Madras Agric. J., 95 (7-12) : 480-485 July-December 2008
https://doi.org/10.29321/MAJ.10.100618

Research Notes

Effect of seed grading on seed quality in Harar *(Terminalia chebula* Retz.)

M. SIVAPRAKASH, P.R. RENGANAYAKI, G. DHARMARAJ AND P. BALAMURUGAN
Tamil Nadu Agricultural University, Coimhatore - 641 003

Terminalia chebula Retz. commonly known as 'Harar' belongs to the family combretaceae. It is distributed throughout the greater part of India except in arid zones (Troup, 1921). The most important produce of the tree are the fruits known as myrobalans of commerce or chebulic myrobalans. The fruit is extensively used for medicinal purpose and tanning. The dried flesh surrounding the seed contains 30 to 32% tannin. The content varies with the season of collection and the locality. Apart from its use as tanning material, myrobalans are employed in making of ink and in dyeing. The fruits are credited with laxative, stomachache, tonic and alternative properties. The fruit pulp is used as a dentifrice to cure bleeding and ulcertation of gums.

The supply of good quality planting stock is of prime importance. Seed is one of the most important inputs for forest nursery production. Grading that entitled to remove the empty, immature, broken and insect damaged seeds (FAO, 2000) is done mainly to improve the physical and physiological quality of the seed lot. In order to improve the seed quality, the present study was conducted in Forest College and Research Institute, Mettupalayam.

T.chebula fruits collected during January and February from Kunchappanai, Nilgiri district were used for this study. The fruits were collected from the ground as soon as they fell, dried under shade and stored in gunny bags.

Bulk fruits were graded into different groups as small, medium and big in size grading method based on size by visual observation. In floatation method bulk fruits were separated based on specific gravity. Fruits were soaked in a beaker containing water, 2% NaCl and 3% NaCl and allowed for 15 minutes to settle. Then the sinking and floatating fractions of the fruits were separated manually. The treatments used in this experiment were as follows.

T0 - Control (bulk)
Size variation (visual observation)
T1 - Small
T2 - Medium
T3 - Big
Floatation technique in water
T4 - Sinkers
T5 - Floaters
Floatation technique in *2%* NaCl solution
T6 - Sinkers
T7 - Floaters
Floatation technique in 3% NaCl solution
T8 - Sinkers
T9 - Floaters

Table 1. Effect of seed grading on germination behaviour of *Terminalia chebula*

Parameter / Treatment	100 fruit weight (g)	Days taken to: Initial germination	Days taken to: Peak germination	Days taken to: Complete germination	Speed of germination	Germination percentage(%)
T_0	142.573	30.50	36.75	44.25	0.391	46.50(42.99)
T_1	127.823	29.00	35.50	41.50	0.505	46.00(42.70)
T_2	142.768	28.00	34.00	40.75	0.634	49.25(44.57)
T_3	158.040	28.00	34.00	40.50	0.631	52.25(45.54)
T_4	116.835	27.00	32.00	41.00	0.682	50.50(45.28)
T_5	140.480	32.25	37.25	44.50	0.463	46.25(42.85)
T_6	151.970	27.50	32.50	41.50	0.640	49.50(44.71)
T_7	165.108	32.50	37.50	44.50	0.359	46.50(44.43)
T_8	134.295	28.50	33.50	42.00	0.660	51.00(45.57)
T_9	167.148	33.00	37.75	44.75	0.432	45.50(42.17)
Mean	144.71	29.63	35.08	42.53	0.54	48.33(44.18)
SEd	2.26	0.53	0.52	0.47	0.03	0.79
CD(P=0.05)	4.61	1.08	1.06	0.96	0.05	1.60
CD(P=0.01)	6.20	1.45	1.43	1.29	0.07	2.16

(Figure in parenthesis indicate sine value transformation)

Table 2. Effect of seed grading on seedling growth and vigour of *T. chebula*

Parameter / Treatment	Root Shoot Ratio	Fresh weight(g): Root	Fresh weight(g): Shoot	Fresh weight(g): Total	Dry weight (g): Root	Dry weight (g): Shoot	Dry weight (g): Total	Vigour Index
T_0	0.155	0.124	0.547	0.671	0.019	0.152	0.171	8.18
T_1	0.129	0.136	0.619	0.755	0.030	0.230	0.255	12.04
T_2	0.135	0.148	0.691	0.839	0.036	0.263	0.298	14.69
T_3	0.127	0.149	0.720	0.870	0.035	0.272	0.309	16.16
T_4	0.149	0.153	0.711	0.865	0.036	0.240	0.275	13.88
T_5	0.165	0.124	0.553	0.677	0.024	0.133	0.156	7.22
T_6	0.155	0.153	0.707	0.859	0.037	0.235	0.271	13.43
T_7	0.171	0.125	0.546	0.671	0.023	0.133	0.156	7.23
T_8	0.181	0.148	0.685	0.834	0.035	0.194	0.226	11.53
T_9	0.157	0.121	0.519	0.639	0.021	0.130	0.151	6.86
Mean	0.153	0.138	0.629	0.767	0.029	0.198	0.227	11.123
SEd	0.008	0.003	0.017	0.019	0.001	0.010	0.011	0.579
CD (5%)	0.017	0.006	0.035	0.039	0.003	0.020	0.022	1.184
CD (1%)	0.023	0.008	0.047	0.052	0.004	0.028	0.030	1.595

Fig. 1. Influence of seed grading on germination percentage and duration of *T. chebula*

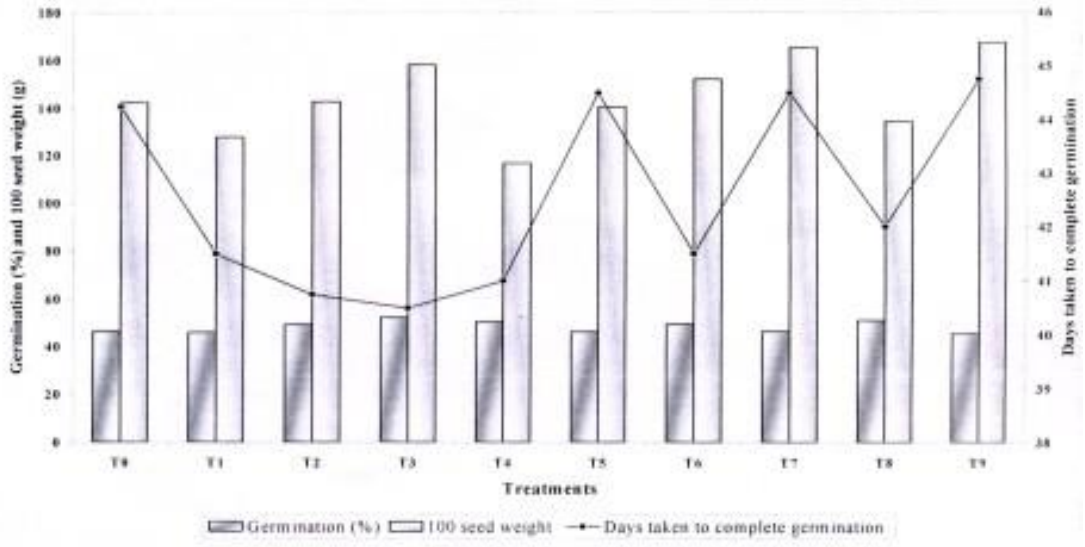
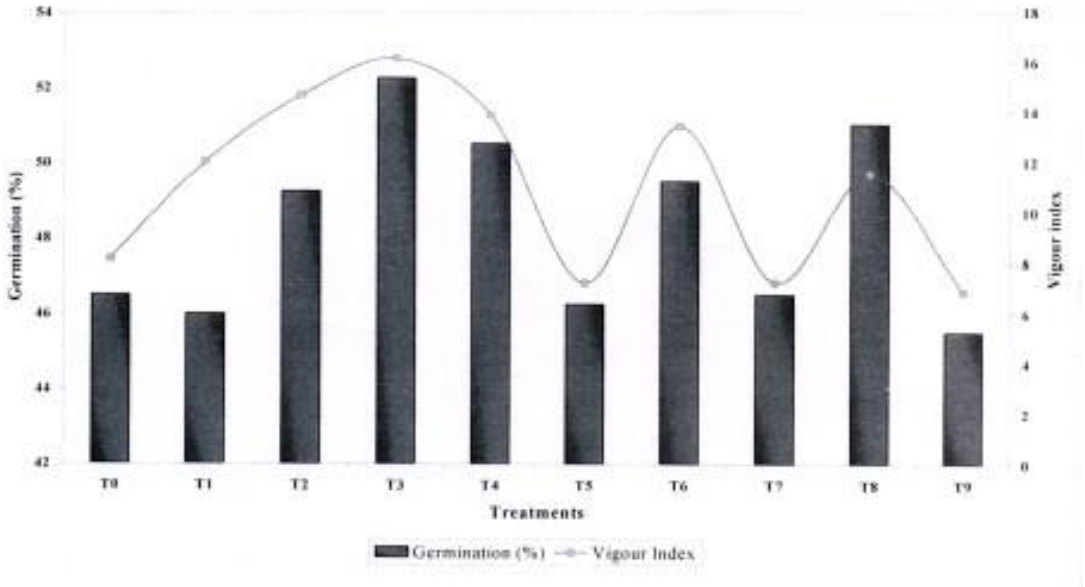


Fig. 2. Influence of seed grading on germination percentage and vigour index of *T. chebula*



The treated fruits were kept for germination in sand medium. The following observations were recorded *viz.*, 100 fruit weight, speed of emergence, initial germination, peak germination, days taken to complete germination, germination percentage, seedling growth measurements and vigour index. The recorded data were analyzed statistically following Panse and Sukhatme (1985). Critical difference (CD) was calculated at both 5 and 1 per cent probability level and the mean values of the experiments were compared using Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

Size and density grading of fruits influenced the germination behaviour, as a result of which significant variation was noticed among treatments. The maximum 100 fruit weight (167.148 g) was noticed in T9 and minimum was observed in T4 (116.835 g) (Table 1).

Among the different treatments, T4 recorded earlier initial germination and earlier peak germination (27.00 and 32.00 days respectively), whereas the maximum period for initial germination (33.00 days) and delayed peak germination (37.75 days) were noticed in T_9. In *T. Ichebula* T3 completed its germination earlier (40.50 days) which was on par with T2 and T4. The longest germination period was observed by T9 (44.75 days). In case of speed of germination, maximum was noticed by T4 (0.682), whereas minimum was noticed in T_7 (0.359). Germination percentage was higher in T3 (52.25%) which was on par with T_8 (51.00%), whereas the lower germination percentage of 45.50 was recorded by T9 (Table 1).

Significant variations due to treatments for root/shoot ratio, fresh weight, dry weight and vigour index were observed. The maximum root/shoot ratio was recorded in T_8 (0.181 cm), whereas the minimum root/shoot ratio of 0.127 was noticed in T_3. Significant variations were noticed for fresh and dry weight of root, shoot and total. T_3 registered the maximum total fresh weight (0.870 g) and dry weight (0.309 g). The above said parameters recorded its minimum in T9 (0.639 g and 0.151 g respectively). Among the treatments T3 produced vigorous seedling with maximum vigour index of 16.16, which was on par with T2 (14.69), whereas the minimum vigour index of 6.86 was registered by T9. (Table 2).

Seed size and weight play an important role in deciding the planting value of the seed. Seed grading is a continuation of seed cleaning in which the seeds are graded according to size or weight. A number of studies in tree species (Sivasamy, 1991; Masilamani, 1992; Manonmani *et al.*, 1996; Srimathi, 1997 and Umarani, 1999) identified grading as an integral part of post harvest operations to enhance the planting value of seed lots. Grading that entitled to remove the empty, immature, broken and insect damaged seeds (FAO, 2000) is done mainly to improve the physical and physiological quality of the seed lot.

Variation and inheritance of seed size have been documented for a number of species *viz., Picea glauca* (Helium, 1976), *Acacia holoserecia* (Helium, 1990), *Pinus sylvestris* (Lindgren, 1982), *Santalum album* (Bagchi and Sharma, 1989) and many other *Acacia* species (Bagchi *et ai*, 1999). Seed size variation may be caused by heredity or environmental or developmental factors. In the present study, the results of the size grading of fruits indicated that medium and bigger size fruits performed better than the smaller size fruits in terms

of early germination, speed of germination, germination percentage, seedling length and vigour index (Fig. 1 and 2). This is in harmony with the assumption that the large seeds provide a better physiological advantage in terms of a large nutrient supply for the germinating seeds and thus secured rapid, vigorous germination and seedling growth.

Seed weight or density is mainly influenced by maternal factors and is under strong genetic control (Tyson, 1989). Density grading of Terminalias using water, 2% NaCl and 3% NaCl showed better performance (Fig. 1 and 2). In all the three methods, sinkers performed better with early germination (27.00) speed of germination (0.682), germination percentage (50.50 and vigour index (13.880). Hence, for seeds like *T. chebula* were the ill-filled, air spaced and empty seeds could be removed by density grading by the application of floatation techniques.

Higher germination, seedling length and vigour index were noticed in medium sized seeds followed by bigger sized seeds as reported by Virendra Singh *et al.* (1995), Ghosh *et al.* (1976), Banik (1977). These increased germination, seedling height and vigour index indicated that seed size had a marked influence on germination behaviour. The medium sized seeds contained less food reserved when compared with large sized seed, the seedling emerging from the medium sized seed were forced to establish quickly. The above results are supported by Srimathi *et al.* (1991) in case of *Acacia mellifera,* Singh *et al.* (1993) in *Assculus indica,* Ponnammal *et al.* (1992) in *Zyzygium cuminii* and Dar *et al.* (2002) in *Acacia catcheu, Albizia lebbeck, Pinus roxburghii* and *Rubunia pseudoacasia.*

References

Bagchi, S.K. and Sharma ,V.P. (1989). Biometrical studies on seed characters of *Santalum album L. Silvae Genetica,* **38(3-4):** 152-153.

Bagchi, S.K., Joshi, D.N. and Rawat, D.S. (1999). Variation in seed size of *Acicia* spp. *Silvae Genetica,* **39:** 107-110.

Banik, R.L. (1977). Studies on grading of teak fruits. *Bano Biggyan Patrika,* **6(1):** 1-7.

Dar, F.A., Gera, M. and Gera, N. (2002). Effect of seed grading on germination pattern of some multi-purpose tree species of Jammu region. *Indian Forester.*

FAO. (2000). Guide to handling of tropical and subtropical forest seed. Danida Forest Seed Centre, Denmark.

Ghosh, R.C., Bakshish Singh and Sharma, K.K. (1976). Effect of seed grading by size on germination and growth of pine seedlings. *Indian Forester,* **102(12):** 850-858.

Gomez, K.A. and Gomez, A.A. (1984). Statistical procedures for agricultural research, II Edn., John Wiley and Sons. Inc., New York.

Helium, A.K. (1976). Grading seed by weight in white spruce *(Picea glauca). Tree planters Notes,* **27:** 16, 17, 23.

Helium, A.K. (1990). Seed ecology in population *of Acacia holosericea. Can. J. For. Res.,* **36:** 927-934.

Lindgren, D. (1982). Fractionation of seed orchard seeds by weight does have genetic implications. *Silva Fennica,* **16:** 156-160.

Manonmani, V.K., Vanangamudi, K. and Rai, R.S.V. (1996). Effect of seed size on seed germination and vigour in *Pongamiapinnata. J. Trop. For. Sci.,* **9(1):** 1-15.

Masilamani, (1992). Production, processing and storage technology for seeds of *Cassia siamea* Lamk, *Hardwickia binata* Roxb. and *Prosopis juliflora* Swartz DC. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

Panse, U.G. and Sukhatme, P.V. (1985). Statistical methods for agricultural workers. 2nd edition, ICAR, New Delhi, pp 150-157.

Ponnammal, N.R., Antony, K.A. and Arjunan, M.C. (1992). Seed polymorphism seed germination and seedling biomass in *Syzygium cuminii*. *J. Trop. For.*, **8(2):** 155-159.

Singh, Sarjan, Ombir Singh and Virendra Singh. (1993). Effect of seed weight on germination, survival and initial growth of *Aesculus indica. Indian Forester,* **119(8):** 627-629.

Sivasamy, M. (1991). Net production effect, seed production spectrum and quality polymorphism as influenced by ecology in *Azadirachta indica* A. Juss., *Derris indica* L. and *Ailanthus excelsa* Roxb. seeds. *Ph.D. Thesis,* Tamil Nadu Agricultural University, Coimbatore.

Srimathi, P. (1997). Research focus on seed collection, processing and storage of amla *(Emblica officinalis* Gaertn.), jamun *(Syzygium cuminii* Skeels.) and ber *(Zizyphus mauritiana* Lamk.). *Ph.D. Thesis,* Tamil Nadu Agricultural University, Coimbatore-3.

Srimathi, P., Vinaya Rai, R.S. and Surendran, C. (1991). Studies on the effect of seed coat colour and seed size on seed germination in *Acacia mellifera* (Vahl.) Benth. *Indian J. For.*, **14(1):** 1-4.

Troup, R.S. (1921). Silviculture of Indian Trees, Vol. I, II and II, Clerendon Press, Oxford, p 193.

Tyson, H. (1989). Genetic control of seed weight in flax *(Linum usitatissimum)* and possible implications. *Theoretical and Applied Genetics,* **77(2):** 260-270.

Umarani, R. (1999). Studies on the physiological and biochemical basis of seed germination and deterioration in *Casuarina equisetifolia. Ph.D. Thesis in Seed Science and Technology,* Tamil Nadu Agricultural University, Coimbatore.

Virendra Singh, O.P.S. Bana and Sah, V.K. (1995). Influence of seed size and GA_3 treatment on the germination and growth of oak. *Ind. J. For.*, **18(1):** 66-73.