



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF  
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.1411932>Available online at: <http://www.iajps.com>

Research Article

**THE EFFECTS OF ADIANTUM CAPILLUS VENERIS HYDRO  
ALCOHOLIC EXTRACT ON PLASMA PROTEINS AND BLOOD  
ELECTROPHORETIC PATTERN IN MICE**Masoomeh Pashaei<sup>1</sup>, Mehrdad Modaresi<sup>2\*</sup>, Habibolah Nazem<sup>1</sup><sup>1</sup> Department of Biology, Payam e Noor University, Isfahan Center, Isfahan, Iran<sup>2</sup> Department of Physiology, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran**Abstract:**

*The Adiantum capillus veneris is a known medicinal herb in traditional medicine which is widely used in traditional medicine to deal with infection by having chemical compounds that affect the immune system. Current study was carried out to investigate the effects of adiantum hydro alcoholic extract on plasma proteins and electrophoretic pattern of blood in small laboratory mice. Mature female mice (Balb/C) were divided into 5 groups including control, placebo, and 50, 100, and 200mg/kg of extract. The extract was injected intraperitoneal every other day for 20 days. At the end of the experiment, blood samples were taken and used to measure blood proteins and their electrophoretic pattern. Obtained data were analyzed using SPSS program ( $p < 0.05$ ). According to the results, 100 and 200 mg/kg doses increased the amount of albumin, alpha-1 globulin, beta globulin and A/G ratio. Therefore, it can be said that the extract has a positive effect on blood system and plasma proteins and can increase the immune system without the presence of antigenic factors.*

**Keywords:** *Adiantum capillus veneris, blood proteins, mice***\*Corresponding Author:****Mehrdad Modaresi,**Associated Prof., Department of Physiology,  
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Isfahan, Iran.**Tel:** +98(913)2074854, **Fax:** +983135354060**Email:** mehrdad\_modaresi@hotmail.com**Address:** Jey St., Arghavanieh, Department of Physiology,  
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Please cite this article in press Mehrdad Modaresi et al., *The Effects of Adiantum Capillus Veneris Hydro Alcoholic Extract on Plasma Proteins and Blood Electrophoretic Pattern in Mice.*, Indo Am. J. P. Sci, 2018; 05(09).

**INTRODUCTION:**

It has been tried in traditional medicine to use chemical compounds of plants to balance the unhealthy part of the body with other healthy parts. In the other words, in traditional medicine, the goal is to improve the performance of a system in conjunction with other systems and for that reason herbal medicines have a wider effect than chemical drugs. Today, herbal medicines are used in many parts of Europe in a completely scientific way to treat diseases and most of these drugs are also prescribed as complementary medications along with new therapies [1]. Today, plants extracts and pure chemicals extracted from the plant are used after laboratory tests in the treatment of diseases [2].

*Adiantum* is a persistent herbaceous plant from fern family, with a narrow, nodular brown rhizome and narrow, thin roots. This plant has three-part leaflets with very thin, branching petioles in brown or dark purple colors. The sori that appear at the tip of the leaflets as green or brown spots are from main characteristics of the *Adiantum* [3]. This plant is most commonly found in southern Europe, the Alps, the Atlantic, as well as Iran [4]. It belongs to the pteridophytes branch, polypodiales order, polypodiaceae family and *Adiantum* genus. *Adiantum* is often found in humid areas rich in organic matter or in the margins of rivers and streams. This plant is very similar to green coriander [5].

This plant has many pharmacological properties with its various ingredients. Mucilage in this plant has a moisturizing effect on the upper respiratory tract and facilitates the release of the phlegm [6, 7]. In traditional medicine, *Adiantum* has been used as a cough medicine, anti-fever drug, and diuretic agent. It has been used in the treatment of respiratory diseases in the form of tea and in severe coughs in the form of syrup [8, 9]. Plant flavonoids (routine and isocoristin) have anti-inflammatory effects [10], antibodies and delayed tumor growth. In addition, the plant has a protective effect on the vessels, antithrombotic effect, and effects on hematocrit, prothrombin time, thromboplastin time, and red blood cell volume [5].

It also has a protective effect on the digestive system, removes gallstones, and is anti-hair loss and so on [10]. All parts of the shoot and rhizome of this plant

are used as a medicine. Chemical compounds of this plant are mucilage, sugar, caffeic acid, gallic acid and bitter substance called capillarin. Recent studies indicate the existence of adanthocide, terpene oxide, 21 hydroxyadineptone, flavonoids, astragaline, and tannin in this plant [6].

Current study was carried out to investigate the effects of *Adiantum capillus veneris* hydro alcoholic extract on plasma proteins and electrophoretic pattern of blood in small laboratory mice.

**MATERIALS AND METHODS:**

Current study was carried out at Payame Noor University of Isfahan (2017). In the present study, ethical principles were observed in accordance with the rules of support and maintenance of laboratory animals and statements of university.

Mature female mice in the weight range of 30±5 gram were randomly divided into groups and kept under laboratory conditions for one month to adapt to environment. During storage and injections mice were kept under normal photoperiod and humidity, 28-32 °C temperature with sufficient water and standard food. Mice were divided into five groups with ten mice in each group:

- Control group: without any injection
- Placebo group: received normal saline to ensure that injections would not affect the results
- Three experimental groups: received ten injections each containing 0.5 cc of 50, 100, and 200 mg/kg doses of extract in peritoneum.

Injections were done for 20 days every other day. At the end of injections, blood samples were taken in heparin tubes and centrifuged at 5000 rpm for 10 minutes until the plasma was completely separated. After these steps, samples were used for electrophoresis of blood proteins.

Obtained data were analyzed using SPSS-13 program, one-way variance analysis and Duncan test at 5% probability level.

**RESULTS AND DISCUSSION:**

- *Electrophoretic pattern of blood protein components*

In the following, electrophoretogram are presented for the control and treatment of 200 mg/kg group (Figure 1 and 2).

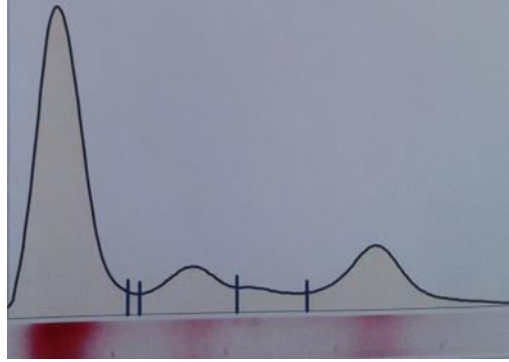


Figure 1. Electrophoretogram from a of control group

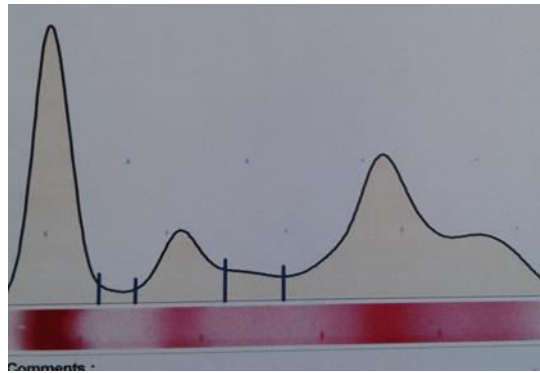


Figure 2. Electrophoretogram from a of 200mg/kg group

- *Albumin content*

The results showed that the amount of albumin in the 200 mg / kg group was significantly increased ( $p < 0.05$ ) compared to the control (figure 3).

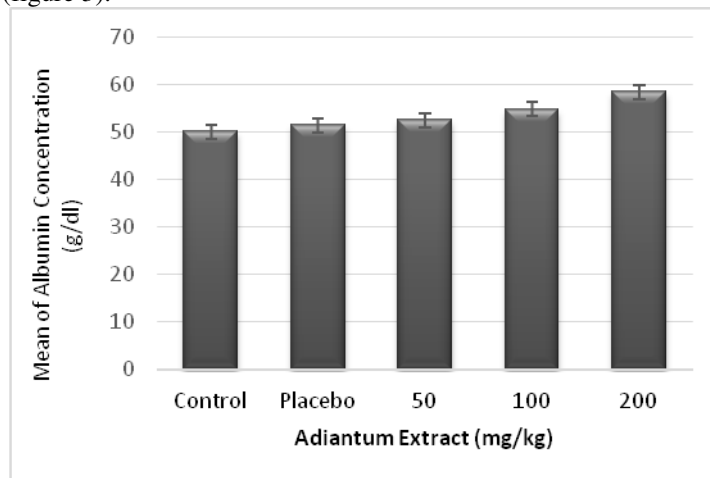


Figure 3. Albumin level in all treatment groups

- **The amount of alpha-1 globulin**

The amount of alpha-1 globulin in the 200 mg / kg group was significantly higher ( $p < 0.05$ ) than control group (figure 4).

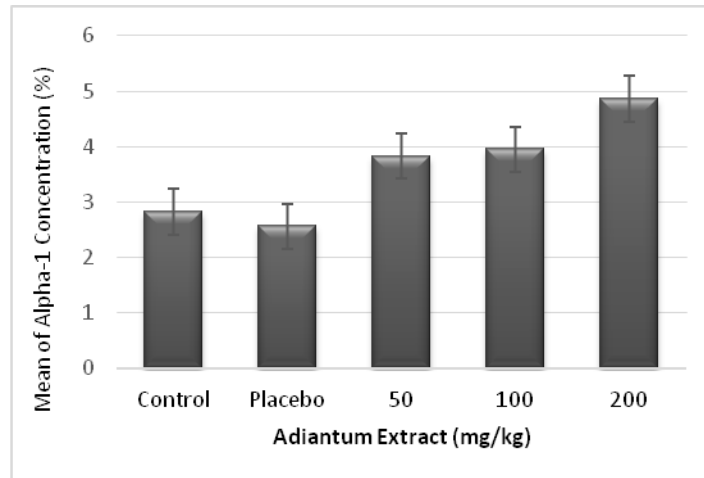


Figure 4. Alpha-1 globulin level in all treatment groups

- **Beta-globulin content**

100 mg/kg and 200 mg / kg group had significantly higher beta-globulin content ( $p < 0.05$ ) than control group (figure 5).

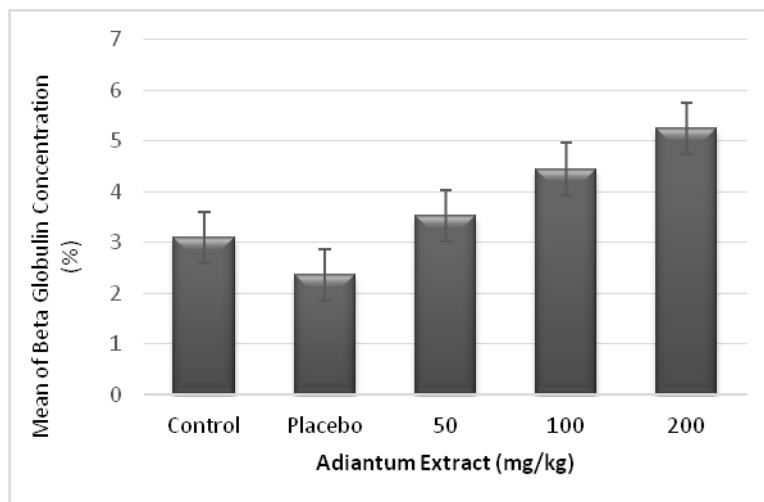
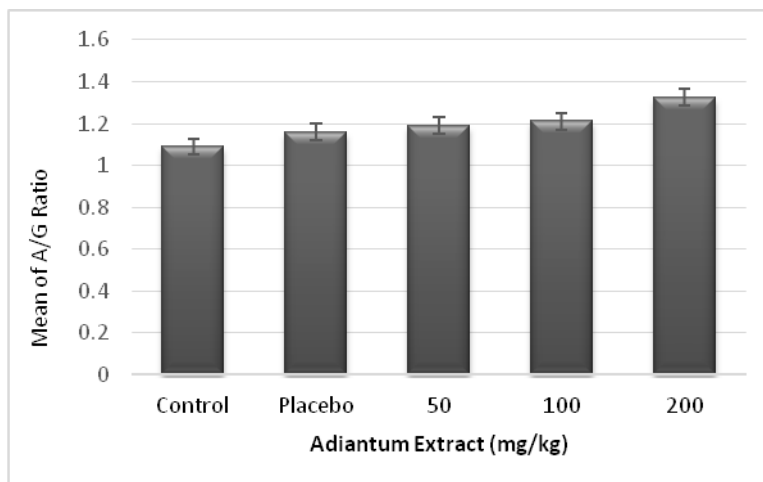


Figure 5. Beta-globulin level in all treatment groups

- *A/G ratio*

200 mg / kg group significantly increased the ratio of albumin to globulin in this ratio in proportion to the control group (figure 6).



**Figure 6. A/G ratio in all treatment groups**

The present study was carried out in view of the fact that the use of this herbal medicine has been recommended in traditional medicine to strengthen the immune system. Albumin synthesis is reduced in various diseases, especially in liver diseases [11]. Therefore, increasing the amount of albumin in the extract groups shows that the greater amounts of extracts not only did not cause degeneration in the liver tissue, but may also increase the activity of the liver.

The amount of alpha-1 globulin was increased in extract groups. The largest component of alpha-1-globulin is alpha-1-antithyresin [12]. Deficiency of alpha-1-antithyresin is associated with emphysema and a type of liver disease [11]. Alpha-1-antitripsin is one of the blood glycoproteins that rises in response to acute inflammation. However, this increment has a very limited clinical point of view and is not specific to a disease. The use of adiantum extract in this study showed a significant decrease in alpha-2-gluboline. In nephrotic syndrome, with the loss of other small proteins, the amount of alpha-2-macroglobulin increases to tenfold or even more [12]. In this disease, lightweight proteins especially albumin, are filtered and appear in the urine [13] and electrophoretic pattern shows a decrease in albumin and alpha-1- globulin and an increase in alpha-2 macroglobulin [12]. In current study, the amounts of albumin and alpha-1-gluboline were increased whereas the amount of alpha-2-gluboline was decreased; this is very effective in the treatment of nephrotic syndrome.

Significant increase in  $\beta$ -globulin levels was observed under the influence of adiantum extract. Increasing beta-globulin levels in experimental treatments suggests that the increased levels of adiantum extract at concentrations of 100 and 200mg/kg may have positive effects on iron metabolism of mice, dose-dependently. Also due to the synthesis of this globulin in the liver and positive effects of this plant on this organ, adiantum extract may have increased the amount of beta-globulin. Significant changes in immunoglobulin amount of extract group's shows that the immune system has been stimulated in these groups and injection of the extract has caused positive responses in the recipient groups.

#### CONCLUSION:

The results of this study on laboratory mice showed that by injection of adiantum extract, the ratio of albumin to globulin was significantly increased in these groups. The amount of albumin and globulins, as well as the ratio of these two proteins, represent the liver function. Albumin synthesis is reduced in various diseases, especially in liver disease and the albumin to globulin ratio is often reduced in the plasma of patients with liver disease. In general, adiantum can be considered as an herbal medicine that influences the immune system.

#### ACKNOWLEDGEMENT:

We extend our gratitude to the members of the research group in the laboratory at Payam e Noor University Isfahan center.

**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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