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UTILIZATION OF RAPESEED MEAL/CAKE IN POULTRY FEED *I.* EFFECT OF INCORPORATING 10% RAPESEED CAKE IN POULTRY DIET ON THE GROWTH AND LAYING PERFORMANCE OF BROWN-EGG-LAYER (TETRA SL)

Amal Badshah, Aurang Zeb*, Nizakat Bibi, Sajjad Ali and M A Chaudry

Nuclear Institute for Food and Agriculture Tarnab, P O Box 446, Peshawar

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Fifteen days old 100 chicks were divided into two groups. One group was maintained on standard diet, while the other group was fed on the diet containing 10% rapeseed cake. During 34 weeks of the experiment, rapeseed group was studied for liveability, feed consumption, laying performance and egg quality in comparison with the standard group. No adverse effect was observed rather beneficial effect was observed on the growth and laying performance at this level. Feed consumption for the period of first 6 weeks was 857g chick^{-1} for standard group and 918g chick^{-1} for rapeseed cake group. Live weight after 20 weeks was 1478.88g pullet^{-1} for standard group and 1503.07 g pullet^{-1} for rapeseed cake group. Laying record of seven weeks showed significant increase ($p<0.05$) in egg production for rapeseed cake group (72.43%) as compared with 65.58% in standard group. Egg size ranged between 56 to 59g in standard group and 54 to 60g in rapeseed cake group. Organoleptic testing revealed no differences in the overall acceptability scores which were 8 in both the cases.

Key words: Rapeseed cake, Layers, Growth, Production performance.

Introduction

Ample quantities of rapeseed meal/cake are available in Pakistan at a comparatively cheaper rate as feed component for livestock and poultry feeding. However, widespread use of rapeseed meal/cake in poultry feed without constraint is not in vogue basically because of past problems associated with its feeding. A number of studies have been reported which show that rapeseed meal can be used in laying diets to replace a substantial quantity of soybean meal protein without any change in laying performance (Hulan and Proudfoot 1980; Clandinin *et al* 1983a; Summers 1983). A general recommendation for the use of upto 10% canola meal has been made for laying hen-diet as a result of these studies. While canola meal is now being used more extensively in laying hen-diet, there is still some controversy about its nutritional value. There are some reports which suggest that it may play a role in precipitating a fatty liver and/or haemorrhagic conditions in layers (Pearson and Butler 1978; Papas *et al* 1979; Ibrahim *et al* 1980; Hulan and Proudfoot 1981). Nevertheless, there are equal number of reports that indicate no liver problems with canola feeding (March *et al* 1975; Thomas *et al* 1978; Proudfoot *et al* 1983). The possibility of reduced egg size has also been reported with the feeding of canola to laying hens (March *et al* 1975; Leeson *et al* 1978; Proudfoot *et al* 1982).

*Author for correspondence

The use of high glucosinolates (HG) rapeseed meal or cake is, on the other hand, subject to severe criticisim in several published works. It was reported that with 10% rapeseed meal in the diet there was a 15% reduction in the egg production, 8% lower feed conversion efficiency and 11% reduced feed intake, whereas with 20% rapeseed meal in the diet there was 23% reduction in egg production and 26% lower feed efficiency. Egg quality with respect to smell and taste decreased. It was suggested by the authors that the highest possible level of rapeseed meal in the layers ration should be about 8% and the highest permissible level of oxazolidinethione in the layers ration should not be more than 0.05% (Vogt *et al* 1969a). In another study the same authors (Vogt *et al* 1969b) reported that maximum recommendable limit of 5% was set for rapeseed meal and 0.5% for oxazolidinethione in the diet of laying hens. The reduced performance of laying hens was attributed to the glucosinolates in the rapeseed meals.

These results, however, were contradicted by those of Summers *et al* (1971a) who carried out the work to see the comparative effect of feeding rapeseed meal and soybean meal on the layers performance. These authors failed to establish a cause and effect a relationship between enlarged thyroid (due to glucosinolates) and reduced performance in the rapeseed meal fed hens. In another study (Summers *et al* 1971 b) the authors established that the poorer performance of rapeseed meal-fed groups was related to the amino acid imbalances in rapeseed protein rather than to some

antinutrients. These findings can be supported by the findings of O'Neil (1957) who reported that rapeseed meal could replace all of the soybean meal in a diet containing 3% of animal protein without any detrimental effect on production and hatchability of eggs from laying breeders. Mcgregor and Blakely (1964) included 10% of rapeseed meal in the diets of turkey breeder flock and observed no adverse effects on the performance. This level of rapeseed meal inclusion was also found suitable by Robblee and Clandinin (1967).

The study reported herein was undertaken to further investigate the growth and laying performance as well as the fishy taint production in the eggs of brown-egg-layer (TETRA SL) receiving 10% HG- rapeseed cake in their diet.

Materials and Methods

One hundred brown-egg-layer (TETRA SL) chicks were brooded and reared to the age of 140 days in two cages (50 chicks in each cage) each with an area of 8.0 m^2. The composition of starter and grower diets of standard and rapeseed groups are given in Table 1. The chemical composition of ingredients used during the forlmulation of experimental diets was taken from Scott *et al* (1982) and Malik and Chughtai (1979). A computer (Microsoft Excel-5) spread-sheet was developed for the formulation of the diet as well as for determining the calculated analysis of the feeds.

Starters were fed from 1 to 35 days and growers from 36 to 140 days. One group was kept on standard diet while the other was maintained on diet containing 10% rapeseed cake of Pakcheen variety (glucosinolate =60.8 u mol g^{-1}). Rapeseed cake replaced cottonseed cake and corn gluten in these diets and adjustment were made in the amount of ground corn to keep difference in level of energy and protein among the diets to a minimum. Both the groups were given continuous lighting for the first 24 h. Then this duration was decreased at a rate of 2 h per day until the prevailing natural day light condition (duration of day light was 13.5 h at that time). Natural conditions were maintained thereafter, throughout the experiment. The intensity of light provided to the chicks was 12 lux which was fulfilled using 60 watt bulbs. During the laying period (140 to 235 days) all birds were maintained under natural day light condition. The data given here, pertain to the months of November and Decem-

Table 1
Composition of starter and grower diets*

Ingredients	Starter		Grower	
	Standard	Rapeseed cake	Standard	Rapeseed cake
Wheat	44.00	44.00	47.00	43.25
Maize	19.00	17.00	30.00	30.00
Rice Polishing	5.00	10.00	5.00	5.00
Wheat bran	5.00	—	—	—
Fish meal	4.25	4.25	3.00	4.00
Blood meal	3.00	3.00	1.25	—
Cotton seed cake	5.00	—	2.00	—
Corn gluten (60)	4.00	1.00	2.00	—
Molasses	5.00	5.00	5.00	5.00
Meat meal	3.00	3.00	2.00	—
Rapeseed cake	—	10.00	—	10.00
Dicalcium-phosphate	1.5	1.5	1.5	1.5
Limestone	1.25	1.25	1.25	1.25
Total	100.00	100.00	100.00	100.00
Crude protein % **	18.01	18.06	13.98	13.99
ME (Kcal $100g^{-1}$)	343.77	342.04	348.22	344.96
Fibre%	3.14	3.25	2.55	24.00
Glucosinolates (ug g^{-1})	0.00	6.08	0.00	6.08
Calcium %	1.34	1.41	1.19	1.16
Total phosphorus%	0.96	1.02	0.83	0.85
Available P %	0.66	0.66	0.57	0.53
Lysine %	0.9	1.01	0.62	0.7
Methionine %	0.39	0.38	0.31	0.32

*To each 100kg of diet 250g vitamineral mixture was added; ** Calculated analysis.

ber, when the duration of the natural day light was 11 to 10 h. The composition of layer diets is shown in Table 2. Additional calcium was supplied in the form of lime stone. For the first 6 weeks feed was provided *ad-libitum* and from 7th week onward the feed was provided according to the schedule given in Table 4.

Table 2
Composition of layer diets*

Ingredients	Standard	Rapeseed cake
Wheat	38.00	38.00
maize	19.00	17.00
Rice polishing	5.00	5.00
Wheat bran	5.00	5.00
Fish meal	4.00	4.00
Blood meal	3.00	3.00
Cotton seed cake	5.00	—
Corn gluten (60%)	4.00	1.00
Molasses	5.00	5.00
Meat meal	3.00	3.00
Rapeseed cake	—	10.00
Dicalciumphosphate	2.00	2.00
Limestone	7.00	7.00
Total	100.00	100.00
Crude protein %**	17.20	17.23
ME (Kcal $100g^{-1}$)	320.75	319.02
Fibre %	2.98	3.10
Glucosinolate (ug g^{-1})	0.00	6.08
Calcium %	3.47	3.55
Total phosphorus %	1.03	1.08
Available P %	0.74	0.75
Lysine %	0.86	0.97
Methionine %	0.37	0.35

*To each 100kg of diet 250g vitamineral mixture was added. ** Calculated analysis.

After 20 weeks the birds were shifted to a cage of 0.6 x 1.2m size. There were seven cages for each group and 5 birds per cage i.e. each group was replicated 7 times. The data pertaining to laying performance of the last seven weeks has been reported in this paper. The following parameters were studied: mortality, live weight, weight gain day^{-1}, egg production (27th to 34th week), egg size and feed conversion (g feed/g egg).

Sensoric Evaluation. Eggs samples from RSC and control groups were boiled then presented to a panel of 8 judges trained on the subject and to whom the phenomenon of off flavour production was explained. The samples were scored [1-10] for flavour, with 1 extremely disliked and 10 extremely liked (Larmond *et al* 1980). The data was statistically evaluated by the analysis of variance using Co-State pakage and means were separated using DNMRT.

Results and Discussion

No effect of diet composition was observed as for as growth performance and mortality is concerned. During the entire duration of 34 weeks, 3 birds died in the control group and two in rapeseed cake group. Feed consumption during the first 6 weeks was 857g $pullets^{-1}$ for standard group and 918g $pullets^{-1}$ for rapeseed cake group. Data on live weight and increase in weight day^{-1}, noted at different stages of growth, is depicted in Table 3. No adverse effect was observed rather beneficial effect, was observed on growth performance of chicks receiving the diet containing 10% rapeseed cake.

Table 3
Growth performance of brown-egg-layer (Tetra SL) recieving diet with 10% rapeseed cake

Age (days)	Standard		Rapeseed cake	
	Live weight (g)	Weight gain per day (g)	Live weight (g)	Weight gain per day (g)
15	104.20	—	107.20	—
30	433.80	21.97	436.75	21.97
48	881.11	24.85	884.00	24.85
63	956.85	5.05	965.36	5.42
84	1062.88	5.05	1079.27	5.42
105	1168.91	5.05	1193.18	5.42
127	1280.00	5.05	1312.5	5.42
141	1478.88	14.21	1503.07	13.61
160	1748.80	14.21	1761.7	13.61
181	1789.90	1.96	1819.45	2.75
235	1905.20	2.14	1981.7	3.00

Table 4

Laying performance of brown-egg-layer recieving diet with 10% rapeseed cake in their diet

Week	Egg Production (%)		Egg size (g)		Feed conversion (g feed per g egg)	
	Standard	Rapeseed cake	Standard	Rapeseed cake	Standard	Rapeseed cake
1	64.30	64.50	55.73	54.28	3.21	3.28
2	68.80	68.90	57.7	56.95	2.90	2.93
3	66.80	74.40	55.63	56.26	3.09	2.75
4	69.40	74.80	58.92	56.36	2.81	2.73
5	67.29	75.20	56.43	58.52	3.02	2.61
6	61.29	73.10	56.00	59.18	3.35	2.66
7	61.20	76.10	56.78	60.88	3.31	2.48
Mean	65.58*	72.43*	56.74ns	57.63ns	3.31	2.78

*Significant; ns, non significant.

Table 5

Feed consumption record of brown-egg-layer receiving 10% rapeseed cake in their diet

Week	Feed chick^{-1} day^{-1} (g)	week	Feed chick^{-1} day^{-1} (g)
7	45	18	74
9	50	19	77
10	53	20	81
11	55	21	86
		22	91
12	58	23	96
13	61	24	100
14	62	25	106
15	65	26	110
16	69	27	115
17	71	28	115

Note: For the first six weeks feed was provided *ad-libitum* to all the chicks. For the 7th week and onward the feed was supplied according to the above schedule. Feed consumption per chick during first six weeks was standard 857g and Rapeseed cake 918g.

Inclusion of rapeseed cake significantly improved ($p<0.05$) the laying performance of brown-egg-layer under study (Table 4). Some improvement, though statistically non significant, in egg size in the rapeseed cake group was noted. The same pattern was observed in feed conversion ratio (g feed/g egg).

Results of the organoleptic evaluation of the eggs from control and RSC group (not given in table) showed that the judges could not sense any fishy flavour due to RSC feeding. Both the samples presented in triplicate obtained equal score for flavour i.e. 8.

The results of this study indicated that incorporation of 10% rapeseed cake had a beneficial effect on growth as well as laying performance of brown-egg-layer (TETRA SL).The decrease in feed intake associated with dietary rapeseed and canola meal (Clandinin and Robblee 1983b) was not apparent in this study. On the other hand, recently, Mawson *et al* (1993) reported less sensitivity in growing birds to palatability problems associated with rapeseed meal which is in agreement with our findings. Increase in egg production using rapeseed cake in this study is contrary to the findings of Pekerten and Ergul (1981) and Thomas *et al* (1983) who reported decrease in egg production as a result of dietary canola meal. These results, however, confirm the observations of Albino *et al* (1982), Salmon (1982), Proudfoot *et al* (1983) and Leeson *et al* (1987). Organoleptic quality was determined through 10 trained judges. Contrary to Mawson *et al* (1995), it revealed no difference in overall acceptability of eggs from both the groups.

The data presented confirm that 10% rapeseed cake can be substituted for expensive protein sources in layer diet with beneficial effect on growth and laying performances (Table 5).

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