Relationship between Genetic Origin and Characterization of Varieties of *Lotus corniculatus* L. in Uruguay

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Introduction

Changes in cropping systems have moved pastures into more restrictive environments, affecting the traditional seed crop harvest of *Lotus corniculatus* L. in Uruguay. This traditional harvest may have generated landraces (LR) with differences in dry matter and seed production and/or adaptation. The potential seed yield of *L. corniculatus* and that obtained by farmers is very different (Garcia *et al*, 1991). Several factors impact on achieving potential seed yield and it is possible that these constraints maybe overcome via breeding. The objective of this study was to identify LR's with more seed production and/or persistence, compared with parental cultivars and determine if indirect parameters of yield components could be identified.

The study also identify the degree of association between LR and the original cultivar sown in sampled paddocks, and their ranking in terms of seed production towards new cultivars generated by INIA.

Methods

Direct drilling in microplots (0.68x2 m) with 12 kg/ha was sown 24 July 2006 at INIA La Estanzuela, Colonia, Uruguay. The experimental design of 100 LR with genetic information and years of self-multiplication (Rebuffo *et al*, 2005), and four check cultivars ('San Gabriel' = SG, 'INIA Draco' = ID, 'Estanzuela Ganador' = EG and 'Rigel' = RI) were established as an incomplete block with 2 replications. The harvests were seed and biomass production in C1 = January 2007; C2 = March 2007; C3 = January 2008; C4 = March 2008. Other variables studied, were: date of full bloom, green and dry matter yield, seed yield and random sample of 25 mature plants per plot in C1 to determine yield components (number of pods/umbel, number of seeds/pod, seed size), and pod number and length (mm). Statistical analysis used REML, and least significant difference was $P<0.05$ for comparison of means and multivariate analysis (Principal Components Analysis =PCA), so as to achieve mean 0 and variance 1 (Pearson, 1901). This research is part of the research developed by the Project FTG-787/2005: Amplification of the genetic base of naturalized forage legumes for sustainable pastoral systems, financed by FONTAGRO.

Results

Integrating the first two factors with seed production component in PCA developed by Pearson (1901), explained 77% of the total variance (Fig. 1). PC1 is determined by variables associated with persistence: C3 seed yield and forage production in C3 and C4. In contrast, PC2 is determined by two factors highly associated: seed yield and density of umbels in C1 (Cuitiño, 2012). The relative location of the check materials in the PCA (Fig. 1) showed their productive behavior. SG was associated with initial forage production, while EG location presented high seed yield in C1 (parent material of ID and RI). In contrast, RI exceeded 125% to SG at C4 due to its greater persistence. The advantage of RI in seed production is in the second year, probably provided by greater persistence and a deep root system that confers increased tolerance to water stress (Altier *et al*. 2000). Also ID showed intermediate characteristics compared to SG (forage and seed production), which was in contrast to the good forage yields registered by Castro (2008, 2009) in the second and third years. While seed production during breeding is a consideration in the selection index, these results demonstrated that the greater emphasis on persistence and production has caused an apparent reduction in seed production in C1, compared with EG, one of the parents. The LR's had a wide dispersion in all variables studied, and was not associated with genetic origin or years of self-multiplication on farm. The dispersion of LR probably reflects greater genetic variability, which could be an input in a breeding program from the point of view of seed production and persistence. Although several LR with high

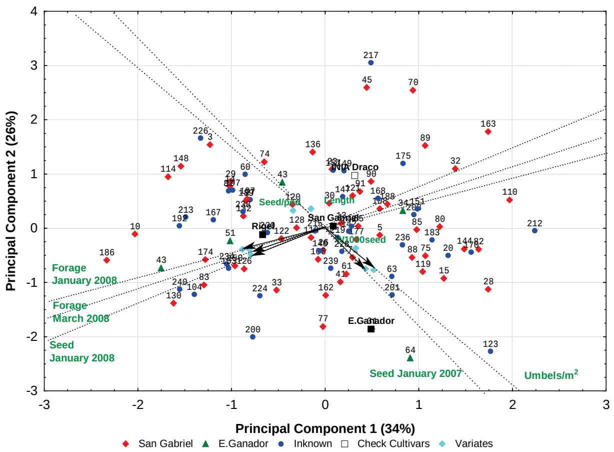

Figure 1. Spatial representation of landraces identified by genetic origin for the first two Principal Components. Dot lines are the significant variates for each component.

seed production similar to EG were identified, RI outperformed others in persistence and few materials combine both parameters (*e.g.,* RL 200).

Conclusions

The principal component analysis reflected the relationship of the LR with the main factors of production. Breeding orientation determined an increase in the persistence and possible reduction in seed production potential. The differences witnessed among check cultivars in seed and forage production indicated that breeding has been focused on increasing persistence and maintaining desirable characteristics such as seed production. Natural selection (on-farm selection) has generated few landraces (LR 200) that combine good persistence and high seed production potential, which could be of interest to the breeding program.

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