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Does *Lotus glaber* improve beef production at the Flooding Pampas?

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Introduction

The Flooding Pampas is an extensive and flat region whose natural grasslands offer an appropriate set of nutrients for the beef cow-calf operations. More than 50% of the beef calves of Argentina are produced in almost 6 million ha of this area. Although most of the ranches of the Flooding Pampas have introduced some improved technologies regarding cattle and grasslands management, the low forage quality in winter, and the frequent and extensive floodings it suffers, keep extensive and conservative management as a dominant feature.

The natural grasslands of the Flooding Pampa are dominated by perennial grasses that could be classed in two groups according with their seasonal growth: winter-spring grasses and summer grasses. Winter growth is limited by low solar radiation and temperature. Growth rates of about 4-5 kg MS/ha/day are common. During spring and summer, growth reaches 20-30 kg DM/ha/day and it extends through the autumn until air temperature decreases (Figure 1). Primary productivity of the main forage communities ranges among 6000 and 2500 kg DM/ha/year along the soil gradient they grow (Hidalgo and Cauhépé, 1991a). Forage quality varies markedly with its minimum values during winter and top quality during spring and summer**.**

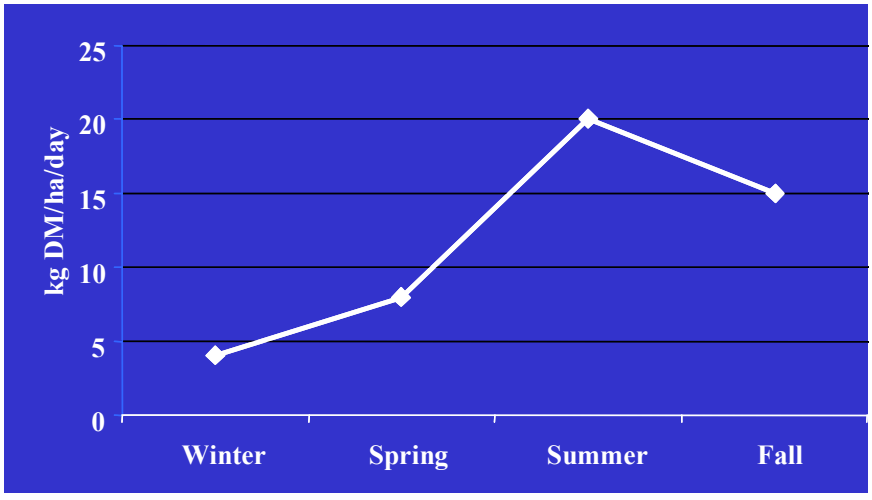

Figure 1. Forage production of a flooding Pampa grassland (Source: Hidalgo and Cauhépé, 1991a)

Lotus (*Lotus glaber*) was introduced long ago in the Flooding Pampa and naturally expanded favored by floodings. At present, covers an extense area. Ranchers see Lotus as a valuable species and a significant number of researches give some support to this rancher's opinion (Mazzanti *et al.*, 1988; Miñón *et al.,* 1990). Thus, the objective of this review is to evaluate the possible impact of *Lotus glaber* on the beef cattle production of the Flooding Pampas through the research results produced on the region.

Could Lotus improve the forage production?

The Nitrogen fixation of Lotus growing in a fescue (*Festuca arundinacea*) pasture varied between 39-42 kg N/ha/year (Refi *et al.*, 1989). Lotus coverage ranged in this experiment from 7-24%. As in temperate grasslands nitrogen is related directly to forage production, the presence of Lotus is expected to increase the forage production of grasslands. The winter forage production of a fescue-lotus mixture (Miñón *et al.,* 1990) almost tripled the daily growth rates: of native grasslands: 15 kg DM/ha/day as compared with 4-5 kg DM/ha/day (Hidalgo and Cauhépé, 1991a). In other experiment conducted in humid native grassland, Hidalgo and Rimoldi (1992) found higher forage production in a pasture with Lotus than others without Lotus and attributed this result to the N fixation of Lotus.

Could *Lotus* improve the forage quality?

Native grassland at the Flooding Pampa has good nutritional quality for breeding cattle all year around except during winter. Pigurina *et al.* (1998) showed that pregnant heifers grazing native grasslands of Uruguay lost between 15-20 kg live weight from June through August.

Figures 2 and 3 shows the diet quality of steers grazing a native grassland of the Flooding Pampa and the impact of Lotus on the forage quality of a native grassland. It is apparent that the main effect of Lotus on the nutritive value of grasslands is during the winter months when the diet reaches their poorest nutritional values. Moreover the impact on the pregnant cows and especially on pregnant heifers is stressed as a consequence of the high nutrient requirements of the final pregnancy and early lactations phases.

Rosso and Chifflet (1991) found an increase of live weight gains of steers grazing a tall wheatgrass without and with lotus from 400 g/head/day to 700 g/head/day, respectively. Freddi *et al.* (1991) and Rosso and Gómez (1995) also found improvement of nutritional quality related with the presence of Lotus in pastures of the Flooding Pampa.

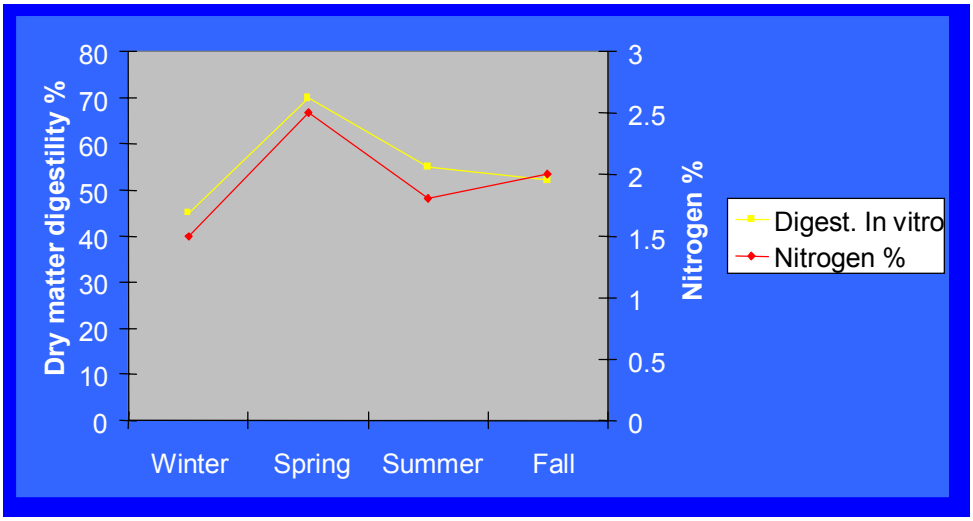

Figure 2. Digestibility and Nitrogen content (%) in diets of steers grazing a native grassland of the flooding Pampa (Source: Hidalgo and Cauhépé, 1991b)

Further comments on the possible impact of Lotus on beef production

So far, the available data allows us to tentatively support the hypothesis that the increase of Lotus in the Flooding Pampa grasslands will have a positive effect on beef production as a result of the expected increase in forage production and in forage quality. Moreover it seems to be other processes related to internal parasites on which Lotus genera has anti-helmintic effect: the condensed tannins, common in the *Lotus* genera, would compensates the loss of protein absorption as a consequence of the action of internal parasites (Otero [1]).

The resistance of *Lotus glaber* to flooding has been proved by Vignolio and Fernández (1994) and Vignolio and Fernández (1997). Lotus plants formed aerenchyma which provided them the oxygen necessary to survival and growth under flooding. Also the lower phosphorus requirements of Lotus is an economic advantage o this specie. The response to phospahte fertilizers has been erratic (Quadrelli de Escuder *et al.,* 1997). Resistance of *Lotus* to soil salinity has been shown by Bañuelos and Beuselinck (2003).

Lotus promotion through phosphate fertilization and herbicides, grazing management or aerial post-burning seeding (Juan *et al.,* 2000) and sod seeding (Miñón and Colabelli, 1993; Laterra, 1997) could be a ways to increase its biomass and the beef production in Flooding Pampa grasslands.

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[1] OTERO M.J. Efecto de distintas especies forrajeras que contienen taninos condensados sobre la productividad de ovinos parasitados. Monografía. Facultad de Ciencias Veterinarias, Universidad Nacional del Centro de la Provincia de Buenos Aires, Argentina. 22 p. [Spanish]

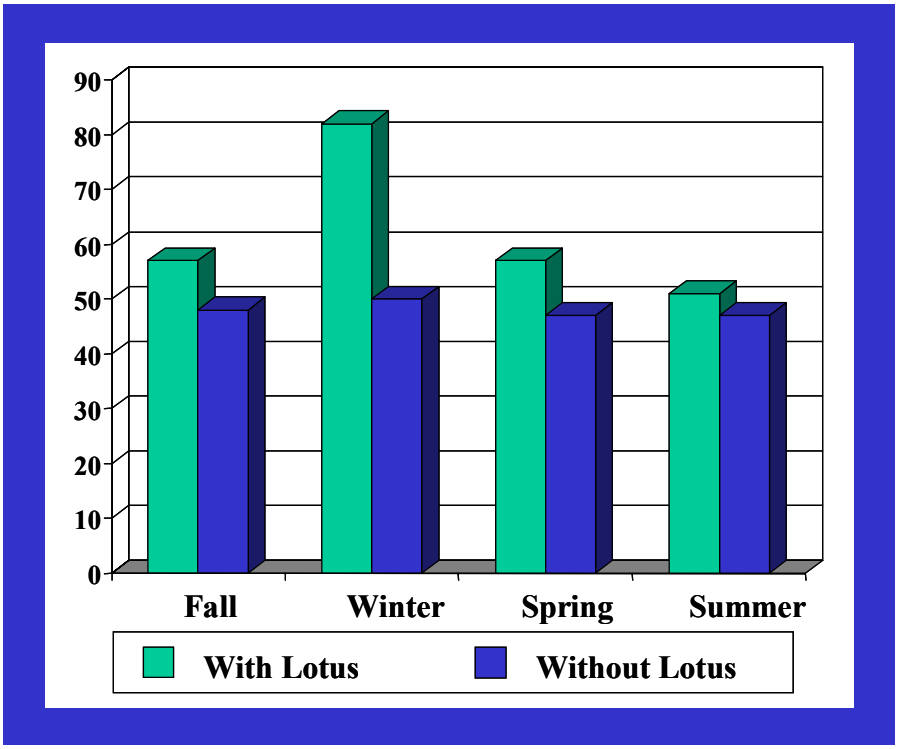

Figure 3. Effect of *Lotus glaber* on the forage quality (dry matter digestibility, %) of a flooding Pampa grassland (Source: Hidalgo and Rimoldi, 1992)

Considering beef cattle management, the nutrition of pregnant premature heifers, especially during their last third of pregnancy, the nutritive value of native Flooding Pampa grasslands is inadequate in terms of metabolizable energy concentration and protein content (Hidalgo and Cauhépé, 1991b; Pigurina *et al.,* 1998). The use of native grasslands with Lotus has been successful to manage this kind of heifers, although no scientific demonstration is available. However, it will be necessary to conduct more intensive research to prove the overall advantages in beef production of the inclusion of Lotus on native grasslands under the Flooding Pampa conditions.

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