



# Heritability and Genetic Control of Black Pod Disease Caused by *P. palmivora* Infection in Cacao<sup>1</sup>

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## Introduction

Black pod resistance in cacao could be developed through breeding program. Understanding heritability and genetic control of black pod resistance should be beneficial (Sudarsono *et al.* 2008). The objective of the study was to evaluate heritability and genetic control of resistance against black pod disease caused by *P. palmivora* in cacao.

## Materials & Methods

Hybrid arrays were obtained (Table 1) by half diallel crosses among 5 cacao clones. After germination, leaves of 2 months old seedlings were tested against *P. palmivora*. Inoculation was done using agar plug carrying freshly grown mycelia of *P. palmivora*. Leaf necroses symptoms were recorded 2 weeks after inoculation. The width of necroses symptoms and the disease index were calculated from recorded data. Data were used to determine heritability, general (GCA), & specific combining ability (SCA) for resistance character.

Table 1. Half diallel crosses among 5 cacao clones to generate F1 hybrid arrays.

Clone	ICC RI3	TSH 858	DR1	ICS 13	Sca 6
ICC RI3	-	X	X	X	X
TSH 858		-	X	X	X
DR1			-	X	X
ICS 13				-	X
Sca 6					-

Fig. 1: Two months old hybrid array seedlings used in the experiment (Top) and *P. palmivora* inoculated leaf—covered with wetted tissue paper to keep the inoculated site moist.



## Results

The broad & narrow sense heritabilities of black pod resistance character were medium—high. GCA of TSH858, Sca6, and ICCRI3 were high. Crosses among ICCRI3x-Sca6, DR1xICS13, TSH858xICS13 and TSH858xDR1 exhibited the best SCA for black pod disease resistance character (Table 2).

Black pod resistance in cacao was most probably controlled by at least two genes and one of them was recessive.

Table 2: GCA of 5 cacao clones and SCA of specific crosses among clones for black pod resistance determined based on symptom width (SW) & disease index (DI).

Cacao clone	Average		GCA	
	SW	DI	SW	DI
ICCRI3	18.2	20.4	30.9	13.8
TSH 858	24.6	22.4	35.6	12.9
DR1	20.2	18.4	14.8	18.0
ICS13	13.5	23.2	4.5	16.3
Sca 6	14.7	15.3	34.4	3.2
Hybrid array	Average		SCA	
	SW	DI	SW	DI
ICCRI3x TSH858	24.7	13.8	-8.1	1.2
ICCRI3xDR1	20.3	15.5	-0.9	0.0
ICCRI3xICS13	10.2	12.3	-5.3	-2.2
ICCRI3xSca6	46.4	8.3	14.3	1.0
TSH858xDR1	26.2	9.6	2.3	-5.4
TSH858x ICS13	23.0	11.7	4.9	-2.3
TSH858xSca6	35.5	13.2	0.8	6.4
DR1xICS13	13.6	25.5	7.0	8.7
DR1xSca6	14.7	6.3	-8.5	-3.3
ICS13xSca6	10.7	4.4	-6.7	-4.1

## Literature

Sudarsono, A. Purwantara, D. Suhendi, Rubiyo, & S. Kurniasih. 2008. Molecular Technique and Plant Breeding to Speed up the Development of Cacao (*Theobroma cacao* L.) Cultivar with Resistance against Black Pod Disease Due to *Phytophthora palmivora* Butl. Infection. KKP3T Research Report, Institut Pertanian Bogor, Bogor, Indonesia.

## Conclusions

Crosses between cacao clone ICCRI3xSca6 and DR1xICS13 were the best for producing hybrid seeds with acceptable degrees of *P. palmivora* resistance character.

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