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## Utilization of Camel's Foot (*Piliostigma reticulatum*) (Hochst.) Pods among Ruminant Farmers in the Semi-arid Environment of Kebbi State, Nigeria

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**ABSTRACT:** A survey was conducted in the three senatorial districts of Kebbi State comprising of a local government per senatorial district with 5 villages each located within the semi-arid region to investigate the use of Camel's foot (Kalgo) pods among the ruminant farmers. A structured questionnaire was administered to 150 farmers within the study areas. The data collected was analyzed by using simple statistical tools such as frequency counts and percentages. The results revealed the age groups of the majority (38.36%) of the respondents were between 21-30 years. Male were the majority (94%) of the respondents encountered and 69.18% were married and 79.06% had some form of education with 33.11% having Quranic education. Majority (62.84%) of the respondents reared cattle, sheep and goats with a flock size and years of experience in livestock management between 21-35 animals and 10-20 years respectively. The feed resources used during the dry season revealed that the most (37.33%) of the farmers engaged their animals on free grazing/browsing system and about 28% used concentrates and supplements to sustain their animals. Majority of the respondents (50%) offered Kalgo parts in dried form to feed their animals with sheep and goats (48.57%) preferring Kalgo parts most. The part of the Kalgo mostly preferred by ruminants indicated the pods are mostly (48.57%) preferred and 14.28% prefers the leaves alone. Kalgo parts is obtained for usage in the dry season as agreed by all (100%) the

respondents with about 50.39% covering a distance of 1-2km from their homes/farms before obtaining Kalgo parts for usage. Majority of the respondents (75.17%) obtained Kalgo parts by self and all the respondents in the study areas agreed to the fact that Kalgo is naturally occurring plant. The results obtained in this work revealed that Kalgo plant is a permanent and important browse indigenous to the semi-arid environments of Kebbi State, Nigeria.

**Keywords:** kalgo, utilization, ruminant farmers, kebbi state

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## 1. Introduction

Local people generally recognize the trees and shrubs which are well appreciated by ruminants, and their nutritive importance [1]; [2]; [3]; [4]; [5]. The role of browse during periods of drought has been recognized and has attracted attention from scientists [6]. Hence, some authors have recently focused on screening indigenous fodder trees and shrubs by involving farmers in the choice of promising species. Indigenous browse species that are well adapted to the local environment are well known by farmers and the planting material can easily be collected in the area. The methods have consisted of interviews with farmers on the diversity of browse species and their knowledge of their palatability by livestock [7]; [4]; [8]; [9], the ranking of browse quality coupled with chemical analysis [10]; [7] and the preference of selected animals [11]. Over 160 browse species were recorded by [9], working with indigenous farmers in south eastern Nigeria, as used for ruminant feeding, and this list exceeded the previous report in the literature from the area. The ranking of fodder quality revealed that the farmers' knowledge of the quality is well correlated with the chemical composition. The knowledge of the palatability in different animal species was also in accordance with the field observations [6]. Hence, farmers' preference of browse species was related to the availability, palatability and drought resistance. According to [12] local people also have an intimate knowledge of the characteristics and value of different plants e.g. their value in stimulating milk and meat production, the toxicity, saltiness and medicinal value, the ability to indicate the agricultural potential of soil and the prominent characteristics such as prolific fruiterers and fast growth.

In a previous survey conducted by [13], the authors observed that parts of browse species utilized by livestock were leaves, pods, twigs and flowers. In all browse plant, leaves were parts mostly utilized by livestock. The pods of *Piliostigma reticulatum* were important feed resources for goats, sheep and cattle during the dry season [14]. Earlier study [15] indicated that Camel's foot is highly abundant in Kebbi State.

It is against the above back ground of the importance of woody shrubs and trees in rangelands that the study was embarked upon to investigate and ascertain the claim made by farmers on the use of

*Piliostigma reticulatum* which is commonly known as Camel's foot and locally called Kalgo in the northern region of Nigeria as potential feed resource in Kebbi State.

## **2. Materials and Methods**

### *2.1. Study Area*

The research was conducted in December, 2017 in five villages in one selected area from each senatorial district (north, central and south) of Kebbi State. The areas selected and their villages are: Arugungu (Kebbi north) comprising of; Lailaba, Felande, Tungur Arkasim, Wali and Gulme. Suru (Kebbi central) comprising of; Baba tugga, Hore, Kawasa, Shuwaka and Runtuwa. Shanga (Kebbi south) comprising of; Giron Masa, Nassarawa, Gwalango, Hundiji and Bakin turu.

The State lies at the extreme North West corner of Nigeria on latitudes  $10^{\circ}$  to  $13^{\circ} 15^1$  and longitude  $3^{\circ} 30^1$  to  $6^{\circ}$  east. Annual rainfall ranges between from 550mm-650mm occurring between April and September. The mean temperature is  $23^{\circ}\text{c}$ , maximum is about  $38^{\circ}\text{c}$  and the minimum is about  $18^{\circ}\text{c}$ . The relative humidity ranges from 21-47% and 51-79% during the dry and rainy seasons respectively [16].

### *2.2. Sampling Techniques and Questionnaire Administration*

A total of 150 structured questionnaires were administered on 50 respondents in the three senatorial districts (one area per district) comprising of five randomly selected villages in each area with ten farmers per village were sampled and orally interviewed during the dry season month of December, 2017. The selection was based on the availability of the farmers present in those areas. The structured questionnaire was designed in order to facilitate data collection. The questionnaires which captured the farmer's bio-data, rearing experience, flock/herd size, ruminant specie kept, browse plant usage and dry season feed resources were read to the farmers and their responses recorded in the appropriate columns. Data Analysis. The data obtained from questionnaires were analyzed using simple descriptive statistics of Microsoft Excel, 2007.

## **3. Results and Discussion**

Table 1 presents the demographic characteristics of the respondents. The society is highly dominated by male as indicated in Table 1. This might be as a result of the cultural and religious setting reducing the involvement of female farmers in most rural areas in the Fulani/Hausa dominated Muslim communities of northern Nigeria [17]. There was a close relationship between the ages of the respondents and their marital status in which most were within the age categories of 21-30 years and 31-

40 years. This could be regarded as the actual age classes which is responsive to take care of their family. This observation was in line with the study of [18]. Quranic education constituted the majority (33.11%) in this study. However, western education in the study areas was found to be encouraging as compared to the earlier report by [19]. The farmers with tertiary education certificates were all located at the developed side of the local government areas.

**Table 1:** Demographic characteristics of the respondents

Items	n=150 Frequency	Percentage (%)
<b>A. Gender/sex</b>		
i. Male	141	94
ii. Female	9	6
<b>Total</b>	<b>150</b>	<b>100</b>
<b>B. Age (years)</b>		
i. Below 16	8	5.48
ii. 16-20	40	27.40
iii. 21-30	56	38.36
iv. 31-40	23	15.75
v. 41 above	19	13.01
<b>Total</b>	<b>146</b>	<b>100</b>
<b>C. Marital status</b>		
i. Single	28	19.18
ii. Married	101	69.18
iii. Widower	12	8.22
iv. Divorced	5	3.42
<b>Total</b>	<b>146</b>	<b>100</b>
<b>D. Educational status</b>		
i. Never went to school	31	20.94
ii. Quranic school	49	33.11
iii. Primary school	18	12.16
iv. Secondary school	12	8.11
v. Post-secondary school	38	25.68
<b>Total</b>	<b>148</b>	<b>100</b>

Source: field survey, 2017

Results on animal species kept, flock/herd size and their management are shown in Table 2. Majority (42.67%) of the respondent reared more than one ruminant species (cattle, sheep and goat) which might be attributed to complementary feeding habits among the ruminant species. This finding is in line with the work of [20] who reported that cattle and sheep grazes lower grasses while goats browse shrubs and trees. There is an increase in goats' numbers relative to sheep and cattle. This was due to the goats' good adaptation to harsh and hot environments [21]. The highest range (10-20) years of

experience in livestock rearing by the farmers was in agreement with the findings of [19] who reported a range of 11-20 years as the highest experience in rearing livestock in their study on browse plant in the semi-arid environments. The feed resources used during the dry season for feeding animals revealed that 37.33% of the respondents engaged their animals on free grazing/browsing system and the least (28%) used concentrates and supplements to sustain their animals. This agreed with the earlier reports of [22] and [23] in the northern states of Nigeria.

**Table 2:** Animal species reared, flock/herd size and their management

Items	n= 150 Frequency	Percentage (%)
<b>A. Types of animal kept</b>		
i. Cattle	26	17.33
ii. Sheep	6	4
iii. Goats	13	8.67
iv. Sheep and Goats	41	27.33
v. Cattle, Sheep and Goat	64	42.67
<b>Total</b>	<b>150</b>	<b>100</b>
<b>B. Flock/herd size</b>		
i. 1-20	21	14.19
ii. 21-35	93	62.84
iii. 36-55	26	17.57
iv. 56 above	8	5.41
<b>Total</b>	<b>148</b>	<b>100</b>
<b>C. Experience of keeping livestock</b>		
i. Below 10	44	33.85
ii. 10-20	47	36.15
iii. 21-30	39	30
iv. 31 above	0	0
<b>Total</b>	<b>130</b>	<b>100</b>
<b>D. Feed resources used during dry season for animals</b>		
i. Free grazing/browsing	56	37.33
ii. Cut and carry system	42	28
iii. Concentrates and supplements	52	34.67
<b>Total</b>	<b>150</b>	<b>100</b>

Source: field survey, 2017

The results of Kalgo plant usage, preference and method of utilization were presented in Table 3. Different forms of using Kalgo parts (leaves and pods) for feeding animals in the study areas ranges from fresh, dry and wilted. Majority of the respondents (50%) offered Kalgo (leaves/pods) to feed their animals in dried form and the least (14%) served wilted (pods) Kalgo to their animals. Most of the

respondents (68%) offered Kalgo (pods) by mixing it along with other feed ingredients in feeding their animals while about 32% offered Kalgo (leaves/pods) alone to feed their animals

**Table 3:** Kalgo plant usage, preference and method of utilization

Items	n=150 frequency	Percentage (%)
A. In what form is Kalgo fed to animals?		
i. Fresh (pods/leaves)	54	36
ii. Dry (pods/leaved)	75	50
iii. Wilted (pods/leaves)	21	14
<b>Total</b>	<b>150</b>	<b>100</b>
B. How is Kalgo offered to animals?		
i. Kalgo alone	48	32
ii. Kalgo with other ingredients	102	68
<b>Total</b>	<b>150</b>	<b>100</b>
C. Which of the animal species prefers Kalgo most?		
i. Cattle	31	21.38
ii. Sheep	7	4.83
iii. Goats	13	8.97
iv. Sheep and Goats	58	40
v. Cattle, Sheep and Goats	36	24.83
<b>Total</b>	<b>145</b>	<b>100</b>
D. Which part of the plant is most preferred by animals?		
i. Leaves	20	14.28
ii. Pods	68	48.57
iii. Pods and leaves	52	37.14
<b>Total</b>	<b>140</b>	<b>100</b>
F. Other usage of Kalgo plant		
i. Animal health	141	100
ii. Others, specify	0	0
<b>Total</b>	<b>141</b>	<b>100</b>

Source: field survey, 2017

The parts are offered as whole as there is no any form of processing such as grinding, pounding and milling done on the leaves/pods before serving it to the animals. This might be as a matter of choice by the farmers depending on their engagement with the animals while browsing from one place to another. This proved the acceptability of the parts of the plant in whatever form by animals. The findings of this study indicated that most of the farmers offered Kalgo (leaves/pods) to their animals in combination with other ingredients. This is in agreement with the work of [24] who reported that browse

plants alone can keep animals in a fair condition but may be inadequate as the sole feed stuff. All the farmers reported an increased use of the parts of kalgo (leaves/pods) to feed their ruminants. Sheep and goats (40%) are found to prefer Kalgo (leaves/pods) most in this study. However cattle (21.38%) also preferred the plant but not as much as compared with small ruminants. This observation was in line with the report of [14], they reported that some browse plants preferred by small ruminants in the sub-sahelian zone were not used by cattle. Goats and sheep had nine browse plants preferred in common. All the parts of Kalgo (leaves/pods) are preferred by ruminants but the most (55.33%) preferred part are the pods as observed in this study. Nouhoun *et al.* [14] observed that pods of some browse plants such as *Piliostigma spp* and *F. albida* are especially preferred and used by all ruminant species across the Sahelian zone of Burkina Faso.

The use of Kalgo parts for animal health apart from feeding as agreed by all (100%) the respondents in this study is in line with the findings of [19]; [25]; ;[14]; These authors reported the various uses of browse plants for animal health care ranging from anthelmintic and stimulation of milk in cows and does.

The results on the availability and accessibility of Kalgo plant in the study areas is presented in Table 4. All the respondents (100%) in this study agreed that Kalgo plant parts for usage are obtained mostly during the dry season (late October to late March). This is in line with the findings of [26] who reported that browse species are particularly available for usage during the cool and hot dry season, which correspond to their fructification period when herbaceous forage is scarce. Ways of obtaining Kalgo pods in this study includes; by self and by purchase. However some farmers engage in both by self and purchasing of the pods. This observation is in agreement with the findings of [14] who opined that children and women in the northern Sudanian zone of Burkina Faso are engaged in the collection and storage of the pods of *P. reticulatum* and *F. albida* for sale at local fodder markets. Distance covered by the farmers to obtained Kalgo plant parts for their livestock either from the homes or farms ranges from 1-2km, 3-5km and 5km above. The variations in the distance might be due to the proximity of some farmers from homes/farms to the areas where Kalgo plant stands are found. The distance travelled as observed in this study is lower than those reported by [14] who reported distances covered per day by the farmers ranged from 7.5 to 17.14 km, 7.3 to 18.8km and 4.5 to 10.5km for cattle, sheep and goats respectively from the farm to graze and browse. All (100%) the respondents in the study areas agreed to the fact that Kalgo is naturally occurring plant.

**Table 4:** Availability and accessibility of Kalgo plant

Items	n=150 frequency	Percentage (%)
A. In what season is Kalgo obtained for usage?		
i. Dry season	150	100
ii. Rainy season	0	0
<b>Total</b>	<b>150</b>	<b>100</b>
B. How is Kalgo plant obtained?		
i. Self	<b>109</b>	75.17
ii. Purchase	23	15.82
iii. Both	13	8.97
<b>Total</b>	<b>145</b>	<b>100</b>
C. Distance covered to obtained Kalgo from the farm/home		
i. 1-2km	64	50.39
ii. 3-5km	43	33.89
iii. 5km above	20	15.75
<b>Total</b>	<b>127</b>	<b>100</b>
D. Is Kalgo naturally occurred or planted?		
i. Naturally occurring	150	100
ii. Propagated	0	0
<b>Total</b>	<b>150</b>	<b>100</b>

Source: field survey, 2017

#### 4. Conclusion

Browse plant is an important component in ruminant production especially during the long dry season in the semi-arid environment. The results obtained in this work revealed that Kalgo plant is a permanent and important browse indigenous to the semi-arid environments. Management is however necessary in the production of Camel's foot in order to improve ruminant production. It is recommended that the pods should therefore be milled and incorporated with other ingredients when feeding the animals for effective utilization and reduced cost of feeding.

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