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Research Paper

Effect of decorticating and cooking lablab seeds on performance and cost of producing table rabbits

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Abstract. A study was conducted to compare feed value of rabbit diets containing decorticated and cooked lablab seeds. Four weaner-rabbits were assigned to each of treatments T1, T2 and T3 in a completely randomized design, with one rabbit serving as a replicate. Rabbits in T1 were fed toasted un-extracted soybeans as the main nitrogen source in diet. T2 and T3 diet contained decorticated lablab seeds and boiled lablab seeds respectively with shared contribution of dietary protein with soybeans on a 50:50 basis. Weight gains, feed intake, nutrient content of feed and faeces, and carcass parameters were taken and the data was analysed using analysis of variance. Daily weight gains were 14, 11 and 15 g; feed conversion was 3.1, 4.3 and 3.2, while carcass dressing% was 60, 55 and 57 for T1, T2 and T3 respectively. T1 exhibited higher Nitrogen-free-extract digestibility than the other treatments. There was no significant ($P < 0.05$) difference in meat yield between the Treatments, but cost of production and profitability were best for T3. It was concluded that the use of lablab seeds boiled in water could be recommended for the feeding of growing rabbits.

Keywords: Economics, growth, Lablab-seed, meat-rabbit, processing, response.

INTRODUCTION

High feed cost is the major constraint in the development of animal production in developing countries, such as Nigeria, where many of the conventional livestock feed ingredients like maize and soybeans, also serve the roles of human food staples (Shaahu *et al*., 2008). There is therefore an urgent need to develop alternatives to these conventional livestock feed resources, so that the production and consumption of animal products may continue in the desirable path of rapid growth. One such alternative could be the seeds of *Lablab purpureus*, one of the numerous grain legumes that are readily available, but not preferred by humans as food. Lablab is, therefore, underutilized and cheap, compared to other leguminous seeds of equivalent nutrient composition. Unleashing the potential of lablab, such that it becomes major livestock feed resource, would be a breakthrough in animal production in Nigeria.

Lablab seeds contain 23 to 29% crude protein (Osman, 2007; Shaahu *et al*., 2008), and the fact that it contains more than twice the crude fiber content of soybean seeds makes it a good feed resource for animals such as rabbits that require a minima of dietary fiber for their digestive systems to function optimally (de Blass and Wiseman, 2010; Sarwatt *et al*., 2005). Like many other legumes, the raw seeds of lablab are reported to contain significant quantities of anti-nutritional factors, such as lectins, cyanic acid, saponins, and inhibitors of enzyme systems like trypsin and urease (Kaankuka, 1998). The deleterious effects of these anti-nutrients are usually manifested as depressions in feed intake, nutrient utilization and growth rate. Various methods of processing, such as soaking, maceration, decortication, fermentation, and cooking by mironisation, roasting and boiling, has been shown to counteract the effect of these anti-nutrients (Liener and Kakade, 1980; Kaankuka, 1998).

The search for solutions to the problem of availability and consumption of animal protein for the general populace in underdeveloped societies cannot be confined to feed cost alone, but must also take livestock characteristics into consideration. This brings rabbits into focus, because they are fast growing, with short gestation length, and have early sexual maturity, high prolificacy and ability to rebreed shortly after parturition. Rabbit should, therefore, be used more in research, so that their full potential may be highlighted and exploited.

This study is aimed at evaluating the effects of boiling and decortication of lablab seeds on nutrient digestibility and utilization, growth rate and feed cost in the production of table rabbits.

MATERIALS AND METHODS

The study was carried out at the Rabbitry Unit, Livestock Teaching and Research Farm, University of Agriculture Makurdi, Benue State, Nigeria.

Twelve weaner rabbits of both sexes, with average live weight of about 430 g were used for the experiment which lasted for 56 days. The rabbits were weighed individually and grouped into three sets of four rabbits each, in such a way as to balance for live weight and sex. The three groups were randomly assigned to treatments 1, 2 and 3, with one rabbit acting as a replicate and treatment one served as the control.

The main dietary nitrogen source in diet for animals in Treatment 1 (T_1) was toasted, un-extracted soybeans. Raw, decorticated lablab seed was utilized in the diet of Treatment 2 (T_2), and cooked whole lablab seeds were used for Treatment 3 (T_3). The raw decorticated and whole cooked lablab seeds were included to provide 50% of the dietary protein contributed by soybeans in the control diet.

Toasting of soybean was done by pouring seed into a dry round bottomed pot heated over an open fire made from wood. The seeds were stirred constantly until they turned brown and crisp, accompanied with flaking of seed coats, and the characteristic aroma of roasted seeds. Decortication of raw lablab seeds was carried out by cracking the seeds in a burr mill. This enabled the separation of the seed coat from the rest of the seed through winnowing. The process used for cooking whole lablab seeds was to bring water to the boil in a large pot and adding the seeds to the boiling water. Heating was continued for 40 min after the mixture returned to the boil. The mixture was allowed to cool until only warm to the touch, after which water was drained off, and the seeds were spread thinly on a clean concrete surface, and sun dried until they were crisp. The decorticated and the cooked lablab seeds were then milled and sampled for chemical analysis and for inclusion in the test diets.

The animals were individually housed in wood/wire mesh cages, measuring 50 cm × 30 cm × 40 cm high, raised 50 cm above the floor, in an open sided, dwarf walled, building screened with wire gauze. The rabbits were watered and fed *ad libitum*. A known quantity of feed was offered and leftovers weighed to monitor feed intake, and a record of weight gain was kept by weighing the animals weekly.

Faecal sample from each rabbit was collected for seven days at the 8th week of the experiment. Efforts were made to minimize soaking of faecal sample in urine by fastening under each cage a material for separating urine and faeces. The faecal samples were collected daily, oven dried at 60^{o}C, pooled for each replicate, weighed, thoroughly mixed, sampled and analyzed for proximate chemical composition (A.O.A.C., 1995). Digestibility coefficient was computed as follows:

Apparent Digestibility = [((%NFd × FI) – (%NFe × FO)) / %NFd] × 100

Where: NFd = Nutrient in feed, NFe = Nutrient in faeces, FI = feed intake, FO = faecal output.

After 8 weeks of feeding, all animals were evaluated for meat yield and size of some visceral organs as follows. Feed was withdrawn for about 12 h, the rabbits were then weighed, stunned and slaughtered by severing the jugular vein, carotid arteries, trachea and the oesophagus in the neck region. The carcasses were suspended head down and allowed to bleed completely. They were eviscerated by opening along the median line of the abdomen and removing all gastro-intestinal tracts and visceral organs, the carcasses were then singed and weighed to provide the dressed weight, head, skin and feet inclusive. Visceral organs (Table 5) were separated out, blotted dry with tissue paper and weighed with an electronic balance.

The data obtained from the above measurements was subjected to analysis of variance (ANOVA) using SPSS 15 software. Where significant differences between treatments were detected, the means were separated using Duncan Multiple Range Test.

Cost of feed was calculated using the following formula:

Cost (₦/kg) = ∑[Cost of ingredient (₦/kg) × Coefficient of inclusion in diet]

Cost of feeding was calculated according to the following formula:

Feed cost (₦/kg weight gain) = Cost of feed (₦/kg) × FCR

Where FCR = Feed Conversion Ratio

RESULTS AND DISCUSSION

The proximate composition of lablab seeds and ingredient

Table 1. Proximate chemical composition of lablab seed.

	Decorticated	Cooked	Raw seed*
Crude protein	27.75	24.75	34.33
Crude fiber	2.52	9.85	7.22
Fat	5.60	5.92	5.87
Ash	3.68	4.14	4.77
Nitrogen free extract	60.45	55.34	47.81
Gross energy (kcal/kg)	3211.10	3336.91	3771

*Shaahu *et al*. (2015a)

Table 2. Ingredient composition of experimental diets.

Ingredients (%)	T_1 (Control)	T_2 (Decorticated.)	T_3 (Cooked)
Maize	36.00	32.67	31.05
Lablab	0.00	13.33	14.95
Full fat soybeans	20.00	10.00	10.00
Rice offal	26.00	26.00	26.00
Brewer's dry grain	14.00	14.00	14.00
Salt	0.50	0.50	0.50
Bone ash	3.00	3.00	3.00
Premix	0.50	0.50	0.50
Calculated analysis			
Crude protein (%)	16.11	15.81	15.66
Crude fiber (%)	13.15	12.83	13.93
Digestible energy (kcal/kg)	2719.16	2583.98	2575.71

Table 3. Performance of weaner rabbits fed diets containing decorticated and cooked lablab seed.

Parameters	T_1 (control)	T_2 (decorticated)	T_3 (cooked)	SEM
Initial weight (g)	425.00	437.50	437.50	19.78
Final weight (g)	1222.50	1025.00	1260.00	57.62
Total weight gain (g)	797.50	587.50	822.50	54.03
Mean weight gain (g/day)	14.24	10.49	14.69	0.96
Mean feed intake (g/day)	44.25	42.90	46.25	2.27
Feed/gain ratio	3.09	4.31	3.19	0.27
Mortality (%)	0	0	0	0

composition of experimental diets are presented in Tables 1 and 2, respectively. The main effect of decortication appears to be a 75% lowering of crude fibre, which is not necessarily beneficial for species such as the rabbit, due to the role dietary fibre plays in the efficient functioning of rabbit digestive system. Decortication is also accompanied by, a much less drastic, lowering of crude protein and energy.

There were no significant ($P > 0.05$) differences among treatments in growth performance, as shown in Table 3. This is an indication that cooking and decortication of lablab seeds are effective in significantly lowering the effects of the anti-nutrients contained in lablab seeds. Decortication was attempted because it has been demonstrated that the anti-nutrients in many legume seeds tend to be concentrated in and around seed coats (Shaahu *et al*., 2015b).

Results of the nutrient digestibility trial are presented in Table 4. The only significant difference among treatments was that digestibility of nitrogen free extract by rabbits fed the control diet was better than those of the rabbits fed diets containing lablab seeds. This collaborate the result of the growth study, that cooking and decortication are effective in counteracting anti-nutrients present in lablab seeds. Shaahu *et al*. (2015b) reported that boiling practically eliminates the deleterious effect of anti-nutrients, while decortication, resulted in substantial loss of material, but had very limited effect in counteracting anti-

Table 4. Nutrient digestibility (%) by rabbits fed decorticated or cooked lablab seed.

Parameter	T_1 (control)	T_2 (decorticated)	T_3 (cooked)	SEM
Dry matter	55.61	46.03	57.36	1.41
Crude protein	53.47	42.85	51.62	2.80
Crude fibre	51.20	47.97	55.95	1.70
Ether extract	67.92	49.22	62.72	3.30
Nitrogen free extract	67.87^{a}	49.08^{b}	58.42^{ab}	1.80

^{ab} means of different superscripts along the same row are significantly different ($p < 0.05$).

Table 5. Meat yield and organ weights of rabbits fed corticated or boiled lablab seed.

Parameter	T_1 (control)	T_2 (decorticated)	T_3 (cooked)	SEM
Slaughter weight (g)	1152.50	925.00	1167.50	
Dressed weight (g)	700.00	512.50	667.50	
Dressing percentage	60.40	54.67	57.11	0.94
Organ weight (% of live weight)				
Oesophagus	0.16	0.18	0.19	0.01
Heart	0.40	0.44	0.41	0.02
Spleen	0.05	0.07	0.05	0.05
Lungs/trachea	0.91	1.00	0.94	0.46
Pancreas	0.08	0.11	0.20	0.03
Stomach	2.20	2.74	2.38	0.11
Small intestine	3.46	3.72	2.95	0.19
Large intestine	4.71^{ab}	5.81^{a}	3.90^{b}	0.34
Caecum	2.64	3.35	3.20	0.25
Kidney	0.99	1.12	1.09	0.01
Kidney fat	0.66	0.45	0.58	0.08
Liver	3.79	4.60	3.89	0.19

nutrient activity. The effect of decortication in this study appear to be an improvement on this earlier work, since differences are now limited to NFE digestibility.

Table 5 shows that there was no significant difference ($P < 0.05$) in meat yields, measured as dressing%, between treatments, the values obtained being similar to those observed by Ominisi *et al*., (2008) and Abu and Bakare (2008) who studied the effect of feeding steamed castor bean cake and sorghum grains, respectively, on the performance of growing rabbits.

The only differences observed for visceral organs are that the small intestines of rabbits fed decorticated lablab were heavier than those of other treatments. The mechanisms and/or factors responsible for this are unknown. Higher amounts of fiber have been known to increase gut length Shaahu *et al.* (2005), but the diet containing decorticated lablab was the lowest in fibre in this study.

Parameters of feed and production cost are presented in Table 6. The control diet was more expensive than the lablab diets, a fact attributable to the difference in cost between soybeans (₦60/kg) and lablab seeds (₦40/kg). Gross margin (profit) was best for rabbits produced using feed containing cooked lablab. The poor returns from rabbits produced with decorticated lablab are attributable to poor growth rate and feed conversion. At present, the soybean is a major crop in some parts of Nigeria, while lablab is still just a fringe crop. If research, such as the present study, succeeds in transforming lablab seeds into a major feed ingredient, its cultivation will escalate, the price will fall and the advantage of using lablab seeds will be even greater than indicated in the results of this study.

CONCLUSION

Lablab seed, especially when cooked, is a better alternative protein source than soybeans in rabbit production. Effort should be devoted to conducting more research to extend both technical and practical knowledge about lablab so that its full potential may be achieved, thus helping to improve the living condition in

Table 6. Economy of feeding decorticated and cooked lablab seed to rabbits.

Parameter (₦)	T_1 (control)	T_2 (decorticated)	T_3 (cooked)
Cost/weaner rabbit	700	700	700
Cost/kg finished rabbit	600	600	600
Cost/kg diet	39.15	36.55	36.25
Average cost of feeding to final weight	97.01	87.80	93.88
Feed cost/kg live weight gain	120.92	157.50	115.63
Sales value of rabbits	916.88	768.75	945.00
Gross margin	119.87	19.05	151.12
1$(US) = ₦312.00			

areas where shortage of animal feedstuffs and sub-optimal levels of human consumption of animal protein exist.

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