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REPLACEMENT OF MAIZE WITH RICE POLISH IN THE FEEDING REGIME OF WEANER RABBITS.

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ABSTRACT

Thirty weaner rabbits of Soviet Chinchilla (35d old) were divided into three groups of ten each. They were fed a diet (T1) containing maize-30, groundnut cake-20, sunflower cake-5, soyaflakes-5, wheat bran-30, fish meal-3, molasses-5, mineral mixture-1.5, and common salt-0.5 % and mixed green grass ad lib. In T2 and T3 maize was replaced by 25 and 50 % rice polish, respectively. All the proximate principles excluding nitrogen free extract increased with rice polish supplementation. Final body weights (84d), live weight gain and feed intake during the experimental period were not affected whereas, feed conversion ratio improved ($P<0.05$) from 5.15 to 4.80 and 4.96 in T1, T2 and T3, respectively. This might be due to the increased level of fat and energy concentration in these diets. Differences among the gastrointestinal contents were not observed except for weight of caecum which decreased ($P<0.05$) with increase in proportion of rice polish in the diets. This might be due to the higher level of fibre in rice polish than maize which resulted in fast excretion of digesta. Carcass parameters as dressed carcass, liver weight and dressing percentage remained unaffected due to presence of rice polish in the diet. Digestibility of dry matter was not affected whereas that of crude protein decreased and of crude fibre, ether extract, neutral detergent fibre was increased with rice polish supplementation. The balance of nitrogen decreased which was reflected by lower DCP contents but growth of rabbits was not affected though the availability of energy as TDN remained similar due to rice polish supplementation. The results reveal optimum protein to energy ratio with diets containing rice polish; secondly the importance of rice polish as source of energy for rabbits. Thus it could be concluded that rice polish can replace dietary maize supplement up to 50 % or could be used up to 15% in the feeding regime of weaner rabbits.

INTRODUCTION

Rice polish is the finely powdered material obtained during polishing of rice kernels, after the hulls and bran have been removed; its protein and fat contents are equivalent to that of rice bran and total digestible nutrients are equivalent to maize (Morrison, 1961). Rice polish has been used extensively in swine and poultry feeding (Yadav and Gupta, 1995; Tiemoko, 1992; Rao and Reddy, 1986; Ali and Leeson, 1995). Soluble carbohydrate contents of rice by products are lower than maize (McDonald *et al.,* 1995) which reflected its suitability as a rabbit feed ingredient because higher soluble carbohydrates in diet aggravate enteric disorders (Robinson *et al.,* 1988). Due to cost difference between these two ingredients, substitution of maize by rice polish as source of energy may help in economical feeding of rabbits. Keeping in view the above literature, rice polish was evaluated as source of energy in the rabbit diet by replacing maize by 25 and 50 per cent.

MATERIAL AND METHODS

The experiment was conducted with thirty, 35-d old weaners of Soviet Chinchilla breed by dividing into three groups of ten each, having equal sex ratio (5M + 5F). Three experimental diets were formulated by using maize, groundnut cake, sunflower cake, soyaflakes, wheat bran, fishmeal, molasses, mineral mixture and common salt (Table 1). Maize in the test diet (T_1) was replaced by 25 (T_2) and 50% (T_3) level by rice polish.

Table 1: Ingredient composition of experimental diets

Feed ingredients	T_1	T_2	T_3
Maize	30	22.5	15
Groundnut Cake	20	20	20
Sunflower Cake	5	5	5
Soyaflakes	5	5	5
Wheat bran	30	30	30
Rice-polish	-	7.5	15
Fish-meal	3	3	3
Molasses	5	5	5
Min-mixture	1.5	1.5	1.5
Common salt	0.5	0.5	0.5
Cost of diet (Rs/ Kg)	7.15	6.95	6.75

The rabbits were kept individually in cages and offered mash diet and green grass *ad lib* throughout the experimental period. The experiment was conducted during the month of May-June having average minimum and maximum temperature of 16.5 1.8 and 30.3 0.2° C, respectively with average humidity of 75.8 %. Live weight and feed intake was monitored weekly during the experimental period. At the end of the feeding trial, a metabolic trial was conducted to assess nutrient digestibility. Feeds offered, faeces and urine samples were analysed for proximate principles and calcium (AOAC, 1990), phosphorus (Gupta *et al.,* 1992) and fibre fractions (Goering and Van Soest, 1984).

Data obtained during the experiment were statistically analysed using a randomised block design (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

Chemical composition of diets (Table 2) revealed that levels of crude protein, crude fibre, ether extract, total ash, calcium, phosphorus, acid detergent fibre, neutral detergent fibre, hemicellulose and lignin were higher whereas those of nitrogen free extract and cellulose were lower in diets containing rice polish. The changes in composition were due to inclusion of rice polish included in the diets. The nutrients are within permissible limits (NRC, 1977). Chemical composition of rice polish was slightly different from the earlier observations (Rao and Reddy, 1986; Sawal and Kurar, 1997); which indicated lower values for CP, EE, ADF and mineral matter. The variations in composition may be due to differences in source and processing techniques used for removal of rice by products.

Biological performance of broiler rabbits (Table 3) revealed non significant differences for initial body weight, final body weight and total feed intake; whereas feed conversion ratio (FCR) improved ($P<0.05$) with incorporation of rice polish due to higher level of fat and energetic concentration in these diets (Fernandez and Fraga, 1992).

Table 2: Chemical composition of dietary feedstuffs (% on DM basis)

Nutrient	T_1	T_2	T_3	Green grass	Rice polish
DM	89.9	89	89.8	90.7	90.2
CP	18.9	19.2	19.4	17.8	18.5
CF	7.9	10.4	10.7	24.9	12.1
EE	4.5	6.2	6.6	2.8	21.7
Total ash	7.8	9.2	9.6	10.2	10.2
NFE	60.9	55	53.7	44.3	37.5
Calcium	0.89	0.95	1.08	0.97	1.26
Phosphorus	1.02	1.16	1.33	0.55	2.1
ADF	15.89	16.67	18.59	37.21	21.9
NDF	44.65	49.7	52.6	58.86	51.5
Hemicellulose	28.76	33.03	34.01	21.65	29.6
Cellulose	13.64	12.17	12.59	32.51	21.3
Lignin	2.25	4.5	6	4.7	8.3

Table 3: Biological performance, carcass attributes and gastrointestinal contents of rabbits fed experimental diets

Parameters	T_1	T_2	T_3
Body weight (g)			
Initial (35d)	572 ± 34.8	576 ± 35.2	573 ± 37.4
Final (84 d)	1632 ± 61.3	1642 ± 49.2	1647 ± 45.9
Gain	1060 ± 26.4	1066 ± 14.0	1074 ± 5.3
Daily gain (g)	21.6	21.7	21.9
Dry matter intake (kg)			
Total	5.45 ± 0.2	5.10 ± 0.16	5.33 ± 0.19
Concentrate	3.83 ± 0.14	3.42 ± 0.13	3.77 ± 0.15
Roughage	1.62 ± 0.06	1.68 ± 0.03	1.56 ± 0.04
Daily intake (g)	111.3 ± 19.3	104.2 ± 13.1	108.7 ± 19.0
Concentrate (g)	78.2 ± 14.6	69.9 ± 12.9	76.9 ± 15.0
Roughage (g)	33.1 ± 4.7	34.3 ± 0.2	31.8 ± 4.0
Feed conversion ratio*	5.15 ± 0.12^{b}	4.80 ± 0.11^{a}	4.96 ± 0.14^{ab}
Slaughter weight (kg)	1.82 ± 0.9	1.83 ± 0.5	1.83 ± 0.3
Dressed carcass + Liver weight (g)	903 ± 52	896 ± 45	891 ± 20
Liver weight (g)	52.8 ± 2.5	52.5 ± 1.6	57.1 ± 1.8
Dressing percentage	49.6 ± 0.6	48.9 ± 0.8	48.7 ± 0.6
Gastrointestinal weight (g)	471.7 ± 21.3	475.0 ± 16.0	478.6 ± 15.0
Caecum weight (g)*	157.8 ± 7.9	149.4 ± 4.7	127.1 ± 6.1

Improvement in FCR has also been reported with increase in fat level in the diet (Bhatt and Swain, 1999). Comparable results for daily gain and dry matter intake in pigs fed rice polish on conventional concentrate diets have been observed (Yadav and Gupta, 1995); which were in agreement with the findings of this experiment. Though improved weight gain with similar

FCR in broiler chicks fed rice polish at 15 and 30 % as a replacement of maize, wheat shorts and soybean meal have been observed (Tiemoko, 1994). The best FCR was observed in T2 group which was due to lower daily dry matter intake at 7.5 % level of rice polish supplementation, this might be due to higher utilization of nutrients (Table 4).

Table 4: Nutrient digestibility (%) and nitrogen balance in rabbits fed experimental diets

Nutrient	T_1	T_2	T_3
DM	67.5 ± 2.1	67.1 ± 2.5	65.6 ± 1.5
CP*	74.8^{b} ± 3.6	72.4^{a} ± 2.5	69.3^{b} ± 0.9
CF*	36.8^{a} ± 4.1	48.6^{b} ± 3.2	46.3^{b} ± 1.4
EE*	60.5^{a} ± 1.5	84.7^{b} ± 2.6	84.3^{b} ± 1.9
NFE	72.8 ± 2.9	73.5 ± 2.7	70.8 ± 2.6
NDF*	35.2^{a} ± 3.8	43.7^{b} ± 3.7	45.2^{b} ± 2.0
ADF	49.6 ± 3.2	48.1 ± 3.5	49.9 ± 4.5
Hemicellulose	66.2 ± 3.8	72.9 ± 0.7	75.6 ± 1.5
Cellulose*	64.8^{b} ± 4.4	60.3^{ab} ± 5.3	54.8^{a} ± 5.1
Balance of Nitrogen (g/d)			
Intake(g)			
Concentrate	3.35 ± 0.10	2.95 ± 0.10	3.11 ± 0.20
Roughage	1.21 ± 0.12	1.34 ± 0.10	1.11 ± 0.10
Total	4.56 ± 0.07	4.29 ± 0.05	4.22 ± 0.27
Excretion (g)			
Faeces	1.20 ± 0.17	1.33 ± 0.05	0.96 ± 0.13
Urine	1.11 ± 0.17	1.42 ± 0.13	1.53 ± 0.13
Total	2.31 ± 0.17	2.75 ± 0.09	2.45 ± 0.13
Balance (g/d)*	2.25^{c} ± 0.05	1.54^{a} ± 0.03	1.77^{b} ± 0.02
DCP	**14.1**	**13.9**	**13.4**
TDN	**65**	**65.1**	**64.9**

*Figures bearing different superscripts differ significantly (P<0.05)

Gastrointestinal contents were observed to be similar among the groups for gastrointestinal weight whereas significant (P<0.05) differences were recorded for weight of caecum, which decreased with increase in proportion of rice polish. This might be due to higher level of fibre in diets containing rice polish which resulted in faster excretion of digesta. Carcass parameters indicated non significant differences for dressed carcass, liver weight and dressing percentage among different groups reflecting no effect of rice polish supplementation as source of energy.

Digestibility and balance of nutrients (Table 4) indicated better digestibility of CF, EE and NFE in T_2 group whereas, CP digestibility decreased with rice polish supplementation. Digestibility of crude protein of rice by product was reported to be lower than maize (Fekete and Gippert, 1986). Improved utilization of nutrients in T_2 group correlated well with improvement in FCR. Significant (P0.05) differences were recorded for the digestibility of CP, CF, EE, NFE, NDF, cellulose and balance of nitrogen. Improvement in digestibility of

energy yielding nutrients with supplementation of rice polish may be due to better combination of nutrients. In agreement to our findings earlier observations (Aboul-Ela *et al.,* 1996) reveal slightly lower DM and CP digestibility but higher CF digestibility at 10.22% CF level compared to 7.15% dietary CF level. Ether extract digestibility in experimental diets (T_2, T_3) was higher ($P<0.05$) due to higher EE level in these diets. Improvement in digestibility of dietary fat has been observed when fat was added up to 8 % level through vegetable oil (Bhatt and Swain, 1999). Lower balance of nitrogen in test diets indicated poor protein value of rice polish which correlated with protein digestibility of these diets. The digestibility of NDF and hemicellulose increased with the incorporation of rice polish, whereas, that of cellulose decreased significantly ($P<0.05$) this might be due to fibre characteristics of rice polish. Growth of rabbits was not affected though the availability of energy as TDN remained similar due to rice polish supplementation.

The results reveal optimum protein to energy ratio with diets containing rice polish; secondly the importance of rice polish as source of energy for rabbits. Thus it could be concluded that rice polish can replace dietary maize supplement up to 50 % or could be used up to 15% in the feeding regime of weaner rabbit.

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