DEHULLED, 'FULL-FAT' SOYBEAN MEAL IMPROVES BROILER AND LAYER PERFORMANCE

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Summary

The addition of dehulled, 'full-fat' soybean meal to poultry diets may improve the performance of broilers and layers in comparison to diets containing only dehulled soybean meal and an equivalent amount of vegetable oil. In broilers, increases of 7.9% in weight gain and 12.0% in feed efficiency were recorded for Avian Farms broilers. In layers, significant improvements in egg mass and a higher number of larger eggs were observed.

I. INTRODUCTION

A dehulled soybean meal produced using new technology has increased availability of nutrients in comparison to standard soybean meals and may improve the performance of broilers and layers (Neoh and Raghavan, 2002). This is supported by recent chick assays comparing this soybean meal with three other soybean meals from different sources on the basis of protein efficiency ratios (Swick, 2003). This technology has been extended to the production of 'full-fat' soybean meal in which the oil content is retained rather than extracted. The technology produces oil-extracted and 'full-fat' soybean meals in which heat-labile, anti-nutritive factors, including trypsin inhibitor, are reduced by a modified process. It is possible that the modified process is associated with better utilisation of energy and availability amino acids following their absorption from the gut. Recently, Subuh *et al.* (2002) showed that replacing soybean meal and poultry tallow with 'full-fat' soybean meal in isocaloric and isonitrogenous diets improves weight gain and feed efficiency of broilers by up to 2.5 and 5.5%, respectively. However, the total replacement of soybean meal by 'full-fat' soybean meal is not usually commercially viable due to economic and handling issues. Therefore this paper investigates the effects of incorporating 'full-fat' soybean meal into broiler and layer diets at 60 to 100 g/kg.

II. METHODS

The proximate analyses of oil-extracted and 'full-fat' dehulled soybean meals supplied by Soon Soon Oilmills of Malaysia are shown in Table 1. Feeding studies compared the growth performance of broilers offered diets formulated without and with 'full-fat' soybean meal. Six groups of straight run broilers of three different breeds were used. Each group consisted of 6 replicates of 83 birds each. Isocaloric and isonitrogenous starter and grower diets were formulated without and with 'full-fat' soybean meal. The metabolisable energy and protein levels for the crumbled starter and pelleted grower diets were 12.86 and 13.18 MJ and 21 and 19%, respectively. The control starter diet contained 250 g/kg and the finisher diet 200 g/kg soybean meal. One group of Avian Farms broilers were offered the control diet. The treatment diet was prepared using 100 g/kg 'full-fat' soybean meal to replace 80 g/kg soybean meal and 20 g/kg vegetable oil and was offered to two groups of Avian Farms (Avian), two groups of Arbor Acres (AA) and one group of Cobb birds. Growth performance and mortality rates were recorded over the 40-day feeding period.

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Table 1. Proximate analysis of 'full-fat' and oil extracted dehulled soybean meals.

Item	'Full-fat' soybean meal	Oil extracted soybean meal
Moisture, g/kg	124	115
Protein, g/kg	363	467
Fat, g/kg	210	25
Crude Fiber, g/kg	29	34
Ash, g/kg	49	65

The objective of the layer trial was to investigate the effect of using dehulled 'full-fat' soybean meal on egg mass and egg size. The trial was conducted using flocks close to peak production in three commercial farms with production ranging from 90,000 to 150,000 eggs per day from Lohman, Hisex and Golden Comet layers. Each farm was divided into two equal groups. One group was fed with feed formulated with only soybean meal. The other group was offered diets with 60 g/kg 'full-fat' soybean meal partially replacing soybean meal and vegetable oil. However, the metabolisable energy was reduced by 0.21MJ and protein level by 3 g/kg in the 'full-fat' soy diets. The diets were prepared in mash form and the nutrient specifications matrixes are listed in Table 2. The trials were conducted for a total of 10 weeks starting from 25 weeks of age during which time egg size, distribution and egg mass were recorded.

Table 2. Nutrient specification of layer diets formulated without and with 'full-fat' soybean meal.

Item (g/kg)	Feed without 'full-fat' soybean meal	Feed with 'full-fat' soybean meal
Crude protein	178	175
Metabolisable energy (MJ/kg)	11.72	11.50
Fat	65	60
Fiber	35	35
Calcium	38	38
Phosphorus	7.5	7.5
Available phosphorus	4.0	4.0
Linoleic acid	17.5	17.5
Methionine	4.5	4.5
Lysine	10	10
Methionine and cysteine	7.0	7.0

III. RESULTS

Significant improvements in performance were observed with broilers offered diets containing 100 g/kg 'full-fat' soybean meal compared to broilers offered diets containing only soybean meal and vegetable oil (Table 3). Body weights at 40 days post-hatch were increased by up to 9.9% (2028 versus 2228 g/bird) and feed efficiency was improved by up to 13.3% (1.88 versus 1.63). Avian Farms broilers (groups B and C) outperformed their control counterparts by an average of 7.9% and 12.0% for weight gain and feed efficiency, respectively. Mortality rates did not differ between treatments ($P = 0.78$). Subsequent field trials in commercial units with diets of similar specifications containing 100 g/kg 'full-fat'

soybean meal indicated that the growth performance obtained in the experimental unit can be duplicated in the commercial situation.

Table 3. Body weight, feed efficiency and mortality rate at 40 days post-hatch for broilers offered a control diet (A) or diets containing 100 g/kg 'full-fat' soybean meal (B to F).

Group	A	B	C	D	E	F
Breed	Avian	Avian	Avian	AA	AA	Cobb
Body weight, g	2028[a]	2188[d]	2189[d]	2138[b]	2198[d]	2228[c]
Feed:Gain	1.88[a]	1.65[d]	1.66[d]	1.70[b]	1.65[d]	1.63[c]
Mortality rate (%)	3.84	3.04	3.02	3.1	2.96	2.98

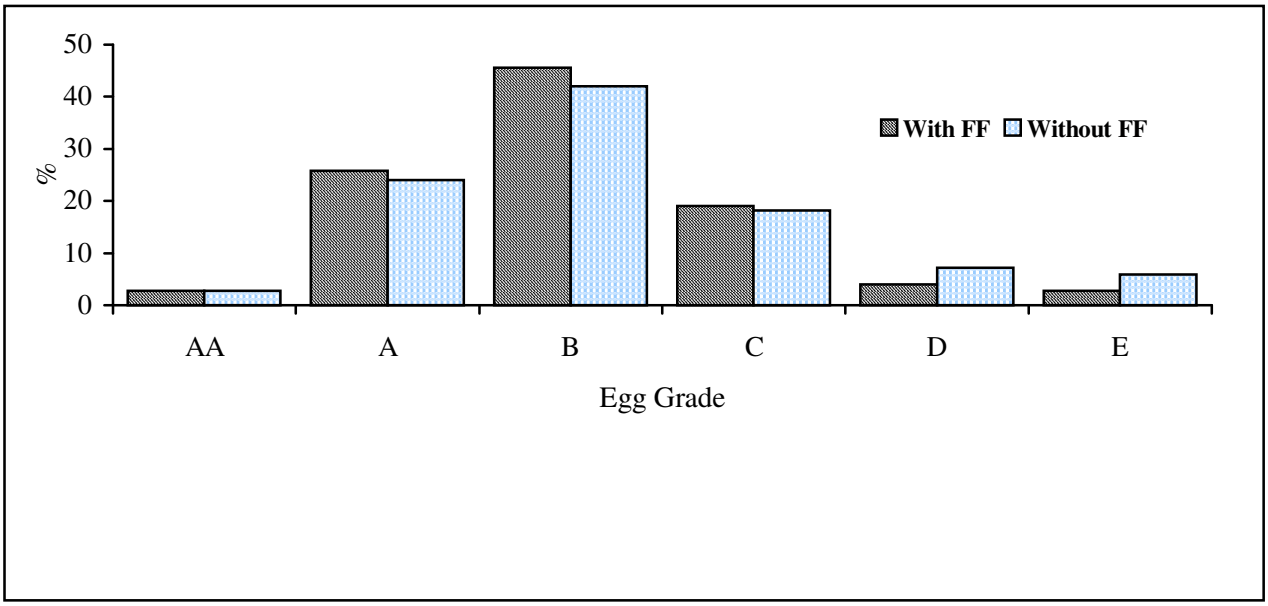
[a,b,c,d]means in a row without common superscripts differ significantly, P< 0.001

Incorporating 60 g/kg 'full-fat' soybean meal into layer diets increased (P < 0.001) egg mass by an overall average of 1.7% (64.03 to 65.11 g/h/d) as shown in Table 4. The distribution of egg weights of the various grades is AA 70-73g, A 63-68g, B 58-60g, C 56-58g, D 50-54g and E 40-43g and are illustrated in Figure 1. 'Full-fat' soy increased the percentage of A, B and C grade eggs by 1.7, 3.6 and 0.8%, respectively. On the other hand, smaller eggs such as grades D and E were reduced by 3%.

Table 4. Comparison of egg mass for layers offered diets with and without 'full-fat' soybean meal.

Treatment	Egg Mass (g)		
	Lohman	Hisex	Golden Comet
'Full-fat' soybean meal	65.15	65.06	65.14
Control	64.10	64.00	63.99

Figure 1. Egg size distribution for layers fed with diets with and without 'full-fat' soy.



IV. DISCUSSION

Substituting 100 g/kg 'full-fat' soybean meal for soybean meal and vegetable oil, on an isocaloric and isonitrogenous basis, can improve weight gain and feed efficiency of broilers. Similarly, layer trials using diets containing 60 g/kg 'full-fat' soybean meal resulted in heavier egg weights and an increase in the number of larger eggs although the diets containing 'full-fat' soybean meal had lower metabolisable energy and protein levels in comparison to the control diets. This suggests that 'full-fat' soybean meal has higher nutritive values in comparison to equivalent amounts of soybean meal and vegetable oil. As reviewed by Waldroup (1982) 'full fat soy is a viable feed ingredient for the poultry industry. Further studies are being conducted to quantify the additional availability of nutrients in 'full-fat' soybean meal, which may generate enhanced performance.

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