On-offer and residual forage in a Massai-*Leucaena* pasture at different Leucaena density

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Introduction

Mexican livestock producers in tropical areas are increasingly interested on the establishment of silvopastoral systems based on Leucaena (*Leucaena leucocephala* (Lam.) de Wit) and different tropical grasses as the Massai grass (*Panicum maximum* cv Massai); among questions raised on this is the importance of Leucaena density in relation to forage available. Then the objective of the study was to determine total and by species on-offer and residual forage in a grazed Massai-Leucaena pasture with different Leucaena density.

Materials and Methods

Three Leucaena densities: 1363, 2232 and 4916 plants/ha during three grazing cycles were evaluated under a split-plot design (Steel and Torrie, 1988) main plots were Leucaena densities and sub-plot the grazing cycles; there were three replications, the experimental unit was a plot with 13 Leucaena plants, each plot was of 26.4, 58.3 and 95.3 m^2 for the highest to the lowest Leucaena density, respectively. For all plant densities Leucaena rows were 2 m apart, target plant densities were reached by changing plant distance within the row. Massai grass was sown between Leucaena rows. Experiment lasted from late June to early September, when grass growth rate is the highest. Grazing was done by replications, within each grazing cycle only three replications were grazed at the time. Grazing and resting periods were five and 37 days respectively, grazers were ewes at a stocking density of 264 ewes/ha, ewes grazed on grass pasture while not in the experimental plots. On-offer and residual Massai grass were measured by clipping to ground level three 0.25 m^2 per plot, for Leucaena one plant was selected and all leaves removed, in each sampling a different plant was selected, no estimation of residual Leucaena forge was done as there was no leave left at the end of the each grazing period.

Results and Discussion

Massai forage on-offer was not influenced (P>0.05) by Leucaena density, grazing cycle and the interaction between factors (Table 1). The different Leucaena densities left a constant surface free from tree cover to the Massai grass, the 2 m aisle that could explain this pattern of response.

Table 1: Massai forage on-offer (t DM/ha) at three grazing cycles and three *Leucaena* plant densities.

Grazing cycle	Leucaena density (plants/ha)			Grazing cycle mean
	4916	**2232**	**1363**	
First	2.98 ±0.38	3.40 ±0.92	2.38 ±0.45	2.9 ±0.45
Second	2.23 ±0.36	3.06 ±0.94	3.21 ±0.61	2.83 ±0.61
Third	2.56 ±0.15	2.48 ±0.28	2.85 ±0.45	2.63 ±0.48
Season mean	2.57 ±0.18	2.98 ±0.41	2.81 ±0.28	
No effect (P>0.05) of Leucaena density, grazing cycle and interaction of these factors.				

Leucaena forage on-offer was determined (P<0.05) by density, grazing cycle and the interaction of these two factors. The trend was to a lower forage on-offer with the lowest density and in the last grazing cycle (Table 2). Lower Leucaena density might determine regrowth potential towards the end of the active growing season.

Table 2: Leucaena forage on-offer (t DM/ha) at three grazing cycles and three Leucaena plant densities.

Grazing cycle	Leucaena density (plants/ha)			
	4916	2232	1363	Grazing cycle mean
First	0.30 ±0.07 ab	0.41 ±0.05 a	0.19 ±0.04 ab	0.301 ±0.04A
Second	0.19 ±0.07 ab	0.13 ±0.02 b	0.08 ±0.01 b	0.132 ±0.02B
Third	0.17 ± 0.07 ab	0.18 ±0.06 ab	0.09 ±0.04 b	0.147 ±0.03B
Season mean	0.218 ±0.04AB	0.243 ±0.05A	0.118 ±0.02B	
a, b means with at least one letter in common are not different; A,B means within columns or rows with at least one letter in common are not different.				

Residual Massai forage showed same response pattern than forge on-offer of not being influenced (P>0.05) by any of the two factors and of the interaction of them (Table 3). The higher Leucaena density was not enough to promote a higher grass intake by ewes.

Table 3: Massai residual forage (t DM/ha) at three grazing cycles and three Leucaena plant densities.

Grazing cycle	Leucaena density (plants/ha)			
	4916	2232	1363	Grazing cycle mean
First	0.49 ±0.03	0.84 ±0.32	1.38 ±0.36	0.9 ±0.19
Second	0.86 ±0.16	1.25 ±0.37	1.54 ±0.19	1.22 ±0.16
Third	1.58 ±0.06	1.27 ±0.26	1.50 ±0.42	1.45 ±0.15
Season mean	0.98 ±0.16	1.12 ±0.17	1.47 ±0.17	
No effect (P>0.05) of Leucaena density, grazing cycle and interaction of these factors				

Conclusion
Massai grass is not influenced by Leucaena density on the amounts of forage on-offer and residual; while, Leucaena forage on-offer tends to be influenced by density at the end of the grazing season.

References
Steel R. G. D. and Torrie J. H. 1988. *Bioestadística: Principios y Procedimientos*. Edit. McGraw-Hill. México, D. F.