

RUBBER CLONE RECOMMENDATION IN CAMBODIA FOR 2007-2009

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Abstract

Since 1995, the Cambodian Rubber Research Institute (CRRI) has established a network of clone trials in the rubber growing traditional regions in Kampong Cham, Kratie and Rattanakiri Provinces in an altitude lower than 200 m.a.s.l. The ecological conditions were noted that 6-month rainy season and 6-month drying season, which the absolute temperature is in the interval of 16 °C and 41 °C, the wind speed varied from 1 m/s to 7 m/s and the average rain fall is lower than 1,500 mm.

The Agro-climatic constraint for rubber growing in Cambodia is the rainy season including an irregular drying season, which causes a big problem for planting rubber trees. The most important rubber diseases in Cambodia are Pink disease and Oidium leaf fall disease. Colletotrichum leaf disease, Phytophthora panel disease and Phytophthora leaf fall disease are sometimes severe, others diseases are not of importance. Root diseases and Corynespora are temporarily absent in Cambodia.

Up to now, there are 19 LSCT and 20 simple small scale clone trials (SSSCT) have been established. CRRI has established and continuously surveyed a network of clone trials in major rubber growing areas. The result derived from network clone trials permitted to upgrade the promising clones for the planting recommendation, which has been improved every 3 years.

Database from the network of LSCT planted in 1995-96 indicated that, under the favorable conditions of central, East and North-East regions, the growth in immature period to the first four years of tapping of clones PB235, IRCA130, PB330, PB280, RRIC101, RRIC110, IRCA111 and KV4 appeared to be better than GT1 (control clone). Clones KV4, PB260, RRIM600 and PR107 had moderate growth and comparable to GT1 and the growth of IRCA18, RRIM712 and PR series clones appeared lower than GT1.

The LSCT planted in 1986 in CHUP company shows that the cumulated yield in 12 years of clones KV4, PB235, RRIM600, PB324, PB310, PB255, RRIC110, RRIC121, PB255 and PB324 are higher than GT1, but the clones PR107, RRIC102 and PB86 yielded less than GT1. It also mention that the clone PB 235 has the best growing and followed by RRIC121, PB255, PB310, PB324 and RRIC110, all are better than GT1, but the other clones grow lower than GT1.

Although the yield performance of traditional clones such as GT1, RRIM 600 and PR107 show less than some new foreign clones, they were usually classified in class I and class II, especially GT1 which is usually planted on the wide areas and it was seen as a security clone. GT 1 and RRIM 600 will be proposed again in class I for the period of 2007-2009. The promising clones such as IRCA230, IRCA130, PB217, PB235, PB255, PB260, PB314, PB330, KV4, and RRIM712 were contributed to the diversification of the planting recommendations.

Introduction

Natural rubber is one of the main agricultural resources, which plays an important role in national economy in Cambodia. The Government has defined a clear policy and planned to expand the rubber crop for the target of total 350,000 ha, including 66,000 ha of old plantation in the traditional region and non-traditional region in some provinces in Central, East and North-East.

The first rubber plantation in Cambodia was set up in 1921 by the French, mainly on the red basaltic soil in Kampong Cham province. At the end of 1969, the areas covered by rubber were amounted to 70,000 ha. From 1979, entire of rubber plantation was nationalized; it was divided into state establishments and placed under the strict control of the General Directorate of Rubber plantation. During 1970-1990 the situation of rubber development was set still due to Cambodia was fallen down in the civil war and followed by transition period with difficult conditions of economy.

During 1990s, all of plantations were in the period of renovation and the smallholder rubber development program was activated, in this moment the rubber planting material has met a big problem on non confirmable clones, because it is lack of maintenance in period of war. In the difficult condition, 42 rubber clones were introduced (10 clones introduced by RRIV in 1986, 30 clones introduced by CIRAD during 1992-2005 and 02 clones introduced by RRISL during 2005). All of introduced clones were established in LSCT. CRRI continuously characterized the performance of rubber tree, and then set up the rubber clone recommendation every three year for the rubber planting.

The main objectives of Agro-Economical research work are:

- Clone diversification
- Labour productivity
- Reduction of risk
- Reduction of immature period
- Security and productivity of the plantation
- Valorisation of rubber wood

Material and method

Experimental Design

- LSCT were established on a total surface of about 6 ha, arranged in Randomized Complete Block Design (RCBD) with 4 replications and 6-8 treatments, each replication consisted of 80-100 trees and GT1 was used as a control clone.

- SSSCT were established on a total surface of about 1-1.2 ha, arranged as a simple scale, no replication and 4 treatments, each replication consisted of 140-160 trees.

Tapping system

The tapping system used in routine was: $\frac{1}{2}$ S d3 7d/7 ET 2.5% Pa 1(1) 2-6/y 11m/12

Results and discussion

Data derived from the experimental network was introduced on girth growth and yield only (girth at opening, girth on recent measure and cumulated yield). Tables 1 and 2 present the girth and yield of clones in the network of LSCT (% of GT1)

Table 1: Girth of clones in the network of LSCT (% of GT1)

Clones	Girth(cm) at opening	%GT1	Girth(cm) at 9 yrs	%GT1	Girth (cm) at 10 yrs	%GT1	Girth (cm) at 20 yrs	%GT1
GT1 ^(C)	52.5	100					67.29	100
KV4	54.8	104					65.35	97
PB86	49.3	94					66.78	99
PB235	58.9	112					75.53	112
PB255	55.2	105					73.8	110
PB310	55.0	105					71.25	106
PB324	52.5	100					70.49	105
PR107	51.5	98					59.41	88
RRIC102	51.7	98					58.2	86
RRIC110	54.3	103					69.1	103
RRIC121	54.2	103					75.08	112
RRIM600	53.9	103					65.14	97
GT1 ⁽¹⁾	50.6	100			56.94	100		
IRCA18	51.6	102			55.59	98		
IRCA111	52.5	104			58.33	102		
IRCA130	49.3	98			55.97	98		
PB235	54.6	108			61.38	108		
PB260	50.2	99			55.98	98		
PB280	50.8	100			60.25	106		
PB330	52.4	104			61.79	109		
GT1 ⁽²⁾	51.6	100			57.31	100		
PR255	49.1	95			56.48	99		
PR300	49.1	95			54.90	96		
PR107	49.6	96			56.99	99		
PR306	51.0	99			56.05	98		
PR303	48.8	95			57.01	99		
RRIM600	52.9	103			58.11	101		
RRIC101	49.6	96			56.17	98		
GT1 ⁽³⁾	53.9	100	56.28	100				
IRCA41	52.9	98	54.50	97				
IRCA109	54.3	101	55.72	99				
IRCA209	55.6	103	56.58	101				
IRCA230	55.2	103	57.57	102				
PB217	54.8	102	57.95	103				
PB254	54.6	101	56.46	100				
PB314	54.6	101	55.63	99				
GT1 ⁽⁴⁾	55.6	100	57.81	100				
AF261	56.5	101	61.10	106				
BPM24	52.8	95	54.71	95				
K1	55.7	100	58.45	101				
K2	53.3	96	57.15	99				
PR261	53.8	97	55.99	97				
RRIC110	56.3	101	59.95	104				
RRIM712	53.1	95	55.05	95				

(C): LSCT planted in 1986 at CHUP Rubber Plantation and opening during 1993-1994

(1): LSCT No 1 planted in 1996 at rubber research station/CRRI and opening early 2002

(2): LSCT No 2 planted in 1996 at rubber research station/CRRI and opening early 2002

(3): LSCT No 3 planted in 1997 at rubber research station/CRRI and opening end of 2003

(4): LSCT No 4 planted in 1997 at rubber research station/CRRI and opening end of 2003

Table 2: Cumulated yields of clones in network LSCT (kg/ha/y)

Clone	Cumulated yield in 2	%GT1	Cumulated yield	%GT1	Cumulated	%GT1
GT1 ^(C)					20093	100
KV4					27196	135
PB86					18514	92
PB235					26725	133
PB255					21370	106
PB310					24868	124
PB324					21487	107
PR107					18321	91
RRIC102					17914	89
RRIC110					22774	113
RRIC121					23211	116
RRIM600					24092	120
GT1 ⁽¹⁾			3787.6	100		
IRCA18			5484.1	145		
IRCA111			5814.3	154		
IRCA130			8751.5	231		
PB235			7502.5	198		
PB260			5366.2	142		
PB280			5279.7	139		
PB330			5491.2	145		
GT1 ⁽²⁾			4380.6	100		
PR255			4286.8	98		
PR300			4400.6	100		
PR107			2752.2	63		
PR306			3991.4	91		
PR303			4232.1	97		
RRIM600			4318.1	99		
RRIC101			6634.1	151		
GT1 ⁽³⁾	1531.3	100				
IRCA41	1937.9	127				
IRCA109	2163.7	141				
IRCA209	2346	153				
IRCA230	2042.3	133				
PB217	1979.9	129				
PB254	1840.9	120				
PB314	3565.7	233				
GT1 ⁽⁴⁾	1587.3	100				
AF261	1419.6	89				
BPM24	2164.8	136				
K1	2647.2	167				
K2	550.3	35				
PR261	1632.9	103				
RRIC110	1670.6	105				
RRIM712	2858.6	180				

Growth

1- Data derived from LSCT planted in 1986 in CHUP rubber plantation show that:

* Growth of immature period

- Girths of clones KV4, PB235, PB255, PB310, RRIC110, RRIC121 and RRIM600 were higher than GT1.
- Girth of clone PB324 was equivalent to GT1
- Girths of clone PB86, PR107 and RRIC102 were lower than GT1

* Growth of mature period

- Girth of clone PB86, even though it grew lower than GT1 in the immature period, but tended to be better in girth increment during the tapping period
- Clones KV4 and RRIM600 grew a little bit higher than GT1 at the opening time, but it tended to be reduced in girth increment during the tapping period
- Clones PB235, PB255, PB310, PB324, RRIC 121 and RRIC10 grew better than GT1 during immature period, but their girth increment were very stable during the mature period
- Clone PR107 grew lower than GT1 during immature period and its girth increment was even lower than GT1 during the tapping period.

2- Data derived from LSCT No 1 planted in 1996 at rubber research station/CRRI show that:

- Girths of clones IRCA18, IRCA111, PB330 and PB235 were higher than GT1 in immature period. The girth increment of clones PB280 and PB330 were still higher than GT1
- Girth of clones IRCA111 and IRCA18 was good at the opening but its girth increment lower than GT1 during of mature period
- Girth growth of clone PB260 is lower than GT1 at opening period and it is still lower than GT1 after four years of tapping.

3- Data derived from LSCT No 2 planted in 1996 at rubber research station/CRRI show that:

- Growth in immature period of all clones in LSCT 2 were lower than GT1, except clone RRIM600 was higher than GT1 and continue growing well than other clones, including GT1.

4- Data derived from LSCT No 3 planted in 1997 at rubber research station/CRRI show that:

- Growth of all clones in this trial were little bit higher than GT1 except clone IRCA41 was lower than GT1 and during 2 yrs of tapping period girth increment of all clones tend to be lower than GT1.

5- Data derived from LSCT No 4 planted in 1997 at rubber research station/CRRI show that:

* Growth of immature period

- Girth growth of clones AF261 and RRIC110 were a little better than GT1, others clones are lower than GT1.

* Growth of mature period

- After 2 years of tapping, three clones had girth increment better than GT1 and others were equivalent or lower than GT1.

Yield

1- Data derived from LSCT planted in 1986 in CHUP rubber plantation showed that the cumulated yield during 12 yrs of clones KV4, PB235, PB310, RRIM600, RRIC121, RRIC110, PB255, and PB324 were higher than GT1. Clones PR107, PB86 and RRIC102 yielded lower than GT1. Based on the result of this trial, three clones have been considered in class I of the clone recommendation: KV4 and PB235 and RRIM600, which yielded 120-135% as compared to GT1.

2- Data derived from LSCT No 1 planted in 1996 at rubber research station/CRRI showed that the cumulated yield during 04 yrs of foreign clones were higher than GT1. Especially clones PB235 and IRCA 130 yielded 198% and 231%, respectively, as compared to GT1.

3- Data derived from LSCT No 2 planted in 1996 at rubber research station/CRRI showed that the cumulated yield during 04 yrs of all clones was comparably lower than GT1, except clone RRIC101 yielded 151% as compared to the GT1, but it tended to be dropped down from year to year.

4- Data derived from LSCT No 3 planted in 1997 at rubber research station/CRRI showed that the cumulated yield during 02 yrs of all clones was higher than GT1; especially clone PB314 yielded 233% as compared to GT1, it will be ranged in class II. IRCA230 yielded 133% as compared to the GT1, it will be ranged in class I of the clone recommendation.

5-Data derived from LSCT No 4 planted in 1997 at rubber research station/CRRI showed that the cumulated yield during 02 yrs of all clones tended to be higher than GT1. Except clones K2 and AF261 yielded lower than GT1. The most yielding clone of this trial was RRIM712, which is 180% as compared to GT1; it will be ranged in class II of the clone recommendation in Cambodia for period 2007-2009.

Conclusion

Even research data come from a few experiments in Cambodia, in a relative short period of experimentation, it is absolutely important to begin drawing a strategy for rubber development, including a clone recommendation to the planters. Five strategies have been identified to sustain rubber development through out the clone characterization.

Strategy 1: to maximize Security of Rubber Smallholder: clone GT1

Strategy 2: to increase rubber production of the smallholder: clones PB260, RRIM 600 and IRCA230

Strategy 3: to reduce immature period and wood production for industrial rubber plantation: PB235, PB330 and IRCA 230

Strategy 4: to sustain long term productivity: clone PR107

Strategy 5: to improve labour and land productivity: clones PB217 and IRCA230

Hereafter CRRI planting recommendation is proposed for period 2007-2009 in Cambodia.

Table 3: Clone recommendations in Cambodia for period 2007-2009

Class I	Class II	Class III
GT 1	KV 4	IRCA 41
RRIM 600	PB 260	IRCA 109
PB 217	PB255	IRCA 111
IRCA 230	PB235	IRCA 209
	PB314	PB 280
	PB330	PB 310
	PR 107	
	IRCA 18	
	IRCA130	
	RRIM 712	

- Class I refers to the clones that have been tested and grew widely. Their yield performances and other characteristics for at least 5-10 years in LSCT are well described. So they were approved by industrial planting and small holders. Such

clones are recommended to be planted on 50-55% of total areas and each clone to be planted about 15-20 %.

- Class II refers to clones growing for shorter times in LSCT and their yields have shown good performances but with a lack of information. This class can also comprised some clones in class 1, which currently occupied more than 20% of total areas. Such clones are recommended to be planted about 40 % of total areas and each clone to be planted 10%
- Class III refers to clones which have been tested in SSCT, they show temporary good performances on a short period of testing. It is recommended to be planted about 5-10% of total areas and each clone to be planted in the interval of 5-10ha.

This clone recommendation is subjected to be modified according to the new results from field experiments at CRRI as well as in traditional area, then in other new location to develop rubber planting and farms. CRRI will strengthen its effort in testing new plant material and then initiating a national program for early selection and clone creation. The main point is to propose new plant material adapted to the needs of planters as well as the estates and small holders.

Annex

Cumulated Production of LSCT in Cambodia and some country

Clone	CRR I		VIET NAM		IVORY COAST		CHUP		IVORY COAST	
	Prod/4 yrs	%	Prod/4 yrs	%	Prod/4 yrs	%	Prod/12 yrs	%	Prod/12 yrs	%
GT1 ^(C)			3245	100	4671	100	20093	100	16841	100
KV4			5231	161			27196	135		
PB86							18514	92		
PB235			5115	158	6293	135	26725	133	20265	120
PB255			3758	116	6652	142	21370	106		
PB310			5590	172	5607	120	24868	124		
PB324			3979	123	5534	118	21487	107		
PR107					4715	101	18321	91		
RRIC102							17914	89		
RRIC110			4758	147			22774	113		
RRIC121							23211	116		
RRIM600			3634	112			24092	120	17467	104
GT1 ⁽¹⁾	3788	100								
IRCA18	5484	145			6839	146				
IRCA111	5814	154			6701	143				
IRCA130	8752	231			7864	168				
PB235	7503	198			6293	135				
PB260	5366	142			7520	161			20945	107
PB280	5280	139			6628	142				
PB330	5491	145			6055	130				
GT1 ⁽²⁾	4380.6	100								
PR255	4286.8	98								
PR300	4400.6	100								
PR107	2752.2	63								
PR306	3991.4	91								
PR303	4232.1	97								
RRIM600	4318.1	99								
RRIC101	6634.1	151							13698	81

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