

I INTRODUCTION

A wilt disease of cacao, known as the "Ceratostomella-Xyleborus Complex" has been reported from Costa Rica, Colombia, Mexico, Venezuela, Ecuador and Trinidad. Diseases of a similar nature involving beetles of the genus Xyleborus (Scolytidae) have been reported in Tea (Gadd, 1941), Coffee (Ultee, 1931), (Lavabre, 1958), (Mellamaire, 1954), Dutch elm and conifers (Hopkins, 1909), (Doane et alia, 1936) and (Leach, 1940).

In Trinidad, a rapid wilting which results in the death of cacao trees in the Northern and Central Ranges, was reported in 1958 in several cacao growing areas. At River Estate, the mortality rate has risen from 0.7% in January 1959 to 5% by the end of 1960, in a population of 90,000 trees. Reports from the other countries of the New World indicate that the disease is taking a heavier toll each year, and that early control is an absolute necessity. Iton (1961) sounds this note very precisely when he states that "... this disease may well become one of the major cacao diseases in the New World..."

Intensive studies were initiated by E.F. Iton (1959, 1960, 1961) assisted during the 1960/61 academic year by G.R. Conway and a detailed report was presented in Iton and Conway (1961). The results of these investigations form a major portion of this report, as they represent the most thorough and comprehensive research account in this field to date.

As can be realised from a complex fungus-insect association of this nature, effective and comprehensive control measures can only be formulated when the ecology and bionomics of the fungus and the insect, separately and in association, have been thoroughly established.

Iton and Conway (1961) postulated a hypothesis of attractiveness to account for the fact that the insect population is developmentally most advanced in the galleries at ground level and is progressively less so in the galleries above and below

this level. This conclusion was arrived at by the detailed examination of galleries in one dead cacao tree from River Estate. Conway, in his D.T.A. thesis, added these words of caution:-

"In concluding this section it should be stressed that the findings described are based on a single examined tree and that this should be borne in mind in any consideration of the hypothesis put forward".

Before any further work could be done on the development of Xyleborus infestations in cacao, it was realised that it was absolutely necessary to conduct a detailed examination of at least one other tree, adopting the same technique described by Iton and Conway (1961) to find out whether their findings are fairly representative. Details of this investigation are included in the main body of this report (Section B).

Preliminary studies were also initiated into the diurnal flight rhythm and the time flight of the Xyleborus species in Trinidad Cacao.

It has been established Idrobo (1958), Desrosiers (1958) and Iton (1959, 1960, 1961) that Xyleborus species are vectors of the Ceratostomella. Iton has shown conclusively that Xyleborus species are vectors of considerable importance. In a recent work, Iton (1961) and Iton and Conway (1961) suggested that infection precedes infestation.

It is, therefore, apparent that effective control of Xyleborus species in Trinidad cacao is essential. This will tend to reduce the transmission potential of the pathogen both in extent and intensity, and thus create a more favourable environment for a concentrated attack on the pathogen itself.

Effective control of the insects depends upon a detailed knowledge of the ecology and bionomics of the insect, so that insecticides can be applied where and when they will effect optimum control. The latter part of this report on the preliminary studies of the flight behaviour of Xyleborus beetles aims at providing some information on the periods of relative

abundance of the beetles. Such an information, when obtained from a large number of observations can be utilised in forecasting trends in beetle population and thus indicate those periods when the application of insecticides will effect optimum control.

It is relevant to end this introductory remark with the words of Dr. G.C. Varley (1944):-

"The place of a plant or animal species in any eco-system is dependent on its quantitative status, on whether it is common or not. This is ideally definable either in terms of population density or weight per unit area. Problems of numbers, or of animal or plant distribution, are insoluble until the fundamental problem of what factors controlled the population density of the species of plant or animal in the community has been solved. The reaction of each species to the physical environment, and its interaction with other species, has to be known. It is my belief that when ecology goes beyond the descriptive stage, and studies and analyses the problems numerically, a rapid advance will follow".

The symptoms of the disease are described in great detail by Iton (1959). Briefly, the external symptoms of the disease consists of wilting of the whole tree or part of it, followed by rapid death of the whole tree or the affected parts. In the early stages of the disease the mature leaves assume a pendulous posture and show yellow to brown discoloration, then become dry and longitudinally rolled. These symptoms are invariably associated with borings in the stem, branches and roots of the plant, small coiled plugs of chewed wood material being extruded from these holes. When the borings are on the root or the trunk, the whole tree dies, whilst borings restricted to the branches are associated with the death of the infested branches only.