

## **Early Growth and Secondary Characteristics of RRIM 2000 Series Clones in a Large Plantation Group**

**CHAN WENG HOONG\*, TAN KIAT SIANG\* AND ONG TEE SAN\*\***

**Applied Agricultural Research Sdn Bhd.\*  
Locked Bag 212, Sungei Buloh Post Office, 47000 Sungei Buloh, Selangor, Malaysia**

\*\* formerly of AAR, currently retired.

### **ABSTRACT**

A large plantation group has been replanting their rubber estates since 1998 with RRIM 2000 series clones based on their high latex and timber yield potential. A proper trial was established in 1999 to monitor growth and secondary characteristics of these clones. Early results from the trial and also observations in commercial plantings confirm the superior growth in terms of girthing of most of the RRIM 2000 series clones compared with PB 260, the control clone. RRIM 2024 registered the best growth over 36 months after planting, followed by RRIM 2002 and RRIM 2014. Most of the RRIM 2000 series clones showed satisfactory secondary characteristics. The exceptions were RRIM 2001 and RRIM 2002 which might require corrective pruning to improve initial tree shape and RRIM 2008 and RRIM 2016 which experienced some wind-damage. RRIM 2014 exhibits long internodes and high branching which however can be exploited for the purpose of supplying vacancies. RRIM 2015 appeared susceptible to *Oidium* leaf disease and RRIM 2023 and RRIM 2026 exhibited mild to moderate *Colletotrichum* leaf disease scars. RRIM 2009 and RRIM 2020 suffered *Corynespora* leaf disease infection in the nursery but have remained unscathed in the field after 36 months.

It is still premature from these early observations to make firm judgement on the clones. Additionally, yield figures would also have to be obtained and are patiently awaited with interest.

**Keywords :** RRIM 2000 series clones, early growth, secondary characteristics.

## **Introduction**

Eight clones of the RRIM 2000 series were first introduced in 1995 by the LGM (Lembaga Getah Malaysia) as the `1<sup>st</sup> Selection` clones and were placed under Group II` in the RRIM planting recommendations for 1995-1997 (Ong *et al.*, 1995). Group II clones have been defined as `experimental clones with limited information on their yield and growth performance with an element of risk in the planting of these clones. The 1<sup>st</sup> Selection clones were RRIM 2001, RRIM 2002, RRIM 2008, RRIM 2009, RRIM 2014, RRIM 2015, RRIM 2016 and RRIM 2020. Four clones, RRIM 2023, RRIM2024, RRIM 2025 and RRIM 2026 were released as the 2<sup>nd</sup> Selection of the RRIM 2000 series clones in 1998 and were also classified as Group II clones in the RRIM planting recommendations for 1998-2000 (LGM planting Recommendations Committee, 1998). The RRIM 2000 series clones of both the 1<sup>st</sup> and 2<sup>nd</sup> Selections have been classified as `latex timber clones` producing high latex and timber yield in small scale clonal trials (SSCT) (LGM Planting Recommendations Committee, 1998).

Attracted by the prospective higher latex yields, a large plantation group with still some interest in rubber, attempted to look further into the RRIM 2000 series clones with a view to raising the Group's yield which had been hovering around 1600 kg/ha in the last 10 years (Chan and Ong, 2000). Discussions on the clones with LGM officers ensued. Table 1 shows the mean yield/ha on panel BO1 (Ramli *et al.*, 1995) of some of the RRIM 2000 series clones can potentially exceed the mean commercial yield of PB 260 in the Group by 38 to 75%. The markedly higher timber yield of some RRIM 2000 series clones over PB 260, the principal clone planted in the Group (Chan, 1997) can be considered an added bonus. Armed with the above experimental data, visits were made to the trial sites in the experimental stations in Sungei Buloh and Kota Tinggi, of LGM by interested managers, planting advisors and agronomists from the Group. Convinced by the extraordinary size of most of the RRIM 2000 series clones ( Figure.1) and also comparative girth difference between the former and PB 260 of the same vintage in the Group (Table 3), selected estates in the Group were instructed to establish budwood nurseries for future dissemination to other estates. Budwood of the various RRIM 2000 series clones was obtained from LGM.

The hectareage of RRIM 2000 series clones planted in the Group from 1998 to 2002 is given in Table 4. The earliest planting of the clones was in 1998. The clones comprised mainly the 1<sup>st</sup> Selection as budwood of the 2<sup>nd</sup> series were not available then. The 2<sup>nd</sup> Selection clones were planted from 2000 onwards. Based on early results of a trial set up to evaluate performance of the RRIM 2000 series, choice of clone has been tentatively narrowed down to RRIM 2024 from year 2002 onwards.

This paper describes the early growth and secondary characteristics of some of the RRIM 2000 series clones planted in commercial areas as well as in a trial in the Group.

## **Materials and method**

A proper trial was laid down in 1999 with the objective of evaluating the growth, secondary characteristics and yield of the twelve RRIM 2000 series latex timber clones.

## **Trial site and clones planted**

The trial is located in Kelantan on rolling to hilly ( 12-20<sup>0</sup> slope) terrain with mainly Batang Merbau soil series (Typic Kandiudult). Clones planted for evaluation are RRIM 2000 series clones ( RRIM 2001,RRIM 2002, RRIM 2008, RRIM 2009, RRIM 2014, RRIM 2015, RRIM 2016, RRIM 2020, RRIM 2023, RRIM 2024, RRIM 2025 and RRIM 2026). PB 260 serves as control.

## **Nursery and field planting**

Two whorled buddings were prepared in the estate using the young budding technique described by Ong et al., (1997).

The twelve RRIM 2000 series clones and PB 260 were planted in a completely randomized design with plots of 1.46 ha per clone at a stand of 440 trees/ha giving a task size of 643 trees. The clonal plots were replicated twice giving a total plot area of 38 ha. Field planting commenced in late November and was completed in mid-December 1999.

## **Growth measurements and assessment of secondary characteristics**

### **Girth**

Ninety trees per plot comprising 30 trees each located at the hilltop, mid slope and lower slopes were demarcated as measurement trees. Girth was measured at a height of 160 cm from the ground from 12 months after planting and at 6 monthly intervals thereafter.

### **Branching habit**

The branching habit was arbitrarily graded as follows:

- a. Satisfactory to good – uniform production of and regularly spaced branches.
- b. Moderate- acute branching with several branches clustered at each whorl.
- c. Poor - irregular production of and irregularly spaced branches tending to sparse branching.

### **Leaf disease**

Incidence of leaf disease was visually scored as under:

- a. Mild – no defoliation and less than 10% of lamina showing disease scars.
- b. Moderate- no defoliation but 10-50% of lamina showing disease scars.
- c. Severe- defoliation with more than 50% of lamina showing disease scars.  
Oidium and Colletotrichum were the main diseases identified. Corynespora was also identified at the nursery stage.

## Wind damage

Incidence of trunk snap or uprooting of trees was scored as,

- a. Negligible - less than 1%.
- b. Low – 1 to 3%.
- c. Moderate- more than 3 to 5%.
- d. High –more than 5%.

The grading of branching habit was mainly based on observations made in the trial area while incidence of leaf disease and wind damage was scored both from the trial and commercial areas.

## Results

### Girth

The girth measurements of trees from 12 to 36 months after planting are given in Table 5. All RRIM 2000 series clones except RRIM 2008 and RRIM 2009 outgrew PB 260 at 12 months after field planting. The growth of these two clones improved in the second year when they grew 5% better than PB 260. Subsequently however, PB 260 caught up with them and at the end of three years, all three clones showed similar girth.

All other clones grew better than PB 260 throughout the three years, albeit at varying rates. Among these clones RRIM 2024 was outstanding, being the highest ranking at every period of measurement. At the end of the third year after planting, the top five clones in descending order of growth were RRIM 2024, RRIM 2002, RRIM 2014, RRIM 2001 and RRIM 2023. These clones outgrew PB 260 by 14-20%.

### Annual girth increment (Table 6)

The annual girth increments of the various trial clones are shown in Table 6 and Figure 2.

Annual girth increment from the 12<sup>th</sup> to 24<sup>th</sup> month after planting ranged from 10.8 to 13.5 cm for the RRIM 2000 series clones. Increment for PB 260 was just under 10.0 cm. From the 24<sup>th</sup> to 36<sup>th</sup> month annual girth increment was slightly less, ranging from 9.4 to 11.4 cm. Increment for PB 260 was slightly over 10.0 cm.

Mean annual increments from the 12-36 months ranged from 10.2 to 12.2 cm for RRIM 2000 series clones, exceeding the mean increment of 10.0 cm for PB 260.

## **Secondary characteristics ( Table 7 )**

### Branching habit

Most clones showed satisfactory branching with regularly spaced branches. The exceptions were RRIM 2001 and RRIM 2002 where branching was more acute and clustered, RRIM 2008 which showed obtuse branching and RRIM 2014 where branching was irregular and high.

### Wind damage

Incidence of wind damage was nil to negligible in the trial area over the 36 months of growth. However low to moderate incidence of wind damage occurred in three fields of RRIM 2016 while some low to moderate wind damage was noted in one field of RRIM 2008.

### Leaf disease

Most clones exhibited fairly unblemished foliage throughout the period of assessment except for RRIM 2015 which showed moderate to severe Oidium scars in the trial area and also some commercial fields. Mild to moderate Colletotrichum scars were also spotted in RRIM 2023 and RRIM 2026 in the trial area. Corynespora leaf disease was detected in RRIM 2009 and RRIM 2020 in the nursery but the clones have remained unscathed so far in the field.

## **Discussion**

Most of the RRIM 2000 series clones evaluated in the trial area registered better growth in terms of girth than PB 260, the control clone at the end of 36 months in the field. RRIM 2024 was the most vigorous, outgrowing PB 260 by 20%. This clone showed all round good features, with regular good branching habit, relatively mild to negligible leaf disease infection and has not experienced any wind damage to date. In view of these good characteristics and high yield potential shown in small scale clonal trials, the choice of clone for replanting in the Group's estates from year 2002 onwards has tentatively been narrowed down to RRIM 2024.

RRIM 2001 and RRIM 2002 also grew well, exceeding PB 260 by 15-18%. However their clustered and acute branching habit required some corrective pruning to improve tree shape in the initial stages of growth.

RRIM2008 and RRIM 2016 experienced some minor wind damage in the commercial areas but not in the trial area.

Corynespora leaf disease was detected in RRIM 2009 and RRIM 2020 in the nursery but has so far not affected the clones in the field.

RRIM 2014 grew in a spindly manner initially, showing irregular branching, long internodes and high branching. However girthing improved significantly with age for this clone which was only slightly behind RRIM 2024 at 36 months after planting. RRIM 2014 was the most vigorous clone in the RRIM 2000 series trial in the LGM research station in Kota Tinggi (Ismail Hashim, 2002,

pers. comm.). This clone appears suitable for use in supplying vacant points. Owing to its high branching habit, the supplied RRIM 2014 rises very quickly above the canopies of its earlier grown neighbours, thereby escaping from being overshadowed by the latter.

RRIM 2015 may be characterized by its unique horizontal branching habit. Although initially promising, it suffered moderate to severe *Oidium* infection in the trial as well as in some commercial fields.

Among the 2<sup>nd</sup> Selection clones, RRIM 2023 and RRIM 2026 exhibited mild to moderate *Colletotrichum* infection in the trial area.

Some commercial fields have shown better girthing than their counterparts in the trial area (Table 8). RRIM 2015 and RRIM 2008 have exceeded their counterparts in the trial area, by 7% and 12% respectively. In the commercial areas, RRIM 2024, RRIM 2002 and RRIM 2014 were also the more vigorous among the RRIM 2000 series clones, as in the trial area

For the Group which has decided to have a small proportion of crop mix with rubber as the other crop, moving into the RRIM 2000 series clones appears to have been a step in the right direction. For a start, the period of immaturity of these clones should reduce significantly compared with PB 260 due to their more superior girthing. The short cut exploitation systems with enlarged task size being practiced by the Company (Chan and Ong, 2000), also appears to be suitable for these clones due to their superior girthing even after opening of trees for tapping. With a burgeoning rubberwood furniture downstream industry (Mohd Noor Ghani, 1999), much better returns from sale of rubberwood may be expected due to the much higher log volume available from the RRIM 2000 series clones and the rapid decline in rubber hectareage in the country (Primary Industry, 1999). A high price of RM 10,800 per hectare of rubberwood (of PB 260 at felling) has already been obtained by an estate in the Group (Tan Seng Yeang, 2003, pers. comm.).

The results and observations todate on early growth and secondary characteristics of the RRIM 2000 series clones are however considered preliminary. Longer term observations are required for better judgement on the clones.

Much hope from planting of the RRIM 2000 series clones basically rests on the projected high yielding capacity of the clones. If the projected high yields obtained from the small scale clonal trials translate into commercial reality, the Group would 'hit the jackpot'.

In the mean time the yield potential of the RRIM 2000 series clones is patiently awaited with interest.

## **Acknowledgement**

The authors wish to thank Applied Agricultural Research Sdn. Bhd. for permission to publish this paper. Thanks are also due to Dr Soh Aik Chin, Head of Agricultural Research, AAR Sdn. Bhd. for his valuable comments on the paper. The assistance rendered by M/s Julie Yee in the computation work is acknowledged. The estate managers who supplied the commercial girth

data are also thanked for their assistance. Finally a big thank you to officers of Lembaga Getah Malaysia without whom the RRIM 2000 series clones would not be available.

## References

1. ONG S.H.; RAMLI O; MOHD ZAIN A A; OTHMAN HASHIM and MASAHULING B (1995). RRIM Planting Recommendations 1995-1997, Proc. Rubb. Grow. Conf. Kuala Lumpur, 1995, pp 19-39.
2. RAMLI O; NAJIB L A; ONG S.H.; MASAHULING B; MOHD GHOUSE W; MOHD ZAIN A A; ZARAVI AG and MOHD NOOR A G. (1995). Potential Hevea Genotypes for Timber Production. Proc. Rubb. Growers Conf. Kuala Lumpur, 1995, 340-360.
3. CHAN WENG HOONG (1997). Performance of clone PB 260 in a Large Plantation Group in Peninsular. Malaysia. The Planter 73 (857), 403-418.
4. ONG TEE SAN; CHAN WENG HOONG and HEH WUN YEE (1997). Towards Maximising Growth of Young Rubber with Improved Planting Materials and Agronomic Practices – Proc. International Planters Conf. Kuala Lumpur, 1997, 323-338.
5. LGM PLANTING RECOMMENDATIONS COMMITTEE (1998). LGM Planting Recommendations 1998-2000. Kuala Lumpur. (No pp reference. Paper not edited)
6. MOHD. NOOR ABDUL GHANI (1999). Top Down Priority Areas in Rubber from a Commercial Perspective. IPRA Workshop on Rubber Agro-Industry, RRIM Sungei Buloh, Selangor, 1999. (No pp reference. Paper not edited)
7. MINISTRY OF PRIMARY INDUSTRY (1999). Statistics on Commodities, 1999. (No pp reference)
8. CHAN WENG HOONG and ONG TEE SAN (2000). Enhancing Sustainability of Rubber Plantations in Peninsular Malaysia. MEOA Seminar on survival of the Rubber Industry. RRIM Sungei Buloh, 2000, pp 31-39.

Table 1. Yield of some RRIM 2000 series clones on panel BO1 (SSCT) (Ramli *et al.*,1995)

Clone	Year					Mean
	1	2	3	4	5	
RRIM 2001	1695	2048	4568	2561	3376	2850 (175)
RRIM 2008	1512	2321	2955	3506	3135	2686 (165)
RRIM 2016	2173	2499	2938	2946	2369	2582 (158)
RRIM 2020	1691	1860	2526	2517	2564	2232 (137)
RRIM 2024	1509	2802	2828	3482	3158	2756 (168)
RRIM 2025	1921	2915	3174	2793	2967	2754 (168)
PB 260*	1140	1522	1791	1868	1837	1631 (100)

\* - Group commercial yield

( ) - %

Table 2. Timber yield of some RRIM 2000 series clones (Ramli *et al.*, 1995)

Clone	Age (years)	Total wood volume m <sup>3</sup> /tree
RRIM 2001	14	1.23
RRIM 2008	14	1.32
RRIM 2016	14	1.28
RRIM 2020	14	1.00
RRIM 2024	14	1.26
RRIM 2025	14	1.87
PB 260	20	1.29

Table 3. Comparison of girth (cm) between RRIM 2000 series clones\* and Group PB 260\*\*

Clone	Year planted	Mean girth
RRIM 2001	1977	116 (130)
RRIM 2002	1977	122 (137)
PB 260	1977	89 (100)
RRIM 2008	1980	119 (152)
RRIM 2009	1980	89 (114)
RRIM 2014	1080	124 (159)
RRIM 2015	1980	96 (123)
RRIM 2016	1980	125 (160)
RRIM 2020	1980	113 (144)
PB 260	1980	78 (100)

\* - Representative trees measured during visit to RRIM experimental station, Kota Tinggi in March 1998

\*\* - from 3 group estates

( ) - %



Table 4. Hectareage of RRIM 2000 series clones planted in the Group

Clone	1998	1999	2000	2001	2002	Total
RRIM 2001	2	195	191	12	0	400
RRIM 2002	3	99	0	0	0	102
RRIM 2008	1	64	7	12	0	84
RRIM 2009	1	106	0	0	0	107
RRIM 2014	3	0	0	0	0	3
RRIM 2015	3	50	166	12	0	231
RRIM 2016	0	205	213	75	0	529
RRIM 2020	2	48	0	0	0	50
RRIM 2023	0	0	312	66	0	378
RRIM 2024	0	2	29	33	442	506
RRIM 2025	0	0	80	143	0	223
RRIM 2026	0	0	15	0	0	15
Total	15	769	1013	353	442	2592

Table 5. Girth ( cm) of RRIM 2000 series clones in the trial area

Clones	Months after field planting				
	12	18	24	30	36
RRIM 2001	7.5 (109)	14.7 (125)	20.6 (123)	25.1 (119)	30.7 (115)
RRIM 2002	7.4 (107)	14.1 (119)	20.9 (125)	25.8 (122)	31.8 (118)
RRIM 2008	6.8 (99)	11.7 (99)	17.6 (105)	21.3 (101)	27.4 (102)
RRIM 2009	6.9 (100)	11.7 (99)	17.8 (106)	21.0 (100)	27.2 (101)
RRIM 2014	7.8 (113)	14.0 (119)	20.3 (121)	25.0 (118)	31.7 (118)
RRIM 2015	7.2 (104)	13.7 (116)	20.1 (120)	24.2 (115)	30.1 (112)
RRIM 2016	7.1 (103)	13.0 (110)	18.2 (108)	22.7 (108)	28.3 (105)
RRIM 2020	7.4 (107)	14.0 (119)	19.2 (114)	24.3 (116)	30.5 (113)
RRIM 2023	8.0 (116)	14.2 (120)	20.1 (120)	24.1 (114)	30.6 (114)
RRIM 2024	8.2 (119)	15.4 (131)	21.5 (128)	26.3 (125)	32.3 (120)
RRIM 2025	7.6 (110)	14.2 (120)	19.7 (117)	24.2 (115)	30.5 (113)
RRIM 2026	7.2 (104)	12.6 (107)	18.6 (111)	22.9 (109)	28.4 (106)
PB 260	6.9 (100)	11.8 (100)	16.8 (100)	21.1 (100)	26.9 (100)
LSD 0.05	0.7	1.6	2.2	2.9	3.6

( ) - %

Table 6. Annual girth increment (cm) of RRIM 2000 series clones in the trial area

Clones	Initial girth - 12 months after planting	Annual girth increment		Mean annual increment 12-36 months
		12-24 months	24-36 months	
RRIM 2001	7.5	13.1	10.1	11.6
RRIM 2002	7.4	13.5	10.9	12.2
RRIM 2008	6.8	10.8	9.8	10.3
RRIM 2009	6.9	10.9	9.4	10.2
RRIM 2014	7.8	12.5	11.4	12.0
RRIM 2015	7.2	12.9	10.0	11.5
RRIM 2016	7.1	11.1	10.1	10.6
RRIM 2020	7.4	11.8	11.3	11.6
RRIM 2023	8.0	12.1	10.5	11.3
RRIM 2024	8.2	13.3	10.8	12.1
RRIM 2025	7.6	12.1	10.8	11.5
RRIM 2026	7.2	11.4	9.8	10.6
PB 260	6.9	9.9	10.1	10.0

Table 7. Secondary characteristics of RRIM 2000 series clones

Clone	Branching habit	Incidence of wind damage	Incidence of leaf disease infection		
			Oidium	Colletotrichum	Corynespora
RRIM 2001	moderate, acute branching	negligible	mild	moderate	nil
RRIM 2002	moderate, acute branching	negligible	mild	mild	nil
RRIM 2008	satisfactory, low and obtuse branching	low to moderate	mild	mild	nil
RRIM 2009	satisfactory, low branching	negligible	nil	nil	( moderate to severe infection in nursery)
RRIM 2014	poor, high branching	negligible	mild	mild	nil
RRIM 2015	satisfactory, horizontal branching	negligible	moderate	mild	nil
RRIM 2016	satisfactory	low to moderate	mild	mild	nil
RRIM 2020	satisfactory	negligible	mild	mild	( moderate to severe infection in nursery)
RRIM 2023	satisfactory	negligible	mild	mild to moderate	nil
RRIM 2024	satisfactory	negligible	mild	mild	nil
RRIM 2025	satisfactory	negligible	mild	mild	nil
RRIM 2026	satisfactory	negligible	mild	mild to moderate	mild
PB 260	satisfactory	negligible	mild	mild	mild

Table 8. Comparison of growth of RRIM 2000 series clones in the trial and commercial areas

Clone	Girth at 36 months after planting ( cm)				
	Commercial areas				Trial area
	Number of fields	Highest	Lowest	Mean	Mean
RRIM 2001	4	32.7	27.4	29.8	30.7
RRIM 2002	3	34.1	30.2	32.0	31.8
RRIM 2008	4	33.6	27.3	30.6	27.4
RRIM 2009	3	31.7	26.8	28.6	27.2
RRIM 2014	3	32.4	31.2	31.8	31.7
RRIM 2015	3	34.4	30.1	32.2	30.1
RRIM 2016	3	34.6	28.1	30.6	28.3
RRIM 2020	5	35.7	26.9	30.3	30.5
RRIM 2023	0	nil	nil	nil	30.6
RRIM 2024	2	35.8	32.2	34.0	32.3
RRIM 2025	0	nil	nil	nil	30.5
RRIM 2026	0	nil	nil	nil	28.4

**Figure 1. Some RRIM2000 series clones**



**Note size of tree – RRIM 2025**

**Note size of tree – RRIM 2025**



**0 Note size of visitors !**

**Figure 2. Annual girth increment(cm) of RRIM 2000 series clones**



