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Research Article

THE EFFECT HYDRO-ALCOHOLIC EXTRACT OF YARROW (*ACHILLEA OFFICINALIS*) ON BLOOD FACTORS OF FEMALE LABORATORY MICE

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Abstract:

Yarrow (Achillea officinalis) is one of the plants from the Asteraceae family. In fact, it is one of the most famous medicinal plants that boosting the immune system is one of its benefits. Current research was carried out to study the effect of hydroalcoholic extract of yarrow (Achillea officinalis) on blood factors of female laboratory mice. Fifty female mice were divided into five groups including control group, placebo 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 from the heart the number of blood cells were measured using an automatic cell counter machine. Results showed that the number of white blood cells, lymphocytes and monocytes were increased significantly in 50 all treatment groups in proportion to control group. WBC was increased in 50 mg/kg group showed significantly increase. The number of RBC was significantly increased by 200 mg/kg dose whereas the number of neutrophils was decreased significantly in all three doses. According to results, yarrow extract showed a significant effect on blood factors in all three doses and can have a positive effect on the number of red blood cells and white blood cells

Keywords: Yarrow, Blood factors, Laboratory mice

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INTRODUCTION:

Widespread acceptance of herbal medicines has taken place in various medical fields. This is due to the use of herbs as a medicine from centuries ago (thousand years B.C.). The Egyptians, the Romans, the Babylonians, the Assyrians, and the Chinese have been among the leading human communities in the consumption of medicinal plants. Returning to traditional medicine is one of the ways to achieve new drugs [1]. Since active ingredients of herbal drugs are accompanied with other matters, they may be better absorbed, have more curative effect and less side effects and toxicity.

Yarrow (*Achillea officinalis*) is one of the plants from the Asteraceae family. Yarrow is a herbaceous, perennial plant with a height between 90 and 15 centimeters, according to the climatic conditions. The plant flowers are used to treat respiratory problems due to its anti-allergic and decongestant activity. Oil extract of Yarrow's Flower is used to eliminate inflammation and spasm, skin moisturizing, makeup cleanser, anti-dandruff, hair growth stimulator and healers (in shampoos) [2]. Yarrow's leaves are used as a stimulant for blood coagulation and healing wounds and injuries. Chewing fresh leaves is recommended for toothache. Aerial parts of the Yarrow are used in the treatment of digestive problems like stomach pains, flatulence, anorexia, hemorrhoids as well as gastrointestinal stimulant, anti-flatulence and laxative. In the treatment of genitourinary problems, it is used as a disinfectant for urinary tract, menstruation regulator, reducing monthly bleeding and pain reliever [3]. It is also used to treat cardiovascular problems, for

example, as a circulatory stimulator and peripheral vascular relaxant [4]. Yarrow reduces blood pressure, brain and arterial thrombosis, and strengthens varicose veins. Other effects are anti-fever, anti-virus, antibacterial, and anti-worm effects [5].

MATERIAL AND METHODS:

Fifty matured female mice from Balb/C race in the weight range of 30 ± 5 gram were prepared (from Isfahan University) and kept under laboratory condition ($28-32^{\circ}\text{C}$ and normal photoperiod) for two months to adapt to environment. Mice were kept in separate cages and had free access to food and water.

Mice were divided in five groups randomly:

- Control group: without any injection to access the base of blood cells
- Placebo: received ten intraperitoneal injections of normal saline (0.5cc) to ensure that injections will not affect the results
- Three experimental groups: received 0.5cc of 50, 100, and 200 mg/kg doses of the extract in peritoneum every other day for twenty days.

Obtained data were analyzed using SPSS program and one-way analysis of variance. Mean comparison was done using Duncan multiple ranges test at 5% probability level.

RESULTS AND DISCUSSION:

Mean comparison results of treatment groups showed that the amount of white blood cell was increased significantly in 50 experimental group in proportion to control group ($p < 0.05$).

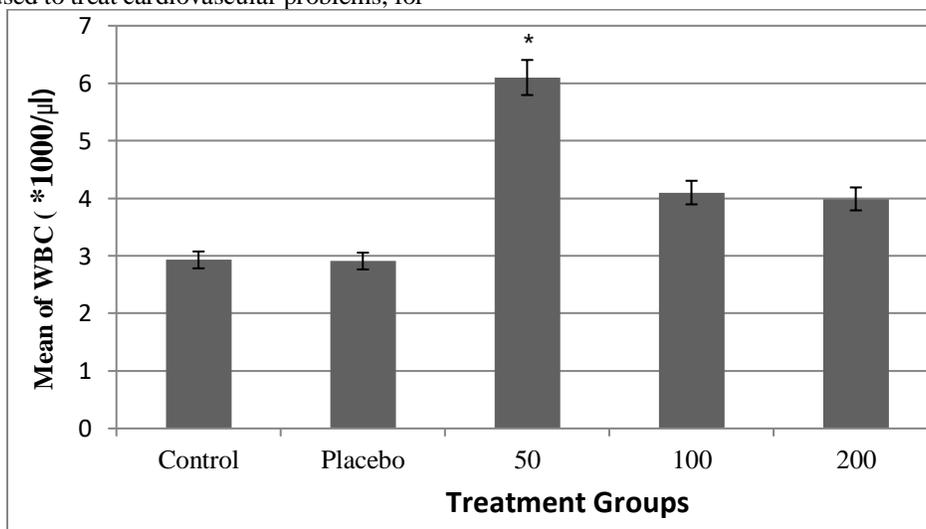


Figure1: Mean comparison results of white blood cells

Neutrophil percentages of experimental groups were significantly ($p < 0.05$) less than control group (Figure2).

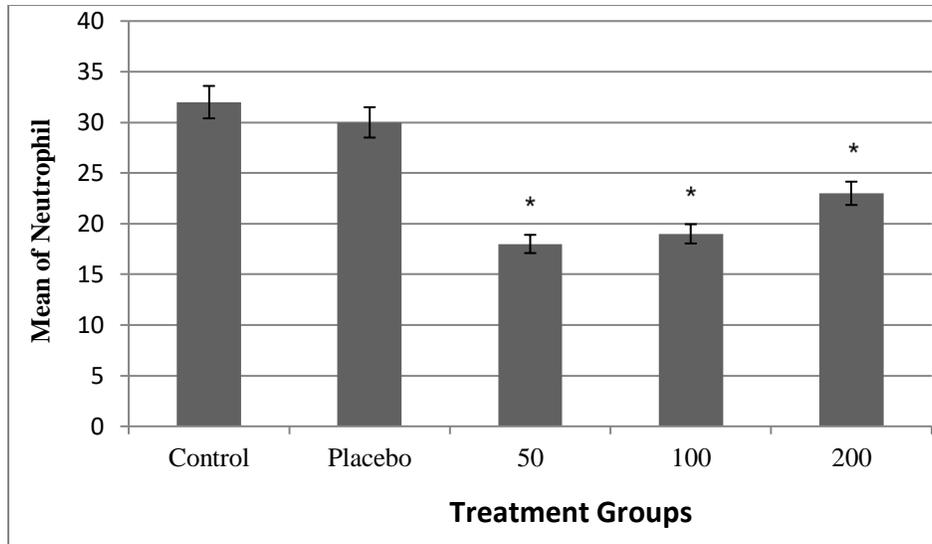


Figure 2: Mean comparison results of neutrophil amount

The percentage of lymphocytes was increased significantly (Figure3) by three experimental groups in proportion to control group ($p < 0.05$).

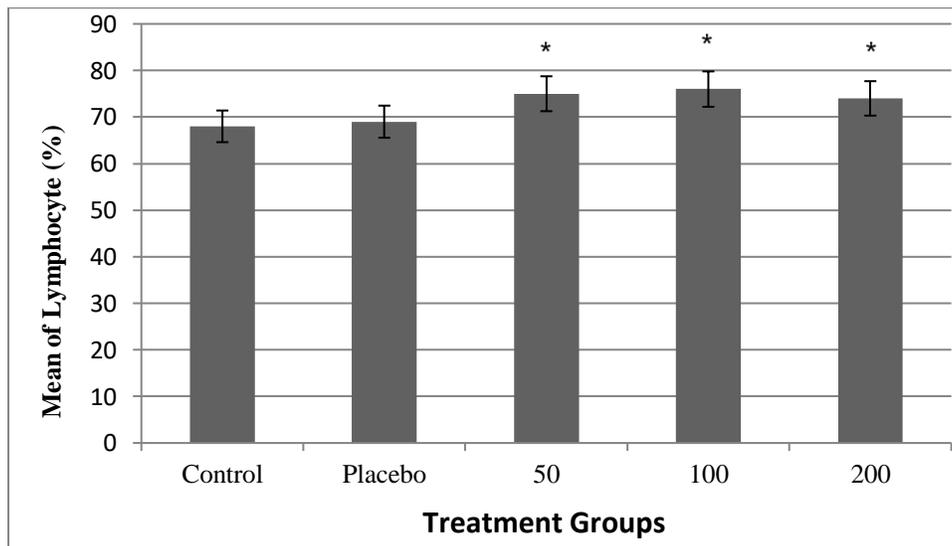


Figure 3: Mean comparison results of lymphocytes percentage

Mean comparison results of treatment groups (Figure4) showed that the amount of monocyte percentage was increased significantly by all experimental groups in proportion to control group ($p < 0.05$).

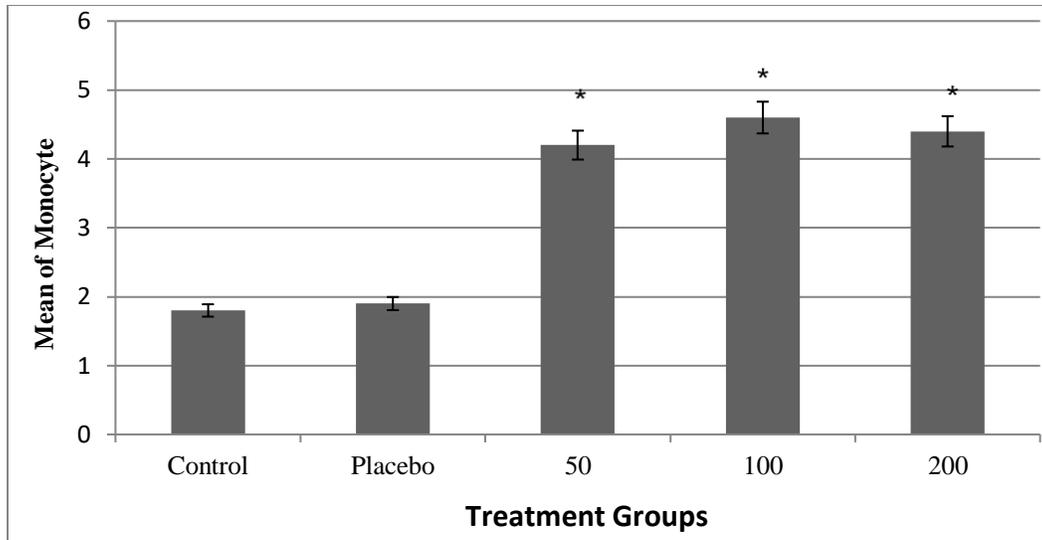


Figure 4: Mean comparison results of monocyte percentage

The amount of red blood cells was increased by three experimental groups in proportion to control group (Figure5). This increase was significant ($p < 0.05$) for 200 mg/kg dose but not for the other experimental groups.

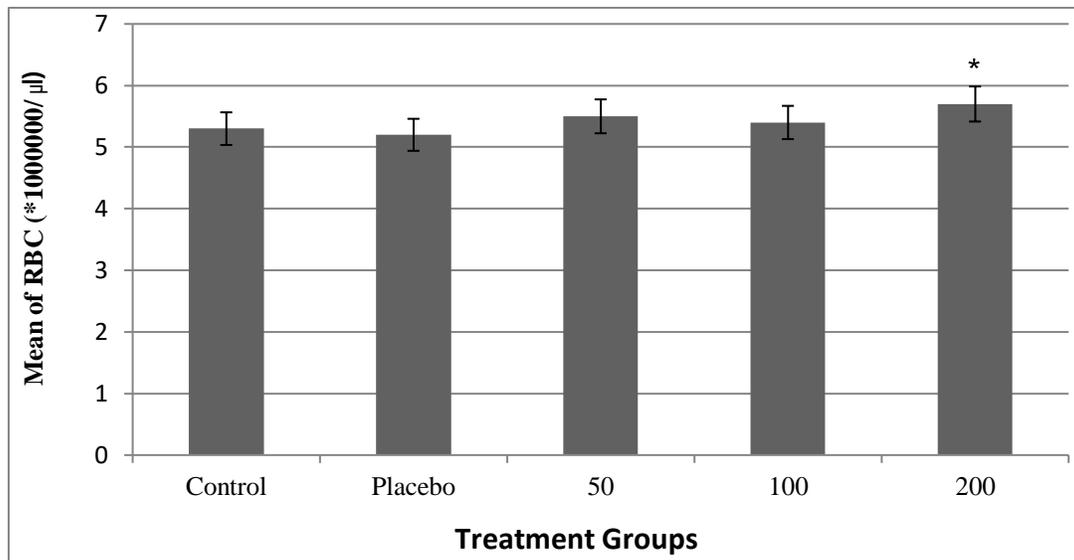


Figure 5: Mean comparison results of red blood cells

According to results, the levels of white blood cells, lymphocytes were increased and monocytes in some experimental groups significantly while they significantly decreased neutrophil level. The reasons for these increases can be anti-inflammatory, antimicrobial and antiviral properties of this plant.

Yarrow is used as an anti-inflammatory and anti-inflammation drug for protease diseases such as human neutrophil elastase (HNE) and metalloproteinase matrix, which are associated with the inflammatory process. Benedek *et al.* (2007) studied extant flavonoid and decaeoeciotic (DCQAS) in yarrow and reported that 50 mg/kg dose of

flavonoid reduced HNE by 20 microg/ml while DCQAS has responded less. The inhibitory activity of metalloproteinase-2 was increased in dose 50 from 600 to 800. DCQAS was stronger here than flavonoids. In this way, neutrophil reduction due to the anti-inflammatory properties of the yarrow is explainable [6].

According to Tozyo et al. studies, sesquiterpene lactones of yarrow are the leading Azulenes [7] and have antibacterial, anti-inflammatory effects. According to Alcaraz et al. studies, the aerial part of the yarrow has rich flavonoids component which all of them act as antioxidants and have anti-inflammatory properties. For example, isoorientin is xanthine oxidase inhibitor and thus has anti-rheumatoid and anti-acute arthritis effects [8].

Golberg et al. (1969) reduced the inflammation by 35% by isolating a component of the yarrow and examining its effect on white mice. This component may be a combination of carbohydrates and proteins [9].

Chehregani Rad et al. (2014) investigated the antibacterial effects of Yarrow on various microorganisms and reported that yarrow had the potential to kill the strains with respect to compounds such as kamazolen, caryophyllene, 1 and 8 cineol, and flavonoids such as apigenin and rutin [10].

This research conforms to the studies of Candan et al in 2003 [11]. The aerial extract of yarrow (Hexane-ether-methanol) was tested against five bacteria (*Aerobius*, *Escherichia coli*, *Klebsiella*, *Pseudomonas aeruginosa* and *Salmonella*) and two fungi (*Aspergillus Niger* and *Candida albicans*) and showed a wide range of antimicrobial activity. This effect is carried out through the alkanic and fatty acids, monoterpenes, guanine sesquiterpenes, and flavonoids (*Apigenin santardin*) [3].

According to Tajik et al. research (2007), it can be said that aquatic and alcoholic extracts of yarrow have inhibitory properties on pathogen microorganisms. Linalool, which forms 25% of the essence oil of hexaploid plants can inhibit the growth of more than 17 types of bacteria and 10 types of fungi [11]. Aljancic et al. (1999) stated that the yarrow could inhibit *Candida albicans* and *Bacillus subtilis* in laboratory conditions [12]. Sokmen et al. (2003) stated that aquatic extract of the yarrow had no antimicrobial activity, but activity was found in alcoholic extract and oil of the plant. They also showed that two essential substances in yarrow oil, called camphor and eucalyptol, had significant inhibitory effects on *Candida albicans* [3]. Bahmani et al. (2014), evaluated the anti-*Limnatis nilotica* effect of *Achillea millefolium L.* ethanolic extract as well as levamisole and niclosamide. In an experimental study the extract of *Achillea millefolium L.* aerial parts was prepared and then the severity effect of the treatments was

recorded and compared with placebo group on *L. nilotica* as anti-leech assay. The average time of paralysis and death of *L. nilotica* for Levamisole, niclosamide and *Achillea millefolium L.* plant were 12.66 ± 5.19 min, 19.22 ± 3.42 min and 90 ± 17 min, respectively. Distilled water was determined as the inert for control group. In this study, it was determined that *Achillea millefolium* plant with an intensity of 3+ have a good anti-leech effect and can be shown to be effective in cases of leech bitings. [13].

The value of the first lethal dose for the flower extract was about 40 mg/dl whereas it was 1.2 mg/dl for the essence. Also, the extracts and the essence reduced the number of excreted eggs dose dependently. So, both the flower extract and the essence of the plant have a high anti-parasitic (antihelminthic) effect. A study has examined anti worm effects of yarrow on sheep digestive tract both in vitro and in nature. During two experiments, the inhibition of the movement of the worm (*haemonchus contortus*) in the laboratory environment and the reduction of egg numbers in nature was studied. Farmers have used this plant for its anti-worm effect on the health of domestic animals. The aquatic extract reduced the worm movement by 94.44% whereas the ethanolic extract reduced it by 88.88% [14].

In the study of Csopor-Löffler B, the anti-proliferative effects of two flavonoids and sesquiterpenes of yarrow were studied on tumor cell culture. N-hexane-chloroform- aquatic- methanol extract of yarrow's aerial parts was tested on three tumor patients through MTT test (a color test method that changes from colorless to violet in the presence of the enzyme) and cell count (cell toxicity which causes lack of growth and death of other cells). When the reductase enzyme was activated [15].

Chloroform extract prevented the proliferation of Hela cells (from cancer cells of the womb) and MCF-7 cells (It was first discovered in the 1950s in polio. It reproduces rapidly, has telomerase and prevents telomere shortening, aging and cell death) and had a moderate impact on the A431 (cancer cells of the 85-year-old woman for testing cell cycle and cellular cancer). Sentinadine had the greatest impact among the five flavonoids and five sesquiterpenes. Apigenin, lutein and iso paulitin had a moderate effect whereas psilostachinc and diacetyl matricarin and sintinin did not show any effect. Paulitin and Cysticin had a significant effect on hela and MCF-7 cells, but this effect was obvious for 50 mg/kg group [15].

Given all the above effects, yarrow can reduce inflammation by reducing neutrophil counts. It can also fight through humoral and cellular immune responses (via lymphocytes) against bacteria, viruses and parasites and can destroy alien cells through increased monocyte and macrophage production. All of these, can be the reason for the charts.

CONCLUSION:

According to the results, we can conclude that Yarrow strengthens the immune system through increased white blood cell counts and other immune parameters. It also increases the red blood cell and, consequently, increases hematocrit and hemoglobin.

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CONFLICT OF INTEREST

Authors claim that there is no conflict of interest.

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