Gliricidia sepium: a promising legume tree for the brazilian semiarid zone

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Abstract: In the Brazilian semiarid, there are recommendations for the cultivation of gliricidia to use as protein banks, in association with forage cactus, maize, bean, use as live fences, and as preserved forage such as hay and silage. A successful strategy is its cultivation in alleys in association with grasses for direct browsing. Integrating gliricidia into grazing systems increases carrying capacity of the pasture and promotes greater animal performance, being equivalent to N fertilization applied in the grass-monoculture pastures. Gliricidia silage or hay can substitute about 50% of the concentrate feed in lamb's diet without altering their live weight gain. These findings confirm the importance of gliricidia for the Brazilian semiarid livestock production.

Keywords: Integrated crop-livestock systems, protein banks, forage conservation

Introduction

Gliricidia sepium, Jacq. Kunth, Walp, or gliricidia as it is commonly called in Brazil, is also known as "madreado" in Honduras, "madero negro" in Costa Rica, "madre cacao" in Guatemala, "mata raton" in Colombia, and "coyote" in Mexico. It is a short to medium tree, 10 to 15 m height and 30 to 40 cm stem diameter (1). It has composite leaves and white-pink flowers 2- to 2.5-cm wide. The fruits are flat pods, pale green when immature and dark brown when ripe (2). Its propagation can be done through seeds or cuttings (3).

Native to the lowlands of Mexico and Central America, gliricidia was introduced in most tropical zones and naturalized from northern South America to Brazil, the Caribbean, Hawaii, West Africa, Asian countries such as India, Sri Lanka, Thailand, Philippines, Indonesia, and Australia. It grows in places with annual rainfall of 500 to 1500 mm and adapts to a great variety of soils (4). In Asian, African, and Central American countries, it is commonly used by small farmers, under cut and carry management, to provide animals with high-quality fodder.

Brazilian experience

In Brazil, the results of research carried out with this legume have caught producer's attention. Most research was carried out in northeastern Brazil on green manure (5,6), integrated systems (7,8), and animal feed (7). In the present review, we compared the results obtained for that region. For semi-arid conditions, gliricidia is recommended for protein banks, in a consortium with forage cactus, maize and bean, living fences, and as preserved forage (i.e. hay and silage). Gliricidia can be cultivated in alleys intercropped with grasses for direct browsing (7). This strategy was developed for coastal areas but can also be used in the semiarid conditions.

One of the important points for the sustainability of gliricidia crop is its harvest management. The resting period between each harvest and defoliation intensity will influence the speed of regrowth. In our studies, we have worked with spacing of 1.0 m between rows and 50 and 35 cm between plants in the row, resulting in populations between 20,000 and 30,000 plants/ha, depending on the availability of water and soil fertility. In sites or years with greater rainfall and more fertile soils, wider spacing between plants in the row is recommended and the opposite for sites with lower rainfall and poorer soils (Table 1). Data of tender and edible stems are not presented in Table 1. The number of cuts/year will vary mainly due to water availability.

Harvested material may be used "*in natura*"

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Table 1. Productivity and chemical composition of *Gliricidia sepium* at different cropping years. Adapted from (9)

	Rainfall	Total edible fresh Biomass yield	Leaf Fresh Biomass yeld	DM Leaves	Leaf DM Yeld	CP Leaves	NDF Leaves	ADF Leaves
	mm/year	t/ha/year	t/ha/year	%	t/ha/year	%	%	%
2010	800	106	69	20.1	13.8	22.3	35.8	26.3
2011	651	90	61	20.5	12.5	22.9	34.9	26.9
2012	375	71	42	25.2	10.5	22.0	33.7	26.3
2013	652	107	75	19.8	14.8	23.4	34.6	25.4

Figure 1. *Gliricidia sepium* intercropped with palisadegrass (*Urochloa brizantha*) for onsite browsing

or as hay or silage. In a study carried out to replace concentrate feed for Santa Inês lambs, we found that silage or gliricidia hay can substitute about 50% of the concentrate feed without altering the lambs' average weight gain that was 213 g/day (10).

Gliricidia has been used in direct browsing systems, increasing pasture carrying capacity and promoting greater animal performance, equivalent to N fertilizer applied to the pasture. In an 11-yr study by Embrapa in a dystrophic yellow soil of the coastal tablelands, livestock gains were 685 kg/ha/yr in the intercropping system of palisadegrass and gliricidia, against 497 kg/ha/yr for palisadegrass in monoculture fertilized with 240 kg N/ha/yr. In this system, gliricidia was cultivated in single rows spaced 5 m apart and 2 m between plants in the row (Figure 1). The great advantage of the palisadegrass intercropping system with gliricidia over the monoculture system is during the dry season, when grass herbage mass is low and the gliricidia biomass remains high.

In crop-livestock-forestry integrated systems, gliricidia has been used in several associations, cultivated with corn, forage cactus, palisadegrass, citrus, and coconut trees. In the case of the forage cactus, gliricidia not only adds N to the system supplying N to the cactus, but also provides high-quality fodder for the animals. Gliricidia will supply the protein fraction of the diet and the cactus the energy fraction (Figure 2a). In reports with coconut trees, besides being harvested and used by animals, gliricidia still increased coconut production by the incorporation of the biologically fixed nitrogen in the soil (Figure 2b).

Perspectives

Having in mind its great adaptability to different climatic and soil conditions of various micro-regions of the Brazilian Northeast, together with a high forage value, gliricidia is a strong ally in the search for economic alternatives, to complement the ruminant diets, especially in the semi-arid conditions. In addition, it has shown to be very efficient in the composition of crop-livestock-forest integration systems, increasing the nitrogen input in soil and providing shade and feed to the animals.

There is currently a great demand for information on cultivation technologies and use of gliricidia by farmers and technical assistance agents. Although many technologies are already available to meet most of those demands, the lack of a recognized quality seed production and distribution system has been the main bottleneck for the expansion of this crop. Such lack is mainly due to the absence of registered cultivars of this species. In this sense, Embrapa initiated a selection program of gliricidia accesses, aiming at the registration and market launch of cultivars with proven agronomic performance.

Figure 2. A) Gliricidia integrated with forage cactus, and B) with coconut trees.

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