

FORAGE SPECIES AVAILABILITY, PREFERENCE AND GRAZING BEHAVIOUR OF MUTURU AND ZEBU CATTLE IN ASABA, DELTA STATE, NIGERIA

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ABSTRACT: The objectives of this study were to identify the forage species available, species preference and to compare the grazing behaviour of Muturu and Zebu cattle under semi intensive system of management in Delta State University, Asaba Campus, Asaba Nigeria. Eleven cattle made up of one bull and ten cows each of Muturu and zebu were used for the study. There were five grazing areas. The total number of plant species, their population density and the most significant forage species preferred by the cattle were noted by the use of the quadrat method. Seventeen forage species were classified comprising twelve grasses, two legumes, two shrubs and one tree, which formed most of their food. Among the forage species identified, panicum maximum, grass specie was the most preferred and incidentally the widest spread forage in the area. Zebu significantly ($P<0.05$) bites more than muturu on ellusine indica, axonopus compressus, imperata cylindrica cynodon polystachus, centrosema pubescen and aspillia Africana. Muturu cattle showed significantly ($P<0.05$) greater preference for sida acuta and tridax procumbens than zebu. Zebu cattle spent significantly ($P<0.05$) more time on resting, courtship behaviour, brushing of the body and digging of soil than Muturu. Muturu cattle spent significantly ($P<0.05$) more time on playing and bullying than zebu. The finding in this study will be useful in the establishment of pastures and grazing management of muturu and zebu cattle in this ecological zone of the country.

Key words: Cattle, Plant Species, Population Density, Preference, Time Spent

INTRODUCTION

Forages are source of food for ruminants. The ruminant digestive system is designed to utilize non starch polysaccharides (NSPS) for the majority of the energy need of the animal. The availability of forage species vary from one place to another. This difference in forage species availability underscores the need to identify the various forage species available in an area which could be useful in pasture establishment. Cattle vary substantially in their ability to harvest and digest forages (Launchbaugh and Hunt, 2001). Making efficient use of existing forage resources can therefore be done by selecting the species and breed of animal that has the natural ability to eat the available forage (Launchbaugh and Hunt, 2001). Forage acceptability by animals on pasture or zero grazing conditions is a function of forage palatability and forage morphology (Komwihangilo et al., 2007). Palatability reflects the animal's preference of one forage specie to another based on the ability of the forage to satisfy the animal's nutritional needs. Forage preference involves proportional choice of one plant specie from among two or more species and is commonly behavioral. Herbivoures vary in their choice or preference of one forage specie to another. It is also believed that feeding behaviour patterns varies according to breed within each specie of animal (Paggot, 1992). Muturu are short horned cattle distributed all over the rainforest zone of Africa (Nweze, 2006). The cattle are indigenous to south eastern states of Nigeria. It is the smallest cattle breed known with height at withers of 95cm for the male and 88cm for the female (Maule, 1990). In south eastern Nigeria the muturu is usually black or black and white. The breed is reported to be trypanotolerant and has significant cultural values (Adeneji, 1983). The zebu cattle are believed to have originated from south west Asia and are found in northern ecological zone of Nigeria. They are usually red or grey in colour, have loose skin, large ears and humps above their shoulders. They have large horns and are highly heat tolerant. They are believed to be less trypanotolerant compared to the muturu. Understanding the forage species available and the grazing behaviour of these two traditional breeds of cattle will help in establishing pastures for these animals. The specific objectives of this research were as follows.

1. To identify the forage species available in the grazing area and their population density.
2. To determine the forage preference of zebu and muturu.
3. To compare their grazing behaviour.

ORIGINAL ARTICLE

MATERIALS AND METHODS

Experimental site

The study was conducted at Delta State University farm, Asaba Campus. The study area lies between latitude 4° 10' N and longitude 6° 8' E in Oshimili south local government area of Delta State. Annual rainfall was 1505-1849mm, mean annual temperature 28.6 °C, relative humidity 69-80% and monthly sunshine of about 4.8bars (NIMET, 2006).

Experimental animals

The experimental animals comprised 10 cows and 1 bull each of muturu and zebu reared under semi-intensive system of management at Delta State University farm, Asaba Campus in the southern guinea savannah ecological zone of Nigeria. The age of the animal as ascertained from dentition ranged 2-3 years. The animals were allowed to graze on available pasture from 8am-2pm daily, after which they returned to their pen and supplementary feed provided for them.

Experimental procedures

The grazing activities of the animals were monitored daily from the hours of 8am-2pm from August 2011 to October 2011. Grazing observation involves following and monitoring the animals during grazing. The observations include plant species chosen by the cattle and their grazing behaviour.

Forage specie availability

The different forage species available were determined by the use of quadrat method, where the different grazing area located at different areas were measured (Odo et al., 2001). The size of the first grazing area was 4000m² and the second measured 3000m², the third 5000m², fourth 9000m² and the fifth 9000m². Each of the measured area was further divided into five equal parts. All the plant species intercepted by the tape were identified. A wooden quadrat of 1m² was thrown randomly from any standing point at any direction. Ten throwing were made at different sides of each measured area and the different plant species occurring in each throw were identified, enumerated and recorded. Trees, grasses, legumes and shrub occurring within the quadrat were identified, counted and recorded. The total plant species were calculated. The method used to calculate the population density for each plant species was described by Odo et al. (2001) as follows:

Population density of specie A= Number of times specie A occurred divided by the area.

Number of bites and time spent on individual specie

The method used to observe forage preference involved close observation of randomly selected focal animal (one at a time) as they grazed with others (Osolo et al., 1994). A bite was taken as the act of breaking or picking up a piece of forage (Osolo et al., 1994; Odo et al., 2001). The time spent by the animal feeding on one species of plant without walking one full step was estimated in seconds and recorded (Osolo et al., 1994). The animals were grazed in different areas and a different individual was randomly selected for observation one at a time.

Statistical Analysis

The data collected on the number of bites, the time spent for each forage specie and the grazing behaviour of the two breeds of cattle were subjected to t-test (SPSS, 2007).

RESULTS

The numbers of forage species available in the study area as well as their relative density expressed as number of plants per 3000m² are shown in Table 1. Seventeen plant species were identified comprising 12 grasses, 2 legumes, 2 shrubs and one tree. The five most wide spread forage species in the study area were *panicum maximum*, *axonopus compressus*, *ellusine indica*, *amaranthus spinosus* and *commelina nudiflora*. The least noticeable forage specie in the area was *chromoleana odorata*. Table 2 presents the mean \pm se of number of bites per second while table 3 shows the mean time spent on each forage specie by zebu and muturu cattle. Table 2 shows that *panicum maximum* was the most preferred forage specie by zebu and muturu followed by *ellusine indica*, *axonopus compressus*, *penisetum purpurem* and *imperata cylindrica* in that order. Incidentally, the most preferred forage was the most abundant in the grazing area. Significant (P<0.05) differences were observed between muturu and zebu in the number of bites and the time spent on each forage specie. Zebu cattle bite significantly (P<0.05) more than muturu on *ellusine indica*, *axonopus compressus*, *imperata cylindrica*, *cynoden polystachus*, *aspilla Africana* and *ageratum conizoides*. Muturu cattle showed significantly (P<0.05) greater preference for *sida acute* and *tridax procumbens* than zebu. *Pueria phasioloide*, *chromolaene odorata* and *talinum triangulare* were not eaten by the animals. Both breeds of cattle graze a minimum of five hours daily and grazed thoroughly for the first one hour before carrying out some of the grazing behaviours shown in table 4. There were significant (P<0.05) differences in time spent by zebu and muturu cattle in carrying out all the observed grazing behaviours. Zebu spent significantly (P<0.05) more time in resting, brushing of the body, digging of soil and courtship behaviour than muturu. On the other hand, muturu spent significantly (P<0.05) more time on playing and bullying than zebu.



Table 1 - Average plant population density (plants/ 3000m²) of forage species

Forage species	Total frequency	Plants/ 3000m ²
Grass species		
<i>Panicum maximum</i>	1737 ± 34.74	0.579
<i>Axonopus compressus</i>	817 ± 16.34	0.273
<i>Ellusine indica</i>	629 ± 12.58	0.209
<i>Amaranthus spinosus</i>	524 ± 10.48	0.175
<i>Commelina nudiflora</i>	300 ± 6.00	0.100
<i>Pennisetum purpureum</i>	140 ± 2.80	0.047
<i>Aspilla Africana</i>	131 ± 2.63	0.045
<i>Tridax procumbens</i>	127 ± 2.54	0.042
<i>Cynodon polystachus</i>	89 ± 1.73	0.029
<i>Ageratum conizoides</i>	67 ± 1.34	0.022
<i>Imperata cylindrica</i>	13 ± 0.26	0.004
<i>Talinum triangulare</i>	3 ± 0.06	0.001
Legume species		
<i>Centrosema pubescens</i>	184 ± 3.60	0.061
<i>Pueria phasioloide</i>	21 ± 0.42	0.007
Shrub species		
<i>Sida acuta</i>	143 ± 2.86	0.048
<i>Chromolaena odorata</i>	2 ± 0.04	0.001
Tree species		
<i>Gmelina arborea</i>	21 ± 0.42	0.007

Table 2 - Mean ± S. E of number of bite per second on the various forage species for zebu and Muturu cattle

Forage species	Zebu	Muturu
<i>Panicum maximum</i>	9.17 ± 7.56	8.50 ± 0.75
<i>Ellusine indica</i>	7.40 ± 0.66 ^a	5.44 ± 0.53 ^b
<i>Axonopus compressus</i>	6.56 ± 0.74 ^a	5.06 ± 0.67 ^b
<i>Penisetum purpureum</i>	6.06 ± 0.86	6.56 ± 0.80
<i>Imperata cylindrical</i>	5.94 ± 0.93 ^a	4.00 ± 0.68 ^b
<i>Amaranthus spinosus</i>	5.89 ± 0.72	6.28 ± 0.85
<i>Gmelina arborea</i>	5.50 ± 0.79	5.11 ± 0.49
<i>Commelina nudiflora</i>	4.44 ± 0.96	4.28 ± 1.09
<i>Cynodon polystachus</i>	4.44 ± 0.62 ^a	1.56 ± 0.53 ^b
<i>Centrosema pubescens</i>	3.39 ± 0.62 ^a	2.61 ± 0.81 ^b
<i>Aspilla Africana</i>	2.39 ± 0.62 ^a	1.33 ± 0.38 ^b
<i>Ageratum conizoides</i>	0.89 ± 0.30 ^a	0.06 ± 0.06 ^b
<i>Sida acuta</i>	0.83 ± 0.43 ^b	3.89 ± 1.36 ^a
<i>Tridax procumbens</i>	0.61 ± 0.23 ^b	4.00 ± 0.68 ^a
<i>Pueria phasioloide</i>	0	0
<i>Chromolaena odorata</i>	0	0
<i>Talinum triangulare</i>	0	0

a, b means with different superscripts are significantly (P<0.05) different

Table 3 - Mean ± S.E for time spent on each forage specie by Zebu and Muturu cattle (in seconds)

Forage species	Zebu	Muturu
<i>Panicum maximum</i>	10.72 ± 0.96	10.17 ± 0.80
<i>Ellusine indica</i>	9.56 ± 1.05 ^a	7.99 ± 0.67 ^b
<i>Axonopus compressus</i>	7.33 ± 0.94 ^a	6.28 ± 0.76 ^b
<i>Pennisetum purpureum</i>	7.72 ± 1.14	7.50 ± 0.99
<i>Imperata cylindrical</i>	6.61 ± 1.09 ^a	4.44 ± 0.87 ^b
<i>Amaranthus spinosus</i>	8.44 ± 1.21 ^a	6.61 ± 1.08 ^b
<i>Gmelina arborea</i>	7.94 ± 0.93	7.17 ± 0.87
<i>Commelina nudiflora</i>	6.50 ± 1.39	5.67 ± 1.10
<i>Cynodon polystachus</i>	4.28 ± 0.92 ^a	1.44 ± 0.49 ^b
<i>Aspilla Africana</i>	2.50 ± 0.65 ^a	1.28 ± 0.38 ^b
<i>Ageratum conizoides</i>	0.89 ± 0.40 ^a	0.67 ± 0.46 ^b
<i>Sida acuta</i>	1.00 ± 0.72 ^b	4.56 ± 1.72 ^a
<i>Tridax procumbens</i>	0.33 ± 0.20 ^b	0.72 ± 0.29 ^a
<i>Centrosema pubescens</i>	2.60 ± 0.89 ^a	1.45 ± 0.20 ^b
<i>Pueria phasioloide</i>	0	0
<i>Chromolaena odorata</i>	0	0
<i>Talinum triangulare</i>	0	0

For each forage specie, b < a (P<0.05)



Table 4 - Mean time in minutes \pm S.E spent by Zebu and Muturu cattle in carrying out some grazing behaviours

Observed activity	Zebu	Muturu
Resting with or without rumination		
Playing and bullying	10.83 \pm 2.51 ^a	9.00 \pm 1.54 ^b
Courtship behaviour	0.72 \pm 0.57 ^b	7.44 \pm 1.88 ^a
Brushing of the body	0.44 \pm 0.28 ^a	0.28 \pm 0.16 ^b
Digging of the soil	0.46 \pm 0.25 ^a	0 ^b
	0.22 \pm 0.15 ^a	0 ^b

a, b means with different superscripts are significantly ($P < 0.05$) different.

DISCUSSION

The results obtained in this study showed that *panicum maximum* was the most dominant forage specie in this area. This was followed by *axonopus compressus*, *ellusine indica* and *amaranthus spinosus*. The least dominant forage specie in this area was *chromolaena odorata*. This means that the soil type, soil composition and the topography of the ecological zone favoured the growth of these forage species more than others. It is a well-known fact that soil structure, soil composition, climate and topography of a region influence its vegetation (Odo et al., 2001). Incidentally the most abundant forage specie was the most preferred in this grazing area. By implication, it means that the dry matter (DM) content and moisture content of the forages preferred most were higher than those of the least preferred forages. It has been reported by Gibb et al (1998) and Komwihangilo et al. (2007) that the DM content and moisture content of grazed forages increased bite rate and bite mass. The nutrient composition of forages also influence bite rate and bite mass. Forages that have high acid-detergent fibre, sodium or nitrogen content were preferred most compared to forages with low content of these nutrients (Osolo et al., 1994). Animals usually prefer foods that meet their nutritional need (Hughes, 1993). During grazing, zebu cattle bites more and spent more time than muturu on some forage species such as *ellusine indica*, *axonopus compressus*, *imperata cylindrica* and *cynodon plectostachus*. This could be related to the fact that zebu has a bigger body size and therefore more rumen fills time than muturu cattle. The differences in biting rate could also be as a result of differences in the nutrient requirements of the two breed of cattle. Observation on grazing behaviour showed that muturu showed highest time in playing and bullying than zebu cattle. This behaviour could be due to the fact that muturu has a shorter rumen filling time than zebu cattle. The results also showed that zebu exhibited higher preference for digging of soil than muturu cattle. This could be related to the fact that zebu cattle has horn and use it in searching for root crops and minerals in the soil especially iron. The courtship behaviour exhibited by both breeds of cattle during the grazing period could be due to the effect of sun light on the activities of ovarian hormones (Odo et al., 2001).

CONCLUSION AND RECOMMENDATION

It was concluded from this study that *panicum maximum* was the most dominant while *chromolaena odorate* was the least noticeable forage species in this area. Panicum maximum was the most preferred forage by the grazing animals compared to other forage species. Zebu significantly ($P < 0.05$) bites more than muturu on *ellusine indica*, *axonopus compressus*, *imperata cylindrical*, *cynodon polystachus*, *centrosome pubescens*, *aspilla Africana* and *ageratum conizoides*. Muturu showed significantly ($P < 0.05$) greater preference of *sida acuta* and *tridax procumbens* than zebu cattle. The findings of this study will be useful in the establishment of pastures and grazing management of zebu and muturu in this ecological zone of the country.

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