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# Determination of the optimum dietary levels of cracked and cooked jackbean meal for finisher broilers

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## Abstract

*A 35-day feeding trial was conducted to determine the optimal dietary level(s) of cracked and cooked (CAC) jackbean meal for finisher broilers. Five diets were formulated such that they contained cracked and cooked jackbean meal at 0%, 15%, 20%, 25% and 30% levels respectively. Each diet was fed to a group of 45 finisher broiler birds beginning at 5 weeks of age. Average daily feed intake of the groups were 99.00g, 95.00g, 89.00g, 89.00g and 90.00g for the control, 15%, 20%, 25% and 30% respectively. Body weight gains were 34.00g, 33.00g, 30.00g, 27.00g and 23.00g respectively and feed conversion ratio for the groups were 2.95, 2.88, 2.91, 3.25 and 3.83 respectively. There were no significant (P > 0.05) differences among the control (0%), 15% and 20% groups in feed intake, body weight gain and feed conversion ratio. The 25% and 30% groups however, showed significantly (P < 0.05) depressed body weight gain and poor feed conversion ratio. Organ weights of the birds relative to body weight did not indicate any significant differences among the five experimental groups. The results of this trial suggest that the optimal dietary inclusion of cracked and cooked jackbean meal for finisher broiler is 20%*

**Keywords:** *Cracked and cooked jackbean (CAC), optimal level, broiler finisher diet*

## Introduction

One strategy for alleviating animal food shortages is to develop novel feed materials unsuitable for human use but which could be incorporated in livestock feed. Jackbean, a tropical legume, has a high potential as an energy and protein supplement in livestock feed. The crude protein content of the ripe seed ranges from 26 to 32% on dry matter basis and the protein has relatively good amino acid profile (Udedibie, 1990).

However, the use of raw jackbean as protein for non-ruminants is limited by its content of anti-nutritional factors (ANF). These include the alkaline amino acid, canavanine, concanavalin A and B, and the enzyme urease (Udedibie *et al*, 1986). In addition to these anti nutritional factors, jackbean contains Saponins, alkaloids, glycosides and terpenoids (Esonu, 1996).

Earlier studies have shown that heat treatment alone (Udedibie *et al.*, 1986), addition of ferrous sulphate to heat treated jackbean (Imo, 1988), dry urea treatment prior to toasting (Udedibie *et al.*, 1994), 2 – stage cooking (Esonu, 1996), sprouting and boiling (Esonu *et al.*; 1997) and fermentation (Esonu *et al.*, 1996) only gave indications of partial detoxification, hence its dietary inclusion could not exceed 20%.

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**Table 1** *Proximate composition of cracked and cooked jackbean meal (% of DM)*

| Component | % |
|---|---|
| Moisture | 12.66 |
| Dry matter | 87.35 |
| Crude protein | 24.44 |
| Crude fibre | 11.05 |
| Ether extract | 2.28 |
| Ash | 2.98 |
| Nitrogen free extract | 59.26 |

Recently Udedibie and Carlini (1998) reported that by cracking jackbean seed into pieces (3 – 7 pieces per seed), both the protease inhibitors and Concanavalin A in the seed could be eliminated within an hour of cooking. Hence, jackbean so processed has not been tested on farm animals.

This study was therefore designed to determine the optimal dietary inclusion of cracked and cooked (CAC) jackbean meal for broiler finishers.

## Materials and methods

Jackbean were cracked to pieces of 3 – 7 parts/seed using 2mm screen Wiley mill adjusted plate electric grinding machine. The cracked jackbeans were then cooked for one hour at 100$^0$C, timed from boiling, sun dried and finally ground into a meal. A sample of the materials was analysed for proximate chemical composition (AOAC, 1995), (Table 1). The jackbean meal so prepared was used to formulate diet for broiler finisher chicks at 0%, 15%, 20%, 25% and 30% inclusion levels respectively (Table 2).

Two hundred and twenty-five, 5-week old broiler birds of Hubbard breed were randomly assigned to five treatment diets. Each group was further sub-divided into 3 replicates of 15 birds per replicate in a completely randomized design (CRD). Each replicate was kept in a compartment measuring 4m x 6m. Feed and water provided *ad lib*. The birds were weighed initially and thereafter on a weekly basis while feed intake was recorded daily.

At 10 weeks, two birds per replicate were fasted for 18 hours, slaughtered and eviscerated. Weight of the liver, heart, gizzard, GIT (less gizzard) and carcass were recorded and expressed as percentage of live weight.
Data collected were subjected to analyses of variance (Snedecor and Cochran, 1978). Where significant differences were observed between treatments, the means were compared using Duncan's New Multiple Range test as outlined by Obi (1990). The experiment lasted for 35 days.

## Results and discussion

The proximate composition of the CAC jackbean is presented in Table 1. The nutrient and chemical composition of the experimental diets are shown in Table 2, while data on the performance of the birds and their proportion of internal organ are presented on Table 3.

Feed intake of the group on the control (0%) diet was significantly ($P < 0.05$) higher than of those of the 20%, 25% and 30% CAC jackbean meal (JBM) groups. The lowest feed intake was recorded from the 20% group. The body weight gain of the groups on 15% and 20% CAC and JBM compared favourably with the control (0%) group. Birds on 25% and 30% CAC JBM recorded significantly ($P < 0.05$) depressed body weight gain when compared with those on the control (0%), 15% and 20% CAC JBM. The feed conversion ratio recorded from birds on control (0%) 15%, 20% and 25% CAC JBM were significantly ($P < 0.05$) better than that from the 30% group. The relative organ weights did not indicate any significant differences among the five experimental groups.

Jackbean has been processed in various ways by different investigators with their results indicating no more than partial detoxification (Udedibie *et al.*, 1994; Aguirre-Montaya, 1998; Melcion *et al.*, 1995; Esonu, 1996; Pino *et al.*, 1997), which limited its dietary inclusion to 15 – 20%.

The results of this trial shows that cracking the jackbean before cooking for one hour (CAC) could not also improve its nutritive value beyond 20% dietary level compared to 30% optimal dietary level of soybean meal. Although this method is a significant improvement over earlier processing methods, being a process so simple as to be started and finished in a day, it shows that CAC jackbean still contain some other anti-nutritional factors, possibly canavanine and yet to be identified ones.

**Table 2** *Composition of the treatment diets (g kg$^{-1}$)*

| Ingredients | Dietary levels of Jackbean Meal (%) | | | | |
|---|---|---|---|---|---|
| | 0 | 15 | 20 | 25 | 30 |
| Maize | 550 | 430 | 400 | 370 | 340 |
| Soybean meal | 150 | 120 | 100 | 80 | 60 |
| Jackbean meal | 0 | 150 | 200 | 250 | 300 |
| Wheat offal | 130 | 130 | 130 | 130 | 130 |
| Palm kernel cake | 80 | 80 | 80 | 80 | 80 |
| Fish meal | 30 | 30 | 30 | 30 | 30 |
| Blood meal | 20 | 20 | 20 | 20 | 20 |
| Oyster shell | 150 | 150 | 150 | 150 | 150 |
| Bone meal | 20 | 20 | 20 | 20 | 20 |
| Vit/Min Premix* | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Common salt | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| *Chemical composition gkg$^{-1}$DM* | | | | | |
| Crude protein | 1954 | 2055 | 2050 | 2044 | 2039 |
| Crude fibre | 567 | 565 | 593 | 622 | 630 |
| Ether extract | 383 | 354 | 345 | 336 | 327 |
| Calcium | 149 | 148 | 148 | 147 | 147 |
| Phosphorus | 7.0 | 7.1 | 7.1 | 7.2 | 072 |
| L – Methionine | 3.3 | 3.0 | 2.9 | 2.8 | 2.6 |
| L – Lysine | 100 | 165 | 184 | 203 | 223 |
| Calorie/protein ratio | 1.6 | 1.5 | 1.5 | 1.5 | 1.5 |
| ME (MJ/kg)** | 12.82 | 12.52 | 12.46 | 12.38 | 12.30 |

*To provide the following per kg of feed
Vit A, 10,000.00iu; $D_3$ 2,000.00iu; $B_6$, 500iu, Vit K, 2mg; Riboflavin, 3mg; Panthotenic acid, 5mg; Nicotinic acid 20mg; Chlorine, 5mg; Vit. $B_{12}$, 0.08mg; Folic acid, 4mg; Mn, 8mg; Zn, 0.5mg; Iodine, 1.0mg; Iron, 20mg; Cu, 10mg; co, 124mg.
**Calculated values.

**Table 3** *Effect of dietary levels of cracked and cooked jackbeans on the performance and internal organs of finisher broilers*

| Parameters | Dietary levels of CAC JBM | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 15 | 20 | 25 | 30 | SEM |
| Initial body weight (g) | 434.0 | 433.0 | 434.0 | 432.0 | 432.0 | 0.45 |
| Final body weight (g) | 1625.0$^{a}$ | 1592.0$^{a}$ | 1500.0$^{ab}$ | 1396.0$^{b}$ | 1255.0$^{c}$ | 8.62 |
| Body weight changes (g) | 1191.0$^{a}$ | 1159.0$^{a}$ | 1006.0$^{ab}$ | 964.0$^{b}$ | 823.0$^{c}$ | 8.58 |
| Daily weight gain (g) | 34,03$^{a}$ | 33.11$^{a}$ | 30.46$^{ab}$ | 27.54$^{b}$ | 23.51$^{c}$ | 1.92 |
| Daily feed intake (g) | 99.20$^{a}$ | 95.43$^{ab}$ | 88.69$^{c}$ | 89.47$^{bc}$ | 89.95$^{bc}$ | 2.04 |
| Feed conversion ratio (g feed/g.gain) | 2.95$^{a}$ | 2.88$^{a}$ | 2.91$^{a}$ | 3.25$^{a}$ | 3.83$^{b}$ | 0.18 |
| *Organs (% body weight)* | | | | | | |
| Dressing | 60.74 | 59.30 | 59.71 | 60.77 | 58.67 | 1.86 |
| Gizzard | 3.38 | 3.19 | 3.92 | 3.19 | 3.38 | 0.27 |
| GIT (less gizzard) | 5.86$^{a}$ | 5.83$^{a}$ | 5.52$^{a}$ | 6.10$^{a}$ | 7.32$^{b}$ | 0.32 |
| Heart | 0.45 | 0.47 | 0.45 | 0.42 | 0.44 | 0.01 |
| Liver + Gall bladder | 2.03$^{a}$ | 1.93$^{ab}$ | 1.83$^{b}$ | 2.02$^{a}$ | 1.93$^{ab}$ | 0.04 |

$^{abc}$Means within rows with different superscripts are significantly different ($P < 0.05$)

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