Collecting and Characterizing Landrace Populations of *Trifolium pratense* in Uruguay

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Introduction Forage legume production is restricted by several environmental constrains, such as drought, flooding, soil acidity, that may affect the establishment, growth and persistence, in spite of the adaptation of naturalized legumes to low fertility soils. The physiologic and morphologic characterization of naturalized populations help to determine the genetic diversity generated by natural selection (biotic and abiotic stresses, grazing, etc) due to several years of on-farm seed multiplication. 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 (http://www.inia.org.uy/sitios/lesis/). Landraces (L) of *Trifolium pratense* collected from different Uruguayan farming systems were compared with local check cultivars (LC) that were initially introduced by the farmers.

Landraces forage and seed production Direct drilled experiments sown in June 2006 compared 27 L for forage production and 33 L for seed production with 3 LC cv. Estanzuela 116 (E116), INIA Mizar and LE 113 at Colonia, Uruguay. Forage was evaluated in plots (5.36 m^2) with 4 repetitions; seed production was recorded in small plots (1.32 m^2) with 2 repetitions. Plant density, dry matter yield, seed production and seed components were the main traits evaluated. The establishment was good, although the early spring drought reduced seedling survival and delayed the first forage evaluation. The accumulated forage production in the first year was relative low for red clover (8117 kg DM.ha^{-1}). The differences in the seedling density were reflected in the yield of the first spring harvest carried out November 24 2006 (D1), when the average was 3131 kg DM.ha^{-1}, and the range 2601 to 3662 kg DM.ha^{-1} among the worst and best accession ($P>0.05$), respectively. The crop recovered with late spring rains; January 10 2007 harvest (D2) produced 3438 kg DM.ha^{-1} on average, and a range of 3167 to 3758 kg DM.ha^{-1}. Water stress in summer reduced red clover regrowth. Production on March 21 2007 (D3) dropped to 1549 kg DM.ha^{-1} (range 1146 to 2131 kg DM.ha^{-1}). All L were compared with E116, the cultivar most widely used in Uruguay. E116 produced 2988, 3316 and 1789 kg DM.ha^{-1} on D1, D2 and D3 harvests, respectively, and the annual yield was 8104 DM.ha^{-1}. Total yield of most of the L was similar ($P>0.05$) to E116; only FTG-022 produced more forage and FTG-218 less ($P>0.05$). FTG-022, FTG-025, FTG-042, FTG-04 were superior ($P>0.05$) to E116 on D1. Small differences were recorded in D2, when FTG-022 was superior to E116. Summer conditions differentiated more accessions on D3, when 10 accessions (FTG-017, FTG-019, FTG-058, FTG-095, FTG-097, FTG-143, FTG-169, FTG-176, FTG-180 and FTG-194) yielded less than E116. This differential performance of the accessions throughout seasons could indicate differences of growth cycle, water stress tolerance and/or persistence among L. The traits measured for the reproductive stage and growth cycle were seed production, seed components, and days to flowering. Seed yield was higher than average because it was possible to accumulate two flowerings. Average production was 262 kg.ha^{-1} (range 208 to 337 kg.ha^{-1}), while FTG-073, FTG-097, FTG-169, FTG-181, FTG-194 produced 46% more than E.116 (221 kg.ha^{-1}) on average. This preliminary characterization has shown large diversity among L that could be exploited for breeding.

Physiological response of red clover to water stress The differential yield of some L in summer could be due to water stress sensitivity. In order to adjust technology for evaluation of water stress tolerance, an experiment with cv E116 was performed under controlled conditions. Stomata conductance (SC), fresh weight (FW) and dry weight (DW) were evaluated for the physiological response. The drought treatment was imposed at 25-30 days after seedling emergence. Plant growth conditions were 23℃ temperature, 40-50% relative humidity and 15 hours light with 300 $\mu E.m^{-2}.s^{-1}$, in pots with a mixture of sand and vermiculite (1:1) and watering with Hornum solution. Stress was induced by irrigation suppression. SC was determined with a porometer on 4 leaflets at similar phenological stage from 2 pots. Six leaves were taken for water content, three from each pot. Water content (WC) was estimated as (FW-DW).DW^{-1}. SC decreased from 598 to 539, 147, 22 and 10 mmol.$m^{-2}.s^{-1}$ after 48, 72, 96, 72, 120 and 144 hours of irrigation suppression, respectively. Leaf water content dropped from 7 to 6, 4, 4 and 2 g water.g DW^{-1} during the same period of evaluation. Leaf dehydration was visually detected at 96 hours. The determination of stomata conductance is a quick and simple methodology to evaluate red clover L capacity to adapt to stress condition, with the advantage of been a non destructive technique that could be utilized in breeding.