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RESEARCH NOTES

(I)

A NOTE ON ALBINISM IN *MADHUCA LATIFOLIA* J.F. GMEL

Madhuca latifolia (Syn *Madhuca indica*) commonly known as Mahua belonging to family *sapotaceae*, is an important non-timber forest product, playing an major role in tribal economy of country. It is mostly distributed in the forest areas of Madhya Pradesh, Chhattisgarh, Jharkhand, Uttar Pradesh and Maharashtra, etc. Mahua is considered as one of the most prominent multipurpose tree, not only due to its valuable timber but because of its delicious and nutritive flowers and seeds. Flowers are rich source of sugar and protein. Mahua flowers are used as ready currency in some tribal places, where they are sold to provide income for essential food items on a regular basis during the collection period (May-June). More than 75% of the tribal population is engaged in collection of flowers and seeds. Mauha flower/seed collection provides 28,600 persons year of employment. The most valuable part of mahua's seeds is the kernel, which contains 30-40 per cent fatty oil, commonly known as mahua oil or butter of commerce. Wood is used for building purposes, furniture, tannery, sports goods, musical instruments, oil and sugar presses, ship building, agricultural implements and carving. Seed cakes possess pesticidal and insecticidal properties. Apart from this, recently it is gaining importance as tree borne oil seed i.e., for biodiesel. The kernel oil content varies from 30 – 43%.

In the present study, seeds were collected from trees grown at National Research Centre for Agroforestry (NRCAF), farm in the month of July. It was sown in the nursery of NRCAF, Jhansi (altitude 271 m amsl, latitude 25° 35' N, longitude 78° 35' E, mean rainfall 958 mm). The polybags were filled with sand, soil and Farm yard manure (FYM) in the ratio of 1:2:1 and seedling behavior were observed regularly to calculate germination percentage. Out of 272 seedlings germinated, two were of albino seedlings were noticed and that is being reported here (Fig 1). After 45 days, albino seedlings turned in to pale yellow colour and died. As albino is characterized by partial or complete loss of chlorophyll pigments and incomplete differentiation of chloroplast membranes that in turn impairs photosynthesis and the plants eventually, die at a young stage without reaching maturity (Kumari *et al.,* 2009). The leaves show a wide range of coloration owing to differences in photosynthetic pigment content that may have a direct effect on the photosynthetic rate. Since albino seedlings lack of chlorophyll, they do not survive for long and die soon after the food reserves stored in the endosperm/cotyledon(s) are exhausted (Gunaga *et al*., 2013). The comparison of normal and albino seedling is presented in Table 1.

The term 'albinism' is derived from the Latin word 'Albus', which means 'white'. Albinism is defined as a lack of pigmentation, but can take various forms depending on the severity of pigment loss, as well as the nature of the missing pigments. Environmental conditions such as light, temperature, media composition and culture conditions play some role in determining the frequency of albino plant formation. Genetic factors are even more important, and are major determinants in albinism (Kumari *et al.,* 2009). Albino is largely documented in angiosperms and which a product of recessive trait governed by many loci. Albinism is caused due to the inheritance of recessive alleles (alternative form of gene), either from a single parent (very rare) or from both the parents. As the majority of leaf pigments are in plastids, it is clear that albinism involves dramatic alterations to chloroplast biogenesis. Most of the research in this area has found that albino plants have altered plastid ultrastructure as compared to their green counterparts (Clement *et al.,* 2005). Besides, mutation whether induced or spontaneously, albino seedlings may be produced either by selling of an albino carrier (Aa) or by mating of albino carriers. In both cases the results may be as depicted below.

Aa x Aa = AA (1) Aa (2) → 3 normal seedlings; aa (1) → 1 albino seedling

Where A- dominant gene

a- recessive gene

However, under natural conditions, the frequency of such seedlings will vary depending on the extent of natural selfing or mating of albino carriers, reduced population size, high degree of inbreeding, reduction in heterozygosity and spontaneous mutation (Gunaga *et al.*, 2013). In the current study, albinism may be caused due to environmental factors or mutations that have occurred between seed formation and germination

Table 1 : Comparison of normal and albino seedling (30 DAS)

Type of seedling	Shoot length (cm)	Root length (cm)	No. of leaves	Remark
Normal seedling	8.5	12.00	4	Normal growth and Healthy
Albino 1	6.5	14.20	6	Abnormal pale whitish
Albino 2	4.5	12.00	More than 5	Abnormal and leaves partially developed

stage. Most studies conducted to find the inheritance of albinism have found that it is a recessive trait governed by one or two genes with two alleles; albinism being recessive. Also Sharma (1995) mentioned that the phylogenetic distance between parents is positively correlated and as distance increases, albinism increases. In any effective tree improvement programme, the knowledge of breeding behavior of a species assumes a great importance. Such seedlings (albino and chlorophyll deficient) may be used as genetic markers for estimation of natural selfing. Occurrence of albino has been reported in *Pongamia pinnata* (Kannur *et al*., 2004; Kumaran *et al.,* 2007 and Beniwal and Chauhan, 2012), *Putranjiva roxburghii*, Kala and Dubey (2013), *Swietenia mahahoni* (Durai, 2012), *Sarka ashoka* (Gunaga *et al.,* 2013), *Tamarindus indica* (Jaiysankar *et al.,* 2011), *Bombax ceiba* (Venkatesh and Emmanuel, 1976), *Pterocarpus santalinus* (Vakshasya, 1981), *Dendrocalamus strictus* (Kumar *et al.,* 1993) and *Dendrocalamus giganteus* (Dhaman and Sharma, 1997), *Bombusa arundinacea* (Kondas *et al*., 1973; Indira, 1988 and Kumar *et al.,* 1995), *Eucalyptus cameldulensis* and *E. tereticornis* (Venkatesh and Sharma, 1974), *Gmelina arborea* (Karoshi *et al*., 2001), *Simarouba glauca* (Rathakrishnan *et al.,* 2003), *Artocarpus integrifolia* (Rao *et al.,* 1999) and *Azadirachta indica* (Kulkarni and Srimathi, 1987).

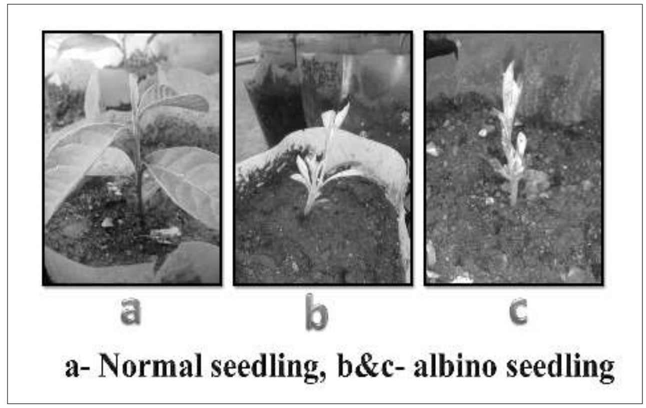

Fig. 1 : A view of normal and albino seedlings in *Madhuca latifolia*

However, albino mutants may be important material for functional studies and may lead to gene discovery. Albinism is difficult to eliminate, but at least in some cases it can be overcome to reap the benefits to plant improvement through interspecific crosses and development of doubled haploids. Moreover, in any tree improvement programme, knowledge of breeding behavior is essential. Reporting of such occurrence is important and also further studies are required to ascertain the frequency of albino.

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