



**Ministry of Agriculture, Livestock and Irrigation**  
**Department of Agriculture**  
**Perennial Crops Research and Development Center**  
**(PCRDC) Mawlamyine, Mon State**

# **Assessment of Growth and Yield Performance of Rubber Clones of ARCPC**



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# Introduction

- ✓ Crop - Rubber (*Hevea brasiliensis*)
- ✓ Experimental type - Growth and Yield performance
- ✓ Experimental location - Perennial Crops Research and Development Center (PCRDC), Yo Go Estate Division
- ✓ District/ State - Mawlamyine/ Mon
- ✓ Presenter - Daw Thanda Moe
- ✓ Position - Deputy Staff Officer  
Department of Agriculture



# Background

- ✓ Situated - (8) miles (5) furlongs far from Mawlamyine, side of Mawlamyine- Kyaik Kha Mie High way
- ✓ Area - 557 ac (research 285 ac)
- ✓ Annual Rain fall - 4638 mm (183-200 inches)
- ✓ Raining days -124 days
- ✓ Temperature - 23° C – 32 °C
- ✓ Soil pH - 5.75
- ✓ Soil Texture - Sandy Clay Loam



Perennial Crops Research and Development Center  
PCRDC

- ✓ Native - tropical forest of Amazonian basin of South America
- ✓ First introduce Myanmar - 1876
- ✓ Commercial planting - 1905 (MOAI 2013)
- ✓ Rubber clones introduce - 1958-1993
- ✓ Myanmar cannot depend - foreign sources all the time
- ✓ Hybridization and clonal selection- resulted- outstanding rubber clones
- ✓ PCRDC tried to improve high yielding and disease resistance clones
- ✓ Information - need to access in small-scale, large-scale and farm trials



# Objectives

- ✓ to evaluate growth and yield performance of ARCPC hybrid Clones
- ✓ to improve high yielding, disease resistance and local adaptable rubber clones
- ✓ to explore rubber clones for future breeding trial

# Materials and Methods



**Breeding Plot**



**Rubber flowers**



**Hand Pollination**



**Small plug of cotton wool**



**Small plug of cotton wool**

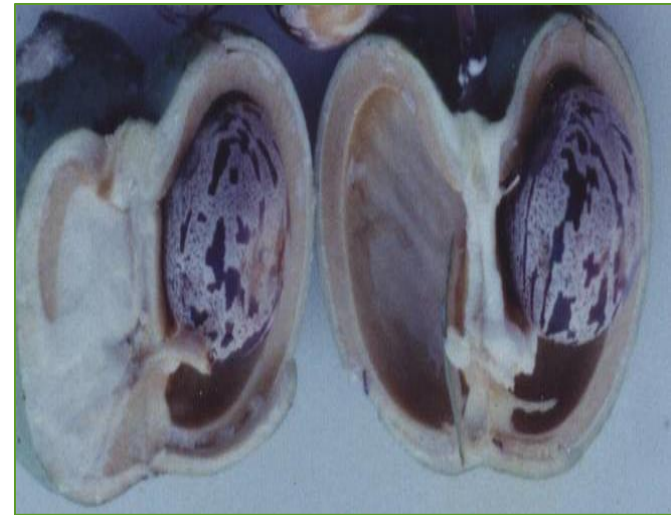


**Fertilized fruit**

## Hybridization of Rubber



**Bagged fruit borne from hand  
pollinated flowers**



**Seeds**

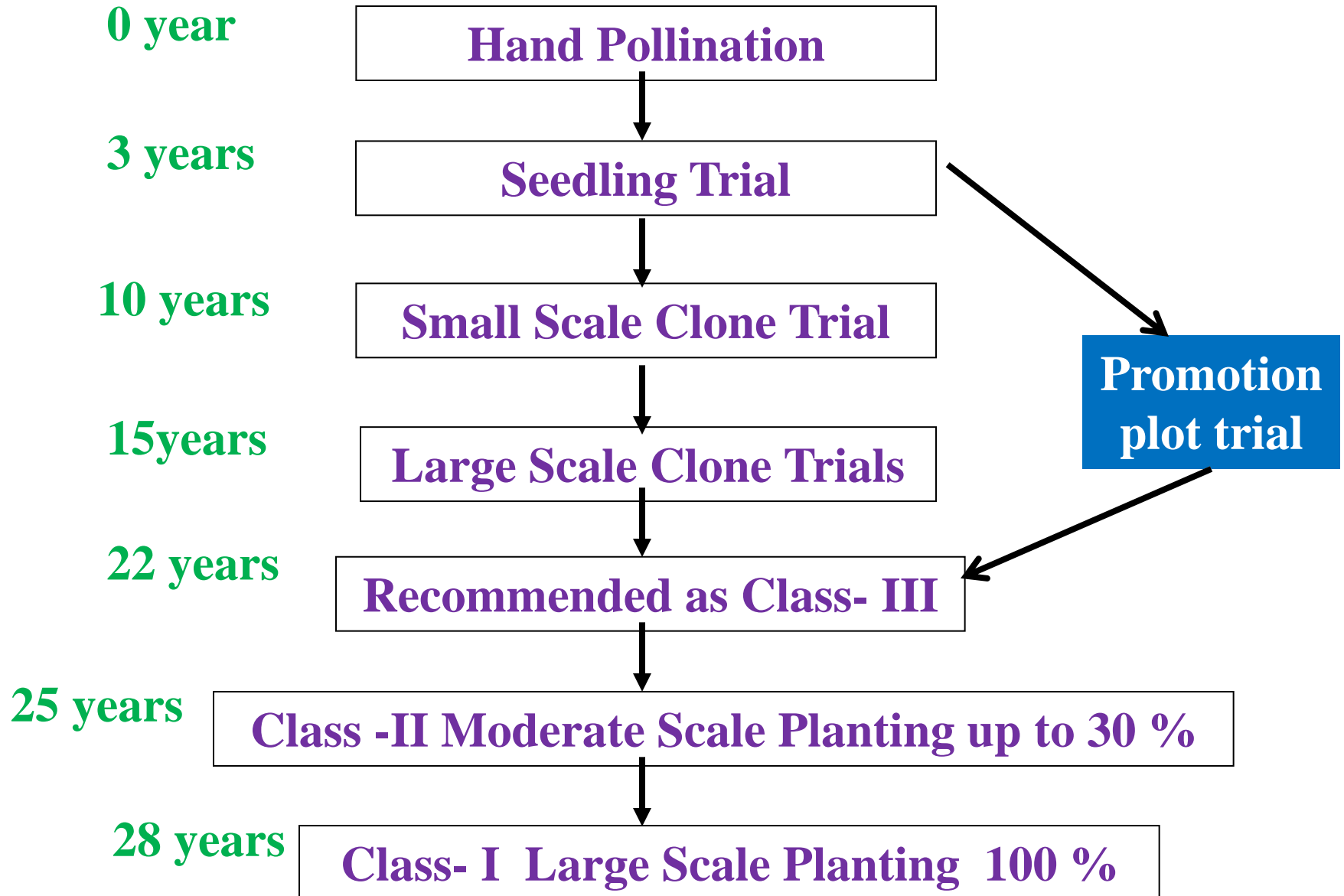


**Seedling**



**Seedling Trial**

# Rubber Breeding Program



- Spacing - 20 ft x 9 ft
- Tapping system - S/2 d2
- Field upkeep
  - Weeding
  - Fertilizer application < 5 year - 15 : 15 : 6 : 4
  - > 5 year - 15 : 7 : 18 : 2
  - Mulching
  - Controlled Pruning and Branch Induction
  - Disease Control



- Treatments
 

ARCPC 1	GT1 × PB 260 (9)
ARCPC 2	BPM 24 × PB 260 (4)
ARCPC 3	BPM 24 × PB 235 (1)
ARCPC 4	BPM 24 × RRIC 100 (7)
ARCPC 6	PB 260 × RRIC 100 (22)
ARCPC 7	RRIC 110 × PB 260 (16)
ARCPC 8	BPM 24 × PB 235 (2)
ARCPC 9	RRIC 110 × PB 260 (17)
BPM 24	GT 1 × AVROS 1734
PB 260 (Control)	PB 5/51 × PB 49

- Design - RCB
- Replication - 3
- Plot size - 6 plants/plot
- Experimental area - 1.5 ac



# Data Collection

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





weighing rubber latex by individual clones



coagulation of latex



milling rubber sheet

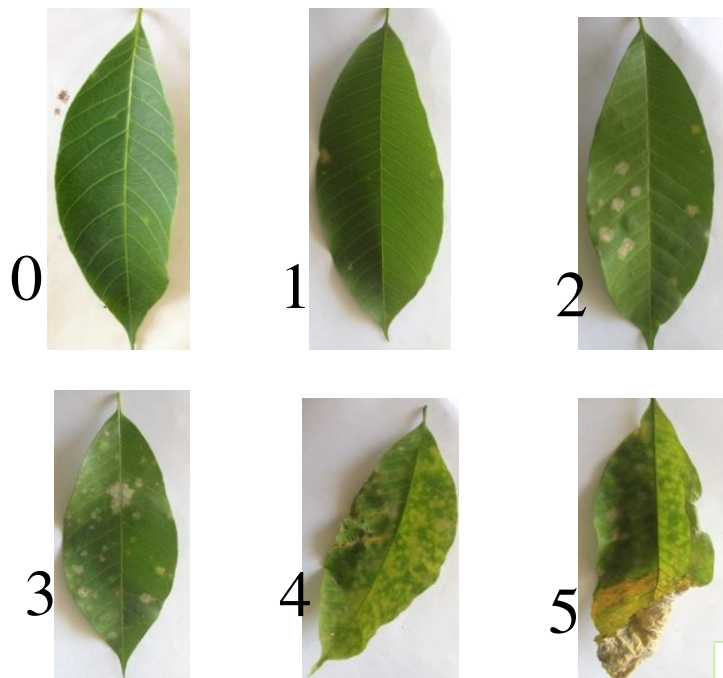


drying rubber sheet



weighing dry rubber sheet

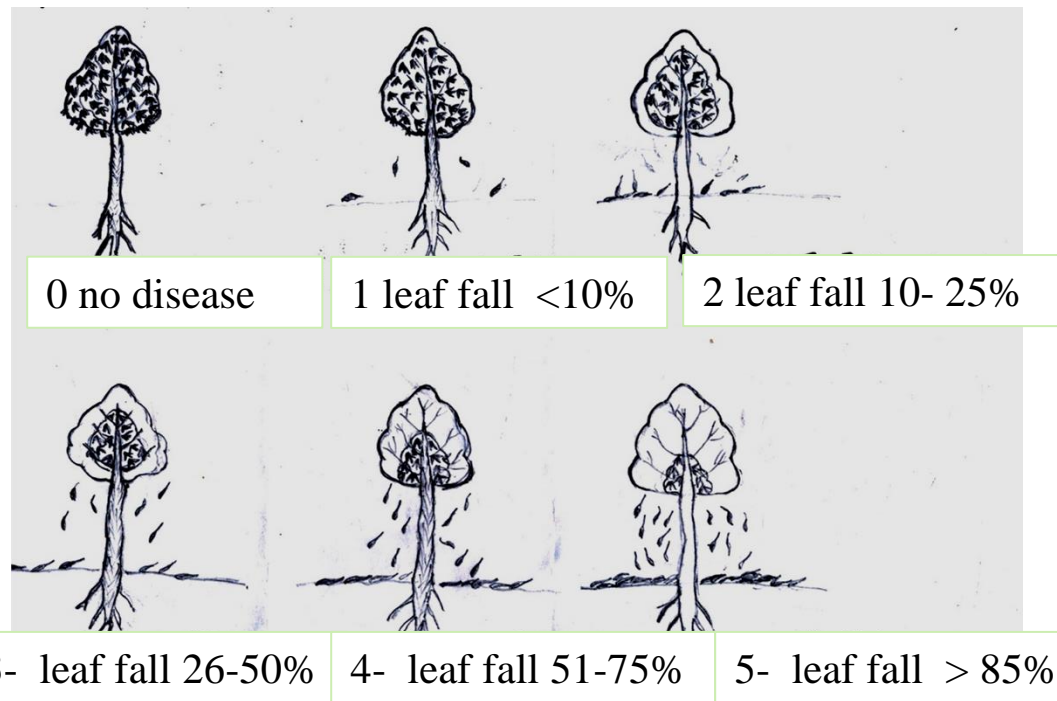
## Powdery Mildew (*Oidium heveae*) disease score chart



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

(Yoon et al. 1992)

## 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)<sup>13</sup>

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

(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)**



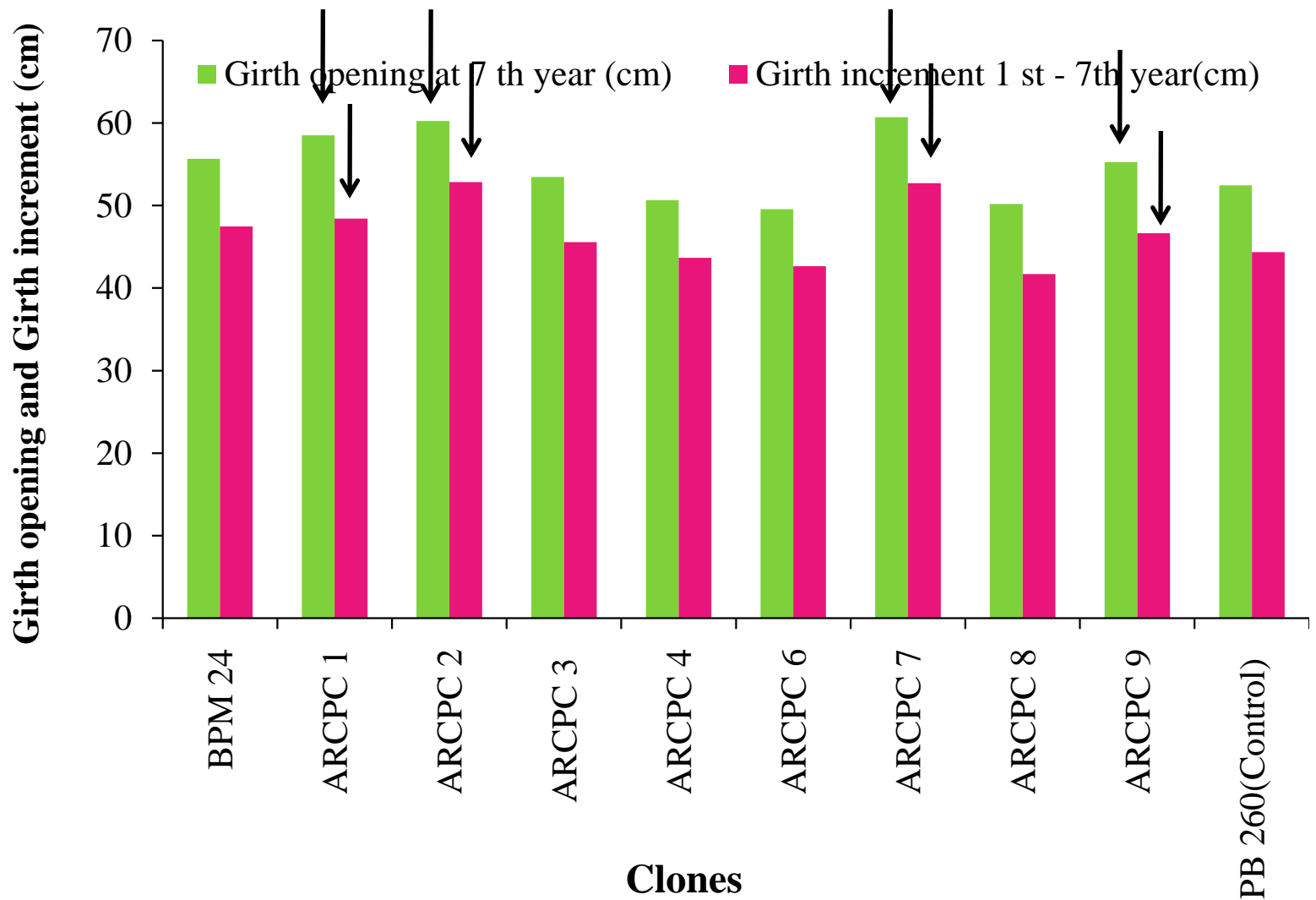
## **Data Analysis**

- ✓ Experimental data - analyzed - Statisix software 8.0 version
- ✓ Mean comparison - performed by using LSD test at 5% probability level

## **Results and Discussion**

- ✓ Compare four years yield (g/t/t and lb/ac/yr)
- ✓ Compare Girth, Girth increment
- ✓ Compare Disease incidence

<b>Table 1. Dry rubber yield (g/t/t and lb/ac/yr) of four years compared to control (PB 260) evaluated in small scale trial</b>												
<b>Clones</b>	<b>First year</b>		<b>Second year</b>		<b>Third year</b>		<b>Fourth year</b>			<b>Mean</b>		
	<b>g/t/t</b>	<b>lb/ac/yr</b>	<b>g/t/t</b>	<b>lb/ac/yr</b>	<b>g/t/t</b>	<b>lb/ac/yr</b>	<b>g/t/t</b>	<b>lb/ac/yr</b>	<b>g/t/t</b>	<b>Rank</b>	<b>lb/ac/yr</b>	
BPM 24	63.4	2304	50.6	1839	51.2	1861	62.1	2257	56.8	2	2065	b
ARCPC 1	28.6	1039	22.0	800	21.3	774	21.1	767	23.3	10	845	ef
ARCPC 2	67.9	2468	59.6	2166	79.3	2882	81.5	2962	72.1	1	2619	a
ARCPC 3	30.7	1116	26.5	963	33.5	1218	38.3	1392	32.3	8	1172	cdef
ARCPC 4	52.5	1908	36.7	1334	38.1	1385	35.0	1272	40.6	7	1475	cde
ARCPC 6	63.5	2308	33.1	1203	39.8	1446	49.1	1784	46.4	3	1685	bc
ARCPC 7	38.7	1406	34.1	1239	41.5	1508	50.1	1821	41.1	6	1494	cde
ARCPC 8	48.7	1770	43.1	1566	40.6	1476	45.4	1650	44.5	4	1615	bcd
ARCPC 9	49.1	1784	36.5	1327	42.9	1559	48.7	1770	44.3	5	1610	bcd
<b>PB 260 (C)</b>	<b>32.8</b>	<b>1191</b>	<b>38.3</b>	<b>1392</b>	<b>23.6</b>	<b>858</b>	<b>27.6</b>	<b>1003</b>	<b>30.6</b>	<b>9</b>	<b>1111</b>	<b>de</b>
LSD <sub>0.05</sub>	31.67	1150.9	19.59	710.8	18.06	656.6	21.04	764.5	14.9		544.40	
Pr ≥ F	0.049	0.04	0.009	0.008	0.0002	0.0002	0.004	0.004	0.000		0.0001	



**Fig 1. Secondary characters of Girth opening at 7<sup>th</sup> year and Girth increment 1<sup>st</sup> -7<sup>th</sup> year in small scale trial**

**Table 2. Percentage of Phytophthora leaf fall disease, Tapping Panel Dryness and incidence of Powdery Mildew Disease in 2017-2018**

Clones	Phytophthora Leaf Fall (%)	Disease severity (%)	Tapping Panel Dryness(%)	Powdery Mildew (%)
BPM 24	16.00± 5.81	40.00 (R)	1.44±1.17 (VL)	1.77±0.26 (L)
ARCPC 1	26.33±4.48	48.89(MS)	0.70±0.57 (VL)	1.65±0.13 (L)
ARCPC 2	19.97±5.23	63.33(MS)	0.00±0.00 (N)	1.63±0.32 (L)
ARCPC 3	35.43±0.49	60.00 (MS)	0.00±0.00 (N)	2.37±0.57 (M)
ARCPC 4	17.77±3.33	42.22(MS)	2.56±2.09 (VL)	2.22±0.56 (M)
ARCPC 6	49.33±2.52	66.67 (S)	0.00±0.00 (N)	1.60 ±0.67 (L)
ARCPC 7	38.33±3.18	61.67(MS)	0.00±0.00 (N)	2.15±0.30 (M)
ARCPC 8	35.43±0.49	63.33(MS)	0.73±1.42 (VL)	2.22±0.32 (M)
ARCPC 9	26.33±2.23	53.33(MS)	0.00±0.00 (N)	1.95±0.23( L)
<b>PB 260 (C)</b>	<b>22.47±4.1</b>	47.77(MS)	<b>0.00±0.00 (N)</b>	<b>1.42±0.32 (L)</b>
LSD <sub>0.05</sub>	10.91	12.88	3.44	0.44
CV %	22	14.11	15	29
Pr ≥ F	0.0001	0.0093	0.7318	0.4200

# Conclusion

- ✓ ARCPC 2 is high yield potential , fast growth performance and low disease incidence clone.
- ✓ ARCPC 6 is high yield but susceptible in phytophthora leaf fall disease.
- ✓ ARCPC 8 } are promising prospective rubber clones due to growth  
ARCPC 9 } characteristic, yield and disease incidence
- ✓ would be used as reliable data for clone recommendation to fulfill the needs of farmers indeed
- ✓ can be used as parents for improvement programs in future breeding and selection work

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Clone	Parentage	Origin
PB 260	PB 5/51 × PB 49	Malaysia
PB 235	PB 5/51 × PB 5/78	Malaysia
BPM 24	GT 1 × AVROS 1734	Indonesia
RRIC 100	RRIC 52 × PB 86	Sri Lanka
RRIC 110	LCB1320 x RRIC 7	Sri Lanka