

## The Effect of Almond (*Prunus amygdolus*) Extract on Blood Proteins Concentration in Mice

<sup>1</sup>Mehrdad Modaresi and <sup>2</sup>Fariba Dehghan

<sup>1</sup>Department of Animal Sciences, Khorasgan (Isfahan) Branch, Islamic Azad University, Isfahan, Iran

<sup>2</sup>Department of Zarrin Shahr Education, Zarrin Shahr, Iran

**Abstract:** Almond is a plant with a scientific name *Prunus amygdolus*. This plant has much medical effects that is the most important increase of immune system potential. In this research, the effect of *Prunus amygdolus* extract on blood protein concentration was investigated in mice (Balb/C). In this research, 50 mice were divided casually in 5 groups (control, placebo and 3 care groups). The extract was obtained in 50, 100 and 200 mg kg<sup>-1</sup> dosages, in an Inner Peritoneum (IP) method was injected, respectively to the 3 care groups for 20 days. The control group did not receive any extract. The placebo group received normal saline for 20 days. Then blood samples were collected of all mice by blood to the heart and albumin,  $\alpha$ -1 and 2,  $\beta$  and  $\gamma$  globulin were analyzed in the level  $p < 0.05$  with the statistical software SPSS in  $p < 0.05$ . The study showed that the concentration of  $\alpha$ -1 in all groups and  $\beta$  globulin in 50 and 100 groups increased but  $\alpha$ -2 and  $\gamma$  globulin in all groups decrease significantly ( $p < 0.05$ ). Albumin concentration decrease in 200 group significantly ( $p < 0.05$ ). These findings indicate *Prunus amygdolus* extract has effect on blood protein concentration and immune system function dose dependently.

**Key words:** *Prunus amygdolus*, blood proteins, mice, globulin, blood samples

---

### INTRODUCTION

Using herbal extracts have many advantages like improving metabolism, good performance of digestion system, healthy heart and veins via blood pressure regulation, positive effects on diabetes and strengthening the immune system (Van, 2009).

Almond is one of the most important pharmaceutical plants in traditional medicine (Dugenci *et al.*, 2003). This plant grows very well in Mediterranean weather with warm and dry Summers and mild Winters; however, it is sown also in regions with very cold Winters. There are two types of almond as bitter and sweet almond. Usable parts of this plant are fruits, blossoms, flowers, leaves and kernel. White kernel is covered by a thin brown layer which can be separated using warm water (Moure *et al.*, 2007). Sweet almond's kernel is easily be detected from bitter one's. All parts of sweet almond tree have medicinal advantages including blossoms, leaves and fruits. Pharmaceutical properties of this plant are common cold prevention and curing coughs, asthma, diarrhea and cramps (Barreira *et al.*, 2009). The oil amount of sweet almond is 50-55% whereas bitter almond has 40-45% oil. Almond has also 25% white material, a diastase called emulsine, sugar, gum, mucilage and minerals (Mandalari *et al.*, 2008). Bitter almond has about 1-3%

amygdaline which produces cyanuric acid, aldehyde benzoic and glucose in reaction with water. Researchers have shown that all almond kernels adjust blood cholesterol (Sang *et al.*, 2002). Kernel's skin has vitamin E which is from effective anti oxidant for muscles weakness, prostate health and prevents damage to cells and DNA. Extant potassium in almond is useful for muscle contraction, balancing blood pressure and better cardiac performance. Almond increases energy in body because of having vitamins, protein and iron. Considering the emphasis of traditional medicine on almond's role in increasing immunity the effect of its hydro alcoholic extract was studied on laboratory mice.

### MATERIALS AND METHODS

Mice were used in this study as experimental samples. Almond's extract was injected in peritoneum of mice in 50, 100 and 200 mg kg<sup>-1</sup> of body weight doses. One week prior to injection mice were divided randomly into five groups with eight members in each group and were kept in different cages. Average weight of each group was 30±3 g.

In first group (control) mice were kept without receiving any extract to have basic values of blood

proteins. Second group (placebo) received 0.5 cc of normal saline daily to ensure that injection did not affect results. Third, fourth and fifth groups received extract in 50, 100 and 200 mg kg<sup>-1</sup> doses, respectively every other day for 20 days. In order to stimulate immune system of mice, all groups except control were injected in peritoneum by Sheep Red Blood Cells (SRBC) in 5th and 9th injection days. Blood samples were prepared in 20th day after last injection.

The average concentration of  $\alpha$ -1,  $\alpha$ -2 globulin and  $\beta$  and  $\gamma$  globulin and mean Albumin to Globulin ratio (A/G) were studied in experimental groups. Results were analyzed using one way ANOVA and means were compared using Duncan multiple ranges test at 5% probability level.

### RESULTS AND DISCUSSION

Mean comparison of  $\alpha$ -1 globulin concentration showed significant increase in groups 3, 4 and 5 ( $p < 0.05$ ) whereas  $\alpha$ -2 globulin was decreased in all experimental groups significantly (Fig. 1).

Mean comparison of  $\beta$  and  $\gamma$  globulin concentrations among groups showed significant increase in  $\beta$  globulin of third and fourth experimental groups (50 and 100 mg kg<sup>-1</sup>) and significant reduction in  $\gamma$  globulin in all experimental groups (Fig. 2).

The ratio of albumin to globulin showed significant increase ( $p < 0.05$ ) in all experimental groups (50, 100 and 200 mg kg<sup>-1</sup>) while albumin concentration was decreased significantly ( $p < 0.05$ ) by 200 mg kg<sup>-1</sup> dose (Fig. 3).

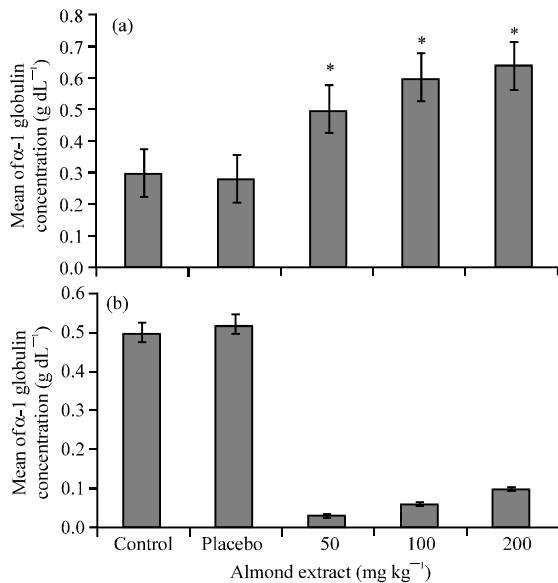


Fig. 1: Concentration of  $\alpha$ -1 and 2 globulin in studied groups

Natural defense system of body is one of the most important complicated and automated systems with many secrets. White blood cells and anti bodies can identify

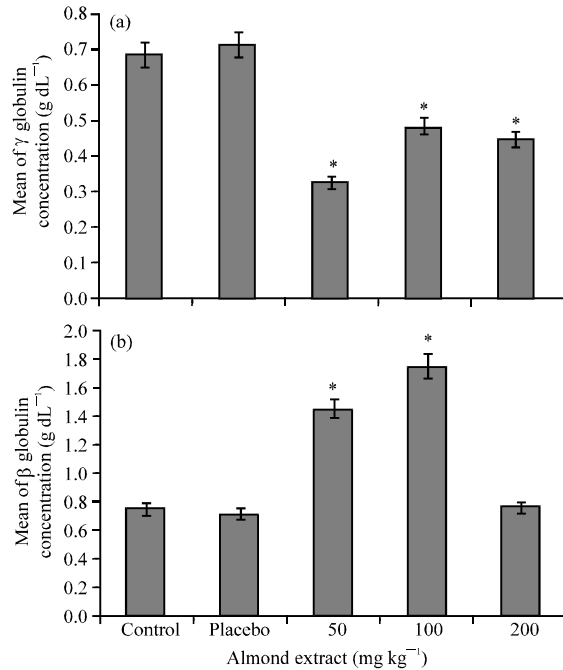


Fig. 2: Concentrations of  $\beta$  and  $\gamma$  globulin in studied groups

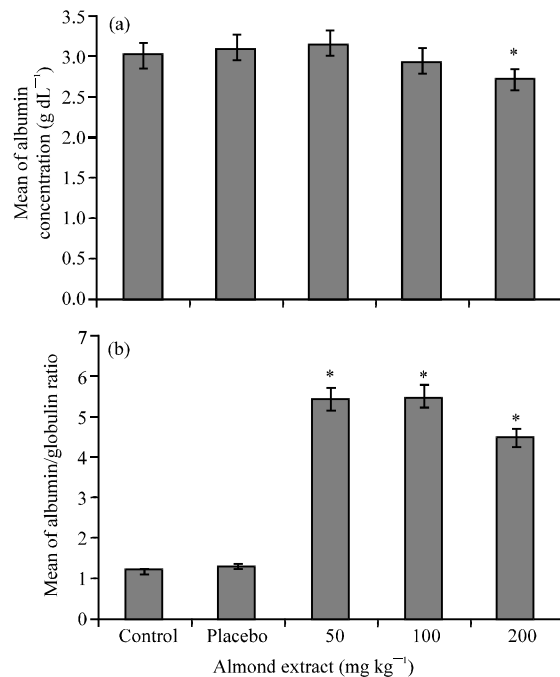


Fig. 3: A/G ratio and albumin concentration of studied groups

rapidly and destroy severely harmful bacteria. Strengthening immune system has wide effects on body undoubtedly. For instance, it can be considered in wound healing, regeneration of damaged tissues, dealing with infectious diseases like influenza, food poisoning and cancer prevention. Also, it can reduce seasonal allergies intensity. Using natural products is a turning point for human in age of chemical based products (Modaresi, 2012).

A specific protein called albumin is one of the most important matters in transferring toxic substances to liver which are broken down there and then excreted from the body (Modaresi, 2012). Without certain amount of albumin in blood, liver and kidneys and other vital organs cannot work properly.

Also, albumin is one of the most significant transporters of vitamins, minerals, non saturated fatty acid, hormones and other useful compounds (Harrison, 1994). But white blood cells need high quality proteins to appropriate growth, reproduction and distribution and also providing necessary amounts of blood albumin.

Reduction in albumin of 200 mg kg<sup>-1</sup> group shows that almond has probably reduced liver activity and therefore caused albumin synthesis. The  $\alpha$ -1 concentration had significant changes in this study. The main part of  $\alpha$ -1 globulin is  $\alpha$ -1 anti proteinase. Reduction in this protein is related to emphysema and a type of liver disease and increase in it is observed in response to acute inflammation. Increasing  $\alpha$ -1 concentration in all three treatment groups can be indicative of improvement in liver action (Bolkent *et al.*, 2005).

Main proteins in  $\alpha$ -2- globulin ribbon are  $\alpha$ -2 macro globulin and hapto globulin. Using almond's extract reduced  $\alpha$ -2 globulin significantly in third, fourth and fifth groups. Increase in permeability of glomerular capillary in nephritic syndrome causes increase in  $\alpha$ -2-macro globulin 10 times or more by losing other small proteins. In this disease, researchers observe a drop in albumin and  $\alpha$ -1 globulin amounts of electrophoresis pattern whereas  $\alpha$ -2 macro globulin shows increase (Stout, 1999).

Reduction in albumin amount of 200 mg kg<sup>-1</sup> group plus increase in  $\alpha$ -1 globulin and reduction in  $\alpha$ -2 globulin of experimental groups show that higher amounts of almond have controlled losing  $\alpha$ -2 globulin protein by changing in permeability of glomerular capillary. The  $\beta$  globulin amount was increased significantly in 50 and 100 mg kg<sup>-1</sup> groups of this study. Transferrin is the main part of  $\beta$  globulin. This protein transfers ferric ions from iron deposits of cells or mucosal ferritin to bone marrow. Increase in  $\beta$ -globulin amount of experimental groups show that 50 and 100 mg kg<sup>-1</sup> extracts of almond have positive effect on iron metabolism of Syrian mice dose

independently. Significant reduction in  $\gamma$ -globulin of experimental groups shows that almond extract can decrease production of these immune globulins of blood plasmocytes with antigenic stimulation. Determining these immune globulins can be the subject of later studies. All drugs should be studied for their effects on immune system. Reduction in level of serum globulins can be indicative of decrease in immune globulins production. Although, reduction in serum level of anti bodies is a relatively insensitive indicator, response of anti body must be evaluated for determine control of immune system. Decrease in  $\gamma$  globulins of serum in this study shows that almond can have reducing effect on activity of immune system to produce these types of globulin in Syrian mice.

The ratio of albumin to globulin is another important parameter for evaluating liver action (Huang, 2008). Almond extract increased this ratio in all doses significantly. In various diseases, especially liver diseases, albumin synthesis is reduced and the ratio of albumin to globulin is also decreased in patients' plasma (Modaresi, 2012). But in this study, considering decrease in albumin of 200 mg kg<sup>-1</sup> group, increase in  $\beta$  globulin of 80 and 100 mg kg<sup>-1</sup> and increase in  $\alpha$ -1 in all groups, changes are probably due to severe increase of globulins in proportion to albumins. Increase in albumin to globulin ratio shows that almond strengthens immune system of mice.

## CONCLUSION

On the whole, researchers can say that almond extract in high doses can increase the strength of immune system by changing electrophoresis pattern of blood proteins which are important parts of immune system.

## REFERENCES

- Barreira, J.C.M., I.C.F.R. Ferreira, M.B.P.P. Oliveira and J.A. Pereira, 2009. Effect of different phenol extraction conditions on antioxidant activity of almond. *J. Food Chem.*, 33: 736-776.
- Bolkent, S., R. Yanardag, O. Karabulut-Bulan and B. Yesilyaprak, 2005. Protective role of *Melissa officinalis* L. extract on liver of hyperlipidemic rats: A morphological and biochemical study. *J. Ethnopharmacol.*, 99: 391-398.
- Dugenci, S.K., N. Arda and A. Candan, 2003. Some medicinal plants as immunostimulant for fish. *J. Ethnopharmacol.*, 88: 99-106.
- Harrison, H., 1994. Principles of Internal Medicine of Blood Disease. 1st Edn., McGraw-Hill, New York, pp: 40-60.

- Huang, C.F., S.S. Lin, P.H. Liao, S.C. Young and C.C. Yang, 2008. The immunopharmaceutical effects and mechanisms of herb medicine. *Cell Mol. Immunol.*, 5: 23-31.
- Mandalari, G., C. Nueno-Palop, G. Bisignano, M.S.J. Wickham and A. Narbad, 2008. Potential prebiotic properties of almond (*Amygdalus communis* L.) seeds. *Applied Environ. Microbol.*, 74: 4264-4270.
- Modaresi, M., 2012. A comparative analysis of the effects of garlic, elderberry and black seed extract on the immune system in mice. *J. Anim. Vet. Adv.*, 11: 458-461.
- Moure, A., M. Pazos, I. Medina, H. Dominguez and J.C. Parajo, 2007. Antioxidant activity of extract produced by solvent extraction of almond shells acid hydrolysates. *Food Chem.*, 101: 193-201.
- Sang, S., K. Lapsley, W.S. Jeong, P.A. Lachance, C.T. Ho and R.T. Rosen, 2002. Antioxidative phenolic compound isolated from almond skins (*Prunus amygdalus*). *J. Agric. Food Chem.*, 50: 2459-2463.
- Stout, R.L., 1999. The significance of liver enzymes elevations. *Clinical Reference Laboratory*.
- Van, V., 2009. The most important medicinal plants of the world. *Green Farm Raining Complex, Mashhad*, Pages: 234.