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Influence of Seed Storage and Seed Treatments on Germination of *Garcinia gummi-gutta* (L.) ROXB. in Ponnampet, Kodagu District, Karnataka, India

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ABSTRACT

Germination studies of Garcinia gummi-gutta conducted at college of forestry, Ponnampet with the objective to determine the effect of seed storage and treatment on germination. Study indicated that seed stored up to 90 days showed highest germination (46.91%) followed by 60 days (38.18%) while the minimum germination was recorded in fresh seeds (32.75%). Seed treated with mechanical scarification of seed coat showed higher germination (63.88%) followed by treatment with GA_3 (60.03%) while minimum germination was observed in hydrogen peroxide treatment (10.66%). The study concluded that seed stored for short period did not reduce the germination and the seed treated with mechanical scarification of seed coat effective in breaking the dormancy and favoured early germination in Garcinia gummi-gutta.

Key words: *Garcinia gummi-gutta, Germination, Seed treatment, Storage.*

INTRODUCTION

The genus Garcinia contains several important economic species such as *Garcinia mangostana*, *Garcinia gummi-gutta* and *Garcinia indica*. 31 species of Garcinia occur in India. *Garcinia gummi-gutta* is an evergreen tree mainly found along the Western Ghats of India. It is a moderate sized tree with round canopy, drooping branches[11] and the trees have a dark, smooth bark with an average thickness of 5.3 mm[5]. Most of these tropical fruit species show dormancy and delayed germination[9]. A notable feature of all Garcinia is the exudation of yellow latex from stem[13].

The tree possesses great economic value as their fruits impart a special flavour and tastes besides the medicinal properties[4]. Due to the increased utility with respect to medicinal and nutritive value of the tree, the demand for the fruits is increasing in India and abroad rapidly. *Garcinia gummi-gutta* naturally found in the forest of Western Ghats and extracted in large scales as an important Non Wood Forest Product (NWFP) in parts of Karnataka (Kodagu and Uttara Kannada), Kerala and Maharashtra.

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Because of its diverse utility, destructive harvesting of fruits and restricted distribution, *Garcinia gummi-gutta* has been assigned lower risk/near threatened status locally by CAMP process[10]. Recently FRLHT (Foundation of Revitalization of Local Health and Traditions) has assigned a threat status of near threatened-globally to this species. If the present exploitation trend continues, its natural regeneration through seeds will drastically decline leading to extinction.

MATERIAL AND METHODS

The experiment was conducted at College of Forestry, Ponnampet (Karnataka), during the year 2013-14, in a split plot design with three replications. The study area has tropical humid condition with mean annual temperature ranging from 18˚ to 28.4˚ C, mean annual rainfall of 1656 mm and mean annual rainy days 77. Seeds were collected from healthy and high yielding mother plants from nearby estates in Ponnampet, Kodagu during month of July. For the germination study seed storage selected as the main plot and seed treatment as subplot. In the present study seed stored up to 0, 30, 60, 90 days respectively with the eight different seed treatments. In each treatment 30 seeds were used per replication. Observation on germination recorded after 180 day of sowing for each storage period.

Table 1: Treatment detail for the experiment

Main plot- Storage	Sub plot-Seed treatments	
M_1: Sowing of fresh seeds	S_1	Control (soaking in water)
M_2: Sowing after 30 days storage	S_2	Mechanical damaging of seed coat
M_3: Sowing after 60 days storage	S_3	Acid scarification for 3 minute
M_4: Sowing after 90 days storage	S_4	Treatment of kernel with 50 ppm GA_3 after removal of seed coat
	S_5	Cow dung slurry treatment for 48 hours
	S_6	Hot water treatment for 30 minutes
	S_7	H_2O_2 (30%) treatment for 30 minutes
	S_8	Fresh cow urine treatment for 24 hour

Observations recorded

1. Germination per cent: The germination was recorded when cotyledons were emerge out of sand on seed bed and expressed in percentage.

$$\text{Germination per cent} = \frac{\text{Number of seed germinated}}{\text{Number of seed sown}} \times 100$$

2. Mean daily germination (MDG) =

$$\text{Mean daily germination} = \frac{\text{Cumulative per cent germination}}{\text{Total no. of days}}$$

3. Peak value (PV) = Maximum mean daily germination reached at any stage of germination period.
4. Germination value (GV) = Germination value was estimated according to the method prescribed by Czabator[2].

   GV = Mean daily germination x Peak value.
5. Germination energy = Time taken up to the peak day of germination.

RESULTS

The present study results revealed that the effect of seed storage on seed germination showed significant differences for all the germination parameters. Out of the different storage period tried, seed stored up to 90; 60 days after collection recorded the higher germination. The maximum germination (46.91%) was recorded in storage period of 90 days followed by 60 days (38.18%) while the minimum (32.75%) was recorded in fresh seeds. Other germination parameter like MDG, PV and GV were also found maximum in seed stored up to 90 days, while the minimum

germination parameters were found in fresh seeds. Significant less germination energy was observed in seed stored up to 90 days followed by 60 days (Table 2).

Table 2: Effect of seed storage on germination parameters

Storage	Germination (%)	MDG	PV	GV	GE
M_1	32.75^a (34.91)*	0.19^a	0.20^a	0.05^a	140.70^b
M_2	35.92^b (36.82)	0.22^b	0.23^b	0.06^b	141.80^b
M_3	38.18^c (38.16)	0.24^b	0.24^b	0.08^c	134.00^b
M_4	46.91^d (43.23)	0.34^c	0.38^c	0.18^d	70.50^a
Mean	38.38 (38.28)	0.25	0.26	0.09	121.70
SEm±	0.02	0.01	0.01	0.00	4.18
LSD(0.05)	0.28	0.03	0.03	0.01	14.47

* Values in the parentheses are arc sine transformed values; LSD- Least Significant Difference, Figure with similar letters as superscript do not differ significantly

The effect of different seed treatment on germination of seed showed significant variation for all the germination parameter. Seed treated with mechanical scarification of seed coat showed best germination (63.88%) among all the treatments closely followed by treatment with GA_3 (60.03%). Among all the treatments seed treated with hydrogen peroxide recorded significantly lower values for germination (10.66%). The other germination parameter such as MDG, PVand GV were also found maximum values in seed treated with mechanical scarification of seed coat followed by treatment with GA_3 and significant less germination energy is recorded in seed treated with hydrogen peroxide (Table 3).

Table 3: Effect of seed treatments on germination parameters

Treatments	Germination (%)	MDG	PV	GV	GE
S_1	50.10^d (45.06)*	0.30^c	0.31^c	0.10^c	134.30^c
S_2	63.88^e (53.06)	0.39^d	0.43^d	0.19^e	132.30^c
S_3	27.99^b (31.94)	019^b	0.19^b	0.06^b	115.40^b
S_4	60.07^e (50.81)	0.36^d	0.40^d	0.15^d	133.50^c
S_5	50.89^d (45.51)	0.30^c	0.31^c	0.11^c	132.70^c
S_6	11.89^a (20.17)	0.10^a	0.10^a	0.02^a	101.80^a
S_7	10.66^a (19.06)	0.10^a	0.09^a	0.01^a	96.70^a
S_8	42.35^c (40.60)	0.26^c	0.27^c	0.09^c	127.40^c
Mean	38.38 (38.28)	0.25	0.26	0.09	121.70
SEm±	1.85	0.02	0.02	0.01	4.13
LSD(0.05)	5.25	0.05	0.05	0.03	11.71

* Values in the parentheses are arc sine transformed values; LSD- Least Significant Difference, Figure with similar letters as superscript do not differ significantly

DISCUSSION

The present study revealed that germination has increased with increase in storage period. The increase in germination with increase in storage period was indicated the delay germination nature of seed or some kind of seed dormancy such as seed coat imposed dormancy[1]. Wang *et al*.[14] reported an increase

in seed germination with the increase in duration of seed storage time in some subalpine species. Mathew and George[6] reported that *Garcinia gummi-gutta* seeds require more than one year for germination if they are sown soon after harvest and as the storage time increases, the time taken for germination decreases. Silveira *et al.*[12] reported that seed storage for short period did not reduce seed germination, seedling growth and survival per cent in *Mimosa foliolosa*.

In seed treatment experiment mechanical scarification of seed coat was recorded maximum germination it could be due to the removing or damaging of seed coat. Damaging or removal of seed coat makes the seed permeable for oxygen, water and it enhances the emergence of primary root. Seeds with intact seed coat took approximately four months to initiate germination. Studies done by some author also concluded that mechanical scarification improves the seed germination. Neetha *et al*.[8] reported that rubbing of *Albizia lebbeck* seeds with sand paper reported 85% germination compared to that of control which recorded only 17% germination. Dayanand and Lohidas[3] and Nagaraja and Christopher[7] also followed the same trend of results.

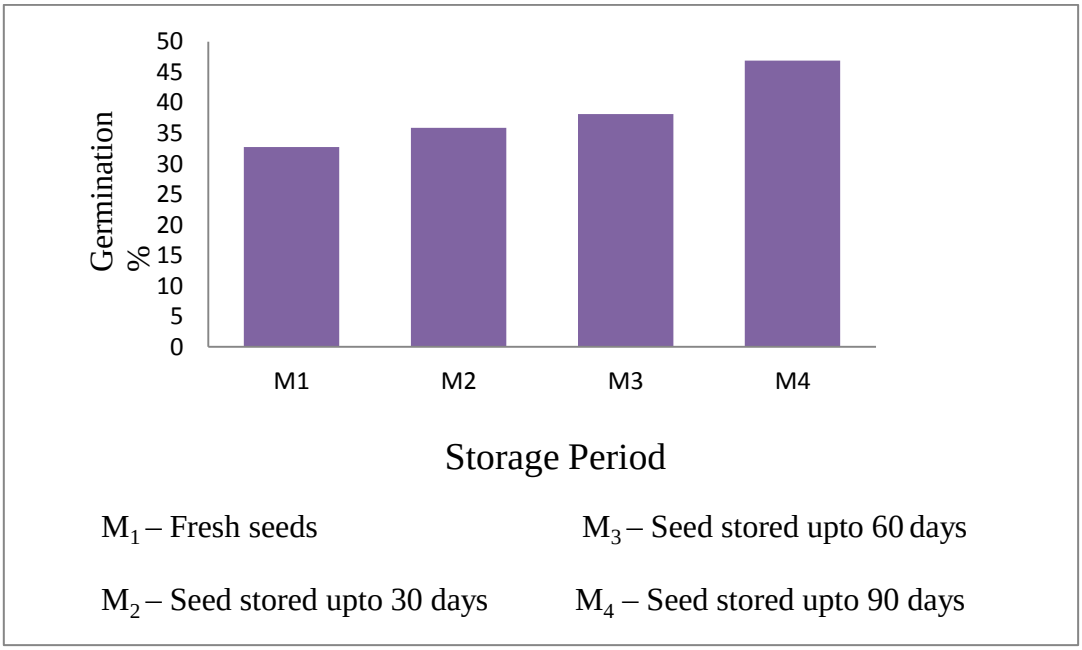

Fig. 1: Effect of different storage period on germination per cent

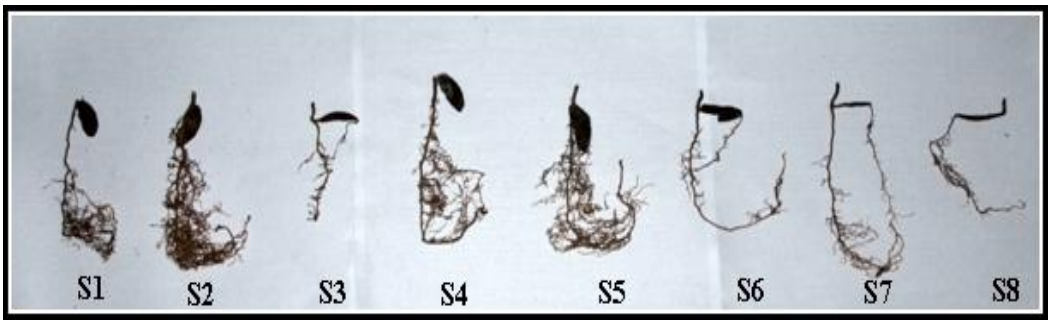

Plate 1: Influence of seed treatments on root growth in fresh seeds

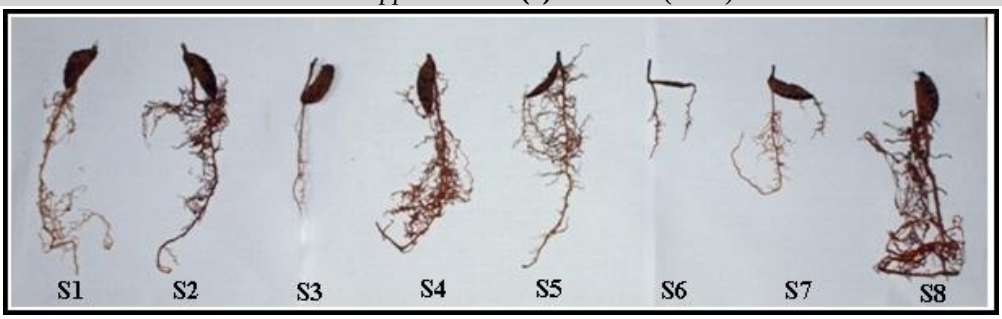

Plate 2: Influence of seed treatments on root growth in seed stored for 30 days

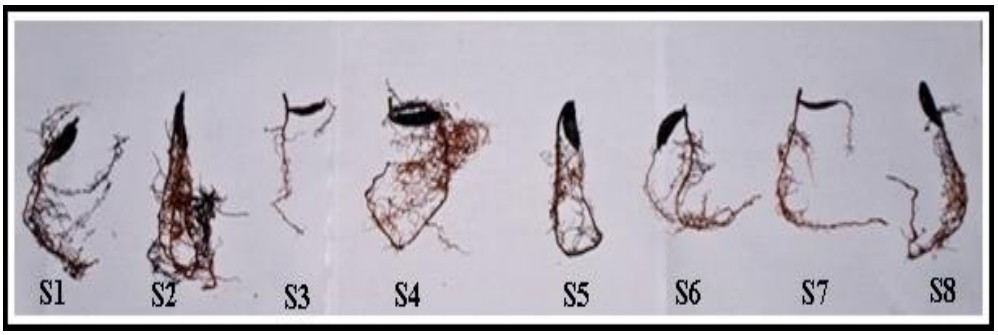

Plate 3: Influence of seed treatments on root growth in seed stored for 60 days

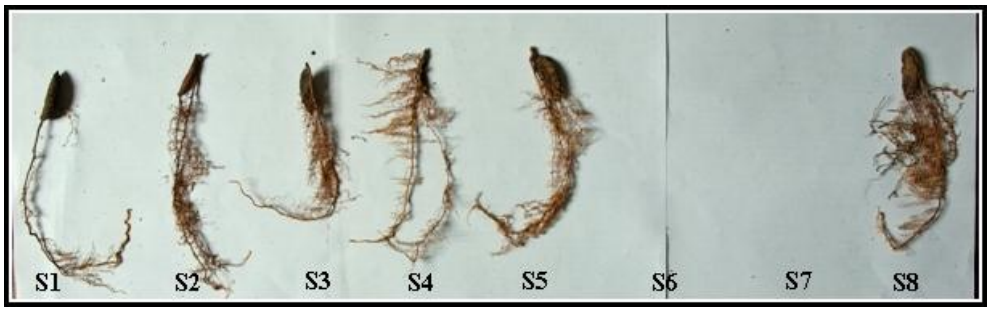

Plate 4: Influence of seed treatments on root growth in seed stored for 90 days

CONCLUSION

The overall results indicated that seed stored for short period did not reduce the germination of seed. Seed treated with mechanical scarification of seed coat effective in breaking the dormancy and favoured early germination in *Garcinia gummi-gutta*.

REFERENCES

1. Anil, K. C., Babu, K. P. and Krishnan, P. N., Dormancy mechanism and effects of treatments on the germination of *Garcinia gummi-gutta* (Clusiaceae) seeds. *Journal Tropical Forest Science* **14:** 322-328 (2002).
2. Czabtor, F. J., Germination value: an index combining speed and completeness of Pine seed germination. *Forest Science*, **8(4):** 386-396 (1962).
3. Dayanand, T. and Lohidas, T., Effect of different treatments on pod germination of red sanders. *Indian Journal of Forestry* **11(1):** 87-88 (1988).
4. George, G. L., Lakshamanan, R., Mathew, K. M. and Rao, Y. S., Review of research on Kokum, Camboge and other related species. *Journal of Spices Aromatic Crops* **11(1):** 1-12 (2002).
5. Hegde, R. S., Suryaprakash, A., Choth, L. and Bawa, K. S., Extraction of non-timber forest products in the forests of Biligiri Rangana hills, India. 1: Contribution to rural income. *Economic Bot*any **50(3):** 243-251 (1998).
6. Mathew, K. L. and George, S. T., Dormancy and storage of seeds in *Garcinia cambogia* Desr. (Kodampuli*)*.

Journal of Tropical Agriculture **33:** 77–79 (1995).

7. Nagaraja, B. N. and Christopher, J. P., Germination studies in *Adenthera pavanina*. *My Forest* **27(4):** 365- 366 (1991).
8. Neeta, M., Bohra, M. D., Udayburman and Harsh, L. N., Effect of seed size and pre-treatments on germination of *Albizia lebbeck* (L.) Benin. *Indian Journal of Forestry* **27(1):** 11-14 (2004).
9. Normah, M. N., Ramiya, S. D. and Gintangga, M., Desiccation sensitivity of recalcitrant seeds - a study on tropical fruit species. *Seed Science Res*earch **7:** 179–183 (1997).
10. Ravikumar, K. and Ved, D. K., 100 red listed medicinal plants of conservation concern in southern India. FRLHT, Bangalore 146-149 (2000).
11. Shringeshwara, A. N., Kirana, V. C., Rajanna, M. D., Hareesh, G. R. and Balakrishna, G., Studies on *Garcinia gummi-gutta* (L) Robson. A non-timber forest product of Shringeri taluk, Chikamagalur district, Karnataka. *My Forest* **36(1):** 61-64 (2000).
12. Silveira, F. A. O., Negreiros, D., Ranieri, B. D., Silva, C. A., Araújo, L. M. and Fernandes, G. W., Effect of seed storage on germination, seedling growth and survival of *Mimosa foliolosa* (*Fabaceae*): implications for seed banks and restoration ecology. *Tropical Ecology* **55(3):** 385-392 (2014).
13. Subhash, C. M. D., The Kokum tree. *Resonance* **3(4):** 12-15 (1996).
14. Wang, J. H., Baskin, C. C., Chen, W. and Du, G. Z., Variation in seed germination between populations of five sub-alpine woody species from eastern Qinghai-Tibet Plateau following dry storage at low temperature. *Ecological Res*earch **25(1):** 195-203 (2010).