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FLOWERING DISTRIBUTION PATTERN IN WHITE CLOVER CULTIVARS

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Abstract

A trial was carried out at Pergamino Agricultural Experimental Station to examine the distribution pattern and the profuseness of inflorescence production of white clover (*Trifolium repens* L.). The treatments were 16 cultivars (Churrinche, El Lucero MAG, Bayucuá, Estanzuela Zapicán, Lucero Plus Inta, Haifa, California, Ladino Gigante Lodigiano, Dubrava, Susi, Merwi, Blanca, Sonja, Espanso, Nora, S 184) of different origins and leaf size. The experimental design was a lattice with four replications. Southamerican cultivars showed a similar distribution pattern and had the highest inflorescence production. They also flowered earlier than foreign cultivars, except Haifa. Some of the cultivars evaluated did not have an acceptable inflorescence production. Some others produced seeds at the end of the season under bad weather conditions. Small-leaved varieties tended to have less inflorescence density. The spread of flowering during the reproductive cycle and the number of inflorescence per unit area are important characters that must be considered during breeding and before releasing introduced cultivars to the market.

Keywords: white clover, flowering pattern, cultivars

Introduction

White clover (*Trifolium repens* L.) is one of the most nutritious and widely distributed forage legumes in the world and has shown its main adaptation within the temperate zones. In Argentina this species is the predominant legume of forage based livestock systems in the humid and subhumid area.

The major key issue in expanding the market of cultivars is the ability to have adequate and consistent seed production to meet the demand. This characteristic is also necessary for natural resowing of pastures.

The most important factor affecting seed production potential in white clover is flower head density, expressed as number of heads per area (Zalesky, 1970; Hollington et al 1989; Marshall 1995, Thomas 1987). According to Serrano et al (1991) 700 inflorescences/m^2 are needed in order to obtain 600 kg/ha of seed in the north of Buenos Aires province, Argentina.

The principal factors that determine inflorescence production are temperature, humidity, light intensity, plant age and genotype.

Varietal differences in individual seed yield potential have been documented (Marshall et al 1989, Evans et al 1986). The varieties from different leaf size categories differed in seed yield potential and in the pattern of inflorescence development (Hollington et al, 1989). The small-leaved varieties in general have the greatest numbers of inflorescences. When this is combined with high seed set per inflorescence as in AberDale, high harvestable seed yields result (Williams et al, 1998)

Management systems have also been developed to optimize seed yields for varieties from the different leaf size categories and their effect on seed yield components quantified (Hollington et al 1989, Marshall et al 1989).

The objectives of this paper were to establish the distribution pattern and the maximum number of inflorescence production in 16 cultivars of different origins and leaf size.

Materials and Methods

Cultivars evaluated and countries of origin are shown in Table 1. The experimental design was a lattice with four replications. Individual plots measured 3 m^2. Number of inflorescence by square meter was measured during four months, from September 18^{th}, 1997 to January 16^{th}, 1998.

An analysis of variance (ANOVA) was performed for number of inflorescences on December 10^{th}. At this observation date it was registered the peak of flowering for the check cultivar El Lucero MAG. Leaf size (cm^2) as calculated according to Carlson, (1966). The least significant difference (LSD) was calculated at the 0,05 probability level.

Results and Discussion

Flowering distribution pattern was different among cultivars (Figure 1). Southamerican cultivars evidentitate their adaptation in flowering production and had a similar distribution pattern which is related to their common origin, as was already observed by Rosso et al (1998). They also flower earlier than foreign cultivars, excepting Haifa (Australia).

There was significant difference ($P<0,05$) in the number of inflorescence/m^2 among cultivars (Table 1) at the peak of flowering on December 10th. Maximum profuseness of flowering corresponded to southamerican varieties and Haifa.

Some cultivars as S184 and Nora had an insignificant inflorescence production. S184 performed completely different to what was informed in its country of origin regarding inflorescence production. In Argentina it could be considered as a non-flowering cultivar.

Other cultivars such as Merwi, Susi and Dubrava did not show a prominent peak of flowering. Those cultivars that do not produce a pronounced peak of flowering exhibit problems identifying optimal harvest date and harvesting a high proportion of ripe inflorescences.

Locally adapted cultivars showed a peak of flowering on December 10th, whereas California and Ladino Gigante Lodigiano peaked much later (January 4th).

Varieties from different leaf size differed in seed yield potential. Those varieties with smaller leaf size tended to produce less inflorescences/m^2 opposite to what was observed in the United Kingdom by Williams et al, 1998.

The requirement for long summer days for floral initiation by northern European varieties may well prohibit these varieties from producing flowers at their full potential at more southerly latitudes (Norris, 1984). Even so, photoperiodic response can be greatly affected by temperature and the relationship between them must be defined for each variety in order to assess the potential for seed production at a given latitude (Norris, 1987)

Even though in literature large-leaved varieties are quoted as low inflorescence production, in this experiment they performed differently. Espanso (large-leaved) had low flowering density as suggested by Caradus and Woodfield (1997). But large-leaved local cultivars did produce the highest number of inflorescence/m^2.

According to this results it is suggested to study inflorescence patterns and production during the evaluation of potential parental clones in breeding programs, and before releasing any foreign cultivar to the market.

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Table 1 - Number of inflorescences/m^2, and leaf size(cm^2) of each cultivar on December 10th

Cultivar	Origin	Number of inflorescences/m^2		Leaf size (cm^2)	
Churrinche	Argentina	530	A	3,37	BCD
El Lucero MAG	Argentina	518	A	3,78	ABC
Bayucuá	Uruguay	506	A	4,04	AB
Estanzuela Zapicán	Uruguay	499	A	3,84	ABC
Lucero Plus Inta	Argentina	462	A	4,36	A
Haifa	Australia	286	B	3,19	CDE
California	USA	179	C	4,05	AB
Lad. Gigante Lodigiano	Italy	164	CD	3,99	AB
Dubrava	Czechoslovakia	128	CDE	2,57	EF
Susi	Ireland	113	CDEF	3,13	CDE
Merwi	Belgium	73	DEFG	2,69	DE
Blanca	Belgium	56	EFG	2,84	DE
Sonja	Sweden	52	EFG	2,62	E
Espanso	Italy	46	EFG	4,41	A
Nora	Sweden	30	FG	1,88	FG
S 184	United Kingdom	2	G	1,18	G
LSD (P<0.05)		96		0,71	

Figure 1. Flowering distribution pattern of 16 cultivars of white clover

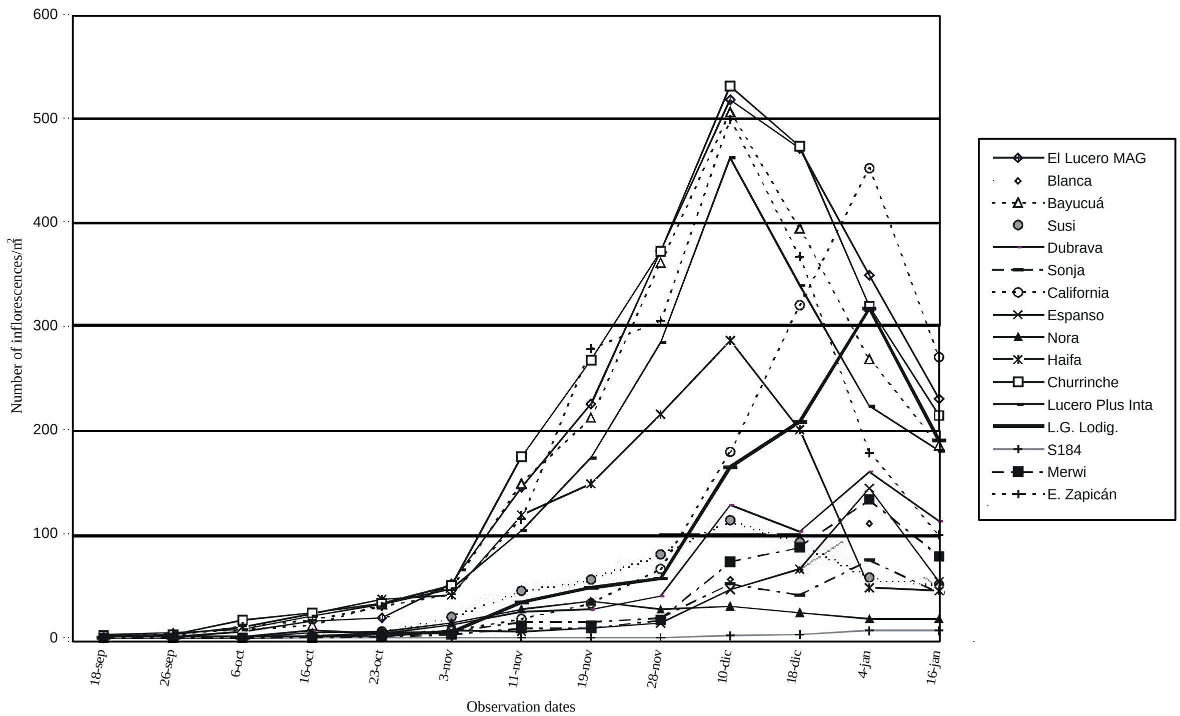

Figure 1 - Flowering distribution pattern of 16 cultivars of white clover