The Pharma Innovation Journal 2021; 10(4): 1055-1057

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(4): 1055-1057

www.thepharmajournal.com
Received: 19-02-2021
Accepted: 21-03-2021

Srikantaprasad D
Assistant Professor, Department of PMA, KRC College of Horticulture Arabhavi, Gokak Tq. Belagavi Di. Karnataka, India

Mallikarjuna Gowda AP
Senior Scientist & Head (Horticulture), ICAR-Krishi Vigyan Kendra, Bengaluru, Karnataka, India

Umesha K
ICAR - Emeritus Prof., & Former Dean, College of Horticulture, Bengaluru, Karnataka, India

Thimmegowda MN
Professor of Agronomy (DLAP), UAS, Bangalore, Karnataka, India

Pusha TN
Department of PMA, KRC College of Horticulture Arabhavi, Gokak Tq. Belagavi Di. Karnataka, India

Corresponding Author:
Srikantaprasad D
Assistant Professor, Department of PMA, KRC College of Horticulture Arabhavi, Gokak Tq. Belagavi Di. Karnataka, India

Influence of nursery hosts on physiology of sandalwood seedlings

Srikantaprasad D, Mallikarjuna Gowda AP, Umesha K, Thimmegowda MN and Pusha TN

Abstract
A study was conducted on the influence of nursery hosts on physiological parameters of sandalwood seedlings with eleven treatments and three replications. The nursery hosts found to influence the chlorophyll, free proline and soluble sugar content of sandalwood seedlings. The estimated chlorophyll a, chlorophyll b and total chlorophyll contents were the maximum with *Cajanas cajan*, while free proline and soluble sugar contents were high with *Prosopis juliflora*.

Keywords: Sandalwood, nursery, free proline, chlorophyll, soluble sugar

Introduction
Sandalwood (*Santalum album* L.; Santalaceae) is an important aromatic and medicinal evergreen hemi parasitic tree native to India, which is highly valued for its fragrant heartwood, which yields essential oil (upto 6%) rich in santalol (α & β 90%). Owing to its hemiparasitic nature, sandal is reported to associate with highly variable trees/bush species [1]. Sandal seedlings initially obtain nutrients from its seed reserve but, in the later stages they are partly dependent on host species for water and nutrients. Sandalwood seedling without host has shown deficiency symptoms associated with N, P, K, S and Ca [2]. Since the reserved nutrients in seeds deplete as the seedling grow, in the initial stages itself, the successful cultivation of sandalwood depends on growing it with appropriate host in the nursery as well as in the main field. The haustoria of sandalwood are reported to be site of free proline synthesis[3], which is an important drought related chemical. In the current study we examined the influence of host on physiologically important chemicals in sandalwood seedlings

Material and methods
The study was carried during June – 2019 to January - 2020 in a shade net house at, Kittur Rani Channamma College of Horticulture, Arabhavi, which is situated in Zone-3 (Northern Dry Zone) and Region-2 of Agro climatic zones of Karnataka. The sandalwood seeds treated with 100 ppm GA_3 for 24 hours were sown in poly bags with pre established hosts (*viz*., *Alternanthera sessilis, Alternanthera ficoidea, Boerhavia diffusa, Ayapana triplinervis, Cassia angustifolia, Medicago sativa, Trigonella foenum-graecum, Cajanus cajan, Mimosa pudica and Prosopis juliflora*) along with control. The experiment was conducted as per CRD in three replication. At 150 days after sowing, the chlorophyll a, chlorophyll b and total chlorophyll contents of sandalwood seedlings were estimated using freshly collected recently matured leaf samples[4] and expressed as mg g^{-1} of fresh weight. The free proline content was estimated[5] and expressed as mg g^{-1} of fresh weight. While the soluble sugar content of sandalwood seedlings estimated[6] and expressed as mg g^{-1} of fresh weight.

Result and discussion
The estimated chlorophyll a, chlorophyll b and total chlorophyll contents were maximum in leaves of sandalwood seedlings grown with *Cajanas cajan* (4.24, 1.88 and 6.11 mg g^{-1}, respectively) and was *on par* with *Prosopis juliflora* (4.11, 1.70 and 5.81 mg g^{-1}, respectively), *Medicago sativa* (4.09, 1.73 and 5.82 mg g^{-1}, respectively), *Mimosa pudica* (4.00, 1.73 and 5.73 mg g^{-1}, respectively) and *Alternanthera sessilis* (3.52, 1.47 and 4.98 mg g^{-1}, respectively). They were followed by *Ayapana triplinervis* (3.30, 1.15 and 4.45 mg g^{-1}, respectively), *Cassia angustifolia* (3.16, 1.38 and 4.54 mg g^{-1}, respectively) and *Boerhavia diffusa* (3.10, 1.21 and 4.31 mg g^{-1}, respectively).

The sandalwood seedlings grown without host were recorded with lower chlorophyll a, chlorophyll b and total chlorophyll contents (1.59, 0.76 and 2.35 mg g^{-1}, respectively).

The free proline content of leaf, which is an indication of hardiness of the plant, was also influenced greatly by nursery host. But the trend was not similar as that of chlorophyll content. The higher free proline content was observed in sandalwood seedlings grown with *Prosopis juliflora i.e*., 2976.78 n mol g^{-1} of fresh weight, which was followed by *Mimosa pudica* (2089.77 n mol g^{-1} of fresh weight). The lower free proline content was recorded in hostless sandalwood seedlings (331.63 n mol g^{-1} of fresh weight).

The soluble sugar content followed the same trend as that of free proline content. It was higher in *Prosopis juliflora* (276.59 µ mol g^{-1} of fresh weight) and was followed by *Mimosa pudica* and *Medicago sativa* (222.54 and 214.63 µ mol g^{-1} of fresh weight, respectively). The lower soluble sugar content was estimated in sandalwood seedlings without host (131.04 µ mol g^{-1} of fresh weight).

The influence of nursery host on chlorophyll content of sandalwood seedling was also reported earlier [7]. In general, legumes being the nitrogen fixing plants have influenced the chlorophyll content of sandalwood seedlings. Higher chlorophyll content in sandalwood seedlings grown with legumes like *Mimosa pudica* as a result of high glutamine synthase (Preferential assimilation of NH_3 over nitrate) activity of sandal associated with legumes over non legumes [8].

The free proline content was higher among the sandalwood seedlings with hardy species like *Prosopis juliflora* and *Mimosa pudica.* The haustoria were already reported to function as major sites of synthesis and export of proline in *Santalum acuminatum*[3]. Hence, the influence of proline content in sandalwood tree can be attributed to the host through haustorial connection, where in inter plant chemical exchange take place. A direct effect of proline content *i.e.* plant water potential a direct effect of free proline was reported to get influenced by host [9].

The trend was similar for soluble sugar content as that of free proline content where the higher values were recorded with *Prosopis juliflora*, *Mimosa pudica* and *Medicago sativa*. Higher soluble sugar content associated with higher chlorophyll content was also reported in the sandalwood grown along with *Mimosa pudica* [8].

Summary and Conclusion

The estimated chlorophyll a, chlorophyll b and total chlorophyll contents were maximum with *Cajanas cajan* and *on par* with *Medicago sativa* and *Alternanthera sessilis*. The highest free proline and soluble sugars were observed in sandalwood seedlings grown with *Prosopis juliflora*. Hence it can be concluded that, nursery hosts apart from supplying nutrients and water, they also influence physiology of sandalwood seedlings.

Table 1: Physiological parameters of sandalwood seedlings as influenced by different nursery hosts at 150 days after sowing

Treatments	Nursery host	Physiological parameters				
		Chlorophyll-a (mg g^{-1})	Chlorophyll-b (mg g^{-1})	Total Chlorophyll (mg g^{-1})	Free proline in leaf (n mol g^{-1} fresh weight)	Soluble sugar content (µ mol g^{-1} fresh weight)
T_1	*Alternanthera sessilis*	3.52	1.47	4.98	1818.44	186.15
T_2	*Alternanthera ficoidea*	2.84	1.13	3.97	1488.39	152.93
T_3	*Boerhavia diffusa*	3.10	1.21	4.31	1532.82	160.84
T_4	*Ayapana triplinervis*	3.30	1.15	4.45	1721.64	173.76
T_5	*Cassia angustifolia*	3.16	1.38	4.54	1282.11	176.13
T_6	*Medicago sativa*	4.09	1.73	5.82	1956.48	214.63
T_7	*Trigonella foenum-graecum*	2.29	0.99	3.28	787.04	171.39
T_8	*Cajanus cajan*	4.24	1.88	6.11	1315.43	177.71
T_9	*Mimosa pudica*	4.00	1.73	5.73	2089.77	222.54
T_{10}	*Prosopis juliflora*	4.11	1.70	5.81	2976.78	276.59
T_{11}	Control	1.59	0.76	2.35	331.63	131.04
Grand Mean		3.29	1.38	4.67	1572.77	185.79
F test		*	*	*	*	*
S. Em. ±		0.25	0.17	0.41	133.86	11.74
CD (p=0.05)		0.73	0.50	1.20	392.59	34.44

Note: * - Significant at 5%

References

1. Durairaj P, Kamaraj M. Assessment and conservation strategies for *Santalum album* in manmalai RF of thuraiyur range at Tiruchirappalli district. International Journal of Humanities, Arts, Medicine and Sciences 2013;1(1):1-12.
2. Barrett DR, Fox JED. *Santalum album*: Kernel composition, morphological and nutrient characteristics of pre-parasitic seedlings under various nutrient regims. Annals of Botany 1997;79:59-66.
3. Tennakoon KU, Pate JS. Biological and physiological aspects of the woody root hemi-parasite *Santalum acuminatum* (Quandong) and its common hosts. In: *Sandal and its Products*. Ed: Radomiljac AM, Ananthapadmanabha HS, Welbourn RM and Rao KS, ACIAR Proceedings. No.84. ACIAR, Canberra, Australia 1998, 58-59.
4. Kamble PN, Giri SP, Mane RS, Tiwana A. Estimation of Chlorophyll content in young and adult leaves of some selected plants. Universal Journal of Environmental Research and Technology 2015;5(6):306-310.
5. Bates LS, Waldren RP, Teare ID. Rapid determination of free proline for water-stress studies. Plant Soil 1973;39:205-207.
6. Hedge JE, Hofreiter BT. *Carbohydrate Chemistry*, **17** *Eds.* Whistler R.L. and Be Miller, J.N., Academic Press, New York 1962.
7. Annapurna D, Rathore TS, Joshi G. Modern nursery practices in the production of quality seedlings of Indian Sandalwood (*Santalum album* L.) - Stage of host

requirement and screening of primary host species. Journal of Sustainable Forestry 2006;22(3, 4):33-55.
8. Deepa P, Yusuf A. Histological and biochemical evaluation of *Santalum album* L. Seedlings cocultivated with different hosts. Annals of Plant Sciences 2015;4(03):1016-1021.
9. Rocha D, Ashokan PK, Santhoshkumar AV, Anoop EV, Sureshkumar P. Influence of host plant on the physiological attributes of field-grown sandal tree (*Santalum album*). Journal of Tropical Forest Science 2014;26(2):166-172.