

Effect of replacement of rice offal with graded levels of melon (*Citrullus Vulgaris*) seed offal on performance of growing rabbits

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Abstract

The feeding value of melon (*Citrullus vulgaris*) seed offal (MSO) was determined in a 12-week feeding trial using 25 six weeks old male rabbits with an average initial weight of 485g. The animals were fed diets containing 0, 7.5, 15, 22.5 and 30% MSO in a completely randomized design (CRD). Digestibility trial and economic benefits of using the test material were carried out. Data obtained were subjected to analysis of variance (ANOVA) and differences between means were also determined. Results obtained showed no significant ($P > 0.05$) treatment effects on daily weight gain (DWG), daily feed intake (DFI) and feed conversion ratio (FCR). The cost of feeding diets 1 and 2 was significantly ($P < 0.05$) higher (₦152.34 and ₦157.20) than for diets 4 and 5 (₦143.53 and ₦135.56). The cost generally decreased from ₦152.34- ₦135.56 with increase in the level of MSO in the diets. The digestibilities of dry matter (DM), crude protein (CP) and ether extract (EE) were significantly ($P < 0.05$) affected by increase in the levels of MSO in the diets. DM and CP digestibilities were significantly ($P < 0.05$) higher at 15 and 30% MSO levels when compared with the control and other MSO levels. MSO inclusion in the diets significantly ($P < 0.05$) improved EE digestibility above that of control diet but EE digestibility did not differ significantly ($P > 0.05$) among diets containing MSO. Crude fibre (CF) and Nitrogen free extract (NFE) digestibilities were similar ($P > 0.05$) for all the diets. It can be concluded that MSO could be used up to 100% replacement for RO in rabbit diets.

Key words: rice offal, melon seed offal, performance, growing rabbits.

Introduction:

The ever-increasing population growth in the developing countries means a greater demand for animal protein which is already in short supply in this region. This animal protein shortage is due largely to low level of animal productivity.

Traditionally, cattle, sheep, goats, pigs and poultry are the sources of meat, especially for urban dwellers. However, rabbits are beginning to gain ground in many developing countries. Rabbits have an added advantage since a substantial part of their feed can be provided by local resources such as forage crops and weeds (Fielding and Matheron, 1991) coupled with fact that they are small and can be

raised in towns and villages. They can also easily utilize high quality roughages and other household food by-products and agro-industrial by-products (Makhambare, 1983).

Literature abound on the utilization of agro-industrial by-products and farm wastes in livestock feeding. Some of these include brewers' dry grain, wheat offal, rice offal and maize bran among others. Atteh and Opawande (2000) used brewers' dry grain to replace groundnut cake in broiler finisher diets. Elsewhere Awesu *et al* (2000) utilized rice milling waste in diets for cockerel finishers while Afolayah (2004)

used corn bran meal at different levels in diets of broilers. All these workers reported satisfactory performance of the birds. However the prices of some of these by-products have gone up as a result of high demand.

Melon seed offal, a product obtained from melon seed, has hitherto been wasted. It consists mostly of melon seed shell and broken pieces of edible part. The potential of this by-products as a possible feedstuff in livestock production has not been fully exploited. Unlike the ones mentioned earlier, there seems to be a dearth of information on the utilization of this material.

This research was therefore carried out to determine the effects of replacing rice offal with melon seed offal in feed on the performance of growing rabbits.

Materials and Methods

Experimental site

The experiment was conducted at the Teaching and Research Farm, University of Agriculture Makurdi, Nigeria.

Experimental rabbits and management

Twenty-five cross-bred male weaner rabbits were used in the 12-week feeding trial to evaluate the effect of replacing rice offal with graded levels of melon (*Citrullus vulgaris*) seed offal on performance of growing rabbits.

Five experimental diets containing 0,7.5, 15, 22.5 and 30% MSO representing 0,25,50,75 and 100% replacement for RO were formulated as treatments 1 (control), 2,3,4, and 5 respectively. After a 7-day preliminary period the experimental animals were weighed and grouped into five in a completely randomized design (CRD). Animals were then put in individual cages and fed experimental diets with five animals to a diet. Feed and water were made available *ad-libitum*.

Source and processing of MSO

The MSO used in the experiment was obtained from Makurdi metropolis. It was processed by threshing previously moistened melon seed, allowing the threshed content to dry and then winnowing to separate the edible part from the offal. The offal was later ground before being used for ration formulation.

Nutrient digestibility/metabolic trial

During the 12th week of the study faecal collection was done using three animals from each treatment. A net that retained the faecal pellets but allowed the drainage of the urine was fastened under the cages. The total faecal output for each day was weighed and aliquot sample was taken and dried in oven at 80°C for 24 hours. The dried faecal samples for each animal over the seven-day collection period were bulked, ground and taken for analysis. The chemical composition of feed and faeces was determined using the procedure of A.O.A.C (1995).

Economic benefits

The economic benefits were based on the cost per kg diet and the average cost of feeding for 84 days.

Data collection

Animals were fed at 008h each day. Feed offered and residues were weighed in order to determine the amount of feed consumed. Animals were also weighed weekly so as to determine their weight gain. The average daily feed intake (ADFI), average daily weight gain (ADWG), feed conversion ratio (FCR) and coefficient of nutrient digestibility (CND) were all determined.

Statistical analysis

Data obtained were analyzed using the analysis variance (ANOVA) technique outlined in the MINITAB statistical software for completely randomized design (MINITAB, 1991) while significant

differences between treatment means were determined using least significant difference (LSD) as outline by Steel and Torrie (1982).

Table 1: Nutrient composition (%) of Melon Seed Offal (MSO) and Rice Offal (RO)

| | MSO | RO |
|----------------|-------|-------|
| Dry Matter | 91.17 | 90.60 |
| Crude protein | 9.61 | 6.80 |
| Crude fibre | 28.97 | 36.60 |
| Ether extracts | 8.38 | 7.60 |
| Ca | 0.36 | 0.17 |
| P | 0.15 | 0.49 |
| ME (MJ/kg) | 12.93 | 9.77 |

Table 2: Percentage composition of experimental diets

| Ingredients | Diets | | | | |
|---------------------------|----------------|----------------|----------------|----------------|----------------|
| | T ₁ | T ₂ | T ₃ | T ₄ | T ₅ |
| Yellow maize | 38.10 | 38.20 | 38.50 | 38.60 | 38.80 |
| Roasted full-fat soybeans | 28.40 | 28.20 | 28.00 | 27.90 | 27.70 |
| Melon seed offal | 0.00 | 7.50 | 15.00 | 22.50 | 30.00 |
| Rice offal | 30.00 | 22.50 | 15.00 | 22.50 | 0.00 |
| Bone meal | 2.75 | 2.75 | 2.75 | 2.75 | 2.75 |
| Salt | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Mineral vitamin premix | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Crude protein | 17.72 | 17.73 | 17.78 | 17.85 | 17.84 |
| Crude fibre | 12.73 | 12.41 | 11.94 | 11.46 | 10.99 |
| Ether extract | 10.31 | 8.66 | 8.69 | 8.27 | 8.69 |
| Ash | 10.91 | 8.18 | 0.07 | 6.26 | 5.88 |
| NFE | 48.33 | 53.02 | 53.52 | 53.16 | 56.60 |
| Ca | 1.28 | 0.94 | 1.04 | 1.17 | 1.20 |
| P | 0.85 | 0.77 | 0.75 | 0.81 | 0.40 |
| ME (MJ/kg) | 15.46 | 15.68 | 15.77 | 16.07 | 16.28 |

Table 3: Performance of experimental animals and economics of feeding experimental diets

| Parameter | Diets | | | | | SEM |
|---|---------|---------|----------|---------|---------|-------|
| | T1 | T2 | T3 | T4 | T5 | |
| Average Initial body weight (g) | 485.00 | 480.00 | 480.00 | 490.00 | 490.00 | 12.41 |
| Average final body weight (g) | 1890.40 | 1806.40 | 1848.00 | 1858.60 | 1669.00 | 32.28 |
| Average daily feed intake g/rabbit/day | 83.75 | 87.51 | 81.85 | 81.48 | 77.64 | 1.04 |
| Average daily weight gain g/rabbit | | | | 16.29 | 14.04 | 0.38 |
| FCR | 5.06 | 5.56 | 5.05 | 5.03 | 5.66 | 0.12 |
| Cost/Kg of diet (N) | 21.79 | 21.44 | 21.21 | 20.97 | 20.72 | 0.40 |
| Average cost of feeding for 84 days (N) | 152.34a | 157.20a | 145.82ab | 143.53b | 135.56b | 1.85 |

^{ab} Means on the same row with different superscripts are significantly different (P<0.05)

SEM- Standard Error of Means

FCR- Feed Conversion Ratio

Results and Discussion

The proximate composition of MSO, RO and the percentage composition of experimental diets are presented tables 1 and 2. Tables 3 and 4 show the performance of experimental animals, economics of feeding and the digestibility of the diets.

There were no significant (P>0.05) differences in the average daily feed intake and weight gain of animals due to diets even though diet 2 (7.5% MSO) had the highest feed intake value followed by diets 1 (Control), 3 (15% MSO), 4 (22.5% MSO) and 5 (30% MSO), respectively. The average feed intake of between 77.64 and 87.51g per animal per day observed in this experiment was quite high when compared with the values of between 51.28 and

71.88g (Attah and Ekpenyong, 1998) and between 60.08 and 62.86g (Agunbiade, *et al* 1999) reported for the same species of animals.

The average daily weight gain did not differ significantly (P>0.05) from diets 1 to 5. The highest average daily weight gain of 16.73g (treatment 1) and the lowest value of 14.04g (treatment 5) are lower than the ones obtained by Agunbiade *et al* (1999) (17.65-18.57/g/day) and Aduku *et al* (1998) (18-20g/day). These values are however superior to 7.71-14.69g/day obtained by Oyewale and Nelson (1998) and 7.53-12.23g/day obtained by Anugwa *et al* (1998).

There was no significant (P>0.05) effect of diets on the feed conversion ratio (FCR).

The values of between 5.03 and 5.66 obtained in the work indicate a lower feed utilization when compared to 2.93-4.20 obtained by Oyewale and Nelson (1998) but higher utilization than the 5.33-7.43 obtained by Attah and Ekpeyong (1998). Several factors including the nature of feed and the age of the animal are known to affect FCR. The cost per kg of diets and the average cost of feeding each animal for the period the experiment lasted are presented in Table 4. The cost/kg of diet (N) decreased

from N21.79-N20.72 with increase in the level of MSO in diets. The differences were however not significant ($P > 0.05$). The cost of feeding diets 1 and 2 was significantly ($P < 0.05$) higher than that for 4 and 5. The cost generally decreased with increase in the level of MSO in diets even though the cost per g weight gain did not show significant ($P > 0.05$) differences among the treatments being N9.11, N9.96, N8.96, N8.81 and N9.66 per g weight gain for treatments 1, 2, 3, 4 and 5 respectively.

Table 4: Nutrients digestibility coefficient (%) by Growing Rabbits fed graded levels of Melon Seed offal

| Parameter | Diets | | | | | SEM |
|-----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|------|
| | T ₁ | T ₂ | T ₃ | T ₄ | T ₅ | |
| Dry Matter | 68.31 ^b | 67.82 ^b | 71.76 ^a | 67.25 ^b | 73.15 ^a | 0.38 |
| Crude Protein | 69.65 ^b | 72.78 ^b | 79.59 ^a | 72.07 ^b | 81.25 ^a | 0.73 |
| Crude Fibre | 38.41 | 41.68 | 49.99 | 34.41 | 49.28 | 1.16 |
| Ether Extract | 87.40 ^b | 92.34 ^a | 94.25 ^a | 93.93 ^a | 94.81 | 0.46 |
| Nitrogen Free Extract | 75.94 | 75.77 | 76.62 | 75.92 | 75.41 | 0.51 |

^{ab} Means on the same row with different superscripts differs significantly ($P < 0.05$)

SEM- Standard Error of Means

The apparent digestibility of nutrients was generally high and CP and EE digestibilities improved with the inclusion of MSO in the diets of rabbits. Digestibility of all the nutrients was highest at 30% level of inclusion. DM and CP digestibilities were highest in diets 3 and 5 (15% and 30% levels of MSO inclusion) ($P < 0.05$). There were no significant differences in the digestibilities of CF and NFE among the diets. The DM digestibility values of 67.82-73.15% obtained in this study compare favourably with the values of 60.20-79.80% reported by Oyewale and Nelson (1998) who fed graded levels of rice offal to rabbits but higher than 42.33-57.46% recorded for rabbits fed graded levels of cocoa pod husks, (Babatunde *et al* 2000). The CP digestibility range of 69.65-

81.25% obtained in this study were higher than 65.60-74.50% reported by Oyewale and Nelson (1998) but lower than the 71.63-93.08% obtained by Babatunde *et al* (2000).

The CF contents of the diets increased with increase in MSO contents in the diets. Crude fibre digestibility was highest in diet 3 followed by diet 5 even though there were generally no significant ($P > 0.05$) differences among the treatments. There was no clear relationship between CF content of a diet and its digestibility in this work. Ani (2008), however observed a significant decrease in CF digestibility with increase in dietary CF when he increased the level of bambara groundnut waste to 30% in diets of growing rabbits. The author

reported a higher CF digestibility of 44.34 62.47% than 34.41 49.99% obtained in this study.

Of all the nutrients, the EE had the highest digestibility which ranged from 87.40 to 94.81%. Inclusion of MSO in diets significantly improved EE digestibility. This was probably due to the decrease in the fibre content of the diets as a result of MSO inclusion.

Conclusion

The performance and nutrient digestibility of growing rabbits fed MSO in this study were quite encouraging. The results showed that MSO could be used up to 30% as a component and up to 100% as a replacement for RO in rabbit diets with a good performance. The fact that MSO is cheaper than RO is in fact, an added advantage.

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