Trifolium vesiculosum: Exploring Its Potential in the Uruguay Lowlands Rice Region

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Introduction

Trifolium vesiculosum, commonly known as arrowleaf clover, is a winter-growing annual legume native to Europe (Duke, 1981), with high persistence and low risk of bloat. Several reports show a wide annual production range between 1.9 and 9.8 t DM/ha/year (Gomes and Reis 1999; Evans and Mills 2008). It shows a high nutritional value (Tekeli *et al*. 2005) that declines with increasing maturity. Grazing management should consider the need for seed production to ensure natural re-seeding in subsequent years. Recently, INIA Uruguay released the *T. vesiculosum* cultivar Sagit (Glencoe EC1), characterized by intermediate growth habit and flowering period.

The objective of this paper is to report the adaptation and performance of cv. Sagit (Glencoe EC1) in the lowlands rice region of Uruguay, under different grazing intensities with weaned calves.

Methods

The experiment was conducted in INIA Treinta y Tres (33°16'S: 54°10'W) in 2011 on the second year of a *T. vesiculosum* Sagit (Glencoe EC1) pasture that had naturally re-seeded and remained undefoliated during autumn. Grazing treatments were conducted for 84 days (21/6-13/9). After the grazing period, paddocks were closed to allow seed production. Three grazing intensities were evaluated (T1: 6.0, T2: 7.5 and T3: 9.0 animals (an)/ha), using 18 Hereford and crossbreed calves that initially weighed 124.1±0.7 kg. The animals had *ad libitum* access to bales of hay during the entire period. The design was a randomized block with 2 replicates and plot size was adjusted by managing grazing intensity to 3 an/treatment. Each plot was sub-divided into 3 sub-plots, with animals remaining on them for 14 days each, giving 2 grazing cycles of 42 days each: C1 (21/6-3/8) and C2 (3/8-13/9). Measurements included sward height, pre-grazing (PreG) and post-grazing (PostG) herbage mass, botanical composition and forage quality (*in vitro* digestibility (IVD) and crude protein (CP)). The animals were weighed every 42 days without fasting, coinciding with the end of each grazing cycle. The PreG and PostG herbage mass variables and animal liveweight gains (LWG) were analysed by ANOVA test (SAS V. 9.2) and treatment differences were compared by LSD at P<5%.

Results

There were no significant differences in PreG and PostG herbage mass for the different grazing intensities during C1 (Table 1). Mean PreG herbage mass in C1 was 4064 kg DM/ha, consisting of 76% clover and 14.2% of forage dry matter content with mean height of 26.9 cm. Mean PostG herbage mass was 3110 kg DM/ha, but clover percentage declined with increasing grazing intensity. In C2 significant differences (P<0.0001) were detected in PreG herbage mass among treatments, with the 9.0 an/ha treatment having significantly less herbage mass than the others. During C2 PreG herbage mass declined in comparison with C1. In general, *T. vesiculosum* maintained a high contribution, having a mean sward height of 18.2 cm and 13.8% of forage DM content. The proportion of clover in PostG herbage mass was 35% less in T3 than the average of T1 and T2.

IVD and CP content were monitored 3 times during the experiment. At the beginning of June, CP was 31.5% and 15.9% in leaves and stems, respectively and IVD ranged between 80.1-83.4% in both fractions. Over time both parameters declined; IVD reduced to a range of 67-73% and CP to 15.3-17.1% for the different treatments.

Mean herbage allowances (HA) for the whole period were 10.2, 7.6 and 5.8 kg DM/100 kg LW for 6, 7.5 and 9 an/ha, respectively (Table 2), these differences being attributable to the different grazing intensities applied.

Table 1. Total pre- and post-grazing herbage mass and average legume contribution of a *T. vesiculosum* pasture during 2 grazing cycles under 3 grazing intensities.

Cycle	Grazing intensity (an/ha)	Pre-grazing		Post-grazing	
		Total biomass (kg DM/ha)	Clover %	Total biomass (kg DM/ha)	Clover %
1	T1 (6.0)	4288	70	3293	65
	T2 (7.5)	4154	80	3210	60
	T3 (9.0)	3751	77	2828	49
	Probability (*P*)	0.28		0.25	
2	T1 (6.0)	4001 a	64	1151	44
	T2 (7.5)	3572 a	64	997	27
	T3 (9.0)	2793 b	57	801	29
	Probability (*P*)	<0.0001		0.16	

Different letters in each column show significant differences (LSD <5%)

Table 2. Herbage allowance (HA; kg DM/100 kg LW) and liveweight gains (LWG; g/an/day) in grazing cycles C1, C2 and C1+C2 of calves grazing a *T. vesiculosum* pasture under 3 grazing intensities.

Grazing intensity (an/ha)	C1		C2		C1+C2	
	HA	LWG	HA	LWG	HA	LWG
T1(6.0)	11.9	893	8.5	1231 a	10.2	1058 a
T2 (7.5)	9.1	977	6.1	933 a	7.6	955 a
T3 (9.0)	7.1	696	4.6	498 b	5.8	599 b
Probability (*P*)		0.1007		0.05		0.0046

Different letters in each column show significant differences (LSD<5%)

Liveweight production in the period was 536, 602 and 452 kg/ha for T1, T2 and T3, respectively.

There were no significant LWG differences in C1 (Table 2). However, in C2 calves from the highest grazing intensity had significantly lower LWG (P<0.05) than those from T1 and T2 (Table 2). This difference in LWG was also apparent for the whole period (C1+C2), with the lower grazing intensities (T1 and T2) having significantly higher LWG (P=0.0046) than T3 (Table 2).

Conclusion

T. vesiculosum cv. Sagit (EC1) showed good adaptation to the lowland rice region, achieving high calf LWG during the winter period. The results revealed that 7.5 an/ha was the most suitable stocking rate of those evaluated, combining adequate individual animal performance and pasture productivity.

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