groups

Comparing the average percentage of MCHC in control and placebo groups does not show any significant change compared to treatment groups, but comparison of the average percentage of MCH index in terms of picogram in all treatment groups shows a significant increase (Figure 5).

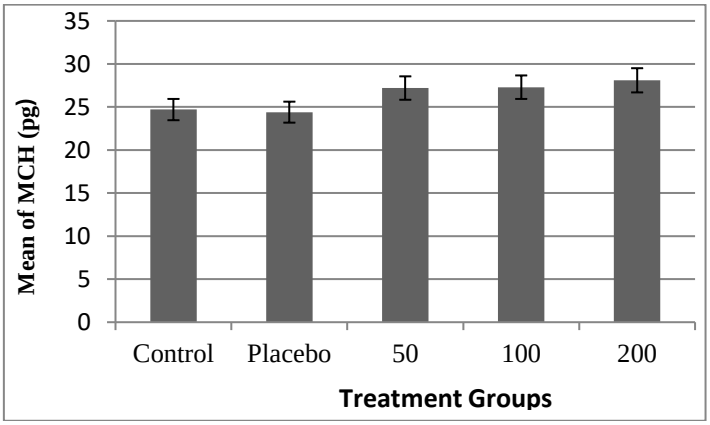

Figure 5. Mean comparison results of MCH index in all groups

The mean of hemoglobin concentration of red blood cells in all experimental groups compared to the control group, shows a significant increase (Figure 6).

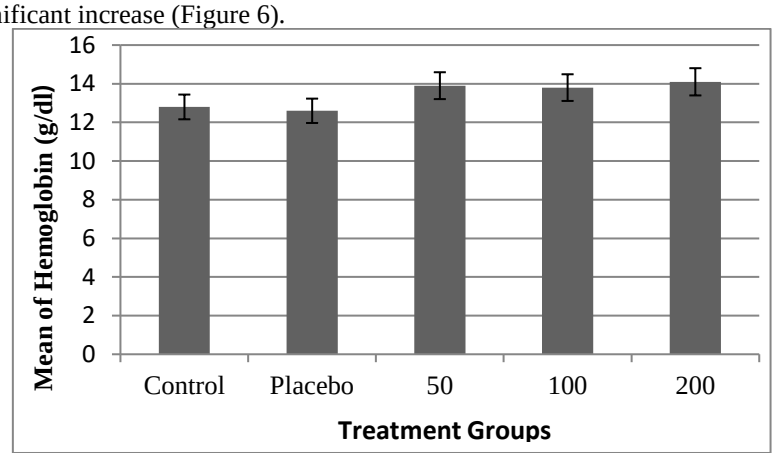

Figure 6. Mean comparison results of hemoglobin concentration in all groups

Due to the significant reduction in the number of white blood cells, including the percentage of neutrophils, bone marrow or liver tissue damage can be detected. Because this effect is created by injecting plant extracts. And with increasing doses from 50 to 100 and 200, this reduction has become even more dramatic. Based on the findings of Arefian et al. [15, 16]. The effect of lavender hydro-alcoholic extract on liver enzymes and liver tissue is generally toxic. Because they found that by increasing the dose of the extract to 200 mg/kg, the liver tissue became severely necrotic and although the levels of the enzyme aspartate amino transferase decreased, but despite the extreme tissue effect on the liver of small laboratory mice, the effect of the extract in general Lavender hydro-alcoholic on the liver in a dose of 200 is toxic. Therefore, according

to the results of our experiments, the average number of white blood cells in mice decreased sharply due to hepatic necrosis [17]. Which indicates damage to the liver tissue. Decreased white blood cell counts can also be caused by hyperthyroidism caused by injecting plant extracts into mice. Because one of the reasons for the significant decrease in white blood cell count is thyroid hyperthyroidism. The main ingredients of the extract are lavender, linalool and linalool acetate [18]. According to past research, linalool and linaloate acetate have anti-inflammatory and antioxidant activity. Due to the fact that these compounds play a role in reducing stress and reducing the activity of more than one hundred effective genes in stressful conditions. It triggers anti-inflammatory responses and activates AMPK and PPAR-α pathway signals. These factors reduce the production of free radicals and toxins. According to the results of liver histological experiments of Arefian et al. Research, under the influence of Lavender hydro-alcoholic extract, and proving the toxic effect of 200 mg/kg dose on liver tissue, the toxic effect of this plant was confirmed. And according to past research, AMPK pathway activators have anti-cell proliferation and anti-cholesterol synthesis effects [19]. According to research, activating this pathway first activates the protective effect on the liver and then increases the dose by activating the signaling of the Raf-MEK-ERK pathway. It inhibits the cell cycle and reduces cell proliferation, resulting in liver necrosis. Also, according to 31, inhibition of mevalonate pathway is mediated by inhibition of HMGCR enzyme, which inhibits cell proliferation and cellular activity and cholesterol synthesis, which can cause dose-dependent toxic effects on the liver and thyroid and thus reduce the number of white blood cells. In another experiment, polysaccharides from lavender flower extract stimulated active oxygen compounds from phagocytic cells, creating anti-cell proliferation properties against normal and tumor cells. Another evidence confirms the results of the experiment on the toxic properties of the dose of the plant's alcoholic blueberry extract on the liver. There has also been a reduction in platelet counts to 200 and macrocytic anemia. Because the number of red blood cells decreased in doses of 50 and 100, and in all three treatment doses, the percentage of MCH and the volume of MCV and the amount of hemoglobin in the blood increased. But the percentage of hematocrit that shows the percentage of red blood cells remains constant. Also, the mean concentration of hemoglobin in MCHC (red blood cells) is unchanged, so a kind of macrocystic anemia has developed.

CONCLUSION:

Due to the decrease in the number of white blood cells, liver damage and the toxic effect of lavender extract can be found, especially at a dose of 200 mg/kg.

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CONFLICT OF INTEREST

The authors contributing to the present study and to this very manuscript have no conflict of interests to declare.

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