Original Article

Effect of *Saccharomyces cerevisiae* Fortified with Selenium on the Hematological and Some Biochemical Traits of Local Iraqi Goat

Amir Shareef, M[1], Al-Rawi, F. T[2], Kareem Jasim Aremmt, M[2], Thabit Jassim Alrawi, S[2] *, Omar, A. A[2], Muneeb Alrawi, H[3]

1. Presidency of University, University of Anbar
2. Department of Veterinary Public Health
3. Department of Surgery and Obstetrics, College of Veterinary Medicine, University of Fallujah

How to cite this article: **Amir Shareef, M, Al-Rawi, FT, Kareem Jasim Aremmt, M, Thabit Jassim Alrawi, S, Omar, AA, Muneeb Alrawi, H. Effect of *Saccharomyces cerevisiae* Fortified with Selenium on the Hematological and Some Biochemical Traits of Local Iraqi Goat. Archives of Razi Institute. 2023;78(4):1213-16.**

DOI: 10.32592/ARI.2023.78.4.1213

Article Info:
Received: 3 September 2022
Accepted: 10 December 2022
Published: 31 August 2023

Corresponding Author's E-Mail:
abbasmngata@gmail.com

ABSTRACT

Selenium (Se) is a mineral that is often used as a dietary supplement. Its deficiency has been associated with fertility disorders, as well as imbalances and inhibition of the immune system. This study aimed to estimate the role of organic selenium and *Saccharomyces cerevisiae* in improving kids' status, health, and physiological conditions. In total, 10 goat kids at seven days were used, with an average started life body weight (b.wt.) of 4±0.2 kg, and they were divided into two groups. Group 1 (G1) was treated with Se-fortified yeast (*Saccharomyces cerevisiae*+Se) with a dose (30 mg/kg) of body weight. On the other hand, group 2 (G2) was the control group and left untreated. The treatment was started from 7 days of age until three months of age. The kids were administered orally daily for three months of the experiment. The jugular vein was used to draw blood samples within 90 days of the experiment to measure RBC, Hb, PCV, and WBC. Blood serum was separated using a centrifuge to estimate ALT, AST, total protein, Albumin, and Globulin concentrations. The results revealed that Hb, PCV, and Globulin were increased significantly in the G1 ($P \leq 0.05$), compared to the control group. Moreover, AST was improved, compared to the control group. These results showed that using yeast fortified with organic Se has improved hematological and biochemical parameters' concentration.

Keywords: *Saccharomyces cerevisiae*, Organic Selenium, Goats kids

1. Introduction

Goat breeding practices is traditional in Iraq and most Arab countries, and they are still raised with sheep herds in small numbers (1). Due to the ability to produce twins as a source of meat and high-milk production, goat breeding is essential in many Asian and African countries (2). The characteristic of goats is that they can use different fodder sources as feed, compared to cows, and can tolerate different environmental conditions (3). The economic importance of goats has prompted many researchers to conduct studies to enhance reproductive efficiency (4). Selenium (Se) is a required trace mineral for human beings and livestock. Accordingly, Se insufficiency was already linked to various disorders, including impaired fertility, immune imbalance and inhibition, as well as poor nutrition. The most common method to improve the Se status of animals is to use Se supplements in the diet. Inorganic salts, like Se selenite, and organic forms, such as seleno-methionine and Se-yeast, are the most common Se complements. Because it can be assimilated and stored more than inorganic Se, Se-enriched yeast is an appropriate addition for livestock (5). *Saccharomyces cerevisiae* is used to promote microbial expansion and prolong rumen fermentation.

Studies have shown that the yeast supplement has positive effects on the quantity and activity of microbes in the rumen. This is because the supplement provides the majority of the essential mineral nutrients during the digestion process that will positively affect the microbial assemblages and their functions in the rumen (6). In this study, blood factors and some biochemical characteristics of Iraqi goats were evaluated to estimate the result of feeding with Se-enriched *Saccharomyces cerevisiae* yeast.

2. Materials and Methods

2.1. Animals

In total, 10 goats were used at the age of 7 days with an average body weight at the beginning of life (b.wt.) of 4±0.2 kg. The goats were randomly divided into two groups of five kids. Group 1 (G1) was administered with Se-enriched yeast (30 mg/kg/wt) according to NRC (1980), while group 2 (G2) received distilled water. The treatment continued from 7 days to three months.

2.2. Hematological and Biochemical Analysis

The jugular vein was used to draw blood samples within 90 days of the experiment. Blood was separated into two parts. The first part was put in the EDTA tube to assay the red blood cell count (RBC), hemoglobin concentration (Hb), packed cell volume percentage (PCV%), and white blood cell counts (WBC) by hemolysis. The second part was put in the plain tube to collect serum after centrifuging at 3000 rpm for 15 minutes to assay ALT, AST, total protein, Albumin, and Globulin concentration by using spectrophotometric methods according to Morsy, El-Zaiat (7).

2.3. Statistical Analysis

Statistical analysis was conducted using SPSS software (version 25) to determine the Least Statistical Differences at $P \leq 0.05$ by using the analysis of variance test.

3. Results and Discussion

The examination of blood parameters showed that Hb and PCV factors increased significantly in G1, which was treated with *Saccharomyces cerevisiae*+Se, compared to the control group ($P \leq 0.05$; Table 1). The increase of these factors is because the yeast has a synergistic action with Se as an anti-oxidants that prevent free radical from damaging the cells. Moreover, it is one of the components that contribute to the assimilation of ferrous, which is the fundamental basis of hemoglobin (8) in addition to having effects in raising iron intake, which improves blood Hb levels (9). The results of Hb and the ratio of PCV agreed with Shareef, Mohammed (5). Hb levels showed a significant change whenever sheep were fed Se, whereas the findings were incongruent with Alhidary, Shini (2), Aremmt, Jassim Alrawi (4), and Ge, Liu (10) who showed no significant differences in blood picture when using Se-enriched yeast.

Table 1. Hematological effects of *Saccharomyces cerevisiae* fortified with selenium (mean ± SE)

Treated group	G1	Control G2
WBC 10^3/ml	9.57±3.1	8.82±2.35
RBC × 10^6/ml	7.53±0.42	6.89±0.69
Hb g/dl	9.78±0.61A	8.36±0.28B
PCV %	37.24±2.11A	34.13±1.17B

Upper cases show significant differences ($P \leq 0.05$)

The results revealed that Albumin was increased significantly in the control group ($P \leq 0.05$). On the other hand, AST concentration in G1, which was treated with *Saccharomyces cerevisiae*+Se was improved and decreased, compared to the control group. At the same time, the Globulin concentration was significantly increased ($P \leq 0.05$). The present research findings were consistent with the experimental ewes and lambs fed with a combined diet, including Se+vitamin E and had higher plasma globulin levels (11). A comparable increase in serum total Globulin was observed when ewes were fed a Se-enriched diet of 0.03 g/kg with 50 mg of vitamin E two weeks before mating until lambing (12). Increased Globulin, protein, and fatty acid in goats fed 100 mg Se-yeast+vitamin were recorded (13).

Se yeast enhanced nutrient digestibility and dose-dependently and altered the digesting microorganisms and enzymes (14). In addition, Se yeast has been shown to boost the anti-oxidant activities of sea organisms and have a critical role in improving the anti-oxidant capacity of Tibetan sheep, as measured by superoxide dismutase malondialdehyde and total anti-oxidant capacity levels (2, 4, 10). Se has high efficiency of the Se-dependent enzyme Glutathione (15). Numerous critical biological functions of Se include the control of anti-oxidant enzyme activity and enhancement of well-being and productivity (16). These functions and activities of Se and yeast may protect the cells and tissue of the body, especially the liver (Table 2).

Table 2. The role yeast fortified with Selenium *Saccharomyces Cerevisiae* plus selenium on the AST, ALT, and protein concentration (mean ± SE)

Treated group	G1	Control G2
AST Unit/Liter	41.2±6.11B	90.33±8.23A
ALT Unit/Liter	12.8±2.22	18.0±2.64
Total protein g/dl	5.36±0.09	4.8±0.50
Albumin gram/dl	2.43±0.03B	3.02±0.08A
Globulin gram/dl	2.93±0.45A	1.78±0.09B

Upper case letters show significant differences ($P \leq 0.05$)

The results showed that Se-enhanced yeast improves Hb concentration, PCV, Globulin, and AST enzyme deviation. The synergistic action of yeast cells plus Se in organic form was responsible for this increase.

Authors' Contribution

Study concept and design: M. A. S.
Acquisition of data: F. T. A.
Analysis and interpretation of data: M. K. J. A.
Drafting of the manuscript: S. T. J. A.
Critical revision of the manuscript for important intellectual content: A. A. O.
Statistical analysis: H. M. A.
Administrative, technical, and material support: A. A. O.

Ethics

The ethical approval was approved from the University of Anbar.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

1. Baper MI, Hermiz HN. Non Genetec Parameters and Repeatability for Milk Traits Goat in Northern Iraq. Sci J Univ Zakho. 2019;7(3):70-4.
2. Alhidary I, Shini S, Al Jassim R, Gaughan J. Effect of various doses of injected selenium on performance and physiological responses of sheep to heat load. J Anim Sci.

2012;90(9):2988-94.
3. Dehghan-Banadaky M, Ebrahimi M, Motameny R, Heidari S. Effects of live yeast supplementation on mid-lactation dairy cows performances, milk composition, rumen digestion and plasma metabolites during hot season. J Appl Anim Res. 2013;41(2):137-42.
4. Aremmt M, Jassim Alrawi ST, Mohammed T. Study the Role of Selenium or Zinc as Organic form on some Antioxidant and Liver Enzymes of Rams. Indian J Med Forensic Med Toxicol. 2021;15(1).
5. Shareef M, Mohammed T, Alrawi H, editors. Impact of Saccharomyces cerevisiae enriched with Selenium or Zinc on reproductive performance, estrogen and progesterone hormone in local Iraqi female goats. IOP Conference Series: Earth and Environmental Science; 2021: IOP Publishing.
6. Fernández-Lázaro D, Fernandez-Lazaro CI, Mielgo-Ayuso J, Navascués LJ, Córdova Martínez A, Seco-Calvo J. The role of selenium mineral trace element in exercise: Antioxidant defense system, muscle performance, hormone response, and athletic performance. A systematic review. Nutrients. 2020;12(6):1790.
7. Morsy A, El-Zaiat H, Saber A, Anwer M, Sallam S. Impact of organic selenium and vitamin E on rumen fermentation, milk production, feed digestibility, blood parameters and parasitic response of lactating goats. J Agric Sci Technol. 2019;21(7):1793-806.
8. Surai P, Fisinin V. Selenium in poultry breeder nutrition: An update. Anim Feed Sci Technol. 2014;191:1-15.
9. Wang X, Shen Z, Wang C, Li E, Qin JG, Chen L. Dietary supplementation of selenium yeast enhances the antioxidant capacity and immune response of juvenile Eriocheir Sinensis under nitrite stress. Fish Shellfish Immunol. 2019;87:22-31.
10. Ge J, Liu L-L, Cui Z-G, Talukder M, Lv M-W, Li J-Y, et al. Comparative study on protective effect of different selenium sources against cadmium-induced nephrotoxicity via regulating the transcriptions of selenoproteome. Ecotoxicol Environ Saf. 2021;215:112135.
11. Pulina G, Milán M, Lavín M, Theodoridis A, Morin E, Capote J, et al. Invited review: Current production trends, farm structures, and economics of the dairy sheep and goat sectors. J Dairy Sci. 2018;101(8):6715-29.
12. Monteiro A, Costa JM, Lima MJ. Goat system productions: Advantages and disadvantages to the animal, environment and farmer. Goat Sci. 2017:351-66.
13. Mayasula VK, Arunachalam A, Babatunde SA, Naidu SJ, Sellappana S, Krishnan BB, et al. Trace minerals for improved performance: a review of Zn and Cu supplementation effects on male reproduction in goats. Trop Anim Health Prod. 2021;53(5):1-8.
14. Soliman E, Abd El-Moty A, Kassab A. Combined effect of vitamin E and selenium on some productive and physiological characteristics of ewes and their lambs during suckling period. Egypt J Sheep Goat Sci. 2012;7:31-42.
15. Wang Z, Tan Y, Cui X, Chang S, Xiao X, Yan T, et al. Effect of different levels of selenium yeast on the antioxidant status, nutrient digestibility, selenium balances and nitrogen metabolism of Tibetan sheep in the Qinghai-Tibetan Plateau. Small Rumin Res. 2019;180:63-9.
16. Shi L, Ren Y, Zhang C, Yue W, Lei F. Effects of organic selenium (Se-enriched yeast) supplementation in gestation diet on antioxidant status, hormone profile and haemato-biochemical parameters in Taihang Black Goats. Anim Feed Sci Technol. 2018;238:57-65.