SUNFLOWER OIL MEAL AS A SUBSTITUTE FOR SOYBEAN MEAL IN BROILER RATIONS WITH OR WITHOUT MULTIENZYME (KEMZYME)

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ABSTRACT

The study was conducted to investigate the effect of sunflower (Helianths annuus L.) oil meal (SFM) as a substitute for soybean meal in broiler rations with or without multienzyme (Kemzyme). One hundred and eighty day old broiler (Hubbard) chicks were employed for the study using completely randomized design (CRD) with 2 x 3 factorial arrangement. The experiment was conducted in two phases, starter (0-4 weeks) and finisher phase (5-6 weeks). Six different isonitrogenous & isoaloric experimental rations were prepared following NRC requirements with three levels 5, 10 and 15% of SFM without kemzyme supplementation, designated as A, B and C and with kemzyme (500 g/ton) as D, E and F for starter phase. Six corresponding finisher rations designated as A, B, C, D, E and F were used during the finisher phase. The compiled data (starter cum finisher phases) revealed non significant differences in terms of weight gain due to SFM levels or kemzyme addition. The feed consumption was significantly ($P<0.05$) higher in birds fed diets containing kemzyme, but the overall feed efficiency was significantly better without kemzyme. The addition of kemzyme significantly ($P<0.05$) improved the dressing precentage of the birds using rations containing 5% SFM. However, the lowest level (5%) of SFM used in the rations without kemzyme proved to be the most economical and the best in terms of feed efficiency values. The differences in liver, gizzard, heart, pancreas and spleen weights were found to be non significant among all the treatment groups.

INTRODUCTION

Poultry Industry has played a pivotal role in providing food for the rapidly grwonig population in Pakistan. Partly by virtue of poultry, the per capita per day consumptin of animal protein has reached to 16.93 g as against the minimum recommended requirement of 27.7 g (Anonymous, 1987). For the last few years, broiler production has become the focus of attention for Paksitani research workers. Feed cost of poultry production usually ranged between 65-75 percent of the total cost of production. High feed cost is one of the major constraint for further progress of poultry industry in Pakistan.

Sunflower (*Helianthus annuus* L.) oil meal (SFM) is a by-product obtained after the extraction of oil from decorticated sunflower seed. Being a good source of vegetable protein (40% CP), the SFM can be developed as a good vegetable protein supplement for different poultry rations.

The worldwide production of sunflower oil meal is large. In 1990 it was estimated that world production of SFM was 8.6 million metric tons, which ranked fourth in oil seed production behind soybean meal, cotton seed meal, and canola meal, respectively (Anonymous, 1992). In recent years there is an increased interest in the cultivation of sunflower in Paksitan. It is anticipated that its production shall rise sharply in the coming years as reflected by its production pattern of 311 tons in 1980 to 83312 tons in 1992 (Anonymous, 1992). Thus SFM is often used in poultry rations. High levels of SFM can be used successfully in broiler rations if adequate amount of lysine and metabolizable energy are provided (Zatari and Shell, 1990; Vieira *et al.*, 1992).

However, high level of inclusion of SFM in poultry diets poses certain problems due to its high fibre content (14-18% CF) (Rad and Keshavarz, 1976). The testa of SFM is rich in fibre content which reduces the digestibility of the meal prepared from it. The fibre content of the seed can be reduced partially by removing the testa through a process known as decortication (McDonald *et al.*, 1977).

Kemzyme is a stabilized multi-enzyme product from Kemin Eurpoa NV, Belgium. It contains a-amylase, B-glucanase, lipase, protease, cellulase and hemicellulase complex including pentosanase, xylanase, pectinase and cellubiase. The enzyme mixture is clamied to break down the non-starch polysaccharides (NSP), reduces the viscosity of gut content and improves the utilization of feed nutrients, mainly cellulose and hemicellulose complex by degrading high amounts of crude fibre in the SFM. Thus a project was planned to study the

following objectives:

i. To determine the optimum levels of SFM in broiler rations.
ii. To evaluate the effect of mixture of enzymes (kemzyme) on maximizing the use of SFM substituting soybean meal in broiler rations.
iii. To determine the economic feasibility of using enzymes in broiler rations.

MATERIALS AND METHODS

One hundred and eighty day old broiler chicks (Hubbard) were purchased from a commercial hatchery. The chicks were wing banded for identification and randomly divided into 18 experimental units (replicates) of ten chicks each. The birds in each replicate were housed in clean and disinfected separate pens, measuring 4 X 3 X 2.5'. A 2-3 inch thick layer of sawdust was used as litter material in each pen and the litter was regularly stirred twice a day to keep it dry and clean. The brooding temperature was kept at 35°C during the 1st week of age and it was gradually lowered by 3°C till 4 weeks. Thereafter, the temperature of 22°C was maintained for the rest of experimetnal period. A 100 watt electric bulb was hanged over each pen to provide 24 hours light and maintain the required temperature. All the chicks were vaccinated against new castle disease, hydro-pericardium syndrom and infectious bursal disease.

Six isocaloric and isonitrogenous broiler starter rations following NRC standards (NRC, 1994) were prepared using three levels of SFM viz 5, 10 and 15 percent without kemzyme supplementation (500 g/ton) designated as A, B & C and with kemzyme supplementation (500 g/ton) designated as D, E & F (Table 1).

Table 1: Composition of broiler starter rations

Ingredient	A	B	C	D	E	F
Maize	25.0	24.8	23.6	25.0	24.80	23.6
Wheat	15.0	14.0	14.0	15.0	14.0	14.0
Rice broken	5.0	5.5	5.	5.5	5.5	5.5
Rice polishings	12.0	12.0	12.0	12.0	12.0	12.0
Maize gluten 30%	1.5	1.5	1.5	1.5	1.5	1.5
Maize gluten 60%	4.0	4.0	4.0	4.0	4.0	4.0
Cotton seed meal	5.0	5.0	5.0	5.0	5.0	5.0
Rape seed meal	2.0	2.0	2.0	2.0	2.0	2.0
Sunflower meal	5.0	10.0	15.0	5.0	10.0	15.0
Soybean meal	10.0	5.9	1.8	10.0	5.9	1.8
Fish meal	7.0	7.0	7.0	7.0	7.0	7.0
Blood meal	2.0	2.0	2.0	2.0	2.0	2.0
Molasses	1.5	1.5	1.5	1.5	1.5	1.5
Soybean oil	3.0	3.3	3.6	3.0	3.3	3.6
DCP	1.0	1.0	1.0	1.0	1.0	1.0
Premix	0.5	0.5	0.5	0.45	0.45	0.45
Kemzyme	0.0	0.0	0.0	0.05	0.05	0.05
Total	100.00	100.00	100.00	100.00	100.00	100.00
Nutrient composition of starter rations						
Crude protein %	23.05	23.2	23.01	23.05	23.02	23.01
Metabolizable energy (kcal/kg)	3199.62	3200.01	3199.74	3199.62	3200.01	3199.74
Crude fibre %	5.42	5.77	6.11	5.42	5.77	6.11
Kemzyme (g/ton)	0.00	0.00	0.00	500.00	500.00	500.00
Calcium %	0.64	0.64	0.65	0.64	0.64	0.65
Phosphorus %	0.71	0.69	0.66	0.71	0.69	0.66

Using same priniciple, six corresponding broiler finisher rations were prepared which were designated as A, B, C, D, E and F (Table 2). Each experimental ration was randomly allotted to three experimental units. The experiment was conducted for a period of 42 days in two phases, starter phase (28 days) and finisher phase (14 days).

Completely randomized design (CRD) with 2 x 3 x 3 factorial arrangement was used for the study. Weekly weight gains, feed consumption and feed efficiency were recorded. At the end of the experiment two birds from each replicate were slaughtered to obtain their dressing percentage and liver, gizzard, heart, pancreas and spleen weights. The data thus collected were subjected to statistical analysis using analysis of variance technique and the significance of means were compared using Duncan's Multiple Range Test (Steel and Torrie, 1982).

RESULTS

The results obtained during the starter phase on weight gain, feed consumption and feed efficiency did not show any significant effect of the levels of SFM used or due to the additoin of kemzyme in the rations (Table 3). However, during finisher phase, the birds having 15% SFM consumed significantly ($P<0.05$) more feed than birds fed at 5 percent or 10 percent level. Significantly ($P<0.05$) better feed efficiency was recorded in the brids fed finisher ration with 5 percent SFM while weight gain during the phase was not affcted by any treatment (Table 4).

The data on starter cum finisher phase showed the significant ($P<0.05$) increase in the feed consumption of the birds and poorer efficiency of feed utilization with the increasing level of SFM or the addition of kemzyme (Table 5). The weight gain remained

Table 2: Composition of broiler finisher rations

	Rations					
Ingredient	A	B	C	D	E	F
Maize	27.4	26.2	25.0	27.4	26.2	25.0
Wheat	15.0	15.0	15.0	15.0	15.0	15.0
Rice broken	10.0	10.0	10.0	10.0	10.0	10.0
Rice polishings	12.0	12.0	12.0	12.0	12.0	12.0
Maize gluten 30%	2.3	2.3	2.3	2.3	2.3	2.3
Maize gluten 60%	1.2	1.2	1.2	1.2	1.2	1.2
Cotton seed meal	5.0	10.0	15.0	5.0	10.0	15.0
Rape seed meal	0.0	0.0	0.0	0.0	0.0	0.0
Sunflower meal	5.0	10.0	15.0	5.0	10.0	15.0
Soybean meal	10.0	5.9	1.8	10.0	5.9	1.8
Fish meal	4.0	4.0	4.0	4.0	4.0	4.0
Blood meal	2.0	2.0	2.0	2.0	2.0	2.0
Molasses	2.0	2.0	2.0	2.0	2.0	2.0
Soybean oil	2.6	2.9	3.2	2.6	2.9	3.2
DCP	1.0	1.0	1.0	1.0	1.0	1.0
Premix	0.5	0.5	0.5	0.45	0.4	0.45
Kemzyme	0.0	0.0	0.0	0.05	0.05	0.05
Total	100.00	100.00	100.00	100.00	100.00	100.00
Nutrient composition of starter rations						
Crude protein %	20.02	20.02	20.02	20.02	20.02	20.02
Metabolizable energy (kcal/kg)	3204.26	3203.99	3203.71	3204.26	3203.99	3203.71
Crude fibre %	5.40	5.75	6.10	5.40	5.75	6.10
Kemzyme (g/ton)	0.00	0.00	0.00	500.00	500.00	500.00
Calcium %	0.48	0.48	0.49	0.48	0.48	0.49
Phosphorus %	0.64	0.62	0.59	0.64	0.62	0.59

Table 3: Average weight gain, feed consumption and feed conversion ratio of chicks fed on different experimental rations (0-4 weeks).

	% levels of SFM without kemzyme				% levels of SFM with kemzyme			
	5	10	15	Average	5	10	15	Average
Weight gain (g)	976.17	867.23	950.71	931.37	929.32	921.65	940.11	930.35
Feed consumption(g)	1868.28	1858.19	1933.12	1886.51	1939.20	1921.21	1936.60	1932.37
Feed conversion ratio	1.92	2.12	2.03	2.02	1.99	2.05	2.06	2.04

Table 4: Average weight gain, feed consumption and feed conversion ratio of chicks fed on different experimental rations (5-6 weeks).

	% levels of SFM without kemzyme				% levels of SFM with kemzyme			
	5	10	15	Average	5	10	15	Average
Weight gain (g)	834.43	815.577	848.31	832.77	846.447	750.887	768.15	788.49
Feed consumption(g)	1743.17	1771.83	1820.24	1778.41	1736.26	1736.26	1776.00	1752.56
Feed conversion ratio	2.07	2.187	2.157	2.138b	2.053	2.053	2.313	2.291a

Table 5: Average weight gain, feed consumption and feed conversion ratio of chicks fed on different experimental rations (0-6 weeks).

	% levels of SFM without kemzyme				% levels of SFM with kemzyme			
	5	10	15	Average	5	10	15	Average
Weight gain (g)	1819.6	1744.90	1715.54	1760.01	1768.09	1699.73	1708.26	1725.36
Feed consumption (g)	3611.39	3644.70	3678.43	3644.84	3657.47	3675.54	3712.60	3681.87b
Feed conversion ratio	1.987	2.073	2.147	2.069a	2.070	2.163	2.173	2.133b

Table 6: Average weight (g): liver, gizzard, pancreas, heart, and spleen of birds fed on different experimental different experimental rations (0-6 weeks).

	% levels of SFM without kemzyme				% levels of SFM with kemzyme			
	5	10	15	Average	5	10	15	Average
Liver	48.31	51.53	50.23	59.58	50.85	49.65	49.65	52.694
Gizzard	33.16	38.10	36.93	38.40	39.50		38.90	38.54
Pancreas	9.41	9.70	7.65	4.281	8.05	8.05	9.00	4.78
Heart	5.03	3.80	4.01	8.94	5.40	3.90	5.05	8.36
Spleen	3.45	5.10	3.35	4.20	6.25	4.06	3.70	4.43

unaffected. Neither, the various levels of SFM nor the addition of kemzyme showed any effect on the weight of lvier, gizzard, heart, spleen and pancreas of the birds (Table 6). However, the dressing percentage of the birds using 15 percent of SFM without kemzyme was significantly ($P<0.05$) better than the birds using 5 percent or 10 percent of SFM without kemzyme. However, the addition of kemzyme improves the dressing percentage of the birds using 5 percent SFM. The economic picture depicted that the rations with 5 percent of SFM without kemzyme were most feasible.

DISCUSSION

Higher feed consumption in the birds using higher level of SFM (15 percent) may be due to the fact that increased level of SFM in the ration decreased the nitrogen and energy retention as a percentage of intake (Ibrahim and Al-zubeir, 1991).

Although the birds having 15 percent SFM in ration during finisher phase, used larger amount of feed. Their efficiency of utilization of feed is poorer than the birds using 5 percent level of SFM in the ration. The poorer feed utilization of feed containing 15 percent SFM may be due to increased rate of digesta flow becuase of the presence of higher fibre content in their rations. These results are in line with the findings of Silverin *et al.* (1967) who reported that higher leve of SFM (22.5 percent) adversely affected the weight gain and feed conversion efficiency inspite of using more food compared with the 11.3 or 0 percent of SFM in the ration. Similar results have been reported by Walderoup *et al.* (1970). They observed poor feed efficiency due to higher level of SFM in broiler rations.

Addition of kemzyme in the ration containing 5 percent SFM improved the dressing percentage of the birds. These improvement could be related to the lighter content of the gut using the rations containing kemzyme.

The economic picture was most feasible on feeding rations with 5 percent of SFM without kemzyme. Kemzyme addition probably proved feasible under specific conditions e.g. when barley or wheat or single cereal based diets are formulated. The economic picture resembles to the findings by Chesson (1992), who reported that the enzyme activity imposed by the nature of substrate and the host animal are not easy to overcome.

These results are simialr to the findings of Malik *et al.* (1971), who reported that 5 per cent level of SFM in the ration respectively, may be used safely without effecting feed utilization.

As regards replacement of soybean meal with SFM the resutls revealed that complete replacement of soybean meal with SFM did not show any beneficial effect rather it adversely affected the overall performance of the birds. The results are in complete agreement to those reported by Klain *et al.* (1956). They observed that complete replacement of soybean with SFM markedly decreased growth of the broilers. The addition of lysine also failed to restore the performance of the birds using soybean meal in their rations.

CONCLUSION

Use of kemzyme did not show any effect on the performance of the birds. However, 5 percent SFM may be used in the broiler rations without any adverse effect. Moreover, 5 percent SFM level proved to be most efficient and more economical. Maximum profit was obtained by feeding ration "A" (contaiing 5% of sunflower oil meal without kemzyme). kemzyme addition probably proved feasible under specific conditions e.g. when wheat or barley or a single cereal based diets are to be formulated.

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