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Research Article

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The effects of garden sage's hydroalcoholic extract on blood parameters in mice

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ABSTRACT

Garden sage (Salvia officinalis) has many therapeutic properties which one of them is strengthening hematopoiesis. In this study the effects of garden sage's hydroalcoholic extract on blood parameters in mice were studied. Fifty female mice were divided in five groups including control group, placebo group (0.5cc normal saline injections) and three treatment groups which received 50, 100 and 200 mg/kg of hydroalcoholic extract injections in peritoneum for twenty days every other day. After twenty days blood samples were taken and average hematocrit, red and white blood cells, MCV, MCH, and MCHC were measured. Results showed that the amount of total white blood cells was decreased significantly in all three treatment groups in proportion to control group. Red blood cells and averages of hematocrit and hemoglobin were increased significantly. According to results, the extract of garden sage could weaken immune system by decreasing white blood cells and affected hematopoiesis by increase in red blood cells.

Keywords: Garden sage, blood parameters, mice

INTRODUCTION

Garden sage (*Salvia officinalis*) means curative plant. This Mediterranean plant needs warm and dry weather to grow [1]. Rectangular stem, opposite leaves, violet blue colored flowers are in upper part of plant. Fruit is capsulated and brown. Garden sage has numerous health benefits and has been used from ancient times as a medicinal plant [2]. This plant affects human behavioral skills and therefore is used to treat Alzheimer [3].This plant reduces blood sugar[4]. It has anti-oxidant effects [5] and is used as a medicinal plant because it isanti-cancer, anti-perspiration, anti-Alzheimer, antimicrobial, antioxidant, and reduces milk in women during lactation, decreases the libido, lowers blood sugar, stimulates the immune system and is somewhat sedative[6].

Garden sage is one of phytoestrogens which has a long history in Iran traditional medicine. It is planted in home gardens in Eastern Azerbayjan and other parts of Iran [2].

Recent studies confirmed antibiotic, anti-spasmodic, anti-anxiety, sedative, anti-fungal, anti-toxic, hypoglycemic, tonic, anti-sweat and estrogenic properties of this plant.

Garden sage has been used in Europe to reduce sweat and hot flashes due to menopause for long time [7].

Since menopause side effects are ascribed to estrogen deficit it seems that using phytoestrogens or herbal estrogens can reduce symptoms of menopause[8].
The plant has 0.1% essence which is yellow and lighter than water. Main essence matters according to GC-MC analysis are beta caryophyllene (16.3%), asklerol (13.3%), and hexyl octanoate (12.2%) [9]. Compounds of this plant which are identified are thujone, borneol, 1-cineol, 8-acetate, sesquiterpenes, tannin, and phenolic acids [10].

Garden sage is used in traditional medicine to cure neural originated extreme weakness, neurasthenia, fatigue, neural dizziness, nausea, vomiting, tremor, and paralysis.

Red blood cells is an important cell, the reason of blood red color, transfer oxygen from lungs to body cells and are reduced due to gastrointestinal bleeding or wounds.

Decrease in white blood cells causes failure in the immune system and its abnormal increase is due to bone marrow disease or immune system diseases.

Platelets are from blood parameters and low amounts of them causes repeated bleeding of gum and nose. Hematocrit is the ratio of red blood cells in blood.

In this study the effects of garden sage on blood parameters were investigated.

EXPERIMENTAL SECTION

Collected garden sage plants were dried and grinded. 300 grams of obtained powder was dissolvedinethanol97% and kept for 48 hours. After3days, the solution was filtered using filtration paper and the remaining powder was dried and weighed to obtain the amount of dissolved powder. Alcohol was removed from and replaced with saline to prepare desired doses.

Fifty Syrian female mice were prepared and kept for 10 day to adapt to environment. Mice had free access to standard food and water, natural light, temperature (25-30) and humidity. The same situation continued during the injections.

Mice were divided in five groups (with 10 members in each group) including:
- **Control group:** to determine the base levels of blood cells and parameters
- **Placebo group:** members of this group received normal saline injections (0.5cc) to study the effects of injection shock
- **Three treatment groups:** which received 50, 100 and 200 mg/kg of hydroalcoholic extract injections in peritoneum (10-12am) for twenty days every other day.

After twenty days blood samples were taken and sent to laboratory for tests.

Obtained data were analyzed using SPSS program, one way analysis and Duncan test at 5% probability level.

RESULTS AND DISCUSSION

Variance analysis of red blood cells showed significant increase ($P<0.05$) in all treatment groups in proportion to control group (figure 1).

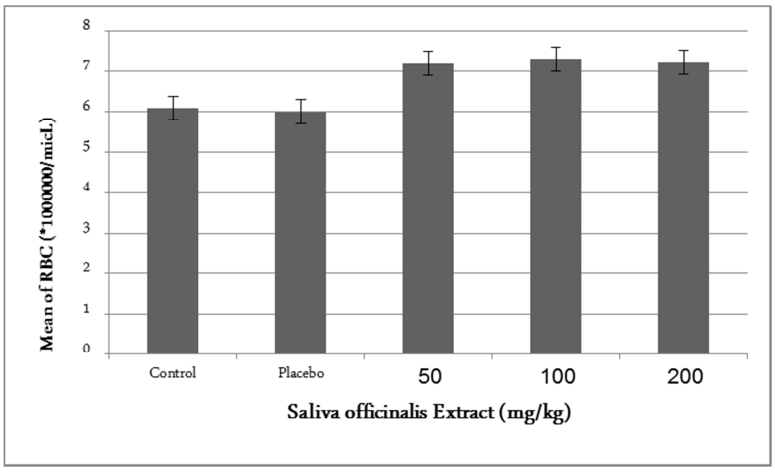

Figure 1: Mean comparison of RBC in all groups

The amount of hemoglobin was increased significantly in treatments groups in proportion to control group. Figure 2 shows mean comparison of mentioned traits concentrations.

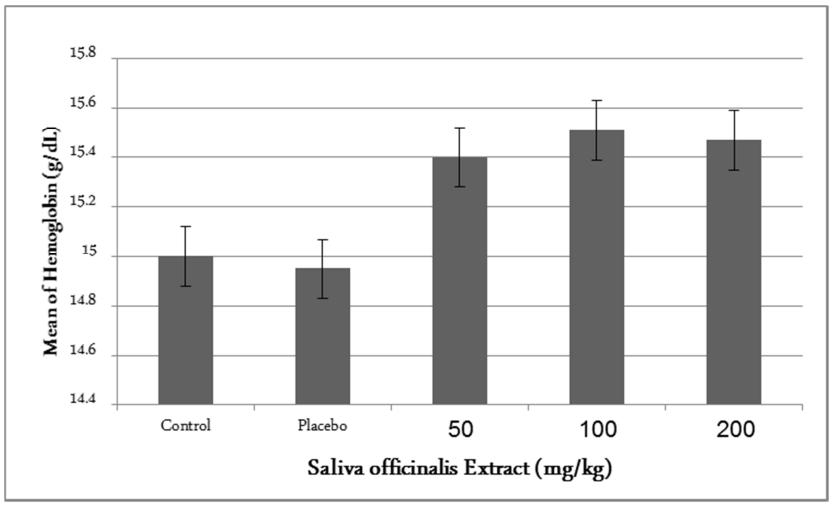

Figure 2: Mean comparison of hemoglobin percentage in all groups

The amount of hematocrit was increased significantly in treatments groups in proportion to control group. Mean comparison of mentioned traits concentrations showed in figure 3.

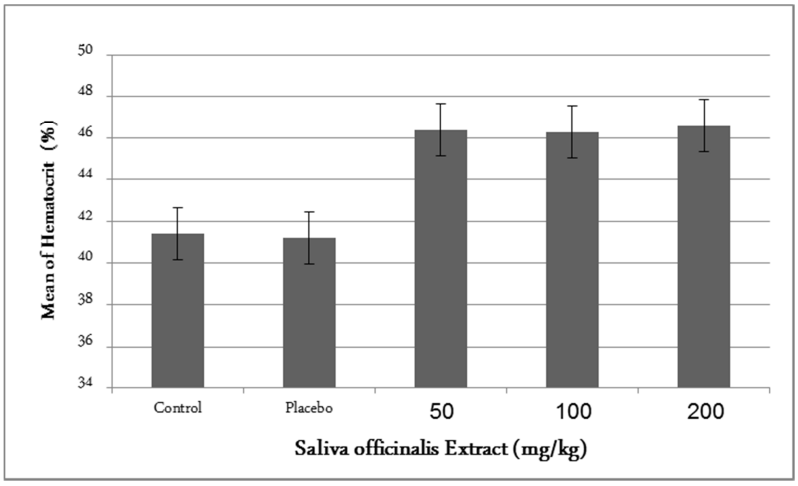

Figure 3: Mean comparison of hematocrit percentage in all groups

Mean comparison of white blood cells showed significant decrease in 50 and 100 mg/ kg in proportion to control group (Figure 4).

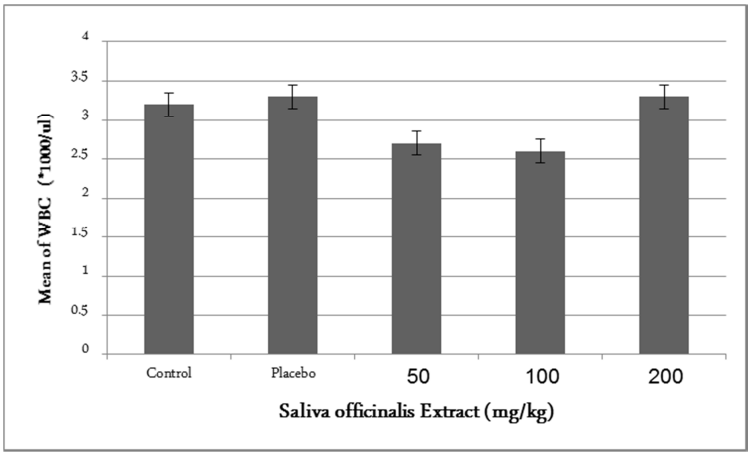

Figure 4: Mean comparison of WBC in all groups

MCHC, MCH and MCHC amounts did not show significant differences in groups.

According to results, using various levels of garden sages extract affected blood parameters including red blood cells, white blood cells, hemoglobin and hematocrit[5].

In this study, the average number ofred blood cells increased in treatment groups significantly. These results are in agreement with Oniell et al. (2002) study on healthy horses which showed that the use of herbal extracts including chinacea and pennyroyal increased red blood cell amount.

Hematopoiesis is result of simultaneous proliferation and differentiation of blood cells which are originated from stem cells.

Increase in RBC amount of treatment groups in this study can be due to positive effects of sage extract on kidney and increase in erythropoietin secretion (which adjust RBC amount) in higher doses [10].

Also, since hemoglobin and hematocrit are two main parts of red blood cells, RBC affecting factors will affect these factors and increase in red blood cells amount will increase hemoglobin and hematocrit amounts.

Average cell hemoglobin is a parameter which is affected by variation of hemoglobin amount and the number of red blood cells. Therefore factors which affect these parameters will affect average cell hemoglobin [9]. But due to little changes in mentioned parameters, red blood cell indices (MCH, MCV, and MCHC) did not change.

White blood cells decreased significantly in 50 and 100 mg/ kg doses in proportion to control group. Considering the results and also hematopoiesis mechanism, reduction in WBC amount by sage extract can be due to:

- Affecting stem cell (pluripotent, myeloid pluripotent and lymphoid) caused reduction in mitosis division.
- Affecting committed progenitor cells and increasing mitosis division of them [8].

CFU-GEH is produced in bone marrow after divisions of myeloid pluripotent cells. These cells divide and make other committed progenitor cells such as CFU - GEM, CFU – baso and CFU-Eo which are affected by Granulocyte-macrophage colony-stimulating factor, IL-3, stem cell factor, and FLt - 3L, stimulated and divided[9].

Probably garden sage controlled GM-CSF production by affecting chromosome 5 of T lymphocyte cells, endothelium and fibroblasts (producers of GM- CSF) and this compound reduced WBC of this class by affecting CFU-GEM and controlling its mitosis division.

This study showed that injecting sage's extract in peritoneum affected blood parameters and confirmed dose dependent stimulating effect of the extract on hematopoiesis.

CONCLUSION

Considering the results, *Saliva officinalis* has desirable effects on red blood cells and its parameters, but could weaken immune system by decreasing white blood cells.

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