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Lupine, field pea, horse bean and soya-bean in combination with maize as feed for 21 to 52 days old broilers

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I. - Introduction

Lupines, horse beans, field peas, some vigni and dolichosa varieties have three to four times more protein than maize and other cereals and are, therefore, a valuable source for balancing diets based on maize. However, the often very high biological protein value of these crops is impeded by the presence of substances such as protease inhibitors, lectins, polyphenols, phytates. Contemporary breeding facilitates the development of not only higher yielding varieties, but also of varieties free of substances which depress the growth and development of livestock. It is also possible to develop rational technologies to eliminate undesirable substances and thus increase the nutritive value of proteins of these feed sources.

Based on the fact that these legumes supplement maize in the cropping pattern culturally, and nutritively, it was our intention to obtain some information on production and carcass performance of broilers, which, after the first three weeks of feeding on standard formula starter feeds, were fed for 30 days diets with a dominant portion of proteins from legumes which can be grown concurrently with maize.

II. - Material and methods

Seeds of lumine, field pea, horse bean and soya bean of known provenance, produced in agro-climatic conditions of Zemun Polje, and of determined chemical composition, were ground in a hammer mill with a 3 mm mesh.

Due to the high content of trypsin inhibitor, the soya bean meal was treated by heat in a special device (Patent of Maize Research Institute N° 126/86). Four experimental mixtures were made from the prepared meals balanced at about 16% proteins, of which 45% was protein from one legume, 30% from maize and 25% from meat meal.

Four groups of 21 days old Hybro chickens, fed previously with standard starter feeds and of average mass of 460 grams, were split into five equal groups, so that each group consisted of an equal number of chickens of both sexes. For the following 30 days the chickens were kept in floor pens ; four groups were fed with diets in which the protein source was meal of one legume, while the fifth group was fed Rekord mixture, a feed having a closed formula with 20% protein level. On conclusion of the fattening period, the broilers were weighed ; typical broilers were selected upon average live mass, and killed 12 hours after last feeding. Typical carcasses were assessed for conformation dressing percentage and abdominal fat according to the method of Pavlovski and Mašić (1983) (Table 2).

III. – Results and discussion

The analysis of broiler production results based on the average final live weight, average gain during the 30 days of feeding with trial diets, feed consumption per kilogram of final gain over the whole period and 30 trial days, shows that the greatest weight gain was achieved with broilers fed with a mixture of lupine meal (A) followed by broilers from the group fed with a mixture of roasted soja bean (D) (Table 3).

However, the average gain of broilers of these groups was by 6% and 8% lower, respectively, compared to the gain of broilers fed with the Record mixture. Broilers fed with the mixture of field pea and horse bean showed by 12% and 18% lower gains, respectively, compared with the group fed with the Record mixture. The analysis of variance and testing of differences among groups indicated that, compared with the group fed with Record diet, only the group fed with horse bean meal showed a significantly lower gain.

The final feed conversion over the whole cycle and 30 trial days showed an interesting tendency. Feed consumption per kilogram of gain was lowest in the group fed with a mixture of roasted soya bean. Compared to broilers fed with the Record mixture, broilers of this group consumed for the trial period and the whole cycle 4,8% and 5,5% respectively less feed per kilogram of gain.

Data obtained in the trial have shown that the group of broilers fed with lupine had the lowest live mass and with it corresponding dimensions of the shank, length of keel, depth of breast, drumstick circumference and breast angle. Table 4 gives data for dressing percentage and abdominal fat. It was found that broilers fed with lupine had the lowest percent of abdominal fat, while dressing percentages did not significantly differ between tested groups.

Results of average final mass of broilers and average gain during the test period, show, regardless of the degree of retardation of broilers fed mixture of field pea and horse bean, that the investigated sources of proteins are of interest. A subsequent analysis of the aminogram of the diets used showed a considerable discrepancy in the amino acid levels in comparison to the Record feed. On the basis of these results, we believe that the effect of the investigated feeds can be improved significantly and thus be of great benefit to producers, who, for various reasons, find it difficult to obtain high quality protein sources.

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**Table 1: Chemical composition of legumes used for the feeding
21 to 52 days old chickens**

Composition %	Lupine S-14	Pea Century	Horse bean (Domestic)	Soyabean Hodgson
Moisture	7.8	9.1	9.0	10.22
Crude protein	33.7	27.5	29.0	37.6
Crude fat	7.9	1.7	1.5	18.3
Crude fiber	11.8	5.7	5.8	6.8
Ash	3.8	3.3	3.9	4.9
N FE	35.0	52.7	50.7	22.7
Amino Acids Content %				
Lysine	1.62	1.53	1.80	2.29
Methionine	0.18	0.16	0.16	0.39
Met. + Cystine	0.83	0.33	0.34	0.83
Threonine	1.81	0.96	1.06	1.14
Arginine	3.53	1.61	3.04	2.56
Glycine + Serine	3.47	2.26	2.82	2.97
Histidine	0.71	0.49	0.73	0.92
Isoleucine	1.51	0.87	1.09	0.51
Leucine	3.06	1.71	2.20	2.36
Phenylalanine	1.48	1.15	1.54	1.72
Phenylalanine + Tyrosine	3.29	1.86	2.60	2.86
Valine	1.45	0.88	1.32	1.56

**Table 2: Structure and chemical composition of mixtures
used to feed 21 to 52 days old chickens**

Structure Composition in %	Trial mixtures-treatments				Formula feed "Record"
	A	B	C	D	
Maize	67.9	63.9	63.9	70.9	
Meat meal	5.0	5.0	5.0	5.0	
Min. Vit. supplements	4.1	4.1	4.1	4.1	
Lupine meal	23.0	-	-	-	
Pea meal	-	27.0	-	-	
Horse bean meal	-	-	27.0	-	
Soyabean meal (full fat toasted)	-	-	-	20.0	
Total	100.0	100.0	100.0	100.0	
Chemical composition in %					
Crude protein	16.4	15.9	16.1	16.3	20.0
Crude fat	5.1	3.7	3.1	7.0	6.0
Crude fiber	4.1	3.0	3.0	2.8	3.8
Ash	3.9	3.6	3.8	3.8	3.7
Lysine	0.66	0.69	0.76	0.75	1.10
Methionine	0.17	0.17	0.17	0.21	0.34
Met. + Cystine	0.44	0.33	0.33	0.43	0.62
Threonine	0.70	0.53	0.56	0.52	1.32
Arginine	1.21	0.85	1.21	0.93	1.20
Isoleucine	0.60	0.48	0.53	0.56	0.88
Phenylalanine + Tyrosine	1.04	1.06	1.26	1.18	1.58
Valine	0.69	0.58	0.70	0.68	0.97

Table 3: Weight gain and feed conversion in 21 to 52 days old chickens, fed mixtures with protein from different sources

Indicator	Treatments				Record Formula feed
	A	B	C	D	
Average body weight, g	1,886	1,805	1,717	1,822	1,983
Average weight gain	1,439	1,348	1,253	1,407	1,528
Feed consumption per kg gain					
– for whole period, kg	2,427	2,584	2,557	2,287	2,420
– period from 21 to 52 days, kg	2,762	2,956	2,995	2,617	2,750
Body weight index, %	95.0	91.0	86.0	92.0	100
Weight gain index	94.0	88.0	82.0	92.0	100
Food consumption index :					
– for whole period	100.2	107.0	106.0	94,5	100
– period from 21 to 52 days	100.4	107.5	109.0	96,2	100

Table 4: Killing data and abdominal fat in the carcass of typical chickens

Treatments		Carcass mass in % of live mass			Abdominal fat in %
		Classical handling	Ready for roasting	Ready for grilling	
Lupine "A"	male	84.79	78.50	69.28	2.79
	female	82.31	75.73	64.14	1.57
Pea "B"	male	83.91	77.65	69.06	2.97
	female	84.04	74.92	66.18	3.44
Horse bean "C"	male	80.68	73.06	63.69	2.55
	female	85.19	78.26	67.96	3.57
Soyabean "D"	male	85.29	77.41	69.70	2.77
	female	84.47	79.77	69.53	2.79