

PROPAGATION AND EVALUATION OF MADHUCA LONGIFOLIA

By

Ranjith Senarathne, B.Sc.(Agriculture)

Thesis

Submitted in partial fulfilment of the requirements

for the degree of

MASTER OF PHILOSOPHY

in

Agriculture

in the

POSTGRADUATE INSTITUTE OF AGRICULTURE

of the

UNIVERSITY OF PERADENIYA, SRI LANKA

Approved.

Examination Committee

*Dalasantha Aramban*

*Ranjith*

*Ranjith*

*340094*

C 583.685

S25



340094

AGRICULTURE LIBRARY  
UNIVERSITY OF PERADENIYA

## ABSTRACT

### PROPAGATION AND EVALUATION OF MADHUCA LONGIFOLIA

Madhuca longifolia (L) Macbr. is a large deciduous tree belonging to the family Sapotaceae which produces seeds profusely and regularly in a semi-wild state. Seed kernel contains as much as 50 % oil and has a considerable economic potential. Hitherto no systematic study has been carried out to ascertain the distribution and abundance of this tree in Sri Lanka. Hence a preliminary survey was conducted by means of questionnaires so as to obtain information as regards the distribution, relative abundance, period of defoliation, flowering and fruit ripening and the average yield of seed kernels per tree per year in each district. Based on information gathered in the questionnaire survey a total of about 54,000 trees of M.longifolia are estimated for Sri Lanka. Of which 44.4% (24,000), 42.6% (23,000) and 13,0% (7,000) are distributed in the Dry Zone, Intermediate Zone and Wet Zone respectively. Defoliation seemed to occur relatively early (from December to January) in wetter areas compared to drier areas (from February to April). Accordingly flowering occurred in wetter areas from February to April producing the crop from May to August whereas in drier areas flowering occurred from April to June producing the crop from August to October. The average yield of seed kernels per tree per year was 140 Kg.

As there was doubt as regards the botanical identify of M.longifolia a careful examination was carried out to characterize some of the salient morphological and histological features of leaves and seeds. The average petiole length, lamina length and maximum lamina breadth were 1.9 cm, 10.8 cm and 3.1 cm respectively. Leaves were linear-lanceolate in shape. Venation was pellucid and the pairs of veins showed

a variation from 12 to 15, 12 being the most common. Stomates were found only in the abaxial surface, thus hypostomatous. The guard cells were surrounded by a number of small epidermal cells. The arrangement of guard cells was anomocytic. No distinguishable difference as regards the shape and arrangement of guard cells was observed in the samples collected from different localities. Epidermal cells have somewhat straight anticlinal walls. Leaf samples collected from dry localities showed well developed upper and lower hypodermis which is a xeromorphic character. But those collected from wet localities did not always manifest both the layers of hypodermis.

Size of the seeds showed a distinct variation. The overall average length, breadth and thickness of seeds were 32.6 mm, 12.5 mm and 9.4 mm respectively. The number of seeds per Kg varied from 1208 to 532 with an overall average of 806/Kg, i.e. a 100 seed weight of 125 g. The testa of M. longifolia comprised of stone cells overlying paranchyma cells. The stone cells in outer layers were isodiametric whereas the ones in the inner layers were elongated in tangential direction. Tanin cells were mostly concentrated in the outer 5-6 layers of the cells of Cotyledons, though found sparsely scattered even elsewhere.

The chromosome number of M. longifolia had not been reported. Cytological studies were therefore carried out using root tips to determine the chromosome number and it was found that the diploid number was 24.

Vegetative propagation of M. longifolia was attempted using stem cuttings, layering, budding, grafting and inarching. No success was achieved in respect of cuttings and layering. But budding, grafting and inarching gave a high degree of success of the order of 100%, 85% and 100% respectively. There was no significant difference between treatments in budding (Patch, H, Modified-Forket) and grafting (whip and cleft) as regards the rate of sprouting and the percentage of success. In connection with the propagation by seeds pretreatments such as soaking overnight, cracking the seed coat, etc. were tried out to enhance the rate and percentage of germination. But there was no significant difference between the treatments compared to the control. A rapid loss of viability of seeds was observed with time on an average of 25% and 50% when the period of storage was 15 and 18 days respectively. A significant variation in the viability was observed between the seed samples even under identical storage conditions.

The quantitative analysis of seed kernels showed a variation of oil content from 57.3% to 48.1% with an overall average of 51.9%. Out of the 12 samples of oil analysed 11 contained fatty acids more or less in comparable amounts with an overall average of 23.3% Palmitic, 15.5% Stearic, 46.1% Oleic, 13.9% Linoleic, 0.75%  $\gamma$ -Linolenic and 0.45%  $\alpha$ -Linolenic respectively. But the sample collected from Walagambahu Puranwela showed a composition rather similar to M. latifolia oil reported by Dhingra et.al., in 1933. The Iodine value of oil varied from 56.5 to 49.7 with an overall average of 53.5. A higher Iodine value was observed in the samples collected from Agro-ecological regions with lower mean monthly temperatures. Saponification value

of oil showed a variation from 168.5 to 206.5 with an overall average of 187.7. The percentage of unsaponifiable matter varied from 1.45 to 1.57 with an overall average of 1.53.