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Influence of Cutting Height and *Gliricidia* Green Leaf Manure Application (GLM) on Different Crops under Alley Cropping System

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A B S T R A C T

Agriculture at present focuses on crop productivity with a balance on soil health. In dryland areas application of green leaf manures in addition to the regular dose of fertilizers, which proves to ensure soil health and cost economics without affecting the yield parameter. *Gliricidia* based alley cropping with Ragi, Barnyard millet and Groundnut intercrops was experimented to understand the influence of *Gliricidia* GLM application on the intercrops. The resultant of incorporating *gliricidia* green leaf manure into the soil was found to increase the yield of intercrops than the mulching technique, which would help the dryland farmers to increase productivity.

Introduction

Agriculture in drylands is still a cumbersome task to be fulfilled in order to enhance the agrarian production. Soil health and crop productivity are the targets of present agricultural sector which can be ensured through crop residue recycling, farm yard manure, biofertilizers, inclusion of legumes as intercrops, green manure crops, green leaf manuring, tank silt addition, vermicoposting etc. (Srinivasarao *et al.*, 2011 a,c). Organic manuring tends to improve soil physical properties (Mc Rae and Mehuys, 1988) where green manuring proves to be important (Meisheri *et al.*, 2001) In this aspect, incorporating *Gliricidia* which is fast growing, tropical nature and a leguminous tree would provide potential benefit to the farmers.

Wani *et al.*, (2009) were able to prove that *Gliricidia sepium* on farm bunds was able to provide 28 – 30 kg/ha of Nitrogen annually in addition to Organic matter. The *gliricidia* leaf manure application of 1 t/ha would be able to

provide 21 kg N, 2.5 kg P, 18 kg K, 85 g Zn, 164 g Mn, 365 g Cu, 728 g Fe in conjunction with considerable amounts of Mo, B, Mg, Ca, S etc. Gliricidia is good source of N (2.76%) and K (4.6%) nutrients (http://agritech.tnau.ac.in). Sharma *et al.*, (2004) found that the treatment 2t *gliricidia* loppings + 20 kg N increased the sorghum yield by 84.6 per cent. This article tends to understand the influence of cutting height and different methods of *Gliricidia* Green Leaf Manure (GLM) application on the growth and yield of Ragi, Barnyard millet and Groundnut intercrops.

Materials and Methods

Study area

The given study about *gliricidia* alley cropping was conducted in Agricultural Research Station, Chettinad during July 2017 to June 2019 period. The *gliricidia* tree species was chosen as the green leaf manure source. Three crops species viz., Ragi, Barnyard Millet and Groundnut were intercropped for the study. The interaction performance was studied and plant height, No. of tillers (Root length in case of Groundnut), Dry weight, Grain yield (Pod yield in case Groundnut) was recorded. Experiments were laid out in replicated factorial randomised block design with four replications and comprising 12 treatment combination with two cutting heights (1 m from ground and 1.5 m from ground), two Green Leaf Manure Application (GLM application with soil incorporation and GLM application with surface application) and three intercrops (Ragi, Barnyard Millet and Groundnut).

Results and Discussion

The influence of cutting height and method of application of *Gliricidia* GLM on growth and yield of Ragi in *Gliricidia* based alley cropping is given in Table 1 and Figure 1.Cutting of *Gliricidia* hedges at various height i.e., 1 m and 1.5 m above ground level plays less significant influence on plant height of intercrop Ragi. Application of *Gliricidia* Green Leaf Manure (GLM) invarious methods i.e., surface application as mulch and soil incorporation plays high significant influence on plant height, Dry Matter Production and yield of intercrop. The interaction between cutting height and method of application of GLM does not have much influence on growth and yield of intercrop. The cutting of *Gliricidia* hedges at 1m above Ground level and applied as GLM by Soil incorporation increase the plant growth and yield followed by cutting at 1.5m height and applied as mulch cover control. The usage of Gliricidia amendments produced higher yields in of Ragi crop with reference to a research conducted by Anchal Dass *et al.*, (2013).

In case of Barnyard millet (Table 2 and Figure 2), the cutting of *Gliricidia* hedges at various heights does not have significant variation in plant growth and yield of intercrop. Application of *Gliricidia* as GLM in various methods viz., surface application and soil incorporation shows significant variation among the growth and Barnyard millet. Cutting of *Gliricidia* at 1m above level and application of *Gliricidia* GLM as soil incorporation shows higher DMP and yield in Barnyard millet. The interaction between cutting height and method of application did not show any variation in growth and yield of Barnyard millet. Similar results were observed by Suguna and Swaminathan (2012) while incorporating *Pongamia pinnata* Green Leaf manure on yield of Barnyard millet where 2000 kg/ha leaf incorporation of Pongamia with 45 days of decomposition period increased the yield to 1216 kg/ha against the 861 kg/ha from zero input management.

Table.1 Influence of cutting height and method of application of *Gliricidia* GLM on growth and yield of Ragi in *Gliricidia* based alley cropping

Treatments	Plant height (cm)			No. of tillers			Dry weight DMP (kg/ha)			Grain yield (kg/ha)		
Control	60			2			1008			300		
H1A1	63.6			2.4			1032			336		
H1A2	69.2			2.8			1144			376		
H2A1	62			1.8			1016			312		
H2A2	68.2			2.4			1136			364		
Mean	64.6			2.28			1067.2			337.6		
	SED	CD		SED	CD		SED	CD		SED	CD	
H	0.37	0.80	NS	0.32	0.69	**	12.33	26.86	*	10.1	21.9	NS
A	0.37	0.80	**	0.32	0.69	**	12.33	26.86	**	10.1	21.9	**
HA	0.52	1.13	NS	0.45	0.97	NS	17.44	37.99	NS	14.2	31.0	NS
H1- Cutting height at 1m above GL							A1- Surface application of Glyricidia GLM					
H2- Cutting of Glyricidia at 1.5 m above GL							A2- Soil incorporation of Glyricidia GLM					

Table.2 Influence of cutting height and method of application of *Gliricidia* GLM on growth and yield of Barnyard millet in *Gliricidia* based alley cropping

Treatments	Plant height (cm)			No. of tillers			Dry weight DMP (kg/ha)			Grain yield (kg/ha)		
Control	57			2			840			520		
H1A1	57.2			24			848			556		
H1A2	64			3.2			896			584		
H2A1	56.4			2.2			824			536		
H2A2	63			3			872			580		
Mean	59.52			6.88			856			555.2		
	SED	CD		SED	CD		SED	CD		SED	CD	
H	0.58	1.26	NS	0.19	0.41	NS	11.55	25.16	NS	6.43	14.0	NS
A	0.58	1.26	**	0.19	0.41	**	11.55	25.16	**	6.43	14.0	**
HA	0.82	1.79	NS	0.26	0.58	NS	16.33	35.58	NS	9.09	19.81	NS
H1- Cutting height at 1m above GL							A1- Surface application of Glyricidia GLM					
H2- Cutting of Glyricidia at 1.5 m above GL							A2- Soil incorporation of Glyricidia GLM					

Table.3 Influence of cutting height and method of application of *Gliricidia* GLM on growth and yield of Groundnut in *Gliricidia* based alley cropping

Treatments	Plant height (cm)			Root length (cm)			Dry weight DMP (kg/ha)			Pod yield (kg/ha)		
Control	16			11			1080			840		
H1A1	17			11.4			1112			832		
H1A2	19.2			12.6			1184			904		
H2A1	17.4			9.8			1096			824		
H2A2	18.8			12			1136			888		
Mean	17.68			11.36			1121.6			857.6		
	SED	CD		SED	CD		SED	CD		SED	CD	
H	0.37	0.80	NS	0.32	0.69	**	12.33	26.86	*	10.1	21.9	NS
A	0.37	0.80	**	0.32	0.69	**	12.33	26.86	**	10.1	21.9	**
HA	0.52	1.13	NS	0.45	0.97	NS	17.44	37.99	NS	14.2	31.0	NS
H1- Cutting height at 1m above GL							A1- Surface application of Glyricidia GLM					
H2- Cutting of Glyricidia at 1.5 m above GL							A2- Soil incorporation of Glyricidia GLM					

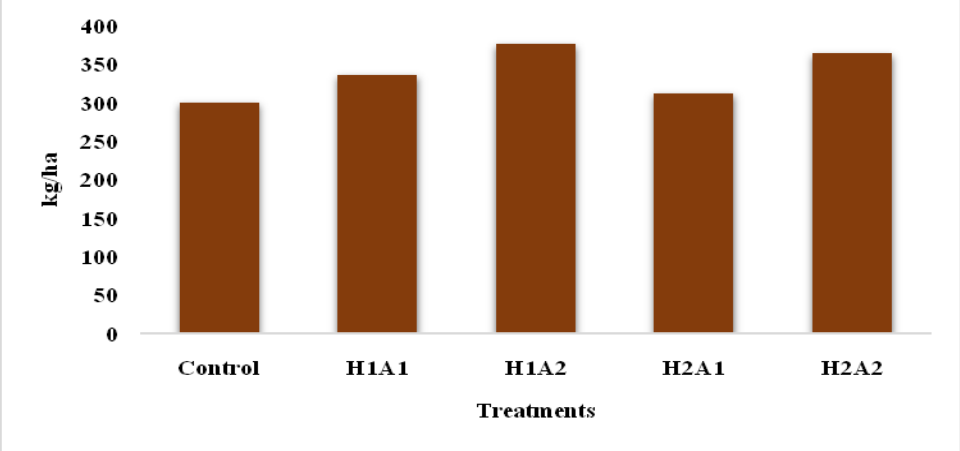

Fig.1 Ragi Grain Yield (kg/ha)

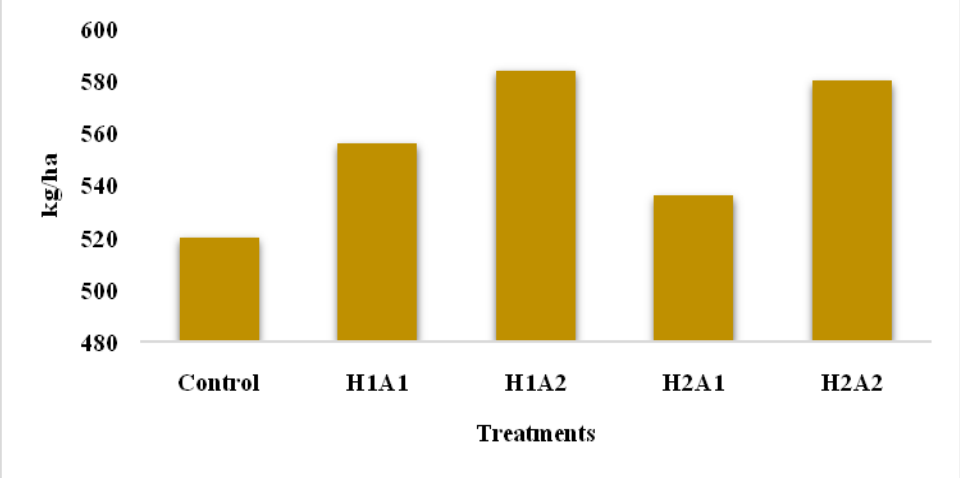

Fig.2 Barnyard millet Grain Yield (kg/ha)

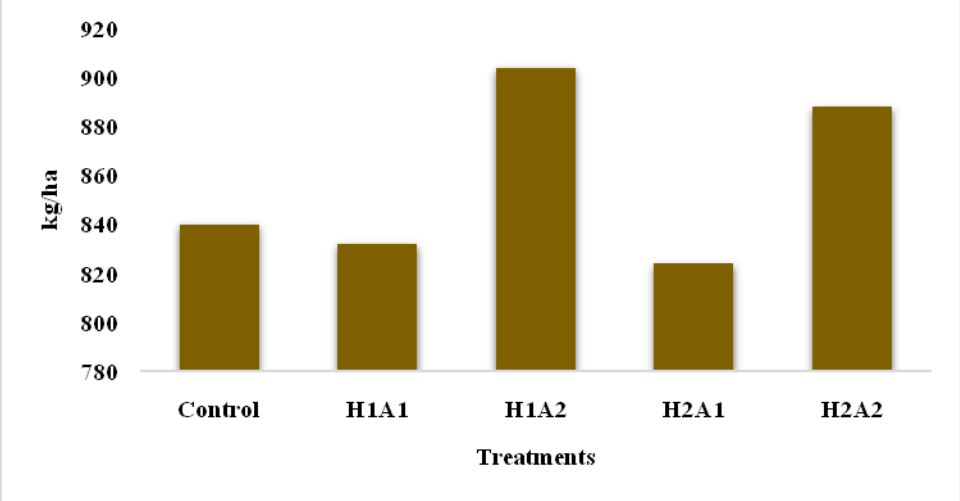

Fig.3 Groundnut Pod yield (kg/ha)

The influence *Gliricidia* GLM on growth and yield of groundnut is given in Table 3 and Figure 4. There is a less significant variation in Root length and DMP of Groundnut due to various level of cuttings of *Gliricidia* hedges i.e., at 1m and 1.5m above ground level.

Significant variation was found in plant height, Root length, DMP and Pod yield of Groundnut due to various methods of application of *Gliricidia* GLM as surface application and soil incorporation. Among the various treatments cutting of *Gliricidia* at 1m above GL and application of *Gliricidia* GLM as soil incorporation shows higher plant growth and pod yield in Groundnut under *Gliricidia* based alley cropping system. Schroth *et al.*, (1995) have evidenced that agroforestry with Gliricidia would potentially increase the yield of groundnut by reducing transpiration and crop diseases in drought years.

The cutting height and method of application of *gliricidia* green leaf manure has differential influence on the three intercrops being chosen. On the whole, cutting of *gliricidia* hedges at 1m above the ground level and soil incorporation of the same as a green leaf manure was found to be more successful in increasing the growth and yield of Ragi, Barnyard millet and Groundnut compared to all other treatments. The application of *gliricidia* green leaf manure would be beneficial as a source of Nitrogen for leaf growth and Potassium for strengthening the source-sink relationship.

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