

Reporte de Belize

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Belize is a small Central American country of 23,300 km² with a population of 200,000 inhabitants. It borders Guatemala to the west and south, Mexico to the north and the Caribbean Sea to the east. The climate is sub-tropical with an annual average temperature of 26 °C and a relative humidity of 82%. There is geographical variation in rainfall, with 1,300 mm in the north and 4,000 mm in the South. Generally, there is a dry season from February to May, followed by heavy showers in June and July with a cold spell from November to February.

Whiteflies were regarded only as a sporadic pest in Belize until 1989, when several crops, including tomato, sweet and hot peppers were seriously affected by whitefly-transmitted geminiviruses. A survey revealed that the problem was wide spread in all major vegetable production areas, often with virus incidences of 75-100%.

In 1989, field research was initiated by screening new tomato and sweet pepper hybrid varieties for their resistance/tolerance to geminiviruses. However, results were not conclusive. Moreover, the high costs of hybrid seeds inhibited their use by smallholders.

In line with Integrated Pest Management (IPM) strategies, research on whitefly control has focused on the use of protective nurseries to delay virus infection. Locally produced raw cotton mosquito nets screens (18x16 mesh) were tested in protective nurseries, as imported

screening material is expensive. Floradade tomato seedlings were grown under protective netting for 4, 6 and 8 weeks. Adult whitefly and nymph populations were recorded weekly, as well as the number of plants with viral symptoms. Although whitefly adult and nymph populations were low, all treatments showed viral symptoms beginning three weeks after transplanting. Protective netting of seedlings did not delay virus infection. The raw cotton net excessively shaded plants, and in the 8 weeks treatment, seedlings started to etiolate. In addition, watering through the net was difficult because absorbed water and it was removed. The problem with the mosquito screen might have been that the mesh size was too coarse to keep whiteflies out.

Another experiment in cooperation with Natural Resource Management and Protection (NARMAP) tested the effectiveness of protective nurseries and the transplant losses of tomato and sweet pepper seedlings in containers rather than seedboxes. Seedlings were grown under 32x32 mesh Lumite screen. Hand made newspaper containers as well as plastic cup containers were used. Viral symptoms appeared 3 weeks after transplanting. The Floradade tomato trial was affected by bacterial wilt (*Pseudomonas solanacearum* race I). Peppers (variety California Wonder) showed three different viral symptoms including upward curling of leaves and severe stunting of plants, yellow mottling and small circular chlorotic leaf spots. It is believed that the plants were affected by a mixture of geminiviruses and potyviruses. This could not be proven due as there are no diagnostic facilities in the country. There were no significant differences in yield between

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unprotected and protected seedlings or seedlings grown in seedboxes and in containers.

The Agronomy Section of the Ministry of Agriculture and Fisheries investigated imidacloprid efficacy against whiteflies in tomato and sweetpepper using both trademarks: Gaucho and Confidor. Plant Protection Section assisted in the investigation gathering data about adult whitefly populations and viral infection rates. Imidacloprid belongs to a new group of active ingredients, the nitroguanidines. The effect of imidacloprid is based on interference with the insect nervous system. It has broad spectrum of activity, demonstrates systemic action and functions as an acute contact and stomach poison. The active ingredient can be used as seed dressing (Gaucho) as well as for foliar and soil treatments (trademark, Confidor). All seedlings, including the control, were free of visible viral symptoms at transplanting. Although adult whitefly numbers were low, the Gaucho and control treatment showed 100% virus infection 8 weeks after transplanting. However, the Gaucho/Confidor treatment only showed 75% virus infection at the same time. Sixty days after sowing, a 50% virus infection was shown in the Gaucho treatment and the control, whereas the Gaucho/Confidor treatment showed 21% virus infection. These data suggest that the application of Confidor reduces the onset of virus infection.

Integrated Pest Management in Belize

Until now there has not been a concerted effort in IPM implementation in Belize. All extension work and technical advice has been based on research results obtained at the agricultural research station (Central Farm) and on the pest control methods obtained via literature review. All this knowledge has never

before been "packaged" and presented to the farmer as IPM. With the advent of increasing concern for the environment, human risk factors and the development of insect resistance IPM has become the novel method to employ in small farm situations in Belize.

With a joint effort between NARMAP/USAID Belize, the Ministry of Agriculture and Fisheries (MAF, Belize) and the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE, Costa Rica), an IPM implementation project was initiated in February of 1995. The IPM project focuses on vegetable production and works with small farmer groups but only in the Cayo district.

This has been the target district because most vegetable production is from this region. However, it is the intention that the project will extend to other districts and crops.

The IPM effort involves five sites of farmer groups, working mainly with cabbages, peppers, and tomatoes. Technology transfer of methods such as protected seedbeds and paper cups to reduce the effect of stress on transplant seedlings is underway. Farmer training in pest and disease monitoring is also in full force. The use of live barriers to reduce pest incidence is also being attempted. This coupled with the training of extension officers of MAF, NGO's and other interested individuals has formed the basis for the formation of an IPM working group known as the Aardvark. This group, the technical advisors of MAF, and the IPM team from CATIE have, together with the farmers, formed the first full strength effort toward an integrated approach to crop management in Belize with the goal of realizing sustainable agriculture for small holding farmers.