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# Effect of *Malva sylvestris* L. extract on blood cell parameters in mice with *Candida albicans* Infection

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**ABSTRACT**

*Various parts of Malva sylvestris have different medicinal benefits including antimicrobial activity.. Sixty female mice were divided randomly in six groups (three experimental groups, Candida, placebo, and control groups) by free access to food and water. Experimental groups received aquatic extract of Malva sylvestris L. (50, 100 and 200 mg/kg) for 20 days every other day via injection in peritoneum. Candida group received $1\times10^6$ cfu/ml of Candida albicans suspension (once) and placebo group received sodium chloride 9%. Control group didn't receive any injection. Main blood parameters including WBC, RBC, Hg, HCT, MCV, MCH, MCHC, PLT, lymphocyte, Neutrophil, eosinophil and Monocyte, were evaluated. Red blood cells, all blood parameters and WBC numbers were increased significantly in proportion to control group, in candida group but it was not different in doses groups lymphocytes and neutrophil percentage were increase and decreased in candida and 200 mg/kg significantly respectively. In general, M. sylvestris L. aquatic extract by controlling red blood cells, all blood parameters, and WBC in candida infected groups was effective in strengthening immune system in proportion to control.*

**Key words:** *Malva sylvestris* L., *Candida albicans*, Blood parameters, Extract, mice

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## INTRODUCTION

Nowadays, infections of opportunistic fungal are really important, two forms of *Candida albicans* is known as a reside forms pathogen of mouth, digestion system, women genital system, and sometime in skin and mucous membrane [1]. Limitation in treatment of fungal disease, like low and costly antifungal medication, their side effect, and medical of fungus has encouraged researchers to search new antifungal drugs especially medicinal plants [2]. Some plants are used in traditional medicine because of antimicrobial, antifungal, anti inflammation, and antibacterial properties. *Malva sylvestris* L. plant from malvaceae family is a biennial plant with about 100 to 120 cm height. This plant is native to Europe, northern Africa, Asia and Mediterranean. All plant ports are used as medicinal compounds but leaves and flowers are used more. Flower of plant is 2 or 5 cm, without any special smell and mucilage test. Plant has been used from old times as food or drug. *Malva sylvestris* L. has many properties in treatment of ulcer, antioxidant, anticancer, skin treatment, antimicrobial and anti inflammation. The most important effective matter of aerial parts are mucilage, flavonoids, tannin, phenolic compounds, ascorbic acid, carotenoids, tocopherols, and antocyanines [3,4,5].

## MATERIALS AND METHODS

In this study, 60 female mice from NMRI race and 25±30 gr were studied. Samples were kept for one month to adapt to environment. Mice had free access to may standard food and water, natural light 25-30 $C^0$ temperature and humidity. Aerial parts of plant were used to prepare aquatic extract. Treatment groups were six groups with to members in each group.

**Control group:** This group didn't receive any direction to compare CBC amounts.

**Placebo group:** This group received sodium chloride 9% injection to study probable stress of injection.

**Candida group:** This group received one injection of *Candida albicans* (ATCC 1677) suspension ( $1\times10^6$ cfu/ ml – 0.5 macfarland) to induce infection.

**Experiment groups:** These groups received to injection of 50, 100 and 200 mg/kg doses of aquatic extract every other day for twenty days every other day via injection and between the fifth and sixth day *Candida albicans* concentration $1\times10^6$ cfu/ ml was injected suspension injection.

All injection were injected into peritoneum, after injections blood samples were taken and used for CBC tests.

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

## RESULTS

Mean comparison results of blood cell numbers and blood parameters at 5% probability level showed that RBC, Hg, HCT, MCV, MCH, MCHC, PLT, and Monocyte has not significant change in all groups.

The number of white blood cells was increased in candida group significantly ($p<0.05$) in proportion to control group, but aquatic extract in 50, 100 and 200 mg/kg doses controlled these parameters at about control group (Figure 1).

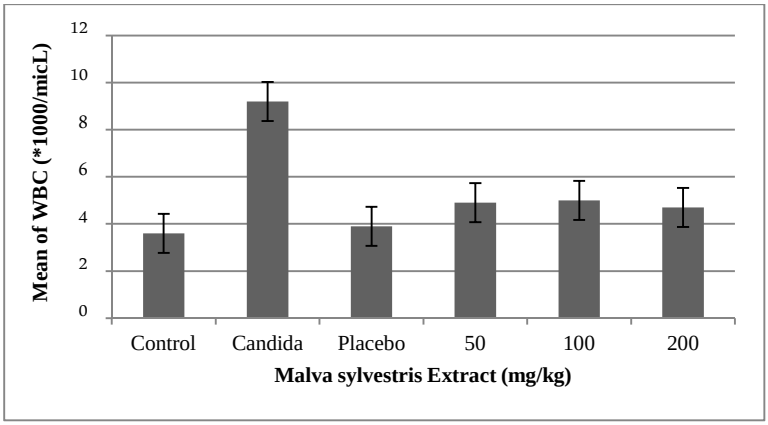


**Figure1. Effect of *Malva sylvestris* L. extract on mean comparison of WBC in all groups**

Lymphocyte percentages were increased significantly in candida and 200 mg/kg groups in proportion to control group. 50 mg/kg and 100 mg/kg doses didn't show significant differences with control group (Figure 2).

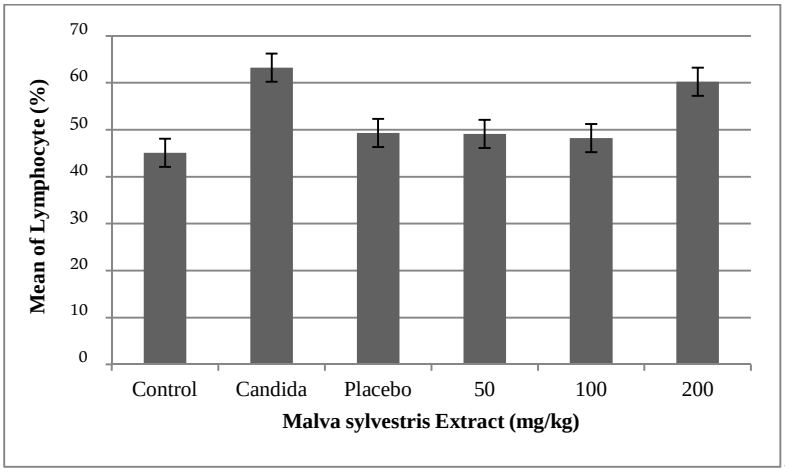


**Figure 2: Effect of *Malva sylvestris* L. extract on mean comparison of lymphocyte in all groups**

Neutrophil percentages were decreased significantly in candida group significantly in proportion to control group. 50, 100 and 200 mg/kg doses didn't show significant differences with control group (Figure 3).

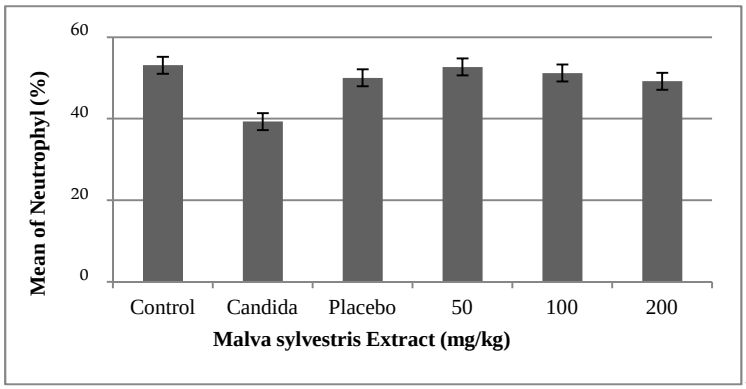


**Figure 3: Effect of *Malva sylvestris* L. extract on mean comparison of neutrophil in all groups**

## DISCUSSION

Results showed that WBC was increase in candida group in proportion to control and experimental groups significantly. White blood cells are important in infections, inflammation and immune responses and destroy microorganisms in infections. These cells activate both cell immune system and hemoral immune system [6]. Flavonoides have a compound named 7- hydroxy-3',4' flavone which acts against *Candida albicans* yeast [7].

Also, pharmaceutical compounds which have antifungal activity including phenols, tannin, terpenes are found in *Malva sylvestris* L. [3,8]. Neutrophil percentage was reduced significantly in candida group. Neutrophils are the first phagocytes in vital immune which enter infection region important role in infection cleaning [9]. *Candida albicans* is from pathogen microorganisms which cause early cell death via decreasing numbers and action of neutrophils and leads to increase cytokinin IL-10 [10].

Percentage of lymphocytes was increased in candida and 200 mg/kg groups in proportion to control group. Cytokinin $Th_1$ is increased like $IL_{12}$ and $IL_2$ against candida and by increasing these cytokins, lymphocyte is increasing in infection site [11]. Experimental study of *Candida albicans* in dog ear showed that lymphocyte numbers increasing after yeast infection [12].

## CONCLUSION

In general, aquatic extract of *Malva sylvestris* L. plant is able to strengthen innate immune system and reduce effect of candida infection.

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