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RESEARCH ARTICLE

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Effect of pruning levels of *Glyricidia sepium* on growth and productivity of field crops

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ABSTRACT : A field experiment was initiated at Main Agricultural Research Station, UAS, Dharwad from 2011-12 and 2012-13. *Glyricidia sepium* was grown at 10 m alley and planted at 1 m apart. Four pruning intensities were imposed on *Glyricidia sepium* alleys. Both groundnut and bengalgram crops were grown sequentially in the inter space of alleys. The groundnut pod yield and grain yield of bengalgram were significantly higher in Glyricidia pruned at 75 per cent of height as compared to the other pruning levels. Pruning of Glyricidia had significantly higher number of branches and total biomass with Glyricidia pruned 75 per cent of height as compared to other treatments. This may be due to higher number of branches and higher number of prunings.

KEY WORDS : Pruning, Coppicing, *Glyricidia sepium,* Alley

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INTRODUCTION

Glyricidia sepium is one of the fodder and green manure tree species grown for hedge row intercropping / alley cropping system. Green manure of Glyricidia has better produce. Glyricidia biomass harvested for three times per season consisted of twigs, leaves, branches which will be incorporated into soil. Fodder and fuel wood are secondary goals of in alley cropping. In the crop – fodder system leaves palated tree legumes such as Glyricidia and Subabul and harvested during the dry season to feed the live stock. It is essential to regulate the frequency to harvest to allow a rest period for hedge row to recover. Growth and productivity of crop depends on the availability of light and moisture. The yield reduction of crops increases along with growth of trees. Trees are maniculated according and growth habits trees, training helps to establish a strong frame word and capable of supporting heavy yield and quality of fruits ad spraying, harvesting become economic and early production in fruit tree species. Pruning is also essential to maintain the proper balance between vegetative growth and thereby reducing productivity of adjoining crops along the alleys. The successful integration of useful trees and perennials into food crop production system is key to developing sustainable agriculture production.

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Pruning and pollarding are the main management activities. Pruning at 0.3-1.5 m will stimulate leaf production. Pollarding at 2 m or above is recommended for optimal wood biomass production. Coppicing is used where the primary objective is fuel wood production. A cropping system that involves either tree-fallow sequentially followed by crops, or simultaneous tree-crop intercropping is needed to help improve yields (Kwesiga *et al*., 2003). A leguminous tree species can improve soil fertility through enhanced nutrient availability and nitrogen supply through biological nitrogen fixation, organic matter build-up, recycling of nitrogen from depth and improved soil physical and biological conditions (Kang *et al*., 1985 and Kwesiga *et al*., 1999). Studying nitrogen dynamics in mixed cropping of Glyricidia and relay cropping of Sesbania with Maize. Makumba and Maghembe (1999) have found that the both practices increased mineral nitrogen in soil which was highly correlated with maize grain yield. Hence, a study was made to know the pruning levels of Glyricidia on field crops.

EXPERIMENTAL METHODS

Glyricidia sepium was planted at 10m alley at 1m part during 2008 in Main Agricultural Research Station, UAS, Dharwad. An experiment on Pruning levels of *Glyricidia sepium* was conducted during 2011-12 and 2012-13 on deep black soil, having pH of 6.85 and organic carbon 0.74 % and phosphorus and potassium content were 21.6 and 320 kg, respectively.

The mean annual rainfall of 922.7mm and 539.3mm received in 71 and 47 days respectively during the year 2011 and 2012. Mean monthly maximum temperature ranges from 27^0C to 35^0C and mean monthly minimum temperature ranges from 13.9^0C to 21.5^0C. The relative humidity is higher in July and least in April. The alleys of *Glyricidia sepium* was pruned from base of tree at 20 m alley. Treatments *viz.*, (1) Pruning at 25% of the height + FC, (2) Pruning at 50% of the height + FC, (3) Pruning at 75% of the height + FC, (4) No pruning (Control) + FC in Randomized Block Design with four replications. Ground nut variety Kadri–6 was grown in *Kharif* season. Groundnut seed kernel was treated with rhizobium culture and Phosphorus solubalizing bacteria and Bavistin. Seed rate of 125 kg/ha sown at 30 x 15 am. The recommended fertilizer dose 35:35:40 NPK kg/ha was applied as basal dose. During the *Rabi* was raised during September Bengal gram (A-1). The recommended seed rate 15 kg/ha and fertilizer dose of 30:6 NPK kg/ha respectively applied as basal dose. Suitable plant protection measures were taken upto control pest and diseases. Silvicultural operations like soil working, weeding was done. *Glyricidia sepium* alley every year at onset and end of five monsoons. Root pruning was made by deep ploughing along both sides of alleys to reduce completion for moisture with crops. Pruning levels were imposed at onset of monsoon and was repeated tri monthly. The woody biomass, lops and tops were collected and weighed and pooled data is presented. Pooled data of field crops were presented in the table.

EXPERIMENTAL RESULTS AND ANALYSIS

The various pruning intensities at Glyricidia had more prounced effect on grain yield of alley cropped groundnut and Bengalgram crop yields were increased with decreasing the pruning height.

Growth and *Glyricidia sepium*:

Collar diameter:

The basal girth was maximum in unpruned treatment, followed by 75 % pruned treatment as compared to other treatments.

Number of shoots / branches:

The number of shoots were significantly higher in 75 % pruned tree species followed by 50 % pruned tree species as compared to unpruned treatments.

Growth is generally considered to include linear increase in dimension gain in organic mass and cell multiplication. In general, pruning intensities influenced the tree growth which might be due to removal of apical dominance bud. Growth response as expressed in turn of trunk diameter and shoot growth has been observed by Guak *et al.* (2003) found that increase in the nitrogen levels and pruning intensities increases the vegetative growth of plants. Kanwar (1979) found that higher shoot growth in heavily pruned trees may be due to the lower yield and conversion of natural element for use in vegetative growth. Singh *et al.* (2009) observed that nitrogen levels in combinations with pruning intensities increased the fruit yield up to certain level. Pruning from *Glyricidia sepium* and *Sesbania sesban* increased mineral N in the soil early in cropping season, and was

reported by Ikerra *et al.* (2000).

Pruning at 75 % of height had benefited effect on the growth of field crops, sapota and *Acacia mangium*. The total biomass productivity was increased with increase in pruning intensities. Similarly the half-life of prunings of *Glyricidia sepium* reported by Wilson *et al.* (1986) to be 20 days, has been found to be relatively short compared with that of *Leucaena leucocephala* and *Flemingia macrophylla* (Budelman, 1988).

Growth of field crops:

Soil moisture content was higher with Glyricidia pruned at 75% height as compared to other treatment. Available nitrogen, phosphorus and potassium were 310, 21.8 and 335 kg/ha, respectively as compared to the field crops. Both physical and chemical parameters were improved through inclusion of Glyricidia as hedge row cropping. Both crops grown parameters were significantly higher in soil field crops as compared to inclusion of Glyricidia as alley cropping.

Pruning intensities had pronounced effect on pod yield of groundnut crop. Higher pod yield of groundnut was recorded in ground nut grown with 75% pruned Glyricidia followed by 50% pruned Glyricidia as compared to unpruned Glyricidia alley.

Higher pod yield of groundnut decreased with increasing pruning height and unpruned treatment. This may be due to higher height, number of pods and kernel weight due to better availability of light in groundnut grown with 75% pruned Glyricidia alleys and also soil moisture as compared to unpruned alleys.

During *Rabi* season, yield induction was slightly higher as compared to *Kharif* season. Bengal gram yield was higher in 75% pruned Glyricidia followed by 50%

Table 1 : Growth parameters of *Glyricidia sepium* as influenced by pruning levels

Pruning levels	Height (m)	No. of branches (m^2)	Collar diameter (cm)	Biomass (kg/pl)	Biomass (kg/ha)	Moisture content of soil (%)	Nitrogen content (kg / ha)	Phosphorus content (kg / ha)	Potassium content (kg / ha)
Pruned at 25 % height + FC	3.62	9.30	4.60	8.14	41.4	9.64	290	20.1	320
Pruned at 50 % height + FC	2.18	12.76	5.80	9.36	47.8	10.46	295	20.6	325
Pruned at 75 % height + FC	1.26	15.61	6.35	12.65	63.5	11.26	310	21.8	335
No pruning	4.85	11.21	7.29	4.60	23.4	8.26	298	20.6	310
Field crops	-	-	-	-	-	-	286	18.6	320
C.D. (P=0.05)	1.84	2.32	2.11	2.34	15.8	2.42	15.8	1.86	16.8

Field crop: Groundnut : Bengal gram in *Kharif* : *Rabi* season, respectively

Table 2 : Pod yield and growth of groundnut as influenced by different pruning levels

Pruning levels	Height (m)	No. of pods	Pod yield / plant (g/plant)	Pod yield (kg / ha)
Pruned at 25 % height + FC	14.6	16.8	136.4	5.14
Pruned at 50 % height + FC	15.4	22.4	160.2	6.92
Pruned at 75 % height + FC	18.6	28.4	180.4	8.24
No pruning	13.4	12.5	110.8	4.75
Field crops	20.9	30.6	210.6	9.26
C.D. (P=0.05)	2.36	3.16	13.86	2.36

Field crop: Groundnut : Bengal gram in *Kharif* : *Rabi* season, respectively

Table 3 : Yield and growth of Bengal gram as influenced by different pruning levels

Pruning levels	Height (m)	Grain yield (g/pl)	No. of pods	Grain yield (g/ha)
Pruned at 25 % height + FC	16.34	6.84	14.8	4.12
Pruned at 50 % height + FC	18.42	8.92	16.4	5.30
Pruned at 75 % height + FC	20.3	9.46	18.2	6.74
No pruning	12.48	5.82	13.2	2.90
Field crops	22.7	11.64	41.5	7.40
C.D. (P=0.05)	2.46	2.84	4.38	2.12

Field crop: Groundnut : Bengal gram in *Kharif* : *Rabi* season, respectively

pruned Glyricidia as compared to unpruned treatment. The moisture content of soil had direct effect on the seeds per plant, pod yield, seed yield per plant as compared to other species. The timing and frequency of coppicing to produce the most biomass at the right time of year was investigated by Ella *et al.* (1989) in Sulawesi, Indonesia. They found that the optimal cutting interval of hedges of *Glyricidia sepium* was 12 weeks and that higher densities, even upto 40,000 trees per hectare, were preferable to lower densities. Widiarti and Alrasjid (1987), also in Indonesia, concluded there was no difference in biomass production from coppicing heights of 20, 40 or 60 cm above ground. Both grain yield of bengalgram and pod yield of ground nut were significantly higher in 75% pruned Glyricidia and also total biomass was higher with pruning of 75% height. Hence, for higher productivity of crops and biomass were attained by pruning alley of Glyricidia at 75% in height.

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