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DIETARY EFFECT OF RAW AND TREATED JACKBEAN (*CANAVALIA ENSIFORMIS*) ON THE PERFORMANCE OF POULTRY: A REVIEW

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ABSTRACT

Jackbean (Canavalia ensiformis) is a relatively good source of protein and apparent metabolizable energy (AME) for young chicks. The use of untreated Canavalia ensiformis seed as a feedstuff for poultry is restricted due to the presence of antinutritional factors, as is the case with the other tropical legumes. The antinutritional constituents of Canavalia ensiformis have been reported to include trypsin inhibitors and concanavalin A which are heat-labile and canavanine and canaline which are hydrosoluble. Canavalia ensiformis seeds can be used as an animal feed ingredient, since they are a good source of starch and protein. However, in order to be use as animal feed ingredient, Canavalia ensiformis seeds would have to be thermally processed. Heat processing is universally accepted as and effective means of inactivating most, if not all of the heat-labile toxic constituents of legume grains. Canavalia ensiformis is a starch storing seed and on the basis of the apparent nutrient content, it should be an extremely useful ingredient in animal feeds. Research has showed that dietary inclusion of detoxified jackbean seed between 20-30% in ration is capable of supporting growth in poultry ration without adverse effects on performance and physiological parameters of poultry animals.

INTRODUCTION

Jackbean (*Canavalia ensifromis*) has a high potential as an economic crop due to its excellent agronomic characteristics. Its excellent germination and rigorous initial growth make its establishment relatively easy (Udedibie, 1997). The crude protein content of dry ripe jackbean seed ranges from 26 to 32%. Udedibie (1990) reported that raw jackbean seeds contain about 30% crude protein and 60% nitrogen free extract. Bressani *et al.* (1987) reported that jackbean contained about 1.8% ether extract, 8.5% crude fibre, 3.2% ash, 13.5% moisture, 26% crude protein and 46.1% carbohydrate. D'Mello *et al.* (1985) reported 2.12%, 2.8% and 9.24% for ether extract, ash and crude fibre, respectively. Studies by Udedibie and Madubuike (1988) showed that jackbean contains about 3.16% ether extract, 3.73% ash and 7.8% crude fibre. The ether extract and ash contents of jackbean seeds are quite low while the crude fibre is slightly high. The gross energy content of 4.26kcal/g for raw jackbean seeds was reported by Udedibie and Madubuike (1988) for raw jackbean seeds.

Jackbean seed is relatively low in the sulphur amino acid, methionine, but high in lysine. It contains significant amounts of thiamine, niacin, phosphorus, calcium and iron (Bressani, *et al.*, 1987; D'Mello *et al.*, 1985; Udedibie and Nwaiwu, 1988; Leon *et al.*, 1990).

It has been reported by Bressani *et al.*, 1987 that both wet and dry thermal treatment resulted in a beneficial effect on protein quality with protein efficiency ratio (PER) increasing from raw seed value of 0.10 to 1.21 and 1.18 for wet and dry cooking respectively. Thermal treatment also increased protein digestibility from 47.9% for raw seeds to 76.4% and 78.7% for wet and dry cooking respectively. These workers also reported the protein quality to be 41.5% as compared with that of casein. This value is similar to that of common food legumes (Bressani, 1987).

DISCUSSION

The proximate chemical composition of jackbean has been studied and it appears to be suitable for poultry nutrition. Kesseler *et al.*, (1990) reported that the amino acid composition of jackbean protein is very similar to that of roasted soybean meal with jackbean containing slightly less lysine than soybean and both having respectively low levels of methionine and cystine.

Jayne-Williams (1973) fed diets incorporating 500g/kg raw *Canavalia ensiformis* seeds to Japanese quails *(Coturnix coturnix japonica)* and obtained 100% mortality. However, when the *Canavalia ensiformis* was autoclaved, mortality was nil. Laviada (1983) included raw *Canavalia ensiformis* in chick diets at levels of 0, 100, 200 and 300g/kg, mortality increased as the inclusion level increased and reached 50% at the 300g/kg level. In a study by Dixon *et al.* (1983), they reported that autoclaved jackbean seeds included at levels of 100 and 150g/kg in chick diet led to growth rate increases of 76% in comparison with that of the raw seeds. Udedibie and Madubuike (1988) in their experiment on the dietary effect of raw and cooked jackbean seeds on the performance of laying hens, showed that dietary inclusion of raw and cooked jackbean seeds at 20% level in the feed, depressed feed intake and percent hen-day egg production with the raw jackbean meal causing greater depression in animal performance.

D'Mello *et al.* (1989) demonstrate substantial improvement in the performance of chicks by supplementing diets containing autoclaved jackbeans with arginine. Kessler *et al.* (1990) in their study examined the effect of two lengths of time of autoclaving the seed of jackbean on the performance of chicks fed with the diets at an inclusion level of 300g/kg diet for the whole of an eight-week growing period and for the finishing (weeks 5 to 8) period only. These workers observed faster growth rates in those birds fed autoclaved *Canavalia ensiformis* for 5-8 weeks, compared with those that received the same treatment from 1-8 weeks. This suggests that the older birds were less sensitive to the anti-nutritive effect of *Canavalia ensiformis* than the young birds.

D'Mello and Walker (1991) in their experiment with young chicks, reported that inclusion of $KHCO_3$-extracted jackbeans at levels of up to 280g/kg diet allowed growth rates, intakes of feed and apparent metabolisable energy and efficiency of feed utilization which were equivalent to those observed in the control groups. Practical experiment on laying hens and broilers showed a severe reduction of feed intake, feed conversion and growth rate for dietary levels as low 10% raw jackbean seeds (Montilla *et al.*, 1981; Vierma, 1984; Carabano *et al.*, 1985).

Studies by Oyawoye and Ogunkunle (1998) on the effects of raw jackbean meal on performance of broilers, showed that both feed intake and body weight gain were reduced as the dietary level of raw jackbean meal increased, but the reduction became significant only at levels above 10% in the diet. Laying hens were reported to be more tolerant, although even in these birds, egg production was severely curtailed by the inclusion of 200g/ jackbean per kilogram of the diet (Herrera *et al.*, 1981).

Ensiling with ammonia or urea also seems to be successful in decreasing the toxicity of jackbeans for chick. The combination of autoclaving and ensiling gave better results than simple ensiling (Montilla *et al.*, 1981). Probably because of the solubilisation of the toxic factor in the alkaline (urea) solution (Ologhobo *et al.*, 1993). Dry urea ensiling before toasting is effective, up to 200g/kg diet jackbeans treated with dry urea and toasted did not have deleterious effect on broiler performance (Udedibie *et al.*, (1994).

Udedibie *et al.*, (2000) showed that cracking and cooking of jackbean alone is not a good method of processing because dietary inclusion above 20% for broilers resulted in declined performance. Soaking the cracked seeds in urea solution for 24 hours prior to cooking could not appreciably improve its nutritive value when included in broiler diets above 20%. Soaking the cracked jackbean seed in water for 24 hours prior to cooking for an hour gave the best results, warranting dietary inclusion level of up to 30%. Perhaps, prolonging the period of soaking in water could result in better performance (Udedibie *et al.*, 2000).

Fabiyi, (1999) reported that detoxified jackbean meal can be included at levels up to 20% in broilers rations without adverse effect on performance and physiological parameters of the broilers.

CONCLUSION

Canavalia ensiformis has a protein quality similar to that of most edible food legumes. Another fact that is of interest is that apparently a simple dry cooking process can improve its nutritional quality. Thus, the use of the processed seeds in animal feeding, particularly for monogastrics, is a possibility. Further research should be geared towards examining the effect of processing methods on the nutritive quality of jackbean and in addition, effort should be intensified on devising ways of improving the palatability of jackbean for poultry feeding, in order to enhance feed intake. Detoxified jackbean *(Canavalia ensiformis)* has high potentials for poultry feeding in Nigeria (Fabiyi, 1999).

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