



IMPACT OF DIFFERENT PRUNING INTENSITIES OF DALBERGIA SISSOO ROXB. ON PADDY YIELD UNDER AGRISILVICULTURE SYSTEM

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Abstract: *The present investigation entitled "Impact of different pruning intensities of dalbergia sissoo on Paddy yield under agrisilviculture system" The main objective of this study was to find out the most appropriate pruning intensity in Dalbergia sissoo for maximum production of paddy under agrisilviculture system. Significantly highest grain and straw yield of paddy was recorded under open condition (26.8 q ha⁻¹ and 45.5 q ha⁻¹ respectively) where as no pruning recorded significantly lowest grain and straw yield (16.5q ha⁻¹ and 34.1q ha⁻¹ respectively) and the percent reduction in grain and straw yield due to shade was 38.44% and 25.06% respectively. Among different pruning intensities, 75% pruning produced significantly maximum grain yield (23.7 q ha⁻¹) and straw yield (40.5 q ha⁻¹) followed by 50% (21.1 q ha⁻¹ and 37.2 q ha⁻¹) and 25% pruning (18.6 q ha⁻¹ and 35.8 q ha⁻¹). The percent reduction in grain yield under no pruning, 25%, 50% and 75% pruning over open (no tree) was 38.44%, 30.60%, 21.27% and 11.57% respectively.*

Key word: *Agroforestry, pruning intensities, grain yield and straw yield.*

Introduction

Agroforestry may be one of the solutions to increase forest area to one third of the total geographical area of our country. The present forest area of the country i.e. 70.1 million ha. (21.34%) is not in a position to meet out the present demand of fuel, fodder, timber, raw material for small and large scale industry and forest products. The importance of agroforestry land use for food, fuel, fodder, fruits, fertilizer, timber, etc. and also in conservation of natural resources have been well recognized. The agrisilviculture (tree+crop) system is more productive and sustainable than agriculture. Agricultural crops grown with agroforestry trees relatively poor yielder due to effect of shade. Shade intensity has strong negative effects on the performance of under storey crops (Singh et al., 1993). Light is a critical factor affecting the performance of field crops under agroforestry intervention. Pruning has become an essential practice for reducing both above and below ground competition with associated crops (Fownes and Anderson, 1991; Sinclair et al., 1998). Paddy can be grown successfully in open condition and in

association with *Dalbergia sissoo*. Management practices are very necessary to get optimum production from an agrisilviculture system. The present experiment was undertaken with the following objectives of the impact of variable pruning intensity on paddy crop yield under agrisilviculture system.

Material and methods:

The field experiment was conducted at Dusty Acres Research Farm, Department of Forestry, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur. Jabalpur is situated at 23°9' North latitude and 79°58' East longitudes with an altitude of 411.78 meters above the mean sea level. The climate of the locality is characterized as typically semi-humid and tropical, which is featured by hot dry summer and cool dry winter. It is classified as " Kymore Plateau and Satpura Hills" agro-climate zone, as per norm of National Agricultural Research Project and is broadly known as rice-wheat crop zone of Madhya Pradesh. During the six growing month of the crop (June to Nov. 2013). Maximum temperature (41.8°C) was recorded in June and minimum temperature (8.9°C) in Nov. relative humidity ranged between 44 to 95 %

in morning and 17 to 88% in evening. The total rainfall received during the six month was 2435.2 mm, in 71 rainy days. Out of which 1798.10mm (73.8%) was recorded in 39 days during growing season of crop mid third week of July to September.

Experimental details

There are 5 main treatments (4 pruning intensities+1 open) P0 - No pruning (control) P25 - 25% pruning, P50 - 50% pruning, P75 - 75% pruning, Open - No tree (Crop only) the Tree spacing 5 m x 5m are Replicated in 5 times under Strip plot design.. The Gross plot size is 4.4 m x 4.4 m Net plot size 4m x 4m Seed rate (Recommended dose)80 kg ha⁻¹ Row spacing for paddy 20 cm Recommended dose of fertilizer 120:60:40 :: NPK kg ha⁻¹.

Growth and yield parameter At and post harvest observations

Number of effective tillers/MRL Length of panicle (cm) Number of grains/panicle Number of filled grains/panicle Number of unfilled grains/panicle 1000 grain weight (g) Grain yield (q ha⁻¹) Straw yield (q ha⁻¹) Harvest index (%) The results recorded in various experiments were statistically analysed for drawing out definite conclusions.

Result & Discussion

Yield attributing characters

Number of Effective tillers/MRL

At harvest different pruning intensities showed significant effect on number of effective tillers/MRL. Crop under open condition (no tree) recorded significantly higher number of effective

tillers/MRL (51.3) at par with 75% pruning but significantly superior to other pruning treatment i.e. 25%, 50% and no pruning. As the pruning intensities increased, there was significant increased in number of effective tillers/MRL, hence, 75% pruning recorded significantly higher number of effective tillers/MRL (50.3) which in turn was significantly superior to rest of the pruning treatment i.e. 50% pruning (46.9) and 25% pruning (45.3). No pruning recorded significantly lowest number of effective tillers/MRL (44.1) at par with 25% pruning (45.3).

Length of panicle

Different pruning intensities showed significant effect on length of panicle. Significantly maximum panicle length was recorded under open condition (25.3 cm) at par with 75% pruning (24.2 cm) and was significantly superior to 50%, 25% and no pruning which recorded minimum panicle length (22.6 cm).

Number of filled grains/panicle

Different pruning intensities showed significant effect on number of filled grains/panicle. Significantly more number of filled grains/panicle (126.5) was recorded in open condition at par with 75 % pruning (122.8) but significantly superior to other treatments. Among different pruning intensities, 75 % pruning recorded highest filled grain/ panicle (122.8) at par with 50 % pruning (116.5) but superior to 25% pruning (110.1). No pruning recorded significantly lowest number of filled grain/ panicle (107.9).

Table1: Yield attributing characters of paddy as affected by different pruning intensities, under agrisilviculture system.

Treatment	No.of effective tillers/MRL	Length of panicle (cm)	No. of filled grains/ Panicle	No. of unfilled grains/ panicle	1000 grain weight (g)
Pruning intensities					
P ₀ - No pruning	44.1	22.6	107.9	43.5	24.3
P ₁ - 25% pruning	45.3	23.0	110.1	38.3	24.5
P ₂ - 50% pruning	46.9	23.8	116.5	36.5	26.3
P ₃ - 75% pruning	50.3	24.2	122.8	37.7	27.0
Open- (crop alone)	51.3	25.3	126.5	37.2	30.2
SEm±	0.5	0.4	3.0	1.4	0.6
CD (P = 0.05)	1.5	1.2	9.1	4.3	1.7

Number of unfilled grain/panicle

Number of unfilled grain/panicle was significantly affected by pruning treatment. Significantly maximum no of unfilled grain/panicle recorded in no pruning (43.5) having maximum shade whereas open condition recorded (no shade) significantly lowest number of unfilled grain per panicle (37.2). Number of unfilled grain per panicle decreased with increasing pruning intensities hence, 75% pruning recorded significantly lowest number of unfilled grain per panicle as compared to 50%

pruning (36.5) and 25% pruning (38.3) which were at par.

1000 grain weight (gm)

Pruning intensities showed significant effect on 1000 grain weight. Open condition recorded significant higher 1000 grain weight (30.2 gm) which in turn was significantly superior to 75% pruning and 50% pruning. Among different pruning intensities, 75% pruning recorded highest test weight (27.0) at par with 50% pruning (26.3). No pruning recorded significantly lowest test weight (24.3) at par with 25% pruning (24.5).

Grain and Straw Yield (q ha-1)

Table 2: Grain yield, straw yield and harvest index of paddy as influenced by different pruning intensities in agrisilviculture system.

Treatments	Grain yield (qha ⁻¹)	Straw yield (q ha ⁻¹)	Harvest Index (%)
Pruning intensities			
P ₀ - No pruning	16.5	34.1	32.6
P ₁ - 25% pruning	18.6	35.8	34.1
P ₂ - 50% pruning	21.1	37.2	36.1
P ₃ - 75% pruning	23.7	40.5	36.8
Open- (crop alone)	26.8	45.5	37.3
SEm±	0.5	0.5	0.6
CD (P = 0.05)	1.6	1.6	1.8

Grain Yield (q ha-1)

Different pruning treatments showed significant influence on grain yield of paddy. Significantly maximum grain yield of paddy was recorded under open condition (26.8 q ha⁻¹) which in turn was significantly superior to all the pruning treatments and no pruning. Among pruning intensities, significantly maximum grain yield was recorded under 75% pruning (23.7 q ha⁻¹) followed by 50% pruning (21.1 q ha⁻¹) and 25% pruning (18.6 q ha-1). No pruning recorded significantly lowest grain yield (16.5 q ha⁻¹). The percent reduction in grain yield under no pruning, 25%, 50% and 75% pruning as compared to open condition was 38.44%, 30.60%, 21.27% and 11.57%, respectively.

Straw yield (q ha-1)

Straw yield of paddy was significantly affected by different pruning treatment. Open

condition recorded significantly higher straw yield (45.5 qha⁻¹) and was significantly superior to all the pruning treatment and no pruning. Among different pruning treatments, 75% pruning recorded significantly higher straw yield (40.5 qha⁻¹) followed by 50% pruning (37.2 qha⁻¹) and 25% pruning (35.8 qha-1). No pruning recorded the lowest straw yield (34.1qha⁻¹). The percent reduction in straw yield under no pruning, 25%, 50% and 75% pruning as compared to open (no tree) was 25.06%, 21.32%, 18.25% and 10.99%, respectively.

Harvest Index (%)

Harvest index was significantly affected by different pruning treatments. Significantly higher harvest index was recorded under open condition (37.3) at par with 75% pruning (36.8) and 50% pruning (36.1). No pruning recorded significantly lowest harvest index (32.6) at par with 25% pruning.

The percent reduction in harvest index under different pruning treatment viz. no pruning 25% pruning 50% pruning and 75% pruning as compared to control (open-no tree) was 12.6, 8.84, 3.2 and 1.34 percent respectively.

Pruning intensities

It is obvious from the results that number of effective tillers/MRL, length of panicle, number of filled grains per panicle, number of unfilled grains per panicle and 1000 grain weight varied significantly by different pruning intensities. Open condition (sole crop) recorded significantly highest number of effective tillers/MRL (51.3), number of filled grain (126.5), length of panicle (25.3), and 1000 grain weight (30.2 g) as compared to crop grown with trees under different pruning intensities. The probable reason for higher number of tillers/MRL, panicle length in open condition was that more light has found and it helps in photosynthesis, multiplication of cells as a result it gives more length of panicle. Similar results was also found by Puri et al., 2001. Islam et al. 2006; Dar, 2007.

Grain and straw yield

Effect of pruning intensities

In the present study crop grown under open condition (without tree) recorded significantly highest grain yield (26.80 q ha⁻¹) as compared to crop grown with trees under different pruning treatments. The probable reason higher yield under open condition is that, open condition received maximum sunlight, result produce maximum number of tillers per meter row length (72.1), number of effective tillers/MRL (51.3), plant height (74.1 cm) and length

of panicle (25.30 cm) as compared to other pruning treatments having different shade areas, as a result it gave higher grain yield. Sharma (2003), Handa and Rai (2001-02), Ram Newaj et al. (2001) reported the similar results. It was also suggested by Prasad et al. (1997) that in an agroforestry system, reduction in intercrop yields could be minimized by proper pruning of tree component. Upadhyaya and Nema (2003) reported that in Acacia based agrisilviculture system different pruning intensities (20, 40, 60 and 80%) improved light penetration and significantly increased the yield of paddy in 80% pruning intensity.

The reduction in growth and yield of field crops grown with tree due to adverse effect of tree species in agroforestry system than their pure cropping. Similar results have also been reported by Puri et al. (2001); Shamughavel et al. (2001); Islam et al. (2006); Karwar et al. (2006); Dhillon et al. (2007).

Conclusion

Among different pruning intensities, 75% pruning recorded significantly higher number of effective tillers/meter row length, length of panicle and all these plant character were decreased significantly with decrease pruning intensities. Hence, no pruning is having significantly lowest number of effective tillers/meter row length and length of panicle as compared to 75% pruning.

Among different pruning intensities, 75% pruning recorded significantly higher grain yield than 50% pruning and 25% pruning. No pruning recorded significantly lowest grain yield.

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