Studies on Seed Production, Germination and Storage of Some Plantation Species in Bangladesh

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Abstract

Bangladesh Forest Department and various NGOs have undertaken large scale afforestation programmes in the country. This necessitates production of a large number of seeds and improved methods of their handling. It is likely that greater number of species will be included for increased afforestation activities. So, information on time of seed availability, quantity of seed production, number of seeds per unit weight, germination percentage, germination period, seed pre-treatment (if any), storage period, etc. will be required. This report is based on available scientific information and professional experience on seeds of forest trees which could help the nursery and plantation managers in raising seedlings.

সারসংক্ষেপ

বাংলাদেশ বন বিভাগ এবং বিভিন্ন বেসরকারী সংস্থা দেশে ব্যাপক বনায়ন কর্মসূচী গ্রহণ করেছে। এতে প্রচুর পরিমাণ বীজ উৎপাদন করা ও তাদের উন্নত ব্যবহার পদ্ধতি জানা অত্যাবশ্যক। ক্রমবর্ধমান বনায়ন কার্যক্রমে স্বভাবতই আরও অধিক সংখ্যক বৃক্ষ প্রজাতি অন্তর্ভুক্ত হবে। এজন্য বীজ প্রাপ্তির সময়, বীজের পরিমাণ, একক ওজনে বীজের সংখ্যা, অংকুরোদগম হার, অংকুরোদগম কাল, প্রয়োজনবোধে বীজ পরিশোধন, সংরক্ষণকাল ইত্যাদি বিষয়ে তথ্য জানা আবশ্যক। বনজ বৃক্ষের বীজের উপর প্রাপ্ত বৈজ্ঞানিক তথ্য ও পেশাগত অভিজ্ঞতা এ প্রবন্ধের ভিত্তি, যা বনজ বীজতলা ও বাগান ব্যবস্থাপককে চারা উত্তোলনে সাহায্য করতে পারবে।

Key words : Germination, plantation species, seed pre-treatment, seed production, storage

Introduction

Before the start of the eighteen century forest seeds were collected for plantation establishment. With the growing general acceptance of plantation as an alternative to natural regeneration in most parts of the world, demand for quality tree seeds has simultaneously increased. Demand for forest and forest based produces is also increasing day by day with the increase of human population. To meet the ever-increasing requirement of forest produces in the country, Forest Department has taken up large scale afforestation programmes in the depleted and barren zones, coastal belts and offshore islands, waste and marginal land, etc. and has been supplying seedlings in the rural areas for restocking the village groves. For proper implementation of the above programmes, a large quantity of seeds are necessary (Jones 1979, Alam 1982). The foresters are, therefore, required to have sound knowledge on the seed characteristics such as harvesting time, production per tree, seeds per unit weight, germination percentage, germination period, pre-treatment (if any),

storage period of seeds, etc. (Wang 1974). For successful raising of seedlings information on seeds of 69 species of forest trees are provided in this paper.

Materials and methods

Observations and data collection were made during 1981-1990 for 69 plantation tree species on various aspects of seed characteristics including time of seed collection, seed production per tree, quantity of seeds per unit weight and germination percentage, etc. Seed viability, germination period, and effect of pre-treatment on germination success were also noted. For each species, seeds were collected from at least 10 trees chosen at random, and studied for 3-5 times during the period. Seed pre-treatment for some species were carried out by soaking seeds in hot water for 30 seconds, soaking in cold for 12 hours or 24 hours or 48 hours, keeping in cow dung for 24 hours and then soaking in water for 48 hours.

In case of teak seeds the following pre-treatments were done :

Heap treatment

Seeds were kept in a bag and soaked in water for 48-72 hours. Then the bag with seeds was withdrawn from the water and kept on the ground for 12 hours to release excess water (Banik 1977). Now the process of soaking and drying alternately in every 24 and 12 hours was continued for 10-12 days. After passing that period the treated seeds were heaped on the ground and covered with sack-cloth or guny bag. Watering was done on the heap of seed once in the noon. After few days the seeds broke to germinate. It was then ready for sowing in the polybag or in the bed.

Pit treatment

Seeds were placed in a pit not less than 40 cm deep. The size of the pit depended on the quantity of seeds. Before placing seeds in the pit its bottom was covered with teak leaves and then 2-3 cm high layer of fresh cowdung was put. The pit was then filled with seeds, and covered with the soil. Metal or bamboo pipes were inserted at every corner and on the middle of the pit to pour water on the seeds once every day at noon. This was continued till the seeds broke to germinate. Now the treated seeds are ready for sowing in polybag or in ground bed. Generally this process required 15-20 days to complete.

Heat treatment

Seeds were placed thinly on dry levelled ground, covered thinly with dry leaves or straw and burnt for 3-5 minutes. It was then ready for sowing in the polybag or in the bed.

Results and discussion

Seed harvesting time, production per tree, number of seeds per kg, germination percentage, germination period, seed pre-treatment and storage period in normal room temperature are presented in Table 1.

The species studied may be grouped into four categories according to the time of seed harvesting, *viz.* (1) January-March, (2) April-June, (3) July-September and (4) October-December. Based on the harvesting time 29 species, mostly legumes, were placed in the first, 27 species in the second, 20 species in the third and 3 species in the fourth group.

Seed production per tree for each species depends on the age and size of the tree, soil nutrient status, moisture, rainfall, temperature, site, aspect, etc. However, these were not taken into account in this study.

Germination was found 70-80% in 22 species, 60-70% in 24 species and below 60% in 23 species. Germination periods were 5-10 days for 44 species, 10-15 days for 13 species, and above 15 days for 12 species.

Seed pre-treatment was necessary for enhanced germination for the species having stony seed coat, like *Albizia* spp., *Tectona grandis*, etc. seeds.

Table 1. Seed harvesting time, seed production, germination and storage behaviour of some forest tree species of Bangladesh.

Species	Vernacular name	Seed harvesting time (month)	Seed production/tree (kg)	Seeds per kg (No.)	Germination (%)	Germination period (day)	Seed pre-treatment	Storage period in normal room temperature
*Acacia auriculiformis*A. Kunn.	Akashmoni	Jan.-Mar.	4-5	38,000-40,000	70-80	5-7	Soaking in hot water for 30 sec.	1 year
A. catechu Wild.	Khair	Dec.-Jan.	2-3	10,000-12,000	60-70	7-10	Best results with fresh seed	A few weeks
A. mangium Wild.	Mangium	Mar.-April	3-4	1,00,000-1,20,000	65-75	6-7	Soaking in hot water for 30 sec.	1 year
A. nilotica Linn.	Babla	Apr.-May	3-4	4,500-5,000	60-70	7-10	Keeping in cow dung for 24 hrs. and then soaking in water for 48 hrs.	3-4 months
Adina cordifolia Hook.	Haldu	Feb.-Mar.	0.5-1.0	1.2-1.3 million	40-50	15-20	Soaking in cold water for 24 hrs.	5-6 months
Albizia chinensis Marr.	Chakua koroi	Feb.-Mar.	3-5	80,000-90,000	40-50	7-10	Soaking in hot water for 30 sec.	1-2 yesrs
A. lebbeck Benth.	Kala koroi	Feb.-Mar.	4-5	10,000-12,000	40-45	7-10	Soaking in hot water for 30 sec.	1 years
A. odoratissima Benth.	Kala sirish	May-Jun.	2-3	9,000-10,000	40-50	7-10	Soaking in hot water for 30 sec.	1-2 years
A. procera Benth.	Koroi	Feb.-Mar.	5-7	35,000-40,000	60-70	5-7	-do-	1 year
A. richardiana King.	Raj koroi	Feb.-Mar.	4-5	10,000-12,000	45-50	7-10	-do-	1-2 years
Alstonia scholaris R. Br.	Chatian	Jan.-Feb.	8-10 Pods	2-3 million	50-60	8-10	-	3-4 months
Anacardium occidentale Linn.	Kajubadam	Dec.-Jan.	3-4	1,200-1,300	50-70	10-15	-	15-20 days
Anisoptera glabra Kurz.	Boilam	Apr.-Jun.	5-7	90-100	70-80	5-7	-	7-10 days
Anthocephaluschinensis Lamk.	Kadam	Aug.-Sep.	1-2	1-1.2 million	40-60	20-25	-	1 year
Aphanamixis polystachya Wall.	Pitraj	Mar.-Apr.	5-7	1,100-1,200	50-60	7-10	-	5-7 days
Artocarpus chaplasha Roxb.	Chapalish	May-Jun.	5-7	300-450	70-80	7-10	-	10-15 days
A. heterophyllus Lamk.	Kanthal	Apr.-Jul.	10-15	60-70	70-80	7-10	-	10-15 days
A. lakoocha Roxb.	Barta	May-Jul.	3-5	500-700	50-60	7-10	-	10-15 days
Azadirachta indica A. Juss.	Neem	Jun-Jul.	3-6	13,000-14,000	70-80	7-10	-	7-10 days
Barringtonia acutangula Gaertn	Hijal	Jul.-Aug.	3-4	2,000-2,100	60-70	10-15	-	7-10 months
Bischofia javanica Blume	Kanjal	Nov.-Dec.	3-4	92,000-1,00,000	60-70	7-10	-	7-10 days
Bombax ceiba Linn.	Simul	Apr.-May	1-2	25,000-26,000	60-70	7-10	-	1-2 months

Note : '-' No need of any treatment.

Table 1. (Contd.)

Species	Vernacular name	Seed harvesting time (month)	Seed production/tree (kg)	Seeds per kg (No.)	Germination (%)	Germination period (day)	Seed pretreatment	Storage period in normal room temperature
Borassus flabellifer Linn.	Tal	Aug.-Sep.	70-100	4-6	60-70	20-25	-	1 months
Butea monosperma Lamk.	Polash	May-Jun.	1-2	600-800	50-60	10-15	-	7-10 days
Cassia fistula Linn.	Sonalu	Nov.-Dec.	2-3	20,000-22,000	45-60	10-15	Soaking in hot water for 30 sec.	1 year
C. siamea Lamk.	Minjiri	Feb.-Mar.	4-6	42,000-45,000	60-70	7-10	-	1 year
Casuarina equisetifolia Linn.	Jhau	Apr.-May	2-3	0.60-0.70 million	40-50	7-10	-	1year
Chuckrasia tabularis A. Juss.	Chickrassi	Jan.-Feb.	1-2	45,000-50,000	60-65	7-10	-	1-2 months
Dalbergia sissoo Roxb.	Sissoo	Dec.-Feb.	2-3	9,000-10,000	60-70	7-10	-	1-2 months
Delonix regia Bajer.	Krishnachura	May-Jun.	3-5	1,700-1,800	60-70	7-10	Soaking in cold water for 48 hrs.	1 year
Diospyrus perigrina Gurke	Gab	May-Jun.	6-8	700-900	40-50	10-12	-	1 month
Dipterocarpus costatus Ridl.	Dhalia garjan	Mar.-Apr.	3-5	140-160	70-80	5-7	-	7-10 days
D. scaber Ham.	Baitta garjan	Apr.-May	5-6	160-180	65-70	5-7	-	7-10 days
D. turbinatus Gaertn.	Tely garjan	Apr.-May	5-7	130-140	70-80	5-7	-	7-10 days
Elaeocarpus robustus Bl.	Jalpai	Nov.-Dec.	8-10	1,200-1,300	40-50	15-20	-	3-4 months
Erythrina indica Lam.	Kanta madar	May-Jun.	2-3	7,000-7,500	60-70	7-10	Soaking in cold water for 12 hrs.	1 year
E. ovalifolia Roxb.	Pani madar	May-Jun.	3-4	4,500-5,000	60-70	7-10	Soaking in hot water for 30 sec. and then in cold water 24 hrs.	1 year
Eucalyptus camaldulensis Dchnh.	Eucalyptus	Jan.-Feb.	0.5	0.80-1.0 million	60-70	5-7	-	1 year
E. tereticornis Smith	Eucalyptus	Jan.-Feb.	0.5	0.40-0.50 million	70-80	5-7	-	1 year
Gmelina arborea Roxb.	Gamar	May-Jun.	5-7	1,300-1,500	70-80	7-10	-	1 year
Hevea brasiliensis Muel.	Rubber	Aug.-Sep.	5-7	90-110	70-80	5-7	-	10-15 days
Hopea odorata Roxb.	Telsur	May-Jun.	5-6	1800-2000	70-80	5-7	-	7-10 days
Lagerstroemia species Pers.	Jarul	Dec.-Jan.	4-5	0.10-0.15	45-60	7-10	-	3-4 months
Leucaena leucocephala Lam.	Ipil-ipil	Nov.-Feb.	2-3	60,000-70,000	70-80	5-7	Soaking in hot water for 30 sec. and 12 hrs. in cold water	1 year

Note : '-' No need of any treatment.

Table 1. (Contd.)

Species	Vernacular name	Seed harvesting time (month)	Seed production/tree (kg)	Seeds per kg (No.)	Germination (%)	Germination period (day)	Seed pretreatment	Storage period in normal room temperature
Mangifera sylvatica Roxb.	Uriam	May-Jun.	8-10	35-45	65-75	15-20	-	10-15 days
Melia azedarach Linn.	Bakain Ghora neem	Jun.-Sep.	5-6	7,000-7,5000	60-70	15-20	Soaking in cold water for 24 hrs.	5-6 months
Melocanna baccifera Roxb.	Muli bans	Apr.-Jul.	3-10	10-12	70-80	7-10	-	10-15 days
Mesua ferrea A. Juss	Nageshwar	Jul.-Aug.	2-3	1,500-2,000	60-70	10-15	-	7-10 days
Michelia champaca Linn.	Champa	Jul.-Aug.	3-5	10,000-12,000	60-70	7-10	-	7-10 days
Mimusops elengi Linn.	Bakul	Aug.-Sep.	8-10	2,000-22,000	35-40	15-20	Soaking in cold water 24 hrs.	1-2 months
Paraserianthes falcatera	Malakana koroi	Feb.-Mar.	2-3	70,000-80,000	60-70	7-10	Soaking in hot water for 30 sec.	1-2 years
Phoenix sylvestris Roxb.	Khejur	Jun.-Jul.	8-10	1,300-1,500	50-60	10-15	-	7-10 days
Phyllanthus emblica Linn.	Amloki	Dec.-Feb.	5-7	4,000-4,500	40-50	15-20	-	3-4 months
Polyalthia longifolia Sonn.	Debdaru	Aug.-Sep.	8-10	1,500-1,700	70-80	10-12	-	15-20 days
Samanea saman Merr.	Rain tree	Mar.-Apr.	5-7	6,000-6,500	60-70	7-10	Soaking in hot water for 30 sec.	1 year
Shorea robusta, Gaertn.	Sal	May-Jun.	7-8	480-500	80-90	5-7	-	7-10 days
Spondias dulcis Soland	Bilati amra	Jul.-Aug.	3-6	100-125	50-60	15-20	-	1-2 months
Swietenia macrophylla King.	Mahogany	Dec.-Feb.	3-5	2,800-3,000	60-70	7-10	-	2-3 months
Swintonia floribunda Griff.	Civit	Apr.-May	5-6	750-800	70-80	5-7	-	7-10 days
Syzygium cumini Linn.	Kalajam	Jun-Jul.	8-10	1,500-1,700	70-80	5-10	-	20-30 days
Syzygium grande Wt. Wald.	Dhakijam	May-Jun.	8-10	110-115	70-80	7-10	-	1-2 months
Tamarindus indica Linn.	Tentul	Feb.-Mar.	8-10	2,200-2,400	70-80	7-10	Soaking in hot water for 30 sces. and in cold water for 24 hrs.	1 year
Tectona gradis Linn.	Shegun, Teak	Dec.-Feb.	3-5	1,500-1,700	40-50	15-20	Seeds to be treated by heap, pit or heat treatment	1 year
Terminalia arjuna Roxb.	Arjun	Feb.-Mar.	10-15	130-140	60-70	10-15	-	4-5 months
Terminalia bellerica Roxb.	Bohera	Dec.-Feb.	10-15	160-170	45-55	10-12	-	1 month

Note : '-' No need of any treatment.

Table 1. (Contd.)

Species	Vernacular name	Seed harvesting time (month)	Seed production/tree (kg)	Seeds per kg (No.)	Germination (%)	Germination period (day)	Seed pretreatment	Storage period in normal room temperature
Terminalia chebula Retz.	Horitaki	Dec.-Feb.	10-15	150-160	35-45	10-15	Soaking in cold water for 24 hrs.	1-2 months
Toona ciliata Linn.	Toon	Mar.-Apr.	3-5	1,40,000-1,50,000	50-60	7-10	-	1 month
Trewia nudiflora Linn.	Pitali	Jun.-Jul.	3-5	22,000-25,000	50-60	15-20	-	3-4 months
Xylia kerrii Benth	Lohakath	Mar.-Apr.	1-2	800-900	70-80	5-7	Soaking in cold water for 12 hrs.	1 year

Note : '-' No need of any treatment.

Fleshy and succulent seeds like diperterocarps could not be stored for more than 7-10 days. Seeds with hard and stony seed coat such as legumes, teak, gamar, eucalyptus, etc. could be stored for more than one year. Thin seeds like toon, chickrassi, chatian, khair, sissoo, etc. and drupes and berries like pitraj, dhakijam, jam, bohera, horitoki, bakul, etc. could not be stored for more than two months.

Conclusion

Seed is the major planting material for reforestation and afforestation programme. To properly implement the programme both quality and quantity of seeds are important. Foresters and nurserymen should have sound knowledge about seed characteristics and behaviour. The information contained in this paper would be a guideline for those who are engaged in nursery raising and plantation activities in Bangladesh.

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