Ministry of Agriculture, Livestock and Irrigation

Department of Agriculture

Perennial Crops Research and Development Center

(PCRDC) Mawlamyine, Mon State

Yield and Related Attributes of ARCPC Hybrid Rubber Clones under Small Scale Evaluation

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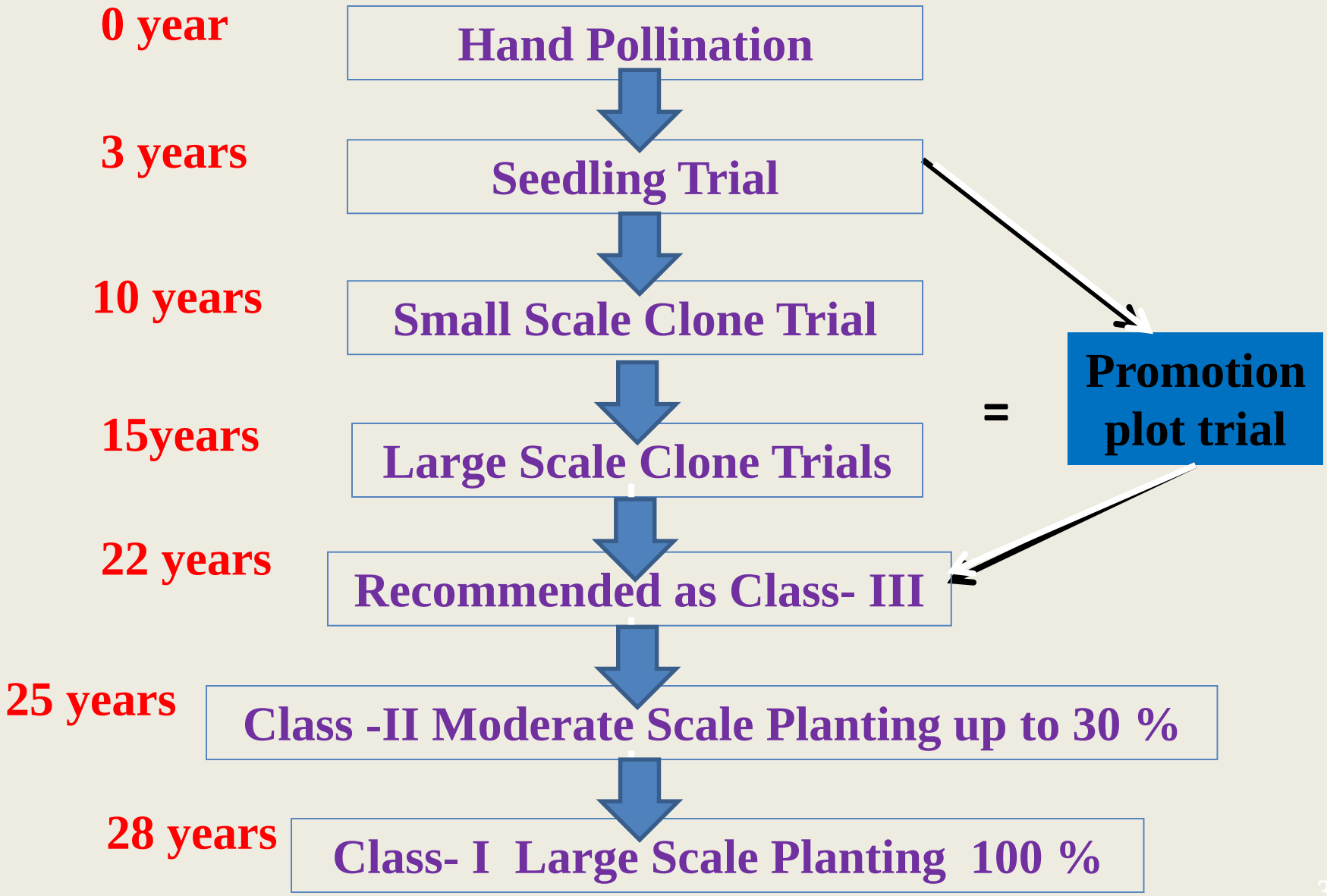
Introduction

- Latex is the major product of *Hevea brasiliensis* while rubber wood (timber) is considered a secondary product **(Priyadarshan et al.,2009)**
- Rubber production in Myanmar is very low so that growing high yielding varieties is one of the important factor.
- Rubber planting materials are imported from foreign countries and it is getting more difficult or even impossible to obtain good high yielding planting material.
- Genetic improvement programme employing hybridization in natural rubber evaluated in a phased manner in small scale trials, large scale trials.
- Conventionally, selection programmes for genetic of *Hevea brasiliensis* are undertaken mainly with yield related attributes.

Rubber Breeding Program



Problem Statement

- Low rubber yield
- Unavailability of high yielding rubber clones
- Susceptibility to leaf disease
- There is no local hybrid clones that are suitable to local climates

Objectives

- to evaluate yield and growth performance of ARCPC hybrid clones
- to improve high yielding, disease resistance and local adaptable rubber clones
- to select rubber clones for large scale clone trial(LSCT)

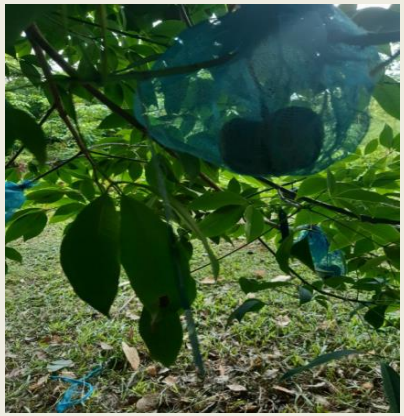
Materials and Metods

Breeding Garden

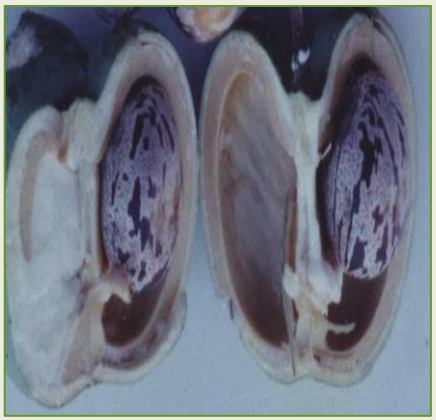
Rubber Flowers

Hand Polination

Small Plug of Cotton Wool



Fertilized Fruit



Seeds

Seedling

Seedling Evaluation Trial

- Experimental site - Perennial Crop Research and Development Center (Mawlamyine), Yogo Estate
- Experimental type-Small Scale Clone Trial (SSCT)
- Design - RCB
- Treatment -BPM 24×PB 235(1),BPM 24 × PB 235(2), BPM 24 × PB260(4), BPM 24 ×RRIC 100 (7), GT 1 × PB 260 (9), RRIC 110 PB260(16), RRIC 110×PB 260 (17), PB 260×RRIC 100 (22), BPM 24 (control), PB 260 (control)
- Replication - 3

- ❑ Spacing - (20 × 9)feet
- ❑ Plot Size - 6 plants/plot
- ❑ Total Plant - 178 plants
- ❑ Experimental Area - 1 acre
- ❑ Tapping System -S/2d2
- ❑ Field Upkeep -Weed control

-Fertilizer application (2 times /year)

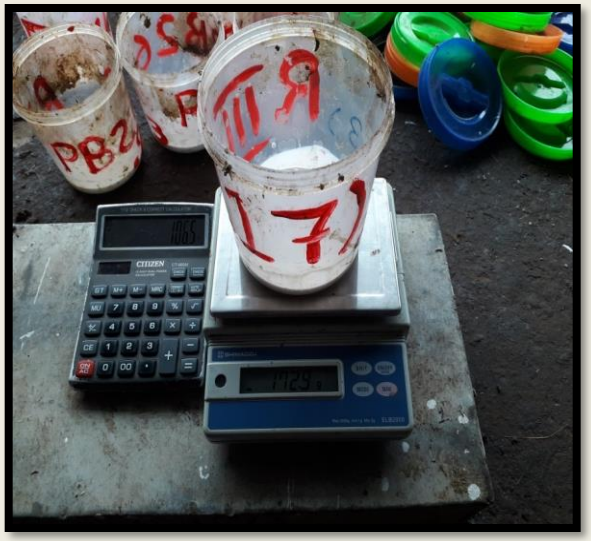
< 5 year - 15 : 15 : 6 : 4

> 5 year - 15 : 7 : 18 : 2

-Pest and Disease Control

Measurement Parameters

- Girth Increment (cm)
- Rubber Yield (gram/tree/tapping) (lb/ac/year)
- Bark Thickness(mm)
- Disease Incidences
  - Phytophthora leaf fall disease
  - Powdery Mildew disease
  - Tapping Panel Dryness (TPD)

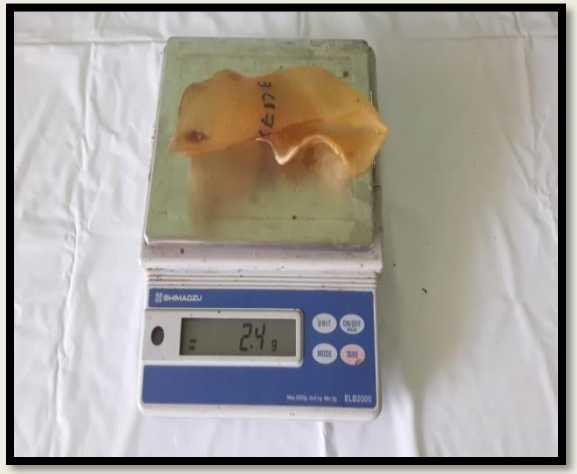


Weighing each sample

Coagulating

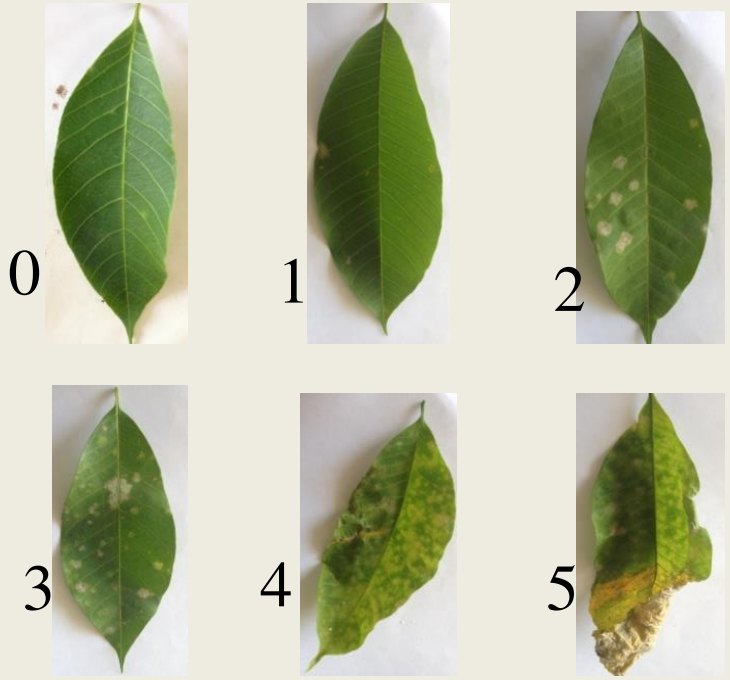
Sheeting

Drying



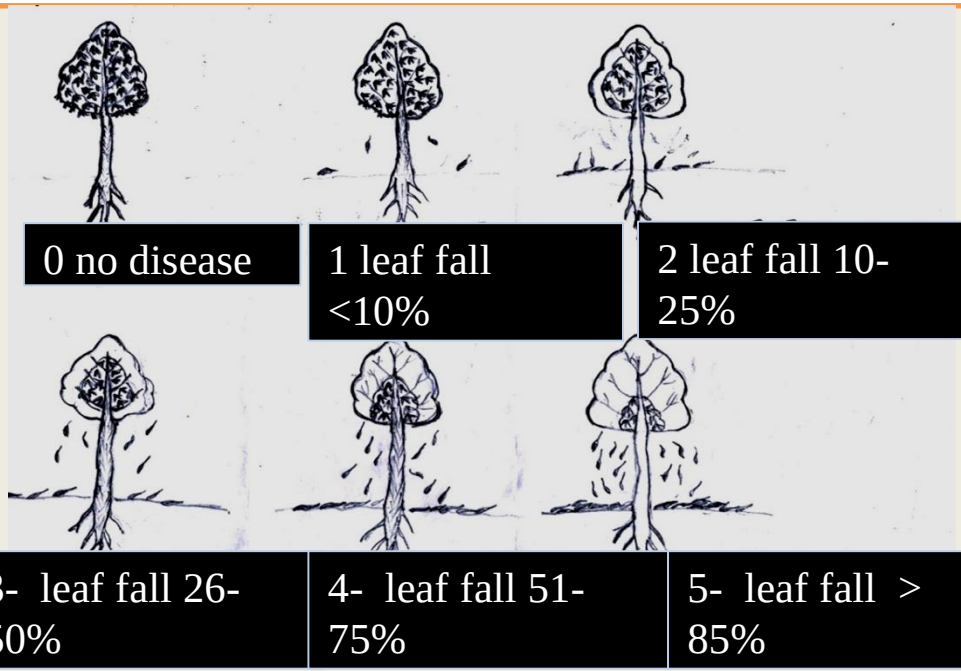
Weighing

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



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)

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

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)

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

0%	**TPD**	**Nill (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. Mean Dry rubber Content (DRC %), dry rubber yield (g/t/t and lb/ac/yr) of six years compared to control (BPM 24 and PB 260) evaluated in small scale trial in (2014 to 2019)

clones	Dry Rubber content	Mean Yield	
	(%)	g/t/t	lb/ac/year
BPM 24 × PB 235 (1)	41.19	32.21 cde	1405
BPM 24 × PB 235 (2)	40.05	40.40 bc	1676
BPM 24 × PB 260 (4)	39.07	66.37 a	2895
BPM 24 × RRIC 100 (7)	39.16	38.64cde	1685
GT 1 × PB260 (9)	36.80	23.73 e	1035
RRIC 110 × PB 260 (16)	39.91	39.81 cd	1736
RRIC 110 × PB 260 (17)	39.52	43.63 bc	1903
PB 260 × RRIC 100 (22)	38.27	35.24 cde	1387
BPM 24 (control)	40.20	55.94 ab	2440
PB 260 (control)	38.98	24.46 de	1009
$LSD_{0.05}$		15.65	
Pr ≥ F		0.0005	

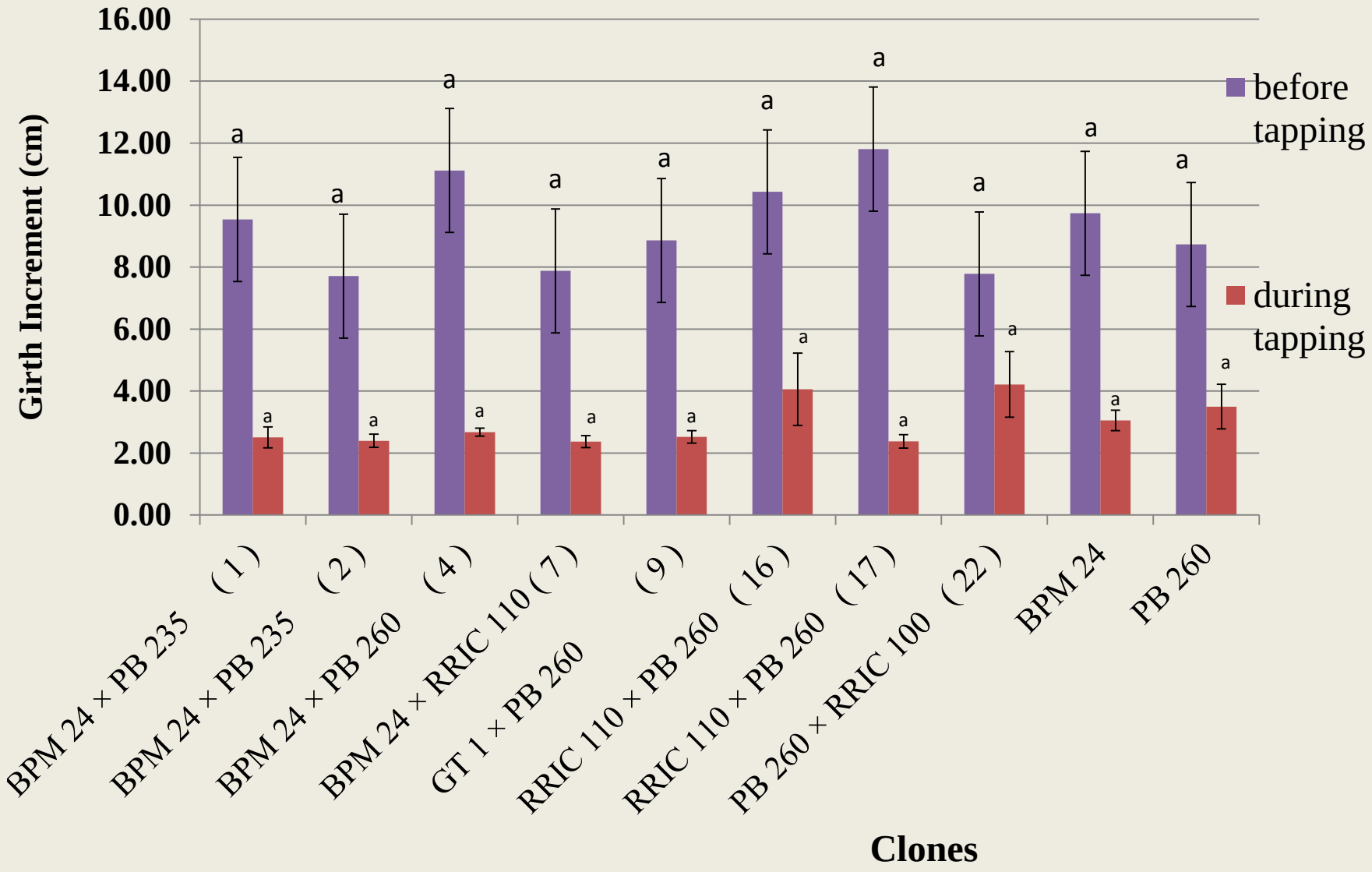


Fig.1. Secondary characters Girth increment in before and during tapping in small scale trial

Table 2. Comparison of virgin bark thickness and renewed bark thickness in different ARCPC clones

N0.	clones	Bark Thickness (mm)	
		virgin bark	renewed bark
1.	BPM 24 × PB 235 (1)	6.85 e	3.88 e
2.	BPM 24 × PB 235 (2)	7.07 de	4.19 de
3.	BPM 24 × PB 260 (4)	8.92 ab	5.58 abc
4.	BPM 24 × RRIC 100(7)	8.04 bcd	4.43 cde
5.	GT 1 × PB 260 (9)	8.26 abc	4.86 bcde
6.	RRIC 110 × PB 260 (16)	8.09 bcd	5.00 abcde
7.	RRIC 110 × PB 260 (17)	7.64 cde	4.76 bcde
8.	PB 260 × RRIC 100 (22)	6.83 e	6.03 a
9.	BPM 24	9.25 a	5.76 ab
10.	PB 260	7.22 de	5.06 abcd
	$LSD_{0.05}$	1.02	1.16
	Pr ≥ F	0.0007	0.019
	CV %	7.68	13.68

Table 3. Percentage of Phytophthora leaf fall disease, Tapping Panel Dryness and incidence of Powdery Mildew Disease in 2019-2020

Clones	Phytophthora Leaf Fall (%)	Disease severity (%)	Tapping Panel Dryness(%)	Powdery Mildew (%)
BPM 24 (control)	16.00± 5.81	40.00 (R)	1.44±1.17 (VL)	1.77±0.32 (L)
GT 1 × PB 260 (9)	26.33±4.48	48.89(MS)	0.70±0.57 (VL)	1.65±0.32 (L)
BPM 24 × PB260(4)	19.97±5.23	63.33(MS)	0.00±0.00 (N)	1.63±0.32 (L)
BPM 24 × PB 235(1)	35.43±0.49	60.00 (MS)	0.00±0.00 (N)	2.37±0.32 (M)
BPM 24 × RRIC 100(7)	17.77±3.33	42.22(MS)	2.56±2.09 (VL)	2.22±0.32 (M)
PB 260× RRIC 100 (22)	49.33±2.52	66.67 (S)	0.00±0.00 (N)	1.60 ±0.32 (L)
RRIC 110 × PB 260 (16)	38.33±3.18	61.67(MS)	0.00±0.00 (N)	2.15±0.32 (M)
BPM 24 × PB 235 (2)	35.43±0.49	63.33(MS)	0.73±1.42 (VL)	2.22±0.32 (M)
RRIC 110 × PB 260 (17)	26.33±2.23	53.33(MS)	0.00±0.00 (N)	1.95±0.23(L)
PB 260 (control)	22.47±4.1	47.77(MS)	0.00±0.00 (N)	1.42±0.32 (L)
$LSD_{0.05}$	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

- ✓ **BPM 24 × PB 260 (4) is high yielding, good bark thickness, fast growth performance and less disease incidence.**
- ✓ **RRIC 110 × PB 260 (17) is high yielding and fast growth but moderately susceptible to phytophthora leaf fall disease.**
- ✓ **BPM 24 × PB 235 (2) is high yielding but moderately susceptible to powdery mildew disease.**
- ✓ would be used as reliable data for clone recommendation to fulfill the needs of farmers indeed

Recommendation

- ✓ **Long term observation will be required for better recommendation of the latex-Timber rubber clones**
- ✓ **Large Scale clone trial will be needed to obtain adaptability in specific environment.**

Reference

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Thank You