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Plant Diseases of Recent Introduction to Guam

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Abstract—Over 50 new reports of plant diseases were included in the Guam Agricultural Experiment Station Annual report of 1988. Some have evidently been here for some time but have escaped detection previously; others are recent introductions. Bacterial blight of cassava (*Xanthomonas campestris* pv. *manihotis*) was first detected in 1986. Fruit blotch of watermelon (*Pseudomonas pseudoalcaligenes* subsp. *citrulli*) was first seen in 1987; several damaging blotch epidemics have resulted in serious economic losses to watermelon growers. A sample of a lanzones tree (*Lansium domesticum*) with stem galls was found to have plant parasitic nematodes. Leaf scald of cabbage was found in 1988; it is caused by a strain of *Xanthomonas campestris* pv. *campestris*, the same bacterium causing black rot. More recently, Bacterial leaf blight (*Pseudomonas avenae*) and leaf blight (*Bipolaris maydis*) have been found on corn. Some control measures are suggested that can slow the rate of pest importation.

Introduction

New plant diseases appear on Guam with relative frequency. Although islands are blessed with a large degree of isolation from other land masses, and therefore sources of pest problems, modern transportation and our modern lifestyles are closing the gap more quickly than our agriculture can adapt to new pest programs. Our quarantine regulations, both federal and local, and the immense efforts made by our quarantine authorities, are successful in protecting us from accidental introductions of new pests, to a certain degree. Our own human population, however, is quite able to find ways of overcoming the very quarantine regulations that are supposed to protect us. Quarantine authorities often discover individuals attempting to "smuggle" plant propagules, fruit, and produce. The reasons why we may want to introduce these materials are numerous and varied, and the reasons why some people attempt to go around legal procedures are also many. I doubt that anyone would want to bring in a new plant pathogen, yet from time to time individuals unaware of the pathogens in their plant material smuggle in their favorite varieties of this or that plant.

Smuggling in plant material is not the only way we can get new diseases introduced. Severe cases of epidemic developments can and have been started

by introduction of planting materials through legal channels. Anyone can order seed through catalogs. There are many seedborne diseases that are not present on island, but may one day appear in our fields. This happens more frequently than we may care to admit. A few potentially devastating diseases not occurring here, but which may be introduced with seed, are various downy mildews of grass crops, and late blight, bacterial canker, spot, and speck of tomato. We can also get seed of witchweed mixed in with seed of other plants, coming from places where that parasitic plant is established. Various weed seeds are thought to find their way into new areas in this way as well.

Infective vectors of plant pathogens can also reach our island, and potentially introduce a new pathogen. Consider, for instance, how often big airplanes are loaded at night, under strong floodlights that surely attract a vast number of nearby insects.

One way or another, many plant pathogens have found their way into Guam in recent years. In the 1988 Guam Agricultural Experiment Station Annual Report, there are more than 50 accounts of plant diseases not known three years earlier (Russo et al. 1985). A number of these plant diseases have evidently been present for some time, while others are recent introductions.

Some recent cases of actual interceptions, limited establishments, and economically damaging epidemics of newly introduced plant diseases on Guam will be discussed.

Interceptions

Numerous plant introductions have been intercepted because samples have been found to contain live plant-parasitic nematodes. Many ornamentals and root crops have been confiscated for this reason. Plant propagules of various sorts have been intercepted and found to be infected with fungal and bacterial pathogens. Produce is sometimes found with potentially infective exotic pathogens. Cabbage heads with black specking, which could be caused by either Turnip Mosaic Virus or Cauliflower Mosaic Virus, or both, have been found several times in produce shipments from Hawaii and from mainland ports. Chinese cabbage from Hawaii has also been confiscated for the same reason. Although specking in chinese cabbage can be caused by a physiologic disorder, it can also be due to Cauliflower Mosiac Virus infection (Sherf & MacNab 1986).

Established Pathogens

Individual trees have been found infected with exotic diseases. One mango tree (*Mangifera indica*) was found in Mangilao in 1988, infected by Woody Gall Virus (*see* Cook 1975). The tree came from a Haden seed; the fruit was bought at a local supermarket (imported most likely from Mexico via USA). Symptoms were obvious after the tree was 8-10 years old. A lanzones tree (*Lansium domesticum*) was found in Sinajana in 1987 infected by a nematode causing galls on its branches. The pathogen is pending identification.

Isolated fields have been found infected with exotic diseases as well. A cabbage field in Barrigade (in 1987) had many plants infected by bacterial leaf scald, caused by a strain of *Xanthomonas campestris* pv. *campestris* (Queensland Dept. of Primary Industries 1982). While the more common strain causing black rot is reported here (Russo et al. 1985) and can be frequently found in cabbage fields, the leaf scald strain is previously unreported. A corn field in Dededo (in 1990) had northern leaf blight, a disease caused by the fungus *Bipolaris maydis* (Shurtleff 1980). During the last decade, this exotic disease created disastrous epidemics in the corn belt region of the United States. The fungus is capable of infecting the corn ears. The same corn field in Dededo was found to have several plants infected with bacterial leaf blight, a disease caused by *Pseudomonas avenae* (Shurtleff 1980). Again, this corn pathogen was found infecting the corn ears.

Epidemics

Cassava blight (*Xanthomonas campestris* pv. *manihotis*) was recently introduced. It was first found on Guam in 1986 by G. V. H. Jackson (SPC, Suva, Fiji). It was very likely introduced through infected cuttings, and spread throughout Mangilao, Barrigada, and Inarajan (Wall & Santos 1987).

The watermelon fruit blotch (*Pseudomonas pseudoalcaligenes* subsp. *citrulli*) was almost certainly introduced through commercial seed, and developed into an epidemic in the Dandan area (Wall & Santos 1988, Wall 1989). It has also occurred in various other locations throughout Southern Guam and in Barrigada. Outbreaks still occur. Fruit blotch may have even found its way to Guam in more ways than one, since fruit shipments coming in from Tinian were intercepted and infected fruit were found (Wall et al. 1990).

Solutions

There is no easy solution available, only hard work to enforce quarantine regulations, educate the public, and keep abreast of disease development and identification. The bacterial blight epidemic of cassava has been controlled in Inarajan Experiment Station so far, for instance, by a series of control measures. These included eradication from the station and surrounding area, strict sanitation to destroy all infected plant residues, and quarantine (no cassava planted) for 3 years (Wall & Santos 1987).

On a more general basis, and dealing with current and future dangers of important exotic pests, the following points need consideration:

1. Our plant quarantine authorities need to hire and train personnel to handle the specimens we have traditionally handled at the University, because sample numbers are constantly increasing and so is our work load.

2. Plant quarantine authorities can now make use of computers and databases for quick references on pests reported from different parts of the world. (FAO database, T. Putter, FAO, Rome, Personal communication).

3. Publications such as the SPC book on exotic pests (O'Connor 1967) make the job easier for persons in charge of inspections and identifications. This publication is outdated, however. Such a list should be updated periodically, at the very least every two years.

4. Techniques for identifying plant pathogens are making the job easier every day, but these techniques are often expensive, and otherwise time-consuming. Already there are serological (ELISA) kits available commercially to identify many viruses, some fungi, and bacteria. The technique could be used either at the point of origin to insure healthy stock is being exported, or at the port of entry to screen shipments for specific exotic pests.

5. Individuals ordering their own seed through catalogs should surface-disinfest their seed before planting. This would not necessarily eliminate systemic pathogens, but would eliminate many pathogens present as contaminants. Seed companies often have a seed treatment service available, upon request by the customer. The implementation of this recommendation requires public awareness.

6. We need to keep in mind that it is easier to exclude than to eradicate. Eradication campaigns have seldom worked. Every dollar spent in efforts to exclude important exotic pests is potentially saving a tenfold amount that would be required for eradication or a hundredfold for continuous control. Funds should be made available generously to our plant quarantine officials, to ensure they can operate adequately and effectively.

7. We need propaganda campaigns to constantly keep the public aware of the exotic pest problem. We can be our own worst enemies.

Conclusion

In spite of the alarming rate of new pest reports, Guam is still free of a vast number of important plant diseases. There are several bacterial diseases of solanaceous crops that are still not found here, for instance, although they can be seedborne (Sherf & MacNab, 1986), and there is a large number of cucurbit and solanaceous viruses not found here as yet. Moko disease of banana is fortunately absent, as is the lethal yellows disease of palms, and the downy mildews of grasses. Historically, however, plant quarantine regulations have had only limited success in excluding pests from a region. Given enough time, these exotic pests can and do find their way in. In the case of important commodities, it is economically and environmentally advantageous to prolong this pest-free period as much as possible. Therefore, existing plant quarantine regulations need to be supplemented in a number of ways, as discussed previously. Most of the recommendations made here have a price tag that would have to be paid by our local quarantine authorities. Some require international funds and cooperation. Perhaps these recommendations will never be implemented. To do so would require that they survive the political battlefields of government policy-making, local and international. Nevertheless, they need to be pointed out and considered.

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