SOCIO-CULTURAL AND PHYTOCHEMICAL RANKING OF *FICUS MICROCARPA* IN COMPARISM WITH SIX SELECTED INDIGENOUS BROWSE PLANTS FROM SOUTHEASTERN NIGERIA.

C. C. ACHONWA, M. C. UCHEGBU AND I. C. OKOLI
Department of Animal Science and Technology, Federal University of Technology, PMB 1526 Owerri, Imo State, Nigeria
Correspondence:chukwumachristian1@gmail.com

ABSTRACT
Domestic animals such as ruminants depend on the availability of biological diversity for sustenance which enables the selection of indigenous available raw materials in a given location. The present study focuses on socio-cultural and phytochemical ranking of *Ficus microcarpa* in comparism with six selected indigenous browse plants of Southeastern Nigeria. Socio-cultural and physicochemical studies of *F. microcapa* was carried out followed by its numerical scoring alongside six other plants; *Garcinia kola,Mucuna pruriens, Gongronema latifolium, Manniophyton fulvum, Nuaclea popegnine* and *Manihot utilissima* to obtain a comparism across the plant types. The socio-cultural scoring scales were given as; whether the plant was planted by man in the compound, used as browse plant, has human food value, has medicinal value, amenable to vegetative propagation, evergreen all year round, and serves as firewood. Thereafter a scoring scale of 7 was used to rank the seven plants across nine selected phytochemical parameters which were based on the crude protein, ash, metabolizable energy, NDF, copper, iron, antioxidants, trypsin inhibitor and cyanide contents of the leaf meals. The two score results were then tallied to obtain the final mean score for each plant.*Ficus microcarpa* recorded the highest score of 85.71% in socio-cultural valueswhereas lowest score of 28.57% was recorded by *M. pruriens*. Based on the phytochemical parameters considered, *F. microcarpa* scored a moderate 47.61% only better than 44.44% scored by *M. fulvum*.The present study has shown that *Ficusmicrocarpa* recorded the highest socio-cultural score across 6 other indigenous plants compared with it and recorded relatively lower phytochemical score than plants such as *M. utilissima,G. latifolium, G. kola, M. pruriens* and *N. popegnine*. The combination of socio-cultural and phytochemical parameters has led to the development of a more reliable though sophisticated ranking method.It is recommended that *F. microcarpa* be promoted as a browse of promise in the hot humid tropical zones of Nigeria and beyond.

Keywords: *Ficus microcarpa,* browse plants, south west Nigeria, ecology.

INTRODUCTION
With the increasing demand for livestock products as a result of rapid growth in the world economies and shrinking land area, the future hope of feeding the millions of future generations and safeguarding their food security will depend on the better utilization of hitherto neglected food and feed resources (Makkar, 2002). The diversity and nutritional values of indigenous browse plants may be well known to local livestock farmers (Okafor and Fernandez, 1987; Okoli *et al.*, 2003a), but limited published information exist on the social and physicochemical issues associated with their use at different farming locations.Proper evaluation of the production characteristics of some economic browse plants of southeastern Nigeriawould provide reliable data to farmers and development workers on the social, nutritional and toxicological issues associated with such browse plants promotion in the area and beyond.

In recent times, a large number of researches have focused on phytochemicals as cheap sources of novel chemicals for animal production and human health/nutrition. Plants with antioxidant properties have received special research attention mainly due to their phenolic compounds (Florou-Paneri *et al.*, 2006), which are beneficial in many applications in animal nutrition (Atawodi *et al.*, 2013). Availability of information on the diversity of browse plants in a given study area enables the selection process to meet the preferences of the indigenous farmers

and research approaches for their improvement (Okoli *et al.*, 2014). There is currently no clearly developed protocol or methodology for selecting local materials of nutritional potentials out of the hundreds of candidate raw materials available in a study area, therefore, development of such a selection protocol could eliminate some of the frustrations experienced with many trial materials which usually arise from poor or non-existent selection process.

The objective of this research work therefore is the socio-cultural and phytochemical ranking of *Ficus microcarpa* in comparism with six selected indigenous browse plants from southeastern Nigeria.

MATERIALS AND METHODS

The study was carried out at Nnobi community in Idemili South Local Government Area (LGA), Anambra Central Agricultural zone of Anambra State, Nigeria which lies between latitude 06°00′N and 06°05′N and longitude 06°57′E and 06°95′E within the south-eastern agricultural zone of Nigeria and has an altitude of 213meters above sea level (Nnadi *et al.*, 2013).

Sample collection and preparation

Fresh foliage from three stands of *Ficus microcarpa* at each study village were obtained at Nnobi, and were used for the study. The Ficus tree was climbed by the researcher and its branches cut down for collection of its leaves. Thereafter, the leaves sampled from each village were plucked and air-dried accordingly. The dried leaf samples were ground with hammer mill through a 1mm screen to produce their respective leaf meals and were collected in sealed polythene bags, labeled and taken to JaaGee Laboratories Nigeria Ltd, Ibadan, Nigeria for physical and phytochemical analyses.The results gotten from the laboratory analysis were compared with already available results of other six plants; *Garcinia kola,Mucuna pruriens* and *Gongronema latifolium* scored by Udedibie (2015) and *Manniophyton fulvum, Nuaclea popegnine*and*Manihot utilissima*(Okoli, 2015)

Socio-cultural and phytochemical ranking of *Ficus microcarpa*

Numerical scoring of the study plant *F. microcapa* was done alongside the three plants *Garcinia kola,Mucuna pruriens* and *Gongronema latifolium* scored by Udedibie (2015) and another set of three plants *Manniophyton fulvum, Nuaclea popegnine*and*Manihot utilissima*(Okoli, 2015) to obtain a comparism across the plant types. First, the socio-cultural scoring of the plants were carried out to determine their indigenous value ranking across seven scoring scale of 2 ('0' and '1') to represent 'Yes' or 'No' answers. Thereafter a scoring scale of 7 was used to rank the seven plants across nine selected phytochemical parameters (Okoli *et al.*, 2014). Scoring of the candidacy of the dried leaf meals as possible alternative feed raw materials for livestock feeding trial was based on the crude protein, ash, metabolizable energy, NDF, copper, iron, antioxidants, trypsin inhibitor and cyanide contents of the leaf meals (Okoli *et al.*, 2014; Udedibie, 2015, Okoli, 2015). The parameters were selected as important representative components of the physicochemical properties of the study materials in order to arrive at a functional and practical score for candidacy selection based on this scoring protocol. The two score results were then tallied to obtain the final mean score for each plant.

RESULTS AND DISCUSSION

Table 1 showed the comparative socio-cultural scores of *F.microcarpa*. Across scores of seven parameters and seven plants, *F. microcarpa* recorded the highest score of 85.71% in socio-cultural value, followed by *G. latifolium, G. kola* and *N. popegnine* that scored 71.43% each.

Of these four plants, *N. popegnine* is the only one that is not domesticated but has remained essentially a wild plant in southeastern Nigeria, where its major use is in the treatment of malaria in humans. The lowest score was recorded by *M. pruriens* even though it has received a lot of research attention as a plant of potential economic value in the tropics (Emenalom *et al.*, 2004; Ravindran and Ravindran, 1988; Siddhuraju *et al.*, 1996). Even though *M. utilisima* (cassava) recorded a moderate score of 57.14% its value as a major human food with a root tuber that contains one of the highest concentrations of calories in nature (Ravindran and Blair, 1992) justifies its domesticated plant status (Burrell, 2003). Thus, the varied socio-cultural functions of *F. microcarpa* may explain its domesticated plant status at Nnobi, however the fact that the highly valued *N. popegnine*

remains a wild plant in the same region cannot be readily explained even though it seems to mimic the neem plant (*Azadiractha indica*), an exotic plant that has received lots of developmental promotion in Nigeria.

Phytochemical scores

Table 2 showed the phytochemical score of *F. microcarpa* leaf meal comparism with the other six plant leaf meal scores. Based on the nine phytochemical parameters considered, *F. microcarpa* scored a moderate 47.61%, only better than the 44.44% scored by *M. fulvun*. The best score of 65.08 and 63.49% were recorded for *M. utilisima*and *G. latifolium* respectively. However, *M. pruriens* that recorded very low socio-cultural score of 28.57% recorded high 60.31% phytochemical score. Specifically, there was clear dichotomy between the socio-cultural and phytochemical scores of *F. microcarpa* and *M. pruriens* as shown by the histogram of percentage differences in the two scores (Figure I). It implies from these results that reliance on laboratory evaluation of *F. microcarpa* leaf meal alone will yield a poor conclusion of its value in livestock production, while for *M. pruriens* reliance on laboratory evaluation results alone may yield an over-rated conclusion of its true value.

For the other five plants studied, the differences between the results generated from the two scoring protocols were narrow indicating that the laboratory evaluation results tended to agree with the socio-cultural results. This implies that *M. fulvum and N. popegnine* which are currently wild plants should be subjected to further studies since their social importance could be linked to their biological values. However, there is the need to take their overall score levels into consideration before deciding on such studies.

When the two scoring results were combined to obtain an overall mean score for each plant (Figure II), an interesting picture emerged. All the plants with exception of *M. pruriens* (44.44%) and *M. fulvum* (43.65%) scored above 60.0%, with *G.latifolium*(67.46%), *F. microcarpa* (66.66%), and *G. kola* (66.66%) scoring highest and followed closely by the 65.08% scored by *N. popegnine*. Of all the high scoring plants, only *N. popegnine* has not been domesticated by farmers in southeastern Nigeria, while the others are domesticated for different human needs. Thus, *N. popegnine* may be the subject of further studies for possible promotion as a plant of animal production promise.

The present results therefore show that the domestication and use of *F. microcarpa* as browse by ruminant farmers in southeastern Nigeria could be explained better by a combination of socio-cultural and laboratory evaluation of the plant and that *N. popegnine* could be a good candidate plant for domestication in the region since it lends itself to several socio-cultural uses and has high biological value.

In an earlier study by Okoli *et al.* (2014), southeastern Nigerian plants were ranked based on a score of 1 to 5, depending on whether the leaf, bark, root, log and fruit of the plants were being utilized endogenously. This ranking method was however silent on the actual use of such plant parts as shown in table 2 of the present study. The adoption of the actual use ranking method is believed to better capture the socio-cultural issues associated with the plants use in the study environment. Again, Udedibie (2015) attempted a scoring of the candidacy of dried leaf meals of *G. latifolium, M. pruriens* and *G. kola* as possible alternative feed raw materials for monogastric animal feeding in the study zone. The study, although limited by small data size concluded that such scoring protocols that make use of representative phytochemical parameters could generate useful clues on the nutritional ranking of lesser known local fodder plants.

It is however possible to combine the two methods as shown in this study and in the report of Okoli *et al.* (2002) for plants of ethno-veterinary importance in southeastern Nigeria. Such combination leads to the development of a more reliable, though sophisticated ranking method. Thapa *et al.* (1997) and Thorne and Herrero (1998) reported that in-depth study of farmer's existing knowledge of the relative quality of different tree fodders could yield sophisticated information to the extent of discriminating different characteristics of tree fodders with different implications for animal performance. Based on this, the consistency between farmer's knowledge and chemical indicators could be demonstrated using simple correlations to show that farmer's knowledge could be to some extent biologically based and conversely that laboratory indicators could

supply important information to farmers (Thorne and Herrero, 1998).

CONCLUSION

The present study has shown that *Ficusmicrocarpa*recorded the highest socio-cultural score across 6 other indigenous plants compared with it. However it recorded relatively lower phytochemical score than plants such as *M. utilissima, G. latifolium, G. kola, M. pruriens* and *N. popegnine* with its overall mean score being higher than those of *N. popegnine, M. utilissima, M. pruriens*, and *M.fulvum*. As observed from the study, farmers' socio-cultural practices and chemical indicators also serves as a good tool for selection of candidate alternative feed resource instead of basing it solely on chemical indicators. The combination of socio-cultural and phytochemical parameters led to the development of a more reliable though sophisticated ranking method.

RECOMMENDATION

It is recommended that *F. microcarpa* be promoted as a browse of promise in the hot humid tropical zones of Nigeria and beyond. *Ficus microcarpa* plantations development is recommended for dry zones of Nigeria where year round availability of animal fodder is a problem.

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Table 1: Socio-cultural and phytochemical ranking of *F. microcarpa* with other plants

Scoring parameters (%)	FM	GL	MP	GK	MU	MF	NP
a) Socio-cultural scores							
Planted by man in the compound	1	1	0	1	1	0	0
Used as browse plant	1	0	1	0	1	1	1
Has human food value	0	1	0	1	1	0	0
Has medicinal value	1	1	1	1	0	1	1
Amenable to vegetative propagation	1	1	0	0	1	0	1
Evergreen all year round	1	1	0	1	0	1	1
Fuel wood	1	0	0	1	0	0	1
Total	6	5	2	5	4	3	5
Total (%)	85.71	71.43	28.57	71.43	57.14	42.86	71.43

FM = *Ficus microcarpa*;GL = *Gongronema latifolium*;MP = *Mucuna pruriens*; GK = *Garcinia kola*; MU = *Manihot utilissima*; MF = *Manniophyton fulvum*; NP =*Nuaclea popegnine*

Table 2: Phytochemical ranking of *F. microcarpa* with other plants

Scoring parameters (%)	FM	GL	MP	GK	MU	MF	NP
CP	1	7	6	3	5	2	4
NDF	2	4	1	3	7	6	5
ME	1	4	2	3	6	5	7
Cu content	6	4	5	7	2	1	3
Fe content	7	6	4	6	3	1	2
Total antioxidant	1	2	4	5	6	3	7
Trypsin inhibitor	1	2	4	3	5	7	6
Cyanide content	4	5	7	6	3	1	2
Ash content	7	6	5	3	4	2	1
Total	30	40	38	39	41	28	37
Total (%)	47.61	63.49	60.31	61.90	65.08	44.44	58.73
Percentage difference	38.10	7.94	31.74	9.53	7.94	1.58	12.75

CP = Crude protein; NDF = Neutral detergent fibre; ME = Metabolizable energy; FM = *Ficus microcarpa*;GL = *Gongronema latifolium*;MP = *Mucuna pruriens*; GK = *Garcinia kola*; MU = *Manihot utilissima*; MF = *Manniophyton fulvum*; NP =*Nuaclea popegnine*

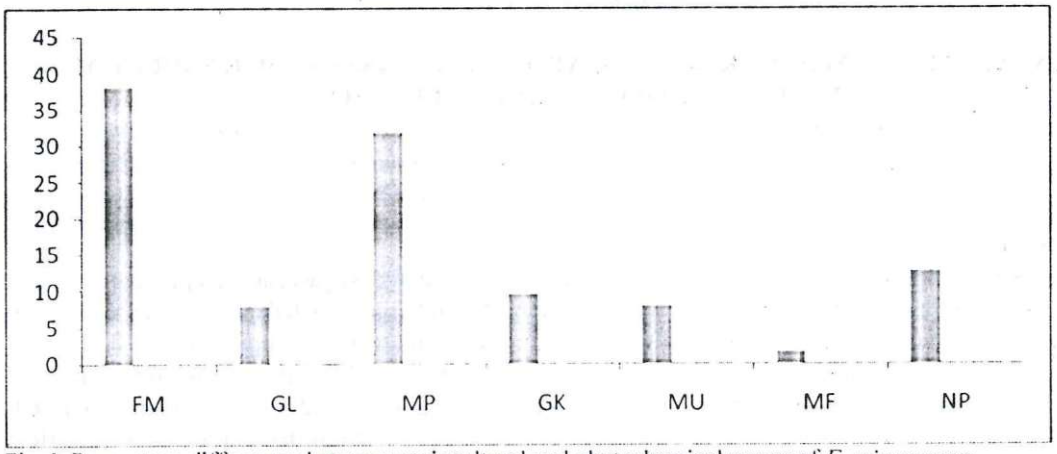

Fig. I: Percentage differences between sociocultural and phytochemical scores of *F. microcarpa* leaf meal in comparism with six other plant scores

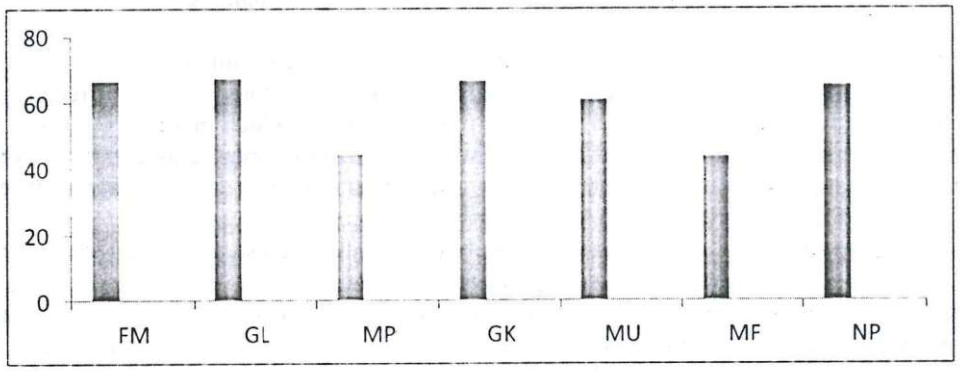

Fig. II: Overall mean scores of socio-cultural and phytochemical ranking of *F. microcarpa* leaf meal in comparism with six other plants scores.