Karnataka J. Agric. Sci., 28(2): (269-270) 2015

Effect of pre-sowing treatments on seed germination of *Melia azedarach* L.

Melia azedarach L., a member of Meliaceae family, is highly valuable indigenous species due to its multipurpose importance and recognized as a species of agro forestry/social forestry/ urban forestry. The wood is extensively used for toys, small boxes, sporting requisites, musical instruments, furniture, veneer, plywood and interior carpentry. It is also a good fuel wood species (Salim Azad *et al.,* 2010) with calorific value of 5043-5176 k cal/kg. It is a profitable species for saw and shuttle making.

A uniform germination of seed with good vigour is necessary for the production of uniform planting stock which is a pre-requisite for any successful domestication and large scale aforestation programme. Use of various pre-sowing treatments which are designed to reduce the dormancy due to hard seed coat has been found to be very effective for many species. Different seed treatments have been found to improve per cent seed germination and seedling vigour index which in turn influence growth of seedlings compared to untreated seeds (Murugesh, 2011; Anand *et al.,* 2012). Salim Azad *et al.* (2010) reported that the main difficulty of establishing forest plantation of *M. azedarach* is its poor seed germination. Rahayu Wulandini and Nurin Widyani (2007) also reported that seeds of *M. azedarach* have hard seed coat and pre seed treatments helps in breaking the physical barrier. Hence, the present study was carried out to know the effect of different pre-sowing seed treatments on germination of *M. azedarach.*

The present study was carried out at the poly house, Department of Silviculture and Agroforestry, College of Forestry, Sirsi, Uttara Kannada district during the year 2012-13. In this trial, eight pre-sowing treatments with one control were tried to know their effect on germination. For the purpose of studying germination, three hundred uniform sized seeds were chosen for each treatment. In cold water treatment (T_1), the seeds were soaked in water for 24 hours. In hot water treatment (T_2), the seeds were dipped in hot water with temperature of 80°C for 10 minutes. In T_3, the seeds were dipped in concentrated H_2SO_4 for 10 minutes and immediately washed with plenty of good quality water. In treatment T_4, seeds were soaked in 200 molar KNO_3 solution for 24 hours. In treatment T_5, the seeds were soaked in 100 ppm of Gibberllic acid solution for 8 hours. In treatment T_6, the seeds were dipped in cow dung slurry which was prepared with 1:4 proprotion of cow dung and water, respectively, for 6 days. In treatment T_7, the seeds were dipped in biogas slurry obtained from a biogas plant for 6 days. In mini sachet method (T_8), the seeds were kept in airtight polythene bag and then these sachets were exposed to direct sunlight for five days. In control (T_9), seeds were sown without any treatment. All the treatments were imposed in such a way that all the treatments end at the same time. Then, the seeds of each treatment were sown in pre prepared nursery beds for germination test. The number of seeds germinated in each day was counted; emergence of plumule was taken as the criterion of germination. The germination was recorded up to 60 days from the day of seeds sowing. Based on daily germination count and the germination per cent, mean daily germination, peak value, germination value and germination rate were worked out by following formulas given below. The data obtained was statistically analysed under M-STAT-C programme by using simple completely randomized design.

$$\text{Germination per cent} = \frac{\text{Number of normal seeds germinated}}{\text{Total number of seeds sown}} \times 100$$

$$\text{Mean Daily Germination (\%)} = \frac{\text{Cumulative germination per cent}}{\text{Total number of days}}$$

$$\text{Peak Value (PV)} = \frac{\text{Total germination per cent}}{\text{Number of days required to reach the peak germination}}$$

$$\text{Germination rate} = (G_1/t_1 + G_2/t_2 + \text{————} + G_n/t_n)$$

Where,

$G_1, G_2, G_3, \ldots\ldots\ldots G_n$ = Germination count taken from day 1 to n^{th} day

$t_1, t_2, t_3, \ldots\ldots\ldots\ldots\ldots t_n$ = Time taken in days from day 1 to n^{th} day

The results obtained from this study are presented in Table 1. The different pre-sowing treatments had significant effect on seed germination. Among the pre-sowing treatments, 200 Molar KNO_3 solution recorded significantly higher seed germination (84.0%) followed by biogas slurry (70.7%) and cow dung slurry (70.0%) which were found on par but significantly superior over other treatments. The increased germination with KNO_3 solution may be due to enhanced imbibition of water into cotyledons (Rahayu Wulandini and Nurin Widyani, 2007) and shift in respiratory metabolism to pentose phosphate pathway due to oxidized form of nitrogen present in KNO_3. Another reason for the positive effect of KNO_3 on seed germination is related to creating a balance between hormonal ratios in seed reducing the growth preventable materials, like ABA (Ali *et al.,* 2010). Similar results were reported by Sinhababu *et al.* (2007) where, nitrogenous substances like KNO_3 and thiourea were effective in increasing germination percentage of *Acacia holosericea* A. Cunn. ex G. Don and *Cassia fistula* L. The increased germination per cent in biogas slurry and cow dung slurry might be due to the increased microbial population, presence of anaerobic condition and moderate temperature which triggers the germination process in the seed. Similar results were reported by Basavaraj *et al.* (2002) in *Elaeocarpus munronii* (Wight) Mast. where cow dung treatment recorded maximum germination per cent compared to control. Lokesh (2007) also reported higher seed germination in *Terminalia chebula* Retz. with cow dung slurry for 30 days.

The germination percentage recorded in cold water treatment (51.3%) and H_2SO_4 treatment (51.3%) was found on par with that of control (53.3%) showing ineffectiveness of these treatments in enhancing germination per cent of *M. azedarach.* However, the hot water treatment was found to reduce the germination percentage of *M. azedarach* significantly when

Table 1. Effect of various pre-sowing treatments on seed germination and seedling quality parameters of *Melia azedarach*

Treatments	Germination (%)	Mean daily germination (%)	Peak value	Germination value	Germination rate	Seedling height (cm)	Vigour index
T_1 Cold water (24 hr)	51.3 (45.78)	1.55	2.24	3.37	4.82	22.26	1138
T_2 Hot water (10 min)	11.3 (19.34)	0.21	0.33	0.08	0.73	15.71	179
T_3 Concentrated H_2SO_4 (10 min dipping)	51.3 (45.76)	1.01	1.45	1.95	4.79	22.69	1182
T_4 KNO_3 (200 milli moles/liter for 24 hr)	84.0 (66.67)	1.54	3.67	5.71	8.24	23.83	1992
T_5 Gibberlic acid (100 ppm for 8 hr)	61.3 (51.66)	1.31	2.29	3.09	5.80	23.03	1425
T_6 Cow dung slurry (6 days)	70.0 (56.97)	1.45	3.02	4.57	6.24	23.55	1648
T_7 Biogas slurry (6 days)	70.7 (57.58)	1.52	2.55	4.05	6.35	21.26	1508
T_8 Mini-sachet method (5 days)	65.3 (54.02)	1.52	2.36	3.67	6.10	20.87	1358
T_9 Control	53.3 (46.91)	1.31	2.01	2.67	4.38	20.50	1088
S.Em.±	3.36	0.19	0.35	0.83	0.55	1.50	153.42
C.D. at 5%	9.97	0.56	1.04	2.47	1.65	4.46	455.83

Figures in parentheses indicate arc sin transformed values

compared to all other treatments. This might be due to lethal effect of higher temperature of water on embryo. Similar results reporting lethal effect of hot water was reported by Khantwal *et al.* (2008) who reported as low as 3 per cent germination of *Bauhinia variegate* L. seeds in hot water treatment.

The mean daily germination and peak value differed significantly among different pre-sowing treatments. The maximum mean daily germination was observed in cold water treatment (1.55) followed by KNO_3 solution (1.54) and were found on par with all other treatments except hot water treatment (0.21). These pre-sowing treatments initiated early germination and reduced period of germination by facilitating enhanced imbibition of water into cotyledons and hastened the biochemical reactions; in turn increased the mean daily germination and peak value. These results are in agreement with that of Manasi (2011) who reported positive effective of KNO_3 solution in enhancing germination percentage and other germination related parameters. The peak value of germination (3.67), germination value (5.71) and germination rate (8.24) recorded were also maximum in KNO_3 solution. The seedling height and seedling vigour of M. azedarach were also maximum in KNO_3 solution (23.83 cm and 1992, respectively) at the end of germination period.

Department of Silviculture and Agroforestry, College of Forestry, Sirsi - 581 401 V. N. SUJATHA
University of Agricultural Sciences, Dharwad - 580 005, Karnataka, India K. MANJAPPA
E-mail: sujathavn8@gmail.com

(Recevied: March, 2014 ; Accepted: April, 2015)

References

Ali, T., Hossein, P., Asghar, F., Salman, Z. and Alizcm, 2010, The effect of different treatments on improving seed germination characteristics in medicinal species of *Descurainia sophia* and *Plantago ovata*. African *J. Biotechnol.*, 9(39): 6588-6593.

Anand, B., Devagiri, G. M., Maruti Gurav, Vasudev, H. S. and Anil Kumar Khaple, 2012, Effects of pre-sowing seed treatments on germination and seedling growth performance of *Melia dubia* Cav.- An important multipurpose tree*, Int. J. Life Sci*., 3: 59-63.

Basavaraj, L. T., Srinivas, V. and Devakumar, A. S., 2002, Effect of seed treatments on seed germination and seedling growth in *Elaeocarpus munronii. My For.,* 119(5): 360-366.

Khantwal, A., Negi, Kalam Singh, Madiwal and Kavita, 2008, Impact of pre sowing treatments on germination of common fodder tree species of lower Siwaliks range of Garhwal Himalayas. *Indian J. For.,* 31(1): 73-75.

Lokesh, S. L., 2007, Standardization of nursery techniques in *Terminalia chebula* Retz : An important medicinal tree. *M. Sc. (For.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Manasi, R. N., 2011, Standardization of nursery techniques in *Hydnocarpus pentandra* (Buch.-Ham.), *M. Sc. (For.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Murugesh, 2011, Effect of seed pre-treatment on germination and seedling attributes of *Grevillea robusta* (Silver oak), *My For.,* 47(1): 53-62.

Rahayu Wulandini and Nurin Widyani, 2007, *Melia azedarach* L. Seed Leaflet, No. 117, Forest & Landscape, Denmark (Website: www. SL. ku. dk).

Salim Azad Md, Zedan-Al-Musa Md and Abdul Matin Md, 2010, Effects of pre-sowing treatments on seed germination of *Melia azedarach. J. For. Res.*, 21(2): 193-196.

Sinhababu, Banerjee, A. and Kar, R. K., 2007, Seed germination and seedling growth in some selected fast growing fuel wood plants. *Indian For.,* 133(4): 534-545.