The Pharma Innovation Journal 2023; SP-12(12): 2354-2358

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(12): 2354-2358

www.thepharmajournal.com
Received: 06-10-2023
Accepted: 10-11-2023

Priya Jaiswal
Ph.D. Scholar, Department of Forestry, CoA, JNKVV, Jabalpur, Madhya Pradesh, India

Yaspal Singh
Assistant Professor, Department of Forestry, CoA, JNKVV, Jabalpur, Madhya Pradesh, India

Dr. Aashutosh Sharma
Scientist, Krishi Vigyan Kendra, Narsinghpur, JNKVV, Jabalpur, Madhya Pradesh, India

Kamal Kishor Patel
Ph.D. Scholar, Department of Soil Science and Agricultural Chemistry, CoA, JNKVV, Jabalpur, Madhya Pradesh, India

Ajay Kumar Shah
Faculty, Department of Forestry, CoA, JNKVV, Jabalpur, Madhya Pradesh, India

Corresponding Author:
Ajay Kumar Shah
Faculty, Department of Forestry, CoA, JNKVV, Jabalpur, Madhya Pradesh, India

Growth behavior and productivity status of wheat under *Dalbergia sissoo* (Roxb.) based agri-silviculture system

Priya Jaiswal, Yaspal Singh, Dr. Aashutosh Sharma, Kamal Kishor Patel and Ajay Kumar Shah

Abstract
The present investigation entitled "Growth behavior and productivity status of wheat Under *Dalbergia sissoo* (Roxb.) Based Agri-silviculture system" were carried out during Rabi season of 2019-20 at the research form of Department of Forestry, College of Agriculture Jabalpur J.N.K.V.V (M.P). the present investigation was aimed to determine production potential of Wheat (JW-1215) under Agroforestry forming practices (Agri-silviculture) were conducted in RBD for different physiological parameter like Plant height, Number of tillers, spike length number of Fertile spikes Grain weight, Grain yield, Biological Yield, Harvesting index, and economics of this system, It was observed that significantly higher field emergence was observed in in 30 DAS and 60 DAS and at harvest stage was Maximum plant height in Open condition (74.73 cm), Among pruning intensity reduction with pruning intensity (75%, 50%, 25%, and no pruning) (72.96 cm, 71.41 cm, 70.31 cm, 68.86 cm) Number of tillers expressed the effect of treatment was significantly maximum in open condition (11.86) at par with 75% pruning intensities (11.12), and Test Weight Varietal variation recorded maximum in open condition (33.82 gm) at par with 75% pruning intensities (31.26 gm) spike length significantly higher was found in open condition (14.29 cm) at par with 75% pruning intensities (13.69 cm) similarly 37.95% Harvest Index were observed maximum in and 75% pruning intensities (37.12 cm) respectively and treatment variation shown significantly effect on grain yield (24.38 kg ha^{-1}) was found in open condition at par with 75% pruning intensities (23.17 kg ha^{-1}).

Keywords: Production, growth, yield, pruning intensity, wheat, *Dalbergia sissoo* etc

Introduction
Agro forestry can be defined as an approach to land use that incorporates trees into farming systems, and allows for the production of trees and crops or livestock from the same piece of land in order to obtain economic, environmental, ecological, and cultural benefits (Thevathasan *et al.*, 2004) [12, 13]. The Agroforestry will receive a major thrust in Madhya Pradesh not only for timer wood, fuel wood fodder production but also for organic matter build up in poor and marginal soil. Agroforestry component can be a progressive method for sequestering excess carbon of the atmosphere and act carbon sink resulting in enhanced productivity and better economic status of farmers from limited area. The agri-silviculture (tree+ crop) system are more productive and sustainable than agriculture. There are many MPTS which can be used in agro forestry system *Dalbergia sissoo* one of them.
Wheat is grown extensively under agro-forestry system in central and northern India. This exhausting cropping system in this fertile plain of country has deteriorated the status of soil and water Such intensive cropping system has led to indiscriminate use of chemical that have further worsened the nutrient balance besides increasing the pest incidence cost of production and environment problems. There is needs for diversification from this this over exploiting cropping system. One of the viable options is the adoption of agro forestry (Gill, R.I. *et al.*, 2016) [2]. In agri-silviculture system pruning facilitates penetration of light and alleviates shading of understory crop and simultaneously increase the merchantable value of tree component. Pruning of tree has been extensively used in silviculture management to improve quality of timber value.
Pruning is a common silvicultural practice to increase wood production, improve tree shape and potentially uses to obtain poles and fire wood without decrease in wood productivity. Pruning of tree component is a powerful approach to regulate light, nutrients and other resource competition, the effect of height and intensity of pruning on biomass production.

It improves wood quality and tree stem shape. Pruning decreased the tree taper and increases the volume and medium pruning intensity has highest volume increment.

Material and Methods

The field experiment was conducted at Dusty Acres Research Farm, Department of Forestry, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur during Rabi season of 2019-2020. 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. In order to find out the physico-chemical properties of soil of the experimental field, soil samples were taken randomly from different spots at a depth of 0 to 30 cm with the help of screw auger before sowing of the experiment. The soil samples were well mixed together for making representative samples. As per treatments nitrogen, phosphorous and potash were given through Urea, SSP and MOP, respectively. The half amount of the nitrogen (as per the treatment) and full quantity of phosphorous (60 kg P_2O_5 /ha) and potash (40 kg K_2O/ha) were applied at the time of sowing as basal dose and remaining half nitrogen applied 30 days after sowing as topdressing on standing crop.

Sowing of wheat was done in all the plots of experiment on 14 November 2020. Required quantity of seed was first treated with Dithane M-45 @ 2-3 gm. per kg of seed against seed borne diseases prior to sowing. Sowing was done in lines 20 cm row to row and furrows of 5 cm depth were opened with the help of pickaxe. These furrows were dressed first with fertilizer (i.e. NPK as per treatment) mixed with soil and then with seeds, covered the open furrow properly with the help of manual labour to prevent damage from bird and for proper germination. Pruning selectively removing branches on young tree through crown promotes the better from and health by increasing light penetration and air movement. Strong emphasis is on removing weak branches.

Result and Discussion

Plant height

The data Table 1 shows the plant height; Plant height open condition recorded significantly higher plant height. Whereas no pruning recorded significantly lowest plant height respectively. increase the pruning intensities, increased the plant height hence 75% pruning recorded significantly higher plant height closely followed by 50% pruning was superior to no pruning. This was found in all the observation recorded at 30 DAS, 60 DAS and at harvest stage. At Harvest open condition recorded significantly higher plant closely followed by 75% pruning (72.96 cm) and 50% pruning (71.41 cm) which was significantly superior to 25% pruning (70.31 cm). no pruning recorded the lowest plant height (68.86 cm) this may be due to fact that tree canopy could have affected the penetration of light and due to shade effect on understory annual crops, growth also effected. Similar result found that (Upadhyaya SD *et al.,* (2020) [15] wheat under open condition recorded significantly higher germination percentage (86.30) and plant height (64.15 cm).

Number of tillers

The data Table 2 demonstrated tillers under different pruning intensity; Number of tillers recorded 30 DAS, 60 DAS and At Harvest stage showed that open condition record significantly higher number of tillers/ meter row length (11.86) closely followed by 75% pruning (11.12) whereas no pruning recorded significantly lowest number of tiller/meter row length (7.05). Among pruning treatment, 75% pruning recorded significantly higher number of tillers meter/row length closely followed by 50% pruning and was superior to 25% pruning. This was found in all observation recorded at 30 DAS, 60 DAS, at harvest stages. at harvest 75% pruning recorded significantly higher number of tillers per meter row length (11.12) than 50% (8.58) and 25% pruning (7.88) which were at par and recorded significantly higher number of tillers /meter row length than no pruning. Droplemann and Berliner (2003) [16] also recorded the same results in agroforestry system. all the observation open condition (crop without tree) recorded significantly higher number of tillers m^{-2} at 30 DAS (290.0), 60 DAS (387.6) at harvest stage (424.4) than the plant grown under trees with differently pruning intensities, no pruning recorded significantly lowest number of tillers.

Spike length of wheat

Table 3 display the post-harvest yield attributing characters spike length different pruning intensities showed significant effect on length of spike significantly maximum spike length was recorded under open condition (14.29) at par with 75% pruning (13.69) and 50% pruning (12.08) which were at par with No pruning recorded significantly lowest spike length (9.44). The probable reason for higher number of spike length in open condition was that more light was helped in photosynthesis, multiplication of cell as a result it produced more length of panicle similar result were also found Puri *et al*., (2001) [7]. Among different pruning intensities, 75%pruning intensities recorded significantly higher yield attributes spike length (21.7).

Number of fertile spikes

Table 4 exhibit the Number of fertile spikes on different pruning intensities showed significant effect on number of fertile spikes significantly more number of fertile spikes (103.71) was recorded in open condition which in turns was significantly superior to other pruning treatments and no pruning. Among different pruning intensities, 75% (100.71) pruning recorded highest number of fertile spikes at par with 50% pruning (96.27) and 25% pruning (80.18) but superior to no pruning which recorded significantly lowest number of fertile spikes (79.49). The probable reason pruning at suitable age had vital importance to get maximum production of intercrops due to more light transmission to crop. Similar results reported by Newaj *et al*., (2005) [4] among different pruning intensities, 75% pruning intensities recorded significantly higher yield attributes as number of filled grains (116.2).

1000 grain weight

Pruning intensities showed significant effect on 1000-grain weight, Open condition recorded significant higher 1000 grain weight (33.82) at par with 75% pruning (31.26) but significantly superior to rest of the treatments. Among different pruning intensities, 75% pruning recorded highest grain weight (31.26) at par with 50% pruning (30.28) but superior to 25% pruning and no pruning. No pruning recorded significantly lowest test weight (27.15) at par with 25% pruning (28.34) and 50% pruning (30.28) this 1000 gain weight shown in Table 5. this was mainly due to fact that the pruning of trees minimum competition for light, nutrient and water similar result found is Suresh and Rao (1999) [11].

Straw and seed yield (q ha^{-1})

Table 6 reflected the straw and grain yield. The wheat straw yield was significantly affected by different pruning treatment. Open condition recorded significantly higher straw yield (41.29 qha^{-1}) at par with 75% pruning (38.33 qha^{-1}) and 50% pruning (37.86 qha^{-1}) and was (37.94 qha^{-1}) significantly superior to 25% pruning and no pruning. Among different pruning treatments, 75% pruning recorded significantly higher straw yield (34.83 qha^{-1}) at par with 50% pruning (37.86 qha^{-1}) but significantly superior to 25% pruning (37.94 qha^{-1}). The percent reduction in straw yield under no pruning, 25%, 50% and 75% pruning as compared to open (41.29) was 75%, 50%, 25% and no pruning, respectively. However the grain yield was varied between 15.44 to 24.38 q ha^{-1}. The data found the significantly superior to each treatment 75% pruning and open system significantly superior to 50%, 25% and no pruning intensity. Whereas 50% pruning significantly to 25% and No pruning. The provable reason might be due to more availability of light in 75% in pruning, canopy pruning increased the availability of photo-synthetically active radiation and reduced the competition for light its help the proper transpiration and all physiology process easily to help to the crop growth. Similar result found also Rahangdale *et al*., (2017) [17], Singh *et al*., (2016) [18] maximum number of shoots (m^{-2}), grain per ear/ panicle, test weight (1000 grain weight grams), grain yield (t ha^{-1}) was recorded in case of wheat variety NW-1067.

Morphological characters of *Dalbergia sissoo* Tree

This study was shown in Table 7. Morphological characters of sheesham Tree height (m), dbh (cm), & Canopy spread (N-S, E-W) pruning intensities showed no significant effect on tree height. The dbh of the tree significantly influenced by different pruning treatments. In 25% pruning (29.29 cm) recorded higher dbh which was at par to 50% pruning (27.23 cm) and no pruning (22.29 cm). The 75% pruning recorded lower dbh (21.97 cm).the pruning levels were respectively light (25%, 50% pruned) it's may be reason of lower dbh value in 75% pruning may be due to heavy pruning leads to greater removal of leaf area than light pruning and strongly reduces the overall carbohydrate production of a tree. In pruning, not only the leaves are removed, but also some unproductive wood is also removed. This implies that pruning reduces both the production and the consumption of the carbohydrates, which affect the tree growth adversely. It may be the reason of lower dbh of tree under 75% pruning as compared to 50% pruning, 25% pruning and unpruned trees similar result found that (Bhargava R. 2016) [19], Breadenkamp *et al*., (1980) [20] Cylindrical volume of tree was significantly influenced by different pruning treatment. 25% pruning recorded significantly higher cylindrical volume (9.20 m^3 ha^{-1}) at par with 50% pruning (7.30 m^3) ha^{-1}and no pruning (5.97 h m^{3}a-1) but significantly superior to 75% pruning, which recorded significantly lowest cylindrical volume (5.30 m^3 ha^{-1}).

Cylindrical volume is ultimate product of height and dbh of tree. pruning by removing leaves and branches from lower parts of crown which changes the stem shape to more cylindrical volume from and increases the clear bole length, result in more biomass allocation in bole the other components Pinkard *et al.*, (2004) [6]. Different pruning intensities showed significant effect on stand biomass of the tree. At the age 21 years, significantly highest stand biomass was recorded in 25% pruning (2394.43 kg ha^{-1}) at par with 50% pruning (1899.60 kg ha^{-1}) and No pruning (1553.30 kg ha^{-1}). 75% pruning recorded significant lowest biomass stand biomass (1402.36 kgha^{-1}). The result clearly showed that more pruning reduced biomass production and this reduction has positive has correlation with amount of pruning, most likely, likely the reduction may be due to the diminished photosynthesis of pruned trees, because pruning of branches leads to decrease in remaining leaf area and to decrease in the number of buds from which new branches and leaves can be produced similar also reported by Pinkard *et al.*, 1999 [5].

Table 1: Plant height wheat under *Dalbergia sissoo* (Roxb.) based Agri-silviculture System

Treatment	30 DAS	60 DAS	At harvest
P_0-No pruning	26.33	58.77	68.86
P_1-25% pruning	27.91	62.10	70.31
P_3-50% pruning	29.77	63.86	71.41
P_4-75% pruning	31.26	67.12	72.96
Open (crop-alone)	32.07	68.76	74.73
SEm±	0.05	0.17	0.09
CD (P=0.05)	0.14	0.49	0.26

Table 2: Number of tillers Wheat under *Dalbergia sissoo* (Roxb.) based Agri-silviculture System

Treatment	30 DAS	60DAS	At harvest
P_0-No pruning	5.23	6.23	7.05
P_1-25% pruning	5.54	7.13	7.88
P_3-50% pruning	6.25	7.96	8.58
P_4-75% pruning	6.91	9.56	11.12
Open (crop-alone)	7.97	10.40	11.86
SEm±	0.06	0.04	0.06
CD (P=0.05)	0.18	0.11	0.18

Table 3: Spike length Wheat under *Dalbergia sissoo* (Roxb.) based Agri-silviculture System

Treatment	60 DAS	At harvesting
P_0-No pruning	3.86	9.44
P_1-25% pruning	4.57	10.51
P_3-50% pruning	4.85	12.08
P_4-75% pruning	5.11	13.69
Open (crop-alone)	5.22	14.29
SEm±	0.05	0.04
CD (P=0.05)	0.14	0.12

Table 4: Number of grain spike Wheat under *Dalbergia sissoo* (Roxb.) based Agri-silviculture System

Treatment	60 DAS	At harvesting
P_0-No pruning	22.08	79.44
P_1-25% pruning	25.32	80.18
P_3-50% pruning	27.06	96.27
P_4-75% pruning	28.62	100.41
Open (crop-alone)	29.60	103.71
SEm±	0.05	0.07
CD (P=0.05)	0.16	0.21

Table 5: Grain weight Wheat under Dalbergia sissoo (Roxb.) based Agri-silviculture System

Treatment	1000 Grain weight (gm)
P_0-No pruning	27.15
P_1-25% pruning	28.34
P_3-50% pruning	30.28
P_4-75% pruning	31.26
Open (crop alone)	33.82
SEm±	0.05
CD (P=0.05)	0.16

Table 6: Grain yield and straw yield Wheat under *Dalbergia sissoo* (Roxb.) based Agri-silviculture System

Treatment	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})
P_0-No pruning	15.44	35.03
P_1-25% pruning	16.25	37.86
P_3-50% pruning	19.27	37.94
P_4-75% pruning	23.17	38.83
Open (crop-alone)	24.38	41.29
SEm±	0.36	1.81
CD (P=0.05)	1.07	5.33

Table 7: Measurement of tree *Dalbergia sissoo* (Roxb.) based Agri-silviculture System

Treatment	Tree height (m)	Dbh 1.37 (cm)	Canopy spread		Cylindrical volume (m^3 ha^{-1})	Stand biomass (Kgha^{-1})
			(N-S)	(E-W)		
P_0-No pruning	10.96	27.23	9.61	7.87	5.97	1553.30
P_1-25% pruning	11.99	29.29	8.71	6.99	9.20	2394.43
P_3-50% pruning	11.41	22.29	7.06	6.12	7.30	1899.60
P_4-75% pruning	10.53	21.97	6.13	5.59	5.30	1402.36
SEm_+	0.04	0.05	0.15	0.04	1.07	244.20
CD (P=0.05)	0.12	0.14	0.14	0.13	3.14	720.29

Conclusion

The result of the present study conducted that open condition was favorable for crop growth followed by 75% pruning intensity. Grain yield, straw yield, biological yield and harvest index were significant highest in open condition at par with 75% pruning intensity but highest obtain Gross monetary return and Net monetary return in 75% pruning intensity at par with 50%, 25% pruning intensity followed by open condition lowest significant recorded in No pruning intensity. Among all the pruning intensities (No pruning, 25%, 50% and 75% pruning) 25% pruning recorded significantly height (11.99 m), dbh (29.29 cm) cylindrical volume (9.20 m3 ha^{-1}) and stand biomass (2394.34 kg ha^{-1})

Acknowledgements

I would like to express my sincere gratitude to the Department of Soil Science and agricultural chemistry CoA, JNKVV, Jabalpur for providing valuable resources for this experiment and to express my humility to the Department of Statistics, CoAE, JNKVV Jabalpur providing a tool for data analysis.

References

1. Fran E, Eduuaro S. Biomass dynamics of *Erythrinal anceolata* as influenced by shoot pruning intensity in cost rice. Agroforestry system. 2003;57:19-28.
2. Gill RI, Singh B, Kaur N. Productivity and nutrient uptake of newly released wheat varieties at different

sowing times under poplar plantation in north western India. Agroforestry System. 2016;76(1):579-590.
3. Handa AK, Rai P. Agrisilviculture studies under rainfed condition. Annual report NRCAF Jhansi. 2002, p. 12-14.
4. Newaj R, Yadav RS, Dar SA, Shankar AK. Response of management practices rooting pattern of *Albizia procera* and their effect on grain yield of soyabean and wheat in agri-silviculture system. Indian Journal of Agroforestry. 2005;7(2):1-9.
5. Pinkard EA, Battagalia M, Beadle CL, Sanda PJ. Modeling the effect of physiological response to green pruning on net biomass production of *Euucalyptus nitens*, Tree physiology. 1999;19:1-12.
6. Pinkard EA, Mohammed GL, Hall MF, WIorledge D, Nollon A. Growth response, physiology and decay associated with pruning plantation grown *Eucalyptus globulus* Labil and *E. nintens* (Deane and Maiden). Forest ecology and management. 2004;200:263-270.
7. Puri S, Rao E, Swamy BSL. Growth productivity of wheat variety in an agri-silviculture system. Indian Journal of Agroforestry. 2001;3(2):134-138.
8. RIS, Singh B, Kaur N. Productivity and nutrient uptake of newly released wheat varieties at different sowing times under poplar plantation in north western India. Agroforestry System. 2009;76(1):579-590.
9. Sharma NK, Singh RJ, Kumar K. Dry Matter Accumulation and Nutrient Uptake by Wheat (*Triticum aestivum* L.) under Poplar (*Populus deltoides*) Based Agroforestry System. International Scholarly Research Network ISRN Agronomy Article ID 359673, 2012, p. 7.
10. Shepherd KR. The effects of low pruning on increment in radiate pine plantation. Research not No.6 Forestry Commission of N.S.W. 1961.
11. Suresh G, Rao JV. Intercropping sorghum with nitrogen fixing trees in semiarid India. Agroforestry System. 1999;42:181-194
12. Thevathasan NV, Gordon AM, Simpson JA, Reynolds PE, Price GW, Zhang P. Biophysical and ecological interactions in a temperate tree - based intercropping system. Journal of Crop Improvement. 2004;12(1-2):339-363.
13. Thevathasan NV, Gordon AM, Simpson JA, Reynolds PE, Price GW, Zhang P. Biophysical and ecological interactions in a temperate tree - based intercropping system. Journal of Crop Improvement. 2004;12(1-2):339-363.
14. Upadhyay SD, Nema S. Tree crop interaction studies in Acacia based agrisilviculture system at farmer's field. JNKVV Research Journal. 2003;37(2):20-24.
15. Singh Y, Mishra RC, Upadhyaya SD, Singh A. Growth performance, productivity and carbon sequestration of wheat (*Triticum aestivum*)-Shisham (*Dalbergia sissoo*) based agri-silviculture system with especial reference to tree pruning intensities and agronomic practices. Int. J Curr. Microbiol. App. Sci. 2020;9(01):406-413.
16. Berliner LM. Physical-statistical modeling in geophysics. Journal of Geophysical Research: Atmospheres. 2003 Dec 27;108(D24).
17. Bisen N, Rahangdale CP. Crop residues management option for sustainable soil health in rice-wheat system: A review. International Journal of Chemical Studies. 2017;5(4):1038-1042.
18. Singh B, Singh JP, Kaur A, Singh N. Bioactive compounds in banana and their associated health benefits–A review. Food chemistry. 2016 Sep 1;206:1-1.
19. Bhargava R, Onyango DO, Stark JM. Regulation of single-strand annealing and its role in genome maintenance. Trends in Genetics. 2016 Sep 1;32(9):566-575.
20. Bredenkamp BV, Malan FS, Conradle WE. Some effects of pruning on growth and timber quality of Eucalyptus grandis in Zululand. South African Forestry Journal. 1980 Sep 1;114(1):29-34.