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# Digestibility and Growth Performance of Rabbits Fed Raw or Processed Lablab Purpureus Seed in Diets

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## Abstract

A study was conducted to determine the Digestibility of growing rabbits fed raw or processed *Lablab purpureus* seed in diets. The Highworth variety was processed by decortication, toasting and boiling, mill and respectively incorporated into diets T2, T3, T4 and T5 to replace 75% of protein provided by full fat soyabean (FFSB) in the control diet (T1). The effect of replacing FFSB with Lablab purpureus seed on nutrient digestibility was investigated in growing rabbits in an 8-week feeding trial with 5-weeks old mixed bred rabbits weighing between 350-358g in a completely randomized design. The Highworth lablab seeds diets and faecal samples of experimental rabbits were assayed for proximate chemical composition. The crude protein, crude fibre, ether extract and energy digestibility were higher in rabbits fed raw or decorticated lablab seed diets than those fed control or heat treated seed diets. Decorticated lablab seed diets were most digested than the other diets. This suggests that the cortex of legume seed may have imposed a negative influence on the digestibility of these nutrients. The present study indicates that the digestion of a diet may be high but the utilization can be poor due to impaired absorption; caused by the presence of anti-nutritional factors like phytohaematogglutinins, which exert a non-selective adverse effect on the absorption of nutrients from the intestinal tract rather than a direct effect on the digestive process.

***Keywords:*** *Digestibility, 'nutrient absorption', rabbits, 'Lablab seed'*

## 1. Introduction

Soyabean meal and groundnut cake which are predominantly used ingredients as protein sources in livestock feed are becoming expensive by the day, due to higher demands for them by humans as food in various forms and for industrial purposes. Non-conventional protein sources should be used if meat consumption demands are to be met, and the production of short-circled animals like rabbits should be encouraged. There are abundance of seeds of several legume, which are presently been cultivated as fodder for ruminant feed whose seeds can be explored for rabbit feeding, among these are the Lablab purpureus seed.

Lablab purpureus is a dual purpose legume, it remains green far into the dry season, very reach in nutrients, the leaves are quite palatable to ruminants and it is rapidly gaining acceptance by farmers ( Abeke et al., 2008) it is reported that raw lablab seed like other legumes is rich in crude protein which ranges from 24.88-34.33% and a relatively good amino acid profile (Shaahu et al., 2014a). Despite the nutritional potential of lablab seed, its utilization as animal feed is limited because the raw seed contains such anti-nutritional factor like haemagglutinnin, trypsin inhibitors, saponins, phytic acid, tinnins alkaloids and polypyhenolic compounds (Shaahu et al., 2014a). These toxic compounds inhibits protein and energy utilization if livestock (Abeke 2005; Igene et al., 2002).

The use of raw legumes in diets of animals as the only source of protein resulted to significant reduction in performances and other undesirable physiological alterations (Liener. 1980, Carew et al 2003; Shaahu et al 2014b). A variety of processing procedures such as boiling and roasting (Shaahu et al., 2014c), soaking, and fermentation (Lee et al., 1972) are commonly used to eliminate the negative effect of anti-nutritional factors present in tropical legumes. Little is known about the effect of these processes on the nutritive value of lablab seed and there is scanty information on the use of this legume as a component

 

of rabbit diet. In view of this, the experiment was therefore conducted to determine the effect of different processing methods of lablab seed on the digestibility of rabbits.

## 2. Materials and methods

The study was conducted at the University of Agriculture, Makurdi Livestock Teaching and Research Farm to investigate the effect of feeding raw and processed lablab seed in diets on the digestibility and growth performance of rabbits. Four equal quantities of the raw lablab (Highworth) seed samples were subjected to different processing procedures. One of the samples was decorticated; the raw lablab seed was cracked in a milling machine to separate the cortex from the seed. The second lablab seed sample was toasted; the seeds was poured directly in a hot toasting pot and agitated (to prevent the seeds from getting burnt) till the seed cortex flaked, producing the characteristics aroma of toasted seed. The Third sample was boiled; water was brought to a boiling point and the seed were added to it, after both the water and the seed begins to boil, it was timed to 40 minutes; water was drained off, the wet seeds were spread thinly on concrete surface, and sun-dried. The Fourth lablab seed sample was left raw. The raw and the processed lablab seed were then milled, and included in the test diets.

### *Experimental animals and management*

Twenty weaned mixed breed (California, New Zealand, American Chinchilla and Dutch) rabbits aged 5 weeks were used for the feeding trial which lasted 8 weeks. At the commencement of the experiment (1st week), all the rabbits were dewormed with *ivomectin*®. Three weeks later the rabbits were given coccidiostat against coccidiosis. The rabbits were individually weighed, grouped into five in such a way to ensure uniformity of initial body weights in all the groups and allotted to different treatments in agreement with the design of the study. The average weight per group ranged between 350-358g and the animals were individually housed in wood and wire cages measuring 2x2x2 feet (WxLxH). The cages were raised 2 feet above the ground to facilitate cleaning. The cages were equipped with drinkers and feeding troughs suitable to ensure that feed and water were available *ad-libitum* and wastage of both feed and water are minimized

### *Experimental diets*

Five diets were formulated incorporating toasted full fat soyabean (FFSB) in the control diet (T1) as the main protein source, subsequently the full-fat soyabean was replaced by raw lablab seed, (second diet; T2), decorticated lablab seed, (third diet; T3) toasted lablab seed (fourth diet; T4) and boiled lablab seed (fifth diet; T5), to provide 75% of the dietary protein (CP) contributed by FFSB in the control diet respectively. The quantity of maize in the diet was adjusted to make a 100% diet (Table 1).

### *Experimental design:*

Twenty weaned mixed breed (California, New Zealand, American Chinchilla and Dutch) rabbits were randomly assigned to the five dietary treatments in a Completely Randomised Design (CRD), with 4 rabbits per treatment, constituting 4 replicates. The rabbits were individually fed for 56 days, and each rabbit represents an experimental unit.

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 collected were air dried, bulked, and pooled for each replicate, weighed and analyzed for proximate chemical composition according to the Association of Official Analytical Chemist (A.O.A.C., 1995). Digestibility coefficient was computed using the formula proposed by Crampton and Harris (1969):

$$\text{Apparent Digestibility} = \frac{[(\%\text{Nutrients in feed X FI}) - (\%\text{Nutrients in faeces X FO})] \times 100}{\%\text{Nutrients in feed X FI}}$$

Where FI= feed intake
FO=faecal output

 

***Statistical analysis***

The data obtained from the above measurements was subjected to analysis of variance (ANOVA) and where differences exist among treatment means, they were separated by means of Duncan Multiple Range Test, using computer software identified as Statistical Package for Social Sciences, Tenth Version (SPSS 15)

Table 1: Ingredient Composition of Experimental Diets (%)

| Ingredients | Control (T1) | TR (T2) | TD (T3) | TT (T4) | TC (T5) |
|---|---|---|---|---|---|
| Maize | 37.28 | 35.36 | 32.27 | 34.69 | 31.85 |
| FFSB | 24.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| *Lablab seed* | - | 19.92 | 23.01 | 20.59 | 23.43 |
| Rice husk | 26.00 | 26.00 | 26.00 | 26.00 | 26.00 |
| BDG | 9.72 | 9.72 | 9.72 | 9.72 | 9.72 |
| Bone ash | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| Salt | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Premix * | + | + | + | + | + |
| **Total** | **100.00** | **100.00** | **100.00** | **100.00** | **100.00** |

TR=Raw lablab seed diet; TD=decorticated lablab seed diet; TT=toasted lablab seed diet; TC=cooked lablab seed diet; BDG=brewers dried grain; FFSB=full-fat soyabean.

*0.25 of Premix (Agrimix Broiler Starter) manufactured by AGRITED NIG. LTD, supplying the following per kg of diet: Vit. A-10,000 iu, vit. D3-3000 iu vit. E-30 iu, vit. K – 0.0023g, Thiamine B1-0.0017g, Riboflavin –B2-0.005g, Pyriboflavin – B6 – 0.0031g, vit. B12-0.016mg, Biotin – 006mg, Niacin – 0.031g, Pantothenic acid – 0.008g, Folic acid – 0.0008g, Manganese – 0.085g, Zinc – 0.05g, Iron – 0.025g, Copper – 0.006g, Iodine – 0.001g, Selenium – 0.12mg, Cobalt – 0.22mg, B.H.T. – 0.06g, Ethoxyquin – 0.065g, Choline chloride – 0.2g.

## 3. Results

***Nutrient composition of experimental diets***

Proximate composition of experimental diets is presented in Table 2. The replacement of full fat soyabean with lablab seed in diet to provide the 75% crude protein supplied by full fat soyabean in the control diet resulted in a decrease crude protein content of the tested diets, especially with the boiled lablab seed diet. Crude fibre, ether extract, nitrogen free extract and gross energy were not so varies among treatment diets.

***Growth performance of rabbits fed experimental diets***

The effect of feeding raw or processed lablab seed diets on growth performance of growing rabbits is shown on Table 3. All the parameters considered in the study were significantly ($p<0.05$) affected among treatments. The daily feed intake and the final weight of rabbits fed T1, T4 and T5 were similar ($p>0.05$) and significantly ($p<0.05$) higher than those fed T2 and T3 diets. The total weight gain and daily weight gain of rabbits fed T4 and T5 diets were significantly ($p<0.05$) higher than the rabbits fed T2 and T3 diets but however, lower ($p<0.05$) than those fed the control diet. The efficiency to which the rabbits utilised the respective diets for growth as measured by the feed to gain ration, maintain the same pattern as the weight gain by the rabbits.

 

***Digestibility of rabbits fed experimental diets***

Digestibility of the young rabbits fed raw and processed lablab seed diets is shown in Table 4. Dry matter digestibility was higher ($P<0.05$) in rabbits fed T3 diet than those fed T1 and T4 diets but the same as those fed T2 and T5 diets. Rabbits fed T1, T2 and T4 also had the same ($P>0.05$) dry matter digestibility.

Table 2. Proximate Chemical Composition of Experimental Diets

| Nutrients | Control (T1) | TR (T2) | TD (T3) | TT (T4) | TC (T5) |
|---|---|---|---|---|---|
| Dry matter (%) | 94.58 | 97.02 | 94.24 | 94.31 | 93.11 |
| Crude protein (%) | 15.38 | 15.00 | 15.25 | 14.38 | 13.44 |
| Crude fiber (%) | 11.43 | 11.02 | 10.62 | 11.21 | 11.89 |
| Ether extract (%) | 2.09 | 2.10 | 3.11 | 2.87 | 3.77 |
| Ash (%) | 8.21 | 3.49 | 4.81 | 5.62 | 4.38 |
| *NFE (%) | 62.89 | 68.39 | 66.21 | 65.92 | 67.52 |
| GE (kcal/kg) | 3455 | 3444 | 3452 | 3562 | 3571 |

-Proximate values are on as fed basis
TR= raw lablab seed diet TD= decorticated lablab seed diet
TT= Toasted lablab seed diet TC= cooked lablab seed diet
*NFE= Nitrogen free extract

 

Table 3: Growth Performance of Growing Rabbits Fed Raw and Processed *Lablab Purpureus* Seed Diets

| Parameters | Control (T1) | TR (T2) | TD (T3) | TT (T4) | TC (T5) | SEM |
|---|---|---|---|---|---|---|
| Initial weight (g) | 351.67 | 358.33 | 366.67 | 350.00 | 354.17 | |
| Daily feed intake (g) | 21.13[a] | 16.93[b] | 16.94[b] | 23.37[a] | 23.03[a] | 0.77 |
| Final weight (g) | 854.17[a] | 481.25[b] | 481.27[b] | 710.00[a] | 702.50[a] | 44.82 |
| Total weight gain (g) | 502.20[a] | 123.25[c] | 131.25[c] | 360.00[b] | 352.50[b] | 30.85 |
| Daily weight gain (g) | 8.97[a] | 2.20[c] | 2.34[c] | 6.43[b] | 6.29[b] | 0.54 |
| Feed/gain ratio | 2.36[a] | 7.70[c] | 7.24[c] | 3.63[b] | 3.66[b] | 0.34 |

[a b c] - Mean values within a row with same or without superscript do not differ (p>0.05)
SEM - Standard Error of Mean
TR= raw lablab seed diet TD= decorticated lablab seed diet
TT= Toasted lablab seed diet TC= cooked lablab seed diet

Crude protein digestibility was the same (p>0.05) among dietary treatments. The range in the crude protein digestibility was 67.38% for T1 to 78.92% for T3. Crude fibre digestibility by rabbits fed T3 diet was significantly (P<0.05) better than that by rabbits fed T1 diets but similar to that of those fed T2, T4 and T5 diets.

Ether extract (EE) digestibility by rabbits fed T3 diet was significantly (P<0.05) higher than that by the rabbits fed T1, T2 and T4 diets, but similar to the EE digestibility by those fed T5 diet. Ether extract digestibility by rabbits fed T5 and T4 diets were the same (P>0.05), but EE digestibility by the rabbits fed T5 diet was significantly (P>0.05) higher than that by the rabbits fed T1 and T2 diets. The control diet group had the least digestibility of ether extract. Digestible energy values were significantly (p<0.05) higher in T3 group than T1 and T4 rabbits. Rabbits fed T1, T2 and T4 group had similar (P>0.05) energy digestibility, likewise rabbits fed T2, T3 and T5 did not differ in the energy digestibility.

 

Table 4: Digestibility of Growing Rabbits Fed Raw and Processed *Lablab Purpureus* Seed Diets

| Nutrients | Control (T1) | TR (T2) | TD (T3) | TT (T4) | TC (T5) | SEM |
|---|---|---|---|---|---|---|
| Dry matter (%) | 61.68$^{c}$ | 71.32$^{bc}$ | 80.82$^{a}$ | 64.26$^{c}$ | 70.32$^{bc}$ | 2.20 |
| Crude protein (%) | 67.38 | 73.95 | 78.92 | 69.54 | 69.22 | 1.96 |
| Crude fiber (%) | 24.02$^{c}$ | 36.80$^{b}$ | 62.08$^{a}$ | 29.00$^{bc}$ | 35.15$^{b}$ | 7.67 |
| Ether extract (%) | 44.64$^{d}$ | 55.80$^{cd}$ | 81.06$^{a}$ | 64.18$^{bc}$ | 75.59$^{ab}$ | 3.94 |
| GE (kcal/kg) | 87.32$^{b}$ | 90.13$^{ab}$ | 93.53$^{a}$ | 88.51$^{b}$ | 90.53$^{ab}$ | 0.71 |

$^{a\,b}$ - Mean values within a row with same or without superscript do not differ ($p>0.05$)
SEM - Standard Error of Mean
TR= raw lablab seed diet TD= decorticated lablab seed diet
TT= Toasted lablab seed diet TC= cooked lablab seed diet

## 4. Discussion

### *Nutrient composition of experimental diets*

The decrease in the crude protein content of the test diets as lablab seed replaced full fat soyabean is an indication of the difference in the crude protein content among the seeds. There is more crude protein in soyabean than lablab seed.

### *Growth performance of rabbits fed experimental diets*

The growth performance indices of the growing rabbits (Table 3) indicates that there were significant difference ($p<0.05$) among treatments. The daily feed intake by the rabbits fed T1, T4 and T5 diets was not less compared to the reported values of projected feed intake by rabbits of this age (5-13 weeks) (Aduku and Olukosi. 1990). According to the authors, rabbits of this age should consume averagely, at least 100g of feed per day. This may however, not be the effect of diet since rabbits in the control diet did not same quantity with those of the heat treated lablab seed diets. the low feed intake by rabbits fed either raw or decorticated lablab seed diets compared to the control, and the heat treated lablab seed diets is an indication of reduced palatability in the former diets. This may be attributed to probably the effect of residual anti-nutritional factors (tannin, alkaloids, phytic acids and haemagglutinin) in the raw and decorticated lablab seed used in the respective diets. According to Aletor and Fetuga (1988a) these anti-nutritional factors causes reduced palatability of diets to animals. Utilization of the full fat soya bean diet was better as observed in the feed to gain ratio of 2.36 as compared to 3.63 and 3.66 for T4 and T5 respectively. Among the lablab seed diets, the toasted and the boiled seed diets were better utilized than the raw and decorticated seed diets, even as the nutrient content of the later diets especially crude protein was higher than that of the former diets. This suggests that other factors other than nutrient content, (especially crude protein) of the diet are responsible for the differences that exist in the feed utilization among the rabbits fed the respective experimental diets. According to Aletor and Fetuga (1988a) anti-nutritional factors such as tannin and hemagglutanins affects feed intake and utilization by animals.

In all the parameters, decorticated lablab seed diets were most digested than the other diets. This suggests that the cortex of legume seed may have imposed a negative influence on the digestibility of these nutrients. Digestibility of the raw lablab seed diets compared to that of the cooked or toasted lablab seed diets and that of the control diets indicates that raw lablab seed diets are highly digestible. It is therefore expected that performance of these groups of rabbits fed the raw and decorticated lablab seed diets would be comparable to those of the toasted, cooked lablab seed diets and the control diets. The present study indicates that the digestion of a diet may be high but the utilization can be poor due to impaired absorption

 

as may be seen in rabbits fed the raw lablab seed diets as compared to the processed and the soyabean diets in the present study. This also suggests that, adequate quality and quantity diets are less digested than unbalanced and insufficient quantity of feed to rabbits, probable due to extra efforts made by the rabbits to maximize what is available to them to obtain their required nutrients. Heat-labile ANF may be implicated in this effect. Heat-labile ANF in some legumes; phytohaematogglutinins exert a non-selective adverse effect on the absorption of nutrients from the intestinal tract rather than a direct effect on the digestive process (Oke, 2007). The binding of hemagglutanins to intestinal membrane of animals is believed to impair the normal absorption of dietary nutrient when feed stuffs containing these factors are consumed (Aleto 1999). Availability of nutrients in utilizable form at both the intestinal level and at the cell levels is capable of influencing utilization of a diet.

## 5. Conclusion

Higher digestibility was obtained in rabbits fed decorticated or raw lablab seed diets as compared to those fed processed and the soyabean diets but this does not translate to the growth performance of the rabbits in the present study. Heat-labile anti-nutritional factors are implicated in this effect. For effective digestibility and nutrient utilization by the rabbits, lablab seeds should be processed either wet or dry cooking to remove anti-nutritional factors that may impair absorption of nutrients by the rabbits.

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