

INFLUENCE OF DIFFERENT FEEDSTUFFS ON QUALITY OF GOAT MILK

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Abstract

Goat milk productivity depends mainly on the quantity and quality of feedstuffs. In this research is analyzed and discussed the influence of different feedstuffs on quantity and quality of goat milk. Analyzing of the 432 milk samples showed that the highest milk yields obtained by adding to basic ration of peas and Galega seeds - respectively 2.84 and 3.30 kg of milk from one goat per day. Adding of fodder yeast, sunflower cake, wheat bran and yeast *Yea-Sacc*¹⁰²⁶ into the ration significantly increased the fat content of milk and wheat bran also increased milk protein content. Sunflower cake, wheat bran and rapeseed meal had positive effect to reduce the somatic cells count in milk by as much as 24.3% to 49.0%.

Key words: Goat, milk, feedstuffs

INTRODUCTION

Goat milk production is a growing industry that is very important to the wellbeing of people worldwide and is an important part of the economy in many countries. The aim of the investigations is to provide an integrated analysis of the major aspects in this field to highlight unexploited nutritional potential of goat milk and the need for improvements, particularly in food safety. Goat milk like cow milk delivers many nutrients with relatively low energy content, and is relevant to the health of consumers. In addition, goat milk possesses many advantages over cow milk, for use as a nutritional source for infants and children, and as a medicinal food [5].

Goat milk production depends on level of intake and quality of feed, but milk fat content on the indirect effect of dilution, while protein content varies generally like milk production. Goat milk production and its fat content can rise when grass forage is at an early growth stage. When supply of concentrates in diets increases to 60% of total dry matter intake, fat content may decrease slowly and linearly, but if concentrate intake reaches 60–80%, fat content may decrease

rapidly due to an increasing shortage of fibrosity in the ration. Milk fat content influences cheese fat content as well as sensorial qualities. In the future, the farmer must select farming or feeding systems in accordance with trade conditions, consumers' demand and socio-economic conditions, and have to find a balance between the level of intensification and the quality of dairy products [2].

In comparison with cow milk, goat milk is higher in medium-chain FA (C8, caprylic acid and, more markedly, C10, capric acid), which could contribute to increases in the specific flavour of goat dairy products. The higher proportion of medium-chain fatty acids in goat milk are known to be anti-bacterial, be anti-viral, inhibit development and dissolve cholesterol deposits [4].

As in cows, lactose constitutes the main carbohydrate in goat milk. Goat milk does contain less lactose than cow milk (on average, 4.1% vs. 4.7%), but cannot be regarded as a dietary solution to people suffering from lactose intolerance. The mineral content of goat milk varies from 0.70 to 0.85%. Compared to human and cow milk, goat milk contains more calcium, phosphorous and potassium [5].

MATERIAL AND METHODS

The study was carried out since 2002 to 2009 in three organic goat farms, by four

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dairy goat feeding trials. There were analyzed 432 milk samples obtained from Latvian goats and Zane goats in farm "Berzi" (A1 test - 4 groups and A2 test - 4 groups), farm "Licisi" (B test - 3 groups) and farm "Mezdruvas" (C test - 2 groups).

Goat's milk production was measured with an accuracy of ± 0.05 kg. In milk samples were determined milk fat, protein and lactose content by the average daily sample once a month - according to the IDF standard 141C:2000 requirements and somatic cell count - in accordance with standard LVS EN ISO 13366-3:1997 requirements.

At accounting period animals of 1st group received basic feed (PB) produced at goat farm. This summary of the study results covers the impact of additional feedstuffs on milk quantity and quality indicators, so it is not made explanation of basic feed (BF) used in each experiment. Goats of the rest trial groups received BF supplemented with yeast, sunflower cake, oat flour, wheat bran, rapeseed meal, peas, *Galega* seeds or live yeast culture *Yea-Sacc*¹⁰²⁶. The trial scheme is shown in Table 1.

Table 1 Analyzed milk samples and trial scheme

Farm	Trial group	Milk samples	Feedstuffs
A1	1.	30	Basal feed (BF)
	2.	30	BF + fodder yeast
	3.	30	BF + sunflower cake
	4.	30	BF + oat meal
A2	1.	18	BF
	2.	18	BF + wheat bran
	3.	18	BF + sunflower cake
	4.	18	BF + rape meal
B	1.	60	BF
	2.	60	BF + fodder yeast
	3.	60	BF + <i>Yea-Sacc</i> ¹⁰²⁶
C	1.	30	BF + peas
	2.	30	BF + <i>Galega</i> seeds

Analysis of feedstuffs and milk were carried out of certified laboratory of Latvia University of Agriculture, laboratory of Scientific Research Institute of Biotechnology and Veterinary Medicine "Sigra" and laboratory of Animal biochemistry and physiology of Latvia University. Nutrient requirements of goats were determined according to animal live weight and milk yield following the normative regulations adopted in Latvia, and also according to the National Research Council (NRC) recommendations [3], [6]. By the amount of dry matter, crude protein, NDF, ADF, NEL, Ca, P and main biologically active substances feed rations for the goats of the trial groups were practically equal according of feed chemical analysis and theoretical dates

RESULTS AND DISCUSSIONS

Experiments were conducted in three different organic farms in Latvia in Kurzeme, Vidzeme and Zemgale regions. Two unrelated trials took place in Talsi district Vandzene goat farm "Berzi" (A1 and A2 farm): A1 trial period - 92 days, A2 trial period - 92 days. Goat feeding studies also were held in Jelgava district goat farm. "Licisi" (farm B): a trial period - 184 days, as well as in Riga district goat farm "Mezdruvas" (farm C): a trial period - 91 days. In the preparatory period, which was lasting for two weeks, feeding, keeping and rearing conditions were equal for all goats included in the trial. By the amount of energy value, protein, Ca, P and other indices goat rations was practically equivalent. Adding of different feedstuffs to a basic feed has affected animal's productivity in the study groups (Table 2).

Table 2 Influence of different feedstuffs on goat milk yield

Farm/ trial group	Feedstuffs	Animals in group	Milk yield per goat per day, kg
A1-1.	Basal feed BF	10	2.30
A1-2.	BF + fodder yeast	10	2.34
A1-3.	BF + sunflower cake	10	2.27
A1-4.	BF + oat meal	10	2.42
A2-1.	BF	6	2.77
A2-2.	BF + wheat bran	6	2.89
A2-3.	BF + sunflower cake	6	2.80
A2-4.	BF + rape meal	6	3.12
B-1.	BF	10	1.73
B-2.	BF + fodder yeast	10	1.73
B-3.	BF + <i>Yea-Sacc</i> ¹⁰²⁶	10	1.54
C-1.	BF + peas	10	2.84
C-2.	BF + <i>Galega</i> seeds	10	3.30

Goat productivity differs both between farms and depending on the supplemented feedstuffs. The higher milk yields obtained by goat farm "Mezdravas" (C farm), where to basic ration as a complementary feedstuffs we added *Galega* seeds and peas. *Galega* and peas are important protein-containing plants, in particular, are suitable for animal nutrition in organic farming, which is not allowed to

use conventional feed resources. The word "Galega" (hence the name "Goat's rue") means "milk creative" and *Galega* seeds contain a substance galaktogogue for use as a milk-forming agent to humans and animals [7]. Also adding of oat or rapeseed meal to a basic feed ration has resulted in milk yield increases.

Table 3 Influence of different feedstuffs on goat milk quality

Farm/ Trial group	Milk fat, %	Milk protein, %	Lactose, %	SCC, thous. ml ⁻¹
A1-1.	3.38	2.84	4.04	428
A1-2.	3.81	2.97	3.62	446
A1-3.	3.55	2.90	3.39	324
A1-4.	3.29	2.79	3.87	537
A2-1.	3.12	2.85	4.37	388
A2-2.	3.83	3.23	4.42	349
A2-3.	3.07	2.96	4.38	225
A2-4.	3.22	2.82	4.30	198
B-1.	4.34	3.15	x	x
B-2.	4.27	3.17	x	x
B-3.	4.58	3.16	x	x
C-1.	4.29	2.96	x	x
C-2.	3.77	2.74	x	x

In different experiments, analyzing the changes in milk quality indicators (table 3), we see that adding of feed yeast, wheat bran or yeast *Yea-Sacc*¹⁰²⁶ to basic ration is caused by increases of milk fat and protein content of milk. Whereas, the addition of sunflower cake, in one experiment, has been a positive effect on milk fat and protein content increases, while in another experiment the effect is exactly the opposite.

Closeness of the relationship between milk yield, milk fat, protein, lactose and somatic cell

counts were determined by correlation analysis. After the establishment of a correlation matrix found that between milk yield and lactose content of milk is a strong positive correlation (= 0.83), but on average positive correlation between milk yield and fat content, protein and somatic cell count ($r = 0.58$, $r = 0.59$, $r = 0.67$, respectively), as well as between protein and fat content of milk ($r = 0.68$).

So, if there is higher animal milk productivity, it means that the milk quality indicators such as milk fat and protein

content are higher, although the some authors do not show the same information [1].

According to the Latvia goat breeding programs by 2015 planned to pay more attention to such selection features that with improving of goat nutrition allow achieving of higher milk yield, milk fat and protein content of milk [8]. However, the increased

milk yield may also be a factor in the increased count of somatic cells in milk.

On the basis of a basic feed ration of each farm experiment separately, we evaluated the intensity of influence of different feedstuffs on goat milk productivity and milk fat, protein, lactose content and somatic cell count (Table 4).

Table 4 The intensity of influence of different feedstuffs on goat milk yield and quality, %

Farm/Trial group	Milk yield	Milk fat	Milk protein	Lactose	SCC
A1-1.	100.0	100.0	100.0	100.0	100.0
A1-2.	101.7	112.7*	104.6	89.6	104.2
A1-3.	98.7	105.0*	102.1	83.9	75.7*
A1-4.	105.2*	97.3	98.2	95.8	125.5*
A2-1.	100.0	100.0	100.0	100.0	100
A2-2.	104.3	122.8*	113.3*	101.1	89.9*
A2-3.	101.1	98.4	103.9	100.2	57.9*
A2-4.	112.6*	103.2	98.9	98.4	51.0*
B-1.	100.0	100.0	100.0	x	x
B-2.	100	98.4	100.6	x	x
B-3.	89.0	105.5*	100.3	x	x
C-1.	100.0	100.0	100.0	x	x
C-2.	116.2*	87.9*	92.6*	x	x

*p<0.05

Adding of fodder yeast, sunflower cake, wheat bran and yeast *Yea-Sacc*¹⁰²⁶ into the ration significantly increased the fat content of goat milk, but milk protein content were affected only with adding of wheat bran to a basic feed ration. Interesting results of reducing of somatic cell count in milk made adding of sunflower cake, wheat bran and rapeseed meal to a basic feed, which made it possible to reduce the count of somatic cells in milk by as much as 24.3% to 49.0%.

CONCLUSIONS

In experiment included goat milk productivity between farms is different; it is also dependent on the supplemented feedstuffs. The higher milk yields were obtained by adding of peas and *Galega* seeds to a basic ration - respectively 2.84 and 3.30 kg of milk from one goat per day. Adding of fodder yeast, sunflower cake, wheat bran or live yeast *Yea-Sacc*¹⁰²⁶ into the ration significantly (p <0.05) increased the fat content of milk. Adding of wheat bran to a basic feed ration significantly (p <0.05) increased milk protein content. Sunflower cake, wheat bran and rapeseed meal to a basic feed

made it possible to reduce the somatic cells count in milk by as much as 24.3% to 49.0%.

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