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Conference paper

THE EFFECT OF DIFFERENT YEAST STRAINS ON MILK YIELD, FATTY ACIDS PROFILE AND PHYSIOLOGICAL PARAMETERS IN DAIRY COWS

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Introduction Products containing live yeast cultures may stimulate growth of bacteria able to utilize lactic acid. This prevents the fluctuation of pH in the rumen (Kamra et al., 2002; Blake, 2003). However, not all yeast strains possess this ability and, therefore, a considerable attention should be paid to the selection of the yeast type (Howes, 2003).

Yea-Sacc yeast directly stimulates growth of fibre-digesting bacteria in the rumen by reacting with the free oxygen and metabolising soluble sugars. The microbial population in the rumen is anaerobic but during feed intake the air with the oxygen gets into the rumen and thus microaerobic regions are developed around fibre and cellulolytic bacteria. Once Yea-Sacc is attached to fibre tufts, it consumes the ambient oxygen and removes the barrier blocking the digestion of fibre by rumen bacteria. After the oxygen is depleted, Yea-Sacc starts to produce peptides stimulating the growth of cellulolytic bacteria (Enjalbert, 1999; Doreau, 1998; Alshaikh, 2002).

The results of some studies suggest that feeding yeast improves the appetite of animals which is important both for dry and lactating cows. The stimulation of bacterial growth is particularly important for cows in the final stage of pregnancy when dry matter intake is reduced and negative energy balance may occur (Kamra et al., 2002).

The objective of the present study was to determine the effect of two different yeast strains *(Saccharomyces cerevisiae)* included in the diet for high producing dairy cows on dry matter intake, milk yield and some physiological parameters.

Material and methods

A total of 24 Holstein and Czech Red Pied cows assigned to three balanced groups were used in the experiment. At the beginning of the

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experiment, the cows were on the average 55 days after parturition. The experimental period was 84 days. Two different commercial supplements containing *Saccharomyces cerevisiae* yeast were added to concentrates at recommended amounts (groups B and L). The third group was control (C) and received no yeast in the diet.

Composition of feeding ration (kg/head/day)

The diet was provided as TMR *ad libitum* four times a day. The cows were loose-housed and milked twice a day. Milk yields were measured after each milking and milk samples were collected once a week.

Three times during the experiment, rumen fluid was collected using a probang and samples of blood from vena jugularis were taken in order to determine basic physiological parameters. The cows were weighted after each milking.

Results and discussion

The results of experiments examining the addition of different amounts of yeast (on the basis of *Saccharomyces cerevisiae*) are rather equivocal. A number of authors (e.g. Garg et al., 2000; Dann et al, 2000; Alikhani et al., 1999; Biricik et al., 2001) reported that diets supplemented with live yeast cultures *Saccharomyces cerevisiae* had no significant effect on milk composition and quality, milk yield, nutrition, nutritive value, rumen pH and rumen liquid. McGilliard (1998) even observed a reduced fat content in milk by 0.1 %.

On the contrary, Kung (1997) and other authors reported that yeast supplementation always resulted in a certain improvement. According to Alshaikh et al. (2002), Robinson et al. (1999), and Garg et al. (2000), yeast supplementation significantly increased dry matter intake, milk yield, milk composition, and crude protein digestibility.

This tendency corresponds to a certain part of our results. The highest content of milk fat and lactose and urea concentration was found in milk from the control group. Milk from the group B had the lowest fat content and yield, FCM yield, protein content, lactose content and urea concentration. The concentration of urea was within the physiological range in all groups.

In our experiment, the inclusion of yeast cultures had no positive effect on dry matter intake but it did improve milk yield. The highest average daily dry matter intake (20.87 kg per cow) was observed in the control group while the cows from groups B and L consumed 20.01 and 19.84 kg, respectively.

Table 1. - AVERAGE VALUES OF NUTRIENTS CONSUMPTION

Traits	*Units*	Group		
		C	B	L
DMI	*kg/head/day*	20.87^{ab}	20.01^{b}	19.84^{a}
Crude protein	*kg/head/day*	21.17	21.69	18.41
Crude fat	*kg/head/day*	1.00	0.92	0.87
Crude fibre	*kg/head/day*	3.69	3.52	3.21
PDIE	*kg/head/day*	2.18	2.36	1.89
PDIN	*kg/head/day*	2.69	2.91	2.33
ADF	*kg/head/day*	4.60	4.44	4.01
NDF	*kg/head/day*	8.99	9.02	7.81
NEL	*MJ/head/day*	156.34	162.76	135.89

Note: For all tables – the same superscript in the same row means statistical significance (P<0,05)

Zhang-Ying Lai et al. (2000) reported that cows fed a diet supplemented with *Saccharomyces cerevisiae* yielded more milk, fat, protein, lactose, and dry matter by 7.1 % (2.01 kg), 20.2 % (175.6 g), 8.6 % (68.4 g), 7.9 % (104.3 g), and 11 % (361.4 g), respectively, compared to control groups. Similarly, the groups supplemented with yeast in our experiment had higher daily milk yields than control cows. The daily yield of milk was by 1.0 and 0.75 kg higher in L and B, respectively, than in C. The differences in milk yield between the experimental groups and the control group were significant ($P<0.05$) while no difference was found between the two experimental groups. Significant differences were also found in FCM yield between the two experimental groups and between the groups C and B.

Table 2. - AVERAGE VALUES OF MILK PRODUCTION PARAMETERS

Traits	Units	Group		
		C	B	L
Milk yield	kg/head/day	28.06^{ab}	28.81^{a}	29.06^{b}
FCM	kg/head/day	29.53^{a}	27.41^{ab}	29.18^{b}
Fat	%	4.34^{ab}	3.69^{ac}	4.00^{bc}
Protein	%	3.48^{a}	3.32^{ab}	3.52^{b}
Laktose	%	4.84^{ab}	4.76^{a}	4.79^{b}
Urea	%	4.32^{ab}	3.93^{ac}	4.17^{bc}

Yeast supplementation did not result in different rumen cellulase activities (11.845, li.b44, and 10.092 μmol/ml/h for C, L, and B, respectively). In agreement with Kamra et al. (2002), no effect of yeast supplementation on the number of rumen ciliate protozoa was revealed.

Rumen liquid parameters were mostly within the physiological range and were similar among the groups. The only exception was the concentration of

ammonia which may, however, be explained by a lower intake of crude protein in the diet. Similar results are reported by Lyons (1993). The acidity of the rumen liquid was only slightly lower in the experimental groups suggesting no significant effect of yeast on this parameter.

Similarly to the rumen liquid parameters, no significant effect of yeast cultures was observed in blood serum parameters.

Table 3. - AVERAGE VALUES OF RUMEN LIGUID AND BLOOD SERUM PARAMETERS

Traits	*Units*	Group		
		C	B	L
		Rumen liquid		
pH	*mmol/l*	6.51	6.54	6.57
Propionic acid	*mmol/l*	28.90	26.84	27.27
VFA total	*mmol/l*	111.69	104.26	98.40
NH_3	*mmol/l*	19.69^{ab}	17.06^{a}	15.08^{b}
		Blood serum		
Glukose	*mmol/l*	3.50	3.63	3.51
Total protein	*g/l*	68.77	70.34	66.80
Urea	*mmol/l*	5.62	5.24	5.50
Cholesterol	*mmol/l*	3.51	3.69	3.91
NEFA	*mmol/l*	0.21	0.27	0.25

Conclusion

Yeast supplements significantly ($P<0.05$) improved milk yield despite of reduced dry matter intake. It did not, however, enhance the cellulase activity inside the rumen. At the same time, the concentrations of milk fat and in case of one commercial supplement also milk protein were ' decreased in the experimental groups.

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DJELOVANJE RAZLIČITIH SOJEVA KVASCA NA PRINOS MLIJEKA, PROFIL MASNIH KISELINA I FIZIOLOŠKE PARAMETRE U MLIJEČNIH KRAVA

Sažetak

Cilj rada bio je odrediti djelovanje dvaju različitih sojeva kvasca (Saccharomyces cerevisiae) uključenih u obroke za visokoproduktivne mliječne krave na unos suhe tvari, prinos mlijeka i neke fiziološke parametre.

Dodavanje kvasca značajno (P<0,05) je poboljšalo prinos mlijeka usprkos smanjenom unosu suhe tvari. Ono nije, međutim, povećalo aktivnost celulaze u rumenu. Istodobno su se koncentracije mliječne masti, i u slučaju jednog komercijalnog dodatka, i mliječnih bjelančevina smanjile u pokusnim skupinama.

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