

EVALUATION OF ANTI-NUTRITIONAL PROPERTIES OF SOME SELECTED BROWSE PODS IN A SEMI-ARID ZONE OF NIGERIA

Uballi, S.,¹ Abdurahman, S. L.,² Muhammad, A. I.,³ Mustapha, K.,³ Abubakar, A. W.³ and Kani, M. M.,³

²Department of Animal Science, Sule Lamido University Kafin Hausa, PMB 048, Kafin Hausa, Jigawa State, Nigeria.

³Department of Animal Science, Federal University Dutse, Jigawa State, Nigeria.

*Corresponding Author's Email ubalisagir28@gmail.com; +2348148537506.

ABSTRACT

The study was conducted to evaluate the anti-nutritional properties of four selected browse pods; *Faidherbia albida*, *Vachellia tortilis*, *Acacia nilotica* and *Piliostigma reticulatum* in a semi-arid zone of Nigeria. The browse pods were sourced from the rangelands in Jigawa and Yobe states. The results revealed significant differences ($P < 0.05$) in the values of Oxalate, Phytate, Tannin and Saponin evaluated. The study therefore concluded that variations exist among the selected browse pods analyzed in terms of anti-nutritive properties; however they were all within the recommended requirement for ruminant nutrition and therefore recommended its use as feedstuff and its incorporation in ration formulation to curtail feed scarcity during the dry season.

INTRODUCTION

Native browse species are beneficial source of animal feeds, as these plants remain green during the dry season and provide foliage with better nutritive value than other annual grass and herbaceous species that become wasted and lignified (Olufayo, 2014). During feed resources scarcity, browse plants are identified as the major sources of feed for ruminant. The chemical composition and nutritional composition of browse plants in rangelands varies according to species, soil type (location), climate, and abiotic factors (Greene, 1987). However, The presence of toxic and plant-secondary metabolite (PSM) constituents also known as an-nutritional substances is a significant restriction to the utilization of browse plants in ruminant feeds (Kumar 1990). In line with the above; this study is designed to evaluate the anti-nutritional properties of four selected browse pods in a semi-arid Zone of Nigeria.

MATERIALS AND METHODS

Experimental Location

The research was conducted at the laboratory of the Department of Animal Science, Federal University Dutse, Jigawa State, Nigeria. Dutse is located between latitude 11° 45' 22.25" and longitudes 9° 20' 20.26" E, at an altitude of 485 m above sea level. The state is situated within the Sudan Savannah vegetation zone, but there are traces of Guinea savannah in the southern region of the State. (Olofin, 2008).

Experimental Materials

Four different browse pods were selected and sourced from rangelands in Jigawa and Yobe states, these include; *Faidherbia albida* pods *Vachellia albida* pods *Acacia nilotica* pods and *Piliostigma reticulatum* pods. The pods were filled in 50 kg jute bags and conveyed to the laboratory of the Department of Animal Science, Federal University Dutse, where they were sun dried and crushed for nutritional and anti-nutritional analysis.

Anti-Nutritional Factors

The presence of anti-nutritional factors; Tannin and Oxalates were determined according to AOAC (2000), Phytate according to Stewart (1974) while saponin was determined according to (Hiai *et al.*, 1976).

RESULTS AND DISCUSSION

Anti-Nutritive Substances of the Selected Browse Pods in a Semi-Arid Zone of Nigeria

The result of Anti-nutritive substances is presented in Table 1. The results revealed significant differences ($P < 0.05$) in the values of Oxalate, Phytate, Tannin and Saponin evaluated.

Table 1 Anti-Nutritive Substances of the Selected Browse Pods in a Semi-Arid Zone of Nigeria

Parameters (mg/g)	Selected Browse Pods				P-Value
	<i>Faidherbia albida</i>	<i>Vachelia tortilis</i>	<i>Acacia nilotica</i>	<i>Piliostigma reticulatum</i>	
Oxalates	0.18±0.24 ^c	0.19±0.24 ^c	0.31±0.39 ^b	1.79±1.24 ^a	0.0001
Phytates	0.37±0.19 ^b	0.29±0.37 ^c	2.13±2.06 ^a	0.47±0.01 ^d	0.0001
Tannins	2.95±1.58 ^d	6.42±5.12 ^b	8.44±0.50 ^a	4.30±2.27 ^c	0.0001
Saponins	0.22±0.21 ^d	0.38±0.97 ^b	0.33±0.59 ^c	0.57±0.00 ^a	0.0001

SEM: standard error of mean. Means on the same row with different superscripts are significantly ($P < 0.05$) different.

Anti-Nutritive Substances of the Selected Browse Pods in a Semi-Arid Zone of Nigeria

Anti-nutritional factors (ANFs) also known as plant-secondary metabolites (PSMs) are those substances naturally formed by normal metabolism and various mechanisms in some plant feedstuffs. These substances inactivate certain nutrients; interfere with the digestive process or the metabolic use of feed that contradict optimum productivity (Aruwayo and Adeleke, 2019). The Oxalate values (0.18mg/g to 1.79 mg/g) recorded in this study was lower than the values (2.64mg/g to 3.96mg/g) found by Uguru (2014) in *Acacia nilotica* pods and (4.58 mg/g to 8.15 mg/g) reported by Njidda (2010) for browse forage of semi-arid zone. The difference could possibly be, due to difference in maturity of the pods and soil type of the location (Abdurrahman *et al.*, 2017).

The phytate content obtained in the present study ranges from 0.29 mg/g to 2.13mg/g which was comparable with the value 0.30 mg/g reported by Dupe (2015) for *Parkia biglobos* seeds. Uguru (2014) reported that ruminant animals can consume certain quantity of feeds with high levels of phytate without any deleterious effect due to the nature of their digestive tract.

The tannin content of the browse pods (2.95% to 8.44%) analyzed were considerably higher than the value of 2.05% reported for *Gliricidia sepium* Ahn *et al.* (1989), 0.99 mg/g to 1.21 mg/g found by Abdurrahman *et al.*, (2017) and 0.80 mg/g to 1.30 mg/g reported by Uguru (2014) for pods. A threshold concentration of 5% tannin concentration had been reported above which there is rejection of browse plants (Ologhobo, 1989). However, goats are known to tolerate a threshold level of about 9% dietary tannin (Dupe 2015). Furthermore, dietary tannins of 2 to 3% have in recent advances in ruminant nutrition been reported to possess some positive effects, because of their unique ability to reduce protein degradation in the rumen by forming protein-tannin complex (Njidda, 2010).

The Saponin concentration in this experiment (0.22% to 0.57%) was within the tolerable amount 1.5 to 2% reported by Onwuka (1983) for some browse plants in the humid tropics. However, the concentration was lower compared to 3.24% and 3.47% reported by Oduguwa *et al.* (1998) for *Parkia biglobosa* and *Afzelia Africana*, respectively. Saponin has been identified as defaunating agents in the rumen when in higher concentration (Newbold *et al.*, 1997). Similarly, Nissar *et al.* (2017) reported that inclusion of saponin 6% level reduced the 24 hrs methane emission and this could be due to its anti-protozoal activity.

CONCLUSION

The study concluded that there are variation in terms of anti-nutritive properties among the selected browse pods analyzed, however they were all within the recommended requirement for ruminant nutrition and therefore recommended its utilization as feedstuff and incorporation in ration formulation for ruminant animals.

REFERENCES

- AOAC. (2000). *Association of official analytical chemist. Official methods of analysis*. Washington, DC, USA.
- Abdurrahman, S. L., Muhammad, I. R. and Ahmad, M. Y. (2017). Nutritional potential of *Piliostigma reticulatum* (dc) Hochst pods in semi- arid zone of Nigeria. *Nigerian Journal of Animal Production*, **44**(4): 287-296.
- Aruwayo, A. and A. Adeleke (2019). A Review of Browse Plants' Use in the Tropics and their Chemical Constituents. *Journal of Department of Applied Chemistry, Federal University of Dutsin-Ma, Katsina State*. **1**(3)

- Dupe O. O., Tona, G. O. and Otukoya, F. K. (2015). Evaluation of the nutritive value of selected browse plant species in the Southern Guinea Savannah of Nigeria for feeding to ruminant animals. *British Journal of Applied Science & Technology*, 7(4):386-395.
- Greene, L. W., Pinchak, W. E. and Heitschmidt, R. K. (1987). Seasonal dynamics of minerals of forages at the Texas Experimental Ranch. *Journal of Range Management* 40 502-506.
- Hiai, S., Oura, H. & Nakajima, T. (1976). Colour reaction of some sapogenins and saponins with vanillin and sulfuric acid. *Planta Medica*, (29):116–122.
- Kumar, R. & Vaithyanathan, S. (1990). Occurrence, nutritional significance and effect on animal productivity of tannins in tree leaves. *Animal Feed Science and Technology* 30: 21-38.
- Newbold, C. J., El Hassan, S. M., Wang, J., Ortega, M. E., & Wallace, R. J. (1997). Influence of foliage from African multipurpose trees on activity of rumen protozoa and bacteria.
- Nissar, J., Ahad, T., Naik, H.R., & Hussain, S. Z. (2017). A review phytic acid: As anti-nutrient or nutraceutical. *Journal of Pharmacognosy and Phytochemistry*, 6: 1554–1560.
- Njidda, A. A. (2010a). Chemical Composition, Fibre Fraction and Anti-Nutritional Substances of Semi-arid Browse Forages of North-Eastern Nigeria *Nigerian Journal of Basic and Applied Science* 18(2):181-188
- Oduguwa, O. O., Oduguwa, B. O., Onwuka, C. F.I, Olajobi, H. O. (1998). Anti-nutritional factors in foliage of some leguminous trees and shrubs. In: O Oduguwa, A O Fanimu, OA Osinowo (eds). *Animal agriculture in West Africa Sustainability Question*, the Proceedings of the silver jubilee Anniversary Conference of the Nigerian Society for Animal Production. ;339-340.
- Olofin E. A. (2008). The Physical Settings in (E. A.Olofin, A. B Nabegu, & A. M.Dambazau) Wudil within Kano region: *A geographical perspective synthesis. Kano city, Adamu-Joji publisher*, Pp.1-34
- Olufayo, O. O. (2014). Nutritive value and forage acceptability of some selected browse plants by West African Dwarf Goats. *Fepi-jopas*, 1(1):72-75.
- Onwuka, F. C. (1983) Nutritional evaluation of some Nigeria Browse plants in the humid tropics. *Ph.D, Thesis, University of Ibadan, Nigeria*.
- Stewart, E. (1974). *Chemical analysis of ecological materials*. Oxford (UK): *Blackwell Scientific*.
- Uguru, C., Lakpini, C.A.M., Akpa, G.N., And Bawa, G.S (2014). Nutritional Potential of Acacia (Acacia Nilotica (L.) Del.) Pods for Growing Red Sokoto Goats *Journal of Agriculture and Veterinary Science*, 7(6): 2319-2372.