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Study the role of *Saccharomyces cerevisiae* fortified with organic selenium on the physical and chemical characters of local Iraqi goat milk

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Abstract

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This study aimed to evaluate the effects of *Saccharomyces cerevisiae* fortified with organic selenium on the milk constituents of the local goats. Twelve does were 2.5-3 years of age and had body weight averaging 40±2.5 kg. The goats were divided randomly into two groups; each group includes six does. All goats were fed the standard ration. The treated group (G1) was administered (*Saccharomyces-cerevisiae-selenium*) (0.03 g/kg/bw), and was given orally for four weeks. The second control group (G2) was late without treatment, the milk samples were collected weekly. The results showed that the group G1 that there administrated *Saccharomyces cerevisiae-selenium* was significantly increased ($P \leq 0.05$) in fat and lactose %, compared to the control group, while the results of physical properties of milk showed non-significant differences between the treated group and control group. From these results, it was concluded that *Saccharomyces cerevisiae* has synergistic activity with selenium as an organic form to improve the fat and lactose percentage of goat's milk.

Keywords: Saccharomyces cerevisiae; organic selenium; female goats; milk
Abbreviations: g*:* gram; kg*:* kilogram; bw*:* body weight; G*:* group; LSD*:* least significant differences; T_4*:* Thyroxin

Introduction

The consumer concern of does goat milk is linked to values of feed and positive health effects involved to these products. Goats milk is less allergy and highly digestibility as compared with cow and ewe milk. Does milk have a functional ingredient, that could be used as in the manufacturing of a wide range of products, such as prebiotic products (Verruck & Prudencio, 2019). Selenium enriched with yeast has been shown effectiveness on the milk yield of goats and cattle, and improve and maintaining the mammary gland healthy and function (Lad et al., 2017). *Saccharomyces cerevisiae* promotes feed conversion efficiency, physiological performance, carcass and meat quality (Odeh, 2019). Many researchers have proven it be helpful to animal health (Dehghan-Banadaky et al., 2013). Minerals, like selenium, greatly affect animal health and physiological and production performance (Dance et al., 2016). Selenium plays a significant part in the regulation of the thyroid hormones, DNA replication, and antioxidant activity (Shils & Shike, 2006). Organic selenium improved milk yield (kg), peak of lactation, fat (%), production of milk (kg), protein (%), production of protein (kg), lactose (%), farm economic income and better health status of their mammary glands, as compared with inorganic selenium (Reczyńska et al., 2019). In another findings study of dairy cattle ration were treated with

6 g of Selenium enriched with yeast/ day/cow, lead to increased milk production (Bagnicka et al., 2017). Therefore, this study was aimed to estimate the role of organic selenium and *Saccharomyces cerevisiae* on the physical and chemical characteristics of goat milk.

Materials and Methods

This research was conducted on twelve adult does goats 2.5–3 years of age with an average of body weight 40±2.5 kg. All does were fed a basal ration (3% bw) (Table 1). Alfalfa, straw and water were given ad liptum. The does were divided randomly into two groups, each group consisting of six does. The first group was administrated (*Saccharomyces-cerevisiae-selenium*) (0.03 g/kg/bw) (G1) that given orally for four weeks. The second group control group (G2) was late without treatment.

Table 1. Components of concentrated ration

Feed ingredients	Percentage
Wheat bran	35%
Barley	50%
Soybean meal	6%
Chopped straw	8%
Salt	0.5%
Vitamins and minerals	0.5%

Milk samples collection;

Milk samples: 30 ml of milk was collected weekly in a plastic container and analyzed. Milk was analyzed by automated analyzer lactoscan to measure the physical parameter (pH, freezing point, density, and conductivity) and chemical parameters (lactose (%), fat (%), salts (%), and protein (%)).

Statistcal analysis

"Data were obtained statisticaly analysis by using SPSS a two-way analysis of variance. A post-hoc procedure has been used to determine the least significant differences (LSD) at ($p \leq 0.05$) (Steel & Torrie, 1980)"

Results

The physical characteristics of goat milk were presented in Table 2 and Figure 1, which showed non-significant differences in the pH, freezing point, density, and conductivity during the study. The *Saccharomyces cerevisiae-selenium* has a non-significant effect on pH, freezing point, density, and conductivity. While Table 3 and Figure 2 showed that the treated group first group increased significantly ($P \leq 0.05$) in lactose percentage in the third and fourth weeks, as compared with the control group. On the other hand, treated group G1 significantly ($P \leq 0.05$) increased fat percentage at the second, third, and fourth weeks of the study period, compared with the control, whereas, the results recorded non-significant differences in salts and protein of milk in control and treated groups during the study period.

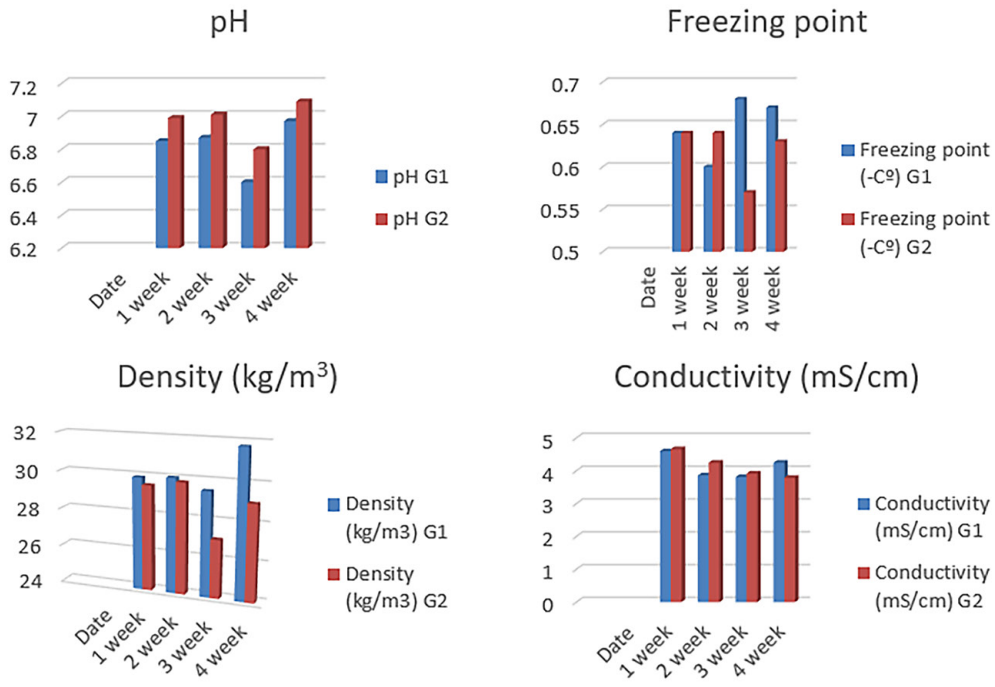

Fig. 1. Physical constituent of milk in different treated groups

Table 2. The effect of *Saccharomyces cerevisiae*-selenium on the physical characters of goat milk

Parameters	pH		Freezing point, -C°		Density, kg/m³		Conductivity, mS/cm	
Treated / Date	G1	G2	G1	G2	G1	G2	G1	G2
1 week	6.85±0.03	6.99±0.07	0.64±0.03	0.64±0.03	29.89±2.14	29.52±1.36	4.60±0.21	4.66±0.23
2 week	6.87±0.04	7.01±0.15	0.60±0.01	0.64±0.02	29.99±2.39	29.80±0.60	3.86±0.31	4.25±0.11
3 week	6.60±0.02	6.80±0.26	0.68±0.02	0.57±0.05	29.46±2.30	27.05±2.33	3.81±0.27	3.92±0.41
4 week	6.97±0.07	7.09±0.14	0.67±0.03	0.63±0.16	31.74±2.28	29.02±1.27	4.25±0.17	3.79±0.40
LSD	NS		NS		NS		NS	

Table 3. The effect of *Saccharomyces cerevisiae*-selenium on the chemical characters of goat milk

Parameters	Lactose, %		Fat, %		Salts, %		Protein, %	
Treated / Date	G1	G2	G1	G2	G1	G2	G1	G2
1 week	5.08±0.19	4.89±0.19	3.78±0.91	3.55±0.41	0.77±0.04	0.78±0.03	3.39±0.13	3.46±0.12
2 week	5.06±0.16	4.86±0.05	3.97±1.80 A	3.52±1.06 B	0.74±0.02	0.79±0.01	3.24±0.10	3.58±0.03
3 week	5.16±0.17 A	4.80±0.39 B	3.89±1.65 A	3.61±1.25 B	0.71±0.04	0.71±0.05	3.11±0.11	3.15±0.22
4 week	5.14±0.22 A	4.83±0.12 B	3.92±0.98 A	3.54±0.06 B	0.77±0.03	0.76±0.02	3.41±0.17	3.36±0.08
LSD	0.31		0.27		NS		NS	

"The different letters refer to significant differences"

* G1: treatment group G2: control group

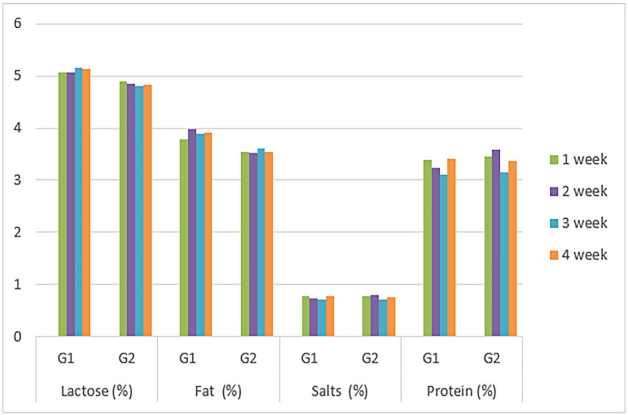

Fig. 2. Chemical constituent of milk in different treated groups

Discussion

The physical characteristics of goat milk's showed non-significant effect, which is consistent with (George et al., 2022: Mohammed, 2022), who have been recorded that the chemical characteristic of solid non-fat in goat's milk, derived from the specific gravity of the milk's physical properties. From another hand, *Saccharomyces cerevisiae-selenium* has improved the lactose content, which may explain the role of selenium, the previous studies find the deficiency of selenium inhibits milk production and induces autoimmune disorders, therefore the susceptibility to infections, particularly udder defects in dairy cattle (Smith et al., 1997). In addition, feeding selenium is an organic form can have an oxidative effect and demonstrate (Wang et al., 2009). The feeding Selenium as the organic form in the pregnancy ration could enhance the level of blood antioxidants and Thyroxin hormone (T4) concentrations and furthermore improve the digestion and assimilation of the essential nutrients in Taihang black goats (Shi et al., 2018), thus, it improves the milk constituents, therefore the organic selenium improved some milk characters in the current study.

Moreover, *Saccharomyces cerevisiae* have increased the production of milk due to improving digestion and fermentation of feed in the rumen. Chaucheyras-Durand et al. (2008) found that the yeast maintained the pH of the rumen and enhanced fiber digestion and nitrogen metabolism. However, certain trace elements that function as coenzymes of many enzymes play a significant role in biological processes and contribute to preserving the homeostasis of animals and enhancing the growth of animals (Enjalbert et al., 2006; Poławska et al., 2016), including milk yield (Yatoo et al., 2013). The increase of fat percentage may be due to the synergistic effect of yeast (*Saccharomyces cerevisiae*) with selenium as organic form, that improved digestibility

efficiency of crude fiber and metabolism, which reflected in its positive role to this increase (Shareef et al., 2019). The organic selenium have an indirect effect on the milk production through improving animal health (Tayeb et al., 2020), who found the sheep that fed organic selenium lead to improve the blood picture compared with inorganic selenium. While Ali & Al-Hassani (2020), who reported that organic selenium reduced stress in broiler chickens that exposure to high ambient temperatures. The results of the study are in agreement with Reczyńska et al. (2019) who find that the using organic selenium was improve milk yield (kg), peak of lactation, and increased fat, protein and lactose. Other study recorded selenium as organic form has a significant influence the physical and chemical properties of milk goats (Bagnicka et al., 2017), Briefly, daily milk, fat, lactose, total solids yield improved dramatically in this study. Perhaps more so, provided the findings of a similar investigation carried out over the entire lactation period on milk goats housed in the same farm, an improvement in daily average milk yield is seen (Bagnicka et al., 2017).

Conclusion

The dietary source of organic selenium did not significantly affect of physical characteristics of milk and analyses for minerals and protein in milk showed non-significant effects. However, our findings intestate a significant increase in fat and lactose. *Saccharomyces cerevisiae* that is fortified with selenium has a synergistic effect to improve the milk characteristics particularly the fat and lactose percentage of the does milk. In addition, there was no indication of adverse impacts associated with the use of the *Saccharomyces cerevisiae* that fortified with selenium. More research needs to be done to clarify the exact mechanisms of action of selenium in relation to its form and method of loading.

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