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THE INFLUENCE OF ZEOLITE TYPE TUFOZEL ON PRODUCTIVE CHARACTERISTICS OF DAIRY COWS[1]

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Contents: The experiments were performed on 24 dairy cows of domestic Simmental race. All heads were divided into three groups of eight cows. First and the second group of cows got 3% and 2% of mineral zeolite through forage mixture while the control group did not get any zeolite.

As for productive features, characteristics of milk yield were examined, especially: chemical content of milk, duration of whole lactations, production of milk and milk fats in whole lactations, production of milk and milk fats in standard lactations, production of 4 % of MKM in whole and standard lactations, reduction of milk yield to fourth lactation.

Feeding with zeolite had a different impact on production features.

Key words: dairy cows, forage mixtures, zeolite, tufozel, production features.

Introduction

Total number of cattle heads in the last years is in decrease while the average milk yield is below the average in developed countries. Taking in consideration this fact it is inevitably that the researches are directed to milk yield increase. Around 6.5% of total number of cows are under control in Serbia. Cow milk makes 97 % of total milk production. Quality food influences the productive performances of dairy cows in great deal. Natural zeolite is used successfully as an additive to feedstuff in cattle breeding with some species and categories of animals. Researches about dairy cows were performed by *Nešić, 2000*. and *Pešev, 2002*. The researches on usage of zeolite of domestic type "Tufozel" on productive features of diary cows are deepened by this work.

The objective of our research is to examine in what degree zeolite as an additive to feedstuff as "Tufozel" will impact the productive features of diary cows.

Materials and methods

The experiments were performed on 24 dairy cows of domestic brindle type. Cows were divided into three groups, eight heads per group. Groups were formed based on the quantity of added tufozel in meals. Control group (K-group) consisted of eight cows not getting tufozel, the first experimental group (I-O) with tufozel addition of 3% and the second experimental group (II-O) with tufozel addition of 2% in meals. Cows were getting tufozel through forage mixtures.

All heads were situated in bricked facilities with combined tied and free system of keeping. Environment conditions were identical for all cows with small deviations.

As for productive features, characteristics of milk yield were examined, especially: chemical content of milk, duration of whole lactations, production of milk and milk fats in tufozel, the first experimental group (I-O) with tufozel addition of 3% and the second experimental group (II-O) with tufozel addition of 2% in meals. Cows were getting tufozel through forage mixtures.

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Results and discussion

Milk content varies depending on type, feeding, breeding, keeping, lactation flow and other factors. The average domestic brindle type milk is shown in table 1.

Table 1. Chemical content of domestic brindle type
Tabela 1. Hemijski sastav mleka domaće šarene rase

Group	Milk fat	Proteins	Lactose	DM
I-O (3%)	4.22	3.30	4.72	8.12
II-O (2%)	4.23	3.31	4.61	8.60
K	4.22	3.56	4.81	8.96

Almost identical values of milk fat contents are clearly seen from the table. Proteins are found mostly with control group (3.56%) while the protein contents of I-O group and group II-O is almost the same, 3.30 and 3.31. The highest average level of lactose is present in control group (4.81%), then in I-O group (4.72%), and the lowest in II-O group (4.61%). Dry matter is found mostly in the control group (8.96%), then (8.60%) in II-O group and the least quantity in I-O group (8.12%). All cows had the even chemical contents of milk.

In order to secure one cattle delivery a year, the optimal period of drying is supposed to be approximately 60 days and service period 80 days. Under these conditions we would have lactation duration of approximately 305 days which is considered to be the best possible. Lactation below this duration does not secure an optimal milk yield. Milk yield beyond this in the following lactation will be lowered and one cattle delivery a year would not be possible to succeed so it would come to decrease of fertility. Average duration of whole lactation with statistic parameters is given below in the table 2. Differences in lactation duration appeared to be statistically important (P<0.05).

Table 2. Duration and variability of whole lactations

Group	N	$\overline{X}$	$s_{\bar{x}}$	SD	CV(%)	Variations min	Variations max	F_{exp}
I-O 3%	8	299	113.00	319.80	106.96	282	316	
II-O 2%	8	300	113.40	320.90	106.97	280	320	3.55*
K	8	297	317.47	317.47	106.89	285	309	

N.S. – P>0.05; *- P<0.05; **- P<0.01; *** - P<0.001

By prolonged lactation it will come to the larger quantity of milked milk but prolonged lactations could not be economically justified even with highly productive heads, *Panić et al.* (1980).

Duration of the lactation has great variations but many authors consider that the greatest impacts on duration of the lactation are done by feedstuff and lactations in line. If it is not transferred to the dried cow feeding program within the period of 60 days prior to delivery, lactation shall last longer while the impact of the lactation by order of turns to milk yield cannot be avoided.

Production of cow milk is under the influence of genetic factors (around 25%) and the environmental factors (around 75%). Taking into consideration that it is under the great influence of environmental factors, cow milk yield shows great variability. Cows in the experiment were not in the same lactation which makes milk yield variability even greater.

The average milk quantities in whole lactations are presented in the table 3. Differences in milk yield between lactations determined by variance analysis were not significant statistically (P>0.05). Similar milk yield in whole lactations are stated by (*Rüesgsegger*,1987, *Vasiljević et al.,* 1990, *Gottschalk,1996*,) in their research.

Table 3. Average milk quantities in whole lactations

Group	N	$\overline{X}$	$s_{\bar{x}}$	SD	CV(%)	Variations min	Variations max	F_{exp}
I-O 3%	8	3720.06	1441.6	4080.00	109.67	2427.00	5400.00	
II-O 2%	8	3629.68	1398.55	3957.90	109.67	2611.50	4575.00	1.63^{NS}
K	8	3410.18	1886.90	5339.93	156.59	2545.00	5440.50	

N.S. – P>0.05; *- P<0.05; **- P<0.01; *** - P<0.00

The average quantities of milk fats in whole lactations are shown in the table 4. Differences in milk fat production in whole lactations, in groups, are very significant statistically (P<0.01). Average quantity of milk fat with cows in the control group is 146.05 kg, with variations in interval between 95.03 kg and 248.63 kg, in I-O group 157.83 kg with variations from 88.82 to 223.02 kg, and in II-O group 155.06 kg with variations from 88.00 to 206.70 kg.

Table 4. Average milk fat quantity in whole lactations

Group	N	$\overline{X}$	$s_{\bar{x}}$	SD	CV(%)	Variations min	Variations max	F_{exp}
I-O 3%	8	157.83	61.54	174.18	110.36	88.82	223.02	
II-O 2%	8	155.06	60.79	172.03	110.94	88.00	206.70	7.45**
K	8	146.05	58.25	164.85	112.87	95.03	248.63	

N.S. – P>0.05; *- P<0.05; **- P<0.01; *** - P<0.001

Similar quantity of milk fat in milk with domestic brindled type of cows were gained by *Miščević et al.* (1995), *Perišić* (1998), and *Petrović* (2000) within their research. Milk production in standard lactation means production in time period of 305 days.

The average milk production in standard lactations is shown in the table 5. Milk production in standard lactations showed statistically very significant differences (P<0.01). The average quantity of milk with cows in control group is 3665.43 kg, in II-O group 3751.06 kg and in I-O group 3763.18 kg.

Table 5. Average milk production in standard lactations

Group	N	$\overline{X}$	$s_{\bar{x}}$	SD	CV(%)	Variations min	Variations max	F_{exp}
I-O 3%	8	3763.18	1458.30	4127.00	109.67	2450.50	5450.00	
II-O 2%	8	3751.06	1447.12	4095.36	109.18	2688.00	4735.00	15.82**
K	8	3665.43	1231.21	3484.34	95.06	2566.00	5580.50	

N.S. – P>0.05; *- P<0.05; **- P<0.01; *** - P<0.001

The average milk fat quantity gained in standard lactations is shown in table 6. Milk fat production in standard lactations also showed statistically very significant differences (P<0.01). The highest quantity of milk fat was gained with cows in II-O group (160.20 kg), lower in I-O group (159.57), and the lowest in K-group (148.48 kg).

Table 6. Variability and milk fat production in standard lactations

Group	N	$\overline{X}$	$s_{\bar{x}}$	SD	CV(%)	Variations min	Variations max	F_{exp}
I-O 3%	8	159.57	62.22	176.95	110.35	89.68	225.08	
II-O 2%	8	160.20	62.86	177.88	111.04	90.58	213.48	6.92**
K	8	148.48	59.35	167.95	113.11	95.88	255.02	

N.S. – P>0.05; *- P<0.05; **- P<0.01; *** - P<0.001

For the reason of elimination of the milk fat contents influence on milk quantity and because of better inspection of milk yield production of 4% MKM in whole and standard lactations were considered.

Production of 4% MKM in whole lactations is shown in the table 7. Differences in production of 4% MKM in whole lactations are statistically very significant (P<0.05).

Table 7. Variability and production of 4% FCM in whole lactations

Group	N	$\overline{X}$	$s_{\bar{x}}$	SD	CV(%)	Variations min	max	F_{exp}
I-O 3%	8	3840.85	1492.48	4223.72	109.97	2281.38	5454.00	
II-O 2%	8	3763.37	2523.19	4140.65	110.02	2350.35	4810.18	5.51*
K	8	3539.96	1400.53	3963.51	111.96	2493.12	5875.74	

N.S. – P>0.05; *- P<0.05; **- P<0.01; *** - P<0.001

Production of 4% MKM in standard lactations is shown in the table 8. Differences in production of 4% MKM in standard lactations are statistically very significant (P<0.01). Similar results were gained by *Panić et al.* (1980), *Perišić* (1988), and *Petrović* (2000) in their research. Taking into consideration that all dairy cows were not in the same lactations for the reason of better inspection of milk yield, all lactations have been transferred to fourth lactation.

Table 8.Variability and production of 4% FCM in standard lactations

Group	N	$\overline{X}$	$s_{\bar{x}}$	SD	CV(%)	Variations min	max	F_{exp}
I-O 3%	8	3837.34	1486.32	4206.28	109.61	2388.07	5504.5	
II-O 2%	8	3888.64	1513.38	4282.87	110.14	2419.20	4967.80	5.93**
K	8	3598.26	1534.71	4343.23	120.70	2514.68	6026.94	

N.S. – P>0.05; *- P<0.05; **- P<0.01; *** - P<0.001

Quantity of milk of whole lactations compiled to fourth is shown in the table 9. Differences in milk production in the whole lactations compiled to fourth are statistically very significant (P<0.01).

Table 9. Production of milk of the whole lactations compiled to fourth lactation

Group	N	$\overline{X}$	$s_{\bar{x}}$	SD	CV(%)	Variations min	max	F_{exp}
I-O 3%	8	4035.50	1549.07	4383.88	108.67	3010.50	4614.80	
II-O 2%	8	4424.00	1688.40	4778.18	108.00	2978.50	5232.10	8.85**
K	8	3810.20	1472.78	4167.97	109.38	2844.50	5580.50	

N.S. – P>0.05; *- P<0.05; **- P<0.01; *** - P<0.001

Milk production of standard lactations compiled to fourth is shown in the table 10.

Differences in milk production within standard lactations compiled to fourth are not important statistically (P>0.05).

Table 10. Milk production of standard lactations compiled to fourth

Group	N	$\overline{X}$	$s_{\bar{x}}$	SD	CV(%)	Variations min	max	F_{exp}
I-O 3%	8	4144.84	1591.52	4504.01	108.66	3221.23	5504.50	
II-O 2%	8	4541.15	1736.91	4915.46	108.24	3306.13	5514.25	1.08^{NS}
K	8	3946.17	1537.56	4351.29	110.26	2560.05	6026.94	

N.S. – P>0.05; *- P<0.05; **- P<0.01; *** - P<0.001

Conclusion

Chemical composition with all three groups of dairy cows appears to be very even. Average lactation duration in I-O group was 299 days, in II-O group 300 and in K-group 297 days. Differences in duration of the lactations are statistically significant (P<0.05).

The average milk production in whole lactations was in I-O group 3720.06 kg, in II-O group 3629.68 kg and in K-group 3410. Differences in milk yield between lactations determined by the variance analysis were not statistically significant (P>0.05).

The average milk fat production in whole lactations with cows in I-O group is 157.83 kg, in II-O 155.06 kg and in K-group 146.05 kg. Differences in milk fat production in whole lactations, per groups, are statistically very significant (P<0.01).

The average milk production in standard lactations with cows in I-O group is 3763.18 kg, in II-O 3751.06 kg and in K-group 3665.43 kg. Milk production in standard lactations showed statistically very significant differences (P<0.01). The average milk fat production in standard lactations with cows in I-O group is 159.57 kg, in II-O group 160.20 kg and in K-group 148.48 kg. Here we have statistically very significant differences as well (P<0.01).

The average production of 4% MKM in whole lactations is 3840.85 kg in I-O group, in II-O group 3763.37 kg and in K-group 3539.96 kg. Differences in production of 4% MKM in whole lactations are statistically significant (P<0.05).

The average production of 4% MKM in standard lactations in I-O group is 3837.34 kg, in II-O group 3888.64 kg and in K-group 3598.26 kg. Differences in 4% MKM production in standard lactations are statistically very significant (P<0.01). The average milk production in whole lactations compiled to fourth is with cows in I-O group 4035.50 kg, in II-O group 4424.00 kg and in K-group 3810.20 kg. Differences in milk production in whole lactations compiled to fourth are statistically very important (P<0.01).

The average milk production in standard lactations compiled to fourth is with cows in I-O group 4144.84 kg, in II-O group 4541.15 kg and in K-group 3946.17 kg. From all the above stated it can be concluded that it is justifiable to add zeolite in feedstuff of dairy cows because of better production and milk quality.

UTICAJ ZEOLITA TIPA TUFOZEL NA PROIZVODNE OSOBINE KRAVA MUZARA

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Rezime

Hemijski sastav mleka kod sve tri grupe krava muzara bio je dosta ujednačen. Prosečno trajanje laktacija kod I-O grupe bilo je 299 dana, II-O grupe 300 i K-grupe 297 dana. Razlike u trajanju laktacija statistički su značajne (P<0.05).

Prosečna proizvodnja mleka u celim laktacijama bila je kod I-O grupe 3720.06 kg, II-O grupe 3629.68 kg i K-grupi 3410. Razlike u mlečnosti izmedju laktacija utvrdjene analizom varijanse statistički nisu bile signifikantne (P>0.05).

Prosečna proizvodnja mlečne masti u celim laktacijama kod krava I-O grupe iznosi 157.83 kg, II-O 155.06 kg i K-grupe 146.05 kg. Razlike u proizvodnji mlečne masti u celim laktacijama, po grupama, statistički su vrlo signifikantne (P<0.01).

Prosečna proizvodnja mleka u standardnim laktacijama kod krava I-O grupe iznosi 3763.18 kg, II-O 3751.06 kg i K-grupe 3665.43 kg. Proizvodnja mleka u standardnim laktacijama pokazala je statistički vrlo značajne razlike (P<0.01).

Prosečna proizvodnja mlečne masti u standardnim laktacijam iznosi u I-O grupi 159.57 kg, II-O grupi 160.20 kg i K-grupi 148.48 kg. Takodje i ovde postoje statistički vrlo značajne razlike (P<0.01).

Prosečna proizvodnja 4% MKM u celim laktacijam iznosi u I-O grupi 3840.85 kg, II-O grupi 3763.37 kg i K-grupi 3539.96 kg. Razlike u proizvodnji 4% MKM u celim laktacijama statistički su značajne (P<0.05).

Prosečna proizvodnja 4% MKM u standardnim laktacijam u I-O grupi iznosi 3837.34 kg, II-O grupi 3888.64 kg i K-grupi 3598.26 kg. Razlike u proizvodnji 4% MKM u standardnim laktacijama statistički su vrlo značajne ($P<0.01$).

Prosečna proizvodnja mleka u celim laktacijama prevedenih na četvrtu laktaciju iznosi kod krava I-O grupe 4035.50 kg, II-O grupe 4424.00 kg i K-grupe 3810.20 kg. Razlike u proizvodnji mleka u celim laktacijama prevedenih na četvrtu statistički su vrlo značajne ($P<0.01$).

Prosečna proizvodnja mleka u standardnim laktacijama prevedenih na četvrtu laktaciju iznosi kod krava I-O grupe 4144.84 kg, II-O grupe 4541.15 kg i K-grupe 3946.17 kg. Razlike u proizvodnji mleka u celim laktacijama prevedenih na četvrtu statistički su vrlo značajne ($P<0.01$).

Iz svega iznetog sledi da je opravdano dodavati zeolit u krmne smeše krava muzara radi bolje produkcije i kvaliteta mleka.

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