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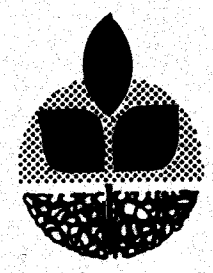
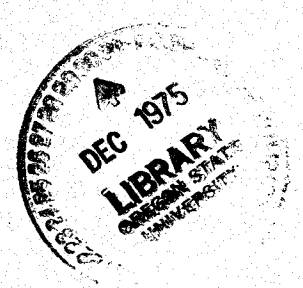


Special Report 448
December 1975

Agricultural Experiment Station
Oregon State University, Corvallis



EFFECT OF SOYBEAN MEAL, EXTRUDED SOYBEANS AND GROUND, RAW SOYBEANS ON THE PERFORMANCE OF WHITE LEGHORN LAYERS

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ACKNOWLEDGMENTS

Chicks were provided by Babcock Industries, Ithaca, NY, and Skylane Farms, Woodburn, OR. Extruded soybeans were provided by McDaniel Grain & Feed Co., McMinnville, OR.

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REVIEW OF LITERATURE

Considerable disagreement appears in the literature concerning the value of unextracted or raw soybeans as a source of protein in layer rations. Adverse effects on egg production from feeding raw soybeans with and/or without methionine to laying hens have been reported (1, 2, 3, 4, 6, 7, 10, 12, 13, 14, 15, 19, 20). On the other hand, others have reported comparable results from feeding raw soybeans with and/or without supplemental methionine when compared to either heat-treated, full, fat soybeans or commercially prepared soybean meals (5, 6, 7, 8, 9, 11, 13, 15, 16, 17, 18). From the literature cited above it is evident that some controversy exists as to the value of supplemental methionine in improving raw soybeans. Accordingly, since soybeans may be available in this area, and experiment was initiated to compare raw soybeans (with or without added methionine) and extruded soybeans, available locally, with a conventional diet containing a commercial form of soybean meal.

EXPERIMENTAL PROCEDURE

Sixty-four Babcock-300 layers were placed in a layer battery containing eight cages in a row at a concentration of two birds per cage. The birds were housed in a positive pressure ventilated room with feed and water available *ad libitum* and at least 15 hours of incandescent light available per day.

The rations used are shown in Table 1. A commercial source of soybean meal containing at least 44% protein served as the positive control in a corn-base diet. The extruded soybeans used were prepared and provided by a commercial mill, as were the raw soybeans. DL-methionine (0.5%) was added to the unsupplemented, ground, raw soybean group.

The experiment commenced when the birds were laying at approximately 70%. The experiment consisted of a pre-test period of 19 days with all birds receiving the commercial soybean meal diet. The test consisted of three 28-day periods and a post-test period of one 28-day period when all birds again reverted to the commercial corn-soybean meal type ration. The data obtained included daily egg production, mortality, feed consumption and body weights. Egg weights were determined from 3 day's eggs at the end of each period. Haugh unit measurements were made from 3 day's eggs at the end of the third 28-day period during the test and at the end of the post-test period. Feed per dozen eggs was calculated from the hen-day egg production and monthly feed consumption. The data were subjected to "t" test analysis.

RESULTS AND DISCUSSION

Since no significant differences were evident between groups during the preliminary test period, the results were averaged and are presented

as follows: egg production, 73.4%; daily feed consumption, 104 g; feed per dozen eggs, 1.61 kg; egg weights, 55.8 g and body wieghts, 1.54 kg.

The results of treatments are summarized in Table 2. Average hen-day egg production for the three 28-day test periods showed a significant reduction ($P < .01$) when ground, raw soybeans with or without methionine served as a protein source for the layers. On the other hand, layers fed extruded soybeans laid at a rate comparable to those receiving a commercial form of soybean meal. To determine whether birds would recover from exposure to raw soybeans, a post-test period was initiated in which all groups of birds were fed the commercial source of soybean meal. During this time, production markedly improved for those layers previously receiving ground, raw soybeans with or without added methionine. At this point no significant differences were evident, although hens previously receiving extruded soybean meal or ground, raw soybeans evidenced a lower rate of egg production.

Examination of the feed consumption data reveals a substantial drop on the raw soybean treatments and to a lesser extent, extruded soybean meal. In the case of the extruded soybean group, the reduction probably was caused by the higher level of fat present; in the case of the ground, raw soybean treatments, the effect of the trypsin inhibitor is also evident. During the post-test period, feed consumption returned to normal for all groups. Feed per dozen eggs was adversely affected in the presence of the ground, raw soybean treatments. Supplemental methionine had no beneficial effect. The differences between groups tended to decrease during the post-test period.

Egg weights were not significantly affected for any of the treatments. However, during the test period, egg weights were the lowest for the extruded soybeans, indicating a possible need for supplemental methionine in view of the higher energy content of this diet. The absence of a marked reduction in egg size on the raw soybean groups, even though a slight improvement with supplemental methionine was noted, is probably caused by the overall reduction in egg production for these groups. During the post-test period, only those layers fed extruded soybeans during the test period showed a significant reduction in egg weights, which proved only to be significantly different ($P < .05$) from the group previously fed raw soybeans.

Body weights were adversely affected for the raw soybean treatments. These tended to improve markedly when the layers were returned to the commercial soybean meal ration, although a significant difference ($P < .05$) still was evident between groups 2 and 4.

Haugh unit values indicate no difference between extruded soybeans and commercial soybean meal; however, hens fed raw soybeans, without methionine, produced eggs containing significantly higher Haugh unit scores ($P < .01$ or $< .05$) during the test period when comparisons were made to groups 1 and 2, respectively. This observation may be caused by the level of production involved, as the advantage largely disappeared during the post-test period when production for these groups increased substantially.

There was no mortality during the test period and death of one hen in group 2 during the post-test period was diagnosed as prolapse.

CONCLUSIONS

In a 3-month experiment, White Leghorn layers fed commercially prepared extruded soybeans performed comparably to those receiving a commercial form of soybean meal as far as egg production was concerned. They consumed slightly less feed, producing eggs slightly more efficiently, but eggs weighed somewhat less than the controls. Ground, raw soybeans on the other hand, with or without methionine, brought about a marked reduction in egg production during the test period that was accompanied by a marked decrease in feed consumption, adverse effect on feed per dozen eggs and body weight. Egg weights were not adversely affected. Mortality was negligible, with only one bird dying in the group fed extruded soybeans during the post-test period. Thus, it may be concluded extruded soybeans may be used to replace commercial soybean meal when economically suitable. Raw soybeans with or without added methionine proved unsatisfactory under the conditions of this test.

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Table 1. Composition of Rations

Ingredients	Ration			
	1	2	3	4
	%			
Corn, yel. grd.	69.6	64.6	64.6	64.1
Soybean meal (44% prot.)	19.0	-	-	-
Soybean, Extruded	-	24.0	-	-
Soybean, grd. raw	-	-	24.0	24.0
Alfalfa meal (20% prot.)	2.5	2.5	2.5	2.5
Limestone flour	3.65	3.65	3.65	3.65
Oystershell, Med.	2.5	2.5	2.5	2.5
Dicalcium phosphate	2.0	2.0	2.0	2.0
Salt, iodized	.5	.5	.5	.5
DL-methionine (98%)	-	-	-	.5
Vit.-tr. min. mix.[1]	.25	.25	.25	.25
Totals	100.0	100.0	100.0	100.0
Calculated Analyses:				
Protein, %	15.3	15.3	15.3	15.3
Energy, Metabolizable, kcal/kg	1321	1433	1312	1312
Methionine, %	.26	.25	.25	.75
Cystine, %	.26	.28	.28	.28

1. Supplies in amts./kg. of premix.: vit. A, 1,320,000 I.U.; vit. D_3, 440,000 I.C.U.; vit. E, 440 I.U.; vit. K, 0.22 g.; riboflavin, 0.88 g.; d-pantothenic acid, 1.32 g.; niacin, 6.6 g.; choline Cl, 44 g.; vit. B_{12}, 1.8 mg.; butylated hydroxytoluene (BHT), 50 g.; Mn, 24g.; Zn, 11 g.; Fe, 8 g.; Cu, 0.8 g.; I, 0.48 g.; Co, 88 mg.

Table 2. Effect of soybeans and soybean meal on performance of layers

Gp. Treatment (Test Pd.)	Hen-day Egg Prod. Test[1]	Hen-day Egg Prod. Post Test[2]	Feed Cons. Test	Feed Cons. Post Test	Feed/doz eggs Test	Feed/doz eggs Post Test
	%		g		kg	
1. Commercial Soybean Meal	75.8±3.7^{A}[4]	70.4±6.0	101	111	1.594	1.898
2. Extruded Soybeans	74.8±2.2^{A}	65.0±5.2	91	102	1.453	1.861
3. Grd. Raw Soybeans	54.5±2.0^{B}	66.7±3.8	81	114	1.857	2.025
4. As 3 + .5% DL Methionine	51.2±2.2^{B}	70.1±2.4	78	112	1.898	1.920

Table 2 (Cont.)

	Egg Wts. Test	Egg Wts. Post Test	Haugh Units Test[3]	Haugh Units Post Test	Body Wts. Test	Body Wts. Post Test
	g.				kg	
1.	57.8±1.3	60.4±1.8	86.6±1.9^{A}	84.2±1.1	1.59±.12^{Aa}	1.68±.13
2.	55.1±1.3	57.1±1.6^{a}	87.0±2.2^{a}	83.9±2.6	1.59±.09^{Aa}	1.68±.11^{a}
3.	56.9± .9	62.3±1.1^{b}	93.8±1.^{Bb}	81.6±2.8	1.45±.07^{b}	1.63±.07
4.	58.0± .7	60.3±1.	90.0±1.4^{ac}	84.5±1.2	1.41±.09^{B}	1.54±.09^{b}

1. Avg. of 3 28-day periods on treatment.
2. One 28-day pd. - all birds returned to Gp 1 ration.
3. Third period only.
4. Upper case letters that differ are significant (P<.01); lower case letters that differ are significant (P<.05).