



The effect of oregano essential oil addition on milk production and composition of organically reared goats.

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Abstract

The effect of adding organic oregano essential oil (EO) to the diet of dairy goats was investigated. Twenty-four age-matched lactating goats, mean live weight 49 ± 1.8 kg, were allocated to 3 equal groups in a randomized design, of 8 goats housed in the same cell. The 3 groups were fed the same standard mixture of corn-based concentrates, while a mixture of alfalfa hay, wheat straw and corn silage was used as roughage. In groups 2 and 3, organic oregano essential oil 1ml and 2ml per animal per day was added to the concentrate feed mixture. Individual milk production performance as well as ration provision was recorded daily, starting from the 150th day of milk production. The chemical analysis of the milk showed that group 2 showed the highest fat content and protein concentration, as well as that the milk from groups 2 and 3 showed a lower number of somatic cells, compared to group 1. In conclusion, EO supplementation can improve the performance of organically reared dairy goats as well as relatively improve the composition of the milk produced. However, the underlying mechanisms leading to this improvement need further investigation.

Key words: Dairy goats, oregano essential oil, milk yield.

1. Introduction

Goat milk production is an important livestock activity both in Greece and throughout the Mediterranean basin. In the case of Greece, the goat's milk participates in the production of a significant number of Protected Denomination of Origin (PDO) cheeses. In the present study, an attempt is made to examine the improvement that can be caused in the yields of an intensive goat rearing that has adopted the use of organically produced feed, by the addition of essential oil (EO) of organic oregano (*Origanum vulgare* L.). The aim of the current study was to investigate the possible improvement in milk production and the characteristics of milk derived from dairy goats that have been fed with rations.

2. Materials and methods

In order to carry out the experiment, a random sample of twenty-four (24) milking goats of Alpine breed was selected, from a total herd of 450 goats kept in the Regional Unit of Evros, Greece.

Selection criteria were only the same age and lactating period of The goats were divided into three treatment groups of eight animals each. Group 1, which was the control, was given the standard binary ration of roughage and concentrated organic feed. In groups 2 and 3, 1ml and 2ml organic oregano essential oil was added to the concentrate feed mixture per animal and day respectively.

The daily roughage supply reached 2 kg and consisted of 1.2 Kg alfalfa hay, 0.3 Kg wheat straw and 0.5 Kg maize silage. Regarding the concentrated feed mixture, the daily supply reached 1.2Kg and its composition was 50% corn, 20% soybean meal, 13% bran, 6% barley, 6% triticale and 5% inorganic and vitamin premix.

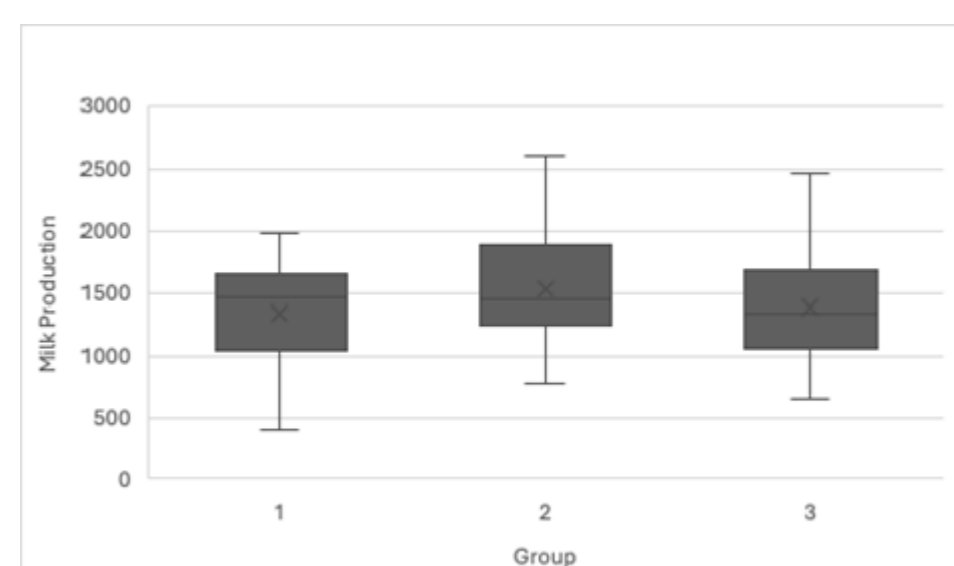
The trial started on the 150th day of milk production and lasted for 50 days after a 15-day adjustment period, where the daily amount of milk production was measured individually. The starting day of the experiment, the 15th, the 30th, the 45th and the 49th day of its implementation were defined as days of milk counting. All goats in the sample were machine-milked twice daily (at 07:00 and 17:00 h) in milking parlor with an identification mechanism for each goat (ruminal bolus). Individual milk samples were analyzed for fat, protein, lactose, total solids, somatic cell count (SCC) and solids not fat (SNF), by using the facilities and equipment of HAO-Demeter (Hellenic Agricultural Organisation-Demeter) in Paralimni/Regional Unit of Pella.

The obtained data concerning total milk production and composition were initially tabulated in MS-Excel worksheets and then the existence of statistically significant differences in the mean values was tested using one-way ANOVA tests in SPSS-24 environment.

3. Results and discussions

Regarding variable milk production, the results showed that the groups of goats with the inclusion of EO showed a greater persistence in milk production compared to the control group. Groups 2 and 3 show increased milk production compared to the control by 13.3% and 3.3% respectively. In addition, groups 2 and 3 presented 21.4% and 10% increased milk production compared to group 1, during the final stage of milk production. The differences between groups are also shown in **Figure 1**.

Figure 1: The differences between groups in the amount of milk production.



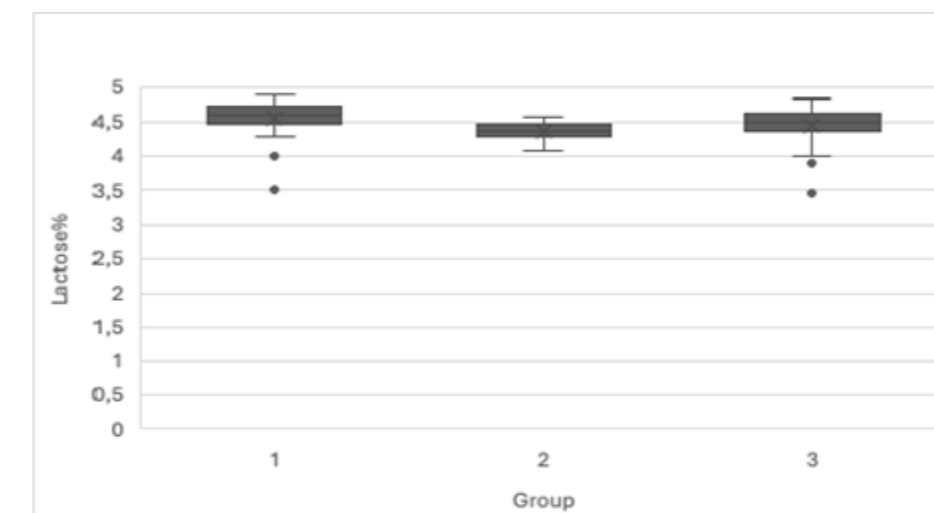
It was also checked if there were significant differences in the values of the variables between the experimental groups, as shown in **table 1**.

From the data in table 2, there are no statistically significant differences at $\alpha=0.05$ level of significance in the variables (excluding the Lactose variable – which is not significant, however, **Figure 2**).

Table 1: Comparisons of variable values between groups

Variables	Sum of Squares	df	Mean Square	F	Sig.
Milk Production * Group	559112.771	2	279556.385	1.392	.254
Fat% * Group	.038	2	.019	.025	.976
Protein% * Group	1.051	2	.525	1.944	.149

Figure 2: The differences between groups in the percentage of lactose.

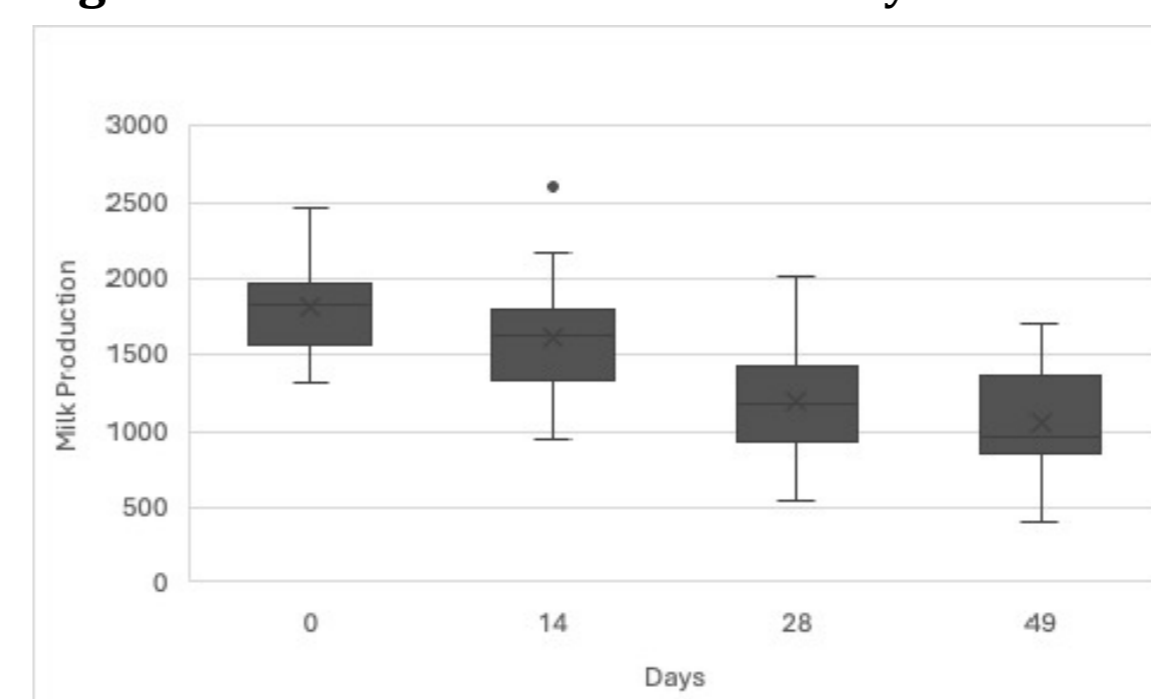


The results in **Table 2** show that the differences are statistically significant for the variables: Milk production, Fat%, Protein%, and Total Solids%. That is, the interactions between treatment and time were significant for the most of the parameters measured. Indicatively, the decline in milk production over time is shown in **Figure 3**.

Table 2: Multiple Comparisons of variable values between groups (combined).

Variables	Sum of Squares	df	Mean Square	F	Sig.
Milk Production * Days	8918959.250	3	2792986.417	26.502	<.001
Fat% * Days	18.900	3	6.300	10.973	<.001
Protein% * Days	5.533	3	1.844	8.218	<.001
Lactose% * Days	.129	3	.043	.666	.575
Total Solids% * Days	33.795	3	11.265	9.637	<.001
Somatic Cell Count *1000/ml * Days	92295347.2	3	30765115.7	1.685	.176
Total Colony Count *1000/ml * Days	2252986.833	3	750995.611	1.214	.309

Figure 3: The differences between days of counting in the amount of milk production.



Overall, in our trial, feeding Alpine goats with organic oregano EO increased milk production compared with the control group. The addition of twice the amount of EO in group 3 did not give a linear increase in milk production following the satisfactory increase shown by group 2 compared to the control. In general, the decline in milk production over time is satisfactory given that the animals are at the end of the lactation period. Also observing figure 3 a trend of improvement in the persistence of milk production is concluded. No interaction was observed between EO addition and milk composition, except for lactose.

4. Conclusions

The addition of organic oregano essential oil to goats at the late lactation, especially at a dose of 1ml per animal and day had a significant effect on milk production. But the effect of adding EO during the in the early period of lactation should be further investigated, as well as the effect on the rumen microbiota, with in vivo tests, in order to explain any changes that may occur in milk yield and composition and the mechanisms of action.

5. Acknowledgement: This paper is part of the “The use of herbs in the Feeding of organic farming goats and their effect on production, quality of milk and its products” («OREGANO») project, which is funded by the Rural Development Project (RDP) 2014-2020, under the project code M16ΣΥΝ2-00144 under the Agricultural European Innovation Partnership (EIP AGRI)

