

The Beneficial Impact of Sage (*Salvia Officinalis*'s) on Hematological Parameters and Liver Function in Rabbits: Implications for Public Health

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Abstract---This study aims to examine the effects of Sage (*Salvia Officinalis*) on liver enzymes, immunity, and blood parameters in rabbits. From November 7, 2023, to January 1, 2024, An Experiment was conducted at the University of Al-Zahrawi's Faculty of Medical Laboratory Technique. where the : Rabbits used in the experiment were housed in special cages. Were housed in individual cages. Twelve rabbits were randomly divided into two groups: G1 received water and pellets as a control, while G2 received Sage (*Salvia Officinalis*). show that red blood cell counts, packed cell volume, and hemoglobin concentration in G2 have significantly increased after 60 days of Sage (*Salvia Officinalis*) treatment compared to the first day, but G1 has not changed significantly. However, white blood cells show a significant increase in G2 compared to G1 after treatment with Sage (*Salvia officinalis*). However, Sage (*Salvia Officinalis*) significantly reduces the levels of liver enzymes, including alkaline phosphatase, aspartate transaminase, and alanine transaminase. In conclusion By raising the white blood cell count, sage (*Salvia officinalis*) improved immunity. Additionally, by raising hemoglobin concentration, packed cell volume, and red blood cell count, the sage *Salvia officinalis* enhances hematopoiesis. Lastly, *Salvia officinalis* is thought to be a good option for liver injury because it has an enhancing effect on liver enzymes.

Keywords - liver enzymes, Sage (*Salvia Officinalis*'s) , hematological parameters.

INTRODUCTION

Traditional knowledge suggests that salvia plants are beneficial for neurological and cognitive disorders, and

they have been used historically to treat a variety of illnesses (1). Current research supports this, showing that there may be value in the knowledge our ancestors passed down. Numerous *Salvia* species and their individual active ingredients influence a number of biological processes that may affect neurological and cognitive function, according to research findings (2). *Salvia* plants have been shown to improve cognitive abilities and protect against neurodegenerative diseases in in vitro animal and preliminary human studies (3). However, more study is needed in a number of areas. The effectiveness of other *Salvia* species is unknown because *S. officinalis* and *S. lavandulaefolia* species have been used in most human studies to date. Furthermore, the extracts employed in different studies have differed significantly (4).

The essential oils of *S. officinalis* and *S. lavandulaefolia* have been utilized in addition to ethanolic, methanolic, and aqueous extracts. These various extracts' potencies and pharmacodynamic effects are likely to differ significantly, which may have an effect on their therapeutic efficacy (5). Because the extracts used are likely to affect results, this is an issue that needs to be taken into account in research. Differences in extract quality are a common problem in herbal medicine, making it challenging to draw broad conclusions about a medicinal herb. The development of standardized, repeatable extracts with some degree of potency and purity is crucial (6).

The majority of research has assessed the effectiveness of a single administration of *Salvia* plants, despite the fact that two studies have been carried out on patients with Alzheimer's disease for up to three months. Therefore, it is necessary to investigate the effects of longer-term consumption of various *Salvia* species on cognition. Larger-scale clinical research is also necessary, especially in light of the initial encouraging results regarding Alzheimer's disease (17). *Salvia* is widely consumed in many cultures, which raises concerns about its safety. However, more research is required to determine its

safety, especially when higher dosages are consumed. Further research is necessary because the *Salvia* constituent thujone may have neurotoxic effects. It may also be wise to use extracts with little to no thujone. Overall, there is encouraging evidence regarding the protective and cognitive-enhancing properties of *salvia* plants. To clarify the potential of this widely consumed herb to improve cognitive health and wellbeing, more research is necessary. This study aims to evaluate the effects of *Salvia officinalis* on hematological parameters, immunity, and liver enzymes in rabbits.

MATERIALS AND METHODS

Experimental Animals and Design

For the duration of the experiment, each animal was kept in a separate cage with comparable environmental conditions and free access to clean tap water and standard commercial pelleted feed. All of the rabbits were checked for wounds, abnormalities, or illness before the experiment began. The study only included animals in good health. Twelve healthy adult male rabbits (domestic crossbreed, weighing 1-1.5 kg, aged 6-11 months) were split into two equal groups at random (n=6): Group 1 (Control): Consumed only clean tap water and regular pellet feed. Group 2 (Treatment): *Saga* (*Salvia Officinalis*) was given by gavage at a rate of 1 ml per day for 50 days in addition to regular feed and water.

Preparation of aqueous extract of *Salvia Officinalis*'s leaves

The aqueous extract of *Salvia Officinalis*'s leaves was prepared based on previous studies. The method (18) is as follows:

- 1- Weigh 1 kg of plant leaf powder and add it to 10 liters of distilled water (ratio 10:1) Using the steeping method (cold extraction method) for 72 hours.
- 2-The mixture was placed on a hot plate using a magnetic stirrer to mix well for 4 hours at a temperature of (25-30)°C.
- 3- Then filter the mixture using filter paper
- 4-The solvent was then removed using a rotary evaporator until it dried Completely dissolve the solution and obtain a very viscous vegetable product with a dark brown-black color.
- 5-The resulting plant extract was weighed, the extract was divided into sections and stored in glass bottles Dark, tightly sealed, at a temperature of 4°C.
- 6-The extract was used within a period not exceeding three months from the time of its preparation

Blood Sampling Procedure

Blood was drawn in accordance with the protocol authorized by the Faculty of Veterinary Medicine's Local Ethics Committee, as previously detailed by . Three milliliters of blood were taken straight from each rabbit's heart at the conclusion of the experiment while they were under mild anesthesia.

Anticoagulant-containing tubes were used to collect blood samples for hematologic analyses. Blood samples were taken in anticoagulant-free gel tubes for biochemical analyses, centrifuged for 20 minutes at 3000 rpm, and the serum was extracted for use in lab tests.

Complete blood count (CBC).

A blood sample was taken and placed in the urit-2900 device, and the measurement was done automatically.

Alanine Amino transferase (ALT) , a spartate Amino transferase (AST) and Alkaline phosphatase (ALP) :

A serum sample was taken and placed in the DC-40-Mindray device, and the measurement was done automatically.

The statistical analysis

The statistical analysis of the data of the experiment was measured by using the SAS (Statistical Analysis System - version 9.1), Using one-way ANOVA for experiment two and Least significant differences (LSD) were performed to assess significant differences among means of the groups. The results were expressed as mean \pm standard errors and $P < 0.05$ was considered statistically significant (19).

RESULT AND DISCUSSION

Results and Discussion

The results were collecting as the effect of *Saga* (*Salvia Officinalis*'s) on hematological parameters and liver enzymes in local rabbit .show there is significant increase of RBCs counts, PCV and Hb concentration in G2 after 60th days of treated *Saga* (*Salvia Officinalis*'s) compared with 1st day while there is no significant differences in G1. On other hand WBCs show significant increase in G2 compared with G1 after treated with *Saga* (*Salvia Officinalis*'s) compared with G1.

Table 1. showed the Effect of *Saga* (*Salvia Officinalis*'s) on blood parameters Red blood cells count($cell/ml \times 10^6$), packed cell volume (%), hemoglobin concentration (g/dl) and white blood cells count($cell/ml \times 10^3$).

Parameters in Group	Mean \pm SE		L.S .D Val ues
	1 st day	After 60 th day	
RBCs of G1	5.89 \pm 0.04 Aa	5.94 \pm 0.17 Aa	1.54
RBCs of G2	4.43 \pm 0.43 Ba	5.97 \pm 0.46 Aa	
PCV of G1	38.00 \pm 1.29 Aa	40.75 \pm 1.38 Aa	4.5
PCV OF G2	37.33 \pm 3.19 Ba	42.25 \pm 2.22 Aa	1
Hb of G1	13.93 \pm 0.15 Aa	14.30 \pm 0.30 Aa	1.0
Hb of G2	14.48 \pm 1.05 Aa	13.38 \pm 0.65 Ba	2
WBCs of G1	3.15 \pm 0.38 Ab	3.03 \pm 0.38 Ab	2.5
WBCs of G2	3.90 \pm 0.67 Ba	7.09 \pm 0.78 Aa	1

Capital letters denote significant difference between periods for each group while small letters denote significant difference between groups for each periods (N =6) for each group .

Show their significant decrease in all liver enzymes in G2 compared with G1 after treated with Saga (*Salvia Officinalis*'s).

Table 2. showed the Effect of Saga (*Salvia Officinalis*'s) on liver enzymes (Aspartate transaminase concentration (IU), Alanine transaminase concentration (IU) and alkaline phosphatase concentration (IU).

Parameters in Group	Mean \pm SE		L.S.D Values
	1 st day	After 60 th day	
AST of G1	90 \pm 4.22 Aa	87.25 \pm 3.35 Aa	16.13
AST of G2	97.5 \pm 5.50 Aa	60.25 \pm 7.04 Bb	
ALT of G1	98.25 \pm 5.03 Aa	99 \pm 2.27 Aa	21.18
ALT of G2	92.25 \pm 4.09 Aa	74.5 \pm 5.17 Bb	
ALP of G1	192.00 \pm 7.45 Aa	191.75 \pm 3.09 Aa	16.66
ALP of G2	190.25 \pm 11.88 Aa	151.50 \pm 7.63 Bb	

Capital letters denote significant difference between periods for each group while small letters denote significant difference between groups for each periods (N =6) for each group .

DISCUSSION

Nutrition, environmental conditions, diseases, stocking density, and environmental pollutants are some of the factors that can alter a rabbit's blood parameters (20). According to our research, sage (*Salvia officinalis*) has an impact on blood parameters (complete count) by raising the red blood cell count, packed cell volume percentage, hemoglobin concentration, and white blood cell count. This is mainly because sage's natural antioxidants, like sage powder, shield cells from reactive oxygen overproduction, which can prevent tissue damage caused by oxidative stress. Sage powder has strong antioxidant properties, according to data from multiple studies (21). and our findings concur with those of (22), who discovered that Saga (*Salvia officinalis*) raises blood parameters. and disagreement with (23), which discovered that hematological parameters are lowered by Saga (*Salvia Officinalis*). (24) found that adding sage extract to rabbit water improves hematological parameters such as hemoglobin (Hgb), red blood cells (RBC), packed cell volume (PCV), white blood cells (WBC), and mean cell hemoglobin concentration (MCHC); however, mean cell volume (MCV) and mean cell hemoglobin (MCH) decreased. Other studies have also shown that sage treatment has a stimulatory effect on hematopoiesis. (25) found that adding powdered sage leaves to the diet of broiler chickens significantly improved their hemoglobin, PCV concentration, and red blood cell count. Garden sage hydroalcoholic extract dramatically raised hemoglobin and hematocrit (HCT) averages as well as red blood cell counts in mice (26). When an extract of the herb was added to the feed, hematological parameters improved even in fish (27).

However, because of its anti-oxidative properties, sage (*Salvia officinalis*) significantly lowers liver enzymes (AST, ALT, and ALP) (28). Numerous plant extracts have been shown to have hepatoprotective properties thus far. All of the extracts, including those that present herbs as hepatoprotective, may work by inhibiting cytochrome P450 or having antioxidant properties. This may be because of the

extract's high polyphenol content, which may have decreased the synthesis and/or build-up of toxic derived metabolites. Additionally, this leads to agreement with (29). Additionally, they found that Saga (*Salvia officinalis*) lowers liver enzymes in accordance with (30). and concur with (31), which discovered that by lowering liver enzymes, Saga (*Salvia officinalis*) reduces hepatotoxicity. Throughout the duration of the experiment, every animal was in good health, and no deaths were noted.

CONCLUSION

Sage (*Salvia officinalis*) enhanced immunity by increasing the white blood cell count. Additionally, the sage *Salvia officinalis* promotes hematopoiesis by increasing hemoglobin concentration, packed cell volume, and red blood cell count. Finally, because *Salvia officinalis* has an enhancing effect on liver enzymes, it is considered a good option for liver injury.

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N/A

Conflict of Interest

The authors declare no conflict of interest.

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