

**EFFECTUL POLIGLUCIDELOR NEAMIDONOASE DIN  
DIFERITE SURSE PROTEICE VEGETALE ASUPRA  
INDICILOR NUTRITIVI ȘI BIOPRODUCTIVI LA PUII DE  
CARNE**

**EFFECT OF NON-STARCH POLYSACCHARIDES FROM  
DIFFERENT NUTRITIONAL PROTEIN SOURCES ON  
BIOPRODUCTIVE AND NUTRITIVE INDICES AT BROILER**

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*The purpose of this paper work was to establish the anti nutritive effect of non starch polysaccharides from different protean sources on nutritive and bioproductive indices at broiler chickens. The experiment was made on a period of six weeks, on 120 broiler chickens divided in four experimental groups (EG1, EG2, EG3 and EG4). Were formed four experimental groups: an experimental group EG1 fed with a forage at which the main protein source was soybean meal in proportion of 34% in the period from 0 to 3 weeks and 30.5% in the period from 3 to 6 weeks, an experimental group EG2 with high quality sunflower meal (36% CP) as protein source in proportion of 10%, an experimental group EG3 at which was used poor quality sunflower meal (27% CP) and an experimental group EG4 at which was used peas in proportion of 15%. At the age of 3 and 6 weeks was determined the nutritive and bioproductive indices. The highest forage consumption is registered at EG4 at which in the structure of combined forage was incorporated peas and it was with 8.69% greater comparative with EG1. The incorporation of poor quality sunflower meal determines a decrease in body weight with 6.16% comparative with the group at which was used soybean meal. The rising of NSPs and NSPt content after incorporating poor quality sunflower meal determines the rising of specific consumption at broiler chickens with 13.29% comparative with EG1 at which was used high quality soybean meal.*

**Keywords:** non starch polysaccharides, nutritive and bioproductiv indices, broilers, protein sources

### **Introduction**

The nutrients contains in corn and soybean meals (SBM) are generally considered to be highly digestible , and heat treatment is commonly used to

inactive anti nutritive factors such as protease inhibitors and lectins in soybean meals. However the energy utilization in SBM also depends on the amount of indigestible carbohydrates present in particular oligosaccharides and non starch polysaccharides. SBM contains approximately 6 % soluble NSP and 18-21 % insoluble NSP. (Bach Knudsen, 1997).

In Europe and many other regions worldwide, cereals and oilseed meals, representing valuable sources of energy and protein, are commonly used as ingredients in animal feeds. However these feedstuffs contain considerable amounts of digestible carbohydrates as well. These fractions of carbohydrates are also referred to as non-starch polysaccharides (NSP) (Bailey, 1973). A number of soluble and insoluble NSP have been identified in cereals and oilseed meals, among which the most important are arabinoxylans, betaglucans and cellulose. Soluble and insoluble NSP have the ability to bind water, thereby increasing viscosity of the digesta in the gut. Insoluble NSP are known to encapsulate nutrients within the fibre matrix of the cell walls. (Hopwood et al, 2004; Pluske et al. 1996). Concentrations of individual oligosaccharides from total beta-glucans have been found to vary between oats and barley, suggesting variability in beta glucan structure (Edney, Marchylo and MacGregor 1991). The increased viscosity interferes with the activity of digestive enzymes and subsequent movement of nutrients prior to absorption, therefore ultimately depressing growth rate and feed conversion. Thus it has been observed that foregut intestinal viscosity, in particular, correlates well with weight: gain and feed: gain (Bedford, Classen and Campbell 1991) and that variation in performance was substantially reduced especially with a multienzyme product which reduced gizzard viscosity to a greater extent (Bedford and Classen 1992).

### **Materials and Methods**

The experiment was made on a period of six weeks, on 120 broiler chickens divided in four experimental groups (EG1, EG2, EG3 and EG4). The hybrid used was Ross 308. The chickens from experimental groups were fed in the first period of growth from eclosion to 3 weeks with combined forage who assured 3025-3194 kcal ME and 21.98-22.2% CP. In the second period of growth from 3 to 6 weeks the combined forage assured 3033-3200 kcal ME and 20.02-20.16% CP (NRC 1994).

Were formed four experimental groups: an experimental group EG1 fed with a forage at which the main protein source was soybean meal in proportion of 34% in the period from 0 to 3 weeks and 30.5% in the period from 4 to 6 weeks, an experimental group EG2 with high quality sunflower meal (36% CP) as protean source in proportion of 10%, an experimental group EG3 at which was used poor quality sunflower meal (27% CP) and an experimental group EG4 at which was used peas in proportion of 15%. At the age of 3 and 6 weeks was determined the nutritive and bioproductive indices.

The forage content of NSP was established by tabular values (Englyst H., 1989) and HPLC determination.

Table 1

The experimental scheme

Period 0-3 weeks			
EG1	EG2	EG3	EG4
Combined forage period 0-3 weeks 34% soybean meal ME (kcal/kg) 3204 CP 22.91%	Combined forage period 0-3 weeks 10 % sunflower meal (36% CP) ME (kcal/kg) 3170 CP 22.85%	Combined forage period 0-3 weeks 10 % sunflower meal (27% CP) ME (kcal/kg) 3162 CP 22.54%	Combined forage period 0-3 weeks 15% peas ME (kcal/kg) 3218 CP 20.20%
Period 3-6 weeks			
EG1	EG2	EG3	EG4
Combined forage period 3-6 weeks 30.5 % soybean meal ME (kcal/kg) 3244 CP 20.16%	Combined forage period 3-6 weeks 10 % sunflower meal (36% CP) ME (kcal/kg) 3185 CP 20.21%	Combined forage period 3-6 weeks 10 % sunflower meal (27% PB) ME (kcal/kg) 3179 CP 19.75%	Combined forage period 3-6 weeks 15% peas ME (kcal/kg) 3185 CP 22.88%

### Results and Discussion

On tabular data basis and on HPLC determination was established the NSP soluble, insoluble and total content of combined forages, values presented in table 2.

From table 2 data it can be seen that the greatest rising of NSPs content (with 1.15% in the first growth period and with 1.18% in the second growth period) was registered at the experimental group at which was incorporated the sunflower meal with 27% CP in proportion of 10%. Regarding the NSPi content, the greatest rising was registered at experimental group at which were incorporated peas in proportion of 15% with 3.05% in the first growth period and with 3.21% in the second growth period. The NSPt content register a rising with 3.58% at the experimental group with sunflower meal with 27% CP.

Table 2

The non starch polysaccharides content of combined forages used in the experiment

Period of growth	Specification	NSPs* (%)	Percentage points	NSPi** (%)	Percentage points	NSPt*** (%)	Percentage points
Period 0-3 weeks	Combined forage with 34% soybean meal	0.86	-	9.55	-	10.415	-
	Combined forage with 10 % sunflower meal (36% CP)	1.95	1.09	10.79	1.24	12.753	2.33
	Combined forage with 10 % sunflower meal (27% CP)	2.02	1.15	11.98	2.43	14	3.58
	Combined forage with 15% peas	1.087	0.22	12.6	3.05	13.687	3.272
Period 3-6 weeks	Combined forage with 29.5 % soybean meal	0.78	-	9.46	-	10.24	-
	Combined forage with 10 % sunflower meal (36% CP)	1.9	1.12	10.8	1.34	12.25	2.01
	Combined forage with 10 % sunflower meal (27% CP)	1.96	1.18	11.69	2.23	13.65	3.41
	Combined forage with 15% peas	1.02	0.24	12.67	3.21	13.69	3.45

\* soluble non starch polysaccharides

\*\* insoluble non starch polysaccharides

\*\*\* total non starch polysaccharides

In order to establish feed consumption of chickens in the experimental groups, we weighed the feed quantities allocated to each experimental group and those remained when the chickens reached the age of 3 and 6 weeks. We calculated the feed consumption on period per chicken and the medium daily consumption for each period. The obtained data are presented in Table 3.

Table 3

## The feed consumption of chickens from experimental groups

Specification	EG1	EG2	EG3	EG4
Period 0- 3 weeks				
Consumption on period / chicken	1.11	1.03	1.06	0.99
Daily medium consumption/chicken/period	52.85	49.04	50.47	47.14
Percentage differences	<b>100</b>	<b>92.79</b>	<b>95.49</b>	<b>89.19</b>
Period 3 - 6 weeks				
Consumption on period / chicken	2.8	2.84	3.09	3.26
Daily medium consumption/chicken/period	133.33	135.23	147.14	155.23
Percentage differences	<b>100</b>	<b>101.42</b>	<b>110.35</b>	<b>116.42</b>
Period 0 - 6 weeks				
Consumption on period/chicken	3.91	3.87	4.15	4.25
Daily medium consumption/chicken/period	93.09	92.14	98.8	101.19
Percentage differences	<b>100</b>	<b>98.97</b>	<b>106.13</b>	<b>108.69</b>

From table data it can be seen that on entire growth period the smallest forage consumption is registered at EG2 at which was incorporated in the combined forage structure 10% high quality sunflower meal with 36% CP. The highest forage consumption was registered at EG4 at which in the structure of combined forage was incorporated peas and was with 8.69% greater comparative with experimental group EG1.

In order to establish the evolution of body weight we weighed the chickens at one day, at 3 weeks and at 6 weeks of age. The obtained results are presented in Table 4

From table data it can be seen that at 42 days of age the highest body weight was registered at EG4 and was with 0.17% greater than EG1. This difference is statistical insignificant. EG3 register a smaller body weight than EG1 with 6.16%, difference that is statistical significant ( $p < 0.05$ ). Therefore it can be said that the incorporation of poor quality sunflower meal leads to a decreased body weight.

The evolution of body weight at chickens from experimental groups

Specification	EG1	EG2	EG3	EG4
n	30	30	30	30
Weight at eclosion (g)	39±0.38	39±0.33	39±0.32	39±0.43
n	27	28	29	28
Weight at 3 weeks (g)	866.4±19.5	702.4±28.1	666±23.7	679.1±23
Percentage values	<b>100</b>	<b>81.07</b>	<b>76.86</b>	<b>78.38</b>
CV (%)	13.2	15.99	14.26	13.54
Statistical differences		***	***	***
n	16	16	16	16
Weight at 6 weeks (g)	2292.3±89.6	2190.6±95.5	2151.1±67.2	2296.3±73.1
Percentage values	<b>100</b>	<b>95.56</b>	<b>93.84</b>	<b>100.17</b>
CV (%)	14.63	14.31	12.09	12.33
Statistical differences	-	NS	*	NS

NS –  $p > 0.05$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

Corroborating the consumption data with body weight we obtained the specific consumption. The evolution of specific consumption is presented in the Table below. On the entire growth period the smallest specific consumption was registered at EG1 (1.73kg). The others experimental groups register a higher specific consumption, with 13.29% at EG3 at which was incorporated poor quality sunflower meal with 27% CP.

Therefore it may be inferred that the rising of NSPs and NSPt content determines a rising of specific consumption at broiler chickens.

Table 5

Evolution of specific consumption at chickens from experimental groups

Specification	EL1	EL2	EL3	EL4
Period 0-3 weeks				
Consumption on period / chicken	1.11	1.03	1.06	0.99
Gain / period / chicken (g)	827.38	663.38	627.00	640.13
Specific consumption (kg feed / kg gain)	1.35	1.56	1.69	1.55
Percentage differences	<b>100</b>	<b>115.5</b>	<b>125.18</b>	<b>114.81</b>
Period 4-6 weeks				
Consumption on period / chicken	2.8	2.84	3.09	3.26
Gain / period / chicken (g)	1425.91	1488.2	1485.13	1617.14
Specific consumption (kg feed / kg gain)	1.97	1.91	2.08	2.02
Percentage differences	<b>100</b>	<b>96</b>	<b>105.58</b>	<b>102.53</b>
Period 0-6 weeks				
Consumption on period / chicken	3.91	3.87	4.15	4.25
Gain / period / chicken (g)	2253.29	2151.57	2112.13	2257.27
Specific consumption (kg feed / kg gain)	1.73	1.79	1.96	1.88
Percentage differences	<b>100</b>	<b>103.46</b>	<b>113.29</b>	<b>108.67</b>

### Conclusions

- the incorporation of poor quality sunflower meal with 27% CP in the structure of combined forage determines the rising of NSPs and NSPt content,
- the rising of NSP content in the combined forage fed to broiler chickens determines the rising of forage consumption with 8.69% at EG4 which have in the structure of combined forage peas,
- the body weight decreases with the rising of NSPs and NSPt content in the structure of combined forage with 6.16% at EG3 which is statistical significant ( $p < 0.05$ )
- the specific consumption rises at experimental groups who consumed forage with poor quality sunflower meal in their structure (with 13.29%),
- the incorporation of poor quality sunflower meal with 27% CP in the structure of combined forage determines the rising of NSPs and NSPt content, which leads to inferior nutritive and bioproductive indices comparative with the use of high quality sunflower meal and peas.

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