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Short Communication

APPLICATIONOFGLIRICIDIA [*GLIRICIDIA SEPIUM* (JACQ.) WALP] LEAVES AS A GREEN MANURE TO REDUCE NITROGEN FERTILIZER REQUIREMENT OF CHILLI

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INTRODUCTION

Chilli is an important cash crop grown in the Dry zone of Sri Lanka and the crop has high nutrients demand. Nitrogen requirement of the crop is high and the present recommended rate of nitrogen is 150 kg/ha. However, farmers apply higher doses of nitrogen fertilizer than the present recommended level and the urea is the common form of nitrogen fertilizer used by the farmers. Since, added nitrogen is subject to a range of factors which decrease it's uptake by plant: immobilization, denitrification, leaching, volatilization and runoff (Ferguson, 2010), application of chemical fertilizer with organic manure has been reported to increase fertilizer use efficiency (Wang *et al.*, 1999). In general organic manure is good sources of plant nutrients. *Gliricidia sepium* (Jacq.) Walp. is one of the most commonly grown nitrogen rich organic manure finds in Sri Lanka. *Gliricidia* shows a faster growth rate (Ch *et al.*, 2011) and the leaves decompose relatively faster, providing nutrients and improving soil moisture availability (Subramanian *et al.*, 2005). Gunapala and Amarasiri (1989) reported that *Gliricidia* leaves have 4.61 % of nitrogen. Sangakkara *et al.* (2008) reported that application of *Gliricidia* leaves at the rate of 4 t/ha (dry weight basis) increased soil nitrogen content. Nagavallemman (2000) observed that surface applied *Gliricidia* leaves increased mineral nitrogen content in soil. *Gliricidia* has significant quantities of other essential plant nutrients as well (Weerakoon, 1989). Nitrogen, potassium, phosphorus, calcium, and magnesium percentage of the *Gliricidia* leaves and tender parts have been reported as 3.26, 2.76, 0.41, 1.08 and 0.36, respectively (Egbe *et al.*, 2012). Hence the use of as a green manure can minimizes the use of chemical fertilizers. The main objective of this study was to find out the possibility of using *Gliricidia* leaves to reduce the nitrogen fertilizer requirement of chilli crop.

MATERIALS AND METHODS

Experiments were conducted during *yala* 2009 and *yala* 2010 seasons at two different field locations of the Field Crops Research and Development Institute (FCRDI), Mahailluppallama and *yala* 2011 in farmer's field, Thambuththegama. Experimental sites

come under the agro-ecological region of DL1 and the soil is classified as Rhodustalfs (Panabokke and Kannangara, 1975). During *yala* 2009 and *yala* 2010, eight treatments, namely Treatment 1 (T1) consists of 150 kg N /ha which is the DOA recommended nitrogen rate for chilli, T2 consists of 112 kg N/ha (75% of DOA recommended N level) + 6 t/ha *Gliricidia* apply one week before planting (WBP); T3 consists of 112 kg N/ha + 8 t/ha *Gliricidia* apply 1 WBP; T4 consist of 112 kg N/ha + 10 t/ha *Gliricidia* apply 1 WBP; T5 consist of 112 kg N/ha + 3 t/ha *Gliricidia* 1 WBP & 3 t/ha *Gliricidia* 4 weeks after planting (WAP); T6 consist of 112 kg N/ha + 4 t/ha *Gliricidia* 1 WBP & 4 t/ha *Gliricidia* 4WAP; T7 consists of 112 kg N/ha + 5 t/ha *Gliricidia* 1 WBP & 5 t/ha *Gliricidia* 4 WAP; and T8 consists of no N fertilizer (control), were tested. Farmer filed experiment contain all treatments except T4 and T7.

All treatments received 45 kg P_2O_5/ha as triple supper phosphate and 30 kg K_2O/ha as muriate of potash. *Gliricidia* was incorporated into the soil on fresh weight basis. Treatments were arranged in a randomized complete block design with three replicates in the research station and four replicates were used in the farmer's field experiment. Thirty five days old chilli seedlings; variety MI-2 were planted on 3.6 m x 4.5 m size plots at the spacing of 60 cm x 45cm. DOA recommended crop management practices were followed. Growth parameters such as plant height and canopy width at 50% flowering and yield parameters such as number of pods/plant, dry chilli yield were taken. Nitrogen content of *Gliricidia* leaves was measured. Soil parameters (pH, EC, exchangeable K, available P and organic matter) were analyzed by the standard methods

RESULTS AND DISCUSSION

Experiments at FCRDI

Some chemical properties of experimental soils are given in Table 1. During *yala* 2009 and *yala* 2010 seasons, the lowest plant height and canopy width at 50% flowering were observed in no fertilizer treatment. Growth parameters of *Gliricidia* added treatments were not significantly different with DOA recommended nitrogen fertilizer application (Table 2). Number of pods/plant was not significantly different between *Glircidia* application and DOA recommended nitrogen fertilizer application (Table 3). *Gliricidia* with 112 kg/ha nitrogen rate and DOA recommended nitrogen rate were given comparable dry chilli yield in *yala* 2009 and 2010 seasons. Kendaragama (1997) reported that application of *Gliricidia* leaves together with recommended chemical fertilizer application increase the chilli yield when compared to the recommended chemical fertilizer. Result show that split application or single application of *Gliricidia* was not affected the fruit/plant and dry chilli yield (Table 3).

Table 1. **Initial soil properties of experimental sites at FCRDI, MI and Farmer's field during *yala* 2009, *yala* 2010 and *yala* 2011.**

	Research fields		*Farmer's field*
Soil property	*Yala 2009*	*Yala 2010*	*Yala 2011*
pH (1:2.5)	6.8	6.7	7
EC (dS/m) (1:5)	0.05	0.07	0.06
Exchangeable K (mg/kg)	238	210	147
Available P (mg/kg)	23	4	15
Organic matter(%)	1.56	1.76	1.22

Table 2. **Plant height and canopy width at 50 % flowering during yala 2009 and yala 2010 at FCRDI, Mahailluppallama.**

Treatment	*Plant height (cm)*		*Canopy width (cm)*	
	Yala 2009	*Yala 2010*	*Yala 2009*	*Yala 2010*
DOA recommended N rate (150kg N/ha)	28 a	30 a	24 a	22 a
112 kg N/ha + 6t/ha *Gliricidia* (Gli) 1WBP	30 a	31 a	26 a	22 a
112 kg N/ha + 8t/ha Gli 1WBP	29 a	31 a	25 a	23 a
112 kg N/ha + 10t/ha Gli 1WBP	28 a	29 a	24 a	23 a
112 kg N/ha + 3t/ha Gli WBP and 3t/ha Gli 4WAP	29 a	31 a	26 a	25 a
112 kg N/ha + 4t/ha Gli 1WBP and 4t/ha Gli 4WAP	28 a	30 a	24 a	23 a
112 kg N/ha + 5t/ha Gli 1WBP & 5t/ha Gli 4WAP	30 a	30 a	23 a	25 a
No N fertilizer	25 b	27 b	20 b	19 b
CV (%)	6	7	11	8

Note: Means in each column followed by same letters are not significantly different at P=0.05 in DMRT

Table 3. **Number of pods/plant and dry chilli yield of different treatments during *yala* 2009 and *yala* 2010 at FCRDI, Mahailluppallama.**

Treatment	*Yala 2009*		*Yala 2010*	
	Number of Pods/plant	*Dry chilli yield (t/ha)*	*Number of Pods/plant*	*Dry chilli yield (t/ha)*
DOA recommended N rate (150 kg N/ha)	25a	1.15 a	51 a	2.39 a
112 kg N/ha + 6 t/ha *Gliricidia* (Gli) 1WBP	30 a	1.28 a	59 a	2.69 a
112 kg N/ha +8 t/ha Gli 1WBP	24 a	1.25 a	54 a	2.53 a
112 kg N/ha + 10 t/ha Gli 1WBP	23 a	1,35 a	50 a	2.21 a
112 kg N/ha + 3 t/ha Gli 1WBP and 3 t/ha Gli 4WAP	29 a	1.29 a	55 a	2.59 a
112 kg N/ha + 4 t/ha Gli 1WBP and 4t/ha Gli 4WAP	21 a	1.21 a	52 a	2.48 a
112 kg N/ha + 5t/ha Gli 1WBP & 5 t/ha Gli 4WAP	23 a	1.32 a	60 a	2.76 a
No N fertilizer	12 b	0.46b	31 b	1.31b
CV (%)	15	14	20	19

Note: Means in each column followed by same letters are not significantly different at P =0.05 in DMRT

Farmer's field experiment

The lowest number of pods per plant and dry chilli yield were shown in no N fertilizer application (Table 4). Number of pods per plant and dry chilli yields of all

Gliricidia application were not significantly different with the DOA recommended nitrogen level (Table4). Therefore, application of 6 t of *Gliricidia* leaves reduced 25 % of nitrogen fertilizer requirement of chilli crop.

Table 4. Pods/plant and dry chilli yield of different treatments at farmer's field during *yala* 2011.

Treatments	*Pods/plant*	*Dry chilli yield (t/ha)*
DOA recommended N rate (150 kg N/ha)	25 a	1.54 a
112 kg N/ha + 6 t/ha *Gliricidia* (Gli) 1WBP	31 a	1.86 a
112 kg N/ha +8 t/ha Gli 1WBP	34 a	1.97 a
112 kg N/ha + 10 t/ha Gli 1WBP	35 a	2.05 a
112 kg N/ha + 3 t/ha Gli 1WBP and 3 t/ha Gli 4WAP	31 a	1.83 a
112 kg N/ha + 4 t/ha Gli 1WBP and 4t/ha Gli 4WAP	12 b	0.79 b
112 kg N/ha + 5t/ha Gli 1WBP & 5 t/ha Gli 4WAP	25 a	1.54 a
No N fertilizer	31 a	1.86 a
CV (%)	18	16

Note: Means in each column followed by same letters are not significantly different at P =0.05 in DMRT

Average nitrogen level of *Gliricidia* leaves was 4.1 %. Moisture percentage of added fresh leaves was 70 %. Hence, application of *Gliricidia* at the rate of 6 t/ha provided 73.8 kg of nitrogen to the soil. However, total nitrogen amount provided by *Gliricidia* leaves could not be available for plant (Ferguson, 2010). However, needed amount of chilli could be provided by the 6 t of *Gliricidia*. These results revealed that total amount of *Gliricidia* applied one week before planting or applied as split did not affect for the dry chilli yield. Hence, total amount of the *Gliricidia* (6 t/ha) could be applied at once or as a split at two different periods. However, application of *Gliricidia* change soil total nitrogen level significantly with time and peaked at 38 days after leaf application (Carol *et al.*, 2005). Therefore, soil nitrogen level could be increased two different time period with split application. Thus, split application of *Gliricidia* was the best method.

CONCLUSIONS

All tested levels of *Gliricidia* had similar effect to reduced nitrogen fertilizer requirement of chilli. Application of *Gliricidia* level of 6 t/ha could be selected as the most suitable *Gliricidia* level with 75 % of DOA recommended N (112 kg/ha). It reduced 25 % of the DOA recommended nitrogen fertilizer requirement of chilli. Total amount of *Gliricidia* (6 t/h) could be applied at once or two different periods.

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