THE NUTRITIVE VALUE OF FODDER BEET IN SOME DAIRY COW FARMS FROM VERŞENI VILLAGE (IAŞI COUNTY)

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Abstract

Fodder beet is an excellent forage for dairy cows in winter time when green fodders are not available.
In this study we focused on the dynamics of the basic indexes of nutritive and energetic value of fodder beet used in dairy cows diet from some farms from Verşeni village. The fodder beet samples were collected from the dairy farms which participated in a feeding improvement programme. There was a low variability of raw chemical composition of fodder beet samples. The protein content varied between 91.79 - 95.78g/ kg DM, the highest value belonging to the fodder beet from Ungureanu Florin farm (2006). The fibre content varied between 83.04- 92.40 g/ kg DM, the highest value belonging to the fodder beet from Isachi Mihail farm (2005). The N-free extract content varied between 708.17- 717.69 g/ kg DM, the highest value belonging to the fodder beet from Ungureanu Florin farm (2004). The energetic and protein values were similar for the analysed samples in the three farms. The energetic value of ENL varied between 1890- 1942 kcal/ kg DM and the ENV value varied between 2049- 2112 kcal/ kg DM, once again the highest value being obtained at Ungureanu Florin farm (2004). The energy values varied among 1.11- 1.14 UFL and 1.13- 1.16 UFV. The protein values varied between 52- 56 g PDIN/ kg DM and 82- 87 g PDIE/ kg DM, respectively. The results of the fodder beet nutritive value obtained in our research had a low variability compared with the ones presented by the scientific literature (INRA tables).

Key words: fodder beet, chemical composition, nutritive value.

Fodder beet is an important forage in dairy cows feeding due to its high productivity and quality (Iacob, T., 1997). Fodder beet is a succulent winter forage characterized by high water (70-90%) and energy (1.15 UFL and 1.16 UFV) content.

Fodder beet has a dietary effect, being easily digestible. Fodder beet is an excellent feed for dairy cows, increasing milk production and it makes possible the decreasing of concentrates quantity. It can be chopped and mixed with grounded concentrate fodders.

Fodder beet can be fed until late autumn and winter, after feeding with green forage, thereby prolonging the so-called green conveyor until late winter (Halga, P.and col., 2000).

It is well known that in small farms with 1-3 dairy cows the winter feeding is based on natural hay, corn cubs, straws and some concentrate. The diet is not balanced and does not correspond to dairy cows nutrient needs. This is what makes fodder beet an excellent forage in this type of farms from the Moldovian area.

MATERIAL AND METHOD

Fodder beet samples were collected with the purpose of determining the nutritive value to calculate the dairy cow's diet in an optimisation feeding research.

Fodder beet samples were collected from 3 dairy farms which took part in this research in Verşeni village. The raw samples were taken from every location and analysed in the laboratory of "Animal nutrition and feeding" department, Faculty of Agriculture, Iaşi.

The analysis of the fodder beet from the energetic and protein point of view took into account the following indexes UFL, UFC, ENL, ENC, PDIE and PDIN using the specific equations for the nutritive value estimation proposed by the French system (Jarrige et al., 1988):

The digestibility- degradability coefficients used for the estimation of nutritive value were taken from the INRA Tables.

Samples preparation

The fodder beet samples were dried in the drying closet at 60^0C and mill-grinded. After having had the samples prepared the dry, organic and mineral matters were assessed using the method of Proximate Analysis presented in *table 3* (Avarvarei Teona, 1999).

Table 1

Equations for assessing the energy value of the fodder beet

Index	Equation
Digestible energy	ED= EB*dE
Metabolic energy	EM= ED*EM/ED EM/ED= 0,8417- 9,9*10^{-5} CFo- 1,96*10^{-4}CPo + 0,0221NA
The fodder concentration in metabolic energy	q= EM/EB
Efficiency of using the metabolic energy in net energy:	
For lactation	kl= 0,60+ 90,24*(q- 0,57)
For maintenance	km= 0,287q+ 0,554
For fattening	kf= 0,78q+ 0,006
For maintenance and meat production	kmf= (km*kf*1,5)/ (kf+0,5*km)
UFL	UFL= EM*kl / 1700
UFV	UFV= EM*kmf / 1820

Table 2

Equations for estimating the protein value of fodder beet

Index	**Equation**
PDIA	PDIA= CP * (1,11*(1-TD))*1*dr
PDIN	PDIN= PDIA + PDIMN
PDIMN	PDIMN= CP * [1-1,11*(1-TD)]*0,9*0,8*0,8
PDIE	PDIE= PDIA+ PDIME
PDIME	PDIME = MOF* 0,145* 0,8* 0,8
SOF	MOF= MOD- CP (1-TD)- CF- FP

Table 3

Working method used in Proximate Analysis

Estimation	Method- method principle	Equation
Water content	The samples were dried to drying closet at 105^{0}C for 4 hours	$Ua\ \% = \frac{100\ x(a-b)}{a}$
Crude ashes content	The samples were calcined to 600^{0}C	$Ashes\ \% = \frac{cx100}{m}$
Crude protein content	Kjeldhal method– mineralized organic matter till CO_2, H_2 and NH_3	$CP\% = \frac{(\ n_1 f_1 - n_2 f_2\ )x0{,}0014x6{,}25x100}{m}$
Crude fat content	Soxhlet method– dissolving fat in organic solvent	$EE\% = \frac{m_1 - m_2}{m}\ x\ 100$
Crude cellulose content	Acid hydrolysis – filtration – calcinations	$CF\% = \frac{m_1 - m2}{m}$ x 100
N- free extract		N.F.E.= O.M. - (CP%+ EE%+ CF%)

RESULTS AND DISCUSSIONS

Chemical composition

The results obtained using the Proximate Analysis are presented in table 4. Analysing the obtained data one notices that there is a low variability in crude chemical content among farms.

The dry matter content of the analysed samples varied between 116.92 g and 140.65 g/ kg with an average value of 131.29 g/ kg.

The average crude ash content was 101.21g/ kg DM with limits between 94.14g and 106.97 g/ kg DM. The average data presented by French system (Jarrige, et al., 1988) is 85 g/ kg DM.

The crude protein content varied between 91.79g and 95.78 g/ kg DM with an average value of 93.80 g/ kg DM. The values we have obtained are lower than the ones presented by the scientific literature (104 g/ kg DM).

The ether extract content varied between 6.66 g and 7.67 g/ kg DM, the average value being 7.05±0.12 g/ kg DM.

The average of crude fibre content was 16 g/ kg DM higher than the data presented by Jarrige, 1988. The average was 86.36 g/ kg DM with values between 83.04 and 92.40 g/ kg DM.

The values obtained for NFE were between 705.93 and 717.69 g/ kg DM with an average of 711.60 g/ kg DM. This value is lower than the data presented by Jarrige (1988) with 22.4 g/ kg DM.

Table 4

Crude chemical content of fodder beet (g/ kg SU)

Exploitation	Year	DM	Ashes	CP	EE	CF	NFE
Buzenchi Mihai	2004	135.73	104.20	93.33	6.88	84.98	710.61
	2005	130.17	106.97	94.12	7.41	83.43	708.07
	2006	137.55	101.30	93.72	7.07	83.04	715.04
Isachi Mihail	2005	116.92	103.18	91.79	6.70	92.40	705.93
	2006	139.00	103.08	94.45	7.14	87.67	707.66
Ungureanu Florin	2004	126.80	94.14	92.42	6.66	89.09	717.69
	2005	123.50	96.76	94.76	7.67	86.27	714.53
	2006	140.65	100.06	95.78	6.86	84.02	713.28
Media $\overline{X} \pm s_x$		131.29±2.97	101.21±1.47	93.80±0.45	7.05±0.12	86.36±1.14	711.60±1.47
s		8.41	4.15	1.28	0.35	3.22	4.17
CV%		6.40	4.10	1.37	4.98	3.73	0.59
INRA, 1988		130	85	104	6.80	70	734

Table 5

The energetic value of fodder beet (kcal/ kg DM)

Farms	Year	GE	DE	ME	ENL	ENV	UFL	UFV
Buzenchi Mihai	2004	3970	3493	2952	1894	2054	1,11	1,13
	2005	3961	3486	2945	1890	2049	1,11	1,13
	2006	3983	3505	2962	1901	2061	1,12	1,13
Isachi Mihail	2005	3975	3498	2954	1895	2055	1,11	1,13
	2006	3979	3501	2957	1897	2056	1,12	1,13
Ungureanu Florin	2004	4011	3570	3017	1942	2112	1,14	1,16
	2005	4008	3567	3013	1940	2109	1,13	1,15
	2006	3990	3551	3000	1931	2100	1,13	1,14
Media $\overline{X} \pm s_x$		3985±6.22	3521±12.40	2975±10.52	1911±7.89	2075±9.66	1,12±0.00	1,14±0.00
s		17,61	35,07	29,75	22,31	27,31	0,01	0,01
CV%		0,44	1,00	1,00	1,17	1,32	1,00	1,02
INRA, 1988		4110	3630	3040	1961	2126	1,15	1,16

Metabolizable protein and energy contents

Table 5 presents the results regarding the energy content of the analysed samples. The energetic value was similar for the fodder beet samples in all the three farms. Thus, the minimum content in ME was 2945 kcal/ kg DM, whereas the maximum content 3017 kcal/ kg DM, accounting for a difference of 2.4%.

At the same time, the results of the analysis displays a low variability value of UFL (1.11- 1.14) and UFV (1.13- 1.16) in fodder beet samples. The energetic value of ENL varied between 1890- 1942 kcal/ kg DM. The value of ENV varied between 2049- 2112 kcal/ kg DM. The highest values were recorded by the fodder beet samples from Ungureanu Florin farm in 2004 (1942 kcal ENL/ kg DM, 2112 kcal ENV/ kg DM) respectively.

Mention must be made that the conversion efficiency of gross energy in milk and meat net energy was 48 and 52% respectively.

Table 6 presents the necessary information regarding the protein value of fodder beet samples.

We come to notice that there was a low variability for the analysed samples. Compared with data from INRA tables, we noticed a difference in PDIN. Thus, the average of the analysed samples is 53 g/ kg DM and value from table is 62 g/ kg DM. For PDIE values, our research have shown that the results are similar; the average value recorded for the analysed samples of fodder beet being 84 g/ kg DM in comparison with 86 g/ kg DM presented by the INRA tables.

CONCLUSIONS

Fodder beet is an excellent forage for dairy cows during winter time when green fodders are not available. Thus, it can be used in dairy cow small farms as basic fodder besides alfalfa hay, straws and corn cubs.

The fodder beet samples were collected from 3 farms from Verşeni village that took part from an improving cow feeding research, in order to analyse them and the obtained data to be used for formulating the optimal diet.

Table 6

The protein value of fodder beet (g/ kg DM)

Farms	Year	PDIA	PDIN	PDIE
Buzenchi Mihai	2004	28	52	82
	2005	29	53	83
	2006	29	53	87
Isachi Mihail	2005	28	54	82
	2006	29	56	87
Ungureanu Florin	2004	28	52	82
	2005	29	53	84
	2006	29	54	87
Media $\overline{X} \pm s_x$		28.63±0.18	53.38±0.46	84.25±0.84
s		0.52	1.30	2.38
CV%		1.81	2.44	2.82
INRA, 1988		11	62	86

The fodder beet samples were analysed using the classical schema of Proximate Analysis.

The crude chemical content of fodder beet among farms had a low variability.

The average values for all three farms were 131.29 g DM/ kg, 93.80 g CP/ kg DM, 7.05 g EE/ kg DM, 86.36 g CF /kg DM, 711.60 g NFE/ kg DM. Values obtained for CP and NFE were lower than the data presented by INRA tables.

The energetic and protein values were similar for the fodder beet samples analysed.

The values obtained for ME were between 2945 – 3017 kcal/ kg DM. The UFL and UFV values of the fodder beet had a low variability, too among all three farms. The average values were 1.12 UFL and 1.14 UFC/ kg DM of fodder beet. These values were lower than the ones presented by scientific literature (1.15 UFL and 1.16 UFC, respectively).

The conversion efficiency of gross energy in milk and meat net energy was 48 and 52% respectively.

The average values for PDIN and PDIE were 53.38 g/ kg DM and 84.25g/ kg DM, respectively. Mention must be made that the PDIN value obtained in our research was lower than the one presented by scientific literature (62 g PDIN/ kg DM). This is due to the low content in CP from the fodder beet samples analysed.

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