

Effect of Yeast (*Saccharomyces cerevisiae*) Enhanced with Selenium or Zinc on the Hematological Characteristics in Iraqi Does

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Abstract

This study was conducted to investigate the effect of yeast (*Saccharomyces cerevisiae*) enhanced with Selenium or Zinc on some hematological characteristics in the Iraqi female goats. The seventeen adult female goats 2-2.5 years old with average body weight (bw) 37.5 ± 2.5 kg that have at least one previous birth were used. The animals were randomly divided in to three groups, group 1 have 5 goats, group 2 and 3 have six goats. all does were fed same ration. Animals of group 1 (G1) were let without treatment which considered as a control group, Animals of group 2 (G2) was given yeast enriched with selenium (0.03 g/kg/bw), While Animals of group 3 (G3) were given yeast enriched with zinc (0.2 g/kg/bw). The animals were treated by dissolving the samples in 30 ml of distilled water and administered orally for 45 days. Blood samples were collected from the jugular vein during first day (first period), twelfth day (second period) fort- fifth day (third period) to carrying out blood tests. The results showed was significant increase ($P \leq 0.05$) in the count of the red blood cells, hemoglobin concentration and Hematocrit of second and third groups as compared with first group. While the second group was significant increase in the number of white blood cells compared with the first and third groups. From the results, it could be concluded that there synergistic effect of *Saccharomyces cerevisiae* with selenium or zinc may be attributed to improve some hematological aspects in does.

Keywords: *Saccharomyces cerevisiae*, Selenium, Zinc, hematological characteristics, female goats

تأثير الخميرة (*Saccharomyces cerevisiae*) المدعمة بالسيلينيوم او المدعمة بالزنك على بعض الصفات الدموية للماعز العراقي

الخلاصة

صممت هذه الدراسة لمعرفة تأثير خميرة الخبز (*Saccharomyces cerevisiae*) المعززة بالسيلينيوم او الزنك في بغض صفات الدم لإناث الماعز العراقي. استخدمت سبعة عشر معزة بالغة، ويعمر 2-2.5 سنة ذات ولادة واحدة سابقة على الأقل بمعدل وزن 37.5 ± 2.5 كغم. قسمت حيوانات التجربة عشوائيا الى ثلاثة مجاميع. كانت مجموعة السيطرة مؤلفة من 5 معزات، اما المجموعة الثانية والثالثة فقد تألفت من 6 معزات. تم تغذية جميع الحيوانات على نفس العليقة، واعتبرت المجموعة الاولى مجموعة السيطرة وتركت بدون اي معاملة. اعطيت المجموعة الثانية الخميرة المدعمة بالسيلينيوم بجرعة (0.03 ملغ/ كغم) من وزن الجسم، واعطيت المجموعة الثالثة الخميرة المدعمة بالزنك بجرعة (0.2 ملغ/ كغم) من وزن الجسم. تم اذابة الخمائر ب 30 مل من الماء المقطر واعطيت عن طريق التجريع الفموي ولمدة 45 يوم. تم سحب عينات الدم خلال اليوم الاول والثاني عشر والخامس والاربعون من تاريخ التجربة لغرض اجراء الفحوصات الدموية. اظهرت نتائج هذه الدراسة بتفوق المجموعة الثانية والثالثة معنويا ($P \leq 0.05$) في عدد كريات الدم الحمراء وتركيز الهيموغلوبين والنسبة المئوية للخلايا المكسدة بالمقارنة مع المجموعة الاولى. بينما تفوقت المجموعة الثانية والثالثة معنويا في اعداد كريات الدم البيضاء بالمقارنة مع المجموعة الاولى. من خلال هذه النتائج نستنتج ان الخميرة المدعمة بالسيلينيوم او الزنك حسنت من بعض الصفات الدموية و الحالة الصحية العامة للإناث.

Introduction

Selenium (se) is an essential trace mineral for human and animal, Se deficiency has been associated with various disorders, such as impaired fertility, retained placenta, apportion and repression of immunity (1; 2; 3). Dietary Se supplementation is the most common approach to improve Se status of animals. Se supplements are mainly in two forms: inorganic mineral salts, typically selenium selenate (Na_2SeO_4) or sodium selenite (Na_2SeO_3), and organic forms such as selenomethionine (SeMet) or Se-enriched yeast (SY). Se-enriched yeast, a highly available form of Se for domestic animals, is an ideal additive because it can be absorbed and retained more than inorganic Se (4; 5; 6). In addition, the antioxidants were used to improve production and reproduction. The new trend in the types of additives, including the use of zinc-supported yeast and organic selenium to improve production efficiency and improve the physiological characteristics of farm animals, which contribute to solving part of the problem (7). Bread yeast (SC) was used to improve fermentation of the rumen, to promote microbial growth, and to improve the stability of rumen fermentation. In addition, yeast supplementation provides some nutrients during digestion that affect microbial populations and their function in the rumen. From other hand, yeast improvement the body weight and feed conversion efficiency and carcass traits (8). Several studies have shown beneficial (9) Zinc is a nutritionally essential trace element for animals, as it assumes critical role for ensuring proper feed intake and nutrient utilization, skeletal and growth development, skin and hair integrity, nutrient metabolism, reproduction, and immunity (10; 11; 12; 13). Therefore, this study was designed to investigation the synergistic effect of yeast with organic selenium or zinc on some blood criteria in local Iraqi female goats.

Materials and methods

1- Experimental animals

The study was investigated in the animal farm of college of veterinary medicine / University of Fallujah, from 18/6/2019 until 2/8/ 2019. Seventeen adult females goats 2-2.5 years old with average body weight (BW) 37.5 ± 2.5 kg that have at least one previous birth were used. The females were numbering by plastic numbers at the ear. All females were fed a concentrated diet (3% from body weight). The ration consists from (barley 50%, wheat bran 35%, chopped straw 6%, soybean meal 8%, salt 0.5% and vitamins and minerals 0.5%). water, straw, alfalfa without bloom and minerals block were given ad libitum. During the adaptation period all goats were administered 2 ml from ivermectin subcutaneous and 10 ml of albendazole was orally administrated.

2- Experimental design:

The goats were divided randomly into three groups. group 1 have 5 goats, group 2 and 3 have six goats. all does were fed on the same ration. The first group was considered as a control group without treatment (G1), the second group (G2) was given yeast enriched with selenium (*Saccharomyces cerevisiae*-selenium) It is produced by a company made in China ,with dose (0.03 g/kg/bw) according to NRC (1980), the third group (G3) were given yeast enriched with zinc (*Saccharomyces cerevisiae* -zinc) It is produced by same company with dose (0.2 g/kg/bw) according to NRC (1980). The animals were treated by dissolving the samples in 30 ml of distilled water and given orally for 45 days.

3- Blood samples collection;

The blood samples were collected from the jugular vein during first day: first period, twelfth day (second period) and at fort- fifth day (third period) to determine the total Red blood cells count (RBC), Hemoglobin concentration (Hb),

Packed cell volume percentage (PCV%), Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH) and Red Cell Distribution Width (RDW), White blood cell (WBC), Lymphocyte, Monocyte and Granulocyte. All samples were measured by Biochemistry automatic analyzer (Erma INC model PCE-210N– Japan).

4- Statistical Analysis

The data were presented as Mean and Standard Error (Mean±SE) and subjected to statistical analysis using Two -way analysis of variance (ANOVA). In addition, post hoc test was used to find out the Least Significant Differences (LSD) between different means ($p \leq 0.05$). Statistical Package for the Social Sciences Program (SPSS) version 25 package was used for this purpose (14).

Results and discussion

The results of Table (1) showed that the group 2 and 3 were significant increase ($P \leq 0.05$) in the (RBC) compared with control (group 1), while the third period was significant increase compared with first and second periods. Perhaps the reason for the significant increase of the red blood cells count of second and third groups that treated with yeast supported with Se and Zn compared with control, due to the synergistic effect of the yeast enriched with selenium and zinc in protecting and developing the cellular membrane of the blood corpus and its association with proteins (15). From other hand, it is attributed to the increase in the absorption of nutrients in the intestine due to the increase in microbial activity inside the rumen using yeast, in addition the role of selenium and zinc in the production and maintenance of red blood cells through its association with blood proteins (16). The results of study (RBC) was agree with (17) when he used ration supplemented with Zn significant increase of the RBC count. From other hand the results were disagree with (7; 18).

The results of hemoglobin concentration and Packed cells volume % which illustrated in Table (2 and 3) showed that the group 2 and 3 were significant ($P \leq 0.05$) increase compared with group 1 at second and third periods. On the author hand the third period was significant increase compared with first and second periods. This could be due to the synergistic effect of the yeast enriched with selenium and zinc, as selenium and zinc are considered an antioxidant that protects the cells from the toxic effect of free radicals, as well as being among the elements That contribute to increasing absorption of metallic elements such as iron, which is the core of hemoglobin, (19; 20), as well as their role in increasing iron representation that raises the hemoglobin level in the blood (16). The results of current study (Hb) and (PCV) were agree with (17) when he treated sheep which Se showed a significant differences of the hemoglobin. While the results were disagreeing with (7; 18).

Table (7) showed the group 2 was significant increase ($P \leq 0.05$) in the white blood cells compared with group 1 and 3, while the group 3 was significant increase compared with group 1. On the other hand, the third period was significant increase compared with first and second period. whereas the second period was significant increase compared with first period. The results of this study were agree with the findings of others studies (7; 21; 22; 23 and 24), whom observed the added of Y+Se and Y+Zn. Caused increased of the WBC counts. The counts of WBC were disagree with results (25) whom used different doses of Zn to the Nubia goats kids, these differences of results are due to physiological condition of animals such as age, sex and pregnancy. The reason for the second group was significant increase in the numbers of white blood cells compared with first and third group may be due to the synergistic effect of the yeast enriched with selenium, which the yeast contributes to increasing the absorption of selenium in the intestine, which contributes to the last in stimulating the immune system as well as

being an antioxidant (26). in addition, the role of selenium its effect on blood components through the binding and protection of cellular membranes and organelles within the cell through the action of selenium as an antioxidant and thus prolongs the life of white blood cells (21). And role of Zinc is necessary to important role in maintaining the immune system through the development of the thymus gland and the role of zinc as an antioxidant that works to protect the cells of the body from the toxic effect of free radicals (22). While table (8 and 10) showed there are not significant increase between groups and periods of Lymphocyte and granulocyte percentage. However, table (9) showed that the third period in the G3 was significant increase ($P \leq 0.05$) in the monocyte percentage compared with first period.

The results of this study were agree with the others study's findings of (17; 24) whom observed the added of Y+Se and Se an different doses didn't effect on the Lymphocyte, Monocyte and Granulocyte. The presents study was agree with (18) when he treated sheep whith Se showed a significant defferences of the percentage of the Lymphocyte, Monocyte and Granulocyte.

Table (1) effect of yeast enriched with Selenium or Zinc on the red blood cell (RBC) of the female goats (cell $\times 10^6$ /ml)

Periods	Treatments		
	Group 1	Group 2	Group 3
First period	6.42 $\pm$ 0.36 B c	8.10 $\pm$ 0.57 A c	8.33 $\pm$ 0.46 A c
Second period	8.95 $\pm$ 0.20 B b	10.30 $\pm$ 0.18 A b	10.75 $\pm$ 0.26 A b
Third period	11.64 $\pm$ 0.10 B a	12.25 $\pm$ 0.33 A a	13.35 $\pm$ 0.20 A a
LSD of group= 1.16		LSD of Period= 1.04	

The different capital letters refer significant differences between groups within one raw at ($P \leq 0.05$). The different small letters indicate significant differences between the times within one column at ($P \leq 0.05$)

Table (2) effect of yeast enriched with Selenium or Zinc on the hemoglobin of the female goats (g/dl).

Periods	Treatments		
	Group 1	Group 2	Group 3
First period	6.58 $\pm$ 0.47 B c	7.88 $\pm$ 0.10 A c	8.23 $\pm$ 0.39 A c
Second period	7.81 $\pm$ 0.39 C b	9.58 $\pm$ 0.21 B b	10.92 $\pm$ 0.27 A b
Third period	10.40 $\pm$ 0.53 B a	11.90 $\pm$ 0.33 A a	12.52 $\pm$ 0.28 A a
LSD of group= 1.1		LSD of Period= 1.04	

The different capital letters refer significant differences between groups within one raw at ($P \leq 0.05$). The different small letters indicate significant differences between the times within one column at ($P \leq 0.05$)

Table (3) effect of yeast enriched with selenium or zinc on the Hematocrit of the female goats (%).

Periods	Treatments		
	Group 1	Group 2	Group 3
First period	21.74 $\pm$ 1.40 B c	25.65 $\pm$ 0.31 A c	26.70$\pm$1.18 A c
Second period	25.43 $\pm$ 1.17 C b	30.75 $\pm$ 0.64 B b	34.74$\pm$0.82 A b
Third period	32.12 $\pm$ 1.60 B a	37.70 $\pm$ 0.99 A a	39.56$\pm$0.84 A a
LSD of Period= 3.2		LSD of group= 2.27	

The different capital letters refer significant differences between groups within one raw at ($P \leq 0.05$)

The ifferent small letters indicate significant diffiencnes between the times within one columnn at (P0.05)

Table (7) effect of yeast enriched with selenium or zinc on the White blood cell (WBC) of the female goats (cell $\times 10^3$ /ml)

Periods	Treatments		
	Group 1	Group 2	Group 3
First period	8.38 $\pm$ 0.12 b	8.90 $\pm$ 0.26 c	8.65 $\pm$ 0.33 c
Second period	9.22 $\pm$ 0.13 C ab	11.57 $\pm$ 0.34 A b	10.38 $\pm$ 0.40 B b
Third period	10.14 $\pm$ 0.14 C a	12.73 $\pm$ 0.38 A a	11.42 $\pm$ 0.44 B a
LSD of group=0.93		LSD of Period= 0.97	

The different capital letters refer significant differences between groups within one raw at ($P \leq 0.05$)

The different small letters indicate significant differences between the times within one column at ($P \leq 0.05$)

Table (8) effect of yeast enriched with selenium or zinc on the Lymphocyte % of the female goats

Periods	Treatments		
	Group 1	Group 2	Group 3
First period	0.78 $\pm$ 0.05	0.8 $\pm$ 0.04	0.70 $\pm$ 0.07
Second period	0.69 $\pm$ 0.10	0.76 $\pm$ 0.08	0.69 $\pm$ 0.05
Third period	0.68 $\pm$ 0.08	0.64 $\pm$ 0.06	0.69 $\pm$ 0.04
LSD of group= NS		LSD of Period= NS	

Table (9) effect of yeast enriched with selenium or zinc on the monocyte % of the female goats .

Periods	Treatments		
	Group 1	Group 2	Group 3
First period	0.12 $\pm$ 0.03	0.1 $\pm$ 0.03	0.14 $\pm$ 0.0 b
Second period	0.14 $\pm$ 0.04	0.14 $\pm$ 0.04	0.16 $\pm$ 0.03 ab
Third period	0.17 $\pm$ 0.03	0.20 $\pm$ 0.03	0.25 $\pm$ 0.04 a
LSD of group= NS		LSD of Period= 0.1	

The different small letters indicate significant differences between the times within one column at ($P \leq 0.05$)

Table (10) effect of yeast enriched with selenium or zinc on the granulocyte % of the female goats.

Periods	Treatments		
	Group 1	Group 2	Group 3
First period	0.10 $\pm$ 0.02	0.10 $\pm$ 0.02	0.17 $\pm$ 0.05
Second period	0.16 $\pm$ 0.06	0.11 $\pm$ 0.04	0.15 $\pm$ 0.03
Third period	0.15 $\pm$ 0.06	0.16 $\pm$ 0.04	0.13 $\pm$ 0.03
LSD of group= NS		LSD of Period= NS	

Conclusion

From result concluded that the using of yeast enriched with Selenium or Zinc (*Saccharomyces cerevisiae*- selenium /zinc) lead to improve a counts of the White blood cells, and Red blood cells, concentration of hemoglobin, PCV, this improvement was done by synergism effect of *Saccharomyces cerevisiae* with selenium or zinc as organic form.

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