JELUTONG: PHENOLOGY, FRUIT AND SEED BIOLOGY

by

S. K. YAP*

Summary 20230

With the growing demand for Jelutong, the forest resource base of the species has diminished rapidly. To replenish the supply through re-forestation and plantation, a constant supply of seeds is needed. This study investigates the production, collection, germination and storage of Jelutong seeds.

Introduction

Jelutong *(Dyera costulata)* has long been known for its latex which is used as a base for chewing gum (Burkill, 1935, Williams, 1963). The trade has declined since the peak production period of 1930 to 1940 (Anon., 1979). In contrast, logging of Jelutong for timber has increased tremendously with the greater awareness of its versatile properties for light industrial use. The only source of Jelutong is from the natural forest but continuous exploitation is rapidly removing trees of this species, making it more scarce. For the future uninterrupted supply of this wood, there will be a need for artificial regeneration in the logged over forest and possibly plantation establishment. These activities will demand a large quantity of seeds and thus there is a need to know more of the production, methods of harvesting, and assessment of the seeds to be used in the planting programmes.

Scattered information on the phenology, fruits, seeds and germination, and the silviculture of Jelutong has been compiled in the Forest Research Institute Report No. 8. This study, which was conducted on trees grown in the Forest Research Institute, Kepong, deals in greater detail with the biology of the species.

Phenology

Observations in the arboretum of F.R.I. from 1974 to 1979 indicated that three of the eleven Jelutong trees were capable of regular flowering (Table 1). Flowering generally occurred from July to December, with a tendency towards synchronization. In 1978, three of the arboretum trees (27.3%) and 34 or 76.0% of the 45 trees along the Jelutong Avenue of the F.R.I. flowered during August to October.

* Tree Physiologist, Forest Research Institute, Kepong.

Table 1. Flowering and fruiting of Jelutong trees in F.R.I. Arboretum (1974 – 1979)

Year	1974	1975	1976	1977	1978	1979
189	—	—	—	—	—	—
196	—	fl/fr	—	—	fl/fr	—
198	—	—	—	—	fl	—
170	—	—	—	—	—	—
210	—	—	—	—	fl	fl/fr
214	—	—	—	—	—	—
222	—	fl	—	fl	fl/fr	fl/fr
663	—	fl	—	fl	fr	fr
2416	—	—	—	—	—	—
255	—	—	—	—	fl	fl/fr
273	fr	fl/fr	—	fl	fl	—

fl — flowering; fr — fruiting.

Anthesis of the flowers occurs in the night and abundant white petals are found on the ground the next morning. The flowering process lasts for 2 – 3 weeks on a tree and young fruits are detected after 2 to 3 months. Ripe fruits can be collected in 8 to 9 months after anthesis. This differs from that reported in Corner (1952) which is 2 – 3 months but is closer to that of Holttum's (1930) of 9 months.

Fruit and seed

Jelutong seeds are enclosed in paired woody pods (Fig. 1a). Each pod varies from 28 to 41 cm in length. An average of 18 overlapping seeds are usually found arranged in two rows in each pod and this number does not seem to vary with the length of the pod (Fig. 1 (b & c)). Some of the seeds (9.8%) do not contain any embryos.

Each seed is extremely flattened with the edge expanded into membranous wings. The seeds are light, weighing only 0.137 gm each, with a moisture content of around 12% on dry weight basis.

Fruit collection

Ripening of the fruits begins with gradual flattening of the pods and the reduction of latex in the pericarp. A split is later formed at the inner surface of each pod and it gets progressively wider but the seeds are still

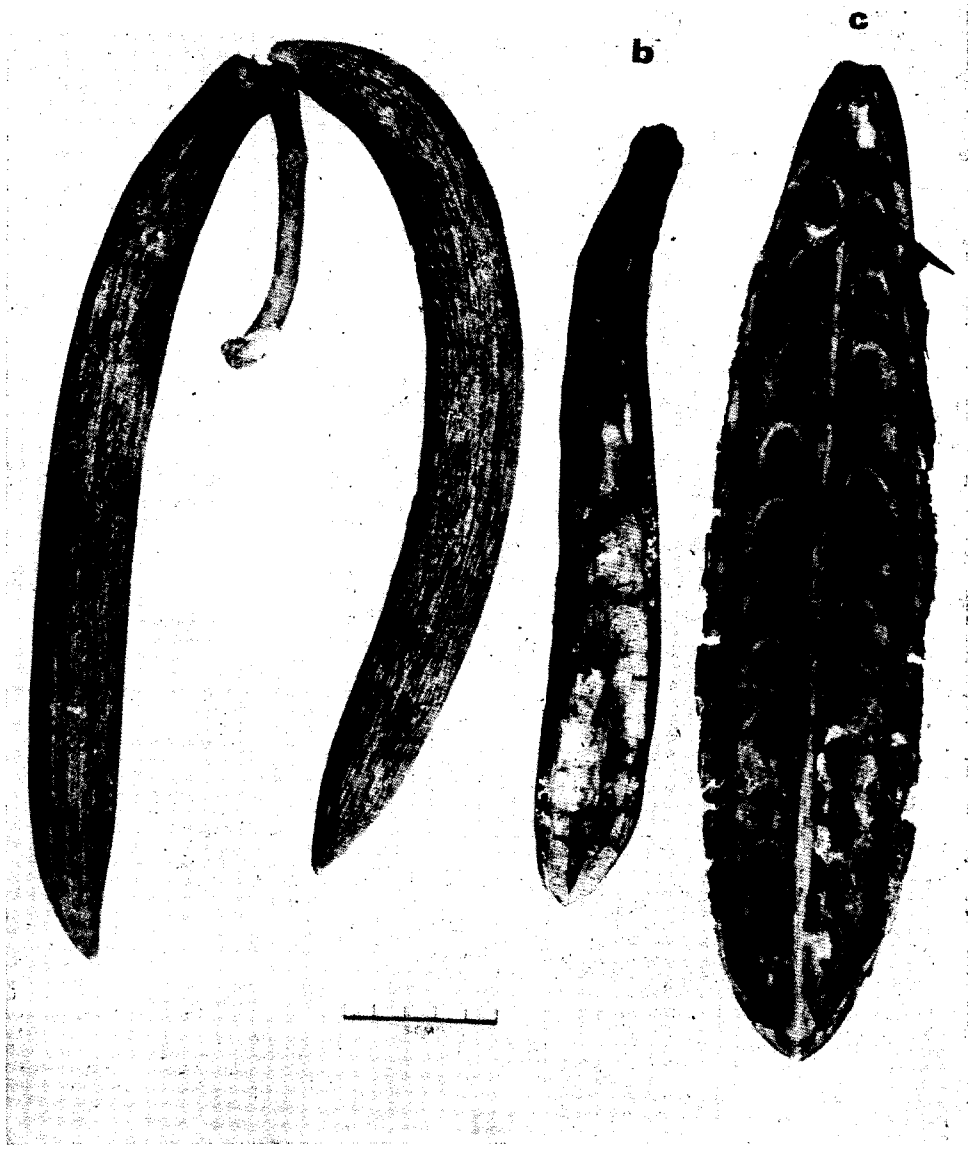

Figure 1. Fruits and seeds of Jelutong.
a = a pair of fruits. b = ripe fruit with split.
c = dehised fruit with two rows of seeds.

closed within the inner fold of the pods. At full maturity, the pericarp rves backwards to expose the seeds which are then scattered by the wind.

Collection can be done by climbing the trees and breaking off the ripe ɔds with long bamboo poles. For trees with large girths, ladders have to used.

Ideally, fruits should be collected when the pods just begin to split. large scale collection it may be difficult to get all the fruits at this stage; us pods that are lighter brown in colour, more flattened than round and th wrinkles on the pods, may also be harvested. Small quantity of seeds ay be collected from the ground in areas that have been kept clear of her vegetation.

ed extraction

The collected pods with the splits will dehise to release the seeds after week of air drying. Those without the visible cracks will require a longer ne to dehise depending on the degree of maturity. Inmature fruits that nnot be forced open by air drying may open by drying in the sun or in ɔubator at 35°C. Fully mature seeds are brownish and with a lower ɔisture content than the inmature greenish seeds.

If the quantity of fruits is small the seeds can be extracted manually thout drying. The central portion of the pods which holds the seeds ɔuld be pulled out after cutting along its ventral surface.

ed germination

The collected seeds were tested on tissue papers under laboratory ɔnditions. Jelutong seeds germinate with the radicle emerging from the ɔint of attachment to the fruit. The germination time of different batches seeds is shown in Table 2. For mature seeds, the radicles emerge within · to 28 days, and this period does not see seem to vary with the length storage. Seeds that were extracted from pods that are not fully ripened ɪd are brownish green, showed a slightly longer period of germination. ɪe time required for germination has been shown to be variable (Foxworthy, '27; Wyatt-Smith, 1963; Ng, 1973), and this may be related to inherent ɪiation or the degree of maturity of the seeds

The viability of seeds varies with different types of seeds (Table 3). ɪlly mature seeds show the highest degree of viability, over 92% in one .tch and 87% in the second batch. Seeds extracted from immature pods ...ing the incubator had only 62% viability. Seeds taken from the ground showed a fairly high viability of 88.4%.

Table 2. Germination time for Jelutong seeds

Type of seeds	Germination time (days)	
	First germination	Last germination
1. Fully mature brown seeds	14 days	28 days
2. Forcibly extracted brownish green seeds	24 days	47 days
3. Seeds stored for 20 days at RT (room temperature, air-conditioned)	14 days	38 days
4. Seeds stored for 30 days at RT	13 days	28 days
5. Seeds stored for 60 days at RT	14 days	22 days
6. Seeds stored for 90 days at RT	13 days	15 days
7. Seeds stored for 8 months at RT	13 days	25 days

Note: R.T. = room temperature.

Table 3. Results of germination tests with different sources of Jelutong seeds

Types of seeds	Germination
1. Ripe seeds freshy extracted from split pods (collected on 22/12/78)	92.5%
2. Ripe seeds extracted from split pods (collected on 31/7/79)	87.5%
3. Seeds collected from ground	88.4%
4. Mature seeds extracted from unopened pods	75.0%
5. Seeds extracted from immature pods using incubator	62.0%

Seed storage

Different storage conditions were imposed on Jelutong seeds, and the results of the various treatments are presented in Table 4. Low temperature of below 10°C was found to be deleterious to the seeds. Best results were obtained in 20 – 40°C storage with a relative humidity of around 60% in an air-conditioned room. Even after 3 months storage, viability was main-

Table 4. Storage of Jelutong seeds

Storage period in months / Treatment	0	1	2	3	8
1. Control — Stored at R.T. 22 – 24°C	92.5%	93.5%	93.0%	93.0%	70.0%
2. Stored in desicator at R.H. 40% and temp. 22 – 24°C	—	87.0%	60.0%	60.0%	—
3. Stored in closed bag at 10 – 14°C	—	86.5%	83.5%	0	—
4. Stored in closed bag at 5 – 8°C	—	70.0%	60.0%	13.0%	—

Note: R.T. = room temperature.
R.H. = relative humidity.

tained as high as those which were freshly collected. The seeds lost only 20% in viability after 8 months under the same conditions. Poor storability in Jelutong seeds had been previously reported by Williams (1963), and this was considered to be an unfavourable factor for its large-scale planting. However, the storability was found to be satisfactory in this study. Furthermore, there was low incidence of fungal attack on the fully mature seeds during storage as well as during germination when compared with dipterocarp seeds.

Discussion

Some of the planted Jelutong trees in the Forest Research Institute show annual regularity in flowering. This is in contrast to many of the natural timber species in this region. With this tendency towards regularity of flowering, and thus fruiting, there is a better chance of a continuous supply of seeds essential for plantation and reforestation. The synchronized behaviour of most trees in their reproductive cycle makes it comparatively more economical to initiate large scale collection. The long ripening period of the fruits allows ample time to organize collection and to prepare sowing beds after detection of flowering.

The timing of collection is critical as the fruits are self-dehising when fully ripe, releasing the light seeds that are easily scattered by the wind. Inmature fruits could be forced to dehise but the seeds are less viable.

Ripe seeds show a high degree of viability of over 87% when fresh and there is a low incidence of pathogenic attack on the seeds. Large numbers of seedlings can therefore be produced.

The ripe seeds lose viability very slowly when stored in a well-ventilated cool place (air-conditioned room). This allows storage of excess seeds as well as spacing out of planting programmes which cannot be done with most dipterocarps.

Acknowledgements

The phenological observation of the Jelutong trees was carried out by Mr. Ang Khoon Cheng, while the fruits were collected by the tree climbing team of F.R.I. The author is also grateful to Dr. F.S.P. Ng for reading critically through this paper. The photograph was taken by Mr. Mat Asri bin Ngah Sanah.

References

Anon. (1979) Jelutong. Unpublished F.R.I. Report No. 8. Forest Research Institute, Kepong.

Burkill, I.H. (1935) Dictionary of the Economic Products of the Malay Peninsula. 2 vols. Agriculture Dept., Kuala Lumpur.

Corner, E.J.H. (1952) Wayside Trees of Malaya (2 vols) 2nd edition Government Printer, Singapore.

Foxworthy, F.W. (1927) Commercial Timber Trees of the Malay Peninsula. Malayan Forest Record No. 3. Forest Dept., Kuala Lumpur.

Holttum, R.E. (1930) On periodic leaf-change and flowering of trees in Singapore. Gdns' Bull. 5: 173 – 207.

Ng, F.S.P. (1973) Germination of fresh seeds of Malayan trees. Malay. Forester 36: 54 – 65.

Williams, L. (1963) Lactiferous plants of economic importance IV. Jelutong (Dyera spp.). Economic Botany 17: 110 – 126.

Wyatt-Smith (1963) Manual of Malayan Silviculture for Inland Forests. Malayan Forest Record. No. 23. Forest Dept., Kuala Lumpur.