

RESEARCH ON CHEMICAL COMPOSITION OF MIXED FEED USED FOR THE FEEDING LAYING HENS IN DIFFERENT SYSTEMS PRODUCTION (CONVENTIONAL AND ORGANIC)

Maria Bologna^{1*}, I.M. Pop¹, Aida Albu¹

¹University of Agricultural Sciences and Veterinary Medicine Iasi, Romania

Abstract

The aim of this study was the comparative analysis of the chemical composition determined for 10 samples of mixed feed collected from two units from Romania with different systems in hens egg production (conventional and organic). Premixtures contain similar ingredients, except for the chemical synthesis of animal origin which are not allowed in organic production. The research focused on determining the gross chemical composition (content of dry matter, crude ash, crude protein, crude fat, crude fiber and SEN) using classical methods in order to standards and legislation. Statistical analysis, revealed significant differences between the mean values calculated for mixed feed samples derived from conventional system compared with the ecological one for dry matter ($0.57 \pm 0.09\%DM$ vs. $91.13 \pm 0.04\%DM$), crude ash ($11.02 \pm 0.05\%Ash$ vs. $12.48 \pm 0.14\%Ash$), crude protein ($19.28 \pm 0.08\%PC$ vs. $14.39 \pm 0.10\%PC$), crude fat ($3.12 \pm 0.05\%FC$ vs. $5.03 \pm 0.04\%FC$) and ($61.19 \pm 0.11\%SEN$ vs. $62.59 \pm 0.12\%SEN$). For crude fiber the differences were insignificant.

Key words: chemical composition, mixed feed, farming system, organic, conventional

INTRODUCTION

In the last decade many studies have been conducted which were aimed at comparing the nutritional quality of foods produced by organic exploitation systems with those obtained from conventional exploitation systems, which are compared and analyzed in the paper with a high scientific value [8, 4, 5, 3], while in regard to fodder data are too limited.

A mixed fodder is a complex mixture of energy fodder (cereals and fats) and protein (meals and flours of animal origin and bacterial), minerals (macro and micro), vitamins and feed additives (antioxidants, growth stimulators, etc.) covering requirements for maintenance and production of the animals [7].

The research objectives focused on comparative assessment of mixed fodder coming from the conventional to organic systems: the percentage in dry matter, crude protein, crude fat, crude ash, crude fiber,

organic matter and extractive substances neazotate.

To achieve that goal were taken and subjected to chemical analysis samples of mixed fodder from a organic exploitation and a conventional exploitation.

MATERIAL AND METHOD

During 2012 were taken ten samples of mixed fodder from a conventional unit from Galati County and from a organic unit from Cluj County, profiled on laying hens exploitation. Premixtures have contained similar ingredients, except for the chemical synthesis and of animal origin which are not allowed in organic production.

Sampling of the two types of fodder was done to meeting the requirements of the standards in force (STAS 9597/1-74, SR EN ISO 13690:2001) [10, 11], so as to be representative for assessing the gross chemical composition. Determination of moisture content and dry matter mixed feed samples was done in accordance the standards in force (ISO 712:2010) [15] by drying in oven kept at a temperature of

*Corresponding author: mary_shoa@yahoo.com

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105°C for 6 hours to analyze the ampoules with product, weighed. Drying operation was repeated until constant mass has been reached. Crude ash content was determined according to ISO 2171: 2010 [16] by calcining the sample at a temperature of 550°C to constant mass, using furnace SUPERTERM 611.06 STC model. Crude protein content was determined by Kjeldahl method (mineralization, distillation, titration) described in ISO 59836-1:2006 / AC: 2009 [14]. Determination of crude fat was done by extraction with organic solvents (petroleum ether) using Soxhlet method according to ISO 6492:2001 [12]. Crude fiber was followed for determining the method described in ISO 6865:2002 [13] using semiautomatic system for extracting fiber-FIWE Velp 6. Determination of nutritional parameters (DM%, Ash%, PC%, FC%, CF%) helped to obtaining through mathematical calculation of organic matter and extractive substances neazotate. Expression of chemical composition of the

fodders analyzed was made by reporting all the parameters analyzed at DM.

The results of analyzes were processed statistically by calculating the position and variation estimators (arithmetic average \bar{x} , respective the variance S^2 , standard deviation s , standard deviation of average $S_{\bar{x}}$ and coefficient of variation $V\%$) and the significance of differences was determined using Fisher Test.

RESULTS AND DISCUSSIONS

In table 1 shows the gross composition and chemical analysis of conventional and organic recipes used in diet of laying hens when laying rate represents 2%.

Analysis of the average values of the gross chemical composition resulting from analyzes performed on the 10 samples studied for mixed fodder, the calculated value and table value for \hat{F} are shown in table 2.

Table 1 The gross composition and chemical analysis of conventional and organic recipes used in diet of laying hens (laying rate of 2%) (according with data sheet product)

Ingredients	Conventional recipe %	Organic recipe %
Corn	48.80	35.50
Soybean shrot 46% / Full fat soya	21.00	20.00
Wheat	10.00	15.50
Calcium carbonate	9.60	4.50
Sunflower shrot	7.20	12.00
Premix GOC 2% 2055/01E	2.00	-
Oil	1.40	-
Gluten	-	4.00
Alfalfa	-	6.00
Phosphate	-	1.2
Salt	-	0.3
Protein	-	1.0
Total	100	100
Metabolizable energy (MJ / kg)	11.5435	11.87
Gross chemical composition %		
DM	90.74	91.28
Aah	11.16	12.90
OM	88.84	87.10
PC	19.50	14.67
FC	3.27	5.13
CF	4.55	4.43
SEN	61.52	62.87

Table 2 The average gross chemical composition of mixed feed (% DM)

SPECIFICATION		n ¹⁰	$\bar{X} \pm s_{\bar{X}}$	s	V%	Limits		FISHER Test	
						Min	Max		
DM% ¹		Conv.	5	90.57±0.09	0.22	0.24	90.2	90.74	$\hat{F} = 25.65 > F_{0.1\%} = 25.42$ *** ⁹
		Eco.	5	91.13±0.04	0.11	0.12	91.01	91.28	
ORGANIC CONSTITUENTS	Ash% ²	Conv.	5	11.02±0.05	0.11	1.04	10.88	11.16	$\hat{F} = 92.36 > F_{0.1\%} = 25.42$ ***
		Eco.	5	12.48±0.14	0.31	2.54	12.06	12.9	
	OM% ³	Conv.	5	88.47±0.13	0.30	0.34	88.13	88.84	$\hat{F} = 89.57 > F_{0.1\%} = 25.42$ ***
		Eco.	5	86.88±0.09	0.22	0.25	86.56	87.1	
	PC% ⁴	Conv.	5	19.28±0.08	0.18	0.98	19.07	19.5	$\hat{F} = 1342.27 > F_{0.1\%} = 25.42$ ***
		Eco.	5	14.39±0.10	0.23	1.59	14.12	14.67	
	FC% ⁵	Conv.	5	3.12±0.05	0.12	4.15	2.93	3.27	$\hat{F} = 660.64 > F_{0.1\%} = 25.42$ ***
		Eco.	5	5.03±0.04	0.10	2.05	4.89	5.13	
	CF% ⁶	Conv.	5	4.30±0.09	0.20	4.78	4.07	4.55	$\hat{F} = 0.01 < F_{5\%} = 238.9$ i.d. ⁸
		Eco.	5	4.29±0.05	0.12	2.89	4.12	4.43	
	SEN% ⁷	Conv.	5	61.19±0.11	0.26	0.41	60.92	61.52	$\hat{F} = 68.12 > F_{0.1\%} = 25.42$ ***
		Eco.	5	62.59±0.12	0.27	0.44	62.27	62.87	

¹DM%= dry matter; ²Ash%= crude ash; ³OM%= organic matter; ⁴PC%= crude protein; ⁵FC%= crude fat; ⁶CF%= crude fiber; ⁷SEN%= extractive substances neazotate; ⁸i.d - insignificant differences; ⁹*** - very significant differences; [6]; ¹⁰n= number of observations from a sample.

From the submitted data it can be seen that the statistical analysis resulting very significant differences between average values calculated for mixed feed samples taken from the conventional system compared to samples taken from organic system for dry matter content (90.57±0.09% DM vs. 91.13±0.04%DM), crude ash (11.02±0.05% Ash vs. 12.48±0.14 % Ash), crude protein (19.28±0.08% PC vs. 14.39±0.10%PC), crude fat (3.12±0.05% FC vs. 5.03±0.04%FC) and SEN (61.19±0.11% SEN vs. 62.59±0.12% SEN). For crude fiber were insignificant differences (4.30±0.09% CF vs. 4.29±0.05% CF).

Results of own research compared to data generated in other studies carried out in the country and abroad are presented in table 3.

From the analysis the average values of own results of research was noticed that the value of dry matter for mixed feed from conventional system (90.57 %DM) and organic (91.13 %DM). was slightly above the interval found in the bibliography (89.90 %DM and respectively 90.40 %DM) [1, 2].

As regards average values for the quantity of crude ash, has been observed that the value found in samples taken from the conventional (11.02 %Ash) are between the values found in other bibliographic sources (10.95 – 12.15 %Ash) [1, 2] and the value found in samples of organic system (12.48

%Ash) is below the minimum value found in other studies (13.35 %Ash) [1].

For value of organic matter content has been observed that the average found for samples taken from conventional system (88.47% OM) and at samples collected from organic system (86.88% OM) were situated above the lower limit of the interval found in other sources (77.4% OM - for conventional and 77.05% OM - for organic) [1, 2].

As regards the average values for crude protein content at samples taken from organic (14.39% PC) is the lower limit of the value found in other studies (17.32% PC) [1] and the samples of conventional system (19.28% PC), these values being in far above the limits found in the sources studied [1, 2, 9].

And for crude fat the values found in own research for the samples of conventional system (3.12% FC) are below the lower limit found in other studies (3.94 to 5.78% FC) [1, 2, 9] and for samples taken from organic (5.03% FC), are above the values found in other studies (4.48% FC) [1].

The interval of values for crude fiber from other studies for conventional (4.75 to 6.95% CF) [1, 2] included the values found in own research (4.30% CF) and for organic values from other research (7.74% CF) [1] are higher than those found in own research (4.29% CF).

The average values for extractive substances neazotate found in own research for samples from conventional system (61.19% SEN) is above the upper limit of the

average values found in other studies (47.02 to 60% SEN) [1, 2] and the values for organic samples (62.59% SEN) is above the average limit found in other studies (47.51% SEN) [1].

Table 3 The average gross chemical composition of mixed feed by different authors (%DM)

Speci-fication	Prove-nance	DM% ³	Constituents % from DM						Source
			Ash	OM ⁵	PC ⁶	FC ⁷	CF ⁸	SEN ⁹	
Mixed feed	Conv. ¹	89.90	12.50	77.4	17.65	5.78	6.95	47.02	Anonymous, 1991
	Eco. ²	90.40	13.35	77.05	17.32	4.48	7.74	47.51	
	Conv.	89	10.95	91.1	17.4	4.4	4.75	60	Burlacu, 2002
	Conv.	n/a ¹⁰	n/a	n/a	16.05	3.94	n/a	n/a	NRC, 1994

¹Conv.= conventional; ²Eco.= ecologic; ³DM%= dry matter; ⁴Ash%= crude ash; ⁵OM%= organic matter; ⁶PC%= crude protein; ⁷FC%= crude fat; ⁸CF%= crude fiber; ⁹SEN%= extractive substances neazotate; ¹⁰n/a= not available

CONCLUSIONS

The results show and confirm that the content of crude fat 5.03% PC, dry matter 91.13 % DM, crude ash 12.48 % Ash and extractive substances neazotate 62.59 %SEN are net superior and crude protein content 14.39 %PC, are net superior and crude protein content 86.88 %OM and crude fiber 4.29 %CF are lower for organic mixed fodder compared to the average gross chemical composition for conventional mixed fodder (11.02 % FC, 90.57 % DM, 11.02 % Ash, 61.19 % SEN – is lower and 19.28% PC, 88.47% OM and 4.30% CF - is higher). Those differences are due to differing mixed feed ingredients that make up the recipe.

In conclusion, it may balance a recipe for laying hens, without adding synthetic nutrients, but increase costs, especially for small farms which have a herd of birds.

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