



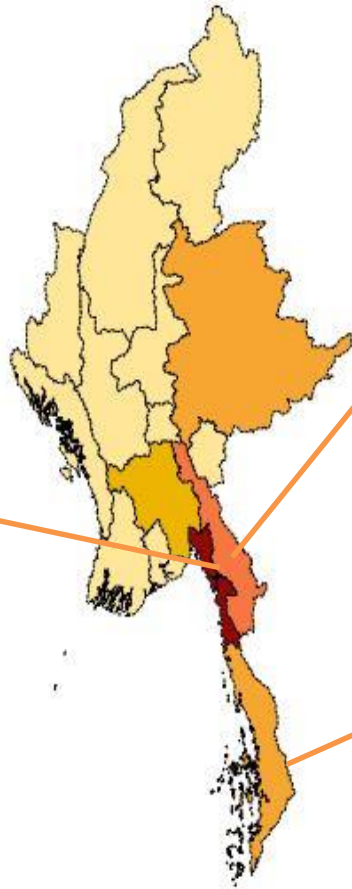
**Ministry of Agriculture, Livestock and
Irrigation
Perennial Crops Division
Department of Agriculture**



**Evaluation of Rubber Clones From RRIM 2000
SERIES in Small Scale Clone Trial**

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Introduction



• Mon State produces the most rubber in Myanmar

• Kayin State produces the second most rubber in Myanmar but ranks the third in terms of planted area

• Tanintharyi Region has more rubber planted than Kayin State
• but currently only about 40% productive

One of the first countries to produce rubber commercially

- Tenth largest producer of rubber in the world (<https://www.nationmaster.com>)
- 90% of rubber produce was exported to other countries

0.4% (300 million USD) of Myanmar's GDP comes from the rubber sector

- Nearly 90% from smallholder rubber farmer (ANRPC 2019)

Clones Imported

-introduced 1876, commercial plantation 1905

-With FAO project 1980-1985, 1985-1992

-2008 - private company(RRIM 2000 series)

Promising High yielding rubber clones

Ortet Selection of High Yielding Rubber Clones

Production of local new clones by breeding

- crop improvement through conventional plant breeding

- breeding success is low

-narrowness of the genetic base of the grown material

-long length of breeding cycle

-try to select seedling trees

Natural Rubber Yield (2019)

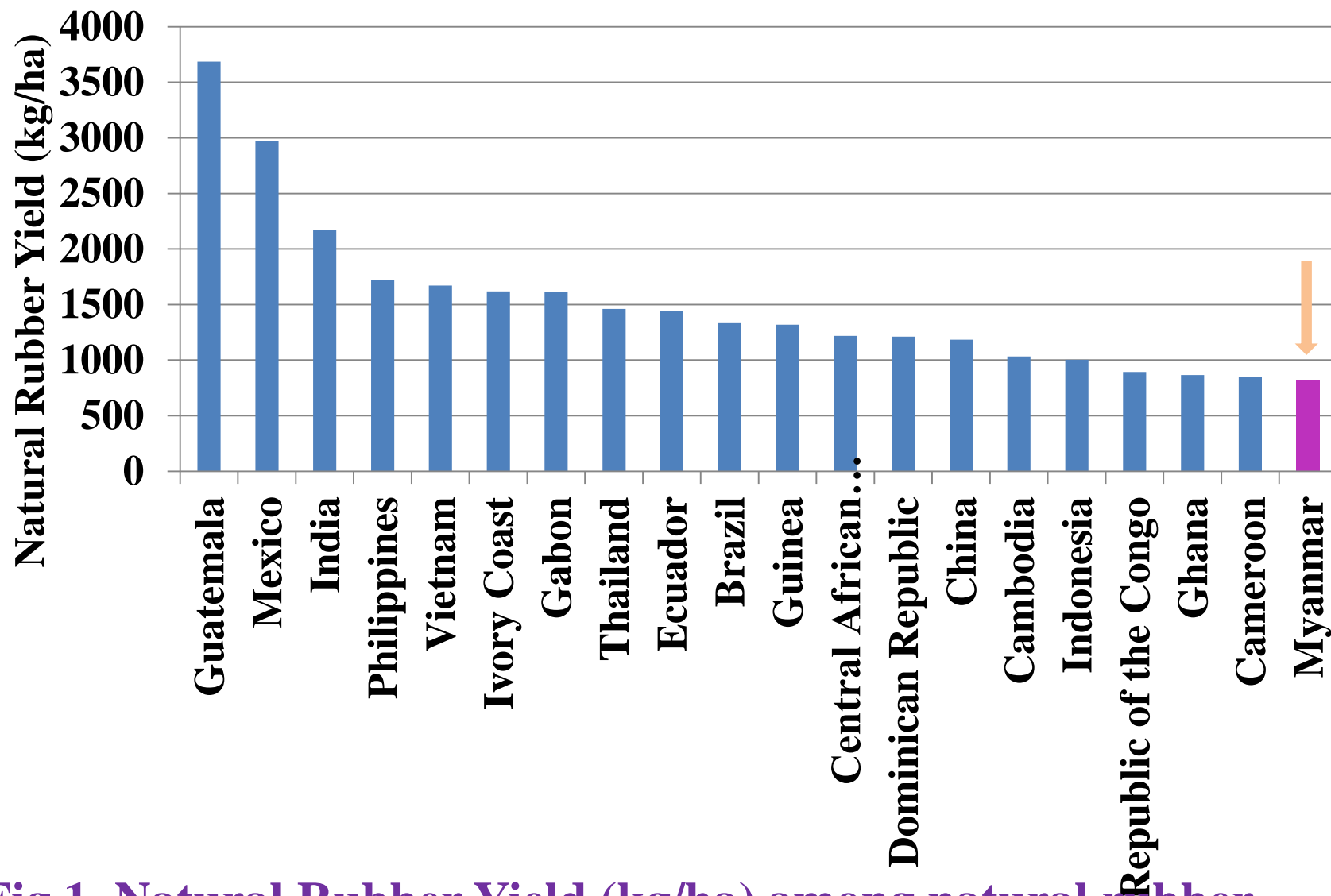


Fig 1. Natural Rubber Yield (kg/ha) among natural rubber producing countries (Source: <http://www.fao.org/faostat>)

Problem Statement

- Rubber yield is low, High Production Cost, Low land productivity
- Susceptibility to leaf diseases
- Rubber Clones that are considered productive in certain areas may behave different in other regions.

Can RRIM 2000 series clones produce higher yield, disease resistance and adaptable to Myanmar condition than current existing rubber clones ????

Objectives

- to evaluate the growth and yield performance of RRIM 2000 series rubber clones
- to discover high yielding, disease resistant and local adaptable rubber clones

Materials and Methods



R1	F	A	J	K	B	E	G	I	L	H	D	C
R2	E	B	C	G	I	D	H	A	J	F	L	K
R3	H	K	B	E	F	G	L	D	A	C	J	I

- | | |
|---------------------|---------------------|
| A-RRIM 2001 | G-RRIM 2026 |
| B-RRIM 2002 | H-RRIM 2025 |
| C-RRIM 2009 | I- RRIM 2027 |
| D-RRIM 2016 | J- RRIM 3001 |
| E-RRIM 2023 | K-PB 350 |
| F- RRIM 2024 | L - BPM 24 |

- Experimental Site - PCRDC (compound)
- Treatment - 12
- Replication - 3
- Design - RCB
- Spacing - 18' × 9'
- Plot Size - 7 trees
- Total plants - 252 trees
- Experimental Area - 1.29 acres
- Tapping System - S/2d2
- Tapping Method - download tapping
- Planted year - 2009
- Production year - 2015

Data Collection

- **Girth (cm)**
- **Girth increment (cm)**
- **Bark thickness (mm)**
- **Latex yield**
(gram/tree/tap and lb/ac/yr)
- **Phytophthora leaf fall disease**
(*Phytophthora botryosa*)
- **Powdery Mildew disease**
(*Oidium heveae*)
- **Tapping Panel Dryness**

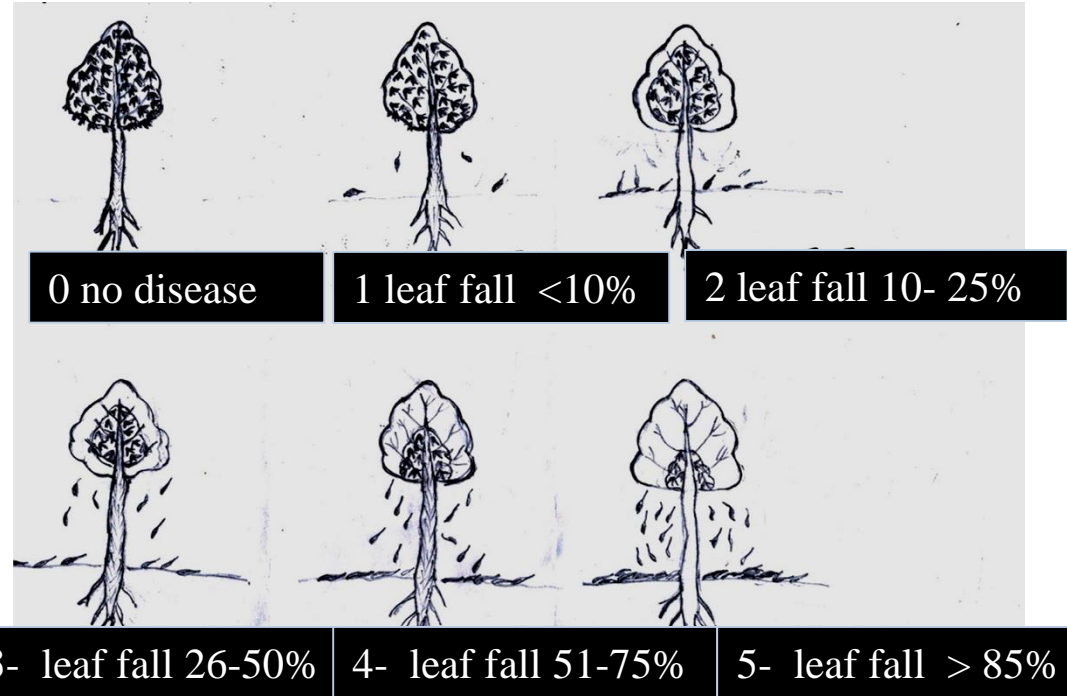


Powdery Mildew (*Oidium heveae*) disease score chart



- 0 = no disease
- 1 = very light (VL)
- 2 = light (L)
- 3 = moderate (M)
- 4 = severe (S)
- 5 = very severe (VS)

Phytophthora leaf fall (*Phytophthora botryosa*) disease score chart



0 no disease

1 leaf fall <10%

2 leaf fall 10- 25%

3- leaf fall 26-50%

4- leaf fall 51-75%

5- leaf fall > 85%

- Highly Resistant (HR) = 0 - 15% DSI
- Resistant (R) = 16 - 40 % DSI
- Moderately Susceptible (MS) = 41 - 65 % DSI
- Susceptible (S) = 66 - 85 % DSI
- Highly susceptible (HS) = > 85 % DSI

(Manju et al. 2011)

$$\text{Disease Severity Index (DSI)} = \frac{(0 \times a) + (1 \times b) + (2 \times c) + (3 \times d) + (4 \times e) + (5 \times f)}{a + b + c + d + e + f} \times \frac{100}{X}$$

(Phytophthora leaf fall)

Where:-

0, 1, 2, 3, 4, 5 = Infection categories

a, b, c, d, e, f = No of leaves/ plant that falls into the infection categories

X = Maximum no. of infection categories

(Manju et al. 2011)

$$\% \text{ TPD (Tapping Panel Dryness)} = \frac{\text{Length of cut affected by TPD (dry area)}}{\text{Total Panel Length}} \times 100$$

0%	TPD	Nil	(N)
1 -20%	TPD	Very Low	(VL)
21-40%	TPD	Low	(L)
41- 60%	TPD	Moderate	(M)
61-80%	TPD	High	(H)
81 -99%	TPD	Very High	(VH)
100%	TPD	Total dry	(TD)

(Okoma et al. 2011)



Results and Discussion

Table 1. Average Dry Rubber Yield (g/t/t and Lb/ac/yr) of RRIM 2000 series with tapping System S2/d2 evaluated in small scale trial of 2019-2020

Clone	Mean Yield (g/t/t) (SE)	Mean Yield (lb/ac/yr) (SE)
RRIM 2001	32.98 (1.66) abc	1453 (73.23) abc
RRIM 2002	12.97 (0.91) e	571 (40.13) e
RRIM 2009	27.57 (0.27) bcd	1214 (12.09) bcd
RRIM 2016	34.98 (3.59) ab	1541 (158.01) ab
RRIM 2023	33.83 (0.97) abc	1490 (42.63) abc
RRIM 2024	35.88 (6.97) ab	1581 (306.89) ab
RRIM 2025	23.20 (1.83) d	1022 (80.65) d
RRIM 2026	34.88 (2.84) ab	1537 (125.00) ab
RRIM 2027	24.78 (3.91) cd	1092 (172.28) cd
RRIM 3001	20.75 (0.68) de	914 (30.13) deab
PB 350	36.87 (3.21) ab	1624 (141.19) ab
BPM 24 (check)	41.46 (3.38) a	1826 (148.97) a
LSD (0.05)	9.4548	414.67
Pr_≥F	0.0001	0.0001

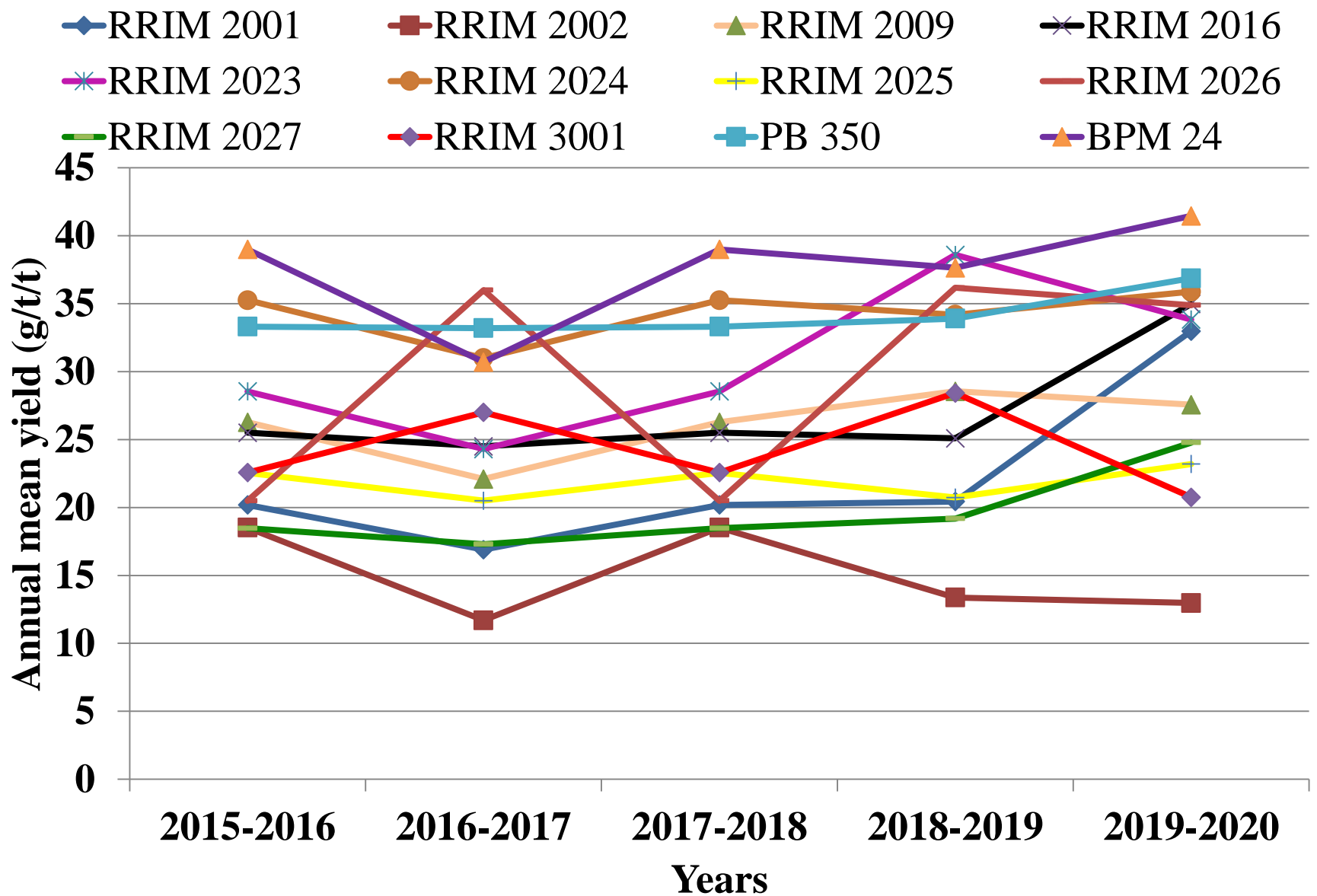


Fig. 2 Comparison of annual mean rubber yield (g/t/t) in 2015 to 2020

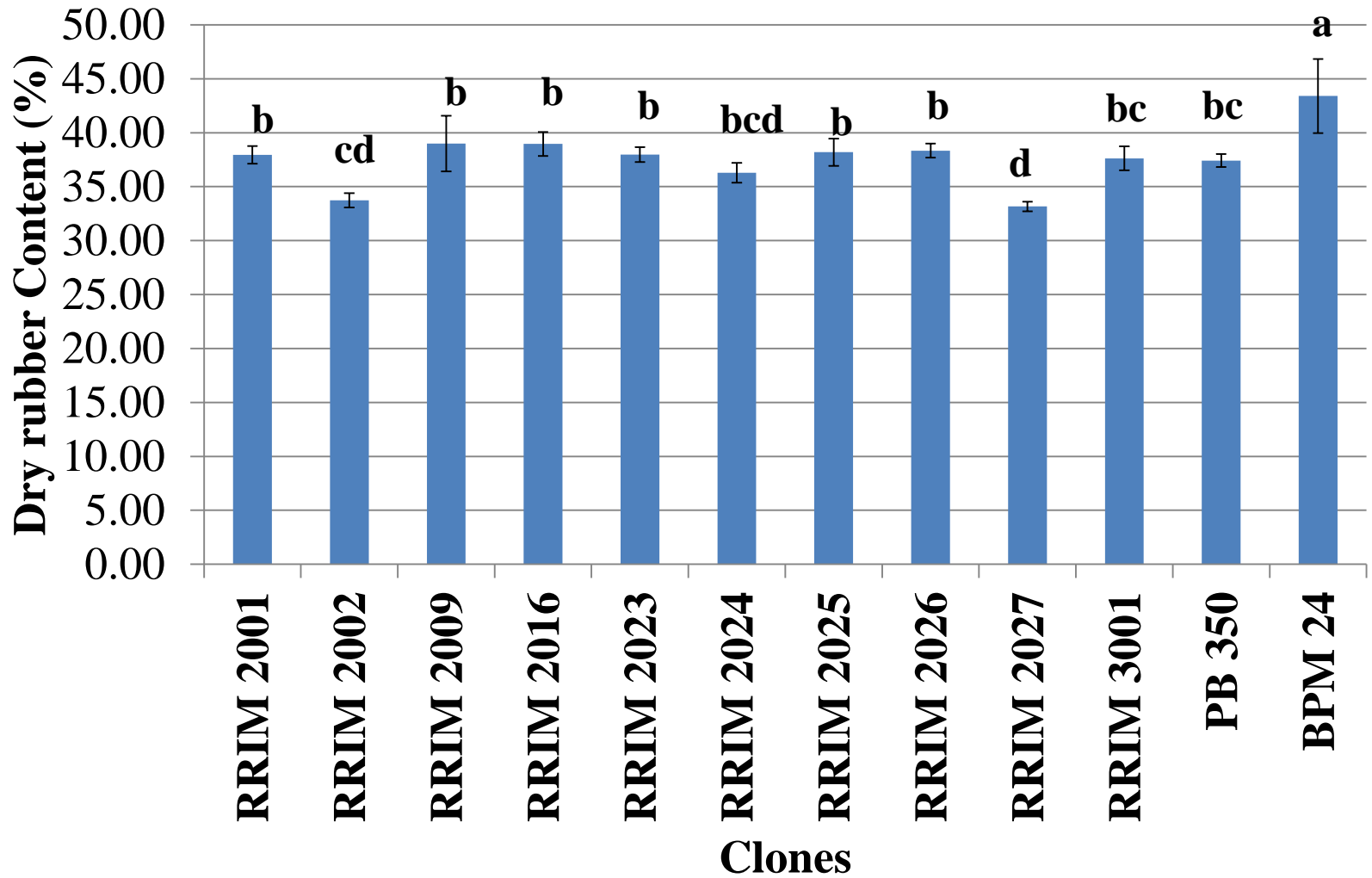


Fig. 3. Dry Rubber Content (%) of RRIM 2000 series the testes clones in 2019-2020

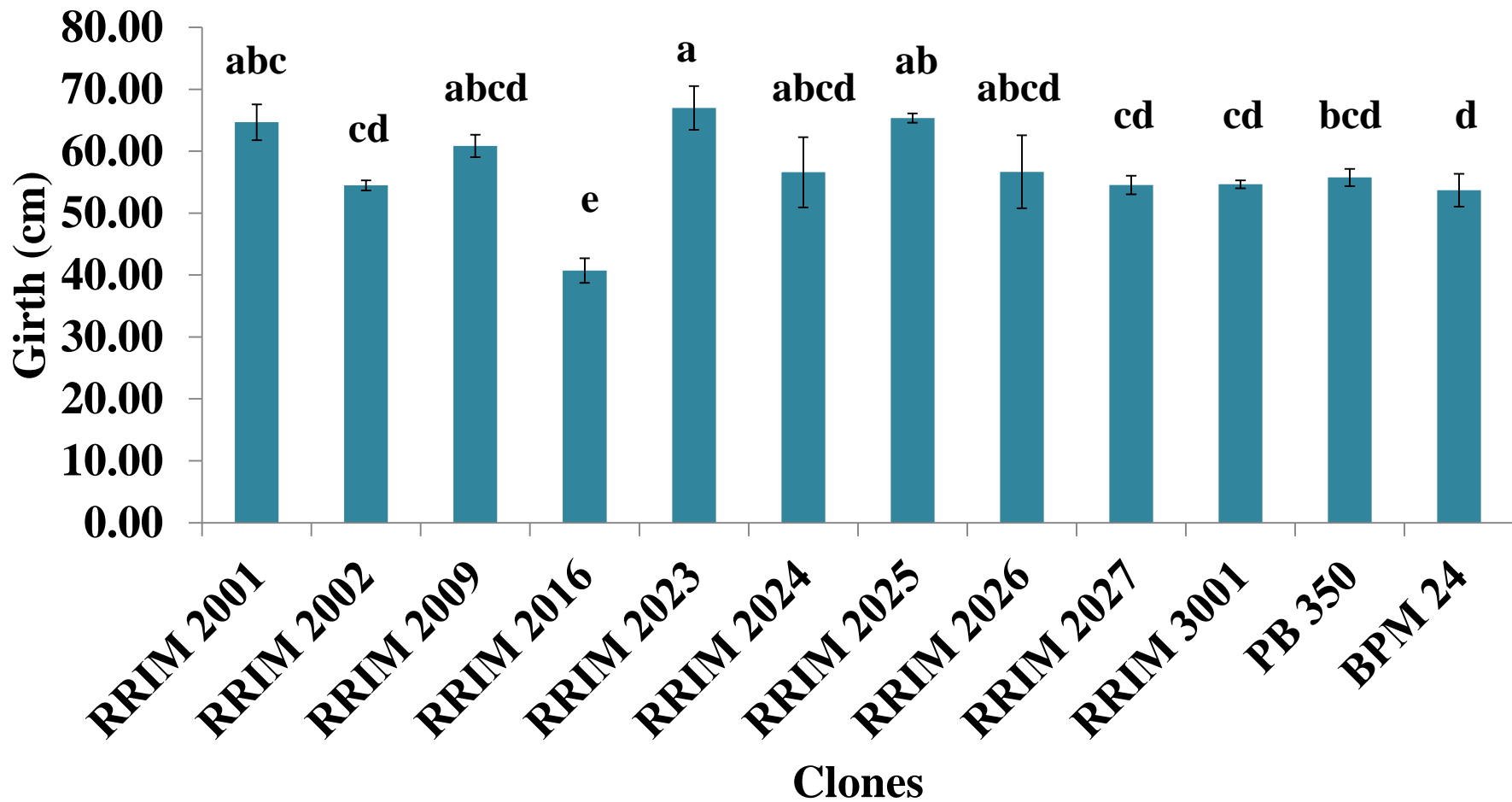


Fig.4 Growth of Girth of RRIM 2000 series testes clones in 2019-2020

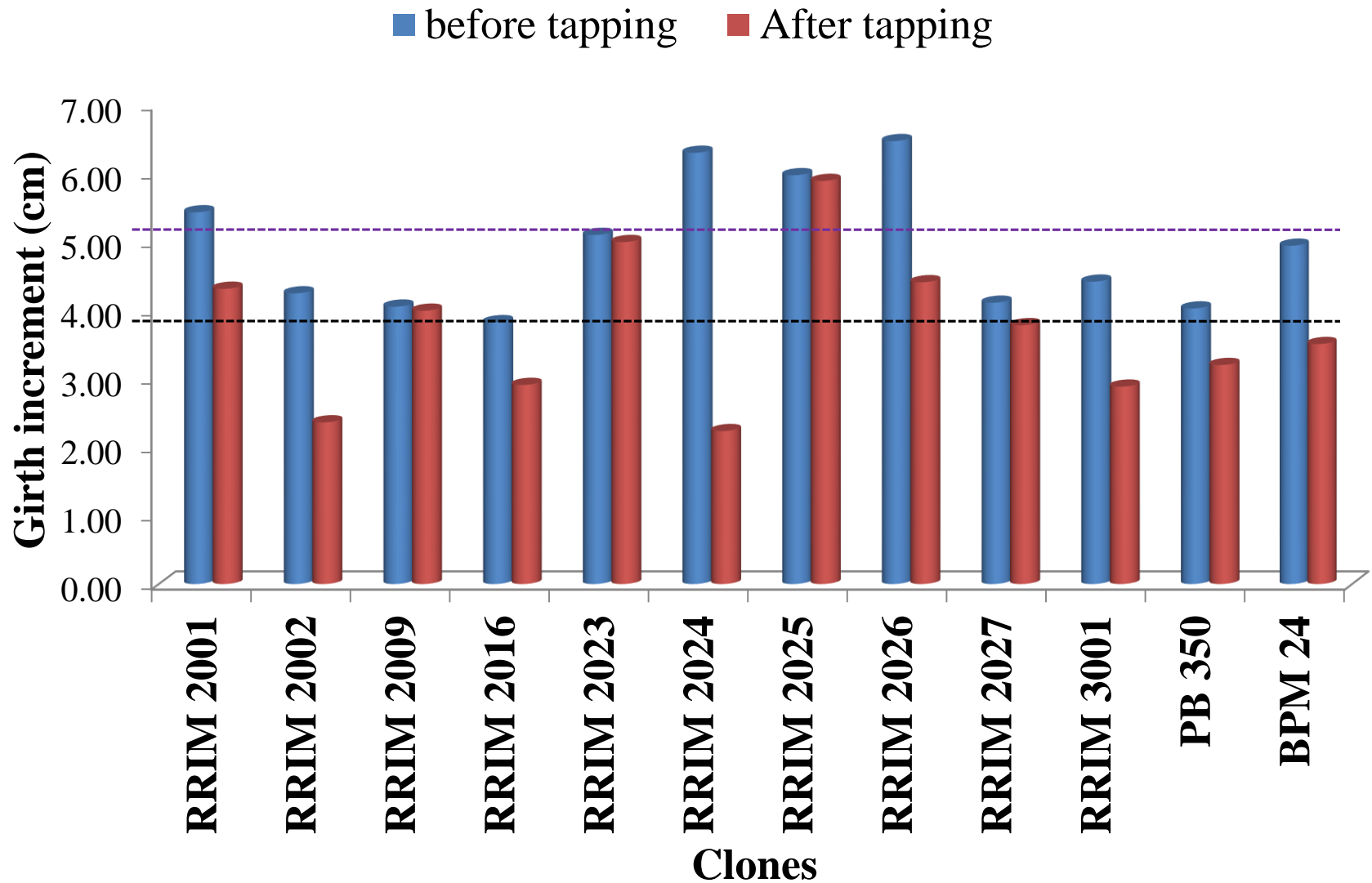


Fig. 5 Girth Increment before tapping and after tapping in small scale trial

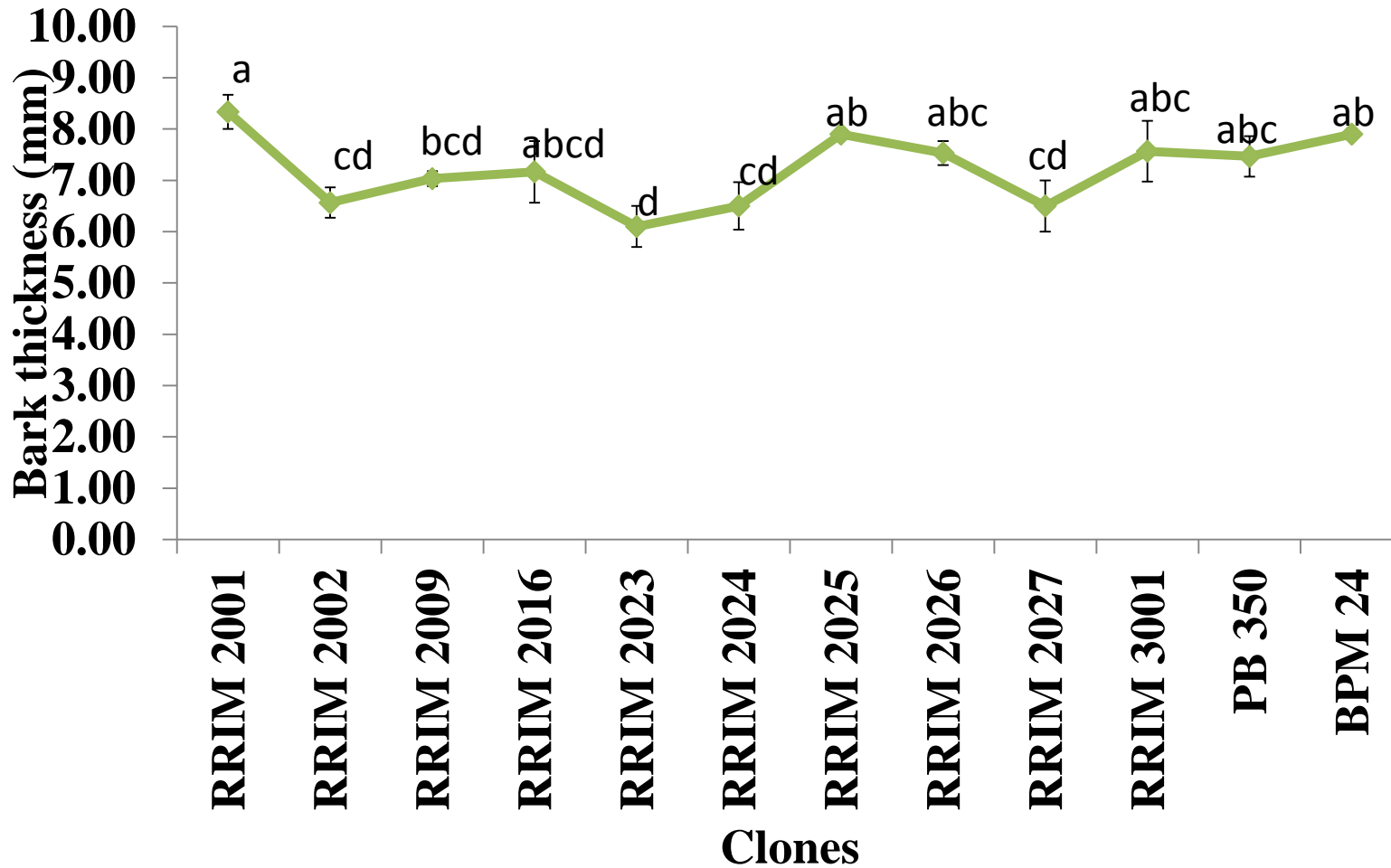


Fig. 6 Bark Thickness of RRIM 2000 series testes clones in 2019-2020

Table 2. Percentage of incidence of Phytophthora leaf fall disease in 2019-2020

Clone	Phytophthora leaf fall		
	Disease Severity Index ± SE		Host Reaction
RRIM 2001	80.0 ± 7.6	ab	Susceptible
RRIM 2002	75.6 ± 4.5	ab	Susceptible
RRIM 2009	36.5 ± 5.3	cd	Resistant
RRIM 2016	80.5 ± 5.4	ab	Susceptible
RRIM 2023	58.5 ± 13.1	bc	Moderately Susceptible
RRIM 2024	51.1 ± 17.9	bcd	Moderately Susceptible
RRIM 2025	61.4 ± 7.1	bc	Moderately Susceptible
RRIM 2026	54.6 ± 11.4	bcd	Moderately Susceptible
RRIM 2027	69.5 ± 12.8	ab	Susceptible
RRIM 3001	97.1 ± 2.9	a	Highly Susceptible
PB 350	75.2 ± 5.1	ab	Susceptible
BPM 24	25.4 ± 12.3	d	Resistant
P ≥ F	0.0028		
LSD _(0.05)	29.57		
CV %	27.37		



Table 3. incidence of Powdery Mildew disease and Tapping Panel Dryness in 2019-2020

Clone	Powdery Mildew		Tapping Panel Dryness
	Percent Disease Intensity± SE	Host Reaction	(%)
RRIM 2001	1.24 ±0.67cd	light	0.00
RRIM 2002	2.26 ±0.51bc	Moderate	0.00
RRIM 2009	3.21 ±0.90ab	Severe	9.00 very low
RRIM 2016	2.94 ±0.59 abc	Moderate	0.00
RRIM 2023	3.06 ±1.06 abc	Severe	0.00
RRIM 2024	3.80 ± 0.31ab	Severe	0.00
RRIM 2025	2.19 ±1.04 bc	Moderate	0.00
RRIM 2026	2.42 ±0.09 bc	Moderate	0.00
RRIM 2027	2.19 ±0.32bc	Moderate	0.00
RRIM 3001	0.15 ±0.08d	Very Light	0.00
PB 350	2.87 ±0.87abc	Moderate	0.00
BPM 24	4.43 ±0.30a	Very Severe	0.00
P ≥ F	0.0150		
LSD _(0.05)	1.92		



Conclusion

RRIM 2026 - Higher performance of rubber yield, girth increment before and after tapping, dry rubber content, and less incidence of leaf disease.

PB 350
RRIM 2024 } High yield potential and less incidence to disease

RRIM 2016 - High yield potential but susceptible to rubber disease and unsuitable in high rainfall area.

RRIM 2002 - stable growth but lowest yield and do not recommend planted in Myanmar.

RRIM 3001 – Highly susceptible to *Phytophthora* leaf disease

✓ The result land further support to the clone recommendation to fulfill the needs of farmers indeed.

Recommendation

- Longer term observations will be required for better recommendation of the Latex –Timer rubber clones.
- To obtain agronomical performance and adaptability in specific environment conditions, the large scale experiment and commercial evaluation should be continued.
- The development of clones on commercial planting should be carried out gradually by considered the suitability of plant growing environment.

Reference


<https://www.nationmaster.com>

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Okoma K. M., S. D. Kouadiaand A.Obouayeba. 2011. Seasonal variation of tapping panel dryness expression in rubber tree *Hevea brasiliensis* muell.arg.in Cote d’ivoire. 3: 559-569.



**Thank
You
Very
Much**

Table.1 Origin of the Clones and Parentage of tested clones

Clone	Parentage	Origin
RRIM 2001	RRIM 600 x PB 260	Malaysia
RRIM 2002	PB 5/51 xFord 351	Malaysia
RRIM 2009	GT 1 x PB 260	Malaysia
RRIM 2016	PB 5/51 x IAN 873	Malaysia
RRIM 2023	IAN 873 xPB 260	Malaysia
RRIM 2024	IAN 873 xPB 235	Malaysia
RRIM 2025	IAN 873 x RRIM 803	Malaysia
RRIM 2026	PBIG-GG-4/5 seedling	Malaysia
RRIM 2027	PBIG-GG-4/5 seedling	Malaysia
RRIM 3001	IAN 873 x PB 235	Malaysia
PB 350	RRIM 600 x PB 235	Malaysia
BPM 24 (Check Clones)	GT 1 x AVROS 1734	Indonesia