# NUTRITIVE VALUE AND ECONOMIC BENEFIT OF BOILED VELVET BEANS (*Mucuna utilis*) IN RABBITS DIET

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## ABSTRACT
Thirty weaned mixed breed (California, New Zealand, American Chinchilla and Dutch) rabbits weighing 313-330g were used in a study using a completely randomized design with 4 rabbits per treatment, each rabbit representing an experimental unit. The study was aimed to evaluate the growth performance and cost benefit of processed mucuna seed in rabbits diet. Five experimental diets were formulated, with full fat soyabean (FFSB) as the major protein source in treatment 1 (T1). The mucuna seeds boiled at different time intervals were included in each of the other four diets at 20% level to replace FFSB as a major protein source representing treatments 2 (T2), 3 (T3), 4 (T4) and 5 (T5) respectively. Duration of boiling did not have any significant ($P>0.05$) effect on the dry matter, crude fibre, ether extract and nitrogen free extract content of the seeds. However, as the boiling time increased, there was a significant ($P<0.05$) decrease in the crude protein (28.72-27.85) and ash content (3.51-1.98) of the seeds. Rabbit fed T5 with lesser daily feed intake among the mucuna seed diets, were more efficient in diet utilization as they put on more weight than those fed T2, T3 and T4 respectively. Higher profit was generated from sales of rabbit fed T1 (□777.99) and lower for mucuna seed diets. Among the mucuna seed diets, however, profit was maximized as duration of boiling increased from □329.97-□582.79 (T2-T5).

## INTRODUCTION
In Nigeria, the problem of inadequate grain, grain by product, oil seed cakes and seed meal has contributed to the gap between animal need and supply in the country. The livestock industry has been crippled because of the high cost of feed which constitute largely of conventional feed materials/stuff. Meat has become an unaffordable luxury in many developing countries such as Nigeria. There is therefore need for non conventional alternative sources of feed ingredient that are cheaper, available and nutritionally adequate to enable Nigeria access to animal protein need of her people. This brings the rabbit into focus, as it forms a very important aspect of livelihood for socio economic reasons. Rabbit production has been noted to be one of the best means of alleviating the prevailing low animal protein consumption in developing countries due to certain characteristic of rabbits and rabbit meat (Aduku and Olukosi, 1990; Taiwo *et al.*, 2005). The rabbits thrive on wide range of fresh or preserved grasses, shrubs and leaves (Ayoade *et al.*, 1985; Carew *et al.*, 1989). The rabbit is also a very efficient converter of feed to animal protein and the meat is very nutritious, easily digested, extremely low in cholesterol and sodium and contains more protein and less fat, when compared to various other meats. Mucuna is a tropical legume with the agrochemical potential of being able to improve on the fertility of the soil on which it grows (IITA, 1993). It is also use as a cover crop in many tropical countries and its importance as food stuff in the diet of non ruminant has not been fully exploited. In addition to this, the seed have been reported to have the potential of being utilize as a livestock feed ingredient, considering its nutritive value (Ravindram and Ravindram, 1988). This study aims to determine the growth performance and cost evaluation of processed mucuna seed in rabbit's diet.

## MATERIALS AND METHODS
The study was conducted at the University of Agriculture, Makurdi Livestock Teaching and Research Farm. Makurdi is the capital of Benue State which lies within Latitude 7° 43` North and Longitude 8° 3` East with ambient temperature range of 17.3°C –35.6°C, and a relative humidity of 47 – 85% [7]. The ambient temperature has recently reached 40°C during February and March, 2010. The mucuna seed used were obtained around the University surrounding villages in Makurdi. The mucuna seeds were

soaked overnight from 9.00pm to 9.00am (12hrs), the next day. Water was heat to boiling point and four separate sample of mucuna seeds were put into the boiling water and allowed to boil at different timing interval according to Shaahu *et al.*, (2014a). First sample was boiled for 45 minutes, second sample for 65 minutes, third sample for 75 minutes, and fourth sample for 90 minutes, while full fat soyabean was boiled without soaking for 40 minutes. Five experimental diet were formulated, with full fat soyabean (FFSB) as the major protein source as treatment 1 (T1). The mucuna seeds boiled at different time intervals were included in each of the other four diets at 20% level to replace FFSB as a major protein source as treatments 2 (T2), 3 (T3), 4 (T4) and 5 (T5) respectively (Table 1). Thirty weaned mixed breed (California, New Zealand, American Chinchilla and Dutch) rabbits weighing between 313-330g were grouped into five and allotted to the five dietary treatments in a completely randomized design, with 4 rabbits per treatment, each rabbit representing an experimental unit. The animals were housed individually while feed and water were provided *ad libitum*. The feeding trial lasted for 12 weeks.

## RESULTS AND DISCUSSIONS

Result of proximate analysis of raw and processed mucuna seeds is presented on Table 1. The crude protein value (31.20%) of raw mucuna seed observed was higher than the values (29.37%) reported for raw mucuna seeds by Tuleun and Patrick (2007) but lower than 35.5% reported by Iyayi and Egherevba (1998). The variation observed in the crude protein content of mucuna seeds could be largely due to genetic origin, geographic source, level of soil fertility, and efficiency of nutrient uptake as well as time of harvesting. Duration of boiling did not have any significant (P>0.05) effect on the dry matter, crude fibre, ether extract and nitrogen free extract content of the seeds. However, as the boiling time increased, there was a significant (P<0.05) decrease in the crude protein and ash content of the seeds. The progressive decrease in the content of crude protein as the boiling time increased can be attributed to the destruction of heat labile amino acids, due to boiling owning to the loss of some soluble or proteinaceous part of the seed into the boiling water. The reduction in the ash content as the boiling time increased is in agreement with the findings of Ukachukwu and Obioha (1997). This reduced ash content shows that nutrient digestibility can be improved when processed mucuna seed is used in diets. While the progressive but non-significant (P>0.05) increase in the ether extract content of seeds with the boiling time is at variance with the report of Tuleun and Patrick (2007) and Ukachukwu and Obioha (1997) that ether extract decreased with increased cooking time. Result of growth rate and economics of production showed that there was significant differences (p<0.05) in daily weight gain, final weight and feed to gain ratio. Rabbits fed the control diet had the highest value for final weight (1377.75) which was significantly (p<0.05) higher than those fed T2 (922.25) and T3 (988.50) but was comparable with T4 (1090.00) and T5 (1157.00). This might be due to the presence of residual anti nutritional factor present which have not decomposed at 45 or 60minutes boiling time. According to Fernandez *et al.*, (1996), tannins and protease inhibitors, inhibits the proteolytic action of protease enzymes which leads to the incomplete digestion of proteins with lower amount of amino acids becoming available for growth. The daily weight gain showed a similar pattern as the final weight, which is expected since the daily weight gain is positively related with total weight gain. The daily feed intake of the rabbits were similar (P>0.05), however there were little variations which did not follow a specific pattern to implicate dietary treatments. The rabbits fed T1 had the highest (50.83g) feed intake while those fed T2 had the lowest feed intake of 35.70g. Shaahu *et al.* (2014b) reported improvement in palatability of heat treated lablab seed diets and the authors ascribed this to the reduction or total removal of anti-nutritional factors in the seeds. Feed to gain ratio shows the efficiency to which feed is been converted to gain (weight). Rabbits fed T1 (4.02) and T5 (4.03) were significantly better (p<0.05) than T3 (5.85) but T2, T3 and T4 were comparable. This could be that T5 was better utilized than the others diets which contained mucuna seeds boiled for lesser durations. Rabbit fed T5 with lesser daily feed intakeamong the mucuna seed diets, were more efficient in diet utilization as they put on more weight than those fed T2, T3 and T4 respectively. The cost per kilogram diet of T1 (64.48) was

higher than the mucuna diets (58.92-61.83), and the variation in the mucuna diets was as a result in the duration of boiling since longer boiling time consumed more heat energy (cost), the cost/kg diet increased as the duration of boiling increased. There was a variation in the total cost of production which was as a reflection of the interplay of cost/kg diet and the feed intake by the rabbits fed the different diets, since all other cost were equally shared among the treatments. It cost much more to raise rabbits on T1 (875.31) and much less on T2 (776.73), however, the cost/kg weight gain was in the reversed order (818.63 for T1 and 1,275.41 for T2). Among the mucuna seed diets, it cost less to produce rabbits with T5 and the cost/kg gain was also less than with the other mucuna diets. This further emphasised the better performance of rabbits fed T5. The revenue and profit generated from the sale of rabbits fed T1 was higher than those fed mucuna seed diets. Both revenue and profit accrued from the sale of rabbits fed the mucuna diets increased respectively while cost/kg weight gain decreased as the duration of boiling increased. This can be attributed to the differences in the feed to gain ratio as expressed by the rabbits from the different treatments.

**Conclusion**

Total revenue from rabbits fed full fat soybean diet (1653.30) was higher among the treatments, while rabbits fed T5 diets gave in more revenue and profit among the mucuna seed. It was observed that full fat soybean diet was utilized more effectively by the rabbits than the mucuna seed diets. It can however be concluded that, mucuna seed soaked and boiled for 90 minutes can promote better growth and provide better revenue than lesser boiling durations.

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Table 1: Percent and nutrient composition of experimental diets

| Parameters | T1 | T2 | T3 | T4 | T5 |
|---|---|---|---|---|---|
| Maize | 24.96 | 24.29 | 24.29 | 24.29 | 24.29 |
| Maize offal | 11.64 | 10.00 | 10.00 | 10.00 | 10.00 |
| Full fat soyabean | 20.00 | 3.69 | 3.69 | 3.69 | 3.69 |
| Mucuna seeds | - | 20.00 | 20.00 | 20.00 | 20.00 |
| Brewers dry grain | 18.08 | 19.16 | 19.16 | 19.16 | 19.16 |
| Rice offer | 21.82 | 19.36 | 19.36 | 19.36 | 19.36 |
| Premix | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Bone ash | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Table salt | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Calculated analysis | | | | | |
| Crude protein | 17.76 | 17.10 | 17.10 | 17.10 | 17.10 |
| Crude fibre | 13.47 | 13.04 | 13.04 | 13.04 | 13.04 |
| Digestible energy | 2733 | 2707 | 2707 | 2707 | 2707 |

Table 2: Proximate composition of raw and processed mucuna seeds

| Parameters | Raw (S1) | 45mins (S2) | 60mins (S3) | 75mins (S4) | 90mins (S5) | SEM |
|---|---|---|---|---|---|---|
| Dry matter | 90.86 | 88.90 | 90.00 | 90.52 | 88.05 | 0.24 |
| Crude protein | $31.20^{a}$ | $28.72^{b}$ | $28.54^{c}$ | $28.38^{c}$ | $27.85^{d}$ | 0.27 |
| Crude fibre | 2.45 | 2.68 | 2.39 | 2.55 | 3.58 | 0.04 |
| Ether extract | 4.99 | 5.45 | 5.50 | 6.52 | 5.47 | 0.25 |
| Ash | $3.51^{a}$ | $2.18^{b}$ | $2.05^{c}$ | $2.03^{cd}$ | $1.98^{d}$ | 0.29 |
| Nitrogen free extract | 48.81 | 49.87 | 51.52 | 51.01 | 49.17 | - |

Table 3: Growth rate and economics of feeding experimental rabbits

| Parameters | T1 | T2 | T3 | T4 | T5 | SEM |
|---|---|---|---|---|---|---|
| Initial weight | 330.50 | 313.00 | 326.25 | 316.00 | 323.50 | 12.82 |
| Final weight | $1377.75^{a}$ | $922.25^{b}$ | $988.50^{b}$ | $1090.00^{ab}$ | $1157.00^{ab}$ | 57.49 |
| Daily weight gain | $12.52^{a}$ | $7.25^{b}$ | $7.88^{b}$ | $9.30^{ab}$ | $9.92^{ab}$ | 0.65 |
| Daily feed intake | 50.83 | 35.70 | 45.12 | 43.38 | 39.58 | 2.34 |
| Feed to gain ratio | $4.02^{a}$ | $5.20^{ab}$ | $5.85^{b}$ | $4.97^{ab}$ | $4.03^{a}$ | 0.24 |
| Cost/kg diet ( ) | 64.48 | 58.92 | 59.89 | 60.85 | 61.83 | - |
| Total weight gain | 1047.25 | 609.00 | 662.25 | 774.00 | 833.50 | - |
| Total Feed Intake | 4269.67 | 2999.43 | 3790.50 | 3644.55 | 3325.56 | 196.58 |
| Total Feeding cost ( ) | 275.31 | 176.73 | 227.01 | 221.77 | 205.61 | 14.78 |
| Cost of Production ( ) | 875.31 | 776.73 | 827.01 | 821.77 | 805.61 | 14.79 |
| Cost/Kg Weight gain ( ) | 818.63 | 1,275.41 | 1,248.79 | 1,061.72 | 966.54 | - |
| Revenue ( ) | $1653.30^{a}$ | $1106.70^{b}$ | $1186.20^{b}$ | $1308.00^{ab}$ | $1388.40^{ab}$ | 68.99 |
| Profit | 777.99 | 329.97 | 359.19 | 486.23 | 582.79 | 58.47 |