The Pharma Innovation Journal 2021; SP-10(5): 537-539

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(5): 537-539

www.thepharmajournal.com
Received: 06-03-2021
Accepted: 17-04-2021

RPS Deswal
RRS Bawal, CCS Haryana Agricultural University, Hisar, Haryana, India

Naresh Kaushik
RRS Bawal, CCS Haryana Agricultural University, Hisar, Haryana, India

MK Jat
RRS Bawal, CCS Haryana Agricultural University, Hisar, Haryana, India

JS Ranawat
RRS Bawal, CCS Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author:
RPS Deswal
RRS Bawal, CCS Haryana Agricultural University, Hisar, Haryana, India

Growth performance of *Ailanthus excelsa* based agroforestry system under different planting spacing in arid region of Haryana

RPS Deswal, Naresh Kaushik, MK Jat and JS Ranawat

Abstract
The field experiment entitled was conducted at Chaudhary Charan Singh Haryana Agricultural University Regional Research Station, Bawal, Rewari, Haryana, India. This experiment was laid out in split plot design with three replications. The seedlings of *Ailanthus excelsa* were planted at planting densities i.e. 10 x 20 m (50 trees ha^{-1}), 10 x 10 m (100 trees ha^{-1}), 10 x 6.5 m (150 trees ha^{-1}), and 10 x 5 m (200 trees ha^{-1}) during 2013-2014. After six year plantation of Mahaneem, the crop rotation sequences *i.e.* moong (*Vigna radiate* variety MH-421)-wheat (*Triticum aestivum* varieties namely WH-711, WH-1105, HD-2967, HD-3086), cowpea (*Vigna unguiculata* variety Pant-1) wheat (*Triticum aestivum* varieties namely WH-711, WH-1105, HD-2967, HD-3086) were intercropped under Mahaneem based agroforestry system. The results revealed that the 20 x 10 m planting spacing was found better for planting of *Ailanthus excelsa* with or without intercrop.

Keywords: *Ailanthus excelsa*, planting spacing, Haryana

Introduction
Population of India has been increased by approximately 1.39 billion, and day by day the population will be increased. Therefore, the Indian farmers' maximum investment has been done in the agriculture sector. Due to the development of the agriculture sector, the basic need for food has been completed but due to so many problems faced by present generation humans as well as upcoming generation of humans (Chauhan *et al*., 2012) [3]. In 20 decades the use of agrochemical in agriculture sector has been increased but the cost of use of chemicals is air, water and soil pollution, degradation of natural resources, degradation of land fertility and drastic reduction in biodiversity, climate change etc. However, agroforestry has great potential to overcome these problems. Agroforestry is better option to promote agricultural sector development with forest trees with the conservation of soils, water, local and regional climate, and biodiversity (Schroth *et al*., 2004) [9] and it has provide great opportunity to generate employment as well as ideal sources of income in the rural areas of India (Kaushik *et al*., 2017) [4].

Mahaneem (*Ailanthus excelsa* Roxb.) is an important fast growing, multipurpose agroforestry tree species for arid and semi-arid regions of India. It has great ability to survive with less rainfall and tolerant high temperature conditions (Bhimaya *et al*., 1963) [5]. It provides fodder; fuel and timber to the farmers as well as rural peoples with conserve the soil moisture, check the soil erosion and prevent the high speed of wind or control sand dunes as avenue planting in rural areas (Kaushik 2012 & Jat *et al*., 2011) [6, 7]. Mahaneem (*Ailanthus excelsa*) has great ability to fulfill the demand of fuel wood, fodder and timber without degradation of land and forest resources and generate the income sources for rural peoples in arid and semi-arid agro-ecosystem. In other hand, if we can grow intercrop *i.e. Rabi* and *Kharif* season that has potential to generate extra income for rural peoples and improve the lifestyle of peoples. So therefore, the objective of this study was standardization of planting density for *A. excelsa* based agroforestry systems in north-west India.

Materials and Methods
The field experiment was conducted at Chaudhary Charan Singh Haryana Agricultural University Regional Research Station, Bawal, Rewari, Haryana, India. This experiment was laid out in split plot design with three replications. Six months old seedlings of *A. excelsa* were planted at four spacing *viz*. 10 x 20 m (50 trees ha^{-1}), 10 x 10 m (100 trees ha^{-1}),

10 x 6.5 m (150 trees ha^{-1}), and 10 x 5 m (200 trees ha^{-1}) during 2013. Plants were protected against termite by applying chlorpyriphos (2 ml per litre of water) with irrigation water. In the year 2019, the crop rotation sequences i.e. moong (*Vigna radiate* variety MH-421)–wheat (*Triticum aestivum* L varieties namely WH-711, WH-1105, HD-2967, HD-3086), cowpea (*Vigna unguiculata* variety Pant -1) wheat (*Triticum aestivum* L varieties namely WH-711, WH-1105, HD-2967, HD-3086) were raised in the interspaces of the trees during the year 2019. In the month of July, the sowing of moong and cowpea was done and the planting of *Rabi* season crop (wheat) was done in the month October- March. Before sowing of *Rabi* and *Kharif*/rainy season crops, the standard cultivation practices was adopted from field preparation to harvesting of both season crops. Half dose of nitrogen and full dose of phosphorus, potash and zinc were applied at time of field preparation and remaining nitrogen doses was applied as top dressed in two split dose after first and second irrigation. The crops were raised under different densities of *Ailanthus excelsa* in three replications. *Ailanthus excelsa* was planted as a sole crop as well as with intercrop as crop rotation during the year and growth performance traits i.e. girth at breast height, plant height and DBH was observed. Data were statistically analyzed by Panse and Sukhatme (1978). Differences between treatments for all variables studied were tested using ANOVA. Treatment means were compared at $P \leq 0.05$. All analyses were performed using plot mean values.

Table 1: Metrological data of Bawal (Recorded by the metrological observatory) at RRS, Bawal

Year	Rainfall (mm)	Max. temperature	Min. temperature
2013	967.3	45.3^0 C May 2013	0.7^0 C May 2013
2014	977.1	45.1^0 C May 2014	2.0^0 C May 2014
2015	671.1	44.3^0 C May 2015	2.4^0 C May 2015
2016	704.4	44.9^0 C May 2016	4.5^0 C May 2016
2017	693.2	42.3^0 C May 2017	2.9^0 C May 2017
2018	547.4	43.5^0 C May 2018	2.3^0 C May 2018
2019	583.2	45.0^0 C May 2019	3.2^0 C May 2019
2020	461.1	44.0^0 C May 2020	2.6^0 C May 2020

Results and Discussion

Growth performance of *Ailanthus excelsa* with intercrop

The data related to height, GBH & DBH of *Ailanthus excelsa* are depicted in figure 1 & 2. The results showed that maximum plant height, GBH & DBH (12.26 m, 112.33 cm & 35.75 cm, respectively), were recorded under spacing 20 X 10 m followed by under spacing 10 X 10 m (12.12 m, 101.33 cm & 32.25 cm, respectively) while minimum plant height was recorded under dense plant under 10 X 6.5 m (10.51 m), least GBH & DBH (81.33 cm & 25.89 cm, respectively) under 10 x 5 m spacing.

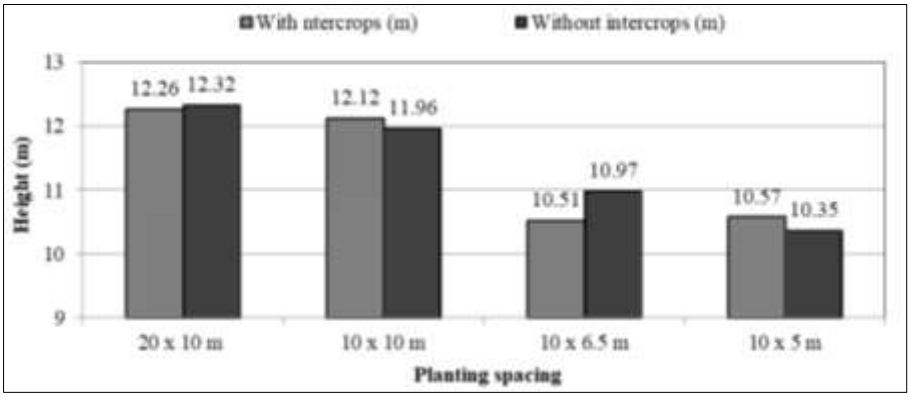

Fig l: Impact of different densities on plant height of Mahaneem with intercrop and without intercrop during the year 2019

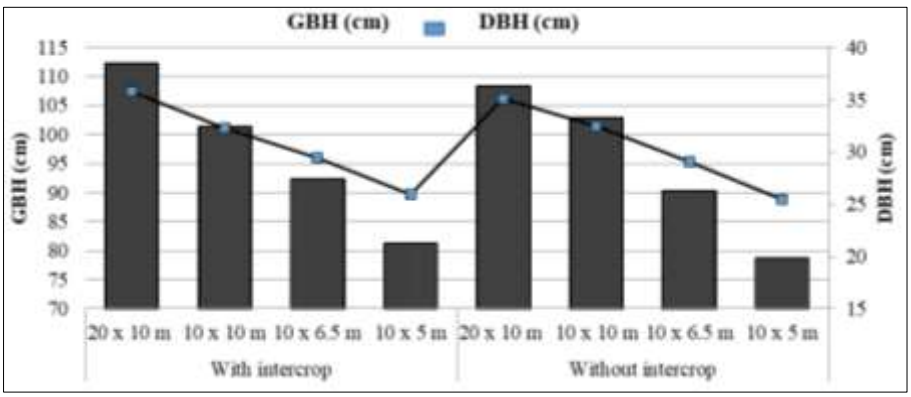

Fig 2: Impact of different densities on GBH & DBH (cm) of Mahaneem with intercrop and without intercrop during the year 2019

Growth performance of *Ailanthus excelsa* as a sole crop

The data regarding height, GBH & DBH of *Ailanthus excelsa* are presented in figure 1 & 2. The results revealed that higher plant height, GBH & DBH (12.38 m, 108.33 cm & 34.48 cm, respectively), were recorded under spacing 20 X 10 m followed by under spacing 10 X 10 m (11.79 m, 102.83 cm & 32.73 cm, respectively), under spacing 10 X 6.5 m (11.44 m, 90.33 cm & 25.04 cm, respectively) however, minimum plant height, GBH & DBH (i.e. 10.12 m, 81.33 cm & 25.89 cm, respectively) under 10 x 5 m spacing.

Table 2: Effect of spacing on height and DBH of Mahaneem

S. No.	Treatments	With crops			Without crops			Mean		
	Spacing (m)	Height (m)	GBH (cm)	DBH (cm)	Height (m)	GBH (cm)	DBH (cm)	Height (m)	GBH (cm)	DBH (cm)
1.	20 x 10	12.26	112.33	35.75	12.38	108.33	34.48	12.32	110.33	35.12
2.	10 x 10	12.12	101.33	32.25	11.79	102.83	32.73	11.96	102.08	32.49
3.	10 x 6.5	10.51	92.33	29.39	11.44	90.33	28.75	10.97	91.33	29.07
4.	10 x 5	10.57	81.33	25.89	10.12	78.67	25.04	10.35	80.00	25.46
Mean		11.36	96.83	30.82	11.43	95.04	30.25			
CD (p = 0.05)-A		0.454	8.480	2.698						
CD (p = 0.05)-B		N/A	N/A	N/A						
CD (p = 0.05)-AXB		0.642	N/A	N/A						

The results shows that the plant height, GBH & DBH of *A. excelsa* were gradually decreased from less plant density to towards higher planting density and the pattern of planting density are from less planting density to higher density *viz*. 10 x 20 m (50 trees ha^{-1}), 10 x 10 m (100 trees ha^{-1}), 10 x 6.5 m (150 trees ha^{-1}), and 10 x 5 m (200 trees ha^{-1}). It might be due to *Ailanthus excelsa* is deciduous tree, strong light demander, drought resistant, and easily survive at maximum temperature varies from 45^0C to 47.5^0C during warm days and the minimum from 0^0 to 12.5^0C during winter season. According to Pratap and Pant (2020) [2], they have recommended wider spacing 8 × 5 m of *M. composita* for intercropping of okra under *M. composita* based Agroforestry system. Rajalingam *et al*. (2016) [1] observed that the tree height and DBH of *Ailanthus* was found highest with intercrop. Patil *et al*. (2012) [8] reported that the diameter at breast height of *Melia azedarach* was recorded higher in wider row spacing *viz.*, 5 m × 4 m as compared to 5 m × 1 m spacing under *Melia azedarach* based Agroforestry system.

Conclusions

It may concluded that the 20 x 10 m planting spacing was found better for planting of *Ailanthus excelsa* as sole crop as well as with intercrop rotation i.e. moong (*Vigna radiate* variety MH-421)-wheat (*Triticum aestivum* varieties namely WH-711, WH-1105, HD-2967, HD-3086), cowpea (*Vigna unguiculata* variety Pant-1), wheat (*Triticum aestivum* varieties namely WH-711, WH-1105, HD-2967, HD-3086) without any harmful impact on intercrops during the whole year.

References

1. Rajalingam GV, Divya MP, Prabaharan C, Parthiban KT. Performance of vegetable crops under *Ailanthus excelsa* a based agroforestry system. Indian Journal of agroforestry 2016;18(1):16-20.
2. Pratap UB, Pant KS. Performance of okra as influenced by tree spacing and organic manures under *Melia composita* based Agrisilviculture systems. The Pharma Innovation Journal 2020;9(10):277-281.
3. Chauhan SK, Sharma R, Dhillon WS. Status of intercropping in poplar based agroforestry in India. For Bull 2012;12:49-67.
4. Kaushik N, Tikkoo Abha, Yadav PK, Deswal RPS, Singh Surender. Agri-silvi-horti systems for semi-arid regions of North-West India. Agricultural Research 2017:6(2):150-158. doi: 10.1007/s40003-017-0247-9
5. Bhimaya CP, Kaul RN, Ganguky BN. Species suitable for afforestation of different arid habitats of Rrajasthan. Annals of Arid Zone 1963;2:162-168.
6. Jat HS, Singh RK, Mann JS. Mahaneem (*Ailanthus* sp) in arid ecosystem: A compatible species for combating with drought and securing livelihood security of resource poor people. Indian Journal of Traditional Knowledge 2011;10:102-113.
7. Kaushik N. *Ailanthus excelsa*: A useful tree for semi-arid ecosystems. Unpublished Data 2012.
8. Patil SJ, Mutanal SM, Patil HY. Meliaazedarach based agroforestry system in transitional tract of Karnataka. Karnataka Journal of Agricultural Sciences 2012;25(4):460-462.
9. Schroth G, Fonseca GAB, Harvey CA, Gascon C, Vasconcelos HL, Izac A-MN. Agroforestry and biodiversity conservation in tropical landscapes. Island Press, Washington 2004, 523.