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Influence of Feeding Processed Pigeon Pea (*Cajanus cajan*) Seeds on Broiler Chick Performance

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Abstract: This experiment was conducted to assess the effect of feeding different processed pigeon pea seeds on broilers performance. Four isocaloric and iso-nitrogenous diets containing (10%) of soaked pigeon pea seeds, decorticated with added enzyme (multi enzymes with high content of pentosanase), decorticated roasted and control diet were formulated. Parameters measured weekly were feed intake, body weight gain and Feed Conversion Ratio (FCR). Overall body weight, hot carcass weight and dressing percentage were recorded. Results revealed that inclusion of 10% soaked pigeon pea seed, decorticated with added enzyme (multi enzyme with a high content of pentosanase) and decorticated roasted had no significant ($p \geq 0.05$) effects on feed intake, weight gain, feed conversion ratio, final live body weight, hot carcass weight and dressing percentage. Inclusion of 10% processed pigeon pea seeds resulted in a similar performance of broiler chicks when compared with the control group.

Key words: Pigeon pea, soaking, roasting, decortications, broiler, enzymes

INTRODUCTION

Pigeon pea (*Cajanus cajan*) is an important grain legume commonly grown and consumed in tropical and subtropical regions of the world (ICRISAT, 1986). Pigeon pea occupies an important aspect in human nutrition as a source of dietary proteins in several countries. Pigeon pea contains a high level of crude protein ranges from 21-30% (Udedibie and Igwe, 1989; Amaefule and Onwudike, 2000). This provides the best source of feed for livestock in addition to manufacture of the byproduct. Pigeon pea was found to contain as percentage CP (22-27), CF (7.3-10), NFE 61.2, fat (1.7-2.1), ash (3.1-4.2), lysine about 7.59 (Morton, 1976; Grimand, 1988). Amino acid availability was 82.33% with low content of sulphur amino acids especially cystine and methionine. Moreover, pigeon pea is a good source of soluble vitamins especially thiamin, riboflavin, niacin and choline (Singh, 1977). The Metabolizable Energy (ME) content was 11.1 Mj/kg in the raw and 12.0 Mj/kg in the toasted seed meal according to Nwokolo (1987).

Pigeon pea (*Cajanus cajan*) seeds are currently considered as a non-conventional feed stuff in poultry feeding and as a valuable protein feed resource (Amaefule and Obioha 1998; Amaefule and Onwudike 2000). Polyphenolic compounds (commonly referred to as tannins), phytic acid, cyanogenic glycosides, etc. act as nutritional inhibitors in coarse grains. They have been reported to reduce the bio-availability of protein. Ene-Obong (1995) found that pigeon pea contain trypsin inhibitor (7.5-14.4 mg/g) and phytate (8.3-11.3 mg/g). Amaefule and Nowaghara (2004) reported that processing of pigeon pea seed improved its dry matter and crude protein retention especially boiling and toasting. Thus protease inhibitor and cyanogens, the two anti-nutritional factors in pigeon pea seed are heat labile and could be effectively removed by heat processing. Germination caused a marked improvement in the caloric value and some valuable nutrients of the seed. However, the increase content of tannin, total phenolics and trypsin inhibitory activity of the seed during progressive germination would certainly limit its nutritive quality (Ologo, 2004). Igbedioh *et al.* (1995) stated that cooking of soaked and dehulled seeds lowered total phenols contents of pigeon pea by 49% and sprouting of seeds increased the protein content and reduced the carbohydrate content. Mulimani *et al.* (1994) reported that soaking for 24 h followed by cooking for 20 min was effective in destroying the trypsin and chemotrypsin inhibitors. Hence the core objective of this study is to evaluate and compare the performance of broiler chicks fed different processed pigeon pea seeds.

MATERIALS AND METHODS

Experimental site, housing and duration: The experiment was conducted in the poultry research unit, Faculty of Animal Production, University of Khartoum during the period between September and October 2006 in which the ambient temperature ranged between 30-42°C.

The experiment was carried-out in an open house located East-west from cemented brick walls, Iron posts

with wire netting. The house was partitioned into 20 pens each of them one meter dimensions. The pens were cleaned by detergent and disinfected by long live (1 liter/100 liter) and vircon (1 kg/100liter). Every pen was covered with clean wood-shaving as bedding, each pen was provided one round fountain drinker and one tabular feed trough. Continuous lighting program was maintained for 24 h naturally and artificially during the six weeks.

Experimental birds: One hundred and forty of unsexed commercial broiler chicks (Ross) were purchased from Coral hatcheries and feed production farm located in Soba, Khartoum state. Some sugar was added to the drinking water at first day. The chicks were weighted and allotted randomly into 20 pens in groups of 7 chicks and replicated five times.

Experimental diets: Pigeon pea seed was subjected to different treatments, soaking, decortications or roasting. It was soaked in water for 10 h and then dry and samples was analyzed their chemical composition (Table 1). The decortication operation carried out by commercial machine while roasting was carried out by using electrical oven with controlled temperature distribution for 15 min at 100^{0}C.

Table 1: Proximate analysis (%) of processed pigeon pea seeds

Item	Soaked	Decorticated	Decorticated roasted
Dry matter	94.39	93.85	95.88
Ether extractives	1.23	1.21	0.98
Crude protein	22.39	23.98	22.4
Crude fiber	9.59	9.30	5.52
Ash	4.00	4.05	4.32
Nitrogen free extractives	56.64	55.26	62.66
ME (kcal/kg)	2605	2597	2846

ME Calculated according to equation of Lodhi *et al.* (1970)

Four experimental diets (Table 2) were formulated to meet the nutrient requirement of broiler chicks according to National Research Council (NRC, 1994). The diets were approximately isocaloric, isonitrogenous. Diet A control with 0% pigeon pea, diet B contained 10% soaked pigeon pea, diet C with 10% decorticated pigeon pea plus BERGAZYMP contains Endo-1,4-B-Xylanase, with 6.000 in EPU/g (Endo Pentosanase Units) and the dosage used is 25 g/100kg) and diet D with 10% decorticated roasted pigeon pea. Samples of experimental diets were approximately analyzed on dry matter basis for chemical composition according to AOAC (1990) (Table 4).

Management and data collection: Vaccination against new castle disease was carried out at day 7 and day 21 in drinking water. Vaccination against Gumboro vaccine was done at day 12 in drinking water. Parameters recorded weekly were live body weight, feed intake, weight gain and Feed Conversion Ratio (FCR) which was calculated for the individual replicates of each dietary treatment. At the end of the experimental period, 15 chicks were randomly selected from each dietary treatment (3 birds/replicate) and were leg-tagged. These birds were weighed individually and slaughtered. Birds were put in boiling water for few minutes and feathers were plucked manually, then the birds were washed and allowed to drain. The hot carcass weight was recorded and dressing out percentage was determined by expressing hot carcass weight to live weight.

Statistical analysis: Complete randomize design was used in the experiment. The data were subjected to analysis of variance according to the (Steel and Torrie, 1980), in SAS (1985) version 6.12. When significant differences occurred, Duncan's multiple test was used to separate treatment means.

RESULTS AND DISCUSSION

Chemical composition of processed pigeon pea seeds (Table 1) revealed that decorticated pigeon pea seed contained higher of CP compared to soaked and roasted pigeon pea which contain similar protein. However, decorticated roasted pigeon pea contained higher values of ME, NFE, Ash, Dry matter and lower content of EE, CP and CF compared to decorticated and soaked pigeon pea seeds. Relatively soaked and decorticated pigeon pea contained similar percentage of all components.

In the present study, Fig. 1, 2 and 3 show the data of weekly feed intake, weight gain and FCR, respectively, as affected by processed pigeon pea.

The overall performance of broiler chicks fed processed pigeon pea seeds is presented in Table 3. The overall feed intake was similar ($p \leq 0.05$) in all groups. This finding agreed with that of Scott *et al.* (1982), who reported that when diets were isocaloric, the birds were expected to consume similar quantity of feed. Moreover, this might have been due to efficient processing which decrease the harmful effect of antinutritional factors (D'Mello, 1995 and Onu and Okongwu, 2006). Moreover, this may indicated that palatability was not affected by processing operation.

Regarding the overall weight gain, there were no significant ($p \geq 0.05$) differences among the groups fed on different experimental diets. Birds fed control diet recorded numerically, higher weight gain followed by the group received diet containing decorticated pigeon pea seeds supplemented with enzymes and that fed decorticated roasted diets. Whereas, those fed on soaked pigeon pea seeds showed the lowest weight gain.

Improvement in overall performance for all groups other than the control may due to the higher level of lysine

Table 2: Composition of experimental broiler diets containing 10% processed pigeon pea seeds

	Experimental diets			
Ingredients, %	Control	Soaked pigeon pea	Decorticated pigeon pea + enzymes	Decorticated roasted pigeon pea
Sorghum	61.7	55.5	55.5	55.5
Groundnut meal	20	20	20	20
Sesame meal	8.3	4.1	4.1	4.1
Wheat bran	1.94	0.4	0.8	0.8
Super concentrate*	5	5	5	5
Pigeon pea	0	10	10	10
Dicalcium phosphate	1.45	1.4	1.6	1.6
Methionine	0.1	0.001	0.001	0.001
Oil	1	3.1	2.5	2.5
Premix**	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Calculated analysis (%)				
CP%	22.76	22.50	22.66	22.66
CF%	4.55	4.67	4.35	4.35
ME (kcal/kg)	3123.89	3101.70	3109.74	3109.74
Lysine%	1.10	1.70	1.70	1.70
Methionine%	0.53	0.48	0.48	0.48
Ca%	1.04	0.945	0.99	0.99
Available phosphorus	0.458	0.43	0.46	0.46
Determined analysis (%)				
DM	95.03	95.02	95.50	94.5
EE	1.91	5.76	5.69	6.67
CP	25.55	25.38	24.15	24.15
Ash	8.05	7.35	8.02	7.39

*Super concentrate contains (%) CP 40, lysine 10, methionine 3, methionine + cystine 3.3 Ca 10, Available phosphorus 6.40, CF 1.44, C fat 3.90 ME 1750 kacal/kg, crude minerals 39.30. **Vitamin composition per kg of diet Vitamin A = 200.000 IU, vit D_3 = 70.000 IU, B_1 = 50 mg, B_2 = 120 mg, B_{12} = 180 mg, K_3 30 mg, Niacin 440 mg, Zinc 1.6 mg, Copper 450 mg, iodine 550 mg Selenium 8 mg, Cobalt 9 mg, Iron 580 mg, Molyden 20 mg

Table 3: Effect of feeding processed pigeon pea on overall performance of broiler chicks

	Experimental diets				
Parameters	Control	Soaked pigeon pea	Decorticated pigeon pea + enzymes	Decorticated roasted pigeon pea	±SEM
Feed intake	3108.52±6.32	2950 40±6.32	2996.50±1.85	3086.80±5.80	38.30
Weight gain	1594.56±6.12	1511.60±6.90	1552.00±9.92	1520.21±7.07	20.46
FCR	1.95±0.07	1.95±0.10	1.93±0.03	2.03±0.03	0.019

Values are means (±SD) of 5 replicates of 7 birds/ treatment. SEM: Standard error of the means from AVOVA d.f. 16

Table 4: Average live weight, hot weight and dressing out percentage of broilers fed diets containing processed pigeon pea seeds during 0-6 week

	Experimental diets				
Parameters	Control	Soaked pigeon pea	Decorticated pigeon pea + enzymes	Decorticated roasted pigeon pea	±SEM
Live weight, g	1754.67±10.0	1735.73±7.07	1787.87±3.67	1633.73±7.91	27.80
Hot weight, g	1174.93±14.14	1143.47±15.81	1201.33±10.25	1091.87±6.12	20.40
Dressing out%	66.89±3.67	65.87±2.12	67.20±3.08	66.63±1.41	0.294

Values are means (± SD) of 5 replicates. SEM: Standard error of the means from AVOVA d.f. 16

intake. This findings support that obtained by Anderson and Warnick (1967).

The improvement in performance in broiler fed decorticated pigeon pea seeds may due to the supplementation of multiple enzymes with a higher content of pentosnase and this consequently, lead to more feed intake which improved the gain.

In response to overall FCR, there were no significant ($p \geq 0.05$) difference between birds fed different diets. However, the poorest FCR was recorded for group fed roasted pigeon pea seeds diet. This result agreed with that obtained by Geervani (1970), who related the negative response of FCR to the destruction of lysine and methionine in the roasting process. In addition,

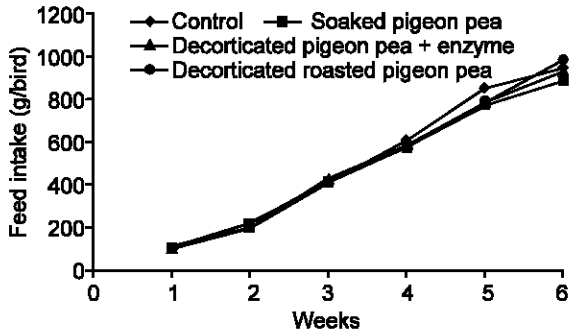

Fig. 1: Effect of pigeon pea seeds on broilers' feed intake

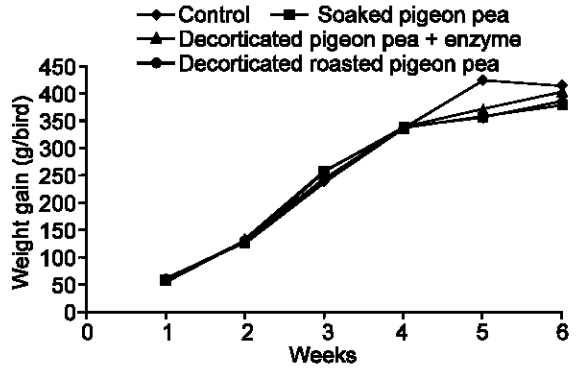

Fig. 2: Effect of pigeon pea seeds on broilers' weight gain

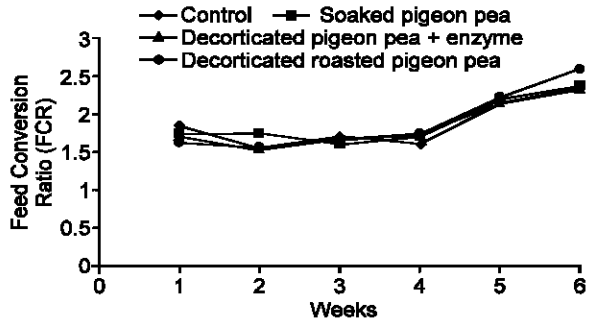

Fig. 3: Effect of pigeon pea seeds on broilers' feed conversion ratio

Wallis and Balnave (1984) stated that lysine, glutamic acid, aspartic acid and threonine most liable to be damage by heat.

The effect of dietary treatments on final live body weight, hot carcass weight and dressing percentage of broilers was shown in Table 4. There was no great difference between groups on live body weight, hot carcass weight and dressing percentage. Birds fed decorticated pigeon pea seed performed the best followed by control group, soaked group and decorticated roasted group. This best performance may be due to the supplementation of multiple enzymes which may enhance digestibility and this lead to better performance.

Conclusion: Chemical Composition of processed pigeon pea seeds showed that nutritional value of pigeon pea was suitable to be used in broiler diets as source of protein at 10% levels without any adverse effect. The result obtained from this study demonstrated that there are no great differences between processed pigeon pea seeds (soaked, decorticated + enzyme and decorticated roasted) in overall performance of broiler chicks compared to control group.

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