Growth and Haematological Effects of Rabbits Fed Delonix Regia Seed Diets

Ishaya B Kaga*
Department of Biological Sciences, Science Teachers Association of Nigeria, Nigeria

Abstract
The growth and haematological response of growing rabbits to diets containing Delonix regia seeds were studied for a period of 63 days. Forty (40) weaner rabbits with an average weight of 350-550 g obtained from College of Agriculture and Science Mando Kaduna State Nigeria, were assigned to eight dietary treatments containing Delonix regia seeds cooked at 100°C for 0, 15, 30, 45, 60, 75 and 90 minutes respectively. The rabbit were assigned in such that their aged, sizes and group weights were balanced as much as possible. The animals were allowed to adjust to the test diets and cages for 7 days before the start of the experiment.

During the period of acclimatization, the rabbits were dewormed with invermatin injection. Each of the treatments contained five (5) rabbits in a Completely Randomised Design (CRD). All cages were supplied feeders and drinkers. The diet were formulated to contain over 18% crude protein and fortified with minerals and Vitamin premix in accordance with NRC nutrient requirements for rabbits. Proximate analysis and haematological parameters were determined. So also average daily feed intake, weight gain, feed efficiency and cost per kg lived weight were calculated using the prevailing market price of that season.

Initial and final weights were also observed. Generally, Delonix regia seed diets performed better than the control group as the duration of cooking increases up to 60 minutes of cooking. Feed efficiency also increases significantly (P<0.05) as the duration of cooking increases. Numerically, rabbits fed on seeds cooked for 60 minutes had the highest feed consumed and the best feed efficiency. The best Packed Cell Volume (PCV) was obtained from the control diet. The absence of monocyte and eosinophils indicated that Delonix regia seed diets could be fed to rabbit from 30-50% inclusion without causing any side effect, thus providing a cheaper source of feeding and feeding conversion ratio.

Keywords: Nutritive value; Growth; Haematological parameters

Introduction
The animal protein for human consumption in Nigeria (from cattle, pigs, poultry, sheep and goats.) has not been able to bridge the gap between demand and supply. Despite the numerous advantages associated with the consumption of animal protein, the minimum intake recommended by FAO (1992) has not been met. This is mostly because the price of meat has gone beyond the means of most Nigerians.

The domestic rabbit (Oryctolagus cuniculus) is an important non ruminant herbivore for meat production. Rabbit meat is a source of healthful food as it is low in cholesterol but high in protein 22 g/1000 kcal [1]. Rabbit can also utilize the available proteins in cellulose rich plants whereas, it is not economical to feed these to chickens and turkeys, the only animals with higher energy and protein efficiency. Since there is high demand for additional source of food world wide the exploitation of plant seeds of low economic importance would be a step toward better resource utilization Telek et al. [2] which is in line with the strategy to achieve sustainable animal production system by matching them with locally available feed sources [3].

The continued increase in cost of conventional feeding ingredients especially grains, cakes and meals and the effective competitions from other industries.

Materials and Methods
Seed collection and preparation
The seeds of Delonix regia were obtained from College of Agriculture and Science, Mando Kaduna State, Nigeria. The pods were soaked in a pool of water for 3 days for the seeds to split open after sun drying. The seeds collected were divided into six batches; one batch was left raw, while other batches were cooked for various durations, namely, 0, 15, 30, 45, 60, 75 and 90 minutes, respectively. Timing commenced immediately after adding the seeds in boiling water. The boiled seeds were drained off the water and sun dried for 4 days. The raw and boiled seeds were milled in a hammer mill and stored in screw-capped container until required for feed formulation.

Proximate analysis
Moisture content: Five grams of the sample was weighed into pre-weighed aluminum drying dish. The sample was dried to a constant weight in an oven at 105°C for 4 h [4]. The moisture content was then determined as follows:

\[
\text{Moisture content} = \frac{m_i - m_0}{m_i} \times 100
\]

Keywords: Nutritive value; Growth; Haematological parameters

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percentage ash was determined using the following formula:

\[
\text{Ash} = \left( \frac{\text{Weight of crucible+ash} - \text{Weight of empty crucible}}{\text{weight of sample}} \right) \times 100
\]

Crude fat: Five grams of the sample was put in the thimbles and plugged with cotton wool. The thimbles were dried and inserted into a Soxlet system HT2. The extraction cups were dried and weighed, 25 ml of petroleum ether was added to each cup. The cup was inserted in the soxhleic, and the sample was extracted for 15 min in a boiling position and 45 min in a rising position. The percentage fat in the sample was calculated as follows:

\[
\text{Fat} = \left( \frac{W_1 - W_2 \times 100}{W_1} \right)
\]

Crude fibre: The trichloroacetic acid method of Joslyn [5] and Adeniji et al. [6] was used. The sample was defatted with petroleum ether. Five grams of the defatted sample was weighed into a 600 ml beaker and 100 ml trichloroacetic acid was added. The sample was boiled and refluxed for 4 min. The cooled sample was filtered with a filter paper, Whatman No. 4. The residue was washed with distilled water and methylated spirit. The filter paper together with the sample were transferred to porcelain crucible and dried in an oven overnight at 100°C. The sample was cooled in a desiccator and weighed. It was then ashed in a muffle furnace and maintained at 50°C for 6 h. It was then cooled in a desiccator and weighed out immediately. The percentage ash was determined using the following formula:

\[
\text{Ash} = \left( \frac{\text{Weight of crucible+ash} - \text{Weight of empty crucible}}{\text{weight of sample}} \right) \times 100
\]

Blood Collection and Clinical Examination

Blood samples were collected at the 8th week from the jugular veins of the rabbits into a set of Bijou bottles, containing Ethylene diamine tetra acetate (EDTA) [7,8] immediately after collection. The blood samples were taken to the laboratory for analysis.

Packed Cell Volume Determination

The Packed Cell Volume (PCV) values of the blood were determined according to the micro-haematocrit method of Benjamin [7] with slight modification Oladele [9] in timing of the centrifuge. Blood containing EDTA was aspirated into a set of plain capillary tubes. The blood sample was centrifuged at 9,500rpm for 15 minutes and PCV read directly from the graphic reader in percentage.

Haemoglobin Estimation

The values of haemoglobin for the rabbits were estimated by dividing the PCV value by 3 Maxwell et al. [10], Makinde and Olowookurun [11].

Total Protein of Determination

The total proteins in the blood of rabbits were determined using hand refractometric method of Benjamin [7]. Data collected were subjected to analysis of variance (ANOVA) Duncan’s Multiple Ranges was used to separate the significant means both contained in SSPPS for Windows 2003.

Results and Discussion

The result of the proximate composition of Delonix regia seed diets are presented in Table 1. Dry matter ranges from 90.48-93.35g while protein is from 18.29-19.02%. Dry matter intake in animal nutrition is very important as it ensures the intake of large quantity of nutrients when compared to high moisture feeds. Significant difference (P>0.05) exist in the dry matter, protein, ether extract, ash and free nitrogen extract when the seeds were cooked at different durations. However, there was no significant difference (P>0.05) in the fibre contents. Crude fibre is useful for maintaining bulk mortality and increase intestinal peristalsis by surface extension of the food in the intestinal track [12].

This is also necessary for food digestion. The result shows that the crude fibre contents of the seeds are within the ranges recommended by Anugwa in 1998 and therefore suitable as materials for monogastric animals.

Table 2 is the effect of cooking Delonix regia seeds at 100°C for various durations. Significant difference exists between seeds cooked at different duration of time. The best cooking time for Delonix regia seed was 60 minutes. At 60 minutes cooking, it had the best feed efficiency, the highest feed consumed and there was no mortality reported. The higher ether extract value indicates a higher fat content.

The crude protein values were well above NRC recommended values for monogastric animals [13]. Studies Aletor and Aladetimi
of these diets on the rabbits. This result is in agreement with the

in all the treatments were apparently, due to better nourishment

an efficient oxygen transport system. The higher PCV and Hb of rabbits

reported by Turfey (1995). This normal range of haemoglobin suggests

Haemoglobin levels were within the reported range of 9.9-19.3%

is the fraction or portion occupied by the red blood cell Bush (1991).

ASAN (2006) and 33-50% reported by Medi Rabbit [18]. The PCV

of 31.0-48.6% reported by Mitruka and Rawnsley [17], 33-50%

study were not significantly (P>0.05) influenced by dietary treatments.

in haematological and biochemical parameters reflect the physiological

Delonix regia seeds. It is well established that changes

rabbits fed

seeds. Table 3 shows the haematological parameters of

Delonix regia seeds. When

Delonix regia seeds are consumed. The values obtained compared

Table 2: Proximate Composition of Experimental Diets of Delonix regia Seeds Meal Cooked at 100°C for Varying Duration (in minutes).

| Parameters | Control | 2     | 3     | 4     | 5     | 6     | 7     | 8     |
|------------|---------|-------|-------|-------|-------|-------|-------|-------|
| Crude Protein (%) | 18.50   | 16.89 | 16.89 | 16.89 | 16.89 | 16.89 | 16.89 | 16.89 |
| Crude Fibre (%)   | 4.01    | 7.15  | 7.15  | 7.15  | 7.15  | 7.15  | 7.15  | 7.15  |
| Ether Extract (%) | 4.09    | 13.62 | 13.62 | 13.62 | 13.62 | 13.62 | 13.62 | 13.62 |
| Ash (%)           | 2.23    | 3.22  | 3.22  | 3.22  | 3.22  | 3.22  | 3.22  | 3.22  |
| Calcium (%)       | 0.32    | 0.46  | 0.46  | 0.46  | 0.46  | 0.46  | 0.46  | 0.46  |
| Phosphorus (%)    | 0.40    | 0.32  | 0.32  | 0.32  | 0.32  | 0.32  | 0.32  | 0.32  |
| Lysine (%)        | 0.80    | 4.38  | 4.38  | 4.38  | 4.38  | 4.38  | 4.38  | 4.38  |
| Methionine (%)    | 0.43    | 0.60  | 0.60  | 0.60  | 0.60  | 0.60  | 0.60  | 0.60  |
| Cost per kg (₦)   | 70.18   | 42.37 | 42.37 | 42.37 | 42.37 | 42.37 | 42.37 | 42.37 |

A vitamin-mineral premix provides per kg of diet: Vit. A, 13,340. i.u; Vit D₃, 2680 i.u; Vit. K, 2.68 i.u; Calcium pantothenate, 10.68 mg; Vit B₆, 0.022 mg; Folic acid, 0.668 mg; Choline chloride 400 mg; Chlorotetracycline, 26-28 mg; Manganese, 133.34 mg; Iron, 66.68 mg; Zinc, 53.34 mg; Copper, 3.2 mg; Iodine, 1.86 mg; Cobalt, 0.268 mg; Selenium, 0.108 mg.

The Packed Cell Volume (PCV) obtained fell within the range

of animal [16]. Packed Cell Volume (PCV) values obtained in this

Conclusion

The results from the feeding trials indicate normal haemoglobin
Table 3: Haematological Parameters of Rabbits Fed Delonix regia Seed Cooked at 100°C for Varying Duration.

|                        | Control | 0 min. | 15 min. | 30 min. | 45 min. | 60 min. | 75 min. | 90 min. | SEM | LOS |
|------------------------|---------|--------|---------|---------|---------|---------|---------|---------|-----|-----|
| Packed cell volume (%) | 35.25a  | 41.65ab| 46.50a  | 33.75b  | 35.00b  | 35.00b  | 38.00ab | 38.75ab | 1.11| NS  |
| Total protein          | 6.44b   | 7.75a  | 6.00b   | 6.65a   | 6.27b   | 6.46a   | 6.20a   | 6.10a   | 0.10| NS  |
| Haemoglobin            | 11.73c  | 12.20c | 15.55c  | 11.23c  | 11.63c  | 12.62c  | 11.90c  | 12.68c  | 032 | NS  |
| Leucocytes             | 10.84c  | 10.65a | 8.75a   | 9.00a   | 7.57a   | 15.06a  | 11.70c  | 10.11b  | 0.90| NS  |
| Neutrophils            | 24.00a  | 30.25a | 31.50a  | 32.00a  | 31.00a  | 28.40a  | 32.60a  | 31.50a  | 2.39| NS  |
| Lymphocytes            | 75.50a  | 68.75a | 68.25a  | 67.25a  | 75.50a  | 71.00a  | 67.00a  | 68.25a  | 2.43| NS  |
| Monocytes              | 1 3 1   | 3 3 2  | 1 1     | 0 0 0   | 0 0 0   | 0 0 0   | 0 0 0   | 0 0 0   |     |     |
| Eosinophils            | 1 0 1   | 1 0 1  | 0 0 0   | 0 0 0   | 0 0 0   | 0 0 0   | 0 0 0   | 0 0 0   |     |     |

Figures followed by the same letter(s) in each row are not significantly different (P< 0.05) using DMRT
SEM: Standard error of means
*: Significant (P < 0.05)
*: LOS: Level of significance
NS: Non-significant difference

and higher PCV values of rabbits in all treatments, thus showing the nutritional status of the seeds. The rare occurrence of monocytes and the absence of eosinophils shows that the seeds did not cause any inflammatory and allergic reactions respectively. It can therefore be included on rabbit diets without compromising the health status of the rabbits.

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