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Effect of Yeast (*Saccharomyces cerevisiae*) Supported by Selenium and Zinc on Lipid Profile of Local Sheep Males

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Abstract

This study was conducted to investigate the effect of (*Saccharomyces cerevisiae*) supported with zinc and selenium on the lipid profile. of Twenty-one Iraqi males sheep were used aged (1-1.5) years and the weight mean approximately (38±4) kg. experiment animals used divided randomly into three treated groups each group have 7 males. All males were fed on the same ration. The first group was considered as a control group without treatment (T1), the second group (T2) were given yeast enriched with zinc (Saccharomyces cerevisiae -zinc) with dosage (0.2 g/kg/bw), the third group (3) was given yeast enriched with selenium (Saccharomyces cerevisiae-selenium) with dosage (0.03 g/kg/bw). The results showed significant (P≤0.05) differences control group compare with the other two-treated groups (T3 and T2) in triglyceride, LDL , VLDL and HDL . The results indicate to significant differences (P≤0.05) of (T2 and T3) compare with the control group by HDL . From the results concluded that there synergistic effect of *Saccharomyces cerevisiae* with zinc and selenium as organic form (Saccharomyces cerevisiae-zinc/selenium) could be attributed to improved animal health.

تأثير خميرة(*Saccharomyces cerevisiae*) المدعمة بالسيلينيوم والزنك على مستوى الدهون لذكور الاغنام الحلية

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الخلاصة

اجريت هذه الدراسة لمعرفة تأثير خميرة السكرومايسس سرفيسيا المدعمة بالزنك والسيلينيوم على مستوى الدهون . استخدم فيها 21 ذكر محلي عراقي وبعمر 1-1.5 سنة وبمعدل وزن حوالي 38 كغم . حيوانات التجربة المستخدمة مقسمة بشكل عشوائي الى ثلاث مجاميع كل مجموعة فيها 7 ذكور . تم تغذية جميع الذكور على نفس العليقة واعتبرت المجموعة الاولى مجموعة السيطرة وتركت دون معاملة ، واعطيت المجموعة الثانية الخميرة المدعمة بالزنك وبجرعة 0.2 ملغم/كغم/وزن الجسم ، والمجموعة الثالثة اعطيت الخميرة المدعمة بالسيلينيوم وبجرعة 0.03 ملغم/كغم/وزن الجسم . اظهرت النتائج وجود تفوق معنوي في مستوى كل من الدهون الثلاثية ، البروتين الدهني عالي الكثافة ، البروتين الدهني منخفض الكثافة ، والبروتين الدهني منخفض الكثافة جدا لكلا المعاملتين الثانية والثالثة . وتشير النتائج أيضاً الى وجود اختلافات الكبيرة في المعاملتين الثانية والثالثة بالمقارنة مع معاملة السيطرة في مستوى البروتين الدهني عالي الكثافة . من النتائج التي توصلت اليها ان هناك تأثير تآزري لخميرة السكرومايسس مع الزنك والسيلينيوم بشكل عضوي ويمكن أن يعزى الى تحسين صحة الحيوان

الكلمات المفتاحية : زنك ، سيلينيوم ، الدهون ،الكباش ، الخميرة المدعمة

Keywords; Saccharomyces cerevisiae, Zinc, Selenium, lipid profile, rams

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Introduction

Livestock and animal production are important in supporting the economy of our country. Animal production has deteriorated in Iraq because of war this deterioration of the economic situation in all ways compared to developed countries. Therefore, the our research focusing on the improvement of animal production In the last decades, feed additives were used, which include the using of probiotics, which are can provide a healthy animal benefit and improve feed digestibility (20). 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. 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 (2). Several studies have shown beneficial (7). Selenium is a rare element that is naturally found in many foods and is available as a dietary supplement. Selenium is a necessary nutrient for humans and animals. It is made up of more than twenty types of selenoproteins that play an important role in the metabolism of thyroid hormone, DNA synthesis, reproduction, anti-oxidant and injury protection (17). Animal health and physiological performance are also significantly affected by minerals, including zinc, and improved production performance is achieved through the addition of energy, protein, and mineral diets in farm animals during pre-puberty (6). Zinc is the second greatest rich element (after iron) and necessary for all animals and human. It is found in the form of (Zn2) and is not oxidized under physiological conditions, which clarifies why zinc achieves several physiological roles in a variability of biological processes (11). The addition of organic zinc to the animals' rations will affect the early puberty and affect the activity of the enzyme antioxidant and DNA synthesis (3). Therefore, the study aimed to evaluate the yeast supported by selenium and organic zinc in the lipid profile of local sheep males.

Materials and methods:

1- Animals of experiment

Twenty-one of males' sheep were used (1-1.5) year of age, and the method of teething was used to estimate their ages. Animals were fed a concentrated diet (3 % from body weight) and fed straw with alfalfa ad labitum.

2- Experimental design;

The males were divided randomly into three treated groups each group have 7 males. All males were fed on the same ration. The first group was let without treatment as a control group (T1), the second group (T2) was given yeast enriched with zinc (Saccharomyces cerevisiae -zinc) with dosage (0.2 g/kg/bw) [13], the third group (3) was given yeast enriched with selenium (Saccharomyces cerevisiae-selenium) with dosage (0.03 g/kg/bw) [13] .

3- Blood samples collection;

The blood samples were collected from the jugular vein during the (First, fourth, eighth, eleventh and thirteenth weeks) to estimate the lipid profile (Triglyceride, cholesterol, High density lipoprotein (HDL), very low-density lipoprotein (VLDL). and low density lipoprotein (LDL).

The concentration of cholesterol was measured by enzymatic decomposition method according to[16] using the kit developed by Human company (German).

The concentration of triglycerides in blood was estimated by the method (4) and using the kit manufactured by the Spanish company Linear Rchmicals. The concentration of high-density lipoprotein (HDL) in the serum was determined according to (8) by using the kit manufactured by Human company (German). While VLDL was calculated by the equation according to [19] (VLDL = triglycerides / 5). Also, LDL was calculated by the equation according to (9).

LDL = Cholesterol – (HDL +VLDL)

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≤0.05). Statistical Package for the Social Sciences Program (SPSS) version 25 package was used for this purpose (21).

Results and discussion:

1- Triglyceride;

Table (1) shows a significant decrease (P≤0.05) in the triglyceride of the third group (T3) compared with the control group at thirteen week.

2-Cholesterol;

Table (2) shows there is no significant difference in the total cholesterol concentration between the second and third treatments compared to control . However, a mathematical differences between the periods within the column for all treatments groups compared to the control was recorded .

3-High density lipoprotein (HDL)

Table (3) shows a significant difference (P≤0.05) in the HDL-C concentration in the second and third treated groups compared with the control group at thirteenth week. And significant differences (P≤0.05) were observed between the time interval within the last week of the experimental study for the third treatment compared with the first week, while the a significant increment (P≤0.05) was observed between the period of the second treatment from the fourth week to the last week of the experiment.

4-Low density lipoprotein (LDL-C)

Table (4) showed a significant decrease (P≤0.05) in the LDL-C concentration in the second and third groups compared with the first treatment group in week thirteen. table (4) was seen at the last week of the experiment Also observed significant decreases (P≤0.05) between the time interval within one column in the last week of the experiment for the second and third treatments compared to the initial weeks of both treatments.

5-Very low-density lipoprotein (VLDL)

Table (5) shows a significant decreases (P≤0.05) in the VLDL concentration in the third treatment compared with the control and the second treatments in the 11th and 13th weeks. In addition, the second group was recorded a significantly decrement (P≤0.05) compared with the first control at 13. While there were no significant differences between the second and third treatments. The results showed significantly differences (P≤0.05) between the periods of all groups.

Table (1) the effect of yeast enrichment with zinc and selenium on the triglyceride of the local males sheep (mg/dl).

Treatment / Time	Control group T1	Group 2 (T2) (Y+Zn) (0.2 mg/kg/ bw)	Group3 (T3) (Y+Se) (0.03 mg/kg/ bw)
First week	55.13±2.51	53.64±1.24	55.29±2.43 A
Fourth week	54.55±2.25	53.51±2.21	53.90±1.07 A
Eighth week	54.82±2.87	54.67±2.65	49.47±2.92 AB
Eleventh week	53.32±1.85	49.48±2.27	49.45±2.49 AB
Thirteenth week	53.74±3.26 a	49.26±1.90 Ab	47.25±2.65 B b

LSD= 6.05

The various capital letters refer significant differences between times within one column at (P≤0.05)
The various small letters indicate significant differences between the groups within one raw at (P≤0.05).

Table (2) the effect of yeast enrichment with zinc and selenium on the cholesterol of the local males sheep (mg/dl).

Treatment / Time	Control group T1	Group 2 (T2) (Y+Zn) (0.2 mg/kg/ bw)	Group3 (T3) (Y+Se) (0.03 mg/kg/ bw)
First week	79.59±1.04	78.42±3.22	76.80±2.54
Fourth week	84.49±2.73	82.95±2.88	81.43±2.58
Eighth week	86.92±2.69	83.31±3.89	84.50±2.15
Eleventh week	87.13±1.57	88.44±2.63	85.63±2.48
Thirteenth week	89.64±2.79	89.12±2.67	88.80±3.02

Table (3) the effect of yeast enrichment with zinc and selenium on the High density lipoprotein (HDL) of the local males sheep (mg/dl).

Treatment / Time	Control group T1	Group 2 (Y+Zn) T2 (0.2 mg/kg/ bw)	Group3 (Y+Se) T3 (0.03 mg/kg/ bw)
First week	36.71±1.51	36.12±2.34 B	33.88±2.01 C
Fourth week	39.20±2.43	42.47±2.37 A	38.01±2.32 BC
Eighth week	37.26±1.19	42.16±3.71 A	34.98±2.0 C
Eleventh week	38.89±1.62	41.58±1.84 A	39.49±3.51 B
Thirteenth week	39.81±0.95 b	44.31±2.06 A a	44.68±2.71 A a

LSD= 5.40

The various capital letters refer significant differences between times within one column at (P≤0.05)

The various small letters indicate significant differences between the groups within one raw at (P≤0.05)

Table (4) the effect of yeast enrichment with zinc and selenium on the Low density lipoprotein (LDL) of the local males sheep (mg/dl).

Treatment / Time	Control group T1	Group 2 (Y+Zn) T2 (0.2 mg/kg/ bw)	Group3 (Y+Se) T3 (0.03 mg/kg/ bw)
First week	38.97±1.82	37.17±1.66 A	38.10±1.04 A
Fourth week	39.42±0.96	37.15±1.21 A	39.71±1..14 A
Eighth week	37.75±2.50	39.08±2.00 A	36.82±0.89 A
Eleventh week	38.72±1.92	37.37±1.07 A	36.74±2.23 A
Thirteenth week	36.15±2.11 a	32.31±2.09 B b	31.36±1.81 B b

LSD= 4.27

The various capital letters refer significant differences between times within one column at (P≤0.05)
The various small letters indicate significant differences between the groups within one raw at (P≤0.05)

Table (5) the effect of yeast enrichment with zinc and selenium on the Very low-density lipoprotein (VLDL) of the local males sheep (mg/dl).

Treatment / Time	Control group T1	Group 2 (Y+Zn) T2 (0.2 mg/kg/ bw)	Group3 (Y+Se) T3 (0.03 mg/kg/ bw)
First week	10.01±0.50 B	10.35±0.24 A	9.81±0.19 AB
Fourth week	12.35±0.59 A	11.72±0.40 A	11.98±0.21 A
Eighth week	12.11±0.73 A	11.20±0.37 A	11.17±0.49 A
Eleventh week	11.53±0.58 A a	10.77±0.50 A ab	9.75±0.55 AB b
Thirteenth week	11.10±0.80 AB a	8.51±0.63 B b	8.76±1.25 B b

LSD= 1.42

The various capital letters refer significant differences between times within one column at (P≤0.05)

The various small letters indicate significant differences between the groups within one raw at (P≤0.05)

Discussion

The results of this study were consistent with the findings of others study of (10) (12), whom observed the added of Se. to the ration recorded a significant difference in the level of triglycerides, cholesterol, VLDL and HDL (5). The result also agreed with the result that obtained by (22) that result revealed to the improvement of triglyceride after added the zinc to the goats' ration. In addition, it was agreed with (1), whom observed significantly decreased of triglyceride compared with a control group after added selenium and zinc of 45 mg and 4366 mg to the sheep ration respectively,The decreased of lipid concentration may be due to the fact that selenium and zinc play an important role as an antioxidant and reduce free radicals and thus can reduce the presence of harmful fats (triglyceride, LDL, VLDL) and increase the level of HDL (18 ; 14). The absence of significant differences in the concentration of cholesterol between the treated groups may be explained by that the cholesterol source of the synthesis of steroids hormones. Cholesterol is a steroid fatty substance found in all animal tissues, especially in cell membranes, also plays a major role of the formation the sexual hormones. From other hands, the reduction of lipid profile may be due to the fact that selenium and zinc can enhance the metabolism of these nutrients. Selenium and zinc are critical to fat metabolism. In addition, there are two main factors in supporting glutathione peroxidase, these enzymes have an important role in fat metabolism (15).

Conclusion;

From the results may be concluded that the using of yeast enriched with zinc and selenium (Saccharomyces cerevisiae-zinc/selenium) lead to improve lipid profile and animal health, this improvement was done by synergism effective of Saccharomyces cerevisiae with zinc and selenium as organic form.

References

1) Abdelrahman, M. M., Aljumaah, R. S. and Khan, R. U. (2017) “Effects of prepartum sustained-release trace elements ruminal bolus on performance, colustrum composition and blood metabolites in Najdi ewes,” *Environmental Science and Pollution Research*. Springer, 24(10), pp. 9675–9680.

2) Ahmed, K. D.A. A. Omar, Alrawi, S.T.J., Abdul Razzaq, Y. A. Mahmud,D. A. N. L.Naif, A. A. O. (2019) "Effect of using the Saccharomyces cerevisiae on the some production traits and carcass characters of the local rabbits," *plant archives,* 19(2).
3) Arangasamy, A. A., Krishnaiah, M. V., Manohar, N., Selvaraju, S., Guvvala, P. R., Soren, N. M. and Ravindra, J. P. (2018) "Advancement of puberty and enhancement of seminal characteristics by supplementation of trace minerals to bucks," *Theriogenology*. Elsevier, 110, pp. 182–191.
4) Bucolo, G. and David, H. (1973) "Quantitative determination of serum triglycerides by the use of enzymes," *Clinical chemistry*. Clinical Chemistry, 19(5), pp. 476–482.
5) Chen, C., Jin, Y., Unverzagt, F. W., Cheng, Y., Hake, A. M., Liang, C. and Li, P. (2015) "The association between selenium and lipid levels: a longitudinal study in rural elderly Chinese," *Archives of gerontology and geriatrics*. Elsevier, 60(1), pp. 147–152.
6) Dance, A. Thundathil, J., Blondin, P. and Kastelic, J. (2016) "Enhanced early-life nutrition of Holstein bulls increases sperm production potential without decreasing postpubertal semen quality," *Theriogenology*. Elsevier, 86(3), pp. 687–694.
7) Dehghan-Banadaky, M. M., Ebrahimi, M., Motameny, R., & Heidari, S. R. (2013) "Effects of live yeast supplementation on mid-lactation dairy cows performances, milk composition, rumen digestion and plasma metabolites during hot season," *Journal of applied animal research*. Taylor & Francis, 41(2), pp. 137–142.
8) Friedewald, W. T., Levy, R. I. and Fredrickson, D. S. (1972) "Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge," *Clinical chemistry*. Clinical Chemistry, 18(6), pp. 499–502.
9) Grundy, S. M. (2004) "Obesity, metabolic syndrome, and cardiovascular disease," *The Journal of Clinical Endocrinology & Metabolism*. Oxford University Press, 89(6), pp. 2595–2600.
10) Hasani, M. M., Djalalinia, S., Sharifi, F., Varmaghani, M., Zarei, M., Abdar, M. E. and Qorbani, M. (2018) "Effect of Selenium Supplementation on Lipid Profile: A Systematic Review and Meta-Analysis," *Hormone and Metabolic Research*. Georg Thieme Verlag KG, 50(10), pp. 715–727.
11) Kambe, T. Tsuji, T., Hashimoto, A. and Itsumura, N. (2015) "The physiological, biochemical, and molecular roles of zinc transporters in zinc homeostasis and metabolism," *Physiological reviews*. American Physiological Society Bethesda, MD, 95(3), pp. 749–784.
12) Musa, I. Bitto, I. I., Ayoade, J. A. and Oyedipe, E. O. (2018) "Serum Immunoglobulins and Lipid Prof le of Sheep as Affected by Selenium and Vitamin E Supplementation."
13) National Research Council (US). Subcommittee on Mineral Toxicity in Animals. (1980). Mineral tolerance of domestic animals. National Academies Press.
14) Prasad, A. S. (2008) "Clinical, immunological, anti-inflammatory and antioxidant roles of zinc," *Experimental gerontology*. Elsevier, 43(5), pp. 370–377.
15) Rayman, M. P. (2000) "The importance of selenium to human health," *The lancet*. Elsevier, 356(9225), pp. 233–241.
16) Richmond, W. (1973) "Preparation and properties of a cholesterol oxidase from Nocardia sp. and its application to the enzymatic assay of total cholesterol in serum," *Clinical chemistry*. Clinical Chemistry, 19(12), pp. 1350–1356.
17) Shils, M. E. and Shike, M. (2006) *Modern nutrition in health and disease*. Lippincott Williams & Wilkins.
18) Smith, M. A. Harris, P. L., Sayre, L. M. and Perry, G. (1997) "Iron accumulation

in Alzheimer disease is a source of redox-generated free radicals," *Proceedings of the National Academy of Sciences*. National Acad Sciences, 94(18), pp. 9866–9868.

19) Snedecor, G. W. and Cochran, W. G. (1994) "Statistical methods 8th edition (New Delhi: Affiliated East." West Press and Iowa: Iowa State University press.

20) Sousa, D. O. Oliveira, C. A., Velasquez, A. V., Souza, J. M., Chevaux, E., Mari, L. J. and Silva, L. F. P. (2018) "Live yeast supplementation improves rumen fibre degradation in cattle grazing tropical pastures throughout the year," *Animal feed science and technology*. Elsevier, 236, pp. 149–158.

21) Steel, R.G.D. & Torrie; J.H. (1980).Principles and Procedures of Statistics. 2nd (ed) McGraw Hill, New York.

22) Zeedan, K. I. I., El-Malky, O. M. and Abu El-Ella, A. A. (2014) "Nutritional, Physiological and Microbiological Studies on Using Biogen-Zinc on Productive and Reproductive Performance of Ruminants: Productive Performance, Digestion and Some Blood Components of Damascus Goats," *Egyptian Journal of Sheep and Goat Sciences*. The Egyptian Association for Sheep and Goat, 65(1800), pp. 1–36.