



Thesis Abstract

Characterization of the resistance gradient of cacao genotypes (F₂ Sca6 x ICS1) to black pod disease using phytopathometric, genetic and molecular approaches

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Black pod is one of the main diseases of cacao (*Theobroma cacao* L.), having been reported in all cacao-producing countries. Among the seven species of *Phytophthora* that cause this disease, *P. palmivora* deserves mention for its wide distribution, causing annual losses of up to 30% of world production. The selection of cacao genotypes resistant to black pod has been a priority of cacao-breeding programs. To optimize the stage of selection, methods for the identification and characterization of resistance levels have been proposed. In this study, an F₂ population of cacao was used, where the parents, Sca6 and ICS1, are known to have contrasting levels of resistance to black pod disease. The objectives of this study were: i) to assess the efficiency of the phytopathometric variable disease score (DS), intensity of infection index (III) and disease index (DI) in the characterization of the resistance gradient of cacao genotypes in regard to *P. palmivora* through the leaf disc inoculation test; ii) to characterize the resistance gradient of cacao genotypes in regard to *P. palmivora* through the leaf disc test using the selected phytopathometric variable, and iii) to identify microsatellite regions associated with cacao resistance to black pod disease, using phenotypic evaluations of fully developed but unripe cacao pods inoculated with *P. palmivora*. The most important results are: i) the phytopathometric variables assessed differed in their efficiency to detect the population gradient of resistance, and DI was the most efficient variable to characterize resistance to *P. palmivora* among the cacao genotypes; ii) the assessment of cacao genotypes through leaf disc inoculation showed genetic variability in the population studied, and iii) an analysis of the association between microsatellite markers and phenotypic characterization of 41 cacao genotypes in regard to black pod resistance indicated the probable existence of two quantitative trait loci (QTLs) for resistance in the linkage groups 8 and 10. Based on the results, it is possible to conclude that: i) the variables DS, III and DI differ as to the characterization of the

gradient of cacao resistance to *P. palmivora*, and DI allows a more detailed classification of the resistance gradient; ii) the genetic variability observed in the population F₂ (Sca6 x ICS1) indicates that it is a potential source of molecular mapping and genetic breeding in studies on resistance, and iii) a larger number of cacao genotypes should be phenotypically evaluated to confirm the existence of QTLs related to black pod resistance in linkage groups 8 and 10 and to possibly detect other regions associated with resistance.

Key words: Disease index; Leaf disc test; Microsatellites; *Phytophthora palmivora*; Quantitative trait loci; *Theobroma cacao*