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LATVIAN BROWN LOCAL BREED AND OTHER BREED COWS MILK YIELD, COMPOSITION AND DRY MATTER INTAKE ANALYZE

SUMMARY

Dry matter intake for dairy cows is very important factor for milk producing. The feeding cost decrease if dry matter intake per one kilogram of milk decrease too. This factor depends of dairy cows breed. The purpose of research was to analyze different breed milk yield and composition, dry matter intake per one kilogram of milk. Data was collected from 2012 to 2013 year. Data was collected from 9 Latvian Brown local breed (genetic resources), 10 Latvian brown breed with Holstein blood, 9 Danish Red and 10 Holstein Black and White breed. Research location was Latvia University of Agriculture Research and Study farm Vecauce. All cows, except genetic resources, were kept in loose housing farm and fed with total mixed ration. Genetic resources were kept in summer time pastures. Data was collected from milk recordings (first five recordings after calving). Milk yield of Latvian Brown local breed was significantly lower in all recordings compared with other research groups (average 17.8 kg per day). Milk yield of Holstein Black and White was significantly higher compared with local breed (average 30.9 kg per day; $p<0.05$). Fat content was significantly different between GR, LB and HBW, but protein content was significantly different in 3rd recording between Danish Red and local breed (3.27 vs. 2.91; $p<0.05$). Dry matter intake per one kilogram milk was significantly higher from local breed cows (average 0.89 kg), but lower Holstein Black and White (average 0.64 kg; $p<0.05$).

Keywords: local breed, milk yield, dry matter intake.

INTRODUCTION

Local breeds have evolved in defined areas during long time. These breeds were adapting in the specific environmental conditions. Local breed usually live in areas where environmental conditions are variable or rough. Milk yield of local breeds is lower, but chemical content is qualitative. Investment for local breed is less compared with commercial breeds, but profit also is less. Local breeds are not suitable for high milk yield, and then widespread and bred breeds are more suitable (Mondal et al., 2010). Local breeds are very important for genes protection. For example, Latvian local breed have genes, which affected

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casein content in milk protein. This milk can give more cheese output in processing (Smiltiņa et al., 2010).

Local breed count is different in each country. In Latvia are two local dairy breeds – Latvian brown (genetic resources) and Latvian Blue (genetic resources), but in Turkey are more local breeds then in Latvia. Special breeding and defensive programs are made for this breed protection. Special genetic markers are used for identification, because uncial genes are in these cow`s genomes, which are only in this cow's genome. These genes usually are homozygotes (Yilmaz et al., 2012; Viinalass et al., 2002).

The purpose of research was to analyzed different breed cow's milk yield and composition and analyzed dry matter intake per one kg of milk.

MATERIAL AND METHODS

Research location was Latvia University of Agriculture Research and Study farm 'Vecauce'. Data was collected from 2012 to 2013. Data were analyzed from 38 dairy cows. By a breed factor dairy cows were grouped in 4 groups – Holstein Black and White (HBW, n=10), Latvian Brown local breed (genetic resources, GR=9), Danish Red (DR, n=9) and Latvian brown with different red breed blood (LB, n=10). Cows of HBW, DR, LB groups were kept in a loose housing farm. Cows had at libidum access to total mixed ration (TMR). TMR ingredients were 20.0 kg grass silage, 20.0 kg maize silage, 1.0 kg hay, 6.5 kg grains, 2.0 kg rapeseed meal, 2.0 kg sunflower meal, 2.0 kg soybean meal, 0.5 kg sugar beet pulp, 1.0 kg molasses, 0.2 kg Biotin plus, 0.15 kg baking soda, 0.08 kg salt, 0.07 kg living yeast, 0.07 kg chalk. GR cows were kept in pasture during grazing period, but during non-grazing period were kept in cowshed and fed with TMR. The 1st recording was on average 15 ± 0.79 day after calving, the 2nd recording was on average 48 ± 0.39 day after calving, 3rd recording was on average 83 ± 0.73 day after calving, 4th recording was on average 115 ± 0.67 day after calving, 5th recording was on average 145 ± 0.64 day after calving.

Recording data was collected from Agricultural data center database from the heard recording data. Monthly control milk samples were analyzed for fat, protein and somatic cells count. All of these parameters were analyzed in accredited milk quality laboratory SIA 'Piensaimnieku Laboratorija' with FOSS instrument CombiFoss FC. Somatic cell count was calculated to somatic cell score (SCS) by formula (Schutz, Powell, 1993):

$$SCS=\log2\ (\text{Somatic cell count}/100000) + 3 \quad (1)$$

Live weight was measured in 1st recording for analyzing energy corrected milk per 100 kg live weight. Energy corrected milk (ECM) was calculated by 1st recording data by formula (Garcia et al., 2006):

$$ECM = \text{milk yield, kg} \times ((0.393 \times \text{fat content,\%}) + (0.242 \times \text{protein content,\%}) + 0.7832)/3.140 \quad (2)$$

For data analysis SPSS and MS Excel software were used. For traits characterization mean values and standard error, minimal and maximal values were used. To examine milk productivity and dry matter intake per kg-1 of milk changes according to breed, ANOVA single factors were performed. Bonferroni test was performed to determine significance. The factor was significant if $p<0.05$. Significant differences were marked by different letters (a;b; c) with superscript.

RESULTS AND DISCUSSION

Milk yield was significantly lower in GR group in all recordings. Milk yield of 1st recording was 19.5 ± 1.48 kg, but it decreased to 16.2 ± 1.36 kg in 5th recording. Milk yield of Holstein breed is affected by genes. Milk yield of Holstein cross-breed is high also (Rahmatalla et al., 2011).

Fat content did differ significantly between research GR, LB and DR groups in 5th recording. Lower fat content was in HBW group in 3rd recording (3.09 ± 0.19%), but higher fat content was in GR group in 1st recording (4.84 ± 0.35%). Protein content was significantly different between GR and DR groups in 2nd recording. Protein content in this recording was 2.91 ± 0.08% in GR group, but 3.27 ± 0.07% in DR group. Protein content was significantly different between DR and HBW groups, when it was 3.69 ± 0.10% in DR group, but 3.24 ± 0.08% in HBW group. Compared protein content, we found that higher protein content was in DR group.

SCS was significantly different between GR and LB group in 2nd recording. SCS was 4.22 ± 0.71 in 2nd recording in GR group, but 0.70 ± 0.44 in LB group. SCS was significantly different between GR, LB and HBW groups in 5th recording. Higher SCS was in GR group in this recording – 3.58 ± 0.32, but lower SCS was in HBW group – 0.78 ± 0.34 ($p<0.05$, Table 1).

Dry matter intake per one kg of milk characterized feed digestibility efficiency. Milk processing is effective if dry matter intake per one kg of milk decrease. Significantly higher dry matter intake was in GR group. Dry matter intake increased from 0.89 ± 0.07 kg to 1.09 ± 0.11 kg per one kg of milk. Lower dry matter intake was in HBW group. Lower dry matter intake of HBW was in 2nd recording – 0.56 ± 0.04 kg. We found tendency in all research groups that dry matter intake per one kg of milk increased in each next recording (Table 2). This tendency can be explained by the fact, that dairy cows can intake less dry matter in early lactation stage, but later dry matter intake increase. Milk productivity increase while reaches its peak. Dairy cows can intake enough dray matter in middle lactation stage, but milk yield decrease. Forage quality is the primary factor affecting the estimated daily feed intake of a cow. As forage dry-matter digestibility decreases, the intake level of that forage also decreases. Forage intake levels will also be greatly influenced by cow body-condition, body weight and stage of production, such as gestation or lactation (Petersson-Wolfe, et al., 2007).

Table 1. Comparison of milk productivity by recordings

Breed	Recording	Milk yield, kg	Fat, %	Protein, %	Somatic cell score
GR	1st	19.5 ± 1.48[a]	4.84 ± 0.35	3.18 ± 0.21	2.96 ± 0.38
	2nd	18.6 ± 1.01[a]	3.88 ± 0.17	2.91 ± 0.08[a]	4.22 ± 0.71[a]
	3rd	18.8 ± 1.43[a]	4.08 ± 0.38	3.09 ± 0.11	2.61 ± 0.92
	4th	17.0 ± 1.59[a]	4.04 ± 0.31	3.31 ± 0.11	3.18 ± 0.48
	5th	16.2 ± 1.36[a]	4.68 ± 0.24[a]	3.43 ± 0.10 [a]	3.58 ± 0.32[a]
LB	1st	29.6 ± 1.80[b]	4.40 ± 0.31	3.48 ± 0.08	2.07 ± 0.81
	2nd	28.9 ± 1.88[b]	3.65 ± 0.15	3.20 ± 0.08[b]	0.70 ± 0.44[b]
	3rd	30.9 ± 1.24[b]	3.93 ± 0.14	3.36 ± 0.08	1.23 ± 0.58
	4th	27.6 ± 1.14[b]	4.16 ± 0.21	3.49 ± 0.06	1.80 ± 0.74
	5th	26.9 ± 1.13[b]	4.08 ± 0.26[ab]	3.56 ± 0.07 [a]	1.34 ± 0.59[b]
DR	1st	31.2 ± 2.57[b]	4.35 ± 0.22	3.53 ± 0.13	2.47 ± 0.67
	2nd	29.1 ± 2.46[bc]	3.89 ± 0.25	3.27 ± 0.07[b]	2.40 ± 0.58[ab]
	3rd	30.7 ± 2.60[b]	3.93 ± 0.40	3.38 ± 0.11	1.71 ± 0.71
	4th	26.7 ± 2.32[b]	4.43 ± 0.48	3.49 ± 0.12	2.51 ± 0.53
	5th	26.7 ± 3.02[b]	4.50 ± 0.21[ab]	3.69 ± 0.10[a]	2.03 ± 0.57[ab]
HBW	1st	26.9 ± 1.12[b]	4.21 ± 0.41	3.41 ± 0.10	2.91 ± 0.67
	2nd	36.4 ± 2.37[c]	3.27 ± 0.13	3.10 ± 0.06[ab]	1.20 ± 0.63[b]
	3rd	35.1 ± 1.69[b]	3.09 ± 0.19	3.16 ± 0.08	1.77 ± 0.35
	4th	32.7 ± 1.76[b]	3.47 ± 0.16	3.14 ± 0.07	1.53 ± 0.58
	5th	27.2 ± 1.64[b]	3.73 ± 0.24[b]	3.24 ± 0.08[b]	0.78 ± 0.34[b]

[a,b,c] – traits with different letter were significantly different between breeds in the same recording; $p<0.05$

Table 2. Dry matter intake per one kg of milk

Breed	Recorgding	Dry matter, kg per kg^{-1} of milk	Min	Max	p value
GR	1st	0.89 ± 0.07[a]	0.60	1.28	0.030
	2nd	0.91 ± 0.05[a]	0.72	1.25	0.000
	3rd	0.91± 0.06[a]	0.58	1.15	0.000
	4th	1.05 ± 0.10[a]	0.68	1.62	0.000
	5th	1.09 ± 0.11[a]	0.76	1.72	0.018
LB	1st	0.68 ± 0.04[b]	0.49	0.87	0.030
	2nd	0.70 ± 0.05[ab]	0.51	0.98	NS
	3rd	0.64 ± 0.03[b]	0.54	0.84	0.001
	4th	0.72 ± 0.03[ab]	0.61	0.86	NS
	5th	0.74 ± 0.04[b]	0.63	0.98	0.023
DR	1st	0.66 ± 0.05[b]	0.41	0.86	0.014
	2nd	0.72 ± 0.07[ab]	0.51	1.13	NS
	3rd	0.67 ± 0.05[b]	0.41	0.97	0.003
	4th	0.78 ± 0.08[b]	0.51	1.26	0.050
	5th	0.81 ± 0.10 [ab]	0.49	1.47	NS
HBW	1st	0.74 ± 0.03[ab]	0.62	0.93	NS
	2nd	0.56 ± 0.04[b]	0.39	0.78	0.000
	3rd	0.57 ± 0.03[b]	0.46	0.73	0.000
	4th	0.61 ± 0.03[b]	0.48	0.87	0.000
	5th	0.73 ± 0.06[b]	0.49	1.08	0.018

a,b – dry matter with different letter were significantly different between breeds in the same recording; $p<0.05$

NS – not significantly different

According by Kolver and Muller (1998) grazed cows can intake less dry matter, compared with cows which fed total mixed ration. Milk yield was lower from grazed cows.

Profit from dairy business increase, if dry matter content high concentration with important nutrients and neto energy of lactation. If dry matter intake per one kg of milk decrease, profit increase. High quality dry matter is important for high milk yield and good reproduction traits, allows avoid from metabolic diseases (Kashfi et al., 2011).

Energy corrected milk (ECM) is depends from milk yield, fat content and protein content in milk (Figure 1). ECM was significantly higher in DR group – average 32.7 kg, but lower ECM was in GR group – 21.2 kg ECM per 100 kg live weight was not significantly different between breeds.

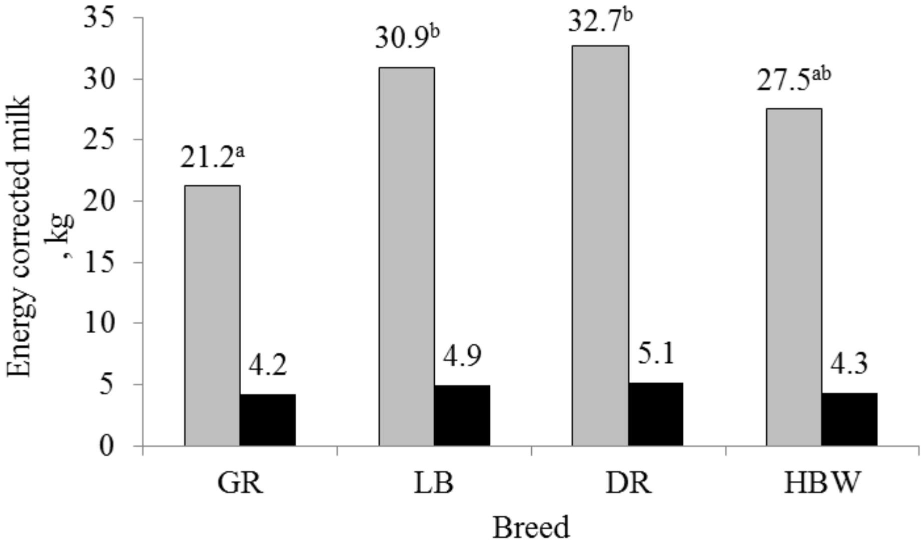

Figure 1. Energy corected milk by different breeds: ■ ECM, kg, ■ ECM per 100 kg live weight

We found conclusions, that cows with lower milk yield have higher fat and protein content. As a result high yielding HBW ECM per 100 kg live weight was not significantly different form low yielding GR.

CONCLUSIONS

Significantly lower milk yield was in GR group (19.5 ± 1.48 kg in 1st recording, 16.2 ± 1.36 kg in 5th recording). Fat content was significantly different between GR, LB and HBW groups, but protein content was significantly lower in GR group in 2nd recording compared with DR (2.91 ± 0.08% vs. 3.27 ± 0.07%), but significantly higher in DR group in 5th recording compared with HBW (3.69 ± 0.10% vs. 3.24 ± 0.08%; $p<0.05$).

Dry matter intake per one kg of milk was significantly higher in GR group in all recordings (0.89 ± 0.07 kg in 1st recording, 1.09 ± 0.11 kg in 5th recording; $p<0.05$).

Significantly higher energy corrected milk was in DR group (32.7 kg), but lower in GR group (21.2 kg), but energy corrected milk per 100 kg live weight was not significantly different ($p<0.05$).

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