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Dietary supplement of the rumen protected methionine and milk yield in dairy goats

Abstract

The experiment was conducted on three farms of dairy goats. The experimental groups of animals were during the four months period supplemented with 5g Mepron®, (Degussa, Germany), daily. Milk yield, milk protein and milk fat content were recorded throughout the experiment. The milk production was statistically higher in the experimental group of animals on two farms, farm 1 and farm 3 in the first control period, a month after the application, whereas on farm 2, the higher milk production was present in the third and forth control period, two and three months after the application. During the experiment there was no statistically differences in milk protein and milk fat content between experimental and control groups on farm 1 and farm 2, whereas on farm 3 the milk fat content was statistically lower during the Mepron® supplementation. In conclusion, the higher milk production in the first control period on farm 1 and 3 with great probability referred to the influence of Mepron®. The higher milk production on farm 2 in the third and fourth control period coincided with introduction of alfalfa hay in daily ration, that may have enriched the amino acid supply.

Key Words: goat, Methionine, milk yield, milk components

Zusammenfassung

Titel der Arbeit: **Pansengeschütztes Methionin als Nahrungsergänzung und die Milchleistung bei Milchziegen**

Die Untersuchungen wurden in drei Milchziegenbetrieben durchgeführt. Im Zeitraum von vier Monaten erhielten die Probanden täglich eine Nahrungsergänzung, nämlich 5g Mepron® (Degussa, Deutschland). Die Milchleistung sowie der Milchprotein- und Milchfettgehalt wurden im Laufe der Untersuchung aufgezeichnet. Die Milchleistung war in der Untersuchungsgruppe in zwei Betrieben (Betrieb 1 und Betrieb 3) im ersten Kontrollabschnitt, d.h. einen Monat nach der Verabreichung statistisch höher, während die Milchleistung im Betrieb 2 im dritten und vierten Zeitabschnitt, also zwei und drei Monate nach der Verabreichung, höher war. Während der Untersuchung gab es keine statistischen Unterschiede im Milchprotein- und Milchfettgehalt zwischen den Untersuchungs- und Kontrollgruppen im Betrieb 1 und Betrieb 2, während der Milchfettgehalt im Betrieb 3 während der Verabreichung von Mepron® statistisch niedriger war. Aus diesen Ergebnissen konnte abgeleitet werden, dass sich die höhere Milchleistung in den Betrieben 1 und 3 im ersten Kontrollabschnitt höchst wahrscheinlich auf die Auswirkung von Mepron® bezieht. Im Betrieb 2 stimmte die höhere Milchleistung im dritten und vierten Kontrollabschnitt mit dem Alfalfa-Heu in der täglichen Futterration überein, wodurch der Aminosäurengehalt wahrscheinlich erhöht wurde.

Schlüsselwörter: Ziege, Methionin, Milchleistung, Milchbestandteile

Introduction

Growing trend in consumption of goat milk and goat milk products initiate the modern dairy industry in order to improve the goat milk production and even to change the milk composition by dietary means.

The immense amounts of research have been done on the dairy cow nutrition basis with a primary goal to higher milk production and eventually to manipulate milk protein and milk fat yield. The implement of the protected amino acids in dairy cows diet showed the improvements of the production of milk and milk proteins

(OVERTON et al., 1996; PISULEWSKI and KOWALSKI, 1998). Although, the literature data are rather variable regarding the amino acid supplements and influence on the milk protein and milk fat synthesis in dairy cows it could be suspected the same effect on the dairy goats performance (OVERTON et al., 1996; OLIVEIRA et al., 2001; KIJORA et al., 2002; WANG et al., 2003). There were experimental model applied to show the gland amino acid uptake and partitioning in dairy goat and possible repercussion on the milk protein synthesis (LEE et al., 1999). The study on dairy goats of BAČAR-HUSKIĆ (1998) showed no significant changes in production of milk components but milk production elevated during the methionine supplementation.

The aim of this work was to evaluate the effect of rumen protected methionine on the milk production, fat and protein content in milk of Alpine dairy goats at three different managed farms.

Material and Methods

Three farms were included in research with a total of 58 Alpine dairy goats. The average milk production and breeding performance of dairy goats are described in Table 1. The experiment was carried out during the four months and started at the beginning of lactation period, from April to July. The animals were on each farm randomly divided in two groups, the control and the experimental group. On two farms (farm 1 and farm 3) both group of animals were in the fourth to seventh lactation, and on farm 2, all animals were at the second lactation. The feeding procedure and applied technology was substantially the same at all farms, but differ in concentrate compo-

Table 1
The average milk production and breeding performance of dairy goats in experimental farms (Durchschnittliche Milch- und Zuchtleistung von Milchziegen in Untersuchungsbetrieben)

Farm	**1**	**2**	**3**
Number of goats	15	23	20
Number of lactation	5-7	2	4-6
Milk yield (L)	800	240	550
Weight (kg)	50	40	50

Table 2
Ingredients and feeding schedule of control (CTRL) and experimental diets (MEP) on dairy goats farms (Nährstoffe und Fütterungsprogramm für die Kontrollgruppe (CTRL) und Untersuchungsgruppe (MEP) auf Milchziegenbetrieben)

	Farm	**1**	**2**	**3**
CTRL	Ingredients			
	Hay (kg/d)	1,5	1,5	1,5
	Pasture (kg/d)	7-8	/	7-8
	Alfalfa hay(%)	/	3-4	/
	Concentrate (kg/d)	1	1,5	1,2
	Corn (%)	50	40	40
	Barley (%)	20	20	30
	Wheat (%)	5	/	/
	Wheat bran(%)	/	40	20
	Oat(%)	25	/	/
	Soybean meal(%)	/	/	10
	NEL (MJ)	33,85	20,9	48,9
MEP	Mepron® (g)	5	5	5
	NEL (MJ)	42,89	25,46	57,94

sition, forage introduction and quality of management. Daily ration consisted of hay, concentrate, pasture, (May until July) or alfalfa hay on one farm only (Tab. 2.). The experimental group was supplemented with 5g rumen protected aminoacid methionine (Mepron®, Degussa, Germany) per goat. Milk yield was recorded weekly and milk samples were collected every four week. The milk components were determined using automatic analyser «Milcoscan 605» (A.S.N. Foss Eletronic). The results were statistically evaluated with ANOVA (STATISTICA 6, Stat soft, USA, 2004).

Results and Discussion

The experimental group of animals (MEP) showed statistically higher milk production ($p \leq 0{,}001$) and ($p \leq 0{,}01$) respectively, on two farms (farm 1 and farm 3), at first control period (Fig. 1. and Fig. 3.).

On the other hand, milk production for MEP group of animals in all other control periods was near the level of CTRL group of animals. The milk production of MEP group on farm 2 was during the first and second control period near control level, whereas in the third and fourth control period milk production was statistically higher ($p \leq 0{,}01$ and $p \leq 0{,}05$ respectively), than in control group (Fig. 2.).

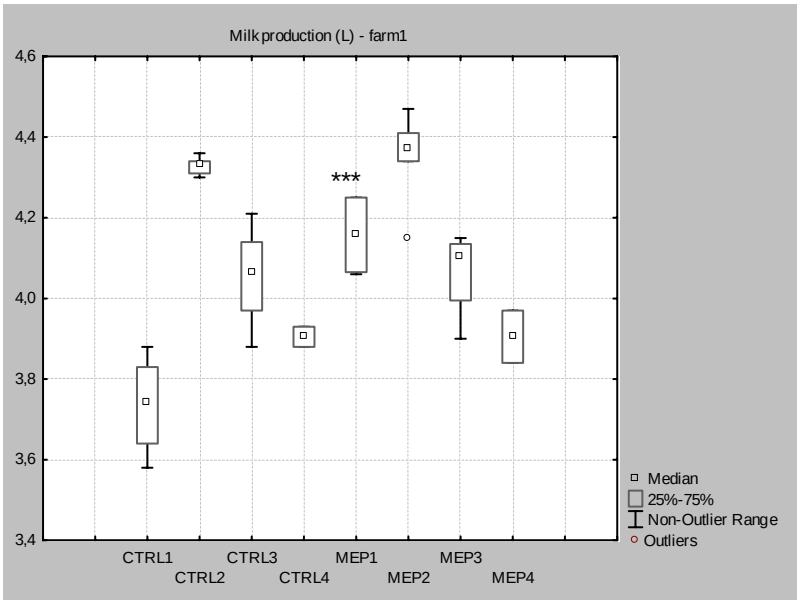

Fig. 1. Milk yield on farm one during the control periods (Milchleistung im Betrieb 1 während der Kontrollabschnitte)

During the whole experiment there were no statistically differences in protein and fat content between experimental and control milk samples on farm 1 and farm 2, whereas on farm three the MEP group had statistically lower fat content in milk. According to HAENLEIN (2001), fat and protein percentage measured on the machine calibrated with cow milk standards might have been underestimated by 0,04 and 0,27%, respectively. The lower milk fat content of MEP group of animals on farm 3 might have been related to basal diet in which soybean meal was incorporated in the concentrate mixture. The influence of active fats on the rumen biohydrogenation processes were discussed by many authors (BESSA et al., 2000; CHILLIARD et al., 2001; WALISIEWICZ-NIEDBLASKA et al., 2004).

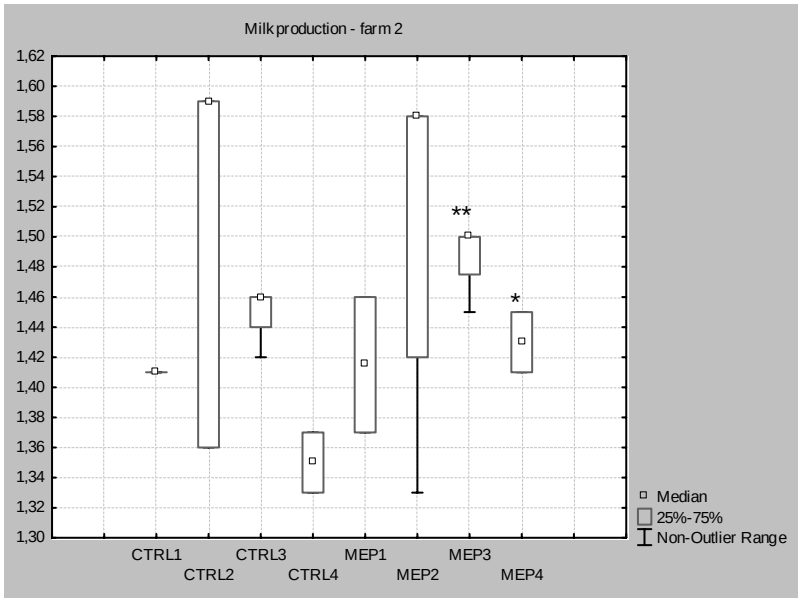

Fig. 2: Milk yield on farm two during the control periods (Milchleistung im Betrieb 2 während der Kontrollabschnitte)

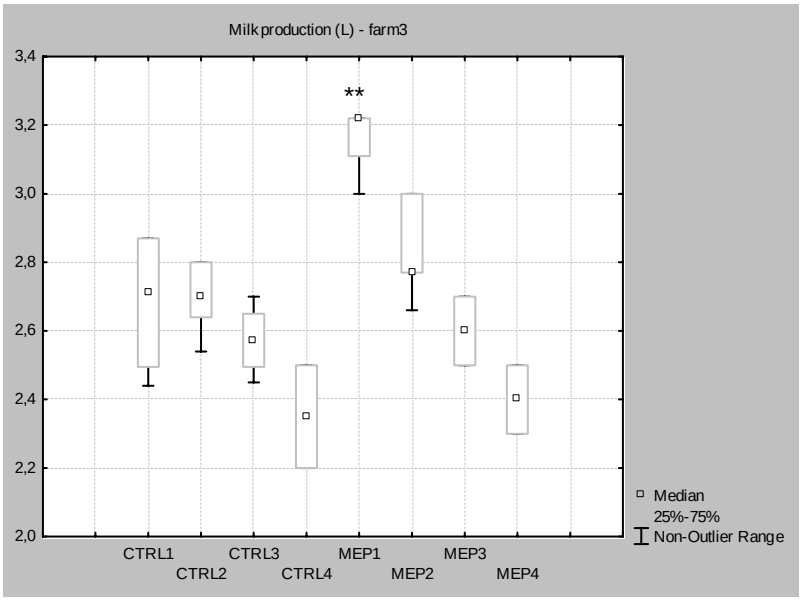

Fig. 3: Milk yield on farm three during the control periods (Milchleistung im Betrieb 3 während der Kontrollabschnitte)

The presented results indicate that the supplementation of the protected methionine (Mepron®, Degussa) resulted in the higher milk production, whereas the milk components, total milk protein and milk fat content were mostly unaffected by this treatment. The results are in agreement with that of previous experiment conducted on Alpine goats (BAČAR-HUSKIĆ et al., 1998). The higher milk production in experimental group of animals was recorded on the different farms at the different stage of lactation. The reason for that incompatibility could be discussed in the light of concentrate composition that may have mayor roll in expression of supplemented rumen protected methionine. KIJORA et al. (2002) in their research stated strong relationship between feed intake and protein content in the ration of dairy goats, thus aminoacid protection might have provided also higher RDP level in duodenum of

dairy goats in our research. In addition, parity and live weight of animals could have had the impact on the production results.

Table 3
Milk components in control (CTRL) and experimental (MEP) group of dairy goats in the study (Milchbestandteile in der Kontrollgruppe (CTRL) und der Untersuchungsgruppe (MEP))

Farm	Milk components			
	Protein (%)		Fat (%)	
	CTRL	MEP	CTRL	MEP
1	2,79±0,13	2,86±0,09	2,97±1,05	3,95±1,56
2	2,88±0,11	2,95±0,17	3,64±0,11	3,60±0,20
3	2,93±0,12	2,92±0,03	3,65±0,12	3,02±0,15*

*p≤ 0,01

The milk production on farm 2 reached the highest level at the third and forth month of experiment. The reason for postponed reaction we may attribute to age and parity (younger animals in second lactation). Moreover, the higher milk yield coincidences with the adding alfalfa hay in daily ration. On the other hand, in farm 1. and farm 3. the milk production in experimental group of animals increased between 6 and 9 week of lactation, what can with the great probability be considered as the influence of Mepron®. This conclusion is additionally supported by the fact that the goats from control groups reached this production value not until the week 10. At the time the animals were moved to more advanced pasture and also this period is known to be physiological peak of lactation curve in the goats.

Beside that, the results of blood analysis, (unpublished data), indicated the variation of urea and mineral concentration, calcium and phosphorus between control and experimental group of animals which should be taken into account while forming the daily ration and using the supplemental feeding in dairy goats.

In conclusion, supplemental feeding with rumen protected methionine Mepron® influenced the production level of dairy goats and the intensity of response might have been also affected by the stage of lactation and diet composition. Positive effect on the milk yield is directly related to well-established lactation and nutritional quality.

However, Mepron® had no influence on the total protein and fat content in milk, yet potential changes in protein fractions and composition are more feasible and should be considered in further trials. The regular control of blood metabolite and minerals during the supplemental feeding is needed since the higher production could change the mineral status, but also an antioxidative status of animals.

References

BAČAR-HUSKIĆ, L.; LJUBIĆ, Z.; MAGDALENIĆ, B.; SAKOMAN, M.:
Results of applying protected methionine to the diet of dairy goats. Krmiva, **40** (1998), 317-327

BESSA, R.J.B.; SANTOS-SILVA, J.; RIBEIRO, J.M.R.; PORTUGAL, A.V.:
Reticulo-rumen biohydrogenation and the enrichment of ruminant edible products with linoleic acid conjugated isomers. Livestock Prod. Sci. **63** (2000), 201-211

CHILLIARD Y.; FERLAY, A.; DOREAU, M.:
Effect of different types of forages, animal fat or marine oils in cows's diet on milk fat secretion and composition, especially conjugated linoleic acid (CLA) and polyunsaturated fatty acids. Livestock Prod. Sci. **70** (2001), 31-48

HAENLEIN, G.F.W.:

Relationship of somatic cell counts in goat milk to mastitis and productivity. Small Ruminant Res., **45** (2002), 163-178

KIJORA, C.; PETERS, K.-J.; REXROTH, H.; CHOWDHURY, S.:
Einfluss des Energie- und Proteinniveaus sowie der Proteinqualität auf die Milchleistung der Bunten Deutschen Edelziege. Arch. Tierz., Dummerstorf **45** (2002), 255-268

LEE, J.; KNUTSON, R.J.; DAVIS, S.R.; LOUIE, K.; MACKENZIE, D.D.S.; HARRIS, P.M.:
Sulfur amino acid metabolism in the whole body and mammary gland of lactating Saanen goat. Aust. J. Agr., Res. **50** (1999), 413-423

OLIVIERA, M.D.S.; OLIVIERA, E.; NALIM, M.D.; MOTTA, L.O.:
Effect of methionine addition in the diet on milk production by dairy cows. Ars. Veterinaria, **17** (2001), 130-136

OVERTON, T.R.; LACOUNT, D.W.; CICELA, T.M.: CLARK, J.H.:
Evaluation of a Ruminally Protected Methionine Product for Lactating Dairy Cows. J. Dairy Sci., **79** (1996), 631-638

OVERTON, T.R.; EMMERT, L.S.; CLARK, J.H.:
Effects of Source of Carbohydrate and Protein and Rumen – Protected Methionine on Performance of Cow. J. Dairy Sci., **81** (1998), 221-228

PISULEWSKI, P.M.; KOWALSKI, Z.M.:
The effect of protected lysine and methionine on milk yield and its composition in lactating cows fed grass silage-based rations. J. Anim. Feed Sci., **8** (1999), 341-353

POLJIČAK-MILAS, N.; ZDELAR, M.; KAMPL, B.:
Effects of Rumen Protected Methionine Mepron®, Degussa, Germany Supplementation on the Milk Production and Somatic Cells count in Milk. Proc. Xth ICPD. Utrecht, Netherlands, (1998), 370

WALISIEWICZ-NIEDBLASKA,W.;PATAKOWSKA-SOKOLA, B.; BODKOWSKI, R.; ROZCYKI, K.:
The influence of linoleic acid and its isomers in goat diet on the composition of fatty acid in goat milk fat. Arch. Tierz., Dummerstorf **47** (2004) Special Issue, 103-107

WANG, J.T.; WAN, W.J.; XU, G.Q.; CUI, G.Y.:
Effects of protected methionine on production performance of dairy cows. China Dairy Cattle, **1** (2003), 15-17

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