LIVE-WEIGHT GAIN OF STEERS GRAZING AFRICAN STAR GRASS AT FOUR HERBAGE ALLOWANCES

J. Pérez-Pérez[1], J. O. Hernández-Velez[2], J.G. Herrera-Haro[1] and R. Bárcena-Gama[1]
[1]Programa de Ganadería. Colegio de Postgraduados. Montecillo, Texcoco, México
[2]C. E. Las Margaritas, INIFAP-CIPEP, A.C. Hueytamalco, Puebla, México

ABSTRACT
The objective was to determine weight changes of steers grazing African star grass (*Cynodon plectostachyus*) at four herbage allowances (2.0, 2.5, 3.0 and 3.5 kg of dry matter/100 kg of live weight day^{-1}). A rotational grazing system with 10 grazing days and 30 days rest was followed. A Split Plot Design with four replications was used. Response variables were: daily gain per steer (DGS) and per hectare (DGH), dry matter forage yield (FY), % of utilization (% U) and *in vitro* dry matter digestibility (DMIVD). DGS and DGH were not different (P >0.05) among allowances and grazing periods. Percent of utilization had a similar trend during the year, but lower in the January-February period. The FY was not affected by allowances, but it was by periods. The DMIVD was different (P<0.05) among allowances and grazing periods.

INTRODUCTION
African star grass commonly outyields Mexican native grasses. Daily herbage allowance is a management tool, that can define relationship between forage availability and animal liveweight gain under grazing (Mott, 1960). The aim of all grazing systems is to preserve and improve pasture conditions while harvesting the maximum amount of forage produced. The objective of this study was to determine forage yield and quality and steer performance from African Star pasture grazed at four herbage allowances.

METHODS
The research work was carried out at the Experimental Station Las Margaritas, Hueytamalco, Puebla, México. Climate is tropical, annual precipitation of 3000 mm and 21½C mean temperature. Soils are classified as Oxisoles and Ultisoles, with low to medium acidity and fertility. African Star pasture was divided into 16 plots, each fertilized with 138-69-00 kg ha^{-1} of N-P-K (urea and superphosphate were used); N level was given in two applications. Experimental plots were grazed for 10 days and rested 30 days. Steer's initial weight was 172 ± 15.9 kg. Besides grazing, steers were given 1.5 kg animal^{-1} day^{-1} of a concentrate (16% protein and 70% TND). Treatments were four daily herbage allowances: 2.0, 2.5, 3.0 and 3.5 kg of dry forage/100 kg of animal live-weight (Paladines and Lascano, 1984). To keep target allowance plot-size was fixed and put and take steers were used. Pregrazing herbage mass was determined to calculate total forage yield. Forage quality was estimated from *in vitro* dry matter digestibility (Keulen and Young, 1977); forage samples for quality came from the first five grazing days of each period, during September-March. Animal measurements were daily live-weight gain per steer (DGS) and per hectare (DGA). Each plot was grazed five times. Split-plot design was used; major plot was allowance and sub-plot grazing period.

RESULTS AND DISCUSSION
No interaction (P<0.5) between allowance and grazing periods was found (Table 1). Mean DGS was 0.637 kg steer^{-1} with no difference (P>0.05) among treatments. Similarity and relative high live-weight gain might be due to the supplement given. There was a small trend among grazing periods, with a higher DGH during September-October period and lower in October-November; an infestation of *Trichoplusia ni* might be responsible for the latter. Grazing periods showed a mean DGH of 44.1 kg. The results before described are similar to those reported by other research workers at this station (Treviño *et al*., 1975), which pointed out the necessity of livestock supplementation, in order to cover the protein, energy and mineral requirements. FY was different (P<0.05) among periods (Table 2), but not among allowances; the highest yield (2271 kg ha^{-1}) was found in September-October and lowest (1060 kg ha^{-1}) in January-February, as a consequence of better environmental conditions in the first period, with high temperature and precipitation. Mean yield across all allowances was 1688 kg ha^{-1}.

Pasture utilization showed no difference (P>0.05) among allowances (Table 2); mean utilization was 38.2%. Differences were only among periods, highest in November-December (57.6%) and lowest in January-February (30.3%). Lower utilization was associated to short, cooler and cloudy days, which might affect grazing animals as Gerald and Holecheck (1984) pointed out.

DMIVD among allowances and grazing periods was different. The highest DMIVD was 64.6%, found at the highest allowance, while the lowest DMIVD 60.3% was found at the lowest allowance; on October-November period the lowest value occurred (53.2%) and the highest in February-March (69.4%). All the values were affected by environmental conditions and management systems, but are in good agreement relative to those found in the scientific literature (Melendez *et al*., 1980). African Star pasture performance and live-weight gain of steers were not influenced by level of daily herbage allowance.

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Table 1
Daily live-weight per steer (DGS) and per ha (DGH) at four herbage allowances grazing on African Star grass. Hueytamalco, Puebla, Mexico.

	Periods (Month)											
H.A.	Sep-Oct		Oct-Nov		Nov-Dec		Ene-Fer		Fer-Mar		Prom.	
	DGS	DGH	DGS	DGH	DGS	DGH	DGS	DGH	DGS	DGH	DGS	DGH
3.5*	1.125	94.3	0.347	24.5	0.612	41.0	0.862	34.5	0.780	42.0	0.746[ns]	47.2ns
3.0	0.810	80.5	0.687	42.5	0.425	28.5	0.816	39.0	0.738	42.5	0.696	46.6
2.5	0.820	74.0	0.485	29.0	0.430	36.2	0.582	26.2	0.697	51.5	0.630	43.4
2.0	0.629	67.0	0.239	14.5	0.630	40.0	0.669	38.7	0.525	35.5	0.479	39.1
Prom.	0.847[ns]	78.9[ns]	0.440	27.6	0.450	36.4	0.733	34.6	0.685	42.9	—	—

ns = Means are not significantly different (P < 0.05)
H.A. = Daily herbage allowance in kg DM/100 kg of liveweight.

Table 2
Forage yield (FY) and utilization (%U) in African Star Grass al four herbage allowances. Hueytamalco, Puebla, Mexico.

	Period (month)											
H.A.	Sep-Oct		Oct-Nov		Nov-Dec		Ene-Feb		Feb-Mar		Prom.	
	FY	%U	FY	%U	FY	%U	FY	%U	FY	%U	FY	%U
3.5*	2311	27	2045	42	1783	56	1162	44	1395	21	1939[ns]	37[ns]
3.0	2212	22	1752	36	1613	63	1048	21	1329	34	1591	35
2.5	2285	35	2245	34	1643	58	979	29	1365	40	1703	39
2.0	2277	47	2051	37	1783	51	1053	27	1432	33	1719	39
Prom.	2271[a]	33[b]	2024[b]	37[b]	1706[c]	58[a]	1061[e]	30[b]	1380[d]	32[b]	—	—

a,b,c,d,e = Means are significantly different (P < 0.05)
H.A. = Daily herbage allowance in kg DM/100 kg of liveweight.