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Influence of nutrition to expose of genetic potency of Holstein-Frisian dairy cows in conditions of North Macedonia

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Abstract

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Research was carried out in order to establish the influence of nutrition to expose of genetic potency of the Holstein-Frisian cows. Two biggest farms in North Macedonia with the total number of 900 cows were analyzed.

In 2017 year on the cattle farm MILKO HF from Prilep with capacity of 200 cows controlled 30 cows with average body weight 730.4 kg in different phases of lactation. The nutrition was compound with ration from fresh brewery by-product, lucerne hay, meadow hay and concentrate like a mixture. Production of milk in lactation period from 305 days is 7356.6 kg standard milk with average daily content of milk 24.12 kg with the following chemical composition of milk: average percent of milk fat is 3.86%; protein – 3.76%; lactose – 4.91% non-fat dry matter – 9.47% and total dry matter – 13.33%.

In 2017 year on the cattle farm AD STOCARSTVO from Bogdanci with capacity of 700 cows controlled 30 cows with average body weight 552.3 kg in different phases of lactation. The nutrition was compound with ration from corn silage, lucerne hay, meadow hay, brewery by-product (dry), sugar beet by-product (dry) and concentrate like a mixture. Production of milk in lactation period from 305 days is 8997.5 kg standard milk with average daily content of milk 29.50 kg with the following chemical composition of milk: average percent of milk fat is 3.99%; protein – 3.11%; lactose – 4.04% non-fat dry matter – 8.39% and total dry matter – 12.38%.

Getting results from the production of Holstein-Frisian cows in North Macedonia, at once to confirm her exception high production superiority for production of milk and they were adapted, acclimatized and accommodated in conditions of North Macedonia and farmers need to know the benefit her genetic and production potency solely through proper nutrition.

*Key words***:** Holstein-Frisian cows; nutrition; genetic potency; production; chemical composition; milk

Introduction

Cattle breeding is a significant branch of livestock and in some European countries such as: Denmark, the Netherlands, Finland, etc. it participates with more than 50-60% of the value of the agricultural production. Similar is the situation with us, where through the cattle production, such values are provided and the largest quantities of milk (80%) and meat (50%) are produced for fresh consumption and for processing. This is the number of 296.634 heads of cattle, of which 133.838 heads or 45.12% belonging to the Holstein-Frisian breed (Official data of the Unit for Animal Identification at the Ministry of Agriculture, Forestry and Water Management of the North Macedonia) makes it the major branch in the meat and milk production. Milk is a primary product of cows consumed by the general population. The highest financial performance is achieved through cattle breeding. Since it is a significant product of the cows, today, through selection, genetics and nutrition seek to create such races and types of milk cows that will provide not only such a high quantity of milk, but it will go improve the standard and health of people.

The production of milk for the market in the North Macedonia is mainly realized with the breeding of Holstein-Frisian cows characterized by high genetic production of 8-10 tons of standard milk and one calf in the 365-day reproduction cycle. However, the realization of such production is possible only with the implementation of paragenetic factors (nutrition, management, holding, health care, etc.) that are specific and significantly different from those used in our wider practice. One of the most important paragenetic factors in the milk production of these cows is the nutrition. Without adequate nutrition, which meets all the nutritional needs of nutrients, it is not possible to produce high milk production. Although these problems are long over the years, science can only be partially expressed and explained what should be kept in mind in order to establish a successful ration for this category of cattle (Grubic & Adamovic, 2003). We consider that the creation and testing of models of rations for dairy cows nutrition programs that fund the modern nutritional value of foods are crucial for the economical production of milk.

For this purpose, the aim of this paper is to show the influence of nutrition on the exposing of the genetic potential of Holstein-Frisian cows in the conditions of the North Macedonia.

Materials and Methods

The researches were carried out at the commercial cow's farms MILKO HF-Prilep and AD STOCARSTVO Bogdanci, North Macedonia. The cows in the MILKO HF Prilep farm were fed with the brewery by-product (fresh), lucerne hay, meadow hay and concentrate mixture, while those in the farm AD STOCARSTVO were fed with maize silage, lucerne hay, meadow hay, brewery by-product (dry), sugar beet

Table 1. Composition of ration for nutrition of high dairy cows on the farm MILKO HF

	Daily	DM	NEL-total	Total protein	Digestable protein	Undigestable protein	Crude fibre	ADF	NDF
	kg	kg	MJ	g	%/g	%/g	g	%/g	%/g
Rouhage feedstuffs									
brewery by-product (fresh)	24	6.12	34.08	313.34	5.2/16.29	57.5/180.2	300.49	4.9/14.72	11/33.0
lucerne hay	4	3.52	16.72	460.06	48.8/224.5	33.3/153.2	928.58	30.1/279.5	40.4/375
meadow hay	2	1.76	8.58	135.87	20/27.17	56/76.08	715.44	38.3/274.4	62.7/449
Total rouhage feedstuffs	30	11.4	59.38	909.27	267.96	409.48	1944.5	568.62	857
Concentrate	12	10.56	91.08	1700	219.6	872.4	651.12	87.24	174.24
Total (rouhage feed stuffs+ concentrate)	42	21.96	150.46	2609.3	487.56	1281.88	2595.6	655.86	1031.2

Table 2. Composition of ration for nutrition of high dairy cows on the farm AD STOCARSTVO

	Daily	DM	NEL-total	Total protein	Digestable protein	Undigestable protein	Crude fibre	ADF	NDF
	kg	kg	MJ	g	%/g	%/g	g	%/g	%/g
Rouhage feedstuffs									
maize silage	13	4.16	23.40	130.21	65.7/85.55	25.3/32.94	467.58	10/46.76	17.2/80.42
brewery by-product (dry)	1.5	1.32	10.04	331.06	5.2/17.22	57.5/190.3	193.38	4.9/9.48	11/21.26
lucerne hay	4	3.60	17.32	354.96	48.8/173.2	33.3/118.2	1405.1	30.1/422.9	40.4/567.6
meadow hay	4	3.56	18.80	239.94	20/47.99	56/134.36	1428	38.3/546.9	62.7/895.3
sugar beet pulp by-product (dry)	1.5	1.27	10.14	119.60	5.2/6.22	61.6/73.7	319.38	32/102.2	41.1/131
Total rouhage feedstuffs	24	13.91	79.70	1175.77	330.18	549.56	3813.44	1128.24	1695.58
Concentrate	9	7.83	68.31	1202.4	155.7	616.5	454.5	61.11	120.51
Total (rouhage feedstuffs+ concentrate)	33	21.74	148.01	2378.17	485.88	1166.06	4267.94	1189.4	1816.1

by-product (dry) and concentrate mixture. All the feedstuffs and mixture were analysed according to the AOAC (1980) analytical procedures according to the Weende method.

The results from the quantity of milk and milk chemical composition (% of milk fat, % of proteins, % of lactose, % of non-fat dry matter and % of total dry matter) have been processed.

Results and Discussion

In Tables 1 and 2 shows the composition of the ration for nutrition of high dairy cows on examined farms

In Tables 3 and 4 shows the results of the average content of milk obtained from the examined farms

Table 3. Average content of milk produced on the farm MILKO HF, kg

Groups	n	Measures of variation				
		x	Sx	Sd	Cv	Iv
		Milk, kg				
I	15	24.30	1.72	9.43	38.80	7-40
II	15	23.93	1.74	9.50	39.70	7-41
Both groups	30	24.12	1.73	9.47	38.92	7-41

Table 4. Average content of milk produced on the farm AD STOCARSTVO, kg

Groups	N	Measures of variation				
		x	Sx	Sd	Cv	Iv
		Milk, kg				
I	15	28.00	0.43	2.33	8.33	24-34
II	15	31.00	0.93	5.09	16.43	22-40
Both groups	30	29.50	0.54	4.21	14.27	22-40

From the presented results in Table 3 it is seen that the average milk content ranged from 24.30 kg in group I to 23.93 kg in II group, or in average for two groups the production of milk amounted to around 24.12 kg and 7356.6 kg standard milk for lactation of 305 days.

From the presented results in Table 4 it is seen that the average milk content ranged from 28.00 kg in group I to 31.00 kg in II group, or in average for two groups the production of milk amounted to around 29.50 kg and 8997.5 kg standard milk for lactation of 305 days.

Our results in relation to the total milk production in the 305-days lactation period are within the boundaries of those that Sretenovic et al. (2007), ranges from 7420 to 8894 kg and above those stands out Palasevski et al. (1995), which ranged from 5795 to 7190 kg and Shokarovski et al., (2001) at a level of 7290 kg and are far better than those established by Kitanovski et al. (1998), the first of which the colonized type 5849 kg in the Pelagonia region and those of Trajkovski and Bunevski (1999) in the Eastern Frisian cows 3658.7 kg in the Skopje region.

It can be emphasized that the average of the examined cows in our conditions relative to some European countries (Arend, 1999), such as the case of the Netherlands, Sweden and Italy, for the lactation period of 305 days for controlled black-and-white cows is over 8000 kg (8003; 8504 and 8134 kg) and for Germany, Finland and Great Britain where it amounts to just over 7000 kg (7438; 7496; 7109 kg); it is within the frames the genetic potential for this type of cows.

In Tables 5 and 6 shows the results of the chemical composition of the milk of the examined farms

Table 5. Chemical composition of milk on farm MILKO HF, %

Groups	n	Measures of variation				
		x	Sx	Sd	Cv	Iv
Milk fat,%						
I	15	3.81	0.12	0.65	17.07	2.78-5.04
II	15	3.92	0.14	0.79	20.19	2.39-6.32
Both groups	30	3.86	0.09	0.72	18.64	2.39-6.32
Proteins,%						
I	15	3.83	0.08	0.43	11.12	3.04-5.03
II	15	3.68	0.06	0.32	8.74	2.87-4.28
Both groups	30	3.76	0.05	0.38	10.19	2.87-5.03
Lactose,%						
I	15	4.84	0.06	0.31	6.32	4.08-5.26
II	15	4.99	0.04	0.24	4.82	4.36-5.28
Both groups	30	4.91	0.04	0.28	5.74	4.08-5.28
Non fat dry matter,%						
I	15	9.49	0.09	0.52	5.43	8.23-10.75
II	15	9.46	0.08	0.45	4.78	8.57-10.37
Both groups	30	9.47	0.06	0.48	5.08	8.23-10.75
Total dry matter,%						
I	15	13.29	0.18	0.99	7.43	11.33-15.20
II	15	13.38	0.18	0.98	7.33	11.07-15.39
Both groups	30	13.33	0.13	0.98	7.33	11.07-15.39

This relates to the average chemical composition of the milk in the first group of cows: 3.81% milk fat, 3.83% proteins, 4.84% lactose, 9.49% non-fat dry matter and 13.29% total dry matter. In group II equaled 3.92% milk fat, 3.68% protein, 4.99% lactose, 9.46% non-fat dry matter and 13.38% total dry matter. The chemical composition of milk for the two groups was average: 3.86% milk fat, 3.76% proteins, 4.91% lactose, 9.47% non-fat dry matter and 13.33% total dry matter.

This relates to the average chemical composition of milk in the first group of cows: 3.91% milk fat, 3.09% proteins,

Table 6. Chemical composition of milk on farm AD STOCARSTVO, %

Groups	n	Measures of variation				
		X	Sx	Sd	Cv	Iv
Milk fat,%						
I	15	3.91	0.10	0.53	13.47	2.32-4.74
II	15	4.07	0.09	0.47	11.59	2.81-5.20
Both groups	30	3.99	0.06	0.50	12.59	2.32-5.20
Proteins,%						
I	15	3.09	0.03	0.19	6.04	2.34-3.33
II	15	3.14	0.02	0.11	3.41	2.84-3.31
Both groups	30	3.11	0.02	0.15	4.91	2.34-3.33
Lactose,%						
I	15	4.01	0.04	0.23	5.84	3.07-4.31
II	15	4.07	0.02	0.14	3.42	3.71-4.31
Both groups	30	4.04	0.02	0.19	4.78	3.07-4.31
Non fat dry matter,%						
I	15	8.32	0.09	0.49	5.92	6.35-8.99
II	15	8.46	0.05	0.28	3.34	7.58-8.88
Both groups	30	8.39	0.05	0.40	4.82	6.35-8.99
Total dry matter,%						
I	15	12.23	0.18	0.96	7.88	8.67-13.73
II	15	12.53	0.12	0.63	5.06	10.39-13.52
Both groups	30	12.38	0.11	0.82	6.64	8.67-13.73

4.01% lactose, 8.32% non-fat dry matter and 12.23% total dry matter. In group II consisted of 4.07% milk fat, 3.14% proteins, 4.07% lactose, 8.46% non-fat dry matter and 12.53% total dry matter.The chemical composition of milk for the two groups was average: 3.99% milk fat, 3.11% proteins, 4.04% lactose, 8.39% non-fat dry matter and 12.38% total dry matter.

Our results in relation to the average content of milk fat, proteins and lactose in the milk are in the range of those who are Djordevic et al. (2005) who for milk fat are moving from 3.34-3.81% depending on the diet, Rajcevic et al. (1997) for milk fat ranged from 3.83% and the content of lactose from 4.58% and Gutic et al. (2001) which for milk protein are at the level of 3.56% and far better than those established by Bobos et al. (2001), which with the control group of cows ran for the average content on milk fat 3.47%; proteins 3.20%; non-fat dry matter 8.27% and total dry matter 11.74%, while in the experimental group where the Sel-Plex TM preparation was added, the increase was increased by the same order: 3.59%; 3.38%; 9.04; 12.61% and those of Adamovic et al. (2004) who had a control group of cows for the average milk content of 3.29%; proteins 2.90% and total dry matter 11.62%, while in the tested group where added buffer (mineral mixture on the basis of magnesium oxide, sodium bicarbonate, bentonite and organic zeolite) increased in the order by 3.58%; 3.03% and 11.99% respectively.

Sretenovic et al. (2007) in their research on the use of yeast in combination with probiotic and enzymes in the nutrition of high-yield cows based on their production properties, reached the results that the control group of cows ran for the average milk content of 3.91%; proteins 3.05%, lactose 4.91% and total dry matter 11.65%, while with the tested group where the said combination was added in the ration at the same order of 4.19%; 3.11%, 5.16% and 11.72%, which is comparable with our results in close cooperation.

Conclusions

The results of the research carried out on Holstein-Frisian dairy cows kept in the conditions of North Macedonia in order to determine the effect of nutrition as a factor for exposing the genetic potential of these cows allowed to be concluded the following:

Milk production in the lactating period of 305 days with the use of the ration (fresh brewery by-product, lucerne hay, meadow hay and concentrate) in the MILKO HF farm, is 7356.6 kg of standard milk with average daily milk from 24.12 kg;

The quality of the milk was with the following chemical composition: the average milk fat percentage equaled 3.86%; proteins 3.76%; lactose 4.91%; non-dry matter 9.47% and total dry matter 13.33%.

Milk production in the lactating period of 305 days with the use of the ration (corn silage, lucerne hay, meadow hay, brewery by-product (dry), sugar beet by-product (dry) and concentrate) in the cow's farm AD STOCARSTVO, it is 8997.5 kg standard milk with an average daily milk of 29.50 kg;

The quality of the milk was with the following chemical composition: the average milk fat percentage equaled 3.99%; proteins 3.11%; lactose 4.04%; non-fat dry matter 8.39% and total dry matter 12.38%.

The obtained results of the Holstein-Frisian cows in the North Macedonia confirm its genetic potential for milk production, as well as being completely adapted, acclimatized and accommodated in the conditions of North Macedonia, so that farmers should know that they use their genetic and production potential solely through proper nutrition.

References

Adamovic, M., Lemic J., Tomasevic-Canovic, Magdalena, Jovcin, M., &Kovacevic, M. (2004). Influence of buffer on production and composition of milk and the metabolic profile of

cows. (Uticaj pufera na produkciju I sastav mleka imetabolicki profil krava). *Biotehnologija u Stočarstvu, 5*(6), 195-202.

AOAC (1980). Official methods of Analysis.Stoloff.L. (Ed) 14th ed., Washington DC.

Arend, P. (1999). International comparasion-The average production figures of the European Black-and White again rose to higher levels. Al Arnhem, Netherlands,*Veepro Magazine*, *36*, 6800.

Boboš, S., Vulić, M., Kraljević, O., &Magura, T. (2001). Influence of yeast form of zinc and yeast selenium on the quality and quantity of milk (Uticaj helatnih formi cinka i selena iz kvasca na kvalitet i količinu mleka). Novi Sad, *Savremena Poljoprivreda,*50 (3-4), 117-120.

Djordjevic, N., Grubic, G., Radivojevic, M., Stojanovic, B., &Adamovic, O. (2005). Cows' feeding cows are based on different types of sowings (Ishrana krava obrocima na bazi razlicitih vrsta silaza) *PKB-Institut Agroekonomik, Zbornik Naucnih Radova*, *11*(3-4),65-74, Beograd.

Grubic, G., &Adamovic, M. (2003). High Produce Cows' Food, Belgrade (Ishrana viskoproizvodnih krava, Beograd).

Gutić, M., Petrović, M., &Lalović, M. (2001). Influence of lactation flow on the amount and content of total protein in milk (Uticaj toka laktacije na količinu i sadržaj ukupnih proteina u mleku). Novi Sad, *Savremena Poljoprivreda,50*, 3-4, pp. 215-220.

Kitanovski, D., Stojanovski, M., Mano, Z., Matevski, V., Veljanov, M., & Presilski, S. (1998). Productive and reproductive characteristics of the newly imported Holstein Frisian cows (*Produktivni i reproduktivni karakteristiki kaj novo uvozenite Holštajn-friziski kravi)*.

Palasevski, B., Veljanov, M., Kocovski, Lj.,Adamov, M., Matevski, V., Filipov, Z.,& Mano, Z. (1995). Ketosis skin texture with production and reproductive ability on the cows. III International Conference on Ovulation and Consumers and I Symposium on Growth in Domestic Life, Ohrid (Povrzanost na ketozata so proizvodnata i reproduktivnata sposobnost na kravite. III Medjunarodna konferencija za ovcarstvo i kozarstvo i I Simpozium za razmnozuvanje na domasnite zivotni, Ohrid).

Rajcevic, M., Zadnik, T., Levstek, J., & Vidic, A. (1997). Odds of cattle feeding on some milk and blood parameters (Odraz ljetne hranidbe krava na neke parametre mlijeka i krvi). Krmiva, *39* (6), 287-297, Zagreb.

Shokarovski, J., Palashevski, B., Micevski, P., Cilev, G., & Naletoski, Z. (2001). Lactation curve-indicator of used meals for high-allied cows feeding under practical conditions (Laktacijska krivulja-indikator koristenih obroka za ishranu visokomlecnih krava u prakticnim uslovima). *Krmiva*, *43* (1), 11-15.

Sretenovic, L., Petrovic, M. M., Petrovic, M. P., &Aleksic, S. (2007).The application of modern biotechnology in order to increase the quantity and quality of milk (Primena savremenih biotehnologija u cilju povecanja kolicine i kvaliteta mleka). *Savremena Poljoprivreda*, *56* (3-4), 31-36

Trajkovski, T., &Bunevski, Gj. (1999). Determination of persistence and odd correlation coefficients between the mid-term control of the eastern frisian cows (Utvrduvanje na perzistencijata i oddelni korelacioni koeficienti medju mesecnite kontroli kaj istocno-friziskite kravi). Zbornik na trudovi, XXIV Sredba*"Fakultet-stopanstvo"* 99, Skopje.