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Research Article

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The Effect of Raw Garlic in Diet, on Blood Phase and Intestinal Parasites of Adult Sheep

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Abstract

Background and aim: The presence of parasites in the digestive system causes various lesions that vary in severity depending on the type and number of parasites. These disorders include diarrhea, anorexia, weakness, weight loss, decrease in animal production, decrease in absorption of food, and in acute and super acute forms cause death. Considering the importance of the infection of sheep with various gastrointestinal parasites, the purpose of this research was to investigate the effect of raw garlic on the intestinal parasites of sheep.
Materials and Methods: This experiment was conducted for 2 months from the first of November to the end of December. For this project, 40 sheep with an average weight of 58.5 kg (Averaged) were used. Animals were divided into the control group, the positive control (drug recipient), the group receiving 10 grams of garlic (per head), and the group receiving 20 grams of garlic (per head). For this research, in addition to counting the number of parasite eggs by flotation method, the Famacha test and hematocrit test were performed and for data analysis, CRD completely random design was used.
Results: The results showed that the Famacha test of sheep receiving garlic decreased ($P<0.05$). However, the results of the hematocrit test of sheep were not significantly different from the control ($P<0.05$). Also, the addition of garlic to the diet of adult sheep decreased the number of *strongyloides*, *Marshallagia*, *Nematodirus*, *Trichius*, and the total number of parasite eggs per gram of feces (EPG), which was significant ($P<0.05$). In general, it can be said that adding 20 grams of garlic to the diet reduced the number of parasite eggs.
Conclusions: The results of the present research show that the amount of consumption of English eggs in sheep that are used with anti-parasitic drugs is very high. For this purpose, anti-parasitic drugs or medicinal plants that have anti-parasitic effects should be used. As found in this research, the use of high levels of raw garlic in the diet reduces digestive parasites and also increases blood mass.

Keywords: *Raw garlic, Intestinal parasites, Blood phase, Adult sheep*

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Introduction

Meat produced by small ruminants is recognized as an important food source worldwide (Malik & Sajid, 2015). The main goal of sheep breeding is to improve meat production to provide a part of people's increasing need for animal protein (Vatankhah *et al.,* 2009). However, various factors have an effect to achieve maximum production, one of these factors is raising livestock with a healthy digestive system because in humid areas, the presence of some parasites in the digestive system is common. However, various factors have an effect to achieve maximum production, one of these factors is raising livestock with a healthy digestive system, because in humid areas, the presence of some parasites in the digestive system is common. Parasitic infections are one of the problems that reduce livestock performance, so the presence of these parasites in the rumen and reticulum causes anorexia, reduced growth, diarrhea, weight loss, and reduced livestock products such as milk and wool, which depending on the type of ration, type and breed of livestock, it sometimes even causes death. (Sharma *et al.,* 1997).

Generally, determining the number of parasite eggs in feces is a tool to quantify the presence of parasites in sheep (Singleton *et al.,* 2011). The studies conducted show that the presence of gastrointestinal parasites can reduce the growth of lambs by 25% without clinical symptoms. Meanwhile, lambs under 6 months are more susceptible to infection than adult sheep (Rehbein *et al.,* 1999). Parasites located in the intestines of animals use the nutrients in the digestive system or feed on the blood of animals that causes a decrease in appetite, a decrease in meat and milk production coefficient, and a decrease in the quality of leather, wool, and hair due to the decrease in proteins. But unfortunately, many nematodes and parasites can be directly or indirectly transmitted to humans and are considered common diseases between humans and animals (Jacobs *et al.,* 2016). Alternative sources of antiparasitic drugs are of interest to small livestock breeders due to their herbal nature and easy access (Knox *et al.,* 2006). Studies show that adding garlic to the diet reduces the number of intestinal parasites (Zargari, 1996). Garlic with its scientific name (*Allium sativum*) is a member of the Asparagus family of the Narcissus family and is used in most parts of the world as a spice and herbal medicine for the prevention and treatment of various diseases. This plant contains phosphorus, potassium, magnesium, zinc, calcium, iron, iodine, sulfur, and chlorine. On the other hand, it is a rich source of folate, thiamin, riboflavin, and niacin vitamins and also contains high amounts of vitamins A, K, and C. The active ingredient of garlic is allicin, which is a light yellow oily compound that creates the special aroma of garlic. This plant is one of the rare dietary sources with organic compounds. Studies show that garlic has anti-parasitic properties so the extract prepared from this plant prevented the growth and even caused the destruction of various microorganisms such as Giardia, and Leishmania in the laboratory environment (Azadbakht *et al.,* 2003; Lemar *et al.,* 2002). Teymourizadeh et al, reported that the sulfur compounds in garlic have the property of modulating the immune system and garlic extract increases the proliferation of lymphocytes and macrophages in mice (Teymourizadeh *et al.,* 2010). The antimicrobial properties of garlic are attributed to a compound called allicin, which is produced from alliin through the allinase (Lin *et al.,* 2000). Based on this, it seems necessary to investigate the addition of garlic to the diet of adult sheep to eliminate the parasites in the digestive system.

Materials and Methods

This experiment was conducted for 2 months from the first of November to the end of December. For this project, 40 sheep with an average weight of 58.5 kg were used. Animals in 4 groups: control, positive control group (2 ml of albendol per 10 kg of body weight and 1 ml of triclabendazole and levamisole per 5 kg of body weight), the group receiving 10 grams of garlic (per head), the group receiving 20 grams of garlic (per head) was divided. For this study, in addition to counting the number of parasite eggs per gram of feces (Figure 1) by flotation method, the Famacha test, and hematocrit test were performed. To check the eggs of *Nematodirus*, *Marshallagia*, *Trichius*, and *Nematode* eggs in the feces sample, 10 grams per head were collected directly from the rectum of the lambs. To prevent hatching of eggs, the samples were tested on the same day. The number of parasite eggs per gram of feces was calculated for *strongyloides*, *Marshalgia*, *Nematodirus*, and *Trichius* eggs by the Clayton Lane method (Castelino & and Herbert, 1972).

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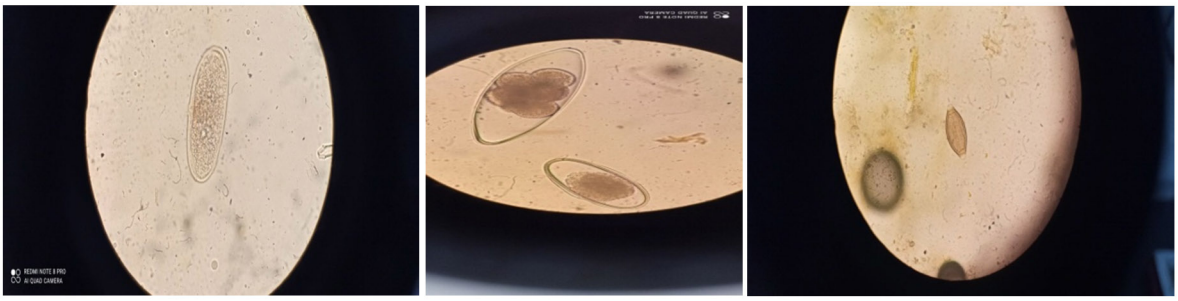

Figure 1. Images of parasite eggs in sheep feces samples.

Also, the Famacha test was used to control parasitic diseases and anemia caused by it. According to the investigations carried out on the last day of the experiment, the lambs were placed in natural light and the color of the inner part of the eyelid was compared with the color of the card, and according to Figure 2, its range was in the range of 1 to 5 (1- optimal level, 2- acceptable level). , 3- border limit, 4- dangerous limit, 5- lethal limit of the parasite) were recorded. As the Famacha number increases, the inner part of the eyelid becomes lighter.

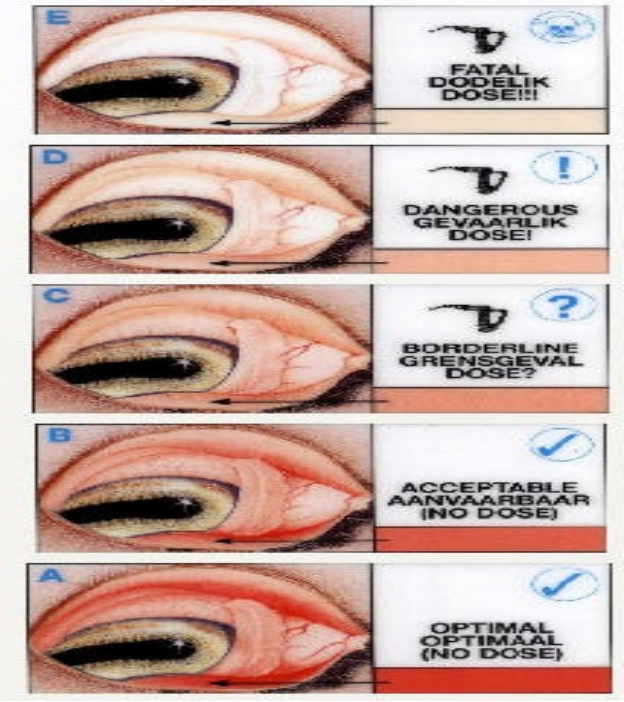

Figure 2. Famacha card test.

The hematocrit test was done by the microhematocrit method. To perform this test, several capillary blood samples were prepared. Almost half of the tubes were filled with blood, then the ends of the tubes were blocked with paste, then the tubes were centrifuged for 5 minutes at 1200 rpm. After separating the plasma with a special ruler, the hematocrit was obtained according to the hematocrit instructions. In this research, a completely random design and the following statistical model were used to analyze the data:

$yij = \mu + Ti + eij$

yij: the value of each observation, μ: average of each observation, Ti: treatment effect, eij: experimental error related to data observation. The data were analyzed using SAS statistical software version 9.1 with the GLM procedure in CRD completely randomized design. Duncan's multiple range test was also used to compare the means.

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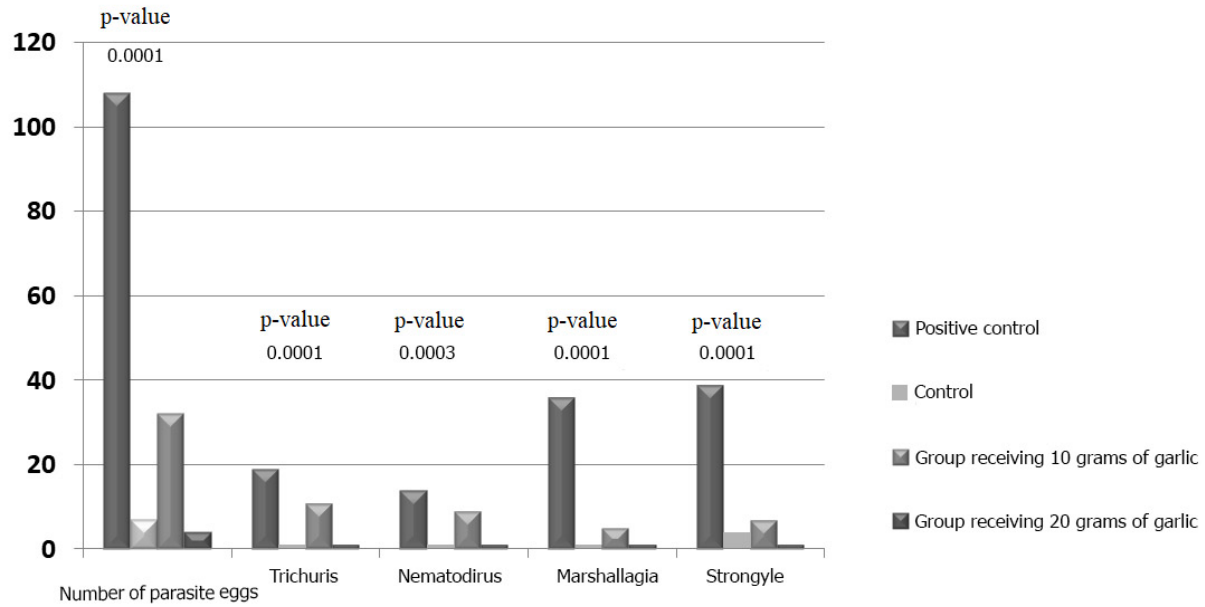
Results

The investigation of the addition of raw garlic in the diet on the number of intestinal parasites on the volume of blood cells is shown in Table 1. The results show that the experimental treatments made the Famacha test significant in sheep ($p<0.05$). So, the Famacha test of sheep that were fed with the treatment containing garlic was much lower compared to the control (Table 1). But the comparison of the results of blood cell volume analysis showed that the blood cell volume was not affected by the experimental treatments ($p<0.05$). But adding 20 grams of garlic to the sheep's diet increased the percentage of hematocrit.

Groups	Famacha test	Hematocrit (percentage)
Positive control	3.75^{a}	20
Control	1.25^{b}	22
Group receiving 10 grams of garlic	1.75^{b}	20.5
Group receiving 20 grams of garlic	1.25^{b}	21.25
Standard error	0.763	2.1
P value	0.001	0.592

Table 1. Mean and standard error of Famacha test and hematocrit percentage in different groups. ^{ab} Dissimilar letters in different columns indicate the existence of significant statistical differences ($P<0.05$).

The investigation of adding raw garlic to the diet on the number of intestinal parasite eggs per gram of feces is shown in Graph 1. The results show that the addition of garlic reduced the amount of *strongyloides* and *Marshallagia* eggs ($P<0.05$). Also, the high level of garlic in the diet decreased the amount of *Nematodirus* and *Trichiuris* eggs in the feces of sheep ($P<0.05$). Counting the total number of parasite eggs per gram of feces (EPG) shows that the total number of parasite eggs in sheep feces was affected by the experimental treatments. So that the treatment containing 20 grams of garlic in the diet of sheep reduced the number of parasite eggs ($P<0.05$).



Graph 1. The mean number of parasite eggs in different groups.

Discussion

The present study is perhaps the first experimental study in this field that has obtained a favorable result. The results of adding raw garlic to the diet of sheep, especially by increasing its amount, caused a significant decrease in the number of intestinal parasites. The results showed that adding 20 grams of garlic to the diet had a positive effect on the Famacha

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test and hematocrit. The comparison of the Famacha test among different treatments was significant. In this test, with a decrease in the score, anemia decreases, which shows that the contamination of the animal is less, but on the contrary, an increase in this value indicates high contamination of the animal. On the other hand, the results of the hematocrit test also show that the volume of blood cells is higher in the sheep receiving the anti-parasitic drug and also in the sheep fed with 20 grams of garlic daily. The frequency of parasitic infections in sheep depends on factors such as breed, parasite species, epidemiological data, host age, humidity, parasite growth stages, rainfall, temperature management, and geography (Nwosu *et al.,* 2007). Meanwhile, several plant species with anti-parasitic properties have been identified, the mechanism of action of these substances has not been fully investigated, but research shows that these substances can directly, indirectly, or have a combined effect on the parasites of the digestive tract (Athanasiadou *et al.,* 2000) So that in the direct method, the effective substance of the plant affects the surface proteins of the parasite and causes the destruction of the parasite (Heckendorn, 2005). In the indirect method, dense tannins released by the plant form a complex with the surface proteins of the parasites and enter the rennet without degradation. In rennet, these complexes are released and decomposed, and then they are ready for absorption (Min *et al.,* 2003). Parasites located in the intestines of animals cause anemia in two ways, either they use the nutrients in the digestive system or they directly use the blood of animals for nutrition, which in addition to anemia causes a decrease in Appetite also increases (Jacobs *et al.,* 2016).

However, due to the presence of high allicin in garlic and the reduction of parasite eggs in the digestive tract, the response of sheep fed with high levels of garlic was positive in Famacha and hematocrit tests. On the other hand, the results show that feeding sheep with 20 grams of garlic daily reduced the number of parasite eggs. Reports show that allicin present in garlic has an inhibitory effect on the cysteine protease enzyme of amoeba (Serge *et al.,* 1997). During the investigations, the researchers reported that feeding mice with garlic extract reduced toxoplasma tissue cysts in the mouse brain (Anthony *et al.,* 2007). Parasites living in the intestines of animals compete with the absorption of nutrients in the digestive tract and cause diarrhea (Jacobs *et al.,* 2016). But during the research conducted in 2006, it was found that different levels of garlic caused the destruction of parasite eggs in the digestive system and caused the treatment of gastroenteritis diarrhea (Fernando *et al.,* 2006).

Conclusion

The cost of chemicals to control parasites in the digestive system, creating resistance to these chemicals, and finally the presence of residues of these substances in animal meat is one of the major problems facing the sheep breeding industry. To overcome these problems, it is necessary to identify effective substances in local medicinal plants according to the geographical location and determine their mode of action. Perhaps the current study is one of the few experimental studies in this field, but considering the positive results obtained, it can be said that garlic is a natural antiparasitic substance. So that the addition of high levels of it had a positive effect on the blood phase of sheep, which is due to the reduction of the eggs of digestive system parasites.

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Conflict of interest

The authors declare that they have no conflict of interest.

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بررسی افزودن سیر خام در جیره، بر فاز خونی و میزان انگل های روده ای گوسفندان بالغ

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چکیده

زمینه و هدف: استقرار انگل در دستگاه گوارش باعث بروز ضایعات مختلف شده، که بسته به نوع و تعداد انگل، شدت و حدت اختلالات متفاوت است، این ضایعات شامل اسهال، بی اشتهایی، ضعف، کاهش وزن، کاهش تولیدات دامی، کاهش جذب مواد غذایی و در اشکال حاد و فوق حاد باعث مرگ و میر می شوند. نظر به اهمیت آلودگی گوسفندان به انواع انگل های گوارشی، هدف از انجام این تحقیق بررسی تاثیر سیر خام بر انگل های روده ای گوسفندان می باشد.

مواد و روش‌ها: این آزمایش از اول آبان ماه تا آخر آذر ماه به مدت ۲ ماه انجام شد. برای انجام این طرح از ۴۰ رأس گوسفند با میانگین وزنی ۵۸/۸ کیلوگرم استفاده گردید. حیوانات در گروه های: کنترل، گروه کنترل مثبت (دریافت کننده دارو)، گروه دریافت کننده ۱۰ گرم سیر (به ازای هر رأس)، گروه دریافت کننده ۲۰ گرم سیر (به ازای هر رأس) تقسیم بندی شدند. برای این تحقیق علاوه بر شمارش تعداد تخم انگل به روش شناور سازی، تست فاماچا و آزمایش هماتوکریت انجام شد و برای آنالیز داده ها، از طرح کاملا تصادفی CRD استفاده گردید.

یافته‌ها: نتایج نشان داد که تست فاماچای گوسفندان دریافت کننده سیر کاهش یافت ($P<0/05$) اما نتایج تست هماتوکریت گوسفندان اختلاف معناداری با تیمار شاهد نداشت ($P>0/05$). همچنین افزودن سیر در جیره گوسفندان بالغ باعث کاهش تعداد تخم *استرونگل*، *مارشالاجیا*، *نماتودیروس*، *تریشیوس* و در کل مجموع تعداد تخم انگل در هر گرم مدفوع (EPG) شد که این کاهش معنادار بود ($P<0/05$). به طور کلی می توان گفت افزودن ۲۰ گرم سیر در جیره باعث کاهش تعداد تخم انگل گردید.

نتیجه‌گیری: نتایج تحقیق حاضر نشان می دهد که میزان آلودگی به انواع تخم انگل در گوسفندانی که از داروی ضد انگل استفاده نکرده اند بسیار بالاست. برای این منظور بایستی از داروهای ضد انگل و یا گیاهانی دارویی که اثرات ضد انگل دارند استفاده شود. به طوریکه در این تحقیق مشخص گردید استفاده از سطوح بالای سیر خام در جیره باعث کاهش انگل های گوارشی و همچنین باعث افزایش توده خونی شد.

واژه های کلیدی: *سیر خام، انگل های روده ای، فاز خونی، گوسفندان بالغ*

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