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EEFECT OF CRUDE PAPAIN ON THE NUTRITIVE VALUE OF RAW, TOASTED AND COOKED JACKBEAN FOR BROILER FINISHER.

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Target audience: Nutritionists , farmers and feedmillers.

ABSTRACT

Jackbeans were divided into four batches . The first batch was milled raw. The second batch was milled raw and mixed with natural papain (2% of the weight of the jackbean meal). The third batch was milled raw before subjecting it to local toasting at temperature fluctuating between 100 and 120° C until it became crispy. The toasting that lasted for 15-20 minutes involved adding about one kilogramme of the meal unto a pan already set on a burner and steadily turning it until it became dark yellow in colour. Natural papain (2% of the weight of jackbean) was thoroughly mixed with it. The fourth batch was cooked for 60 minutes (one hour straight cooking), sun-dried and milled.

This was also thoroughly mixed with natural papain (2% of its weight). The jackbean meals so prepared were used to formulate broiler finisher diets at 0% and 20% dietary levels repectively. Each diet was fed to forty eight(48) young broilers at their finisher phase. At 20% dietary levels, jackbean meal so prepared significantly (P< 0.05) depressed performance of broiler birds.

The result of this trial showed that natural papain at this level could not improve the nutritive value of jackbean.

Keywords: Jackbean meal, Papain, Broiler birds

DESCRIPTION OF PROBLEM

There has been rapid expansion in commercial poultry production in Nigeria within the past decade . However gross inadequacy of protein supplement (concentrates) for poultry ration has become a matter of great concern. The bulk of the feed cost arises from protein concentrates such as groundnut cake, fish meal, soybean meal etc. These conventional protein sources and their prices have hiked so high in recent times that many poultry farmers have sealed up their poultry business.

There is need, therefore, to turn attention to exploitation of other novel legumes particularly those that are indigenous to our tropical environment.

Canavalia ensiformis, commonly known as jackbean has been identified as a high forage and seed yielding tropical legume, currently used in Nigeria as ornamental plant, grown near houses and allowed to trail on walls and trees. It has high potential as energy and protein supplement in livestock feeds.

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 (1). Unfortunately the use of raw jackbean as protein feed for non-ruminants is limited by its content of anti-nutritional factors . These include the protein concanavalin A and B the enzyme urease and the alkaline toxic amino acid canavanine (2). In addition, It contains saponins, alkaloids, glycosides and terpenoids (1).

The most important of these anti-nutritional factors is concanavalin A, which binds to the mucosal cells lining the intestine and thus reduces the body's ability to absorb nutrients from the intestine (3,4).

Papain, a proteolytic enzyme is a protein denaturing agent. It was articulated that papain could have a detoxifying or modifying effect on the toxic components of the jackbean so as to improve its nutritive value.

The trial herein described was therefore conducted to test the efficacy of natural papain as a method of improving the nutritive value of the jackbean for finisher broilers.

MATERIALS AND METHODS

The jackbeans used for this study were produced at Vom in Plateau State of Nigeria and papain harvested from unriped paw-paw fruits. The jackbeans were divided into four batches. One was milled raw using a 2mm screen , wiley mill. The second batch milled raw was mixed with natural papain (2% of its weights, dissolved in 10 litres of water). The third batch was also milled raw before subjecting it to local toasting at temperatures fluctuating between 100 and 120^{0}C until it became crispy. The toasting which lasted for 15 - 20 minutes involved adding about one kilogramme of the meal unto a pan already set on a burner and steadily turning it until it became dark yellow in colour, 2% of its weight of natural papain was dissolved in 10 litres of water and thoroughly mixed with it. The fourth batch was cooked for 60 minutes (one hour straight cooking), sun dried and milled and 2% of its weight of natural papain also dissolved in 10 litres of water and thoroughly mixed with it. Samples of the four jackbean meals so prepared were analysed for proximate composition (5) while the gross energy was determined with a Gallenkamp Oxygen adiabatic bomb Calorimeter (Table 1) .

Using value from the chemical analysis, five dierary treatmens were formulated. The control diet (Diet 1) contained no jackbean. The jackbean meals so prepared were used to formulate broiler finisher diets at 20 % dietary level. (Table 2).

Table 1: Proximate composition of raw, toasted and cooked jackbean mixed with natural papain.

	RJB No-Papain	RJB + Papain	TJB + Papain	CJB + Papain
Crude protein	28.54	34.13	34.63	33.10
Crude fibre	7.82	7.60	7.60	6.55
Ether Exract	3.12	3.11	3.10	3.05
Total Ash	3.71	4.12	4.0	4.50
Calcium	0.14	0.13	0.12	0.12
Phosphorus	0.71	0.68	0.63	0.70
Gross Energy (kcal /g)	4.70	4.70	4.70	4.61

*All value expressed as 100% dry matter basis.

RJB - Raw jackbean meal

RJB + Papain- Raw jackbean meal plus papain

TJB + Papain - Toasted jackbean meal plus papain

CJB + Papain - cocked jackbean meal plus papain.

Two hundred and forty (240) 21- day old broiler chicks of Anak breed were divided into five groups of 48 and each group randomly assigned to the five treatment diets in a completely randomized design. Each treatment group was further sub-divided into three replicates and kept in a 4m x 5m compartment. They were weighed at the beginning of the experiment and once a week thereafter. Feed and water were provided *ad-libitum*. Feed intake was recorded daily and feed conversion ratio subsequently computed. The data collected were subjected to analysis of variance (6). When analysis of variance indicated significance for treatment effect, specific differences between means were detected (7). The trial lasted for 28 days

RESULTS AND DISCUSSION

The calculated composition of the treatment diets is shown on Table 2, while the proximate composition of the jackbean meals prepared is presented on Table 1. Data on the performance of the young broiler chicks on the five treatment diets are shown on Table 3.

Table 2. Composition of the treatment diets

Ingredients	Levels of inclusion (%).				
	Control 0	RJB*** No-Papain 20	RJB*** Papain 20	TJB*** Papain 20	CJB*** Papain 20
Maize	55.0	40.0	40.0	40.0	40.0
Soybean meal	15.0	12.0	12.0	12.0	12.0
Jackbean meal	0.0	20.0	20.0	20.0	20.0
Groundnut meal	5.0	4.0	4.0	4.0	4.0
Palm kernel meal	3.5	2.50	2.50	2.50	2.50
Fish meal	3.0	3.0	3.0	3.0	3.0
Blood meal	5.0	5.0	5.0	5.0	5.0
Bone meal	3.0	3.0	3.0	3.0	3.0
Wheat offal	9.50	9.50	9.50	9.50	9.50
Common salt	0.25	0.25	0.25	0.25	0.25
Vit/premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Calculated Chemical Composition (% of Dm)					
Crude Protein	22.32	23.10	23.15	23.06	23.21
Crude fibre	5.51	5.67	5.80	5.33	5.87
Ether Extract	5.35	5.46	5.10	5.10	5.14
Total ash	4.15	4.02	4.22	4.13	4.12
Calcium	1.40	1.26	1.12	1.11	1.28
Phosphorus	0.79	0.64	0.60	0.63	0.65
Methionine+ Cystine**	0.52	0.56	0.53	0.54	0.55
Lysine**	0.87	1.04	1.00	0.99	0.01
ME (kacl/g)**	2.86	2.58	2.88	2.86	2.88

*Pfizer premix to provide the following per kg of feed Vit A - 10,000 iu; D_3-2,000 iu; Vit B_6. 5000 iu; Vit K, 2mg; Riboflavin, 3mg; panthotenic acid, 5mg; Nicotinic acid, 20mg; Choline, 5mg; Vit B_{12}, 0.08mg; Folic acid, 4mg; Mn, 8mg; Zn, 0.5mg; Iodine, 1.0mg; Iron, 20mg; Cu, 10mg; Co, 125mg.

** Calculated value

**RJB = Raw jackbean

***TJB = Toasted jackbean

***CJB = Cooked jackbean

At dietary level of 20% raw, toasted or cooked jackbean mixed with crude papain significantly ($P< 0.05$) depressed feed intake and body weight gain.

There was no significant difference ($P> 0.05$) among the different groups in feed conversion ratio. It is known that heat denatures proteins, thereby destroying their biological activities. This is mostly applicable to the thermostable ones, although the nature of the solubilized nitrogenous compounds arising from this process was not determined. This might have been partly responsible for the marginal non-significant ($P> 0.05$) increase in feed intake and weight gain of the groups on the jackbean so processed (Diets 4 and 5).

Table 3: Effect of raw (RJB), toasted (TJB) and cooked (CJB) jackbean mixed with natural papain on the performance of finisher broilers.

	Control 0	RJB + No-Papain 20	RJB + Papain 20	TJB + Papain 20	CJB + Papain 20	SEM
Initial body weight (g)	700.00	710.0	710.0	710.0	710.0	0.99
Final body weight (g)	2040.0[a]	1381.0[b]	1410.6[b]	1510.0[b]	1680.0[b]	2.02
Av. daily body wt gain (g)	47.85[a]	23.96[b]	25.02[b]	28.57[b]	33.44[b]	3.10
Av. daily feed Intake (g)	146.0[a]	78.3[b]	80.45[b]	101.3[b]	104.1[b]	5.33
Feed conversion Ratio (g feed/g gain)	3.05	3.27	3.23	3.54	3.11	0.34
Mortality (number)	0.0	0.0	0.0	0.0	0.0	--

[ab]Mean within rows with different superscripts are significantly different (P<0.05).

This results agrees with earlier observation (8, 9, 10) that raw, toasting or one stage cooking could not improve the nutritive value of jackbean beyond 10% dietary level.

Although the exact mode of action of papain from unripe pawpaw on the thermostable anti nutritive factors in the jackbean is not clear, it seems that it could not improve, the nutritive value of jackbean for broiler birds up to 20% dietary level. This is reflected in the poor performance of the broiler birds.

The results of this study suggest that natural papain could not improve the nutritive value of jackbean.

CONCLUSION AND APPLICATION

The present study shows that: (1) crude papain at this level could not improve the nutritive value of jackbean, (2) there may be need to increase the level of the papain in the diet and also determine the mode of action on the thermostable antinutritive factors in jackbean.

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