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EFFECT OF VARYING INCLUSION LEVELS OF HOG PLUM (*Spondias mombin*) LEAF MEAL ON PHYSIOLOGICAL VALUES OF RED SOKOTO BUCKS

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Abstract

The study was carried out to evaluate the physiological responses of hog plum leaf meal on red Sokoto goats (bucks). The bucks were randomly allocated to five treatment diets with 3 bucks per treatment in a Completely Randomized Design. The hog plum leaf meal was fed at levels of 0, 10, 20, 30 and 40% in treatments 1, 2, 3, 4 and 5 respectively. The experimental diets and clean drinking water were offered to the bucks *ad libitum*. All physiological values were measured in accordance with routine clinical procedures. Rectal temperature was significantly higher ($P<0.05$) in bucks on 0, 10 and 40% hog plum leaf meal. The respiratory rate was significantly higher ($P<0.05$) in bucks fed diets with 20 and 40% hog plum leaf meal and the lowest value was recorded on control diet. Heart rate was higher on bucks fed diets with 20 and 40% hog plum leaf meal than other treatments. The capillary refill time was significantly faster ($P<0.05$) in bucks fed 40% hog plum leaf meal than other treatments. A prolonged capillary refill time was observed in bucks fed on control diet. Which is a sign of shock and indicates dehydration in bucks, which was as a result of the absence of hog plum leaf meal in the control diet. It was concluded that Hog plum leaf meal could be used as feed resources to raise goat bucks without any adverse effect on physiological responses.

Keywords: hog plum leaf meal, treatment diet, red sokoto bucks and physiological responses

Introduction

Conventional basal energy feeds are scarce and becoming increasingly expensive in Nigeria. The inclusion of alternative feeding stuffs in animal diet might be interesting in some circumstances (relative price, feed quality) which is limited because of lack of information on their value (Famino *et al*., 2003). Nutrition is the single most important factor militating against livestock production in Nigeria. Hog plum (*Spondias mombin*) is a small deciduous tree plant of up to 20m height and occurs in a great variety of humid tropical climates. Its fruits, bark, leaves and roots are of great importance agriculturally and otherwise. Its leaves make excellent fodder for livestock. The fruits are also of great nutritional value (Oladele, 2008). The leaves are more readily available and cheap especially during the dry seasons when most other forages are in short supply. Well dried leaves can be stored for long periods of time (Aregheore *et al*., 2003). Domestic animals are homotherms which tends to maintain a constant body temperature through a balance of heat gain and loss. Body temperature is one of the good indicators of good health in animals. Its variation above and below normal is a measure of the animals' ability to resist stress factors of the environment. The allowable variation in the body temperature is small (Oladimeji *et al*., 1996). The body temperature of the animal is sometimes an excellent indicator of the animal's general health, because temperature is not always the same in all parts of the body or even constant in one particular place, the rectal temperature is used to show the body's internal temperature. If you take an animal's mouth temperature, you will find that reading is lower than that of the skin, which may be much lower than the rectum, where most animal temperature are taken. Several factors influence body

temperature in a healthy animal. The respiration rate is subjected to body size, age, exercise, excitement, environmental temperature and the degree of fullness of the digestive tract. **Materials and Methods**

Experimental Site

The study was conducted at the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria. Zaria is within Northern Guinea Savannah zone of Nigeria, located on latitude 11' 12°N and longitude 7' 33°E at an altitude of 610 m above the sea level (Ovimaps, 2015).

Sources and processing of Experimental Material

The Hog plum *(Spondias mombin*) fresh leaves were obtained from Bakori, Bakori Local Government Area of Katsina State. The fresh leaves were spread under the shade and allowed to dry for ten (10) days. All foreign materials such as branches and dead leaves were removed from the sample. It was packed into clean polythene bags and stored in a dry place until required for feed formulation.

Experimental Animals and Management

Fifteen (15) Red Sokoto Bucks of average weight range 10-11 kg were used. On arrival, the animals were quarantined for three weeks against internal and external parasites and bacterial infection. They were allowed 14 days to adjust to feed and confinement before the actual start of the experiment. The animals were de-wormed with Albendazol (10 mg/kg) against internal parasites during confinement period.

Experimental Diets

Five diets containing graded levels of hog plum dry leaves meal at 0, 10, 20, 30, and 40% inclusion rates were formulated and designated as T1, T2, T3, T4, and T5. T1 served as the control (no hog plum leaves).

Feeding Trial and Design

The Red Sokoto Bucks were randomly allocated to five dietary treatments with 3 bucks per treatment in a Completely Randomized Design (CRD). The feeding trials lasted for ninety (days (90 days). The bucks were fed at 3% body weight. Water was provided *ad libitum.* Each buck was offered the treatment diet in 2 allocations daily, at 8:00 a.m. and 4:00 p.m. respectively. The left-over was collected the following morning and weighed before fresh feed was offered to determine the feed intake. All bucks were weighed at the beginning of the experiment and fortnightly thereafter to adjust the amount of treatment diet given in order to maintain the pre-determined level of 3% feeding of the animal's body weight for the period of the study. **Measurement of Physiological Response**

Each of the experimental animals was restrained and calmed before taking readings in order to prevent them from undergoing unnecessary stress. All physiological values such as rectal temperature (°C), respiratory rate (breath/minute), heart rate (beat/minute), and capillary refill time (seconds) were measured in accordance with routine clinical procedures. All physiological indices were measured as described by Kelly (1984). The thermometer was inserted in to the rectum of the buck until a beeping sound was heard, usually in one minute. Respiratory rate was taken by counting the movement of the right flank at the paralumbar fossa of the goat (buck) for one minute and presented as the number of breaths per minute. The value was taken for one minute of regular breathing with the buck standing quietly. Heart rate was taken from the heart location which is behind the elbow, between the fourth and fifth rib on the left side of the buck using a Stethoscope by counting the number of heart beats per minute. Capillary refill time was measured by pressing on the gum of the buck for five seconds with a finger or thumb, and noting the time needed for the color of the gum to return once the pressure is released with the aid of a stop watch.

Statistical Analysis

All data generated were subjected to analysis of variance (ANOVA) using the General Linear Model (GLM) procedure of Statistical Analysis System (SAS, 2002). The treatment means were separated using Dunnet test (Dunnet, 1955).

Results and Discussion

Chemical composition of test materials and experimental diets containing graded level of hog plum leaf meal diets.

The results of the chemical composition analysis of hog plum leaf meal from Table 2 below was found to be rich in dry matter (94.57%), Crude protein (13.36%), ash (9.86%) and Nitrogen free extract (67.87%). Chemical composition of experimental diets containing graded level of hog plum leaf meal diets fed the growing red Sokoto bucks are shown in Table 2 The crude protein (CP) content of the diet was approximately 12%. The CP value of Hog plum leaf meal in the present study (13.36%) was higher compared to the treatment diets. The dry matter (DM) contents which varied from 89.52-96.33 was quite high. The highest crude fibre (CF) level was recorded in the control diet (0%) hog plum leaf meal followed closely by diet 10, 20, 30 and 40% Hog plum leaf meal in that order. The level of Ash, Nitrogen free extract and Organic matter increased linearly with increasing level of Hog plum leaf meal, in contrast the level of ether extract decreased with increasing level of Hog plum leaf meal.

Table 2: Chemical composition of test materials and experimental diets containing graded level of hog plum leaf meal diets

Parameter		Dietary Treatment (%)				
	Dry Hog Plum Leaves	0	10	20	30	40
Dry matter	94.57	89.52	94.95	96.20	96.29	96.33
Crude protein	13.36	11.78	11.35	12.26	12.33	12.46
Crude Fibre	0.34	19.83	18.06	16.24	14.32	13.47
Ether extract	2.95	2.69	2.63	2.58	2.53	2.61
Ash	9.86	8.17	8.45	9.86	9.75	9.68
Nitrogen free extract	67.87	47.63	54.59	55.85	57.68	58.32
Organic matter	84.71	81.35	86.50	86.34	86.54	86.65
ME (Kcal/kg)	2758.29	2285.324	2506.236	2628.374	2702.490	2732.452

Effect of varying Inclusion levels of hog plum leaf meal on physiological values of red Sokoto bucks

The physiological responses estimated:- (rectal temperature, respiratory rate, heart rate, and capillary refill time), showed a significant difference between the treatments (P>0.05). Rectal temperature was significantly higher (P<0.05) in goats (bucks) on 0, 10 and 40% hog plum leaf meal. The rectal temperature of 38.09^{0}C to 38.74^{0}C obtained are consistent with Darcan and Güney, (2008). In all farm animals, only goats can maintain their rectal temperatures below 38.5°C, which is considered normal Avendano-Reyes *et al*., 2006). Yousef (1985) reported that increased body temperature is a normal mechanism by which animals diffuse heat from their bodies to maintain thermoregulation in hot ambient conditions. Ogebe *et al*. (1996) reported that, as temperature increased; less time was spent consuming feed, probably to minimize or curtail body heat production and to keep the body cool. The respiratory rate was significantly higher (P<0.05) in bucks fed hog plum leaf meal containing diets on 20 and 40% (40.00 and 42.13 brpm) and the lowest value was recorded on control (37.00 brpm). The basal respiratory rate of goats is about 25-30 breaths per minutes (Silanikove, 2000). Heart rate was higher on 20 and 40% hog plum leaf meal (73.19-74.26 bpm). The decrease in heart rate was drastic in the control (71.87 bpm). The

decrease in heart rate observed is similar to earlier reports of Mohammed and Yelwa, (1993) and Singh *et al.* (2007). Decrease in heart may probably cause bradycardia by increasing the vagal tone and decreasing sympathetic activity of the animals (Mohammed and Yelwa, 1993). The capillary refill time was significantly faster (P<0.05) in goats on 40% hog plum leaf meal (2.01 sec.) than other treatments. Normal capillary refill time for goats is usually within two seconds. A prolonged capillary refill time on the control (2.33 sec.) may be a sign of shock and can also indicate dehydration, and this may be as a result of the absence of hog plum leaf meal in the control diet. When the goat (buck) is dehydrated, the membranes become dry and the capillary refill time will become prolonged (>2-3 seconds).

Table 3: Effect of Varying Inclusion Levels of Hog Plum Leaf Meal on Physiological Parameters of Red Sokoto Bucks

Parameters	Dietary Treatments (%)					
	0	10	20	30	40	SEM
Rectal temperature (°C)	38.09^{a}	38.64^{a}	37.19^{b}	37.77^{ab}	38.74^{a}	0.66
Respiratory rate (brpm)	37.00^{b}	41.60^{a}	40.00^{a}	39.33^{ab}	42.13^{a}	1.11
Heart rate (bpm)	71.87^{ab}	69.89^{b}	74.26^{a}	70.80^{ab}	73.19^{a}	2.11
Capillary refill time (sec)	2.33^{b}	2.29^{b}	2.11^{a}	2.03^{a}	2.01^{a}	0.09

^{abc}Means with different superscripts within the same row differed significantly (P<0.05), SEM= Standard Error of Mean, brpm=breath per minute; bpm= beat per minute.

Conclusion

Hog plum leaf meal is abundantly available and is a cheap alternative source of protein. Up 20% Hog plum leaf meal can be included in the goat diets without any adverse effect on physiological values. It is concluded that Hog plum leaf meal is economical and affordable in goat production.

Recommendations

Further studies should be conducted using higher levels Hog plum leaf meal supplementation to determine the physiological responses of Red Sokoto bucks.

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