

Evaluation of *Lotus* spp. Growth in the Salado River Basin.

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ABSTRACT.

Lotus spp. from an Introduction Garden established in Chascomús, a typical area of the Salado River Basin, are being evaluated since 1994. Results show that of the many species appraised (including naturalized *Lotus tenuis*), *Lotus corniculatus* var. *hirsutus* exhibited the higher productivity and nutritional value. On the other hand, seeds of the different *Lotus* species were found to be attacked by *Bruchophagus platypterus*, a bug representing a plant pest. Interestingly, *Lotus corniculatus* var. *hirsutus* showed a significant resistance to the bug infection. As a whole, results indicate the importance of *Lotus corniculatus* var. *hirsutus* for the improvement of pasture quantity and quality in the geographical area studied.

INTRODUCTION.

The so called "*Depresión del Río Salado*" (Salado River Basin) extends an about 7,000 km² region in Buenos Aires Province (Argentina). Soils in this area characterize by a high salinity and alkalinity, being poorly drained and periodically exposed to waterlogged conditions. The region is mainly utilized for beef and dairy cattle production, with principal feed for these purposes represented by native grassland and naturalized *Lotus tenuis* (Montes, 1987). All these characteristics determine a high technological delay, with a low productivity result (i.e. beef production of 70 kg of livestock/ha/year) (Bochetto, 1981).

A proposed rational strategy to develop in the region is the introduction of foreign pastures, specially leguminous species, in order to increase the cattle production efficiency. In this way, *Lotus* spp. represent an important forage legume because of their growing conditions and significant nutritional value. Different experiences have been carried out with *Lotus* species thriving in Argentina (*L. tenuis*, *L. corniculatus* and *L. pedunculatus*), being *L. tenuis* a foreign species that naturally spread in the Salado River Basin (Montes, 1980, 1987). However, the use of different *Lotus* species/varieties has not been explored in an intensive manner and the achievement of a technological answer to the problems of the region is far to be reached.

The "*Instituto Tecnológico Chascomús (INTECH)*", is located in the Salado River Basin, being one of our efforts oriented to the study of *Lotus* spp. in order to obtain an effective tool to adequately increase the economic efficiency of the zone. Indeed, we have developed an Introduction Garden composed of several *Lotus* species, from which we are evaluating the behavior of the different species/varieties with respect to their productive parameters. Aims of the present report are in two ways: i) to introduce our group and Institute in the field and the community of *Lotus* research, and ii) to summarize experimental data concerning forage disponibility and infection by plant bug pests, which were obtained with the more representative (and potentially interesting) species so far studied.

MATERIALS AND METHODS.

The Introduction Garden was composed by parcel blocks (1 x 5 m) randomly distributed in an area completely representative of the Salado River Basin. Seeds of the different species/varieties were swollen in water during 2 days, and then germinated and grown in growth chambers with an 18 h fotoperiod and 20°C average temperature. Developed plants were rusticated and transplanted to the corresponding parcel block in the Introduction Garden in the fall of 1994 (by the end of March). Samples for analysis started to be monthly taken by May 1994.

Samples were collected manually from a 0.25 m² frame in the parcel blocks and the green matter determined as the total weight of the just cutted plant (Jaunarena, 1991). Dry matter was determined after incubation (until constant weight) in an oven at 105°C, as previously described (Jaunarena, 1991). Whole plants, including roots were morphologically examined at the microscopic level. Seeds were obtained from mature fruits (manually collected in January and February) and analyzed by microscopy. The presence of *Bruchophagus platypterus* in seeds and the evaluation of the infection was carried out after Mujica (1987).

RESULTS AND DISCUSSION.

In the establishment of the Introduction Garden in *INTECH* we started with a germplasm composed of 70 different *Lotus* seeds (including 36 species and 6 varieties). From the data obtained at the present time, Table 1 shows the more productive species, and they are compared with naturalized *L. tenuis*. As shown the productive behavior of *L. corniculatus* var. *alpinus* was similar to *L. tenuis*, whereas *L. corniculatus* x *L. pedunculatus* and *L. filicaulis* exhibited an increased production of dry matter. Interestingly, *L. pedunculatus* showed a dry matter production 10% higher than the reference *L. tenuis*, even when the green matter production of the former was comparatively low. These data suggest a potential importance of *L. pedunculatus* in terms of nutritional value.

The most productive species of those studied in our Introduction Garden resulted *L. corniculatus* var. *hirsutus*, which exhibited a significantly higher production of green matter and (more importantly) dry matter than *L. tenuis* (Table 1). Moreover, *L. corniculatus* var. *hirsutus* was found to be a good forage for the region, considering its adaptation, persistence and nodules formation in roots.

During the analysis of *Lotus* spp. seeds by microscopy we observed the presence of *B. platypterus*, a bug previously reported as a pest for *L. tenuis* plants naturalized in Argentina (Mujica, 1987). Table 2 shows the infection observed in different *Lotus* species. It can be seen that seeds of *L. pedunculatus* x *L. corniculatus* showed a low infection during January but that in February the number of bugs was similar to other *Lotus* species. It is worth to note the low number of *B. platypterus* found in seeds of *L. corniculatus* var. *hirsutus*, indicating a significant resistance to the infection by this plant variety (Table 2).

Our results suggest that *B. platypterus* is one important bug to be considered as pest of *Lotus* spp. growth in the region under study. An interesting behavior was exhibited by *L. pedunculatus*, since it exhibited a significant production of dry matter (with a high dry matter:green matter ratio); and by *L. pedunculatus* x *L. corniculatus*, because of the relatively low infection by *B. platypterus*. However, the species exhibiting the best growth performance in our study was *L. corniculatus* var. *hirsutus*. The high productivity and nutritional value observed for *L.*

corniculatus var. *hirsutus* together with its meaningful withstanding to infection by *B. platypterus*, make of this variety a main option to rationally postulate an improvement of pastures in the region. In this way, it is tempting to speculate on the possibility of using *L. corniculatus* var. *hirsutus* to obtain hybrid varieties with productivity and/or resistance to plant pests more convenient than the currently naturalized *L. tenuis* species. Works in our Institute are being continued, looking for a technological tool for the improvement of the productivity in the Salado River Basin.

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Table 1. Green matter and dry matter production by *Lotus* spp. in the Introduction Garden of INTECH.

Species/variety	Origin	Green matter (kg/ha/year)	Dry matter (kg/ha/year)
<i>L. corniculatus</i>	Turkey	5,136	1,253
<i>L. corniculatus</i> var. <i>alpinus</i>	Turkey	5,362	1,308
<i>L. corniculatus</i> var. <i>arvensis</i>	France	4,952	1,228
<i>L. corniculatus</i> var. <i>hirsutus</i>	Spain	6,767	1,774
<i>L. corniculatus</i> x <i>L. pedunculatus</i>	New Zealand	5,678	1,420
<i>L. filicaulis</i>	Spain	5,470	1,433
<i>L. parviflorus</i>	Portugal	4,915	1,180
<i>L. pedunculatus</i>	Chile	4,003	1,433
<i>L. rectus</i>	Greece	3,208	853
<i>L. tenuis</i>	Naturalized	5,552	1,305

Table 2. Infection of *Lotus* spp. seeds by *Bruchophagus platypterus*.

Species/variety	Number ^a of seeds infected at the degree ^b of						Total ^c
	I		II		III		
	Jan	Feb	Jan	Feb	Jan	Feb	
<i>L. corniculatus</i> var. <i>alpinus</i>	14	16	0	1	5	12	48
<i>L. corniculatus</i> var. <i>hirsutus</i>	0	7	0	0	0	5	12
<i>L. corniculatus</i> x <i>L. pedunculatus</i>	1	18	0	0	2	4	25
<i>L. frondosus</i>	14	6	2	4	24	14	64
<i>L. parviflorus</i>	16	11	3	0	12	4	46
<i>L. tenuis</i>	14	19	0	6	0	4	43

^aNumbers indicate seeds found infected (at the different degree) from a sample of 300 seeds (in each month, January or February) of each species/variety randomly taken from the corresponding parcel block. ^bThe different degrees of the infection are defined after Mujica (1987): I. Empty seeds with perforated envelope. II. Seeds containing bug larvae. III. Seeds containing adult bugs. ^cTotal number of infected seeds (at any degree) from a total sample (Jan plus Feb) of 600 seeds.