

Comparative Characteristics of the Nutritional Values of Fodder in Moldova

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Abstract. The aim of our research was to study the chemical composition and nutritive value of different kinds of fodder produced in different zones of the Republic of Moldova. The research has shown that the comparative characteristics regarding the chemical composition as well as the total nutritive value of fodder from various zones of Moldova significantly differ from each other, and that they also differ from the data provided in the recommended literature on this topic.

Keywords: fodder, nutritive material, total nutritional value

INTRODUCTION

Prompt and accurate information is essential for the development and improvement of the energy saving technologies in the agro-industrial domain. Nowadays the sale of agricultural and food products on the EU market is not possible if a company does not have a confirmed system of quality and safety management based on the principles of HACCP, which is a key element of the international standards ISO. Enterprises assure the security of their products and conduct their own control.

An important factor that determines the productivity of animal husbandry is the quality of fodder. The chemical composition, the nutritive value and the quality of fodder determine the correspondence between the nutrients intake and the animals' needs. The availability and absorption of the nutrients of a ration are ensured by the accurate quantitative and qualitative characteristics, which can be obtained only from accurate laboratory studies.

The principles of proper nutrition involve the knowledge of some problems regarding the nutritional value of fodder and rations, fodder resources and their nutritional features, the necessary quantity of fodder, which differ according to age group, physiological status and production. (Varga P., 1993; Stoica Liliana, 2001).

The provisions regarding the rational sequence of the forage reserve are as follows: to analyze the fodder crops in a pedo-climatic zone, and to obtain large amounts of nutritional fodder at the lowest price. The fodder composition and value also depend on agro conditions (climate, soil, fertilizer, agricultural technology), on plant varieties, phases in which the plants were harvested, and on preservation conditions (Pop I. *et al.*, 2006).

The existence of a significant relationship between the chemical composition of fodder and its availability requires a good knowledge of fodder characteristics and their impact on the agribusiness production. In this connection, it is very important and opportune to study the chemical composition and nutritional value of the fodder produced in Moldova, the improvement of crop harvesting, processing, storage and usage, and quality determination.

Nutrition and diet have a direct and obvious influence not only on the animal production but also on the animal reproduction, growth and development, the state of the animals' health, and last but not the least on the economic efficiency - the decisive goal in the development of animal husbandry (Șimeanu *et al.*, 2006).

MATERIALS AND METHODS

In order to study the chemical composition and nutritional value of the local fodder from some areas in the Republic of Moldova, samples had been collected which were analyzed at the Laboratory of Zootechnical Analysis of the Department of Animal Husbandry of the State Agricultural University of Moldova.

The research was conducted using the methods of the following researchers: Petuhova E. *et al.* (1989), Pop I. (2006). The following characteristics of the fodder nutritive material were examined: humidity (U): including the initial + hygroscopic; dry substance (SU); mineral part (crude ash–CenB); the organic part (SO) or organic substances; protides (PB), lipids (GB), carbohydrates–crude fibre (CB); extractive non-nitrogenous substances (SEN).

The obtained data were compared with the chemical composition of similar fodder shown in speciality literature (Calașnicov A. P. *et al.*, 1985, 2003; Drăniceanu E. *et al.*, 2006; Ștef L., 2008).

RESULTS AND DISCUSSION

The chemical analysis of fodder, extrudates and the products obtained through their processing showed (Tab. 1-3) that the content of nutritive material of fodder differed not only in comparison with literature data, but also depending on the zone and date of samples collection.

Comparing the content of crude protein in conformity with the results of chemical analysis with literature data the following variations were observed: in the corn -0.49 – +1.43%; in wheat grains -0.56 – +0.40%; in soybeans +1.30 – 2.76%. The data on the content of crude protein obtained from the chemical analysis, showed that its de facto content in all quantities of fodder was lower (except soybean) compared to indices presented in specialty literature.

Tab.1

The content of crude nutritive material in the unprocessed grains, % / kg

Fodder	Sample collection		Crude nutritious substances						
	date	place	protein	fat	cellulose	SEN	dry substance	organic substance	ash
Corn	29.03.2010	Orhei	10.92	2,28	3,79	66,63	86,58	83,62	2,96
	19.05.2010		10..63	3,29	3,97	65,48	85,99	83,37	2,62
	02.04.2010		10.20	3,46	3,86	65,35	85,19	82,87	2,32
	29.05.2010	Bălți	9.69	2,93	2,82	63,60	82,26	79,04	3,22
Wheat	29.03.2010	Orhei	12.79	1,56	3,67	64,10	83,37	82,12	1,25
	02.04.2010		13.70	2,28	2,37	61,55	81,97	79,90	2,07
	09.05.2010	Bălți	12.74	2,24	3,68	63,35	83,87	82,01	1,86

Chemical analysis data on crude fat content in fodder were practically similar to those of crude protein content, i.e. its de facto content was lower than that mentioned in literature.

The difference of the crude fiber content in the fodder in Moldova, according to laboratory data as compared to the data in literature, was as follows (in %): in corn -0.17, in wheat +0.88, in soybeans -0.43, in wheat bran -22.15-26.23%. The analysis of the indexes regarding the crude fiber content showed that its level in fodder was lower (except soy grist - 13.0% versus 6.5%) than that presented in literature. Such differences in the crude fiber indices were clearly possible only because the collection of average fodder samples was made in different zones and on different dates.

Tab. 2

The content of crude nutritive material in the extruded fodder, % / kg

Fodder	Sample collection: date /place	Crude nutritive material						
		protein	Fat	Cellulose	SEN	Dry substance	Organic substance	Ash
Corn extrudate	29.03.2010 Orhei	9,60	0,96	0,36	72,80	84,71	83,72	0,99
		10,03	0,85	0,41	71,20	83,60	82,49	1,11
Pea extrudate		14,36	0,54	4,06	62,26	83,35	81,22	2,13
Wheat extrudate		9,72	0,29	2,88	70,46	84,55	83,35	1,20
Barley extrudate		9,43	0,61	2,53	70,26	84,41	82,83	1,58

Tab. 3

The content of crude nutritive material in the unprocessed fodder, % / kg

Fodder	Sample collection: date /place		Crude nutritive material						
			Protein	Fat	Cellulose	SEN	Dry substance	Organic substance	Ash
Pea	29.03.2010	Orhei	23,79	1,93	8,38	46,88	88,20	80,98	2,22
	02.04.2010		22,20	1,23	9,23	48,65	83,80	81,31	2,49
	19.05.2010		21,96	1,86	7,57	50,75	84,20	82,14	2,06
	29.05.2010	Bălți	28,74	1,23	6,41	46,22	85,45	82,60	2,85
Soy	29.03.2010	Orhei	34,66	17,69	6,04	21,77	83,76	80,16	3,60
	02.04.2010		33,20	18,81	5,65	23,76	84,64	81,42	3,22
Soy grist	29.03.2010	Orhei	32,89	14,99	4,66	29,85	85,93	82,39	3,54
Sunflower cake	29.03.2010	Orhei	32,44	7,13	7,54	32,32	85,61	79,43	6,18
	19.05.2010		34,83	10,44	6,40	31,42	88,34	83,09	5,25
	29.05.2010	Bălți	29,86	15,57	4,17	33,81	87,86	83,21	4,65
Bran	29.03.2010	Orhei	14,98	0,36	33,37	31,69	83,35	80,4	2,95
	02.04.2010		15,50	0,80	35,03	29,46	84,00	80,79	3,21
	29.05.2010	Bălți	12,97	0,54	30,95	36,15	85,44	80,61	4,83

Examining tables 4-5 it has been ascertained that the nutritional value of maize and wheat, both in the central and the north zones of Moldova, is decreasing in comparison with literature data respectively with 0.11-0.16 for maize, and 0.15-0.24 for wheat, depending on the pedological zone.

On the basis of obtained data on de facto chemical composition of nutritive material in the examined fodder, the nutritional value expressed in oat nutritional units was calculated and compared with the data given in specialty literature.

Tab. 4

General nutritional value in oat nutritional units

Fodder	Sample collection		Oat nutritional value in 1 kg of fodder		
			Experimental		A.Calaşnicov, 1985
	date	place	swine	cattle	swine / cattle
Corn	29.03.2010	Orhei	1,22	1,26	1,33
	19.05.2010		1,22	1,10	
	02.04.2010		1,22	1,30	
	29.05.2010	Bălţi	1,17	1,04	
Wheat	29.03.2010	Orhei	1,06	1,15	1,28
	02.04.2010		1,04	1,12	
	29.05.2010	Bălţi	1,06	1,20	
Pea	29.03.2010	Orhei	1,17	1,20	1,18
	02.04.2010	Orhei	1,17	1,04	
	19.05.2010	Orhei	1,19	1,12	
	29.05.2010	Bălţi	1,19	0,84	
Soy	29.03.2010	Orhei	1,40	1,19	1,45
	02.04.2010		1,44	1,36	
Soy grist	29.03.2010	Orhei	1,03	1,30	1,21
Sunflower cake	29.03.2010	Orhei	0,87	0,98	1,08
	19.05.2010		0,98	1,31	
	29.05.2010	Bălţi	0,88	1,27	
Bran	29.03.2010	Orhei	0,61	0,75	0,75
	02.04.2010		0,61	0,69	
	29.05.2010	Bălţi	0,62	0,72	

Tab. 5

General nutritional value in oat nutritional units

Fodder	Sample collection		Oat nutritional value in 1 kg of fodder		
			Experimental		A.Calaşnicov, 1985
	data	place	swine	cattle	swine / cattle
Corn extrudate	29.03.2010	Orhei	1,29	1,18	Does not exist
	19.05.2010		1,15	0,69	
Pea extrudate	29.03.2010	Orhei	1,20	1,16	
Wheat extrudate	29.03.2010	Orhei	0,72	0,97	
Barley extrudate	29.03.2010	Orhei	1,17	1,11	

The nutritional value of extruded fodder was also calculated (Tab. 5); the digestibility coefficients were taken from literature. The data showed that the nutritional value of corn extrudate varied from 1.29 n. u. in swine and 1.18 n. u. in cattle; the pea extrudate –1.2 and 1.16 n.u; wheat extrudate –0.72-1.17 n.u. and barley extrudate –1.17-1.11. There is not any information about the nutritional value of these kinds of fodder either in the 1985 or in the 2003 edition of the handbook by Calaşnicov.

On the basis of the data on digestible nutrients and using regression equations, it was possible to calculate the energetic nutritional value of fodder on the basis of energy metabolism.

Tab. 6

Energetic nutritional value of experimental fodder

Fodder	Sample collection:		Energetic nutritional value of 1 kg of fodder			
			experimental		Calaşnicov (1985, 2003)	
	date	place	swine	cattle	swine	cattle
Corn	19.05.2010	Orhei	1.16	1.15	1.33	1.28
	02.04.2010	Orhei	1.12	0.99		
	29.05.2010	Bălţi	1.07	1.19		
Wheat	29.03.2010	Orhei	1.03	0.95	1.36	1.08
	02.04.2010	Orhei	1.02	1.11		
	29.05.2010	Bălţi	0.92	1.10		
Pea	29.03.2010	Orhei	1.17	1.16	1.31	1.11
	02.04.2010	Orhei	1.17	1.18		
	19.05.2010	Orhei	1.19	1.02		
	29.05.2010	Bălţi	1.19	1.15		
Soy	29.03.2010	Orhei	1.19	0.86	1.50	1.47
	02.04.2010	Orhei	1.37	1.11		
Soy grist	29.03.2010	Orhei	1.16	1.30	1.45	1.45

Using the indices in tables 6-7 was determined the energetic nutritional value of 1 kg of fodder in different pedological zones, and compared with the data presented by Calasnicov A. (2003).

Tab. 7

Energetic nutritional value of the experimental fodder

Fodder	Sample collection:		Energetic nutritional value of 1 kg of fodder			
			experimental		Calaşnicov, 2003	
	date	place	swine	cattle	swine	cattle
Sunflower cake	29.03.2010	Orhei	0.86	0.99	1.23	1.04
	19.05.2010	Orhei	1.08	0.62		
	29.05.2010	Bălţi	1.04	1.34		
Bran	29.03.2010	Orhei	0.85	0.89	0.93	0.89
	02.04.2010	Orhei	0.81	0.84		
	29.05.2010	Bălţi	0.84	0.86		
Corn extrudate	29.03.2010	Orhei	1.15	1.21	-	1.22
	19.05.2010	Orhei	1.04	1.26		
Pea extrudate	29.03.2010	Orhei	1.15	1.05	-	-
Wheat extrudate	29.03.2010	Orhei	0.89	1.26	-	-
Barley extrudate	29.03.2010	Orhei	1.13	1.11	-	-

Analyzing the data on the nutritional value of the waste derived from the processing of concentrated fodder it was found that the nutritive value was lower than in the data offered by Calasnicov A.

Tab. 8

Metabolic energy content of experimental fodder

Fodder	Sample collection:		Metabolic energy, MJ					
	date	place	experimental		A. Calășnicov			
					1985		2003	
			swine	bovine	swine	bovine	swine	bovine
Corn	29.03.2010	Orhei	12.54	11.48	13.67	12.20	13.70	13.60
	19.05.2010	Orhei	10.63	9.95				
	02.04.2010	Orhei	13.09	11.88				
	29.05.2010	Bălți	10.52	9.50				
Wheat	29.03.2010	Orhei	11.87	11.13	13.56	10.80	13.60	10.80
	02.04.2010	Orhei	11.76	10.99				
	29.05.2010	Bălți	12.40	11.62				
Pea	29.03.2010	Orhei	14.17	11.77	13.06	11.10	13.10	1.10
	02.04.2010	Orhei	12.38	10.20				
	19.05.2010	Orhei	13.91	11.50				
	29.05.2010	Bălți	10.41	8.56				
Soy	29.03.2010	Orhei	13.63	11.13	15.01	14.70	15.00	14.70
	02.04.2010	Orhei	15.73	12.67				
Soy grist	29.03.2010	Orhei	13.32	12.99	14.49	12.92	14.50	12.90
Sunflower cake	29.03.2010	Orhei	9.89	9.95	12.25	10.44	12.3	10.40
	19.05.2010	Orhei	12.43	6.17				
	29.05.2010	Bălți	11.94	13.41				
Bran	29.03.2010	Orhei	9.82	8.86	9.28	8.85	9.30	8.90
	02.04.2010	Orhei	9.34	8.39				
	29.05.2010	Bălți	9.70	8.64				
Fodder yeast	29.03.2010	Orhei	12.17	12.11	14.69	12.22	14.70	12.20
	02.04.2010	Orhei	12.72	12.64				
Corn extrudate	29.03.2010	Orhei	13.20	10.52	-	-	-	-
	19.05.2010	Orhei	11.95	12.58				
Pea extrudate	29.03.2010	Orhei	13.18	11.11	-	-	-	-
Wheat extrudate	29.03.2010	Orhei	10.27	9.37	-	-	-	-
Barley extrudate	29.03.2010	Orhei	13.02	10.67	-	-	-	-
Powdered milk	29.03.2010	Orhei	13.69	-	19.19	13.3	19.2	13.3
	02.04.2010	Orhei	14.65	-				
Fish flour	29.03.2010	Orhei	11.20	9.08	13.34	11.47	15.10	9.90

CONCLUSIONS

- The data on the content of basic nutritive material in the fodder in Moldova differs considerably from the literature data used to calculate the nutritional value of compound fodder; the nutritional value of fodder also varies depending on the date of sample collection.
- Data obtained from the chemical analysis on the content of crude protein and fat point to a much lower content of these substances practically in all kinds of fodder in Moldova.
- The chemical analysis of nutritive material in Moldavian fodder showed that there is need in depth, thorough, systematic and ecological research of all kinds of fodder on a wide range of their characteristics, in order to discover the content of nutritive material, to assess their general nutritional value with a view to balance the nutrition of domestic animals, and the rational expenditure of fodder.

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