Characterization of Landraces of *Lotus corniculatus* L. in Uruguay

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Introduction

Lotus corniculatus, the main cultivated forage legume in Uruguay since the sixties, is well adapted to soils with low P availability and pH where alfalfa has restricted growth. Local landraces are potential sources of valuable genes that could benefit the farming community. Traditionally farmers harvested their own seed through many generations in the southwest (Garcia *et al.* 1991), where sown pastures were rotated with cereals. These local landraces were conserved *in situ* in the past, but ley-farming systems have been substituted for continuous soybean cropping in recent years. INIA collected 110 samples for *ex situ* conservation with proper passport information (eg. genetic origin, years of multiplication, cultural practices) from farmers' harvests during 1999 (Rebuffo *et al.* 2005) and 2006.

This work outlines the variability of landraces for forage production and their relationship to the cultivars of origin.

Methods

Landraces of *Lotus corniculatus* collected from different Uruguayan farming systems were compared with local check cultivars that were initially introduced by the farmers. Direct drilled experiments sown in June 2006, May 2007 and April 2008 compared 43 landraces for forage production with 4 cultivars ('San Gabriel', 'Estanzuela Ganador', 'INIA Draco' and 'Rigel') at Colonia, Uruguay. Forage was evaluated in plots (5.36 m^2) with 4 repetitions. Plant density and dry matter yield were the main traits evaluated. ANOVA was performed for all harvests. Principal Component Analysis (PCA) was performed using Statistics 7.0 to evaluate the variability of average annual accumulated yield for landraces and their relationship with commercial cultivars. 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

Forage legume production in Uruguay is restricted by several environmental constraints, such as drought, and flooding that may affect the establishment, growth and persistence of *L. corniculatus*. The annual replication of experiments provided information about landraces performance in terms of forage production and persistence under diverse conditions. Severe drought through 2008

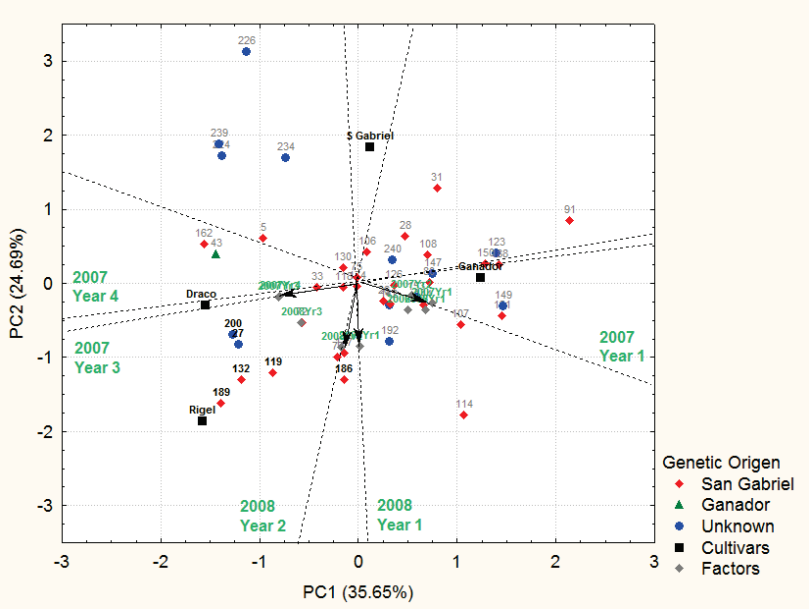

Figure 1. Spatial distribution of 43 landraces accessions and 4 check cultivars for the first two Principal Components. PCA was applied on annual forage yield of the experiments sown in 2006, 2007 and 2008.

restricted forage production of the experiment sown in 2006 to just 2 years of measurements, whereas the experiments commenced in 2007 and 2008 were evaluated for 4 and 3 years, respectively. The 2006 experiment had an averaged dry matter yield of 12.5 t/ha in year one and this dropped to 8.4 t DM/ha in year two, whereas the 2007 experiment first and second year produced only 3.6 and 7.2 t DM/ha, respectively.

The materials evaluated are plotted in Figure 1, where all landraces were classified based on their genetic origin. The first two PC axes explained 60% of the variation in the entire data set, and the third only explained 14.44% and is not interpreted. Axis 1 can be interpreted as being highly positively related to 2007 first year yield and negatively related to 2007 third and fourth year yield. Hence the gradient reflected by axis 1 plotted 'INIA Draco' and 'Rigel' is toward factors related to persistence and away from first year yield. Axis 2, on the other hand, is negatively related to, and therefore correlated with, 2008 first and second year yield. This gradient placed 'San Gabriel', the traditional old cultivar, opposite to 2008 first and second year. The large dispersion of landraces combined with the comparison of means showed that farmers' accessions can be significantly inferior (P<0.05) to the cultivars of origin ('San Gabriel' and 'Estanzuela Ganador').

Conclusion

The genetic origin was not distinct in PCA, since landraces originated from 'San Gabriel' showed extensive overlap with a range with other cultivars. PCA also showed 'Rigel', a cultivar bred after four cycles of selection for persistence, as somewhat distinct for second, third and fourth year yields. These findings support the recognition of improvement through breeding, and also identified landraces (*e.g.*, 200, 27, 189, 132, 119) suitable to include in plant breeding programs. In particular accessions 200 and 186 have proved to combine forage production and persistence with high seed production (Cuitiño 2012).

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