ABSTRACT

BARBADOS SOILS: CHEMICAL COMPOSITION, THERMAL PROPERTIES AND INFLUENCE ON PLANT CROP DISEASES AND THEIR INCITING AGENTS

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The thermal properties of 66 soil samples taken from six Caribbean islands and 37 clay extracts from Barbadian soils were studied using differential thermal analysis (DTA) and thermogravimetric analysis (TG). Each sample gave a unique DTA curve and these data were used to develop a method for classifying the soil samples and clays. Thermogravimetry was only applied to soils of Barbados for which a thermal fertility index was created. This index showed significant linear correlation with cation exchange capacity.

The chemical and mechanical properties of the major soil types revealed no significant change over three decades. The total exchangeable bases (TEB), cation exchange capacity (CEC), pH, % carbonate and exchangeable calcium were higher for calcareous soils than for those of Scotland District origin. Most soils were calyey in nature.

The influence of soil type on three common plant crop diseases, namely common blight of bean (Phaseolus vulgaris L.) Xanthomonas campestris pv. phaseoli, bacterial spot of pepper (Capsicum annuum L.) and tomato (Lycopersicon esculentum Mill L.) induced by X. campestris pv. vesicatoria and anthracnose of four cultivars of yam (Dioscorea spp.) caused by

Colletotrichum gloeosporioides was investigated by determining the extent of crop infestation and associated soil types in which the crops were grown exposed to natural disease infection. In vitro studies of the ability of the causal pathogens to survive in 37 Barbadian soil types were also conducted. The test also sought to investigate the influence of the wild type and mutant forms of the avrBS1 avirulence gene of X. campestris pv. vesicatoria on the survival of two strains carrying either forms of the gene.

Bean grown in the 103-Grey Brown (normal) and 81-Coastal (shallow) associations was consistently the most severely affected by common blight over a two year period. In contrast, bacterial spot of pepper and yam anthracnose were invariably the least severe on crops planted in the 47-Grey Brown (sandy) and the 10-St. Philip Plain associations respectively.

Three isolates of C. gloeosporioides survived for four to five weeks whereas those of X. campestris pv. phasoeli namely XCP3, XCP6 and XCP9 survived for 55, 40 and 48 days respectively. Survival of the two strains of Xanthomonas campestris pv. vesicatoria showed that the mutant which is less virulent than the prototype 81-23, survives significantly better than the latter in both competitive and noncompetitive experiments.

Linear, multiple and polynomial regression correlation analyses show that survival of pathogens was unaffected by four of the thirteen soil parameters examined namely, CEC, exchangeable sodium and calcium and calcium to magnesium ratios.