

EPA Pesticide Environmental Stewardship Program Industry Background

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and the
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Integrated Pest Management Program**

The Hawaii Banana Industry Association (HBIA), Oahu Banana Growers Association (OBGA), and the Big Island Banana Growers Association (BIBGA) are active participants in the development of the banana industry in Hawaii. Of the three associations affiliated with the banana industry, the HBIA is the sole statewide industry association. It represents ninety five percent of banana production in the State of Hawaii. The HBIA was convened thirty-one years ago to increase cooperation between industry members, private industry supporters, consumers and affiliated state and federal government agencies. HBIA represents growers in matters that affect banana production in Hawaii. HBIA represents growers in areas such as legislation, chemical registration, research, and marketing. The HBIA plays a vital role in the development of diversified agriculture in Hawaii and continues to be highly competitive in the global economy.

There are many different types of banana cultivars grown throughout the Hawaiian Islands. However, the Cavendish (Williams, Valery, Chinese, Grand Nain) and Apple (Dwarf Apple, Apple) varieties appear to be the preferred cultivars among island growers. Statistics show 41% of the total acreage in 1998 under Brazilian production, with Cavendish production making up the 59% difference. In 1998, there were 200 farms within the state. Sixty-two percent of the total number of farms resides on the islands of Hawaii and Oahu.

Total statewide acreage devoted to banana production reached a record high at 1,600 acres, of which 1,420 acres or 89% were harvested. Total harvested yields amounted to 21.0 million pounds in 1998, which was valued at 7.35 million dollars.

Present Pest Management Situation:

Hawaii's tropical climate provides an ideal haven for many insect pest and plant diseases. Insects and diseases decrease productive efficiency in many banana production regions. Extensive losses have occurred due to the establishment of many new immigrant pests and significant recurring pest problems. Major pests in Hawaii's banana orchards include thrips, banana root borer, banana bunchy top virus (BBTV), banana leaf streak (BLS), Panama wilt (PW), plant parasitic nematodes, and weeds. Minor pests include Chinese rose beetle, banana fruit-piercing moth, banana skipper, banana leaf roller, sugarcane budmoth, mites, coconut scale, spiraling whitefly, and the plant diseases freckle, and banana mosaic virus.

Elixothrips, *Hercinothrips*, banana rust thrips (*Chaetanaphothrips signipennis*) and Hawaiian flower thrips (*Thrips hawaiiensis*) are common thrips species in statewide

commercial banana production systems. Notable increase in thrips induced losses have occurred due to feeding damage to the fruit. To avoid additional losses and insect damage, majority of the fruits produced locally in Hawaii are treated with timely insecticidal sprays at bunch emergence and covered with un-treated polyethylene bags prior to harvest.

The banana root borer, *Cosmopolites sordidus*, is a continuing problem for commercial and home growers. The larvae of this pest bores through the corm, suckers, roots of existing, and decaying planting material. Large number of larvae and extensive feeding can result in root destruction, slowed plant growth, reduced fruit production, and, sometimes, toppled plants. There are no known effective beneficial parasites. Instead, field sanitation, insecticidal treatments, and hot water treatment practices are being used to manage this pest.

The banana bunchy top virus is a serious problem for banana growers statewide. The banana aphid, *Pentalonia nigronervosa* has been identified as the sole vector of this disease. Adoption of recommended banana aphid management practices is strongly urged. Once the area has been contaminated with the BBTV, eradication of the disease is difficult and the possibility of finding a cure is slim. Prevention is the key. Pesticide applications to kill aphid populations are applied on regularly scheduled intervals. Infected planting material and the failure to destroy diseased plants also attribute to the spread and transmission of the BBTV. Eradication efforts are being conducted on an island to island basis. Utilization of disease free planting material, windbreaks, horticultural oils, and soapy water are alternatives to chemical treatments that reduce aphid populations.

Banana leaf streak disease caused by the fungus *Mycosphaerella fijiensis*, is a destructive disease to banana production in Hawaii. This disease favors warm, wet and humid environments. The fungal pathogens penetrate the leaf tissue and create necrotic lesions, also known as streaks. This disease is managed through cultural and chemical practices. Environmental conditions and site location cause variations in the number of acres treated per year. However, preventative fungicides are administered on a routine basis in areas high in rainfall and humidity. Implementation of preventative control strategies such as using disease-free banana varieties, weather monitoring programs, proper plant spacing, efficient spray coverage, and site evaluation and conditions and are encouraged to minimize disease outbreaks.

Panama wilt is caused by the pathogen *Fusarium oxysporum*. Once the fungus has established, it is difficult to eliminate. Disease prevention includes the selection of resistant cultivars, field sanitation, and moisture monitoring practices. Varieties that are susceptible to the PW are avoided.

Plant parasitic nematodes are a major concern for growers in localized areas in Hawaii. Post-plant nematicides are primarily used to control nematodes through granular applications or administered through drip irrigation lines. Nematode-free planting material such as hot water treated or certified tissue cultured corm aid in nematode prevention. In addition, nematode populations are reduced by incorporation of crop residue and fallowing fields for six to eight months using a non-host or bare fallow.

Weed management is an important component in banana production. Weeds not only compete with the crop for food, water, nutrients, and sunlight, but they also provide shelter for insects and host diseases. Pre-emergence herbicides selected based on scouting records and observations are applied prior to planting to minimize weed production. In banana orchards, weed management strategies involves the prevention of weed seed formation and emphasizes weed control prior to canopy closure.

Risk Reduction Efforts:

The banana industry in Hawaii constantly strives to implement the best management tactics for the production of bananas. Protection of the environment and human health from the direct and indirect pathways of pesticide exposure has prompted the HBIA to support and implement Integrated Pest Management (IPM) practices. Integrated pest management practices strive to achieve greater harmony between agricultural production practices and the stewardship and protection of the environment. The HBIA is currently working with the University of Hawaii College of Tropical Agriculture and Human Resources Integrated Pest Management (UH-CTAHR IPM) Program in developing and adopting an IPM continuum approach to achieve crop prosperity while demonstrating its concern for consumer health and environmentally sound production practices.

The industry is currently exploring reduced risk crop protection tools such as horticultural oils and biological insecticides to efficiently manage pest in a manner that is cost efficient and least harmful to the environment. At the present time, diazinon (organophosphate) is the primary chemical used for thrips control. The HBIA has aggressively searched for low risk pesticides such as imidacloprid and spinosad to replace diazinon use and is collaborating with UH-CTAHR IPM to develop efficacy data that will support registration of the products. Recently, spinosad was accepted as an IR-4 (Interregional Research Project No. 4: minor use program) registration project and imidacloprid will be submitted for IR-4 next year. To avoid pesticide resistance, the industry is actively developing a pesticide resistance program. The HBIA anticipates rotating imidacloprid and spinosad with diazinon to reduce organophosphate usage by approximately sixty-six percent. However, in order to reduce diazinon entirely the HBIA is searching for an additional chemical to be used in the rotation program. Rotation of chemicals will effectively control pest populations and minimize jeopardizing new chemicals to pest resistance. Reduction in high-risk pesticide use will lessen the risk of direct and indirect human exposure, as well as minimize excessive leaching of contaminants into our air, water, and soil resources.

Preliminary research on the efficacy of insecticide (chlorpyrifos) treated bags indicated they were effective in controlling insects and lowering damage levels. The installation of impregnated polyethylene bags on banana bunches prior to harvest protects the crop from pest damage and minimizes repeated pesticide treatments and worker hazards. The HBIA is working with the State of Hawaii Department of Agriculture on allowing these bags to be registered for use in Hawaii.

The HBIA currently uses many forms of biological and cultural controls to manage pest and production challenges. Biological control provides excellent eradication of insect pests such as the banana skipper and armored scale. In addition, many insect pest populations

such as the Chinese rose beetle, banana fruit piercing moth, coconut scale, and the spiraling whitefly are maintained below economic threshold levels due to the encouragement of natural enemies and predators. Many growers have experimented and adopted the practice of removing all flowers prior to bagging fruit to reduce sugarcane budmoth damage in lieu of applying repeated pesticide treatments.

Work is currently underway to develop genetically engineered bananas that are resistant to the banana bunchy top virus. Development of genetically resistant banana cultivars will allow increased productivity in areas infected with the banana bunchy top virus and dramatically reduce pesticide, environmental, and human health risks.

In order to gain a deeper understanding about the mechanisms that affect disease development, the HBIA is evaluating the use and effectiveness of disease forecasting systems. Factors such as solar radiation, leaf wetness, wind speed, wind direction, rainfall, temperature, and relative humidity are taken into consideration when developing a complex prevention and management system. The HBIA will continue to explore the relationship between weather and disease incidence to better schedule disease management strategies.

Nematode management is an essential concern for localized growers in Hawaii. The HBIA is exploring nematicide alternatives and are increasing their knowledge of hot water treatment and tissue culture practices to generate planting material clean of pathogens and pest. In 1998, the HBIA experienced a ninety-five percent reduction in nematicide use due to the adoption of nematode free planting material by industry members.

Through a collaborative effort with the University of Hawaii, research is being conducted to explore the use and efficacy of a bunch injection system. Approval of a bunch injection system will enable growers to administer treatments to flower clusters within the bunch at the time which proceeds excessive pest feeding and damage. Currently, growers must postpone treatment until the fruit is exposed. Consequently, delayed treatments causes additional losses and narrows pest control options.

Due to the possibility of soil erosion, cover crops are also being investigated as an alternative weed control measure to bare fallow and herbicide treatments. Additional research continues to explore the use and feasibility of cover crops in banana production because of the impending threat of losing crop protection chemicals through regulatory action.

REFERENCES

1. Statistics of Hawaiian Agriculture. 1997. Hawaii Agricultural Statistic Service.
2. Per letter received from Richard Ha, President of Hawaii Banana Growers Association.
3. Farmers Bookshelf, University of Hawaii, Department of Horticulture. An Information System of Crops in Hawaii.
4. Knowledge Master, University of Hawaii, Department of Entomology and Plant Pathology. Computer Resource Database.
5. Chia, C. L. 1981. Bananas. Commodity Fact Sheet BA-3(A) Fruit. Hawaii Cooperative Extension Service, CTAHR, University of Hawaii.
6. Extracted from presentation made at the monthly Oahu Banana Growers Association meeting by Dr. Ronald Mau. April 1998.
7. R. Mau. 1985. The Fruit Piercing Moth: A New Pest of Fruits in Hawaii. Proceedings from the 17th Annual Hawaii Banana Industry Association Conference.
8. A. Gettman. 1984. Control of the Banana Root Borer in Banana Planting Stock. Proceedings from the 16th Annual Hawaii Banana Industry Association Conference.
9. S. Ferreira. 1989. Bunchy Top Disease. Proceedings from the 21st Annual Hawaii Banana Industry Association Conference.
10. N. Matayoshi. 1993. The Banana Bunchy Top Program on Oahu. Proceedings from the 25th Annual Hawaii Banana Industry Association Conference.
11. Banana Bunchy Top Virus. 1997. CTAHR Cooperative Extension Service Publication.
12. S. Nelson. 1998. Extracted from Banana Integrated Pest Management Guidelines for 1998 Growing Season. University of Hawaii, CTAHR.
13. S. Nelson. 1994. Epidemiology of Black Leaf Streak. Proceedings from the 26th Annual Hawaii Banana Industry Association Conference.
14. B. Sipes. 1993. Controlling Nematodes in Bananas. Proceedings from the 16th Annual Hawaii Banana Industry Association Conference.
15. Extracted from Hot Water Treatment Project Proposal submitted by Dr. Arnold Hara. University of Hawaii, Department of Entomology. 1997