

**THE INFLUENCE OF SOME ENZYMATIC MIXTURES ON
NUTRITIVE AND BIOPRODUCTIVE INDICES AND ON
DIGESTIVE VISCOSITY AT DUODENUM LEVEL AT
BROILER CHICKENS FED WITH DIETS
RICH IN NDF AND ADF**

**INFLUENȚA UNOR PREPARATE ENZIMATICE ASUPRA
PRINCIPALILOR INDICI NUTRITIVI ȘI BIOPRODUCTIVI ȘI
ASUPRA VÂSCOZITĂȚII LA NIVELUL DUODENULUI LA
PUII DE CARNE HRĂNIȚI CU O DIETĂ
BOGATĂ ÎN NDF ȘI ADF**

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In this experiment we have studied the effect of three enzymatic mixtures incorporated in broiler chicken diets which contained high levels of NDF and ADF. The experiment was carried out on 120 broiler chickens divided into four experimental groups: CG, EG1, EG2 and EG3. The best results were obtained at experimental group EG1 where we used an enzymatic mixture containing amylase, xylanase and protease, followed by experimental group EG2 where we used an enzymatic mixture containing xylanase, and the experimental group EG3 where we used an enzymatic mixture containing xylanase, protease and cellulase. At control group CG we did not use an enzymatic mixture. The use of enzymatic mixture determined the decrease of the digestive viscosity levels at all three experimental groups comparatively with the control group.

Key words: enzymatic mixture, broiler, bioproductive indices, digestive viscosity

Introduction

Cellulolytic enzymes improve the utilization of nutrients from forages rich in fibres by reducing the intestinal viscosity; they reduce the incidence of sticky droppings, improve growth rate, food intake and feed conversion. The supplementation of broiler chickens diets with cellulolytic enzymes determine a better utilization of cellulose categories from: wheat, barley, oat and rye, sunflower meal.

Materials and Methods

The experiment was made in the pavilion of department of Animal Nutrition and Feed Science from the Didactic Station, Timișoara during a period of 5 weeks, respectively from eclosion to 35 days of age, on 120 broiler chickens divided into four experimental groups. The used hybrid was Ross 308.

The diagram of the experiment is presented in Table 1.

Table 1

The experiment diagram				
	CG	EG1	EG2	EG3
Period 0-3 weeks				
n	30	30	30	30
	Combined forage 0-3 weeks	Combined forage 0-3 weeks + EM1	Combined forage 0-3 weeks + EM2	Combined forage 0-3 weeks + EM3
ME (kcal/kg)	3011.26			
CP (%)	24.22			
NDF (%)	13.42			
ADF (%)	6.90			
Period 3-5 weeks				
n	16	16	16	16
	Combined forage 3-5 weeks	Combined forage 3-5 weeks + EM1	Combined forage 3-5 weeks + EM2	Combined forage 3-5 weeks + EM3
ME (kcal/kg)	3043			
CP (%)	20.82			
NDF (%)	13.61			
ADF (%)	6.58			

EM1 (enzymatic mixture) – amylase (400 U/g), xylanase (300 U/g), protease (4000 U/g);

EM2 (enzymatic mixture) – xylanase (1200 U/g);

EM3 (enzymatic mixture) – xylanase (1200 U/g), cellulase (50 U/g), protease (7500 U/g).

In Table 2 is presented the level of supplementation of enzymatic mixture in the diets destined to broiler chickens.

Table 2

Supplementation level of enzymatic mixture	
Specification	The supplementation level
EG1	1 kg enzymatic mixture / 1t forage
EG2	375 g enzymatic mixture / 1t forage
EG3	1 kg enzymatic mixture / 1t forage

Results and Discussions

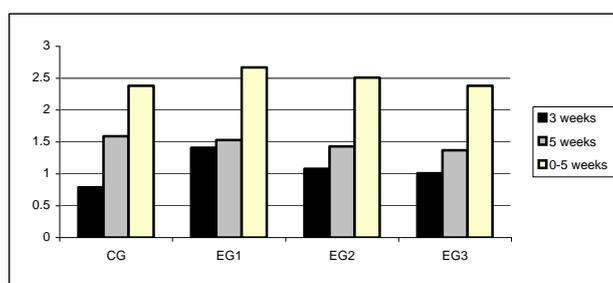
The nutritive and bioproductive indices pursued were: the total feed consumption on each period/ chicken, daily medium consumption on period on chicken, the specific consumption and the digestive viscosity at duodenum level.

In order to establish the feed consumption of chickens from experimental groups the feed quantities allocated to each experimental group and the remained quantities when the chickens had 3 and 5 weeks of age were weighed. Calculating the differences between these values, we obtained the feed consumption on period on chicken and the daily medium consumption on each period. The obtained data are presented in Table 3 and Graphic 1.

Table 3

Feed consumption of chickens from experimental groups

Specification	CG	EG1	EG2	EG3
Period 0-3 weeks				
Consumption on period/chicken (kg)	0.795	1.141	1.080	1.008
Daily medium consumption / chicken / period (g)	37.86	54.34	51.43	48.03
Percentage differences (%)	100	143.52	135.84	126.86
Period 3-5 weeks				
Consumption on period/chicken (kg)	1.594	1.531	1.437	1.375
Daily medium consumption / chicken / period (g)	113.86	109.36	102.64	98.21
Percentage differences (%)	100			
Period 0-5 weeks				
Consumption on period/chicken (kg)	2.389	2.672	2.517	2.383
Daily medium consumption / chicken / period (g)	68.26	76.34	71.91	68.08
Percentage differences (%)	100			



Graphic 1: Feed consumption of chickens from experimental groups

Table 4

Percentage differences of feed consumption of chickens

Specification	CG	EG1	EG2	EG3
CG (%)	-	- 10.59	- 5.08	+ 0.30
EG1 (%)	+10.59	-	+ 5.80	+ 10.81
EG2 (%)	+ 5.08	- 5.80	-	- 5.32
EG3 (%)	- 0.30	- 10.81	- 5.80	-

The data from Tables 3 and 4 and Graphic 1 show:

- the chickens from the control group whose diet was not supplemented with enzymatic mixture registered a feed consumption with 10.59% lower than the chickens from experimental group EG1, whose diet was supplemented with an enzymatic mixture (EM1) based on amylase, xylanase and protease; with 5.08% lower than chickens from experimental group EG2, who had incorporated in their diet an enzymatic mixture (EM2) based on xylanase and similar to experimental group EG3 who had incorporated in the diet an enzymatic mixture (EM3) based on xylanase, cellulase and protease;

- the chickens from experimental group EG1 registered a higher feed consumption with 5.80% comparatively with EG2 and with 10.81% higher than experimental group EG3;

- the chickens from experimental group EG3 who had incorporated in their diet an enzymatic mixture based on xylanase, protease and cellulase have registered the lowest feed consumption, respectively with 10.81% lower than EG1 and with 0.30% lower than the control group.

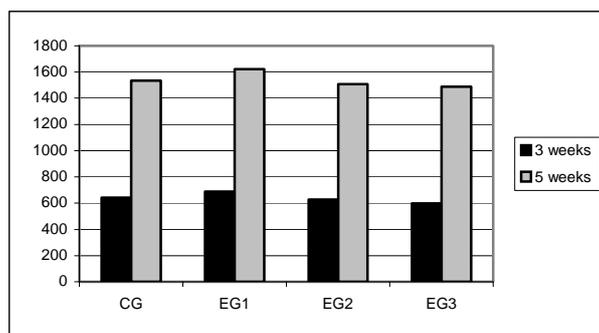
In order to obtain the body growth evolution, weightings were made from one to 21 days of age, respectively at 35 days. The obtained data are presented in Table 5.

Table 5

The body weight evolution of the chickens from experimental groups

Specification	CG	EG1	EG2	EG3
N	30	30	30	30
	X±Sx	X±Sx	X±Sx	X±Sx
Weight at eclosion (g)	39±0.30	37.81±0.33	39.80±0.38	38.60±0.36
Standard deviation	1.64	1.81	2.08	1.97
Variability coefficient	4.18	4.79	5.23	5.10
N	16	16	16	16
Weight at 21 days (g)	641.33±15.71	688.93±16.98	628.67±14.39	597.59±20.80
Standard deviation	86.05	89.87	78.82	112.02
Variability coefficient	13.42	13.04	12.54	18.74
Statistical significance	-	*	NS	NS
N	16	16	16	16
Weight at 35 days (g)	1534.38±27.52	1622.50±27.41	1508.75±28.61	1487.50±27.03
Standard deviation	140.33	139.79	145.87	137.82
Variability coefficient	0.15	8.62	9.67	9.26
Statistical significance	-	NS	NS	NS

* - significant



Graphic 2: The body weight evolution of the chickens from experimental groups

In Table 6 are presented the percentage differences of body weight of the chickens from the experimental groups.

Table 6

Percentage differences of body weight of chickens from experimental groups

Specification	CG	EG1	EG2	EG3
CG (%)	-	- 5.43	+ 1.70	+ 3.15
EG1 (%)	+5.43	-	+ 7.54	+ 10.81
EG2 (%)	- 1.70	- 7.50	-	+ 1.43
EG3 (%)	- 3.15	- 9.07	- 1.43	-

The data presented in Tables 5 and 6 show:

- the body weight of the chickens from experimental group EG1 is superior in comparison with the other experimental groups, with 5.43% higher than CG and 9.07% higher comparative with EG3;

The statistical processing of the data regarding the evolution of the body weight of chickens from experimental groups, show that the registered differences are not statistically covered.

Corroborating the consumption data with body weight we obtained the specific consumption.

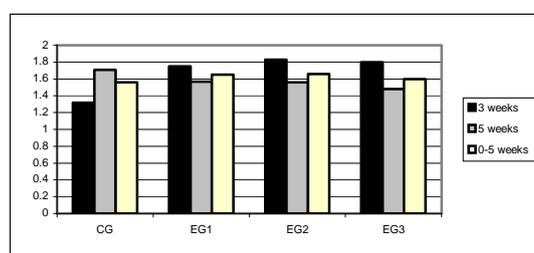
The evolution of specific consumption is presented in the table below.

The data from Table 7 and Graphic 3 show that the supplementation with enzymatic mixture of the combined feed destined to the experimental groups did not improve the feed conversion indices; the chickens from the control group registered a lower specific consumption comparatively with the experimental groups with 2.56 – 6.41%, respectively 1.56 kg feed/kg gain comparatively with 1.60 kg feed /kg gain registered by chickens from experimental group EG3, 1.65 kg feed /kg gain registered by chickens from experimental group EG1 and 1.66 kg feed /kg gain registered by chickens from experimental group EG2.

Table 7

Evolution of specific consumption at chickens from experimental

Specification	CG	EG1	EG2	EG3
Period 0-3 weeks				
Consumption on period / chicken	0.795	1.141	1.080	1.008
Gain / period / chicken (g)	602.14	651.12	589.13	558.99
Specific consumption (kg feed / kg gain)	1.32	1.75	1.83	1.80
Period 3-5 weeks				
Consumption on period / chicken	1.594	1.531	1.437	1.375
Gain / period / chicken (g)	932.34	971.38	919.62	928
Specific consumption (kg feed / kg gain)	1.71	1.57	1.56	1.48
Period 0-5 weeks				
Consumption on period / chicken	2.389	2.672	2.517	2.383
Gain / period / chicken (g)	1534.48	1622.50	1508.75	1487.50
Specific consumption (kg forage / kg gain)	1.56	1.65	1.66	1.60
Percentage differences	100	105.76	106.41	102.56

**Graphic 3:** Evolution of specific consumption at chickens from experimental

The values of dynamic viscosity were determined at the duodenal level in the chickens from experimental groups. The density and pH were also determined. In Table 8 are presented the obtained data.

Table 8

The density, dynamic viscosity and pH registered at duodenum level in the chickens from experimental groups

	Density	Viscosity (cP)	pH
CG	1.0260	2.980	6.50
EG1	1.0105	2.384	6.54
EG2	1.0158	2.537	6.54
EG3	1.0216	2.368	6.62

It may be observed that by adding enzymatic mixture EM3 (xylanase, protease, cellulase) in the structure of the combined feed destined to broiler chickens, the lowest viscosity values at the duodenum level at EG3 were obtained: 2.368 with 25.84% lower than the viscosity value registered in the control group. At the experimental group EG1 (EM1: amylase, xylanase, protease) was registered a viscosity value at duodenum level of 2.384, with 25% lower than CG. By adding enzymatic mixture EM2 (xylanase) in the combined feed destined to broiler chickens, a viscosity indices of 2.537 was obtained, with 17.46% lower than in the control group.

Conclusions

The experiment concerning the nutritive and bioproductive effect of some enzymatic mixtures incorporated in combined feeds destined to broiler chickens lead to the following conclusion:

- the feed consumption of chickens from experimental groups who had included in the diet enzymatic mixture was higher at experimental group EG1 (EM1: amylase, xylanase, protease) with 10.59% respectively 5.08% at EG2 (EM2: xylanase) in comparison to the control group. At EG3 (EM3: xylanase, cellulase, protease) the feed consumption was similar to the control group.

- the highest body weight and gain were registered in experimental group EG1, where the enzymatic mixture EG1 (amylase, xylanase, protease) was incorporated in the diet, comparative with the control group and experimental group EG2 (xylanase) and EG3 (xylanase, cellulase, protease), with 5.43% higher than CG, 7.54% higher than EG2 and 7.54% higher than EG3. The differences registered are not statistically assured.

- the chickens from control group registered a lower specific consumption comparatively with the experimental groups with 2.56 – 6.41%, respectively 1.56 kg feed/kg gain comparatively with 1.60 kg feed/kg gain registered by chickens from experimental group EG3, 1.65 kg feed/kg gain registered by chickens from experimental group EG1 and 1.66 kg feed/kg gain registered by chickens from experimental group EG2.

- by adding enzymatic mixture in the structure of combined feed destined to broiler chickens, were obtained lower viscosity indices at duodenum level, with 25.84% at EG3, with 25% at EG1 (EM1: amylase, xylanase, protease) and with 17.46% at EM2 (xylanase) comparatively with control group.

- the best results were obtained at experimental group EG1 where we used an enzymatic mixture containing amylase, xylanase and protease, followed by experimental group EG2 where we used an enzymatic mixture containing xylanase, the experimental group EG3 where we used an enzymatic mixture containing xylanase, protease and cellulase.

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INFLUENȚA UNOR PREPARATE ENZIMATICE ASUPRA PRINCIPALILOR INDICI NUTRITIVI ȘI BIOPRODUCTIVI ȘI ASUPRA VÂSCOZITĂȚII LA NIVELUL DUODENULUI LA PUII DE CARNE HRĂNIȚI CU O DIETĂ BOGATĂ ÎN NDF ȘI ADF

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În acest experiment am studiat efectul a trei preparate enzimatice încorporate în furajul bogat în NDF și ADF destinat puilor de carne. Experimentul a fost realizat pe 120 pui de carne împărțiți în patru loturi experimentale: LM, LE1, LE2 și LE3. Cele mai bune rezultate s-au obținut la lotul experimental LE1 la care s-a folosit un preparat enzimatic ce conține amilaze, xilanaze și proteaze, urmat de lotul experimental LE2 la care s-a folosit un preparat enzimatic ce conține xilanaze, lotul experimental LE3 la care s-a folosit un preparat enzimatic ce conține xilanaze, proteaze și celulaze. La lotul martor nu s-a folosit nici un preparat enzimatic. Folosirea preparatelor enzimatice determină reducerea nivelului vâscozității digestive la cele trei loturi experimentale comparativ cu lotul martor.
Cuvinte cheie: preparat enzimatic, pui de carne, indici bioproductivi, vâscozitate digestivă