Eco. Env. & Cons. 29 (April Suppl. Issue) : 2023; pp. (S52-S55)
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ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2023.v29i02s.010

Pre-sowing Treatments Impact on the Germination of Three *Melia* species *(Melia Azeadarch, Melia composita* and *Melia dubia*)

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(Received 10 September, 2022; Accepted 27 October, 2022)

ABSTRACT

A nursery experiment was carried out to study germination rate of three different *Melia* species at the Division of Agroforestry, experimental farm at Sher-e-Kashmir, University of Agricultural Science and Technology, Chatha, Jammu (UT). Three *Melia* species drupes (*Melia azedarach, Melia composita* and *Melia dubia*) were subjected to eight pre-sowing treatments. Analysis of the results revealed that *Melia* drupes treated with cow dung slurry for 30 days enhanced germination percentage and days to initial and final germination. Finding of the experiments showed that pre-sowing treatments was effective in enhancing germination and production of quality seedlings of *Melia* species.

Key words*: Pre-sowing treatments, Melia species, Initial and final number of days for germination*

Introduction

The genus *Melia* of family meliaceae belongs to major group of angiosperms. The fifteen species of the genus *Melia* are found across the warmer parts of Asia and Australia, with the exception of the Indo-Malayan region. (Sharma *et al*., 2012). There are three species of *Melia* i.e *Melia azedarach*, *Melia composita*, and *Melia dubia* reported to exist in India. (Parthiban *et al*., 2019). Having a short bole and spreading crown, bi- and tri-pinnate leaves, and dark grey bark with longitudinal furrow, *Melia azedarach* is a deciduous tree (Troup, 1921). The *Melia azedarach* plant is renowned for its eye-catching cluster of pale purplish spreading flowers and the summer time shade provided by its dense, dark and emerald leaves. *Melia azedarach* is occasionally planted for ornamental purposes and makes it as a handsome avenue and shade tree in plantations. *Melia composita* a versatile tree with wide acceptability is commonly known as Burma dek in North Indian states. It is a fast growing tree occurring in tropical and sub-tropical forests/plantation and commercially valued for its multifarious uses. (Prathiban *et al*., 2019). After poplar and eucalyptus *Melia composita* is farmer's third choice for farm forestry plantations due to its clear and straight bole height. *Melia dubia* is another indigenous species of family meliaceae to India, South East Asia and Australia. It is also called as Mahaneem or forest neem or Malabar neem. A fast growing tree species naturally distributed in dry and moist deciduous forest of Western Ghats (Akhilraj, 2017). In short span of time *Melia dubia* has been adopted by the farmers and furniture industry. To fulfill the demand of plantation forestry quality seedling is of great im-

portance. Raising quality seedlings also requires technical expertise and careful planning for all the key elements, including high-quality seeds, nursery management practices. Additionally, farmers now have a huge demand for this variety of seedlings developed in nurseries. Therefore, a big quantity of healthy and vigorous seedlings must be produced quickly using the proper pre-sowing procedures. (Krishna *et al*., 2011). The main problem associated with the *Melia species* particularly with *Melia dubia* is poor germination rate because of its hard seed coat which does not imbibe the water easily (Egley, 1989). Seeds of *Melia* are reproduced at large number and easily accessible every year or at definite period of time (Fenner and Thomson, 2005).

Appropriate pre-sowing techniques for seed germination can improve germination rate and overall process (Koirala *et al*., 2000). Keeping this in mind, this study was carried out with the aim of understanding the effect of pre-seeding treatment on seed germination of different *Melia species*.

Materials and Methods

This study was carried out at the Experimental Farm of the Agroforestry Division, Sher- e-Kashmir, University of Agricultural Sciences and Technology, Jammu (SKUAST Jammu) during March 2021. Jammu is located at an altitude of 332 m above mean sea level with 32º40ˆ N latitude and 74 º 58″ E longitudes which falls under sub-tropical zone. Jammu being a subtropical region experiencing hot and dry summers, wet seasons and cold winter months. Summer usually starts in April and lasts until June. The maximum temperature rises to 45°C from May to June and the minimum temperature drops to 1°C in winter December- January. The average annual rainfall varies from 1000-2000mm with 75 to 80 percent received during July to September and rest 20-25 percent during winter months of December to February. Soil for the experiment was collected from the nursery of the Agroforestry Department, Sher-e-Kashmir University of Agricultural Science and Technology, Jammu. The texture of the soil was sandy loam. Soil was sieved to remove unwanted materials like plant parts, pebbles and weeds. The soil was mixed with sand and FYM in ratio of 1:1:1. This mixture was filled in polythene bags of size 16 cm x 24 cm. Each replication for each treatment contained 10 polybags.

Drupes of *Melia composita* and *Melia azedarach* were collected manually from the healthy and matured trees planted in the campus of University of Sher-e-Kashmir Jammu whereas, seeds of *Melia dubia* were procured from a private nursery of Karnataka. For reduction in moisture seeds were dried in shade after the collection. The seeds were then checked to remove the discolored, damaged seeds. Healthy dried seeds had been used for the experiment. The experiment presented in Factorial CRD (complete randomized design) had two factors, i.e. pre-sowing treatments and three *Melia species* (*Melia azedarach*, *Melia composita* and *Melia dubia*). In total, there were 24 treatment combinations and three replications. A total of 720 polybags were used for the complete experiment. Germination of seeds in each treatment recorded at alternate day. Analysis of variance (ANOVA) was used for the analysis of the data. SPSS statistical *Software* Package for Agricultural Research Workers was used for the statistical performance.

Different pre-sowing treatments used for the current study were as:

T_1- control (no treatment)
T_2- cow dung slurry for 30 days
T_3- Gibberellic acid 100ppm for 24 hrs
T_4- Gibberellic acid 200ppm for 24 hrs
T_5- Gibberellic acid 300ppm for 24 hrs
T_6- Gibberellic acid 400ppm for 24 hrs
T_7- Gibberellic acid 500ppm for 24 hrs
T_8- Concentrated H_2SO_4 (5min dipping)
Germination percentage (%)
Germination percentage was calculated by using the formula given below.

$$\text{Germination (\%)} = \frac{\text{Total number of drupes germinated}}{\text{Total number of drupes sown}} \times 100$$

Mean daily germination

Total percent germination divided by total days in the test gives the mean daily germination per cent

Results and Discussion

Pre-sowing treatments had significant effect on days to initial germination (Table 1). The perusal of the data indicated that different treatment significantly affected the initial days to germination of *Melia seeds*.

Minimum number of days (31.9) taken for initiation of seed germination was recorded in treatment

T2 (cow dung slurry for 30 days) which was statistically at par with treatment T4 (GA_3 200ppm for 24 hours). Days to initial germination was significantly affected by different *Melia species*. Minimum number of days taken (32.1) for initiation of seeds germination was recorded in *Melia composita* which was followed by *Melia azedarach* (33.8). Maximum number of days (38.0) taken for initiation of germination was observed in *Melia dubia* (Table 1). The interaction effect of pre-sowing treatment and species was found to be non-significant. The reason for the lesser number of days in *Melia composita* under the treatment cow dung slurry for 30 days might be due to softening of the seed coat because presence of biodegradable enzyme, NPK, water and micronutrients in cow dung which affect the protrusion of radical (Singh, 2020).

Mean daily germination

Mean daily germination percentage was significantly affected by the pre-sowing treatments (Table 1). Maximum mean daily germination (0.94) was observed in treatment T2 (cow dung slurry for 30 days) which was statistically at par with T3 and treatment T4. Species owing to significant effects on mean daily germination. Maximum mean daily germination (0.99) was recorded in treatments cow dung slurry which was significantly higher than *Melia azedarach* and *Melia dubia.* Interaction had found to be non-significant effect on Mean daily germination. The pre-sowing treatments initiated early germination and reduced period of germination by facilitating enhanced imbibitions of water in to cotyledons and hastened the bio-chemical reactions which intern increased the mean daily germination (Krishna *et al*., 2011).

Germination percentage

Seed germination percentage was significantly influenced by pre-sowing treatments (Table 1). Maximum seed germination percentage 53.3 per cent was observed in treatment T2 cow dung slurry for 30 days which was statistically at par with T3, T4 and T5 and superior to the remaining treatments. Species exhibited significant effect on germination percentage. Maximum germination percentage (55.0%)

Table 1. Effect of pre-sowing treatments on Days to initial germination, mean daily germination, germination percentage and days to final germinal of *Melia species*

Species	Days to initial germination Treatments								
	T1	T2	T3	T4	T5	T6	T7	T8	Mean
M.azeadarch	35.0	31.0	33.0	32.7	32.3	34.3	35.7	36.3	33.8
M. composita	33.0	28.0	31.7	31.3	32.7	33.0	33.3	34.0	32.1
M.dubia	40.0	36.7	37.7	36.0	36.3	38.3	38.7	40.3	38.0
Mean	36.0	31.9	34.1	33.3	33.8	35.2	35.9	36.9	
*CD(0.05)*Treatment= 1.54		Species = 0.94			Treatment x species =N.S				
Mean Daily germination (%)									
M.azeadarch	0.59	1.04	1.01	0.86	0.89	0.82	0.77	0.87	0.86
M. composita	0.68	1.27	1.15	1.15	1.04	0.90	0.78	0.98	0.99
M.dubia	0.24	0.50	0.44	0.40	0.36	0.32	0.32	0.35	0.37
Mean	0.51	0.94	0.87	0.80	0.77	0.68	0.62	0.73	
*CD(0.05)*Treatment= 0.16		Species = 0.09			Treatment x species =N.S				
Germination percentage (%)									
M.azeadarch	36.7	60.0	56.7	50.0	53.3	50.0	46.7	53.3	50.8
M. composita	43.3	66.7	63.3	60.0	56.7	50.0	43.3	56.7	55.0
M.dubia	16.7	33.3	30.0	26.7	23.3	20.0	20.0	23.3	24.2
Mean	32.2	53.3	50.0	45.6	44.4	40.0	36.7	43.6	
CD(0.05)	Treatment= 8.96		Species = 5.49		Treatment x species =N.S				
Days to final germination									
M.azeadarch	62.7	58.0	57.3	58.0	60.0	60.7	61.0	61.7	59.9
M. composita	63.3	52.3	55.0	52.0	54.3	56.3	56.0	57.7	55.9
M.dubia	67.7	66.7	67.3	66.0	64.0	62.3	63.0	68.0	65.6
Mean	64.6	59.0	59.9	58.7	59.4	59.8	60.0	62.4	
CD(0.05)	Treatment= 3.02		Species = 1.85		Treatment x species =N.S				

was observed in *Melia composita* which was statistically at par with *Melia azedarach* but superior to *Melia dubia*. However the interaction effect of treatments and species was observed non-significant. The early and good germination under the treatment cow dung slurry for 30 days because of early softening of the seed coat which increased the permeability to diffusion and early emergence of radical which triggers the seed germination process in *Melia composita* and *Melia azedarach* (Singh, 2020). Similar results were reported by (Anand *et al*., 2012), in *Melia dubia* and (Lokesh, 2007) reported that higher germination percentage of seeds treated with cow dung slurry for 30 days in *Terminalia Chebula.*

Days to final germination

Days to final germination was significantly affected by pre-sowing treatments (Table 1). Seed germination started after 32 days of sowing and continued up to 70 days. Maximum number of days to final germination (64.6) was observed in treatment T1 (control) where as minimum number of days (58.7) to final germination was observed in treatment T4. Species had significant effect on days to final germination. Maximum number of days taken to final germination (65.6) was observed in *Melia dubia* which was significantly higher than *Melia composita* (55.9) and *Melia azedarach* (59.9). Anannd *et al*., (2012), reported the similar results where total number of days for germination in *Melia dubia* was 32- 64 days in *Melia dubia*. Higher number of days taken for germination in *Melia dubia* might be due to its hard seed coat and seed dormancy which prevent the seed to germinate.

Conclusion

The present study clearly demonstrated the influence of pre-sowing treatments on germination of *Melia species*. Among all the pre-sowing treatments applied cow dung slurry for 30 days overall impacted the initial number of days to germination, higher germination percentage, days to final germination and mean daily germination percentage in *Melia composita* as compared to *Melia azedarach* and *Melia dubia*. This study also proves that cow dung have special type of biodegradable enzymes which not only helps in softening of hard seed coat but also helps in breaking of seed dormancy in drupes of *Melia species.* Although, Gibberelic acid was also found to be significant in terms of germination percentage but the use of cow dung slurry is very cost effective as compared to Gibberelic acid.

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