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INGESTIVE BEHAVIOR OF BEEF CATTLE FED EITHER PROTEIN OR ENERGY SUPPLEMENTS UNDER A ROTATIONAL GRAZING SYSTEM.[1]

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Abstract

Eight Nellore bullocks were assigned to a Tanzânia grass pasture (*Panicum maximum* Jacq.) under a rotational grazing system, to evaluate the ingestive behavior under two different grazing residues. Stocking rate intensity was used to reach either 1000 kg DM.ha^{-1} (R1) or 4000 kg DM.ha^{-1} (R2) as residual targets. Three grazing days followed by 33 days resting period, composed a 36 day grazing cycle. Each grazing plot supported four animals, in a 4x4 Latin square design, within the following supplementation rates and sources: S1 = no supplement; S2 = 2,0 kg DM.day^{-1} coarsely ground corn - 8 mm sieve; S3 = 2,0 kg DM.day^{-1} steam flaked corn (360 g/L) and S4 = 0,7 kg DM.day^{-1} soybean meal. Grazing behavior measurements were taken every 15 days after 9 a day adaptation period, during two consecutive summer grazing cycles. Animal activities were recorded every 5 minutes during day time and 15 minutes during night time throughout a 24 hour period. Supplementation with S2 decreased ($P < 0,05$) rumination time under a higher grazing residue (R2). Both grazing and rumination time were increased and led to a decreased resting time ($P < 0,05$) in R2 animals compared with R1.

Keywords: Tanzânia grass, rotational grazing, grazing residues, beef cattle, supplementation, and ingestive behavior

Introduction

Daily forage intake is product of grazing time and intake rate in a 24-hour period. Grazing reflects the time spent on browsing and forage apprehension from pasture (Crowder and Chheda, 1982). According to Hodgson (1990) grazing time is highly variable and dependent on forage allowance, varying between 360 and 720 minutes.day^{-1}. This range is in agreement with recent literature reviews Krysl and Hess (1993), where grazing time changed from 359 to 771 minutes.day^{-1} under different environmental conditions, pasture management and supplementation. Only 4 to 32% of the grazing time variation can be explained by herbage mass and height; leaf area index or digestibility, with most of the grazing behavior not properly explained (Cosgrove, 1997). Rumination time is comprised between a range of 360 to 480 minutes.day^{-1}, and the residual time occupied with resting and miscellaneous (Hodgson, 1990).

The main purpose of this study was to evaluate the effects of herbage allowance and supplementation over grazing and rumination time associated with resting period when bullocks where maintained under a rotational grazing system, with a tropical grass, during summer time.

Material e Methods

The study was carried out from December 1999 through Jan 2000 at the University of São Paulo - ESALQ experimental farm located in Piracicaba, SP. Twelve grazing paddocks were set into a rotational grazing system under irrigation cultivated with Tanzânia grass pasture (*Panicum maximum* Jacq.). Three grazing days followed by 33 days resting period composed a 36-day grazing cycle. Fertilization rate 334 kg.ha^{-1} 24-04-24 (80 kg N.ha^{-1}) was applied after each grazing. Eight Nellore bullocks, 300 kg live weight, were assigned to a Latin square design 4x4, comprised by four supplements (S1, S2, S3 and S4) and two grazing residual targets (R1 and R2) defined as R1 = 1000 kg DM.ha^{-1} and R2 = 4000 kg DM.ha^{-1}.Grazing residues were measured after animals were removed from each paddock. Supplementation treatments were S1= no supplement; S2= 2,24 $kg.day^{-1}$ coarsely ground corn (8 mm sieve); S3= 2,24 $kg.day^{-1}$ steam-flaked corn (360 g/L) and S4= 0,7 $kg.day^{-1}$ soybean meal.

Four skilled watchers recorded animal behavior measurements, every five minutes, during the daytime, and every 15 minutes, at night, at the ninth day of the adaptation period throughout 24 hour. Diurnal grazing behavior was measured by using conventional binoculars whereas at night, observations were supported by binoculars with night vision device based on infrared light (NEWCON, Optik, model BN 456, Cleveland, OH, USA). Grazing, rumination and resting time were measured.

Data were analyzed by using the GLM procedure (SAS, 1990), with behavior mean values compared within grazing residues (Latin squares) and among supplements. Significant differences were declared (P <0.05) when compared by Tukey test.

Results and Discussion

Grazing residues varied significantly from the first through the fourth grazing cycle studied, for both R1 (3645, 1699, 1809 and 1026 kg DM $.ha^{-1}$) and R2 (1629, 1786, 3260 and 1576 kg $DM.ha^{-1}$), respectively.

Grazing time ($minutes.day^{-1}$) (Table1) was not changed across supplements (P > 0,05), for both grazing residues. Adams (1985) observed same trend with beef steers fed energetic supplement (0.3 kg of corn.100 kg $BW^{-1}.day^{-1}$).

Additionally, grazing time values observed in this study are in agreement with those reported by Hodgson (1990) and Krysl & Hess (1993), using temperate grasses. However, mean grazing time values are considered a little lower than those observed with tropical grasses. Euclides et al. (1999) working with Tanzânia grass (*Panicum maximum* Jacq.) under continuous stocking rate found as 514 minutes.day^{-1}, during summer season. Ribeiro Filho et al. (1999) observed 541 minutes.day^{-1} as mean grazing time for grazing behavior performance on Elephant grass (*Pennisetum purpureum*, Schum, cv. Mott) pasture from January through February.

Mean values for grazing time observed for animals in R1 grazing residues were lower than those observed for R2 residues ($P < 0,05$). After first day grazing, there were few remaining leaves available in R1 treatment associated with pasture stubble, which reduced forage apprehension. Such morphology discouraged intake (data not presented) and increased time wasted on walking. Cosgrove (1997) observed an increase in grazing time with higher forage allowance, however in swards where intake is restricted by structure, grazing time might be reduced. Similar trend was reported by Chacon and Stobbs (1976), with cows grazing Setaria pasture (*Setaria anceps* cv. Kazungula).

Both rumination and resting time (minutes.day^{-1}) are available in Table 2. Supplementation determined changes in rumination time only for higher grazing residue treatment (R2). Animals grazing with no supplement showed increased rumination time compared with those fed 2.24 kg coarsely ground corn day^{-1} (S2). Adams (1985) reported ruminal activity up to 420 minutes.day^{-1}, for grazing animals regardless of supplement source., which is similar to R2 treatment (408 minutes.day^{-1}) and higher ($P < 0,05$) than mean values observed to (R1) grazing residue. In general, increased rumination time is associated with higher intake levels and dependent of grazing time.

Resting time was not changed across supplements, even though a significant ($P < 0,05$) effect of grazing residue level was observed.. Animals grazing R2 treatment showed less time spent with resting and miscellaneous due to more time demanded for grazing and rumination when compared with animals under R1 residues. According to Adams (1985) no changes in resting time were associated with supplement effect.

Energy and protein supplements did not show significant effect upon grazing and resting time on beef cattle grazing Tanzânia grass (*Panicum maximum* Jacq.) pasture under rotational system.. Rumination time was decreased ($P < 0,05$) when coarsely ground corn was fed, compared with other supplements. Grazing residual effects were observed on most ingestive behavior parameters. Increasing stocking rate by lowering grazing residues led to a reduced forage allowance , which in turn, was associated with less time spent grazing.

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Table 1 - Grazing time from bulls on an irrigated Tanzânia grass pasture (*Panicum maximum* Jacq) under rotational grazing with two levels of grazing residue fed either protein or energy supplements.

Supplements	Grazing residue (kg DM.ha^{-1})	
	1000	4000
	Grazing time (minutes.day^{-1})	
No supplement (S1)	352,50^{a}	475,00^{a}
Coarsely ground corn (S2)	366,25^{a}	493,75^{a}
Flaked corn (S3)	335,00^{a}	446,25^{a}
Soybean meal (S4)	363,75^{a}	467,50^{a}
Mean	354,38^{B}	470,63^{A}

^{a,b,c}Means within a column with unlike superscripts differ (P<0.05) Tukey test.
^{A,B} Means within a row with unlike superscripts differ (P<0.05) Tukey test.

Table 2 - Rumination time (minutes.day^{-1}) and resting time (minutes.day^{-1}) from bulls on an irrigated Tanzânia grass pasture (*Panicum maximum* Jacq) with two levels of grazing residue fed either protein or energy supplements.

Supplements	Grazing residue (kg DM.ha^{-1})			
	1000	4000	1000	4000
	Rumination time		Resting time	
No supplement (S1)	330,00^{a}	490,00^{a}	757,50^{a}	475,00^{a}
Coarsely ground corn (S2)	327,00^{a}	366,25^{b}	746,25^{a}	578,75^{a}
Flaked corn (S3)	315,00^{a}	391,25^{a,b}	790,00^{a}	602,50^{a}
Soybean meal (S4)	303,75^{a}	386,25^{a,b}	772,50^{a}	586,25^{a}
Mean	319,06^{B}	408,44^{A}	766,56^{A}	560,63^{B}

^{a,b,c}Means within a column with unlike superscripts differ (P<0.05) Tukey test.
^{A,B} Means within a row with unlike superscripts differ (P<0.05) Tukey test.