EFFECT OF SUBSTITUTION OF SOYBEAN MEAL WITH CANOLA AND SUNFLOWER MEALS ON THE PERFORMANCE OF BROILERS

A. Rehman B.M. Bhatti. S.Hameed[1] and S. Afzal[2]

Poultry Research Institute. Rawalpindi. [1]SB Feed Mill. Mandra. Rawalpindi [2] University of Arid Agriculture. Rawalpindi.

ABSTRACT

A study was conducted to determine the effect of replacement of soybean meal (SBM) with locally available oilseed meals i.e. Canola (CM) and Sunflower meal (SFM) on performance of broiler chicks. Five different experimental rations A. B. C. D and E containing SBM 15%. SBM and CM 7.5% each. CM 15%. SBM 7.5% plus 3.75% CM and SFM each and SFM 15% respectively. were offered to the day-old broiler chicks up to six weeks of age. The effect of different rations was observed in terms of the performance parameters of broiler chicks.

The results showed that the weight gain. feed consumption. feed conversion ratio. carcass weight and dressing percentage were comparatively improved ($P<0.05$) where SBM was used as a source of vegetable protein. However. CM and SFM could successfully replace 50% of SBM. The 100% substitution of SBM with SFM resulted in high feed consumption with poor weight gain. feed conversion ratio. carcass weight. dressing percentage and liver enlargement. which could be attributed to comparative poor nutritional value and mycotoxin sesceptibility of SFM.

Key words: Soybean meal. sunflower meal. canola meal. broiler feeding.

INTRODUCTION

Soybean meal (SBM) is the largest produced oil seed meal in the world. The estimated production of SBM is 80.2 million ton per annum. Its largest producers are USA. followed by Brazil. Argentina. China. Thailand. and India (Swick. 1995). The local cultivation of soybean is very limited. Its meal has a comparatively superior form of protein and an excellent source of lysine. tryptophan and threonine. although methionine is the limiting amino acid in SBM. The production of main local oilseed meals in Pakistan during the year 2000-2001 shows that a significant volume of canola and sunflower meals were produced from oil extraction of 42 and 124 thousand tons of the seeds. respectively (Economic Survey of Pakistan. 2000-2001).

The nutritional assessment of local oilseed meals necessitates to improve their effective utilization for poultry feeding so as to save huge foreign exchange in the form of 12-25 million US dollars spent on the import of soybean meal (Anonymous. 1998). SBM has been reported to be replaced up to 20% with sunflower meal without any adverse affect on body weight. feed efficiency. carcass traits and meat composition of chicks (Lee and Lee. 1982: El-Sharif *et al.*. 1997). Aguilera *et al.* (1991) observed that when sunflower meal was replaced with SBM. it resulted in decreased growth rate and efficiency in utilization of protein. Varying level of SBM (10—15%) have also been replaced with sunflower meal by various workers (Kinal *et al.*. 1992). Classen (1992) found that using canola meal at levels higher than 10%. the growth rate decreased and feed conversion efficiency was poor.

The local meals produced in the country vary in nutrient composition from those produced in foreign countries. They contain growth inhibitory toxic and adulterant factors along-with specific amino acids deficiencies. which can be alleviated through proper processing technique and supplementation of deficient essential amino acids (Saeed and Malik 1983: Malik. 1986-87).

The present project was designed to study the effect of substitution of imported soybean meal at different levels with locally available oilseed meals i.e. sunflower and canola meals. The performance of broiler chicks fed different levels of sunflower and canola meals substituting SBM was determined in terms of weight gain. feed consumption and feed conversion ratio. The effects on the dressing quality of broilers in terms of dressing percentage and weight of different body parts and internal organs were also recorded. The effect was also determined on the protein composition of dressed meat and deposition of calcium and phosphorus in the long bone (tibia) of broilers.

MATERIALS AND METHODS

Four hundred and twenty broiler chicks were randomly divided into five groups. each having three

replicates of 28 chicks. Five different experimental rations A, B, C, D and E were prepared so as to replace SBM with sunflower and canola meals. The composition of rations is given in Table I. SBM was replaced at 50% level with CM in ration B, 100% in ration C and 25% each with SFM and CM in ration D and 100% with SFM in ration E.

All the chicks were reared in a separate pen under similar prescribed managemental conditions allotted to each replicate on floor. The chicks were vaccinated against viral diseases as per prescribed schedule. They were fed on allocated rations *ad-libitum*. Fresh and clean water was provided round the clock. The daily feed offered was recorded and weekly weight gain, feed consumption and feed conversion ratio were maintained. At the end of experiment, three birds from each replicate were selected randomly and slaughtered. Their live weights, carcass weight, weight of different edible parts i.e. legs, wings, breast, back, neck and internal organs i.e. heart, liver and gizzard were recorded. The leg and breast muscles were taken as sample from each replicate for the estimation of their crude protein content using Kjeldahl method. Tibial bones of each bird were collected and oven dried for analysis of their calcium and phosphorus contents, following procedures described by Allison *et. al.* (1986). The data thus collected were statistically analyzed by the method recommended by Steel and Torrie (1981).

Table 1: Composition of experimental rations (%)

Sr. No.	Ingredients	A	B	C	D	E
1	Maize	31.8	32.5	40.3	32.5	39
2	Rice broken	8	8	8	8	8
3	Wheat	15	15	15	15	15
4	Rice polishing	10	10	0.7	10	0
5	Cotton seed meal	5	5	5	5	5
6	Corn gluten meal-60 %	2.5	2.5	2.5	2.5	2.5
7	Corn gluten meal-30 %	2	1.2	2	2	2
8	Canola meal	0	7.5	15	3.75	0
9	Guar meal	0	0	1.6	0.1	2.5
10	Sunflower meal	0	0	0	3.75	15
11	Soybean meal	15	7.5	0	7.5	0
12	Fish meal	4.4	5.9	6	6	6
13	Molasses	3.8	3	2	3	2
14	Bone meal	0.6	0.3	0.3	0.3	1.4
15	Marble powder	1.2	1.1	1	1.1	0.5
16	Salt	0.2	0.02	0.04	0.07	0.11
17	Lysine	0.08	0.08	0.15	0.11	0.25
18	Methionine	0.14	0.12	0.1	0.12	0.1
19	Vit.min.premix	0.35	0.35	0.35	0.35	0.35
20	Oil	0	0	0	0	0.32
Chemical Composition						
1	ME (K.Cal./Kg.)	2870	2865	2868	2864	2867
2	Crude protein (%).	19.89	19.93	19.88	19.87	19.85
3	Calcium (%).	0.92	0.92	0.92	0.92	0.92
4	Phosphorus (%).	0.40	0.41	0.40	0.40	0.41
5	Lysine (%).	1.00	1.00	1.00	1.00	1.00
6	Methionine (%).	0.50	0.50	0.50	0.50	0.50

A= 15%SBM
B= 7.5%SBM + 7.5 CM
C= 15% CM
D= 7.5% SBM + 3.75% CM + 3.75% SFM
E= 15% SFM

RESULTS AND DISCUSSION

The results of the experiment are given in Tables 2, 3, 4 and 5. There was a non-significant difference in the average weight gain of the chicks under the substitution of SBM with CM or SFM. Lee and Lee (1982) observed similar findings and reported non significant difference in weight gain when SBM was replaced with SFM. The results are contrary to the findings of Aguilera *et al.* (1991), who observed growth depression under the substitution of SBM with SFM. The feed consumption in group A was significantly ($P<0.05$) lower as compared to birds in groups D and E. A high feed consumption in SFM based ration could be due to deficiency of certain nutrients in SFM. The feed

conversion ratio (FCR) of the chicks fed ratios A. B. C. D and E also showed a significant difference. The use of SBM significantly (P<0.05) improved feed conversion ratio. CM successfully replaced 15% SBM, as the FCR in groups A and B was almost comparable. The use of SFM significantly depressed it, which could be attributed to the poor nutritional value, high fibre content and mycotoxin effect of SFM. These results were contrary to the findings of lee and Lee (1982).

The carcass weight of different groups showed a significant (P<0.05) difference. The carcass weight of groups A and B was significantly (P<0.05) higher than groups C. D and E. The lowest carcass weight was observed in group E. It indicates that SBM had significant contribution towards carcass weight, followed by CM and SFM. It can be attributed to better amino acid profile or biological value of SBM as compared to other oilseed meals. The results also indicate that SFM significantly depressed carcass weight. It could be due to poor biological value of protein of SFM, higher crude fibre content and high susceptibility of SFM for mycotoxin contamination, which subsequently depressed the growth performance

Table 2: Effect of substitution of soybean meal with canola and sunflower meal on the performance of broilers

Groups	Average initial weight (Kg)	Average final weight (Kg)	Average weight gain (Kg)	Average feed Consumption (Kg)	Feed conversion ratio
A	0.050	1.391	1.341	3.168	2.462
B	0.050	1.384	1.335	3.196	2.397
C	0.050	1.362	1.312	3.264	2.488
D	0.051	1.376	1.326	3.270	2.467
E	0.051	1.299	1.249	3.312	2.654

* Significant (P< 0.05)

Table 3: Effect of substitution of SBM with SFM and CM on dressing percentage and weight of parts of carcass (Kg)

Groups	Average live weight	Average carcass weight	Dressing percentage	Average weight / kg carcass				
				Neck	Breast	Legs	Wings	Back
A	1.166	0.857 *	57.28 *	0.060	0.296	0.334	0.099	0.179
B	1.512	0.827	54.71	0.059	0.301	0.355	0.11	0.186
C	1.490	0.788	52.91	0.066	0.300	0.348	0.10	0.189
D	1.430	0.744	52.04	0.063	0.314	0.342	0.099	0.183
E	1.346	0.690	51.35	0.062	0.298	0.337	0.10	0.196

• Significant (P< 0.05) as compared with C, D, & E

Table 4: Effect of substitution of SBM with SFM and CM on weight of internal organs

Groups	Wt. of internal organs / Kg carcass		
	Liver	Gizzard	Heart
A	0.046	0.037	0.008
B	0.051	0.043	0.010
C	0.052	0.040	0.008
D	0.063 *	0.031	0.007
E	0.064 *	0.041	0.009

* Significant P< 0.05 as compared with A, B & C.

Table 5: The effect of substitution of different oilseed meal on the availability of protein and minerals in the different body tissues of broilers

Group	Protein % (Leg)	Protein % Breast)	Calcium (%)	Phosphorus (%)
A	81.97	73.86	28.4	5.70
B	70.58	78.33	32.2	5.39
C	62.45	70.29	32.5	5.17
D	70.91	71.16	28.1	5.00
E	67.37	69.29	33.6	5.39

of group E. The dressing percentage in group A was also significantly ($P<0.05$) higher than groups C. D and E. The results are almost similar to carcass weight. The parts of carcass i.e. neck. breast. legs. wings and back showed non significant difference. The average weight of liver per Kg carcass weight showed significant difference. It was significantly ($P<0.05$) high in D and E as compared with A. B and C. It can be attributed to the presence of certain toxic factors in SFM e.g. mycotoxims which had the hepato toxic effect resulting in the enlargement of liver. The difference in weight of gizzard and heart was found non significant. El-Sharif *et al.* (1995). while replacing SBM with SFM. also observed significant difference in the weight of giblet (internal organs).

The results showed that there was a non significant difference in the protein content of legs and breast muscles of different groups fed on SBM. SFM or CM. It is obvious that isocaloric and isonitrogenous ration did not affect the protein value of muscles. There was also a non significant difference observed in the mineral deposition in the tibia of the broilers reared on different rations containing various oilseed meals. Summer and Leeson (1985) also recorded no response in bone ash. while comparing CM and SBM.

The results indicated that SBM is a good source of protein. which can be attributed to better amino acid profile of SBM. However. 50% of it can be replaced with locally available oilseed meal i.e. SFM and CM without any adverse affect on the performance of broiler chicks.

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