Applicability and effectiveness of the rapid detection method for leaf rust disease resistance in arabica coffee

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Introduction

In Thailand, coffee leaf rust (CLR), causes by the fungus *Hemileia vastatrix*, is the main disease that affects the Arabica coffee crop especially those that are grown in northern Thailand. The screening for leaf rust resistance variety generally involves a long process of pathogenicity testing in coffee seedlings that are vulnerable to environmental factors during the testing. The objective of this study was to investigate the applicability and effectiveness of the rapid screening method using leaf disk test for leaf rust disease resistance in arabica coffee.

Materials/Methods

Hemileia vastatrix Race 37 was use to investigate the pathogenic reaction on 144 samples including 8 arabica coffee varieties and 1 hybrid. The inoculation was done in the 1.5 cm in diameter of coffee leaf discs that placed in 9 cm glass plate and incubated at 20 ˚C with lighting for 16 hours, relative humidity at 90%, qRT-PCR detected of *CaPR10* & *CaPR1b* gene expression of coffee leaf rust disease in F1 arabica hybrid varieties after leaf disc show symptom at 7 dai [1]
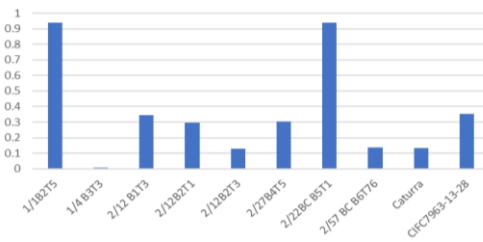

Figure 1: Gene expression (*CaPR10*) of Coffee leaf rust disease in F1 arabica hybrid varieties.
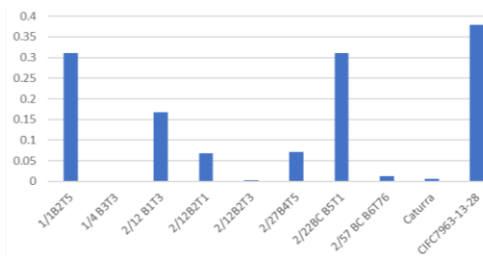

Figure 2: Gene expression (*CaPR1b*) of Coffee leaf rust disease in F1 arabica hybrid varieties

Varieties	Reactions			
	R	MR	MS	S
2/22 BST	0	9	7	0
2/57 BCB6T7	4	10	2	0
2/12 B2T3	5	10	1	0
21/12 B2T1	5	10	1	0
2/27 B4T5	4	10	1	1
2/12 B1T3	4	10	0	2
1/4 B3T3	10	6	0	0
1/1 B2T5	11	5	0	0
CIFC7963-13-28	3	13	0	0
Caturra rojo	0	0	0	16
Total	46	83	12	19

Table 1: Reaction of Coffee leaf rust disease to F1 arabica hybrid varieties.
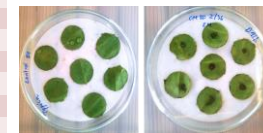
Results/Discussion

The population of No. 1/1 B2T5 and 1/4 B3T3 showed small lesion sizes indicating highly resistant traits while Chiang Mai 80 (CIFC7963-13-28) showed moderately resistance. This result was consistent with the finding that PR1b and PR10 gene are among 5 resistance (R) genes associated with coffee leaf rust disease in arabica coffee. PR1b and PR10 genes were found to be upregulated in coffee leaf rust resistance population including Chiang Mai 80 population and No. 1/1 B2T5 and 1/4 B3T3. [2]

Conclusion/Perspectives

This result support the applicability and effectiveness of this detection method for leaf rust disease resistance in arabica coffee and thus can be used as a rapid and reliable method for the screening of resistance to coffee leaf rust disease in the control testing environment.

References:

1.Silva-Castro, I., Barreto, R.W., Rodríguez, M.C.H., Matei, P.M., Martín-Gil, J. Control of Coffee Leaf Rust by chitosan oligomers and propolis. Agric. Life Agric. Conf. Proc. 2018, 1, 311–315.
2.Ramiro, D.A., Escoute, J., Petitot, A.S., Nicole, M., Maluf, M.P. and Fernandez, D. 2009. Biphasic haustorial differentiation of coffee rust (*Hemileia vastatrixrace* II) associated with defence responses in resistant and susceptible coffee cultivars. Plant Pathology 58(5): 944–955.