ABSTRACT

MECHANISMS OF RESISTANCE TO *Phytophthora palmivora* (BUTLER) BUTLER IN CACAO (*Theobroma cacao*, L.) AND THEIR GENETIC BASIS

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The resistance of cacao (*Theobroma cacao* L.) leaves and pods to *Phytophthora palmivora* (Butler) Butler was investigated in 12 clones representing the three major types of cacao populations; Forastero, Trinitario and Criollo. Inoculation methods were developed to distinguish between resistance at penetration and post-penetration phases. Resistance to penetration was explained by a multiple regression model including cuticle thickness, stomatal frequency and pore length in the leaf and stomatal frequency and pore length in the pod. Post-penetration resistance seemed to be unrelated to anatomical / morphological characteristics and is probably governed by host biochemical factors. Concordance of resistance in both leaf and pod at the post-penetration stage of infection suggests that a test at the seedling stage on leaves will provide a good assessment of pod resistance.

The genetics of resistance was investigated in two experiments, a 4 x 4 diallel mating experiment and a 3 x 8 factorial design. A wide variability was observed among 33 families examined for penetration and post-penetration resistance. Segregation within families showed a continuous

distribution of progeny responses to both lesion frequency and spread, suggesting that resistance is polygenic. Stomatal frequency was shown to be governed by both additive and non-additive genetic effects, while pore length was governed predominantly by additive effects. Similarly, the GCA (general combining ability) effects predominate in the case of lesion size, while both SCA (specific combining ability) and GCA were important in the inheritance of lesion frequency. The non-additive genetic effects for lesion frequency were predominantly in the direction of resistance. The poor association between the genetic mechanism of resistance to penetration and resistance to lesion spread suggests that they are independently inherited and could be selected independently with the aim of accumulating genes determining overall plant resistance. Genetic complementation between the two forms of resistance and transgressive segregation with respect to both forms of resistance were evident within families. The genetic study clearly identified some promising crosses such as SCA 6 X PA 30 and SCA 6 X CATONGO. Possible selection, pre-breeding and breeding strategies based on the new findings are discussed.