Impact of *Saccharomyces cerevisiae* enriched with Selenium or Zinc on reproductive performance, estrogen and progesterone hormone in local Iraqi female goats

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Abstract. This experiment was accompanied to examine the impact of yeast (*Saccharomyces cerevisiae*) supplemented with Selenium (se) or Zinc (zn) on the reproductive performance, estrogen and progesterone hormone in local Iraqi female goats. 17 mature does two - two and half years of old were used. The average of body weight (bw) was 37.5 ± 3 kg. Animals were randomly divided in to three groups, five animals were in the first group, six goats were in the second and third groups. All goat does were nursed on the same ration. The group1 was considered as a control group without processing (G1), the group 2 (G2) was administered with (*Saccharomyces cerevisiae*-selenium) with dose (0.03 g/kg/bw), the third group 3 (G3) were administered with (*Saccharomyces cerevisiae*-zinc with dose (0.2 g/kg/bw). (given orally for 45 days). The results showed that second and third groups were significantly increase (P≤0.05) in fertility and fertilization rate as compared with G1. G3 was significantly increase (P≤0.05) in the Prolificacy rate as compared with G1 and G2. G2 and G3 were significantly increase (P≤0.05) in the pregnancy rate as compared with G1. while G3 was significantly increase (P≤0.05) in the kidding rate as compared with G1 and G2. Estrogen hormone concentration level of the G2 showed a significant increase (P≤0.05) as compared with G1 and G3. While the progesterone hormone concentration level of the G3 showed a significant increase (P≤0.05) as compared with G1 and G2. From the results we concluded that organic form (yeast supplemented with selenium/ zinc) could be credited to enhance the reproductive performance, overall health of kids after birth, progesterone levels and animal health.

1. Introduction:

Selenium is a rare mineral with a molecular weight of 78.96 and atomic number 34 electron. It is found in many foods naturally. Selenium was discovered in 1817, the main sources of selenium are corn, wheat flour, rice, barley bran and sunflower seeds, They are present in less quantities in molasses and soybeans, as selenium has been found to be of great importance in its role as an antioxidant, fighting cancerous diseases and destroying malignant cells\[1, 2, 3, 4, 5, 6\]. Yeast *Saccharomyces cerevisiae* (SC) is widely used in ruminant feeding for its contribution to improving rumen fermentation and animal performance, and its use depends on several factors including feed ingredients, concentrated feed ratio to roughage feed, type of feed, yeast dose and methods of giving it. Yeast (SC) is classified from yeasts that operate in aerobic and anaerobic conditions because it provides a good environment suitable for the work of beneficial microorganisms, and can be on the fermentation and microbial preparation processes in the rumen, (Se) is described as: it is a plant microscopic biology that does not contain chlorophyll, as it belongs to the fungal kingdom but does
not contain fungal yarn, there are about 1500 species found in nature, and (SC) reproduce by simple division and budding. Rapidly spreading in water and resistant to chemical decomposition, there are two types of cells in terms of the first one and the second multicellular, based on the formation of the shape of the connected chains O and N-mannosylated. As for yeasts in general, their activity starts at a temperature (30 °C), but they lose their vitality at a temperature of (0-10 °C), most yeasts cannot live at a temperature of 50 °C. As for the pH which is 4-4.5, it is necessary and influencing the fermentation process [7, 8, 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 immune competence [10, 11, 12, 13].

2. Materials and methods:

2.1. Animal of experiment:
The study was examined in the animal field of college of veterinary medicine/university of Fallujah. Seventeen adult females goats were used 2-2.5 years of old with average of body weight (BW) 37.5 ± 2.5 kg that have at least one previous birth. The females were numbering by plastic numbers in the ear. All females were fed a concentrated diet (2% from body weight). The concentration diet consist 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 bloke were given ad libitum. During the adaptation period all goats were administered 2 ml from ivermacten subcutaneous and 10 ml of albendazol was orally administrated.

2.2. Experimental design:
Does were divided randomly into three groups. five does were in group 1, six does were in group 2 and all does were nourished on the similar ration. Group 1 was considered as a control group without treatment (G1), the second group 2 (G2) was administered with yeast supplemented with selenium (Saccharomyces cerevisiae-selenium) produced by a company made in China/China, https://www.made-in-china.com/products-search/hot-china-products/Yeast.html, with dosage (0.03 g/kg/bw) as stated by NRC (1980), group 3 (G3) were administered with yeast supplemented with zinc (Saccharomyces cerevisiae-zinc) It is produced by same company with dosage (0.2 g/kg/bw) bestowing to NRC (1980). Does were administered by dissolving the specimens in 30 ml of distilled water and given orally for 45 days. The estrus was standardized with the use of vaginal sponges from the Spanish company Cozucu for 12 days, and then the vaginal sponges were removed and the goats were injected with the pregnant mare's serum gonadotropin (PMSG) from the manufacture of the same company at a dose of 350 international units (IU) in the muscle (IM) and the next day it was launched the males are 3 bucks with a mean body weight of 60 ± 2.5 kg for natural mating. The signs of estrus were observed for 3 days and the males were removed after 5 days. Pregnancy was diagnosed by the ultrasound SSO-5000 MH (USA).

2.3. collection of blood samples
Samples of the blood were collected from the jugular vein at first day (first period), 12th day (second period) and 45th day (third period) to evaluation estrogen and progesterone hormones concentration levels.

Estrogen level was estimated by the ELISA device produced by the company Menvides manufactured in France, using (kit) Biosystems manufactured in the United States of America, the estrogen was measured according to what is shown in the instructions attached with the (kit) according to the method [14]

Progestosterone level was estimated by the ELISA device produced by the company Menvides manufactured in France, using (kit) Biosystems manufactured in the United States of America, the progesterone was measured according to what is shown in the instructions attached with the (kit) according to the method [15].
2.4 Statistical analysis

The data were obtainable as Mean and Standard Error (Mean±SE) and exposed to statistical analysis using tow-way analysis of variance (ANOVA). In addition, post hoc test was used to find out the Least Significant Differences (Dunkin) between different means \( (p \leq 0.05) \). Reproductive performance was analysed by Chi-Square. Statistical Package for the Social Sciences Program (SPSS) version 25 package was used for this determination [16].

3. Results and discussion:

3.1 Reproductive performance

Table (1) showed that G2 and G3 were significantly increase \( (P \leq 0.05) \) in fertility and fertilization rate as compared with G1. Its proportion were 83.50%, 83.50% and 60%, and 100%, 100% and 60% respectively. Prolificacy rate in G3 was significantly increase \( (P \leq 0.05) \) as compared with G1 and G2, Its proportion were 160%, 133% and 120%, respectively. Pregnancy rate in G2 and G3 were significantly increase \( (P \leq 0.05) \) as compared with G1, Its proportion were 83.50%, 83.50% and 60%, respectively. while litter size in G3 was significantly increase \( (P \leq 0.05) \) compared with G1 and G2, Its proportion were 1.60, 1.33 and 1.20 respectively. Kidding rate in the G3 was significantly increase \( (P \leq 0.05) \) as compared with G1 and G2, Its proportion were 133.5%, 80% and 100% respectively whereas twinning rate in the G3 was significantly increase \( (P \leq 0.05) \) as compared with G1 and G2 proportion were 60%, 33.50% and 20% respectively. while the G2 and G3 were significantly increase \( (P \leq 0.05) \) in the Survival kids rate as compared with G1 and proportion were 100%, 100% and 50% respectively. The Barrenness rate was improve in the G2 and G3 as compared with G1 its proportion were decreased to 16.50% and 16.50% as compared with 40% respectively.

| Adjective                | G1          | G2       | G3       | Sig. | Chi-Square |
|-------------------------|-------------|----------|----------|------|------------|
| No .goats               | 100 a       | 100 a    | 100 a    | NS   | 0.330      |
| Estrus rate (%)         | 60 b        | 83.50 a  | 83.50 a  | 0.05 | 0.330      |
| Fertility rate (%)      | 60 b        | 100 a    | 83.50 a  | 0.05 | 0.652      |
| fertilization rate (%)  | 133 b       | 120 b    | 160 a    | 0.05 | 0.940      |
| Prolificacy rate (%)    | 60 b        | 83.50 a  | 83.50 a  | 0.05 | 0.330      |
| Pregnancy rate (%)      | 1.33 b      | 1.20 b   | 1.60 a   | 0.05 | 0.866      |
| Litter size (%)         | 80 b        | 100 b    | 133 a    | 0.05 | 0.940      |
| Kidding rate (%)        | 33.50 b     | 20 b     | 60 a     | 0.05 | 0.563      |
| Twinning rate (%)       | 50 b        | 100 a    | 100 a    | 0.05 | 0.190      |
| Survival kids rate (%)  | 40 a        | 16.50 b  | 16.50 b  | 0.05 | 0.343      |

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

The organic selenium and organic zinc were Improved fertility ,fertilization ,fecundity ,pregnancy, kidding, twinning and survival of kidding rate while the yeast enhanced with selenium or zinc decrease the barrenness rate through increase fertilization rate. This may be due to the part of organic zinc in the growth of the embryo [17]. In addition to the role of zinc in increasing female fertility and increasing the number of twins by preparing the uterus for pregnancy and increasing the effectiveness of ovaries, which in turn leads to the production of mature ova , as well as its role in maintaining the fetus and protecting from early embryonic mortality [18, 19]. This may be due to the importance of Selenium or Zinc in improving reproductive efficiency by stimulating the ovaries and creating an appropriate environment for intrauterine pregnancy as well as increasing female acceptance of males at estrus period, and the prevention of mastitis by preventing harmful microorganisms from entering the canal in the udder [20, 21, 22, 23, 24, 25, 26, 27, 28]. Or the reason may be attributed to the role of yeast in improving the rumen
environment and increasing the efficiency of the intestine in absorbing mineral elements in addition to improving the coefficient of digestion and increasing the amount of feed intake [29, 24, 30]. The consequence of this study were compatible with the findings of others study of . [25] [27] whom notice the additional of Se. to the diet noted a significant change in the Fertility ,fertilization ,fecundity ,pregnancy, kidding, twining and Survival of kidding rate. The results was agree with [31] whine treats the goats in diff erent levels of zinc . Perhaps the reason for the similarities in the results is due to the part of Selenium or Zinc as antioxidant that work to get rid of free hydroxyl radicals, or work to increase bloody roses to the reproductive system that led to improved reproductive efficiency [24, 25, 27].

3. 2. Estrogen hormone

Table (2) showed that estrogen hormone in the G2 was significant increase (P≤0.05) compared with G1 and G3. While the first period was significant rise as compared with second and third pieties as well as the second pirod was significant elevation as compared with third period . Role of the zinc in increasing female fertility by increasing the effectiveness of ovaries, [18]. This may be due to the effect of selenium in preventing oxidation of the ovarian tissue and mature follicle, leading to an increase in estrogen secretion from the follicle [32,33]. Or it may be due to the part of zinc in tonic the i mmune system that may lead into stimulating the secretion of estrogen, which has a role in increasing blood flow to the uterus and genital tract and facilitating the transfer of antibodies to eliminate bacterial contamination [34, 35].

| Periods      | Treatments | G1       | G2       | G3       | Mean     |
|--------------|------------|----------|----------|----------|----------|
| First period |            | 28.38±2.38 | 37.20±2.18 | 33.28±2.18 | 32.95±1.30 A |
| Second period|            | 19.38±2.38 | 28.53±2.18 | 23.28±2.18 | 23.73±1.30 B |
| Third period |            | 15.88±2.38 | 19.50±2.18 | 16.01±2.18 | 17.13±1.30 C |
| Mean         |            | 21.21±1.37 b | 28.41±1.25 a | 24.19±1.25 b |

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

3. 3. Progesterone hormone

Table (3) showed that progesterone hormone in G3 was significant increase (P≤0.05) comparison to G1 and G2. While G2 was significant increase comparison to G1. The reason may be due to the positive effect of zinc on the maintenance of the corpus luteum on the ovary and the effect on correlation proteins which leads to an increase in the level of progesterone, or the reason may be due to the correlation between the level of zinc and the level of progesterone as the level of progesterone rises during pregnancy and decreases after birth as well as for zinc Or, the reason may be due to the physiological state of the animal (pregnant, non-pregnant, dry, lactating) [36]. Or the reason for this may be due to the effect of selenium in protecting tissues from the free radicals of hydrogen oxide and then increasing progesterone production From the corpus luteum, In addition to the fact that the animals entered in the early days of pregnancy and had a high level of progesterone [37, 38]
Table 3. The effect of treatments on progesterone hormone in the local Iraqi does (pg/ml).

| Periods        | Treatments | G1         | G2         | G3         | Mean       |
|---------------|------------|------------|------------|------------|------------|
|                |            | 0.11±0.52  | 0.20±0.47  | 0.13±0.47  | 0.15±0.28 C|
| First period  |            | 4.11±0.52  | 5.70±0.47  | 5.88±0.47  | 5.23±0.28 B|
| Second period |            | 12.91±0.52 | 17.92±0.47 | 25.21±0.47 | 18.69±0.28 A|
| Third period  |            | 5.71±0.30 c| 7.95±0.27 b| 10.41±0.27 a|

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

4. Conclusions

From the results we concluded
1- Organic form (yeast supplemented with selenium/zinc) credited to enhance the reproductive performance, progesterone levels and animal health.
2- Yeast supplemented with zinc showed better results as compared with selenium supplemented with yeast and control groups.

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