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Addition of selenium nanoscale to high diets with wheat bran and its effect on Biochemical and characteristics blood and somatic cell count in milk in Awassi ewes

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A B S T R A C T

The study was conducted to investigate the effect of selenium nanoscale in improving the utilization of high wheat bran diet using 15 Awassi ewes weighing 51.58 ± 1.71 kg and their ages ranged between 3-4 years, the ewes were divided into three groups, each group included five ewes, the ewes were fed during the study period, which amounted to 72 days, and the amount of feed provided to ewes was equivalent to 1.5 kg of dry matter per ewe per day. The first group (control) was fed a diet high in barley grains with an ideal percentage of wheat bran, in the second group the ewes were fed a diet that contained less barley with a bran percentage raised to 35% of the components of the diet, while the third group was fed a diet similar to the second diet with daily doses of ewes with 0.3 mg / ewe of nano-selenium. The results indicated that there were no significant differences (P≤0.05) for the biochemical blood traits, in Blood standards for a blood picture, there was no significant difference in the number of white blood cells, the percentage of lymphocytes, the mean corpuscular volume, the number of red blood cells, and blood hemoglobin. At the same time, the ratio of granulocytes increased for each of the second and third treatments, the platelet Counts decreased for each of the second and third treatments, and the number of somatic cells was much less in the second period of the study in Bran and selenium groups compared to control.

Introduct ion

The composition of milk and body weight are usually affected by nutrition and additives to the diet[1-4]. Taking into account the achievement of some economic return from raising milk animals or reducing the costs of breeding, most sheep breeders resort to the use of feed alternatives or food processing wastes that are not used in human nutrition, spelt bran is an essential component in the diet of agricultural animals and one of the most exploited feed alternatives in this area, and the percentage of its use in diets may reach 50% of the components of the diet, as its cost is estimated at about 60-70% of the cost of barley grains, wheat bran contains a good percentage of protein Up to 17%, which is also high in fiber, as its content of neutral washing fibers is 42.5% and acid washing fibers are 15.5% [5]. Thus, it can improve the quality of milk in sheep as it increases the percentage of fat in it due to the increase in the production of acetate in the rumen[6] But in fact, these desired benefits of using bran are not achieved for several reasons, the totality of which is related to the nature of the content of wheat bran from some compounds[7] . have pointed out that spelt bran contains anti-nutrients such as glutens, β-glucans and phenols that can reduce the digestion and absorption of protein and starch in the gut[8]. Although bacteria, pertoire and fungi in the rumen play a major role in removing these substances that reduce food utilization [9]. However, the deterioration or negative impact on production continues [10]. This problem is not related to a specific feed material, but it is a general problem in animal nutrition, and for the purpose of processing, enzymes were used in the treatment of feed before feeding them to animals in order to improve the digestion of food and the processing of a larger amount of absorbable and metabolic food compounds to support production. On the other hand, for the purpose of enhancing the efficiency of the use of feed materials with a high fiber content, there is a need to provide a suitable environment for microorganisms in the rumen to work effectively and increase the microbial protein produced from these feeds, and this is usually done through the use of classic additives such as acidity rates and vital enhancers such as yeast that activate the work of microorganisms in the rumen, it has been noted through previous studies that the element selenium has an important role in improving rumen fermentations, microbiology activity and digestion. Inside the rumen [11,12]. It has also been shown that pregnant or newly born animals are susceptible to diseases as a result of low immunity due to metabolic stress, and the milk gland is often the most vulnerable part of the body to infections [13]. Which leads to a decrease or cessation of the animal from production, all these problems can be treated or immunized against them by supporting the animal's diet with selenium nano, which leads to improving the animal's immunity and benefiting from food and can also maintain the integrity of the milk gland and the quality of the milk produced due to the transfer of selenium to milk, which is an important factor to promote the health of newborns that get milk or even the health of humans consuming milk [14]. According to the data mentioned above, This study was designed to investigate the effect of high-rate wheat bran supplementation with nano-selenium on blood biochemical characteristics, blood parameters and somatic cell count in milk in Awassi ewes.

Materials and Methods

The study was conducted in the animal field of the Department of Animal Production / College of Agriculture and Forestry / University of Mosul, using fifteen Awassi ewes with an average initial weight of 51.58 ± 1.71 kg and their ages ranged between 3-4 years, the ewes were divided according to milk production and their weights into three groups, each group included five ewes, the ewes were fed in the experimental groups gradually on the diets and the collective feeding system was followed during the study period, which amounted to 72 days, and the amount of feed provided to the ewes was equivalent to 1.5 kg dry matter. For each ewe daily. The concentrated feed consisted of barley, spelt bran and soybean meal as shown in Table (1) as the first group (control) was fed on a diet high with barley grains and with an ideal proportion of wheat bran and only [5], in the second group ewes were fed a diet that contained less barley with a percentage of bran to 35% of the components of the diet, while the third group was fed a diet similar to the second diet with ewes dosed daily in the amount of 0.3 mg / ewe Of nano-selenium with purity of 99.9% and a size of less than 80 nm and manufactured by (NANOSHEL LLC Wilmington DE- 19808 United State) after diluting it with distilled water by 5 cm^3 after morning feeding, the feed was provided daily in two meals, the first at eight in the morning and the second at four in the evening, while the coarse feed (hay) was provided in the amount of 0.5 kg / ewe per day, as the quantity was divided into two meals as well. The next morning and before serving the morning feed meal to the groups of ewes. Clean water and mineral salt cubes were continuously provided to the animals, in addition to that, all ewes and lambs were taken out daily for grazing for three hours to graze on short grasses as green coarse fodder in pastures near the animal pens.

Blood samples were drawn at a rate of 5 ml from each animal through the jugular vein every 21 days after feeding, the samples were placed in tubes containing heparin and separated by a centrifuge at a speed of 3500 rpm for 15 minutes, then stored at -20 °C until analysis. The concentrations of some blood traits were estimated using a spectrophotometer. The blood picture and some other parameters represented by white blood cells, red blood cells, haemoglobin and the volume of

blood cells stacked were analyzed using a mineral device of Chinese origin, in addition to measuring somatic cells using the Mini Milk Analyzer - Somatos.

Table 1. Components of the concentrated feed mixture for experimental diets

Feed material	Control Group	Two bran groups	
		- Selenium Nanoparticles	+Selenium Nanoparticles
Crushed barley	68.75	50	50
Wheat bran	17	37	37
Soybean meal	11	10	10
Urea	0.75	0.5	0.5
salt	1	1	1
Limestone	1	1	1
Sodium bicarbonate	0.5	0.5	
Chemical analysis based on dry matter%			
Dry material	90.98	91.12	
Ash	5.75	6.05	
Raw protein	16.01	16.40	
Raw fiber	7.20	7.89	
Ethar extract	1.54	1.75	
Nitrogen -free extract	54.36	52.24	
Mica Gol metabolic energy/ kg	10.35	10.15	

Chemical analysis of the components of the feeds of concentrated feed and hay was actually performed according to[15], on the basis of dry matter, the nitrogen-free extract was estimated mathematically, and the energy value of the feed was calculated according to[16].

The averages were compared using the[17] polynomial test to determine the significance between the averages. According to the following mathematical model:

$Y = \mu + Ti + eij$

Whereas:

μ = overall average of views.

Ti = Effect of experimental treatments spelt bran or spelt bran and selenium nano.

Yij = Standard error for experimental observations.

Results and Discussion

Biochemical blood traits

The results of blood measurements for the biochemical characteristics of the blood in Table (2) indicate that the concentration of blood proteins of total protein, albumin and globulin was close between the three treatments and the differences between them did not reach the level of significance as the total protein reached 6.31, 6.40 and 6.44 g / 100 ml, albumin 4.38, 4.38 and 4.28 g / 100 ml, globulin 1.93, 2.13 and 2.16 g / 100 ml respectively and that the values were within the normal range in the blood of sheep and as reported About [18]. These results were consistent with what [19] obtained when nanoselenium was added to the second group of ewes and [20] when using Holstein calves with two different doses of nanoselenium. But it did not agree with what [21] obtained when using Holstein cows and at different doses of nanoselenium, the results led to a significant increase in the second group and the selenium nanoconcentration was 0.2 mg/kg of dry matter compared to control. The blood creatinine level was very close between the treatments and was 0.91, 0.92 and 0.93 mg/100ml. These results did not agree with [22] when using selenium at a concentration of 5.0 mg/kg feed, as a significant decrease in the creatinine level was found in the second and fourth treatments compared to the control 72.1, 61.1 and 17.2 mol/L after 90 days. The concentration of blood glucose decreased significantly ($P \geq 0.05$) in the treatment of bran and selenium (third) as it reached 35.11 mg / 100 ml compared to the control coefficients 42.17 mg / 100 ml and bran as it was 45.90 mg / 100 ml, as it is noted that the concentration of glucose in the treatments was within the minimum rate of glucose in the blood of ruminants, which ranges between 40-80 mg / 100 ml and a decrease from the normal range in the third treatment bran and selenium the discussion of the cause of low glucose levels can be enhanced by mentioning the milk yield rate concentrations of the treatments. These results did not agree with [20] where no significant differences were shown when using selenium nanometers at concentrations of 0.5 and 1 mg/kg. The results of triglycerides in the blood indicated that their concentrations were not significant between the treatments, although their value in the blood of ewes of high barley treatment (first) was the highest mathematically, amounting to 52.64 mg / 100 ml compared to the other two treatments containing bran or bran and selenium, as it was 46.96 and 46.40 mg / 100 ml, respectively. This is what I agreed with [19,22] where it led to a significant decrease in the level of triglycerides in the group treated with selenium nano, but this decrease indicates an improvement in lipid metabolism. As for the concentration of cholesterol in the blood, no significant differences were recorded between the coefficients, as it amounted to 178.99, 178.78 and 185.53 mg / 100 ml, respectively, but did not agree with the results of [19,20,22] when using selenium nano, which led to a significant significant decrease in cholesterol levels. The values of urea concentration in the blood

in the first treatment were 44.66 mg/100 ml and the second treatment was 43.37 mg/100 ml, and this value decreased in the third treatment, but not significantly, to 38.35 mg/100 ml. This is what I agreed with [22] where urea levels were significantly reduced during two periods when using selenium nanoscale at a concentration of 0.5 mg/kg feed. This did not agree with [21], where the results found no significant differences when using different concentrations of selenium nano.

Table 2. Effect of Feed Content of Spelt Bran and Selenium Nano-Addition on Biochemical blood traits

Blood characteristics	Treatment		
	control	Second treatment (bran)	Third treatment (bran + selenium)
Protein	6.31± 0.07a	6.40±0.07a	6.44±0.07a
Albumin	4.38±0.38a	4.38±0.37a	4.28 ± 0.26a
Clubolin	1.93±0.41a	2.13±0.33a	2.16 ±0.30a
Creatine	0.91±0.03a	0.92± 0.03a	0.93± 0.02a
glucose	42.17±1.29a	45.90 ±2.09a	35.11± 2.30b
Triglycerides	52.64±2.54a	46.96 ± 1.84a	46.40± 2.40a
Cholesterol	178.99 ±15.38a	178.78 ±22.63a	185.53 ±21.87a
Urea	44.66±3.99a	43.37±2.23a	38.31±2.01a

Blood characteristics

Blood measurements in Table (3) indicate that the number of egg blood cells was not significantly affected between the three groups. The numbers were similar, with the control group recording 32.49, the bran group 33.08, and the bran group with selenium 31.67. It was an arithmetic increase in the bran group from the rest of the groups and not significant. While it did not agree with the results of [20,23] where a significant increase in the number of white blood cells was found when using selenium nano. With regard to the proportion of lymphocytes, there was also no significant difference between the three coefficients. The ratios were similar in the control treatment, in the bran treatment, and in the bran treatment with selenium 68.66, 63.46 and 63.43 respectively. There were no significant differences between the three groups. The ratios were 10.53% in the control group, 10.04% in the bran group, and 9.30% in the bran group with selenium. The ratio in the control group was 21.56, while it increased to 26.50 in the bran group and 27.27 in the bran group with selenium. This increase in granulocyte ratio may indicate that bran nutrition, with or without selenium, may stimulate an innate immune response. Similarly, for the number of red blood cells, the results in Table (3) indicate that there are no significant differences between the three groups. The control group had red blood cell counts of 7.63, bran group 8.49, and bran group with selenium 7.90. This result agreed with [20] when using selenium nano, significant differences did not appear between the two groups, but did not agree with [24] when using selenium nanoscale at a concentration of 50 mg / 1 ml / 50 kg led to a significant increase in red blood cells and its disagreement with [23] The use of selenium nanocells may lead to a slight increase in the number of red blood cells initially, followed by a decrease and restoration of normal levels in the long term. In comparison, selenite shows Sodium has more stable effects at first but with a marked decrease in subsequent days. The control group shows small and constant changes in the number of erythrocytes. The results in Table (3) indicate that the values of hemoglobin in the blood of ewes were with non-significant differences between the coefficients and amounted to 90.00, 92.07 and 87.84 g / liter and these values were close to the normal hemoglobin values in the blood of Awassi ewes that were found in the [25] for ewes of ages and stage of production similar to the current study. This result agreed with [20,24] when using selenium nanoscales and at different concentrations to no significant differences between the groups. The results in Table (3) showed significant differences in the number of platelets between the groups. The control group recorded the highest platelet count at 277.53, while the numbers in the bran group and the bran group with selenium decreased by 204.76 and 225.15 respectively. This decrease in the number of platelets may indicate undesirable effects on blood clotting as a result of these dietary treatments. This is what I agreed with [20] when using selenium at a concentration of 1 mg/kg also led to a decrease in platelet counts. While it did not agree with [24] and when using selenium injected under the skin at a concentration of 50 mg / 1 ml / 50 kg there were no significant differences between the groups.

Somatic cell count in milk

The results in Table (4) during the first period of milk production indicate that the number of somatic cells was close between the experimental coefficients and amounted to 822.6, 984.05 and 888.8 ($\times 10^3$ cells/ml) respectively. Also, the differences between the non-significant coefficients and the number of somatic cells in milk were close between the coefficients were 382.64, 390.4 and 321.74 ($\times 10^3$ cells/ml) respectively.

While the number of somatic cells in the second period (984.05, 390.4, 229.66, 465.75) ($\times 10^3$ cells/ml), respectively

During the third period, the values of the number of somatic cells were significantly low ($P \leq 0.05$) in the coefficients of bran and bran with selenium nanoparticles, as they amounted to 229.66 and 252.12 ($\times 10^3$ cells/ml) compared to the coefficient (control) as they were 577.4 ($\times 10^3$ cells/ml).

Table 3. Effect of Feed Content of Spelt Bran and Selenium Nano-Addition on Blood characteristics

Blood characteristics	Treatment		
	control	Second treatment (bran)	Third treatment (bran + selenium)
WPC	32.49±1.98a	33.08±1.18a	31.67±1.53a
Lymphocytes%	68.66±1.95a	63.46 ±2.09a	63.43±2.19a
MCV%	10.53±0.77a	10.04±0.58a	9.30±0.37a
Granulocyte%	21.56±1.71b	26.50±1.37a	27.27±1.18a
RPC	7.36±0.50a	8.49±0.16a	7.90±0.59a
blood hemoglobin	90±4.07a	92.07±3.18a	87.84±1.94a
platelet Counts	277.53± 12.28a	204.76 ±13.70b	225.15± 13.83b

With regard to the general average number of somatic cells in milk during the study period, it is noted that there is an arithmetic decrease that did not reach the level of significance in the treatment of bran and bran with selenium nanoscale compared to the high barley treatment (control) and the values were 559.07, 465.57 and 425.82 ($\times 10^3$ cells/ml) respectively. The number of somatic cells in milk compared to the values obtained by [25]. in Awassi sheep, which were about 344 × ($\times 10^3$ cells/ml) and 467.27 ($\times 10^3$ cells/ml) in the right and left part of the udder respectively, as well as the pattern of preparation of somatic cells during the stage of milk production is consistent with what was indicated by[26], as they show that the number of somatic cells rises at the beginning and end of the milk production period in ewes.

Table 4. Effect of Feed Content of Spelt Bran and Selenium Nanoscale on Somatic cell count in milk

Number of somatic cells in milk	Treatments		
	First transaction (control)	Second treatment (bran)	Third treatment (bran + selenium)
The number of somatic cells in milk in the first period 1-24 days	822.6±216.15 a	984.05±297.88 a	888.8±195.6 a
The number of somatic cells in milk in the second period 24-48 days	382.64±47.71 a	390.4a±42.90 a	321.74±34.96 a
The number of somatic cells in milk in the third period 48-72	577.4±53.57 a	229.66±33.66 b	252.12±37.89 b
The number of somatic cells in milk during the study period 1-72 days	559.07±69.28 a	465.75±104.54 a	425.82±85.13 a

Different letters horizontally indicate significant differences (P≤0.05).

Conclusion

Through this study, We conclude that the use of wheat bran and selenium did not have an effect on the characteristics of the blood except for a significant decrease in glucose concentration, while there was a significant difference in the components of the blood, including Granulocyte%, platelet Counts, as for somatic cells, we note that when using wheat palm and selenium, it led to a decrease in the number of somatic cells in the second and third stage of milking.

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