

**CORYNESPORA LEAF FALL AND FUTURE OF THE
LEADING RUBBER CLONES IN THE WORLD***

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ABSTRACT

Corynespora leaf fall (CLF) of rubber, a disease with relatively a recent origin has now identified as a serious limitation to the production of natural rubber which brings comfort to consumer's world wide. Except China all leading rubber growing countries in Asian and African continents suffer from this disease. During it's worldwide epidemic in mid 1980's two prestigious clones, RRIC 103 and RRIM 725 have been wiped out from the major rubber growing countries. Since then it has become a grave threat to the world's natural rubber industry attacking several outstanding clones namely RRIM 600, RRII 105, AVROS 2037, PB 260, RRIC 110, GT1 and IAN 873 which have been considered as resistant or moderately resistant during the first epidemic. Although hundreds of different genetic materials have been offered by the Breeders, only a handful of clones namely; RRIM 600, GT 1, RRII 105, PB 260, AVROS 2037 and PB 86 dominate the cultivated rubber lands in the world. The apparent sudden susceptibility of most of the leading clones which contribute to more than 60% of the world's natural rubber production has raised the concern over the future development of the rubber plantation industries in both African and Asian continents.

Key words: *Hevea brasiliensis*, *Corynespora* leaf fall, clonal resistant

Today natural rubber (NR) cultivation is a plantation industry which brings only marginal profits for the survival of several million growers mostly in developing countries whilst comfort to consumers world wide. The world consumes around 6.5 million metric tons of NR each year, most of which comes from South and South East Asia. Major producers; Thailand (2 million mt), Indonesia (1.5 million mt), Malaysia (0.9 million mt), India (0.5 million mt), China (0.4 million mt) and Sri Lanka (0.1 million mt) account for over 85% of the world natural rubber production.

Presently almost all rubber plantations in the world are established using improved authentic genetic materials selected from intensive breeding programmes. Although hundreds of different genetic materials have been developed by the Breeders, only a handful of clones namely; RRIM 600, GT1, RRII 105, PB 260),

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AVROS 2037 and PB 86 dominate the cultivated rubber lands in the world which amounts nearly to nine million hectares. As a result 6.5 million mt annual world production of NR, by and large depend upon these well regarded *Hevea* clones.

Origin of *Corynespora* leaf fall and development of epidemics

As any other agricultural crop rubber plantations also suffer from various pests and diseases. The number of pathogens has increased with its domestication. Almost all the diseases which are considered as economically important until recent times have been first recorded at the beginning of its domestication in early 20th century. However, a considerable change has taken place in the relative importance of certain diseases during recent past. Some of the traditional rubber diseases have become less significant due to the well adoption of the disease resistant clones by growers while some of these breeds succumbed to the new pathogens threatening the world's natural rubber industry. Among those diseases, *Corynespora* leaf fall (CLF) caused by the fungus, *Corynespora cassiicola* (Berk & Curt) Wei is considered as the most serious disease affecting *Hevea* rubber in Asian and African continents. It attacks all development stages of the rubber leaves causing repeated defoliation leading to die-back. The disease was first reported from India (Ramakrishnan and Pillay, 1958) and subsequently from Malaysia (Newsam, 1960) and Nigeria (Awoderu, 1969) (Table 1). During this initial period *C. cassiicola* was regarded as a weak pathogen of rubber and it was limited to budwood nurseries and poorly managed seedling nursery plants.

Table 1. Origin and the development of *C. cassiicola* epidemics in the natural rubber growing countries in African and Asian continents

Year	In	Ma	Ni	Id	Af	Th	Sl	Vi
1958	♣							
1960		♣						
1969			♣					
1975		♠						
1980				♣				
1984				♠	♣			
1985						♣ ♠	♣	
1986							♠	
1989								
1996	♠							
1999								♣

In, India: Ma, Malaysia: Ni, Nigeria: Id, Indonesia: Af, Cameroon & Ivory Coast: Th. Thailand, Sl, Sri Lanka: Vi, Vietnam

♣ - First record; ♠ - First epidemic

Source: Ramakrishnan & Pillay, Rajalakshmy & Kothandaraman, 1996; Idicula *et al.*, 2000; Newsam, 1960; Chee, 1987; Anon, 2000; Awoderu, 1969; Situmorang & Budiman, 1984; Situmorang *et al.*, 1986; Jayasinghe, 2000; Dung & Hoan, 1999; Senecha: 1984

The disease reached the epidemic proportions in 1975 for the first time in the world causing die-back of two outstanding clones namely RRIC 103 and RRIM 725 in Malaysia (Table 1). During mid 1980's other leading rubber growing countries in South East Asia experienced the first disease outbreak in their rubber plantations. The most susceptible clones during that era were RRIC 103, RRIM 725, RRIC 52, PPN 2058, PPN 2447, KRS 21 and FX 25. Thousands of hectares have been uprooted in Malaysia, Indonesia, Thailand and Sri Lanka and these clones have been removed from the lists of recommendations. Rubber growing countries in the African continent succumbed to the disease during the end of 1980's and the most seriously affected clones were PB 260, PB 235, IRCA 18 and MDR 180.

By the year 1995 several prestigious rubber clones in the world namely; RRIM 600, GT1, RRIC 110 and RRII 105 succumbed to the disease posing a grave threat to the worlds natural rubber industry as they presently cover very large extents of South and South East Asian rubber plantations. All these clones have been considered as resistant or moderately resistant to this devastating pathogen during the epidemic experienced in mid 1980's. The apparent sudden susceptibility of the resistant clones to this disease in Asia and Africa has caused a great concern over the future development of rubber plantations in both these continents.

The latest attack has been reported from Vietnam. All the clones in Vietnam enjoyed the freedom from CLF until recent times. However, in August 1999 the pathogen invaded Vietnamese rubber plantations attacking clones; RRIC 103, LH 88/372 and RRIC 104 leading to die-back. Republic of China is the only significant rubber growing country free from CLF todate.

Disease incidence on outstanding clones

An account on the outstanding clones succumbed to CLF since it's first detection in late 1950's is given in the tabular form (Table 2). Majority of these clones have now been removed from the lists of recommendations in respective countries due to their high susceptibility to CLF. However, it is a serious matter of concern as thousands of hectares have been already cultivated with these clones in these countries.

Table 2. Outstanding clones succumbed to *Corynespora* leaf fall disease

Clone	World distribution and disease severity
AVROS 2037 (Origin: Indonesia)	Succumbed to the disease in 1999. 9.7% rubber lands amounting to 334,500 ha are under this clone in Indonesia alone. Infections are mild to moderate.

GT 1 (Origin: Indonesia)	Severely affected in Indonesia resulting die-back during mid 1990's. Today about 50% of the rubber plantations amounting to 1,724,000 ha are cultivated with this clone in Indonesia. GT 1 is a highly susceptible clone in Thailand and moderate infections are recorded in Malaysia.
IAN 873 (Origin: South America)	Highly susceptible clone in Malaysia and Indonesia.
PB 28/59 (Origin: Malaysia)	Recommended clone in Malaysia and Sri Lanka in group I. Popular clone in the African continent. Moderately susceptible to <i>Corynespora</i> in Cote D'Ivoire. Slight infection has been noticed in Malaysia. Resistant clone in Sri Lanka.
PB 217 (Origin: Malaysia)	Group I clone in Malaysia and Sri Lanka. Group II clone in Indonesia. Became susceptible to CLF recently in Malaysia but no severe infections. Free from the disease in Sri Lanka.
PB 235 (Origin: Malaysia)	Group I clone in Malaysia and recommended under Group II in Indonesia. Planted in Central Africa also. Succumbed to the disease in early 1990's in Cameroon. Slight infections have been recorded in Malaysia.
PB 260 (Origin: Indonesia)	The most popular clone in Malaysia in early 1990's. Regarded as the best performing clone by Indonesians. Well regarded clone in Africa. Recommended under group II in Sri Lanka. Considered as highly susceptible clone in Central Africa since it's first detection in 1989. In Malaysia and Indonesia only the slight infections are reported. Resistant clone in Thailand and Sri Lanka.
PR 303 (Origin: Indonesia)	Group I clone in Indonesia. Presently 1% of the rubber lands in Indonesia are under this clone. Became slightly susceptible to CLF recently in Indonesia.
PR 300 (Origin: Indonesia)	Group I clone in Indonesia and 2.3% of the Indonesian rubber lands are cultivated with this clone. Slight infections of <i>C. cassicola</i> have been detected recently in Indonesia.
PR 261 (Origin: Indonesia)	Group I clone in Indonesia and Malaysia. Regarded as a moderately susceptible clone in Malaysia.
RRIC 103 (Origin: Sri Lanka)	The most outstanding clone bred by Sri Lankan Scientists upto 1980's. Clone became popular in Indonesia, Thailand, Cameroon, Cote D'Ivoire and Vietnam. The first commercial clone in the world devastated due to CLF. Disease first recorded on RRIC 103 in 1975 in Malaysia. Later all clearings in Indonesia, Thailand, Sri Lanka.

	Cameroon and Cote D'Ivoire were wiped out. The most seriously affected country was Sri Lanka and around 4500 ha representing more than 2.2% of the total area under rubber in Sri Lanka were uprooted. The most recent attack is in Vietnam (1999).
RRIM 600 (Origin: Malaysia)	The most prestigious clone introduced by the Rubber Research Institute of Malaysia during the 20 th century. Though it is not planted today, is the dominant clone in the Malaysian plantations. Became popular in Indonesia, Thailand and Vietnam. Succumbed to CLFD in Malaysia and neighbouring countries during 1995. Severity of the infection varies from severe to light depending on the locality planted and general health condition of the plantation.
RRIM 725 (Origin: Malaysia)	Genetic material has been completely wiped out due CLFD attack. One of the clones succumbed to the disease during beginning of the CLF epidemics in the world. The affected countries are Malaysia, Thailand, Sri Lanka and Indonesia.
RRIC 110 (Origin: Sri Lanka)	A breed from Sri Lanka with very high performance. Highly regarded clone in Africa and Vietnam. Scored No 1 in multi clone trials in the African continent. Another clone completely wiped out from African and Asian continents (except from Vietnam) due to CLF. The affected countries are Cameroon, Gabon, Cote D'Ivoire, Indonesia, Sri Lanka and Thailand. With regard to Vietnamese plantations, only slight infections have been reported so far.
RRII 105 (Origin: India)	The prestigious clone, RRII 105, evolved by the Rubber Research Institute of India has a productivity potential of 300-500 kg/ha over and above the other competitive high yielding clones. Indian growers consider this clone as the most reliable genetic material ever produced by Indian scientists and presently more than 80% of their cultivated rubber lands are under RRII 105. Succumbed to the disease recently (1996) in India. Presently severe incidence of disease is limited only to Karnataka province.

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