

**Interdisciplinary workshop on genetic, molecular and ecophysiological aspects of *Lotus* spp. and their symbionts.
[Taller interdisciplinario sobre aspectos genéticos, moleculares y fisioecológicos del *Lotus* spp. y sus simbioses].**

Chairperson: [OSCAR A. RUIZ](#)*

Held at: Instituto de Investigaciones Biotecnológicas - Instituto Tecnológico de Chascomús. IIB-INTECh. (UNSAM-CONICET). Chascomús. Provincia de Buenos Aires. Argentina.
11 –13 September 2002

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Proposal and program

The introduction and sustainable management of highly valuable forage legumes in the “Pampa Deprimida” is a promissory alternative to increase significantly the cattle production output. In particular, *Lotus glaber* (former *L. tenuis*), species naturalized species from the Mediterranean Basin, has evidenced high adaptability to the environmental restrictions to the plant growth vegetable in these grasslands (flooding, salinity, alkalinity, low concentrations of assimilable Phosphorus, droughts, grazing by cattle, fire, parasites and predators), prospering and spreading in spontaneous form.

The proposed Workshop has an antecedent in the “1er Simposio Argentino del Género *Lotus*” [1st Argentinean Symposium of the Genus *Lotus*] that was developed in the INTECh (at the present time IIB-INTECh) in 1992. From then on, and especially during the last years, the advances in studies of molecular biology and bio-engineering have enlarged and enhanced the opportunities to advance in the efficient use of these strategic resources for our beef production. On the other side, they outline an enormous challenge to integrate these advances in effective form, not only in terms of increasing the cattle production but of making it in the mark of a commitment irreducible with the conservation of the “Pampas” ecosystem.

In this context, the proposed objectives of this Workshop are: 1) to update, exchange and integrate knowledge from different disciplines on biological processes - from molecular to population level-, committed with the adaptability, the production and the persistence of legume populations in grasslands of the Pampa Deprimida (in particular on the Genus *Lotus*); 2) to propitiate the generation of links between disciplines and institutions in order to maximise the investigation efforts that are carried out in the country and overseas; and 3) to evaluate critically and strategically, the new opportunities that the biotechnology advances can offer for the development of a sustainable cattle production.

Program

Day 11 September:

Workshop of Microbiology

Agronomic management of the symbiosis in species of the Genus *Lotus*. [Manejo agronómico de la simbiosis en especies del género *Lotus*.] CARLOS LABANDERA, Laboratorio de Microbiología de Suelos, Ministerio de Agricultura y Pesca, Uruguay.

Characterization of strains of *Rhizobium loti* of the Pampa Deprimida del Salado. [Caracterización de cepas de *Rhizobium loti* de la Pampa Deprimida del Salado.] JULIA ESTRELLA. Instituto de Investigaciones Biotecnológicas, Instituto Tecnológico de Chascomús IIB-INTECh, UNSAM-CONICET, Argentina.

Arbuscular Mycorrhiza in *Lotus glaber* of the “Depresión del Salado” and their possible influence on the mechanism of resistance to plant saline stress. [Micorrizas arbusculares en *Lotus glaber* de la Depresión del Salado y su posible influencia sobre el mecanismo de resistencia a estres salino de la planta.] ANA MENENDEZ, Departamento de Microbiología, Facultad de Biología, Universidad de Buenos Aires (UBA), Argentina.

Molecular aspects of the symbiosis *Rhizobium loti* - *Lotus glaber*. [Aspectos moleculares de la simbiosis *Rhizobium loti*- *Lotus glaber*.] VIVIANA LEPEK, Instituto de Investigaciones Biotecnológicas, Instituto Tecnológico de Chascomús IIB-INTECh, UNSAM-CONICET, Argentina

Physiological conditions of *Rhizobium* in the nodules of legumes. [Condiciones fisiológicas de *Rhizobium* en el interior de nódulos de leguminosas.] JUAN SANJUAN, Departamento de Microbiología del Suelo y Sistemas Simbióticos, Estación Experimental del Zaidin CSIC, España.

Day 12 September:

Workshop of Biology, Biochemistry, Physiology and Biotechnology.

Assimilation of Nitrogen in nodules of legumes: molecular aspects of the enzymes involved. [Asimilación de nitrógeno en nódulos de leguminosas: aspectos moleculares de las enzimas implicadas.] CARMEN LLUCH, Departamento de Fisiología Vegetal, Facultad de Ciencias, Universidad de Granada, España.

Prosopis strambulifera, a halophyte legume with potential use in biotechnology. [*Prosopis strambulifera*, una leguminosa halófito con potencial uso en biotecnología.] VIRGINIA LUNA, Departamento de Fisiología Vegetal, Universidad Nacional de Río Cuarto (UNRC), Córdoba, Argentina.

Populational biology de *Lotus glaber* in the “Pampa Deprimida”. [Biología poblacional de *Lotus glaber* en la Pampa Deprimida.] OSVALDO VIGNOLIO, *Cátedra de Ecología, Universidad Nacional de Mar del Plata (UNMdP), Argentina.*

The inundation in the “Pampas Deprimidas” as a benefit of the nature. Its possible utility for the introduction of *Lotus glaber*. [Las inundaciones en la Pampa Deprimida como servicio de la naturaleza. Su posible utilidad para la introducción de *Lotus glaber*.] PEDRO INSAUSTI, *Cátedra de Fisiología Vegetal, Facultad de Agronomía, Universidad de Buenos Aires (UBA), Argentina.*

An evaluation on the list of the polyamines in *Lotus* spp. under saline stress, as study tool of their mechanisms of tolerance. [Una evaluación sobre el rol de las poliaminas en *Lotus* spp. bajo estrés salino, como herramienta de estudio de sus mecanismos de tolerancia.] OSCAR A. RUIZ, *Instituto de Investigaciones Biotecnológicas, Instituto Tecnológico de Chascomús IIB-INTECh, UNSAM-CONICET, Argentina.*

Workshop of Genetic Improvement and Cultivar Management

Genetic resources and breeding de *Lotus glaber*, ideas for the discussion of a regional strategy. [Recursos genéticos y mejoramiento de *Lotus glaber*, pautas para la discusión de una estrategia regional.] MARÍA DE LA MERCED MUJICA, *Mejoramiento Genético, Facultad de Ciencias Agrarias y Forestales, Universidad Nacional de La Plata (UNLP), Argentina.*

Pampa INTA, a new cultivar of *Lotus glaber* obtained by phenotypic recurrent selection. [Pampa INTA, un nuevo cultivar de *Lotus glaber* obtenido por selección recurrente fenotípica.] MANUEL GÓNZALEZ GARCÍA, *Estación Experimental Agropecuaria de Balcarce, Instituto de Tecnología Agropecuaria (EEA-INTA), Pcia de Buenos Aires, Argentina.*

Management and utilization of *Lotus* spp in the “Cuenca del Salado”. [Manejo y utilización del *Lotus* spp en la Cuenca del Salado.] MATÍAS BAILLERES, *Estación Experimental Manantiales, Ministerio de Asuntos Agrarios de la Provincia de Buenos Aires, Argentina.*

The induced poliploidy in *Lotus glaber* Mill. [La poliploidía inducida en *Lotus glaber* Mill.] MÓNICA BARUFALDI, *Facultad de Ciencias Agrarias, Universidad Nacional del Centro de la Provincia de Buenos Aires (UNCPBA), Azul, Pcia de Buenos Aires, Argentina.*

Breeding of the Genus *Lotus* in Uruguay. [Mejoramiento genético del género *Lotus* en Uruguay.] MÓNICA REBUFFO, *INIA La Estanzuela, Estación Experimental “Alberto Böerger”, Instituto Nacional de Investigación Agropecuaria (INIA), Uruguay.*

Day 13 September:

Workshop of Production and Agronomic Evaluation

Space and temporal heterogeneity of the Pampean vegetation. [Heterogeneidad espacial y temporal de la vegetación pampeana.] *ROLANDO LEON, Facultad de Agronomía, Universidad de Buenos Aires (UBA), Argentina.*

Perception of the farmer on the intensive use of the *L. glaber* in the “Pampa Deprimida del Salado”. [Una visión del productor sobre el uso intensivo del *L. glaber* en la Pampa Deprimida del Salado.] *SYLVIO CORTINA, Productor asociado de la Confederación Agropecuaria de Productores de Buenos Aires y La Pampa (CARBAP) y Sociedad Rural Argentina (SRA), Argentina.*

The contribution of *L. glaber* to the bovine rearing in the grasslands of the inundated pampas. [El aporte de *L. glaber* a la cría vacuna en los pastizales de la pampa inundable.] *MIGUEL CAUHÉPÉ, Facultad de Ciencias Agrarias, Unidad Integrada Universidad Nacional de Mar del Plata, Instituto de Tecnología Agropecuaria, UNMdP-INTA-Balcarce, Pcia. de Buenos Aires, Argentina.*

Agronomy, cultivar evaluation, and characterization of naturalized germplasm of three species of *Lotus* in Chile. [Agronomía, evaluación de variedades, y caracterización de germoplasma naturalizado de tres especies de *Lotus* en Chile.] *HERNÁN ACUÑA, Centro Regional de Investigación Quilamapu, Instituto de Investigaciones Agropecuarias (INIA), Chile.*

Final Conclusions of the Workshop

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After 3 intense days of conferences and discussions, we can say that the execution of this workshop has been a complete success. The implementation of the workshop was itself a challenge, taking into account the difficulty of gathering together scientists, technologists, agronomists and farmers. Despite the difficulties the meeting was extremely dynamic and co-operative. Furthermore, it allowed to evidence the enormous potential of *Lotus* for the

production system in the Pampa Deprimida del Salado, as a real alternative to increase cattle production in this region. The species *Lotus glaber* (previously *L. tenuis*) appeared with a higher adaptive potential to the regional geo-productive conditions.

Thanks to the multidisciplinary character of the workshop, as well as to the great interest of all the participants for the potentiality of this system, it was possible to identify a series of organisational, biological, agronomical and environmental factors which limit or can be limiting crop productivity. The diversity of these factors reflects the intrinsic complexity of a serious and rigorous study towards the sustainable production of this forage legume.

1) *The excessive compartmentalization of the existing knowledge on the geographical, meteorological and productive conditions of the region.*

There are a number of partial studies on different aspects of the system. Much of this information is not optimally reflected in publications easily accessible to the interested parties. On the other hand, it is necessary to integrate all that knowledge, so to facilitate the development of appropriate technological strategies.

2) *The absence of systematic studies of the productive system.*

It was detected the necessity to generate and/or gather evaluation data on the impact of *Lotus* spp. on the beef farming system, with a diagnosis of the potentialities and of the limiting factors in each situation. The apparent environmental heterogeneity that exists in the region imposes the need for this type of studies.

3) *The urgent need of characterization and evaluation of the existing biological resources.*

It is deduced from the available information that a wide biological diversity exists in the region, either for the plant (species and genotypes of *Lotus*), as well as of beneficial micro-organisms important for its nutrition and growth (Nitrogen fixing bacteria, mycorrhiza, etc). Nevertheless, it is necessary an appropriate evaluation of this bio-diversity towards the selection of the best genotypes, particularly in relation to biomass production as well as to those factors limiting for the production, such as:

- low levels of Phosphorus and Nitrogen in the soils of the region.
- alkalinity / salinity of the soils
- the flooding and drought cycles
- the extreme temperatures
- the legume persistence
- agronomic management (the need of optimization of the legume establishment, grazing and the seed production).

4) *Necessity of improvement of the resources*

Particularly in the case of *L. glaber*, there seem to exist only a few cultivars selected for the conditions of the region. Neither there are bio-fertilizers specifically selected for the regional needs. There is a need to identify those cultivars and/or to improve them, as well as to develop specific bio-fertilizers so to improve the *Lotus* adaptive capacity and towards its productive optimization in the region. In this sense, the generation of genotypes with

increased ploidy and the generation of molecular markers to accelerate plant breeding programs are of supreme importance.

5) *Necessity of appropriate strategies of R+D (Research + Development)*

The complexity of factors that determine the productive capacity of *Lotus* spp. in the region makes necessary the establishment of a R+D program that agglutinates all the necessary efforts. The following activities are identified as high-priority:

- the co-ordination of the different participants and activities.
- design of strategies for the obtaining of the necessary human and material resources. Integration with European scientific programs and at Ibero-American level.
- the elaboration of strategies for the implementation and diffusion of results (newsletter, etc.).