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Preliminary assessment of rambutan clones in Australia

F. R. Hobman

Summary

Selected Malaysian rambutan clones were imported in 1973 for agronomic and acclimatisation evaluation. Some of the clones fruited in 1976 and detailed records were taken from the 1983 and 1984 fruit harvests. The fruit was readily accepted by the market with fruit from clones R156 and R134 being preferred. Clone R99 was the heaviest bearer in 1984. The recommended clones are R156, R134, R3, R4 and R99. It is stressed that this is a preliminary evaluation and, while encouraging, more work has to be done especially on yield recordings and clonal differences.

INTRODUCTION

The rambutan (*Nephelium lappaceum*, family Sapindaceae) is indigenous to the Malay Archipelago. It is cultivated throughout the region especially in peninsular Malaysia and Java. A moist hot climate with a well distributed rainfall is the main requirement of the rambutan (Walter 1976). A deep well drained loam is preferred although it is tolerant of many soils types (Torres, Dionido and Zamora 1962).

The rambutan has been successfully introduced into the Philipppines (Mendiola 1941), Sri Lanka, Central America and India. Introductions have been unsuccessful in sub-tropical areas, for example Florida. The wet tropical coast of Queensland has a higher latitude (18°31′S to 16°O′S) than the Malay Archipelago (0°N to 7°N) and has greater seasonal variability. It is however more tropical than Florida (25°N to 31°N).

There are a few old seedling trees in north Queensland which suggests the area may have potential. Australians like the fruit and it is now widely known especially as increasing numbers of Australians visit Malaysia on holiday.

I decided in 1973 to import selected clones for evaluation.

MATERIALS AND METHODS

One year old bud-grafted plants were obtained from Serdang Agricultural College, Kuala Lumpur, Malaysia, in early 1973. The clones were carefully chosen to include some selected by the British before Malaysian independence. The reason for this was that taste preferences of the Malaysian and European are sometimes different and early clonal selection may have been strongly influenced by British taste. The selected clones were R3, R4, R6, R7, R99, R134 and R156. They were kept in quarantine for six months and planted in October 1973 at Innisfail latitude 17°30′S. In August 1978 the clonal plants were replanted at Mena Creek, 16km SW of Innisfail. Two plants of each clone were compared.

Table 1 presents the average rainfall mean monthly maximum and minimum temperatures for South Johnstone (Mena Creek) and Thursday Island latitude 10°S and the 1982 and 1983 rainfall records for South Johnstone, together with data from an ideal Malaysian site.

Table 1. Average monthly climatic data

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)												
Sth. Johnstone[1]	541	592	638	374	258	157	102	84	87	89	123	242
Thursday Is.[2]	400	342	343	210	46	27	10	8	3	10	35	218
Penang (Malaysia)[3]	94	79	142	188	272	196	191	295	401	429	302	147
Temp max. (°C)												
Sth. Johnstone[1]	25.9	30.6	29.4	26.6	25.9	24.2	23.7	24.9	26.6	28.5	30.2	30.9
Thursday Is.[2]	29.7	29.4	29.5	29.5	28.9	28.1	27.4	28.6	29.8	30.9	30.9	29.2
Penang (Malaysia)[3]	32.2	32.8	33.3	32.8	32.2	32.2	32.2	31.7	31.1	31.7	31.1	31.7
Temp min. (°C)												
Sth. Johnstone[1]	21.0	21.3	21.3	19.9	18.3	15.5	14.3[4]	14.7	16.2	18.3	19.7	21.2
Thursday Is.[2]	24.7	24.6	24.5	24.5	24.1	23.0	22.2	22.5	23.1	24.1	25.1	25.4
Penang (Malaysia)[3]	22.8	22.8	23.3	23.9	23.3	23.3	23.3	22.8	22.8	22.8	22.8	22.8
Actual monthly rainfall (mm) **South Johnstone**												
1982	344	212	459	1083	157	27	27	282	75	20	163	118
1983	147	151	884	279	489	63	90	114	104	45	225	228

[1] Sth. Johnstone Research Station Qld.

[2] The Bureau of Meterology, Cairns Qld.

[3] The World Weather Guide, 1984, E.A. Pearce and C.G. Smith. Publishers, Hutchinson, London.

[4] Absolute min. temperatures for July at South Johnstone, 7.4°C in 1982, 6.4°C in 1983.

The soil was a well drained kraznozem (Gn 3.11, Northcote 1965) with analysis pH 5.1, 20 ppmP, 0.3meq % K. Fertilizer was applied five times a year, the yearly rate per tree increased gradually from 200gN, 60gP, 120gK in 1973 to 600gN, 100gP, 200gK in 1983. This rate will apply in future. Weeds were controlled by slashing, herbicide spraying and hoeing. Irrigation was only used during replanting.

Fruit numbers were recorded in 1983 and 1984. Fruit and fruit component weights were recorded in 1984 and a taste assessment done on the fruit.

RESULTS

The rambutans recovered quickly from the quarantine treatments and grew satisfactorily at Innisfail. Pests and diseases were absent until 1976 when a roughness of the bark which was thought to be caused by the fungus *Botryodiplodia theobromae* was noticed. The bark cracked and sloughed off exposing bare wood. A copper fungicide was used frequently to halt the spread of the disease.

R3, R134 and R156 first set fruit in November 1976 with about 20 fruit per tree. The following year R3, R134, R156, R4 and R99 flowered in September. A web caterpillar was causing concern in the flower panicles and the advice to spray with carbaryl was followed. This caused complete fruit and flower drop.

The trees were replanted in August 1978 at Mena Creek near Innisfail. Six weeks prior to replanting they were heavily pruned and the tap root severed at 45 cm. Recovery from this treatment was slow which was to be expected as the trees were three metres high and well developed.

The plantings interrupted flowering in 1978, 1979 and 1980. In September 1981, R3, R134, R156, R4 and R99 flowered, they set fruit in November 1981. The trees flowered later in 1982 and fruit was set in April 1983. R3 and R134 had more than 100 fruit per tree, R156, R99 and R4 had about 50 fruit per tree.

For 1984 additional recordings were made (Table 2). The harvest times varied between clones with R134 being the earliest, 25 April 1984 to 10 May 1984 and R4 the latest, 15 May 1984 to 5 June 1984. Fruit was picked as soon as eight out of ten of the taste panel considered it sweet. A small number was left on each tree. This fruit was left for a further ten days, colour deepened slightly for all fruit during this interval. There was no other noticeable change and the fruit was readily accepted by the market. Taste was evaluated by a panel of ten people. Fruit of R156 was preferred to fruit of the other clones. It was slightly less sweet with a more astringent taste. The attachment of the testa to the aril for some clones resulted in an initial adverse reaction but with practice all the panel were able to reduce the amount of testa sticking to the flesh to negligible proportions and it was not a major factor in assessment. The ranking in order of preference was R156, R134, R3, R4 then R99. Probably the only difference of note was that R156 was definitely preferred to R99. Fruit numbers per tree differed widely between the clones, R7 had no fruit and R99 had the most, 627 fruit per tree.

Table 2. Harvest dates and fruit characteristics, 1984

Clone	Fruit/tree	Harvest dates	Taste	Degree of testa attachment of aril	Skin colour	Fruit shape
R99	627	5 to 20 May	sweet	noticeable	red	ovoid
R156	110	5 to 20 May	slightly sweet with tang	noticeable	yellow	ovoid
R134	250	25 Apr to 10 May	sweet with tang	negligible	red	ovoid
R4	157	15 May to 5 June	sweet	slight	red	flatish
R3	351	15 May to 31 May	sweet with slight tang	slight to negligible	red	ovoid

Samples of fruit were taken from each clone for detailed weight recordings (Table 3). Fruit weight differences were large and R4 and R134 were significantly ($P<0.01$) heavier than those of R99, R156 and R3. R99 fruits were significantly ($P<0.01$) lighter than those of all other clones. The preferred fruit on visual appearance, was R134 due to its large size and spherical shape. R3 was the next preferred. The yellow skin colour of R156 fruit was less appealing than the red fruit colour of the other clones but it was preferred to R99 and R4 due to it being larger than R99 and rounder than R4 which is a flatish fruit.

The samples were peeled and weighed. Peeled fruit of R156 was the heaviest and the weights of both R156 and R134 were significantly ($P<0.01$) higher than those of R4, R99 and R3. The other significant difference ($P<0.05$) was that the weight of R3 was higher than that of R99. The preference, based on size, was R156, R134, R3 and finally bracketed together, R4 and R99.

The aril weights of R156 and R134 were significantly ($P<0.01$) higher than the weights of R4, R99 and R3. The aril recovery as a percentage of total fruit weights varied from 33% for R4 to 54% for R156. There was no clear preference based on aril weights.

Some of the R4 seed was thin and broke up causing difficulty in removing the testa. Adverse comment was expressed regarding this.

Table 3. Weights of fruit and fruit components (g)

Clone	Sample no.	Fruit	Fruit minus pericarp	Aril	Seed	Aril%
R99	16	28.0*c*	13.9*c*	12.4*b*	1.5*c*	44.4*b*
R156	16	32.2*b*	19.4*a*	17.3*a*	2.1*b*	53.8*a*
R4	16	40.1*a*	14.9*bc*	13.4*b*	1.5*c*	32.9*e*
R134	22	43.2*a*	19.0*a*	15.8*a*	3.2*a*	36.7*d*
R3	20	34.0*b*	16.3*b*	13.5*b*	2.8*a*	39.9*c*
s.d.		4.84	2.77	2.59	0.74	4.03

Fruit of all clones was marketed in Woolworths Supermarket, Innisfail. The fruit was packed individually with 36 fruit per tray. It was sold the same day it was marketed consequently the shelf life had to be calculated on the farm. Trays of fruit of each clone were kept in the packing shed. Daily assessment of colour was made for seven days and no change was detected. The fruit was then peeled and eaten. It was a little sweeter than freshly picked fruit.

Growth of the clones was seasonal with slower growth in the winter months of June, July and August. The clones differed in their tolerance to cold and R6 was killed in 1982 and 1983 when minimum July temperatures reached 7.4 and 6.4°C respectively. Minimum temperatures were below 10°C on six and four consecutive days respectively in July, 1982 and 1983. The duration at the minimum temperature was half to one hour per day. R7 and R156 lost a lot of leaf but the other clones were only slightly affected.

Flowering did not occur at a specific time of the year. In 1976, 1977 and 1981 the clones flowered in August-September whereas in 1983 and 1984 flowering started in November.

DISCUSSION AND CONCLUSION

Rambutans grow and fruit on the wet tropical coast. Innisfail may be near the southernmost point for commercial exploitation of rambutans unless a cold tolerant clone is found. R6 was killed by the cold 1982 and 1983 winters and R7 and R156 also suffered damage.

Coastal areas to the north of Innisfail, provided rainfall is sufficient and agronomic requirements can be met, appear to be suitable. Seasonal variations in temperature (Table 1) are less at Thursday Island, latitude 10°S, than at South Johnstone, latitude 17°30′S and the winters are warmer. Cold tolerance will not be a factor in the selection of rambutan clones at these lower latitudes and R6 could be considered. The mean average monthly temperatures at Thursday Island are more than 22°C for all months. This is the minimum temperature (Watson 1981) required for significant growth, consequently at Thursday Island growth can occur at any time of the year, whereas at South Johnstone the growing season is nine months. The northern part of Cape York with a mean average monthly temperature greater than 22°C will also have a year round growing season.

A spread of growing areas up the coast with different climates and possibly different clones may extend the fruiting season and market. At South Johnstone, the harvest period varied with clones and, including shelf life, is eight weeks. If the harvest period at Thursday Island occurs at a different time then rambutans might be marketed for sixteen weeks.

Market acceptance was excellent and the time of availability does not coincide with the Litchi season, rather the seasons are complementary. Litchi is a similar fruit. Rambutans can be marketed in all the southern cities as the shelf life is more than seven days.

Assuming 20% of Australians buy ten fruit then the market size is 3×10^7 fruits per year. At a yield of 2 000 (80kg) fruit per mature tree with 100 trees per ha, 150 ha are needed. My best yield was 627 fruit per tree, however, the trees were not mature. Yields of 5 000 to 11 000 fruit per mature tree in Malaya (Anon. 1964, 1966) have been recorded. The assumption on market size is speculation, however, it provides a workable basis and indicates the market is large enough to support a rambutan industry.

Fruit of all the clones was accepted although there was a preference for R156 and R134; R99 had the most fruit. More information is required on clonal differences before a clear choice can be made.

On the basis of present data it is suggested that preference be given to clones R99, R156, R134, R4 and R3. R7 has not fruited and while it should not be discarded only a limited number should be planted.

More data are required, especially on yields and long term production levels before accurate economic analyses can be safely done. At the present level of knowledge commercial rambutan growing is a speculative venture. This has to be recognised before planting a rambutan orchard.

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The author carried out this research privately and is presently located at P.O. Box 411, Loxton. S.A. 5333.