Int.J.Curr.Microbiol.App.Sci (2019) *8*(6): 743-748

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 06 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.806.088

Effect of *Melia composita* Willd. on Chemical Properties of Soil of Baseri Khadar village of Haridwar District of Uttarakhand, India

Vishwajeet Sharma[1*], Pradeep Kumar Patel[2] and Tara Chand[1]

[1]*Forest Research Institute, Dehradun, India*
[2]*Jawahar Lal Nehru Krisihi Vishwa Vidyalaya, India*

**Corresponding author*

Keywords

Melia composita, Nitrogen, Phosphorous, Potassium, pH, Organic Carbon, Organic Matter etc

Article Info

Accepted:
07 May 2019
Available Online:
10 June 2019

A B S T R A C T

The present study was conducted during the year 2014-2016 in Baseri Khadar site of Haridwar District of Uttarakhand. For analysing the soil of the study sites, we considered following parameters such Nitrogen, Phosphorous, Potassium, pH, Organic Carbon and Organic matter etc. The soil parameter study revealed that organic carbon was significantly different in Baseri Khadar site of Haridwar district of Uttarakhand. While the other soil parameters like pH, N, P, K were not significantly different at different sites. It also enhances the productivity of the soil with improvement in the soil quality, but it further needs to study the soil nutrient status for long term.

Introduction

Melia composita Willd. belongs member of the family Meliaceae. *M. composita* bears clean cylindrical bole attaining height 15-20 ft and sometimes up to 40 ft with big branches. The species originated from southern Asia (India-Pakistan-Iran). Now the species introduced and widely cultivated in South Africa, Middle East, America (Bermuda, Brazil and Argentina), Australia, SE Asia-Pacific islands, and southern Europe. For growing the tree deep red gravelly soil, high light intensity, rainfall of about 800-1000 mm and an elevation of 800-1000 meters are suitable climatic and soil conditions. The species requires deep red gravelly soil, high light intensity, rainfall of about 800-1000 mm with an elevation of 800-1000 mtrs. Seedlings can tolerate frost, however, severe frost can result in plant death. It is a fast growing multipurpose tree species, which bears or has an optional demand in plywood industries. The plant has wide range of activities reported (Koul *et al.*, 2000; Nagalakshmi *et al.*, 2003 and Vijayan *et al.*, 2004), chemical constituents and incriminated properties (Han *et al.*, 1991; Sharma *et al.*, 2000; Khare,

Sahag *et at.,* 2003). The farmers were encouraged to plant a *Melia dubia* with different agricultural crops in large scale just because of its industrial and ecological importance (Parthiban *et al.,* 2009; Nuthan *et al.,* 2009).

Plants Contains some Chemicals with inhibitory activity in many of their organs, including leaves, fruits, flowers, bark, roots, and buds (Inderjit, 1996; Ashrafi *et al.,* 2007). In some of the woody species used in agroforestry models shows allelopathic effects on under storey crops have been reported (Gupta *et al.,* 2007; Narwal *et al.,* 2011; Gunarathne and Perera, 2016). Allelopathy is derived from Greek word *allelon*, 'of each other', and *pathos*, 'to suffer'; hence it means: the injurious effect of one upon another. The term denotes that body of scientific knowledge which concerns the production of biomolecules by one plant, mostly secondary metabolites, that can induce suffering in, or give benefit to, another plant. The phenomenon considered as a biochemical interaction among plants (Rizvi *et al.,* 1992). Compounds are released into the environment through different way like litter decomposition, leaching, direct volatilization or root exudation, and affect (either by positively or negatively) growth and germination of other species (Gross and Parthier, 1994; Seligler, 1996). Present study carried out for understanding the inhibitory effect of leaf leachetes of *Melia composita* on growth and germination of wheat crop under the laboratory conditions.

Materials and Methods

For analysing the soil of the study sites, we considered following parameters such Nitrogen, Phosphorous, Potassium, pH, Organic Carbon and Organic matter etc. For determining the above mentioned parameters standard methods were followed. pH of a soil was measured by soil water suspension mixture in the ratio of 1:5 by using pH meter. Organic carbon (OC) was estimated by the chromic acid titration method (Walkley and Black, 1934). The total nitrogen was estimated by Kjeldahl method (Bremner, 1960). It was determined by the method given by Olsen *et al.,* (1954) and by UV-Spectrophotometer method (Jackson, 1973). The soil available potassium was estimated by Hanway and Heidel's method given in 1952.

Results and Discussion

Data presented in Table 1 has shown soil status in site Baseri-Khadar (UK-2) the highest value of pH (6.94 ± 0.10) was recorded in spacing of 3mx3m in the year 2016 and lower pH (6.78±0.24) was recorded in spacing 4mx4m in the year of 2016. The OC percentage was recorded highest (3.21 ± 0.27%) in spacing of 4mx4m in the year 2016 and the lowest (2.11 ± 0.69%) was recorded in spacing of 2m x 2m in the year of 2014. Available Nitrogen was recorded highest (0.04 ± 0.006%) in spacing of 2m × 2m in the year 2014 and lowest (0.01 ± 0.006%) was recorded in spacing of 2m x 2m in the year of 2016. Available Phosphorus recorded to highest (0.0017 ± 0.0006%) in spacing of 4m × 4m in the year of 2016 and lowest (0.0011±0.0001%) was recorded in spacing of 3m × 3m in the year of 2014. Exchangeable Potassium was recorded highest (0.028 ± 0.029%) under the spacing of 2m x 2m in the year 2016 and lowest (0.011 ± 0.006%) was recorded in spacing of 3m × 3m in 2014. From statistical analysis, it was confirmed that most of the soil parameters were not significantly different. Only soil organic carbon is significantly different in two years and different spacing.

Soil data of sites of Haridwar district of Uttarakhand were analysed through one way Anova post hoc test shown in below Table 2.

In results only organic carbon was significantly differ in all the six sites of three states while the other parameters like pH, N, P and K are not significantly differ in all the sites. It is also depicted from the analysis that the soil organic carbon was not significantly differ at spacing level, it was shown a significance difference only at site level which is due to the amount of litter fall from the tree at site level and the process of their decomposition. While the other parameter like pH, N, P and K were not shown any difference at site and spacing level which may be due to the long-term process of soil genesis and its weathering.

With regard to the nutrients and their uptake in the site were recorded and found that the soil parameter did not show any significant changes. This is in accordance with the observation of Rahangdale and Gupta (1998) who reported that nutrient content in root tissue is not significantly differ. No comparable studies on nutrient content/uptake are available the specifically on *Melia composita*. However, several researchers have studied this aspect in other native and related tree species. The results of the present study are in agreement with the previous studies in species like *Azadirachta indica* (Muthukumar *et al.*, 2001; Sumana and Bagyaraj, 2002), *Ziziphus mauritiana var. rotundifolia* (Aseri and Rao, 2005), *Dendrocalamus strictus* (Muthukumar and Udaiyan, 2006); *Emblica officinalis* (Aseri *et al.*, 2009), *Melia azedarach* (Rajeshkumar *et al.*, 2009) and *Albizia lebbeck* (Pavan Kumar, 2011).

In general organic carbon under forest ecosystem was higher which may be attributed to higher litter fall and consequent decomposition. Jasbir *et al.*, (1995) reported that organic carbon content in natural forest was found maximum (3.85%) because high status of organic matter is maintained in these soils by the fall of huge amount of litter on the surface and its rapid decomposition. The increase in organic carbon level is due to the accumulation of leaf litter and its decomposition to form humus (Maiti and Ghose, 2005, Sawada 1999, Spain *et al.*, 2006 and Tibbett 2008). (Shahoei, 2006), also reported that the pH is affected by the forest but it will take more time to change. Further, several researchers have also reported that dual combinations were found better than individual inoculations (Sumana and Bagyaraj, 2002; Aseri and Rao, 2005; Pavan Kumar, 2011).

Table.1 Effect of growth of *melia composita* on soil nutrient at Baseri-Khadar, Uttarakhand

Site	Spacing	pH	OC	N	P	K
2014	2x2	6.84±0.30	2.11±0.69	0.04±0.006	0.0012±0.0002	0.024±0.03
	3x3	6.92±0.13	2.21±0.60	0.03±0.007	0.0011±0.0001	0.011±0.006
	4x4	6.91±0.13	2.48±0.75	0.03±0.007	0.0014±0.0001	0.012±0.006
2016	2x2	6.84±0.30	2.79±0.40	0.01±0.006	0.0015±0.0002	0.028±0.029
	3x3	6.94±0.10	2.83±0.23	0.03±0.006	0.0016±0.0003	0.014±0.007
	4x4	6.78±0.24	3.21±0.27	0.02±0.005	0.0017±0.0006	0.017±0.004
Mean		6.872±0.06	2.605±0.38	0.027±0.01	0.001±0.0002	0.018±0.01
F value		0.41	3.67	0.13	1.67	0.62
P value		0.84	0.01	0.99	0.17	0.68
Significant		NS	***	NS	NS	NS

*** Significant, NS=not significant at 0.05

Table.2 Statistical analysis of organic carbon

Organic Carbon					
	Site	**N**	**Subset**		
			1	**2**	**3**
Tukey HSD[a,b,c]	HR2	36	2.3314		
	UK1	36	2.3822	2.3822	
	UK2	36	2.6083	2.6083	2.6083
	HR1	36		2.7539	2.7539
	PB2	36			2.8394
	PB1	36			2.9083
	Sig.		0.319	0.071	.234
Duncan[a,b,c]	HR2	36	2.3314		
	UK1	36	2.3822		
	UK2	36	2.6083	2.6083	
	HR1	36		2.7539	2.7539
	PB2	36		2.8394	2.8394
	PB1	36			2.9083
	Sig.		0.053	0.108	.285

Results from the study have shown that the soil quality might have played a significant role in improving the growth response and nutrient uptake of four native tree species under nursery condition.

In conclusion, the soil parameter study revealed that Organic Carbon were significantly different in Baseri Khadar site of Haridwar District of Uttarakhand. While the other soil parameters like pH, N, P and K were not significantly different at different sites. It also enhances the productivity of the soil with improvement in the soil quality, but it further needs to study the soil nutrient status for long term. The trees under agroforestry system found to improve soil fertility status by increasing organic carbon and humus formation due to falling litter. The tree spacing of 3x3 was recorded to be optimum in terms of growth of *Melia* and soil organic carbon increase.

References

Aseri, GK., Jain N, Tarafdar JC (2009) Hydrolysis of organic phosphate forms by phosphatases and phytase producing fungi of arid and semi-arid soils of India. Am-Eurasian J Agric Environ Sci 5:564–570.

Ashrafi, Z., Mashhadi HR, and Sadeghi S (2007). Allelopathic Effects of Barley (*Hordeum vulgare*) on Germination and Growth of Wild Varley (*Hordeum spontaneum).* Pakistan Journal of Weed Science Research, 13: 99-112.

Gross, D., and Paritheir B (1994). Novel Natural Substances Acting in Plant Growth Regulation. Journal of Plant Growth Regulation, 13: 93-114

Gupta, B., Thakur NS, Das B (2007) Allelopathic effect of leaf leachates of *Pinus roxburghii* Sargent on seeds of some grasses. Indian Forester 133: 997-1000.

Han, J., Lin WH, XuRS, Wang WL, Zhao SH (1991). Studies on the chemical constituents of *Melia azedarach* L. Acta Pharm. Sin. (in Chinese) 26:426-429.

Inderjit, I. (1996). Plant Phenolies in Allelopathy. Botanical Review, 62, 186-202.

Jasbir Singh, I.P., Borah and Boruah, A., 1995, Soil characteristic under three different plant communities of North-East India, 121(12): 1130-1134.

Khare, CP., 2003. Encyclopedia of Indian medicinal plants (Springer Germany). Pp. 305-306.

Koul, O, Jain MP, Sharma VK (2000) Growth inhibitory and anti feedant activity of extracts from *Melia dubia* cav to *Spodoptera litura* and *Helivoverpa armigera* larvae. Indian J Exp Biol 38(1): 63-68.

Maiti, S.K., and Ghose, M.K. (2005). Ecological restoration of acidic coal mine overburden dumps- an Indian case study. Land Contamination and Reclamation, 13(4): 361-369.

Muthu kumar, T., Udaiyan. K. and Rajeshkannan, V. (2001). Response of neem (*Azadiruchta indica* A. Juss) to indigenous arbuscular mycorrhizal fungi, phosphate solubilizing and asymbiotic nitrogen-fixing bacteria under tropical nursery conditions. Biology and Fertility of Soils. 34 (6): 417-426.

Muthukumar, T., Senthilkumar, M., Rajangam, M., and Udaiyan, K. 2006. Arbuscular mycorrhizal morphology and dark septate fungal associations in medicinal and aromatic plants of Western Ghats, Southern India. Mycorrhiza, 17(1): 11–24. doi:10.1007/ s00572 006-0077-2. PMID:17109145.

Nagalakshmi, MAH., Thangadurai D, Pullaiah T (2003) In vitro Antimicrobial efficacy of leaf essential oils of *Chukras tubularis* and *Melia dubia* cav (meliaceae). Phyto Res 17(14): 414.416.

Narwal, S.S., Pavlovic, P. and John, J. 2011. Forestry and Agroforestry- Research Methods in Plant Science, Vol. 2: Studium Press, Houstan, Taxas, USA.

Nuthan, D., Reddy KMC, Kumar SP, Vajranabhaiah SN, Yogeesha TD (2009) Cultivation of *Melia dubia* farmlands of Kanakapura taluka Ramanagara district of Karnataka-A success story. Pbli. No 224, National Afforestation and Eco-development Board (NAEB) Ministry of Environment and Forests Government of India University of Agricultural Sciences, GKVK Campus Bangalore India, RC, NAEB.

Parthiban, KT., Bharathi AK, Seenivasan R, Kamala K, Rao MG (2009) Integrating *Melia dubia* in agroforestry farms as an alternate pulpwood species. APA News 34: 3-4.

Rahangdale, Ramesh and Gupta, Nibha 1998. Selection of VAM inoculants for some foresttree species. Indian journal of forestry 124(5): 331-341.

Rizvi, S.J.H., Haque, H., Singh, V.K. and Rizvi, V. 1992. A discipline called allelopathy. Allelopathy: Basic and applied aspects Edited by S. J. H. Rizvi and V. Rizv 1-10.

Seligler, DS. (1996). Chemistry and Mechanism of Allelopathic Interactions. Agronomy Journal, 88, 876-885.

Sharma, PC., Yelne MB, Dennis TJ. (2000) Database on medicinal plants used in ayurveda. Documentation and Publication Division Central Council for Research in Ayurveda and Siddha, New Delhi 389-406.

Suhag, P., Merra, Kalidhar SB. (2003) Phytochemical investigation of *Melia*

azedarach leaves. J. Med. Aro Plant Sci 25(2): 397-399.

Sumana, D.A., and Bagyaraj, D.J. (2002) Interaction between VAM fungi and Nitrogen fixing bacteria and their influence on growth and nutrition of neem (*Azadirachta indica* A Juss). Indian J. Microbiol. 42: 295-298.

Vijayan, P., Raghu C, Ashok G, Dhanaraj S, Suresh B. (2004) Antiviral Activity of medicinal plants of Niligiris including *Melia Dubia*. Indian J. Med. Res. 120(1): 24-29.

How to cite this article:

Vishwajeet Sharma, Pradeep Kumar Patel and Tara Chand. 2019. Effect of *Melia composita* Willd. on Chemical Properties of Soil of Baseri Khadar village of Haridwar District of Uttarakhand, India. *Int.J.Curr.Microbiol.App.Sci.* 8(06): 743-748.
doi: https://doi.org/10.20546/ijcmas.2019.806.088