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EFFECT OF FEEDING GMELINA ARBOREA LEAVES SUPPLEMENTED WITH ASPERGILLUS TREATED RICE HUSK ON GROWTH PERFORMANCE AND HAEMATOLOGY OF WEST AFRICAN DWARF GOAT (WADG)

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ABSTRACT: *One hundred and twenty (120) weaned West African Dwarf Goats of about 3 months of age, averaged 6.0±0.1kg body weight were used in a 84-day feeding trial. The objective of the research was to determine the effect of feeding Gmelina Arborea Supplemented with Aspergilly treated rice husk in the diets of WAD goats on their growth performance and hematological indices. The experimental diets were identified as 0%, 25%, 50%, 75% rice husk and 100% 75%, 50%, 25% Gmelina Arborea respectively. Result indicated significant (P<0.05) differences in the feed intake, weight gain, and Feed Conversion Ratio (FCR) among the treatments except the final body weight. However, these was no corresponding influence of the treatments on the (P>0.05) in the hematological (PCV, Hb, RBC, WBC) indices studied. Result obtained from this study showed that WAD can tolerate up to 75% Gmelina Arborea and 25% Aspergillus treated rice husk inclusion in diet without loss in body weight performance. Results suggest that intensive ruminant production may benefit from the use of rice husk and Grmelina Arborea without any detrimental effect on the health status of the animals.*

KEYWORDS: Growth performance, Rice Husk, Gmelina Arborea, Hematology and West African Dwarf Goat (WADG).

INTRODUCTION

The West African Dwarf Goat (WADG) is a household livestock owned by most rural families in the Southern part of Nigeria. The animals is noted for their ability to convert poor quality fibrous feed into useful animal products. The animals have been fovend to eat up the bark of trees and growing aromatic leguminous plant. This is why they are mostly regarded as inquisitive feeders with a wide range of feeds.

The problems encountered during the dry season in Nigeria has triggered off an aggressive search for novel and less conventional feedstuff, without compromising the quality of various ingredients to be supplied. The available forages are of low quality; hence, there is a sharp decrease in voluntary feed intake and digestibility of ruminants and goats in particular.

Conventimal feedstuff like the concentrates are usually expensive and not readily available in areas where goats are kept. Some multipurpose trees like Gmelina Arborea have been documented as good alternatives feed supplemented to animals (Majgaonka et al; 1987). Carew et al; 1980) reported that sheep and goats have been traditionally sustained more on browse than on grasses in the rain forest areas of southern Nigeria, where there are hardly any pasture lands comparable to those in savanna regions of Northern Nigeria.

Mecha and Adegbola (1980) had reported that browse tree leaves tend to have lower crude fiber content than grasses harvested at some time. On the average, the browse species had more crude protein content even in the rainy season (July-August). Gmelina Arborea has a high digestibility (Lowry, 1995) but showed that most of the rumen fermentation occurred very rapidly in the first 24hours. Studies have shown that partial replacement of energy and protein sources from conventional feeding materials by browse plant leaves neither affect productivity in terms of growth performance and cost reduction (Amata and Bratte, 2008; Amata et al; 2009) nor hematological and serological characteristics (Amata, 2010).

Impact on the grain market from bio-fuel expansion could be solved if attention is paid on the biological treatment of the hvge quantity of the fibrous crop residues. Animal quantity of fibrous residues from cereal crops available in Africa was put at about 340 Million tones. These enormous amounts represent potential valuable materials for future biotechnological exploitation.

The waste agricultural residues like rice husk consist mostly of polysaccharides which are poorly digested by ruminants due to the presence of lignin which is recalcitrant to microbial degradation. Lignin also constitutes a physical barrier to the extraction and utilization of other components. The physical barrier of lignin could be broken either by physical, chemical or biological treatments. Rice husk which is rich in lignocelluloses materials have a complex of three polymers thus, cellulose, hemicelluloses and lignin. The three components constitute a complex that is poor nutritionally but because of the enormous quantities available, it nevertheless represents a potentially valuable material for future biotechnological exploitation (Eggeling, 1983).

The objectives of this work is to evaluate the effects of Gmelina Arborea supplemented with graded levels of Aspergillus treated rice husk on the growth performance and hematological indices of West African Dwarf Goats (WADG). Rice husk which is a waste from processed rice is readily available which in turn constitute environmental degradation or hazard can be recycled to be of importance in ruminant nutrition and biotechnology hence this research work.

MATERIALS AND METHODS.

This experiment was conducted at the Small Ruminant Unit of the Teaching and Research Farm, Department of Animal Science, Ebonyi State University, Abakaliki. Nigeria with the approval of the DRIC (Directorate of Research Innovation and Commercialization) of the University. The experiment lasted for 12 weeks (84 days). One hundred and twenty weaned West African Dwarf Goats (WADG) of about 3 months of age with an averages weight of 6.0±0.1kg were randomly assigned to four dietary treatments at 30 goats per diet and replicated three times at 10 goats per replicate.

The animals were fed four dietary treatments which constituted a combination of Gmelina Arborea and graded levels of Aspergillus treated rice husk into Treatments (T_1 T_2 T_3 and T_4) respectively. T_1 was the control diet which contained 100% Gmelina Arborea and 0% rice husk, T_2 contained 25% Aspergillus treated rice husk and 75% Gmelina Arborea, T_3 contained 50% Gmelina Arborea and 50% Aspergillus treated rice husk while T_4 contained 75% rice husk and 25% Gmelina Arborea.

Weaned goats were housed in pens with dimensions of 2.5m x 4.5m. Goats were allotted on the basis of gender ancestry and weanling weight to twelve pens and fed one of the four dietary treatments (i.e. three replicate pens per diet with ten goats per pen). Does were penned separately in a completely randomized design. The goats were fed 2009 on fresh weight to supply 90g of dry matter requirement of the animals. Each goat was fed 1.8% of their body weight Gmelina Arborea was sourced from the forest located at tree plantation farm of the University while the rice husk was gotten from the Rice Milling industry within the State Metropolis. Inoculums (Aspergillus Niger) was isolated from soil sample collected from compost plot close to the site where the rice husk was deposited in the Rice Milling industry and maintained on potato dextrose agar (PDA). The vice husk which served as substrate was soaked in water and sun-dried to a moisture content of 6-7% and packed in poly there bags.

INOCULATION AND INCUBATION:

The Aspergillus Niger was harvested from the soil sample collected from compost plot. Each bag of the subs trate was inoculated with 5ml of the spore suspension. The inoculated substrate was later incubated at room temperature for about 7days when the fungus had covered the substrates. The furgels treated rice husk was later oven-dried in a laboratory at 70^0C in preparation for inclusion to the experimental diets. The spores of Aspergillus Niger was hamster in a solution and adjusted to 10^3-10^8 spores per ml with sterile water. Each bag of the spore suspension contained 10^7 spores per ml.

The daily feed requirement per replicate was weighed and served daily while the left over per group was collected every morning weighed and recorded. The daily feed in take of each replicate group was determined by the difference between the amount served and the residual feed. The goats were weighed at the beginning of the experiment to obtain their initial body weight and subtracting weighed weekly. At the end of the experiment, the body weight change were calculated by subtracting the initial weight from the final body weight. The daily weight gain was determined by dividing the body weight change by the number of days the experiment lasted. The feed conversion ratio was computed by dividing the feed intake by the weight gain.

HEMATOLOGICAL PROCEDURE:

Blood samples was collected from the vein of the animal into a plastic tube containing Ethylene Diamine Tetra-acetic Acid (EDTA) for the hematological studies. Using standard techniques as reported by Jain (1986) the Packed Cell Volume (PCV), Red Blood Cell count (RBC), hemoglobin concentration (Hb) total white blood cell court (WBC) were determined. For instance, packed cell volume (PVC) was determined with a micro haemocrit centrifuge; Red Blood Cell (RBC) and White Blood Cell (WBC) counts were determined with a haemocytometer. Hemoglobin concentration estimate was determined by cyanomethemoglobin method, while differential leucocyte counts were determined by counting stained leismans blood smear with a light rnicroscope.

STATISTICAL ANALYSIS

Data were analyzed using the GLM procedure of SAS where the growth experiment was analyzed as a 4 x 2 factorial with dietary treatment and gender as main effects, Replicate, block and their interactions were the effects included in the model. The experimental units in the trial was pen. Goat was considered the experimental unit in the hematological portion which was analyzed using the GLM procedure. Least square means and standard error of the means (SEM) were obtained to evaluate the differences among treatment means. Differences were considered significant at 5% level of probability.

RESULTS AND DISCUSSION

Table 1: Proximate composition of Gmelina Arborea[1]

Nutrients(%)	Gmelina Arborea
Moisture content	**74.7**
Crude protein	**14.6**
Ash content	**01.3**
Ether extract	**12.7**
Crude fiber	**06.7**
Energy (kcal/kg)	**1368**

Source: Amata (2010)

The chemical composition of Gmelina Arborea is shown in Table 1. Result of the proximate composition showed that Gmelina Arborea has a lot of potentials as a high quality browse tree with 14.6% crude protein, 12.7% ether extract 06.7% crude fiber and 1368 kcel/kg ME Energy. The values recorded above agrees with many authors who studied the chemical composition of many browse plants and reported that browse tree leaves tend to have lower crude fiber content than grassers harvested at same time and declared that, on the average, browse species had more crude protein content even in the rainy season between July-August (Mecha and Adegbola, 1980). Most multipurpose plants provide green leaves for longer periods of the year than grasses. Otsyina and Mckek (1985) stated that wide spread traditional use of browse as an available source of quality feed during the dry season is vitally important to maintain seasonal and yearly stability in livestock production and local conditions.

Table 2: Performance of the goats fed the experimental diets

Parameter	T_1	T_2	T_3	T_4	SEM
Av. Initial body weight (kg)	6.03	6.10	6.07	5.96	0.03
Av final body weight (kg)	7.12^{b}	7.77^{a}	7.17^{b}	6.91^{b}	0.19
Av. Weekly weight gain (kg)	0.133^{b}	0.209^{a}	0.138^{b}	0.119	0.02
Av. Daily weight gain (kg)	0.019^{b}	0.030^{a}	0.020^{b}	0.018	0.028
Feed conversion ratio	8.37^{c}	5.052^{a}	6.557^{b}	6.715^{b}	0.68
Av. Weekly feed intake (kg)	1.06^{b}	1.09^{a}	0.90^{c}	0.80^{c}	0.07
Av. Daily feed intake (kg)	0.151^{a}	0.155^{ab}	0.129^{bc}	0.114^{c}	0.015
Total feed intake (kg)	8.42^{b}	8.69^{a}	7.21^{bc}	6.40^{c}	0.054

a, b, c: means within row with different superscripts differ significantly ($P<0.05$); SEM:-standard error of means.

Table 2 shows result of growth performance of the goats on the test diets. The highest final body weight of 7.77kg was recorded in (T_2) which was significantly ($P<0.05$) different from the other diets that were equal ($P>0.05$) statistically. Similarly, diet two recorded the best average weekly weight gain of 0.209kg while the rest of the other diets were not statistically ($P>0.05$) different. The average daily weight gain took similar trend just as the best feed conversion ratio was recorded in diet two while the worst was observed from the control diets. The average weekly feed intake, daily feed intake and total feed intake also did not differ from the trend already established in the above mentioned parameters.

The performance assessment of the goats on the test diets showed a gradual decrease as the level of the rice husk increases in the diets. This could be attributed to the high fiber content of the rice husk. However diet two (25% rice husk and 75% Gmelina Arborea) had a positive performance on the goats. The gradual decline in the performance of the goats as the level of rice husk increased suggests that the higher levels of inclusion of rice husk in the diets gave rise to an expected numerical increment in the crude fiber content of the diets. This however, resulted in a gradual decrease in the energy levels of the diets. Hetland et al; 2004 had earlier reported that high fiber content of diets affects gut function by increasing diegsta passage rate and modulates nutrient digestibility. This position was also corroborated by Okagbare at al; (2004) and Shakouri et al; (2006) who stated that high fiber decreased feed intake as a result of increased digesta viscosity which causes increase of feed retention time in the gastro intestinal track. Dietary fiber has a laxative effect and increases the rate of gastric evacuation and is usually compensated for by increased feed intake (Aduku, 1993; Abeke et al ; 2003.

The reduced performance in the growth rate of the goats at higher levels of 50% and 75%, levels of rice husk inclusion could be attributed to the drop in the digestive efficiency impaired by high crude fiber content leading to low dry matter digestibility. Agbede et al (2002) had similarly observed that high fiber contents of diets decreases nutrient digestion and utilization which can also precipitate metabolic dysfunction with resultant weight reduction. The reduction in weight gain at 50 and 75% rice husk inclusion (diets 3 and 4)

respectively goes to point towards the tolerant limit of young goats to diets of rice husk because of the fiber contents.

Tables 3: Hematological indices of goats fed Gmelina Arborea supplemented with Aspergillus treated rice husk

Parameter	T_1	T_2	T_3	T_4	SEM
Packed cell volume (%)	19.7^{b}	20.5^{a}	19.4^{b}	18.6^{b}	0.4
White blood cell x 10^{11}/ml	4.4^{a}	4.5^{a}	4.1^{b}	3.86^{c}	0.15
Haemoglobin count g/dl	5.9^{b}	6.04^{a}	5.7^{bc}	4.9^{c}	0.06
Red blood cell x 10^{12}/ml	5.4^{b}	6.09^{a}	5.4^{b}	4.7^{c}	0.02

a, b, c:- Means on the same row with different superscripts are significantly ($P<0.05$) different. Result of the hematological indices (Table3) showed a significant ($P<0.05$) differences among the treatment diets with diet two having the highest values in the PCV, WBC, Hb and RBC respectively while the other three diets did not show any significant ($P>0.05$) differences in all the parameters. This also reflected similar trend with the growth performance indices as shown in table 2.

The values of Packed Cell Volume (PCV) obtained for the animals fell between the values reported by Daramola et al; (2005) as normal for West African Dwarf Goats (WADG) even though, diet four was slightly lower than normal. The values of PCV reduced as the level of rice husk increased in the diets. The white blood cell levels of the goats on the diets did not affect their performance especially when WADG are known to possess a protective system with a rapid and potent defensive against any infective agent which probably form the physiological basis for the adaptation of the specie to West African eco-zone characterized with high prevalence of diseases (Hetland, 2004). In all the diets, goats under diet 2 had the highest value of WBC and the values decreased as the level of inclusion of rice husk increased.

The values of red blood cell recorded for the treatments show that the goats were not anemic just as the haemoglobin count followed similar trend. The values of red blood cell and haemoglobin recorded could be due to the age of the animals used in this work. Hetland 2004) had reported that age has a significant effect on haemoglobin and red blood cell since haemoglobin function as a carrier of oxygen to target organs by forming oxy-haemoglobin, a situation that favored goats on diet two.

CONCLUSION

The result of the present study has shown that inclusion of Aspergillus treated rice husk at 25% and 75% Gmelina Arborea in the diet of WADG had no deleterious effect in their efficient utilization of the feed hence their performance. This therefore, suggest that feeding

of Gmelina Arborea supplemented with Aspergillus treated rice husk could be used as an alternative feed for West African Dwarf Goats.

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