Int.J.Curr.Microbiol.App.Sci (2018) *7*(8): 4736-4740

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 7 Number 08 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.708.499

Role of Leaf Litter Fall Decomposition of Poplar (*Poplar deltoids*) on Wheat Intercropping System

Sameer Daniel[1], S. B. Lal[2], Puja Kishore[1*], Animesh Kanaujia[1*] and Azad Kumar Singh[1]

[1]Department of Agroforestry, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad (U.P)-211007, India
[2]Department of Forestry, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad (U.P)-211007, India

**Corresponding author*

Keywords

Poplar deltoids, leaf litter, spacing, fresh weight, dry weight

Article Info

Accepted:
26 July 2018
Available Online:
10 August 2018

A B S T R A C T

The study was carried out at school of forestry and environment nursery, Allahabad, Uttar Pradesh. An eight year old plantation of clone of G-48 of Poplar (*Populus deltoids*) was selected. The leaf litter fall we found that the decomposition of poplar leaf litter is very slow; this has detrimental physical effect on wheat intercrop. Plant height, numbers of leaves/ plant, fresh wt. of root (g) dry wt. of root (g), numbers of tiller/plants, fresh wt. of shoot (g), dry wt. of root (g), total dry matter production and yield parameter of intercropped wheat were significantly increased by monthly removal of poplar leaf litter in plantation of poplar raised at 3X6m spacing. However, despite removal of leaf litter at such frequent interval, yield of intercropped wheat crop is quite low in comparison with open field. However, further studies are needed to screen various other cultivated crops of the region to find out compatible crops, which could be complementary in the system. Furthermore, there is a need to evolve wheat varieties suitable for inter cultivation in such a system as the tree mature and attains harvestable age. By combining suitable complementary variety along with tree farming the production level of both grain and timber can be sustained in future.

Introduction

Wheat (*Triticium aestivum* L.) belongs to the family Poaceace. Decendole believed that wheat originated in the valley of Euphriates and Tigirs and spread from there to China, Egypt and other parts of the world. It is believed that wheat developed from a type of wild grass native to the arid lands of Asia Minor. Cultivation of wheat is thought to have originated in the Euphrates Valley as early as 10,000 B.C., making it one of the world's oldest cereal crops. In the Mediterranean region, centuries before recorded history, wheat was an important food. Wheat played such a dominant role in the Roman Empire that at the time it often was referred to as a "Wheat Empire." Wheat is a type of grass grown all over the world for its highly nutritious and useful grain. It is one of the top three most produced crops in the world, along with corn and rice. Wheat is the second most

important grain-crop in India, next to rice and it contributes to the total food grain production of the country to the extent of 35%. Wheat is usually accorded a premier place among cereals because of vast acreage devoted and it's associated with some of the earliest and most important civilization of the world. Wheat, which can be produced in a wide range of climates and soil conditions, grows in areas as far north as the Arctic Circle and as far south as the equator.

The production of wheat is so widespread that it is being harvested somewhere in the world in any given month. But wheat grows best in regions having temperate climates with rainfall between 12 and 36 inches per year. The United States ranks fourth in world wheat production, following: 1) China, 2) the Commonwealth of Independent States, and 3) the European Community (whose major producers are France, the United Kingdom and Germany).

Materials and Methods

The study was carried out at school of forestry and environment nursery, Allahabad, Uttar Pradesh. An eight year old plantation of clone of G-48 of Poplar was selected. The spacing of trees in the plantation was 9x3 m. Variety PBW 343 of wheat was sown throughout the plantation. The same variety was also sown in an open field near the plantation to serve as control. Four replications of the following five treatment of litter removal frequency were allocated in the plots in randomized complete block design. The treatments were Twice in a week (T_1), once per week (T_2), once per two week (T_3), No removal (T_4). Leaf litter was initially removed on December 27, 2013 from the plots in respective treatments viz. T_1 T_2 and T_3 and litter was not removed from T_4. Seedling had already emerged from the ground by that time. Therefore, leaves were removed from the plots as per the schedule.

Results and Discussion

Among the leaf litter fall used the maximum plant height was found with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 30, 60, 90 and 120 DAS. While minimum plant height was recorded with no removal of leaf litter fall i.e. T_4. Scrutiny of the summary shows that the maximum root length was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 120 DAS. While minimum root length was recorded with no removal of leaf litter fall i.e. T_4. The maximum no. of leaves/plants was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 30, 60, 90 and 120 DAS. While minimum no. of leaves/plants was recorded with no removal of leaf litter fall i.e. T_4. The maximum fresh wt. of shoot was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 30, 60, 90 and 120 DAS. While minimum fresh wt. of shoot was recorded with no removal of leaf litter fall i.e. T_4. The maximum dry wt. of shoot was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 30, 60, 90 and 120 DAS. While minimum dry wt. of shoot was recorded with no removal of leaf litter fall i.e. T_4. The maximum no. of tillers/ plants was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 30, 60, 90 and 120 DAS. While minimum no. of tillers/ plants was recorded with no removal of leaf litter fall i.e. T_4. The maximum fresh wt. of root was found

maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 30, 60, 90 and 120 DAS. While minimum fresh wt. of root was recorded with no removal of leaf litter fall i.e. T_4.

The maximum dry wt. of root was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 30, 60, 90 and 120 DAS. While minimum dry wt. of root was recorded with no removal of leaf litter fall i.e. T_4. The maximum total dry matter production was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 30, 60, 90 and 120 DAS. While minimum total dry matter production was recorded with no removal of leaf litter fall i.e. T_4. The maximum grain yield was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 120 DAS. While minimum grain yield was recorded with no removal of leaf litter fall i.e. T_4. Among the different Leaf litter fall used the maximum No. of grain/ panicle was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 120 DAS. While minimum No. of grain/ panicle was recorded with no removal of leaf litter fall i.e. T_4. Among the different leaf litter fall used the maximum straw yield was found maximum with treatment T_5 (open field) followed by T_1 (twice per week removal) and was also statistically significant over the all other treatments at 120 DAS. While minimum straw yield was recorded with no removal of leaf litter fall i.e. T_4. The maximum length of panicle was found maximum with treatment T_5 (open field) followed by T_1 (Twice per week removal) and was also statistically significant over the all other treatments at 120 DAS. While minimum length of panicle was recorded with no removal of leaf litter fall i.e. T_4.

Table.1 Effect of poplar leaf litter fall on wheat under agroforestry system

Observation recorded	Years	
	2013-14	**2014-15**
Plant height (cm)	66.93	60.18
No. of leaves/plants	3.70	3.64
Shoot fresh weight (g)	28.67	27.94
Shoot dry weight (g)	9.90	10.00
No. of tiller/plants	7.24	7.52
Root fresh weight (g)	3.36	3.27
Root dry weight (g)	1.60	1.63
Total dry matter production	11.50	11.26
Grain yield (q/ha)	22.54	22.52
No. of grain/panicle	26.71	32.96
Straw yield (q/ha)	32.85	32.86
Thousand grains wt.	33.09	33.19
Root length	8.72	8.72

Among the different leaf litter fall used the maximum thousand grain wt. was found maximum with treatment T_5 (open field) followed by T_1 (Twice per week removal) and was also statistically significant over the all other treatments at 120 DAS. While minimum thousand grain wt. was recorded with no removal of leaf litter fall i.e. T_4.

From the leaf litter fall we found that the decomposition of poplar leaf litter is very slow; this has detrimental physical effect on wheat intercrop. Plant height, numbers of leaves/ plant, fresh wt. of root (g) dry wt. of root (g), numbers of tiller/plants, fresh wt. of shoot (g), dry wt. of root (g), total dry matter production and yield parameter of intercropped wheat were significantly increased by weekly removal of poplar leaf litter in plantation of poplar raised at 3X6m spacing. However, despite removal of leaf litter at such frequent interval, yield of intercropped wheat crop is quite low in comparison with open field. However, further studies are needed to screen various other cultivated crops of the region to find out compatible crops, which could be complementary in the system. Furthermore, there is a need to evolve wheat varieties suitable for inter cultivation in such a system as the tree mature and attains harvestable age. By combining suitable complementary variety along with tree farming the production level of both grain and timber can be sustained in future.

References

Ahmed, R., Rafiqul Hoque, A.T.M. and Hossain, M.K. (2008). Allelopathic effects of *Leucaena leucocephala* leaf litter on some forest and agricultural crops grown in nursery. Journal of Forestry Research, 19 (4): 298-302.

Chauchan. V.K., and Dhiman, R.C. (2002). Evaluation of wheat (*Triticum aestivum*) under different spacing of poplar (*Populus deltoides*) in lower western himalyas Journal of Agri. Science. 2002, 72: 8, 470, 473; 11

Chauhan *et al.,* (1997) reported that the average annual dry litter production was 4.30 t/ha in Eucalyptus and 4.80 t/ha in poplar. Total annual litter production was maximum with Poplar + Japanese mint (5.36 t/ha) followed by Eucalyptus + Japanese mint (5.06 t/ha), Poplar + lemongrass (4.85 t/ha) and Eucalyptus + lemongrass (4.58 t/ha).

Chauhan, H.S; Kamla, S., Patra, D.D. and Singh, K. (1997). Studies on litter production, nutrient recycling and yield potential under (5, 6 years old) poplar (*P. deltoides*) and Eucalyptus (*E. hybrid*) interplanted with aromatic crops in Tarai region of Uttar Pradesh. Journal of Medicinal and Aromatic Plant Sciences. 1997, 19: 4, 1034, 1038.

Gurbachan *et al.,* (1997) conducted pot study with poplar (*Populus deltoides*) litter collected from 5 yr old plantations. The mean height increment and girth of the poplar saplings 4 months after planting were markedly better in litter-treated soil than in the control (no-litter treatment). Similarly, leaf, stem and root biomass values of the saplings were also significantly more in the litter treatments.

Gurbachan, S. Harinder, S. Jaspal, S. Singh, G; Singh, H; Singh, J (1997) Effects of *Populus deltoides* litter on its saplings, associated agricultural crops and the properties of an alkali soil. *Journal of Tropical Forest Science*. 9: 4, 536,545

Kaul *et al.,* (1983) presented data on biomass distribution and productivity of an 8 yrs old plantation of *Populus deltoides* in Uttar Pradesh, planted for the first three years with agriculture crops such as wheat, maize and oil seeds.

Kershnar, R. and Mountagnini, F. (1998). Leaf Litter Decomposition, Litterfall, and Effects of Leaf Mulches from Mixed and Monospecific Plantations in Costa Rica. Journal of Sustainable Forestry, 7 (3 & 4): 95 – 118.

Sakman (1971) in his study of the prices of Poplar logs in Arbil province, Iraq, presented a 'market-value table' showing the value (in fils) of logs 1, 1.5, 2.8 m long, of mid-diameters 5, 6, 7.33 cm.

Sameer Daniel, Puja Kishore and Animesh Kanawjia (2016) Role of mulching and varietal influence on Brinjal (*Solanum melongena*) in alley cropping system. Journal of the Kalash Science Volume-4, Number-2, 2016: 17-19.

Sharma and Singh (1992) studied wheat inter crop under poplar as boundary planting. Measurement were made of the standing trees (at 3m spacing) and of wheat growth and yield in sample plots

Sheikh *et al.*, (1985) during investigation plants of *Populus deltoides* and *Eucalyptus citriodora*, and cuttings of *Dalbergia sissoo* and *Salmalia malabarica* were planted at 4x4 m spacing in plots and *Sesamum indicum*, Maize and wheat

Singh *et al.*, (1993) studied the grain yield potential of three varieties of wheat (PBW-222, HD- 2329 and PBW-34) were studied for grain yield potential under a 6 yrs old poplar (G-3) plantations in Ludhiana district, Punjab.

How to cite this article:

Sameer Daniel, S. B. Lal, Puja Kishore, Animesh Kanaujia and Azad Kumar Singh. 2018. Role of Leaf Litter Fall Decomposition of Poplar (*Poplar deltoids*) on Wheat Intercropping System. *Int.J.Curr.Microbiol.App.Sci.* 7(08): 4736-4740. doi: https://doi.org/10.20546/ijcmas.2018.708.499