THE NUTRITIVE VALUE OF THE MAIZE GRAIN FROM SOME DAIRY COWS FARMS FROM LESPEZI VILLAGE

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Abstract

The coarsely grinded maize is a basic concentrate fodder used in dairy cows feeding in farms.
In this study we focused on the dynamics of the basic indexes of nutritive and energetic value of coarsely grinded maize used in dairy cows diet from some farms from Lespezi village. The coarsely grinded maize samples were collected from the dairy farms which participated in a feeding improvement research. There was a low variability of raw chemical composition of coarsely grinded maize samples. The protein content varied between 68.97 and 99.49 g/ kg DM, the highest value belonging to the coarsely grinded maize from Ciobanu Elena farm (2007). The fibre content varied between 24.31 and 28.17 g/ kg DM, the highest value belonging to the coarsely grinded maize from Ciobanu Elena farm (2006). The non fibre carbohydrate content varied between 822.83 and 837.71 g/ kg DM, the highest value belonging to the coarsely grinded maize from Maftei Gheorghe farm (2004). The energetic and protein values were similar for the analysed samples in the three farms. The energetic value of ENL varied between 2074 and 2149 kcal/ kg DM and the ENV value varied between 2237 and 2333 kcal/ kg DM, once again the highest value being obtained at Maftei Gheorghe farm (2007). The energy values varied among 1.22- 1.26 UFL and 1.23- 1.28 UFV/ kg DM. The protein values varied between 69 and 77 g PDIN/ kg DM and 115 and 128 g PDIE/ kg DM, respectively. The results of the coarsely grinded maize nutritive value obtained in our research had a low variability compared with the ones presented by the scientific literature (INRA tables), in some cases being similar.

Key words: chemical composition, nutritive value, coarsely grinded maize.

The maize grain is an important concentrate fodder used in animal feeding. This fodder is very digestible (85-90% for OM) and palatable. The content in CP and CF is low (8-10% and 3%, respectively) but higher in starch (over 70% from DM) and fat (4% from DM). For this reason the maize grain represents an energetic fodder.

To dairy cows, the maize grain is used for the increasing the diet energy content and mostly, it is the only source of energy used in dairy cows diet in farms (Halga, 2005).

The grinded maize is used in dairy cows feeding, in moderate quantity. A higher quantity decreases the butter quality (Dinescu, 2001). To balance the diet in energy and protein, the maize grain is mixed with wheat bran, soybean meal and sunflower cake.

MATERIAL AND METHOD

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

Grinded maize samples were collected from 3 dairy farms which took part in this research in Lespezi 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 grinded maize 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):

Table 1

Equations for assessing the energy value of the grinded maize

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

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

Table 2

Equations for estimating the protein value of grinded maize

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

Samples preparation

The maize grain 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).

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.

Table 3

Working method used in Proximate Analysis

Estimation	Method- method principle	Equation
Water content	The samples were dried to drying closet at 105^0C for 4 hours	$Ua\,\% = \frac{100\,x(a-b)}{a}$
Crude ashes content	The samples were calcined to 600^0C	$Ashes\ \% = \frac{cx100}{m}$
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
Non fibre carbohydrate		N.F.E.= O.M. - (CP%+ EE%+ CF%)

Table 4

Crude chemical content of grinded maize (g/ kg SU)

Farms	Year	DM	Ashes	CP	EE	CF	SEN
Boldea Nicolae	2004	873.47	14.20	89.18	33.70	28.05	834.87
	2005	863.10	15.35	94.16	35.94	25.01	829.55
	2006	869.95	14.88	95.29	34.97	26.86	828.00
	2007	870.75	15.41	98.25	35.93	25.19	825.23
Ciobanu Elena	2004	858.73	14.28	92.31	35.63	27.44	830.33
	2005	865.83	14.82	94.89	37.00	25.54	827.74
	2006	873.73	15.47	97.44	36.09	28.17	822.83
	2007	867.40	15.67	99.49	34.58	26.47	823.78
Maftei Gheorghe	2004	893.03	14.03	86.97	36.47	24.82	837.71
	2005	861.72	15.88	92.53	38.95	26.34	826.30
	2006	873.45	14.10	94.97	39.69	24.31	826.94
	2007	869.28	14.69	99.13	36.80	25.49	823.89
Media $\overline{X}$ $\pm s_x$		870.04±2.52	14.90±0.19	94.55±1.11	36.31±0.49	26.14±0.37	828.10±1.30
s		8.72	0.65	3.86	1.69	1.29	4.50
CV%		1.00	4.37	4.08	4.66	4.92	0.54
INRA, 1988		860	15	101	47	27	810

The dry matter content of the analysed samples varied between 861.72 g and 893.03 g/ kg with an average value of 870.04 g/ kg.

The average crude ash content was 14.90g/ kg DM with limits between 14.03 g and 15.88 g/ kg DM. The average data presented by French system (Jarrige et al., 1988) is 15 g/ kg DM.

The crude protein content varied between 86.97 g and 99.49 g/ kg DM with an average value of 94.55 g/ kg DM. The values we have obtained are lower than the ones presented by the scientific literature (101 g/ kg DM).

The ether extract content varied between 33.70 g and 39.69 g/ kg DM, the average value being 36.31 g/ kg DM.

The average of crude fibre content was 26.14 g/ kg DM similar with the data presented by Jarrige, 1988. The values obtained for NFC were between 822.83 g and 837.71 g/ kg DM with an average of 828.10 g/ kg DM. This value was higher than the data presented by Jarrige (1988), 810 g/ kg DM respectively.

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 grinded maize samples in all the three farms. Thus, the minimum content in ME was 3262 kcal/ kg DM, whereas the maximum content 3344 kcal/ kg DM.

Table 5

The energetic value of grinded maize (kcal/ kg DM)

Farms	Year	GE	DE	ME	ENL	ENV	UFL	UFV
Boldea Nicolae	2004	4446	3801	3248	2074	2237	1.22	1.23
	2005	4459	3857	3292	2108	2281	1.24	1.25
	2006	4459	3890	3319	2130	2310	1.25	1.27
	2007	4465	3918	3341	2148	2332	1.26	1,28
Ciobanu Elena	2004	4460	3818	3260	2082	2246	1.22	1.23
	2005	4468	3847	3283	2100	2269	1.24	1.25
	2006	4466	3875	3303	2117	2291	1.25	1.26
	2007	4460	3917	3339	2146	2331	1.26	1.28
Maftei Gheorghe	2004	4456	3814	3262	2084	2249	1.23	1.24
	2005	4471	3836	3275	2093	2259	1.23	1.24
	2006	4485	3880	3311	2121	2294	1.25	1.26
	2007	4474	3922	3344	2149	2333	1.26	1.28
Media $\overline{X}$ $\pm s_x$		4464.08 ±2.86	3864.58 ±12.26	3298.08 ±9.66	2112.67 ±7.73	2286.00 ±10.09	1.24 ±0.0	1.26 ±0.01
s		9.91	42.47	33.45	26.79	34.94	0.01	0.02
CV%		0.22	1.10	1.01	1.27	1.53	1.19	1.50
INRA, 1988		4510	3990	3370	2157	2359	1.27	1.29

At the same time, the results of the analysis displays a low variability value of UFL (1.22- 1.26) and UFV (1.23- 1.28) in grinded maize samples. The energetic value of ENL varied between 2074 and 2149 kcal/ kg DM. The value of ENV varied between 2237 and 2333 kcal/ kg DM. The highest values were recorded by the grinded maize samples from Maftei Gheorghe farm in 2007 (2149 kcal ENL/ kg DM, 2333 kcal ENV/ kg DM, respectively).

Mention must be made that the conversion efficiency of gross energy in milk and meat net energy was 47 and 51%, respectively.

Table 6

The protein value of grinded maize (g/ kg DM)

Farms	Year	PDIA	PDIN	PDIE
Boldea Nicolae	2004	52	70	117
	2005	55	74	119
	2006	55	75	125
	2007	57	77	126
Ciobanu Elena	2004	51	69	115
	2005	52	71	119
	2006	53	73	122
	2007	54	75	127
Maftei Gheorghe	2004	50	68	116
	2005	51	70	115
	2006	52	71	124
	2007	54	75	128
Media $\overline{X}$ $\pm s_x$		53±0.59	72±0.83	121±1.40
s		2.04	2.87	4.83
CV%		3.86	3.97	3.99
INRA, 1988		61	82	120

Table 6 presents the necessary information regarding the protein value of grinded maize 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 72 g/ kg DM and value from INRA table is 82 g/ kg DM.

For PDIE values, our research have shown that the results are similar with the one presented by scientific literature; the average value recorded for the analysed samples of grinded maize being 121 g/ kg DM in comparison with 120 g/ kg DM presented by the INRA tables.

CONCLUSIONS

The grinded maize samples were collected from 3 farms from Lespezi 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.

The grinded maize samples were analysed using the classical schema of Proximate Analysis.

The crude chemical content of grinded maize among farms had a low variability.

The average values for all three farms were 870.04 g DM/ kg, 94.55 g CP/ kg DM, 36.31 g EE/ kg DM, 26.14 g CF/ kg DM, 828.10 g NFC/ kg DM.

The energetic and protein values were similar for the grinded maize samples analysed.

The values obtained for ME were between 3262– 3344 kcal/ kg DM. The UFL and UFV values of the grinded maize had a low variability, too among all three farms. The average values were 1.24 UFL and 1.26 UFC/ kg DM of grinded maize. These values were lower than the ones presented by scientific literature (1.27 UFL and 1.30 UFV, respectively).

The conversion efficiency of gross energy in milk and meat net energy was 47 and 51% respectively.

The average values for PDIN and PDIE were 72 g/ kg DM and 121 g/ kg DM, respectively. Mention must be made that the protein values obtained in our research was similar with the one presented by scientific literature (INRA, 1988).

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