Acta Scientific Veterinary Sciences (ISSN: 2582-3183)

Volume 4 Issue 8 August 2022

Research Article

Effect of Dietary Inclusion Levels of Hog Plum (*spondias mombin*) Leaf Meal on Physiological Responses of Red Sokoto Bucks

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Received: June 21, 2022

Published: July 25, 2022

Abstract

This research was therefore seeks to update baseline data on physiological responses, which help in realistic evaluation of the management practice, nutrition and diagnosis of health condition of Red Sokoto bucks Hog plum plant trees have high conceivable outcomes as imperative nourish resources for ruminants amid the long period of the dry season and are very palatable. The ponder was carried out to assess the impacts of hog plum leaf meal on physiological responses of Red Sokoto bucks. The bucks were apportioned to five treatments and three replicates in a totally randomized design. The hog plum leaf meal (HPLM) was fed at 0, 10, 20, 30 and 40% inclusion rates in 1, 2, 3, 4 and 5 treatments diet respectively. All physiological values such as rectal temperature (oC), respiratory rate (breath/minute), heart rate (beat/minute), and capillary refill time (seconds) were measured in accordance with routine clinical procedures. Rectal temperature was significantly ($P < 0.05$) higher in bucks on 0, 10 and 40% hog plum leaf meal. The respiratory rate was significantly ($P < 0.05$) higher 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 ($P < 0.05$) faster 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. It is concluded that hog plum leaf meal could be utilized as nourish resources to raise goat bucks without any antagonistic effect on physiological responses.

Keywords: Hogplum Leaf Meal; Treatment Diet; Red Sokoto Bucks; Physiological Responses

Introduction

The level of production achieved in any specific livestock farm is a function of the special combination of the animals, nourishing management, environment, and wellbeing care factors [22]. Nourishment is the single most imperative factor militating against animal production in Nigeria. Ailing health particularly within the dry season when herbage quality is low could be a problem. Lack of enhancement in crop yields and competition between people and animals for available grains makes dietary requirements at a sensible cost more troublesome to achieve [23]. The incorporation of elective nourishing stuff in animal diet could be interesting in some circumstances (relative cost, feed quality) which is constrained because of lack of information on their value [6]. Hog plum (*Spondias mombin*) could be a small deciduous tree plant of up to 20m in height and occurs in an extraordinary assortment of humid tropical climates. Its natural products, such as bark, leaves, and roots are of great importance agriculturally and otherwise. Its leaves make fabulous fodder for livestock. The fruits are moreover of incredible dietary value [13]. Nutrition is the single most vital factor militating against animal production in Nigeria. Ordinary basal energy feeds are scarce and getting to be progressively costly in Nigeria. The leaves are more promptly accessible and cheap particularly amid the dry seasons when most other forages are in short supply. Well dried leaves can be put away for long periods of time [2]. 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 [14]. 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 components influence body temperature in a healthy animal. The respiration rate is subjected to body size, age, work out, energy, environmental temperature and the degree of completion of the digestive tract.

Materials and Methods

Experimental site

The study was conducted at the Teaching and Research farm of the Division of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Samaru - Zaria, Faculty of Agriculture, Ahmadu Bello University, Samaru - Zaria. Zaria is inside Northern Guinea Savannah zone of Nigeria, found on scope 11' 12°N and longitude 7' 33°E at an elevation of 610m above the sea level [15].

Feed ingredients

Maize cobs were moreover obtained from Bakori Local Government Area of Katsina State. The maize cobs were packed, prepared and stored earlier to feeding. Other feed ingredients which incorporate cotton seed cake, wheat offal, bone meal, and salt were obtained from the market

Anti-nutritional factor of hog plum leaves extract

Prior to quantitative phytochemical analysis, phytochemical screening was carried out on the plant's leaf extricate utilizing standard methods as portrayed by [1,21]. The percentage compositions of saponins, tannins, and phytate were determined accordingly to the strategies of [8,24]. Oxalate substance was determined by spectrophotometric methods of [7].

Experimental animals and management

Prior to the entry of animals, the pens were cleaned and sanitized. Fifteen Red Sokoto bucks of the average weight range of 10-11 kg were used. On arrival, the animals were isolated for three weeks; and managed ivomectin (Ivomec®) 1% at a rate of 0.2mg/kg body weight (0.2 mg/kg) and anti-microbial Tetracycline LA 200 mg/ml against internal and external parasites and bacterial infection and were vaccinated against Peste des peptits ruminants (PPR) with Tacrive virus disease vaccine (TCRV) [25]. They were allowed fourteen days to adjust to feed and control before the real beginning of the trial. The animals were de-wormed with Albendazol (10 mg/kg) against internal parasites during confinement period [25].

Experimental diets

Five dietary treatments containing evaluated levels of hog plum dry leaves meal at 0, 10, 20, 30, and 40% inclusion rates were formulated and assigned as T1, T2, T3, T4, and T5. T1 serve as the control which had no hog plum dry leaves.

Feeding trial and design.

Fifteen Red Sokoto bucks were haphazardly designated to five dietary treatment diets with three bucks per treatment in a totally randomized design. The feeding trials lasted for three months. The bucks were nourished at 3% body weight. Groundnut haulms was also offered daily, water was provided *ad libitum.* Each buck was offered the treatment diet in two allotments daily. The left-over was collected the following morning and weighed before the fresh feed was offered to determine the feed intake. All bucks were weighed at the starting 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 [9]. The thermometer was inserted into 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 para-lumbar 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 noticing the time needed for the color of the gum to return once the pressure is discharged with the help of a stopwatch.

Chemical analysis

The proximate composition of the Hog plum leaf meal were determined as depicted [1]. Nitrogen Free Extract (NFE) was determined by difference and Metabolisable Energy (ME) was calculated according to the method of [16] as: ME (kcal/kg) = 37 x % potein + 81.8 x % fat + 35.5 x NFE.

Statistical analysis

All data produced were subjected to analysis of variance (ANOVA) using SAS, Statistical Analysis System [18]. The treatment means were isolated using Dunnet test [5].

Results

The results of the chemical composition analysis of hog plum leaf meal in Table 1 were 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 also shown in Table 1. The crude protein (CP) content of the diet was around 12%. The CP content of Hog plum leaf meal within 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.

Parameters		Dietary Treatments (%)				
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

Table 1: Chemical composition of test materials and experimental diets containing graded level of hog plum leaf meal diets.

ME: Metabolisable Energy in Kcal/kg = (%CP x 37) + (%EE x 8.18) + (%NFE x 35 [16].

Table 2 showed the results of anti-nutritional factors of Hog plum leaf meal. Hog plum leaf meal contains 1.01 mg phytate, 0.47mg oxalate, 0.38mg tannin and 2.70mg Saponin in every 100g of *Spondias mombin* dry leaves.

The physiological values of Red Sokoto bucks fed varying inclusion level of hog plum leaf meal are shown in table 3. A significant difference were found between the treatments ($P < 0.05$) for all the physiological values. Rectal temperature was significantly lower

Composition	mg/100g
Phytate	1.01
Oxalate	0.47
Tannins	0.38
Saponin	2.70

Table 2: Anti-nutritional factor of hog plum leaf meal.

for bucks on 20% hog plum leaf meal than 0, 10 and 40% hog plum leaf meal bucks. Respiratory rate was significantly higher for bucks on 10, 20 and 40% hog plum leaf meal than 0% (control). Heart beat was higher on 20 and 40% hog plum leaf meal than 10% hog plum leaf meal while capillary refill time was faster on the control and 10% HPLM than 20, 30 and 40% hog plum leaf meal 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

Table 3: Effect of varying inclusion levels of hog plum leaf meal on physiological parameters of red sokoto bucks.

^{abcd} 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.

Discussion

Proximate crude protein content of Hog plum leaf meal in this present study (13.36%) was marginally higher compared to the treatment diets which was roughly 12%. The dry matter contents 94.57% were quite high. The crude fiber level was recorded as 10.34%. The levels of ash, nitrogen free extricate was 9.86% and 67.87%, respectively. The result of anti-nutritional components in Hog plum leaf meal appeared that there were phytate1.01mg, oxalate 0.47mg, tannin 0.38mg and saponin 2.70mg in each 100g of *Spondias mombin* dry leaves, which may tolerable by ruminants [10], who observed that sheep ingesting up to 0.9mg hydrolyzable tannins per kilogram body weight showed no toxicity These phytochemicals display various pharmacological and biochemical activities when ingested by animals. Saponin may be a known anti-nutritional figure that can decrease the take-up of certain nutrients including cholesterol and glucose at the gut through intra-lumenal physicochemical interaction or other yet unidentified activity [17]. Furthermore, oxalate and saponin observed in the plant had lower concentrations and have been related with the observed antimicrobial impacts in different studies involving plant extracts. The physiological responses (rectal temperature, respiratory rate, heart rate, and capillary refill time) showed an outstanding difference among the treatments. Rectal temperature in bucks on 0, 10 and 40% hog plum leaf meal were higher compared to other treatments. The rectal temperature of 38.09^{0}C to 38.74^{0}C obtained are consistent with [4]. In all farm animals, as it were goats can maintain their rectal temperatures underneath 38.5°C, which is considered ordinary, [3]. [26] reported that expanded body temperature could be a typical mechanism by which animals diffuse heat from their bodies to maintain thermoregulation in hot ambient conditions. [12] 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 [19]. 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 [11,20]. Decrease in heart may probably cause bradycardia by increasing the vagal tone and decreasing sympathetic activity of the animals [11]. The capillary refill time was faster 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).

Conclusion

The study appeared that up to 20% Hog plum leaf feast can be included within the Red Sokoto bucks diets without any antagonistic effect on physiological values.

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