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# Forage and seed production of naturalized germplasm of *Lotus corniculatus* L. multiplied by farmers

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*Lotus cornicualtus* L. (lotus) is a forage perennial legume of great importance because of its large distribution in Uruguay, with the consequent rising seed demand. Nevertheless its adaptation, among the restriction of the species is the slow seedling growth that hinders the establishment and the limited persistence. In spite of being a great seed producer, it is the forage legume with the largest problems at the moment of seed harvest due to pod shattering that is favoured by summer climatic conditions. Lotus lack of persistence affects seed and forage yields from the second year onward. Landvarieties are important sources of genetic variation for pasture improvement. Natural selection, as well as introgression of local populations, gave origin to the development of farmers' Creole varieties with consequent increases in adaptation, as well as intraspecific variability (Rebuffo *et al.*, 2005). The specific conditions of growth in each rural establishment can condition seed yield and its components which could generate specific genetic characteristics of the farmers' seed harvests. The present study, carried out in the frame of Project LESIS (Legumes for Sustainable Systems, FTG-787/2005), characterizes the genetic diversity of Creole varieties in Uruguay in relation to their potential of seed and forage production in the climatic and soil conditions of the Southern region of Uruguay.

In July 2006 were sowed at INIA La Estanzuela 100 accessions from farmers that produced their own seed and 4 cultivars (San Gabriel, INIA Draco, Estanzuela Ganador and LE 212), with a seed density of 12 kg/ha in micro plots (0,68 m x 2 m) with direct drilling. The experimental design utilized was incomplete random blocks (10 plots x block) with 2 replicates, analyzed by REML. Evaluations included biomass production, seed production and yield components at 4 occasions (January 23 2007; March 12 2007; January 4 2008; March 10 2008). Plot experiments (5 x 1.02 m) with 50 accessions in incomplete random blocks (10 plots x block) and 4 replicates were established to evaluate forage production. Evaluations consisted on total production of fresh and dry biomass, legume content (area evaluated 2.65 $m^2$) with their corresponding samples for dry matter, in 6 occasions (November 3 2006, February 8, April 10, August 28 and October 25 2007 and January 21 2008). The production of the accessions was compared with San Gabriel, the public variety mostly used in Uruguay. The experiments will be repeated 3 consecutive years, and the results of establishment in 2006 are presented in this report.

The establishment of the experiments was uniform since sowing densities were corrected by

germination. Results of the two more contrasting seed harvests, that correspond to January 23 2007 (1st crop) and March 10 2008 (4th crop), are presented in this paper, although there were 4 seed harvests. Average seed yield for the 1st harvest was 348,3 kg/ha, similar to yields obtained by the best seed farmers, even though exceptionally superior to the national average (120-150 kg/ha; García *et al*., 1991). Although the climatic conditions were very favourable for lotus seed production, the yield could be overestimated due to the size of the micro plots. In contrast, the 4th crop yielded 82,72 kg/ha. The limited persistence of most of the accessions explains the second year-old low yields. A very wide range of yields was observed in all the harvests. The accessions with the highest seed production in the harvest of January 2007 were FTG 9, FTG 22, FTG 48, FTG 53, FTG76, which yielded 90% more ($P < 0,05$) that San Gabriel (295,7 kg/ha). Production range varied from 5,07 to 192,35 kg/ha for the harvest of March 2008. Yields four times superiors to San Gabriel ($P < 0,05$) were registered for 5 accessions (FTG24, FTG 25, FTG32, FTG 46, FTG 63), that reached an average yield of 182,35 kg/ha, superior to the national average (García *et al*., 1991). Although it was recorded a great variability for seed production, the accession rank was not the same one in these harvests, since the accessions with high initial productions (January 2007) are not the same ones that present high yields in the 4th crop (March 2008). The low yield in the second summer is consequence of the water deficit that took place in this period as well as the lack of persistency of San Gabriel and some accessions.

Most of the forage evaluations registered significant differences between the accessions and San Gabriel, with the exception of February 2007 and January 2008. In the evaluations of November 2006, April and August 2007 no material rise above San Gabriel; inferior accessions were only observed in yield compared with check varieties. The establishment period was under extreme water deficit conditions. Under these conditions, only 3 accessions yielded 22,3% less forage that check varieties ($P < 0.005$; FTG 51, 132, 174). The forage production corresponding to April (2416 kg MS/ha) and August (2367 kgMS/ha) represented 16,7% less than cultivar San Gabriel. In second year Spring San Gabriel registered low persistence, therefore 28 accessions with more persistence raised above San Gabriel in 26,7% on average ($P < 0.005$). In contrast, accessions with lower persistence (FTG 14 and 23) yielded 29,4% less than the check. It was not possible to continue with the experiment evaluations after this date, consequence of the low stand of plants.

The characterization of this first experiment, allowed to identify materials with seed productions 4 times superiors to San Gabriel in each harvest, although the ranking of the accessions was not the same one along the time. The enhancement of seed production is an important characteristic because it could help to increase pasture persistence through natural reseeding, especially in the improvements of natural grasslands. The differences in production in the second year would be indicating a bigger persistence and the potential of these materials for use in plant breeding. Comparing seed production and forage yield of the accessions for both experiments, there was no direct relationship among the variables for this sowing year and climatic conditions, in spite of the identification in both harvests (January 5 2007 and March 10 2008) of accessions with low persistence (FTG 2, 3, 33, 34, 36) that would explain the low yields achieved. Results of the present research will be integrated with information from the 2007 and 2008 sowings to identify superior germplasm for their use in genetic improvement. The information obtained on seed production will be increased with damage evaluation of wasp and yield components to identify the specific

characteristics of the accessions more accurately.

## References

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