International Journal of Farm Sciences **3(2)** :90-94, 2013

Determining maturity indices for time of seed collection in *Gmelina arborea* under Punjab conditions

HS SARALCH and SOM PAL SINGH*

Department of Forestry and Natural Resources
***School of Climate Change and Agricultural Meteorology**
Punjab Agricultural University, Ludhiana 141004 Punjab
Email for correspondence:harmeet.saralch@rediffmail.com

ABSTRACT

In view of enormous potentiality of *Gmelina arborea* in afforestation, diversification of farm grown timbers like poplar and eucalypts and to meet the target of industrial demand along with achieving realization of its multiple uses the maturity indices for seed collection of *G arborea* under Punjab conditions were studied at the experimental area of Department of Forestry and Natural Resources, Punjab Agricultural University, Ludhiana, Punjab during March–June 2012. It was observed that the species started flowering during mid March to end of May and fruits started maturing from April onwards that continued well up to the end of June. During the study period color of fruits changed from green to black at various developmental stages. The fruits remained green till 10th week after flowering and turned yellowish green, yellow and yellowish brown in the 11th and 12th, 13th and 14th weeks respectively. Maximum values for fruits static as well as for per cent germination were also observed during the11th and 12th, 13th and 14th weeks of fruit collection. It is observed from the present studies that fruits of *G arborea* should be collected when their color range is in between yellowish green to yellowish brown instead of taking time as a fixed parameter since the time of season may vary from year to year.

Keywords: Seed collection; maturity indices; *Gmelina arborea;* season

INTRODUCTION

Gmelina arborea (Roxb) belongs to the family verbenaceae and is naturally distributed eastwards from Pakistan throughout India, Bangladesh and Myanmar to parts of Sri Lanka, Thailand, Laos, Cambodia, Vietnam, and China. Characteristically it is found scattered in deciduous and moist deciduous forests but occurs occasionally in evergreen forests. Approximately one million hectare of *G arborea* plantations have been established in small woodlots and agroforestry settings in the tropics and subtropics (Anon 2002). In India it is found in eastern sub-Himalayan tract, Indo-Gangetic plains, Aravali Hills, central India, western Peninsula and western Himalayas. It grows well in temperature ranging from 1^{0}C to 48^{0}C with annual rainfall ranging from 760 to 4,500 mm and prefers fertile alluvial soils.

G arborea is very site specific, prefers moist fertile valleys, deep clay loams and also grows on dry sandy or poor soils (Tewari 1995). It is a light demander, moderately frost hardy and has good power of recovering and doesn't withstand excessive drought and bad drainage.

In view of enormous potentiality of *G arborea* for afforestation, diversification of farm grown timbers like poplar and eucalypts and to meet the target for the industrial demand and along with achieving realization of its multiple uses and fast growth of this species have attracted growers, forest departments and non-government organizations to take up large scale plantation programmes of this species. Growth rates for *G arborea* have been reported to be as high as 40–50 m^3/ ha/ year in areas of good soils and rainfall in southern Costa Rica (Zeaser 1998) but on average sites probably productivity is 15–21 m^3/ha/year for adapted landrace material throughout the tropics and sub-tropics.

Good quality planting stock is the pre-requisite for successfully raising tree plantations. Interest in producing quality seedlings by application of improved and modern nursery technique has increased in recent years (Gera and Ginwal 2002). The success of a plantation program largely depends on prompt germination which has a direct correlation with seed collection time. In modern forestry it is important to produce quality seedlings by inducing morpho-physiological changes in the plants for making them competent enough to bear the shock of field planting and enhance their productivity (Ginwal et al 2004).

In the humid tropics problems are of special nature as the seasonality effects are very strong and the period of maximum seed production is uncertain. The problem is further aggravated as limited information is available on length of time between anthesis and fruit maturity. The physiological maturity denotes the stage of development when seed reaches its maximum dry weight and marks the end of the seed falling period (Shaw and Loomis 1950). Harrington (1972) has suggested that the physiological maturity is the developmental stage at which seeds achieve maximum viability and vigor.

Propagation of *G arborea* for plantation establishments can be done from seed or by rooted cuttings. Seed is the basic unit in a plantation programme of forest tree species and thus sustainable supply of quality seeds continues to be a key factor for the future forestry growth particularly in the developing world. The afforestation programmes need large quantities of quality seeds with greater physiological viability and vigor to produce healthy seedlings suited to plantation sites.

MATERIAL AND METHODS

The present studies entitled 'Determining maturity indices for time of

seed collection in *Gmelina arborea* under Punjab conditions' were carried out in the experimental area of Department of Forestry and Natural Resources, Punjab Agricultural University, Ludhiana during the months of March–July 2012. The study area is at 247 m above sea level and lies at 30º 45'N latitude and 75º 40'E longitude. The area falls in the central zone of Punjab. Climate is sub-tropical to tropical with a long dry season from late September to early June and wet season from July to September. May and June are the hottest months whereas December and January are the coldest. Frost occurrence is not common. On an average site receives 704 mm rainfall which is not evenly distributed and most of it (75-80%) is received during July and September.

To determine the appropriate time for seed collection for better germination collection of fruits of *G arborea* was started from the 3rd week after flowering and continued till 16th week. After collection the fruits were further evaluated for subsequent laboratory investigations viz fruit size, fresh weight, dry weight and germination percentage. For sowing of seeds for germination fruits were depulped for seed extraction. Seeds were washed thoroughly in water and dried under shade for five days prior to sowing. After extraction, cleaning and drying seeds were graded by removing very small seeds and inert matter if any to determine the indicators of seed maturation when seeds attain maximum germination percentage. Germination percentage was calculated as per the formula given below:

$$\text{Germination percentage} = \frac{\text{Total number of seeds germinated}}{\text{Total number of seeds of seeds sown}} \times 100$$

RESULTS AND DISCUSSION

The maturation studies of fruits of *Gmelina arborea* are presented in Table 1. It is evident from the table that *G arborea* started flowering during March to end of May and fruits started maturing from April onwards and continued well up to the end of June. During the study period color of fruits changed from green to black at various developmental stages. The fruits remained green till 10th week after flowering and turned yellowish green, yellow and yellowish brown in the 11th and 12th, 13th and 14th weeks respectively. Maximum values for fruits static were also observed during the 11th and 12th ,13th and 14th weeks which were well supported by the results of germination percentage of seeds during these weeks.

Further a critical review of data presented in Table 1 reveal that fruits collected on or before 9th week after flowering did not germinate. The germination percentage started decreasing in the seeds collected after 15th week of flowering. In general the fruit length varied from 0.63 to 3.28 cm and width from 0.40 to 4.18 cm whereas fresh and dry weights

Table 1. Seed characteristics of *Gmelina arborea* collected at different stages of fruit maturity

Weeks after flowering	Fruit colour	Fruit length (cm)	Fruit width (cm)	Fruit wt (g)		Grmination (%)
				Fresh	Dry	
3	Green	0.63	0.40	0.054	0.011	0.00
5	Green	1.32	1.07	0.32	0.52	0.00
7	Green	1.85	1.31	0.51	0.14	0.00
9	Green	2.56	2.12	0.56	0.48	0.00
10	Green	3.25	4.16	0.59	0.21	29.00
11	Yellowish green	3.28	4.18	0.68	0.34	43.00
12	Yellowish green	3.28	4.18	0.68	0.38	69.00
13	Yellow	3.28	4.18	0.56	0.37	73.00
14	Yellowish brown	3.28	4.18	0.48	0.36	70.00
15	Brown	3.28	4.18	0.46	0.32	57.00
16	Black	3.28	4.18	0.46	0.32	24.00

of fruits varied from 0.054 to 0.68 g and 0.011 to 0.38 g respectively. The maximum per cent germination of seeds was observed in the seeds of yellow color fruits collected after 13th week of flowering closely followed by 12th and 14th weeks of flowering. The results of the present study are almost in agreement with the findings of Kumar et al (2002) where they have also observed similar patterns for maturity indices of *G arborea* at RFRI, Jorhat, Assam.

CONCLUSION

It can be concluded from the present investigations that fruits of *Gmelina arborea* should be collected when their color range is in between yellowish green to yellowish brown. The period between seed maturation and seed dispersal is often short whereas the effects of climate in a particular year may change seed setting and ultimately seed collection by several weeks from the pre-determined average.

REFERENCES

Anonymous 2002. http://www.fao.org/forestry/fo/country/nav_world.jsp?lang_id¼3. Country profiles.

Gera M and Ginwal HS 2002. Preliminary observation on field trial of root trainer raised seedlings. The Indian Forester **128(1)**: 19-26.

Ginwal HS, Rawat PS, Bhandari AS and Mandal AK 2004. Potting mixture affects the seedling quality in *Albizia procera* (Robx) Benth under

root trainer seedling production system. Annals of Forestry **12(2)**: 172-81.

Harrington JE 1972. Seed storage and longevity. In: Seed biology Vol III, TT Kozlowski (Ed), Academic Press, New York, pp 145-245.

Kumar A, Singh AN, Kalita RK and Prasad KG 2002. Gmelina arborea: a technology mission. Rain Forest Research Institute, Jorhat, pp 113.

Shaw RH and Loomis WE 1950. Basis for the prediction of corn yields. Plant Physiology **25**: 225-244.

Tewari DN 1995. A monograph on Gamari (*Gmelina arborea*). International Book Distributors, Dehra Dun, pp 23.

Zeaser D 1998. Vegetative propagation of melina (*Gmelina arborea* Roxb). In: CAMCORE. International Tree Breeding Short Course Book, North Carolina State University, Raleigh, North Carolina, USA, pp 27-34.

Received: 7.8.2012 *Accepted: 24.9.2012*