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PROEXAG

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# DEVELOPMENT OF A REGIONAL VIRUS CONTROL PROGRAM IN THE ZACAPA VALLEY OF GUATEMALA

Assignment Number: ST/87-20

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SUBMITTED TO:
Regional Office for Central America and Panama (ROCAP)
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Over the past decade, the Zacapa Valley in Guatemala has become a major supplier of melons and okra to the United States. Melons are shipped primarily as a fresh fruit commodity, although there is also significant production of frozen melon balls. The source of melon for the frozen product is rejected fruit from the export crop. Okra is being grown on several thousand acres. Two other crops that are grown on significant acreage are tobacco and tomatoes. The tobacco crop is sold mostly for export, while the tomato crop is grown for local use, because of a quarantine for Mediterranean fruit fly which prohibits the export of fresh tomatoes to the United States.

As so often happens when monocultures of crops are established, disease and insect problems proliferate to the point where producers experience severe constraints to production. This has been true for melon growers, where outbreaks of aphid-transmitted viruses and infestations of the melon aphid, Aphis gossypii Glover, have reached epidemic levels.

The author spent the week of March 29 to April 4, 1987 in Guatemala looking at production problems affecting all of the major crops and paying particular attention to interactions that may appear as a pest problem for one crop and may have serious implications for another crop as well. This report discusses observations that were made during the visit and suggests interventions that might be expected to mitigate the problems.

## A. Activities Undertaken

Five working days were spent gathering information. The first day was spent in Guatemala City where a meeting with a number of local growers had been arranged by the PROEXAG team. The second and third days were spent in the Zacapa area where inspections of melon, okra, tobacco, and tomato fields were made. Mr. John Guy Smith was my host during these excursions. The fourth day was spent in the company of Dr. Jose Mendonedo. We visited the melon growing area on the south coast of Guatemala. The fifth day was spent in Guatemala City where talks with snow pea growers were held and a visit to a snow pea farm was made. Dr. Mendonedo arranged these meetings.

## B. Accomplishments versus Objectives

I am satisfied with the information obtained as a basis for making recommendations in the Zacapa area. I have four years of previous experience working with CAPCO as a private consultant; thus, I started with a considerable amount of background information.

C. Problems Encountered

Listed below are the problems I observed for each of four crops.

1. Melons

The principal production problems encountered for melons were virus infection and aphid infestation. The two are interrelated in that winged aphids are the only means by which viruses are disseminated. As explained below, however, all virus spread is not the result of aphids that colonize on melon plants.

Virus has become the major constraint to melon production and there is no reason to believe that this situation will change. There are several, at least four, different viruses affecting melon production. They include, in order of current importance: watermelon mosaic virus 1 (WMV1); zucchini yellow mosaic virus (ZYMV); cucumber mosaic virus (CMV); and watermelon mosaic virus 2 (WMV2). ZYMV, which was apparently introduced in 1985, is becoming more prevalent and may soon be the most common virus in the area. This would be unfortunate, as this virus causes the most severe disease of any of the four. All of these viruses are spread by winged aphids and in no other manner. All of them persist in wild cucurbits during the noncrop season and at least two, CMV and WMV2, are known to occur in plant families other than the Cucurbitaceae. At present, WMV1 is the most common virus in melons.

Control of virus in melon is being achieved through the use of mineral oil sprays. CAPCO has been using JMS Stylet-Oil® and its application system for the past three years and has achieved considerable success in limiting losses. This application system can only be successful if the recommended procedures are followed, notably, the utilization of high pressure ground spray equipment. Backpack sprayers are not efficient in providing the kind of coverage required for oil sprays. It is necessary to spray starting when 50 percent plant emergence has occurred and to use twice-a-week applications until fruit set, when once-a-week applications can be used. Fungicides and insecticides are combined as a tank mix with the oil. Cost of the oil is about $35-40.00 per acre.

Aphid control is not effective in controlling virus spread because aphids can both acquire and inoculate virus in a matter of seconds, a time span much too short for insecticides to exert their lethal effect.

Control of aphids in the crop is important, however, from the standpoints of aphid feeding damage to the crop as well as

dissemination of virus by winged aphids that form in the crop. There are several aphid species that are involved in the transmission of virus, but only one species, A. gossypii, actually colonizes on melons. This species also colonizes on okra. The okra crop undoubtedly serves as a reservoir for aphids which move to melon, and the melon crop serves as a reservoir for aphids which migrate to okra. Sorghum is another very important source of aphids which transmit virus to melons. These aphids do not colonize on melon but they are very efficient vectors of virus to the melon.

There are three important foliar fungus diseases that attack melon and for which fungicide sprays are required. These diseases are downy mildew caused by Pseudoperonospora cubensis; Alternaria leafspot caused by Alternaria cucumerina; and gummy stem blight caused by Mycospaerella melonis. The fungicides used for control of these diseases are principally protectant-type chemicals (maneb, mancozed, and chlorothalonil), and the application technique (i.e., coverage) is critical for optimum effectiveness. Backpack sprayers are commonly used but they are not nearly as efficient as high pressure ground equipment. Metalaxyl (Ridomil) is eradicative in action against downy mildew and should be used only when protectant-type fungicides fail to provide control. Current practice on the part of some growers is to use Ridomil as a preventative chemical. This practice should be discontinued as it will surely result in the development of Ridomil-resistant fungus, and the material will be lost to the growers. By judicious use of Ridomil it should be possible to retain its effectiveness over many years. Gummy stem blight is controlled by maneb or mancozeb in combination with benomyl (Benlate). All of these chemicals, with the exception of chlorothalonil (Bravo), are compatible with oil sprays.

Aphid control has been difficult to achieve even with modern insecticides. This is because the aphids colonize on older leaves deep within the plant canopy and are very difficult to reach with insecticides. Part of the problem is also associated with the use of broad-spectrum insecticides that kill beneficial insects, particularly parasitic wasps, which attack the melon aphid and leaf-miners, as well as Chrysopa, which attacks both aphids and worms. Chrysopa introductions should be tried as a means of combatting aphid infestations.

Worm control is generally achieved by using broad-spectrum insecticides. This practice often leads to the buildup of destructive levels of leafminers in the melon crop. Broad-spectrum insecticides that cause these problems include methamidophos (Monitor, Tamaron), methomyl (Lannate, Nudrin) and several synthetic pyrethroids (permethrin - Pounce, Ambush; decamethrin - Decis; and fenvalerate - Pydrin). We have experienced good worm control using the bacterial insecticide

Bacillus thuriengensis (Dipel, Thuricide, Javelin) in combination with a very low level of methomyl or synthetic pyrethroid (no more than 25% of the label rate). The low amounts of insecticide improve the efficacy of the B. t. by stressing the worms and increasing their susceptibility to the effects of the B. t. The low levels of insecticide do not harm beneficial insects. A final word on synthetic pyrethroid insecticides: they are very repellant to honeybees in addition to being very toxic to them.

2. Okra

There appear to be no foliar diseases of consequence in okra. There appears to be only one insect pest of consequence, the melon aphid, A. gossypii. Nematodes can be a serious problem on okra but are controlled with preplant applications of appropriate chemicals.

3. Tobacco

Tobacco production does not appear to involve any diseases or insect pests that impinge on production of other crops.

4. Tomato

Tomato production does not appear to involve any diseases or pests that impinge on other major crops. There are, however, very serious virus problems in the tomato crop. In looking at three commercial tomato fields I did not find a single plant that did not show obvious symptoms of virus infection.

D. Recommendations for Action

1. Melons

From a regional standpoint, melon growers need to take several cooperative steps. First, they need to destroy crops after they have been harvested. The principal sources of downy mildew and Alternaria leafspot are old melon fields. The principal source of virus disease during the growing season is the abandoned melon field. Virus inoculum can be held in check during the growing phase through the use of oil sprays; but the three most important insect pests, melon aphids, pickleworm, and leafminer, build up rapidly in abandoned melon fields.

Secondly, melon growers need to control aphid infestations that occur in the okra crop. These aphids unquestionably are of major importance as vectors of viruses that affect melons. In addition, they serve as the initiators of aphid buildup in melons. I would suggest that serious consideration be given to utilizing Chrysopa as a means of controlling aphids in the okra

crop. I believe that the cost of control should be borne by melon growers. Such a program would require that okra growers not use toxic insecticides on their okra, but this prohibition should be in effect anyway, because of residue problems in a crop that is picked every other day.

Finally, improved spray machinery needs to be developed for use by small growers. Virus control cannot be achieved without the use of oil sprays, and these sprays cannot be applied effectively with the presently available backpack sprayers. I have tried on many occasions to use backpack sprayers for both oil and preventive fungicide sprays and have never found them to be satisfactory for either purpose.

There are two options available: develop a custom application service for small acreage growers; or develop a backpack sprayer that is more efficient. I believe the latter is preferable. Basically, what is needed is a machine that provides uniform coverage similar to that obtained by large tractor-drawn sprayers. This could be achieved by designing a machine with a small boom (24-inch span) and equipped with the same nozzles currently used on large machines. Such a machine would need to use a spray pressure of 200 psi with a boom equipped with four Spraying System TX-5 SS nozzles spaced at 8-inch centers (total length 24 inches). I know of no serious engineering problem associated with design of such a machine. As someone who has a great deal of experience in the use of preventive chemical sprays, I am amazed at the poor design specifications found on presently available backpack sprayers. The people who designed them were not familiar with the constraints associated with the use of preventive chemicals. They are useful for application of insecticides and systemic fungicides and are strictly inferior for anything else.

I doubt that anyone could make a more significant contribution to the production of crops susceptible to foliar fungus and bacterial disease as well as virus disease than to make this kind of machine a reality.

2. Okra

There are no virus problems with okra. The aphid problem has been discussed in the melon section.

3. Tobacco

Pests and diseases of tobacco do not impinge significantly on the production of the other major crops in the Zacapa area.

4. Tomato

The virus disease problem in tomato is even more serious than in melon. Work is needed to identify these viruses and their insect vectors in order to establish a control program. I would suggest that scientists at a United States university be engaged to do this work. There are people at the University of Florida and the University of California who are qualified to carry out such an investigation. Another possibility would be the USDA. Someone such as Dr. James Duffus at the laboratory in Salinas, California would be eminently qualified.

There does not appear to be any significant interaction between tomato pests and diseases and those affecting melons.

E. General Conclusions

With the exception of the CAPCO operation, state-of-the-art growing practices are generally not well understood in the Zacapa area. Most recommendations are made by chemical company representatives who are anything but qualified in such matters. The development of extension information on how to grow crops, including publication of appropriate circulars, would be invaluable to growers. Information on melon growing is available at present, and I would recommend that this crop be given priority status for such an effort.