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VEGETABLE CROPS UPDATE

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Cucurbit Pest Control

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Introduction

The cucurbit crops, including cucumber, zucchini, watermelon, bittermelon, pumpkins, hyotan, togan, and others are grown in over 1,300 acres in Hawaii, with an annual farm-gate value of over $5.5 million, ranking as a group among the major diversified ag commodities in the state. Pests and diseases are among the major limiting factors for the production of cucurbits in Hawaii. In recent years outbreaks of the silverleaf (formerly sweetpotato) whitefly, leafminers, thrips, viral diseases, among others have resulted in serious losses and reduced yields during the different parts of the year. Hawaii grows most (over 70%) of the cucumber, watermelon, bittermelon, and oriental squash consumed in the state. The opportunity exists to increase the local market share for zucchini and pumpkins. Export opportunities may exist for watermelons and other cucurbits such as kabocha squash to areas that have no melon fry quarantine restrictions. Improved area-wide pest control practices need to be implemented industry-wide to improve the profitability of cucurbit production in the state, with a sight toward increased yields and toward possible export markets. The recommendations on pest control listed below should be considered general guidelines and are provided for informational purposes. Because federal and state laws that regulate the use of pesticides change regularly, growers should always read pesticide labels carefully prior to making any applications, and should consult with local cooperative extension personnel or other professionals to learn about the latest pest control recommendations.

Seedling/ transplant diseases to watch for

i) Anthracnose: symptoms include dark brown lesions on the leaf. The lesions are oval or circular with sharp or angular margins. Tan or pink lesions also develop on the stem, causing seedlings to collapse. Controls include sanitation in the greenhouse or nursery and to avoid planting in anthracnose contaminated fields.

ii) Gummy stem blight: A diagnostic symptom for gummy stem blight is the water soaked lesions that develop at the top of the seedling stem. The lesion turns tan but does not become sunken, and small black, spore-producing structures develop within these lesions. Greenhouse or nursery sanitation is important to manage this disease. Contamination can occur from infected seed, and from dirty trays and tools. Seedlings may be sprayed with fungicide. Once removed from the greenhouse or nursery, seedlings can be sprayed with Bravo or Terranil.

Contents!!

Simple Media Mix For Growing Seedlings
Alton Arakaki, CES-CTAHR, Molokai
One of the first and most important steps in producing healthy vegetable plants and quality products is being able to produce healthy transplant seedlings. Poor condition transplants will set back productivity. Vegetables that are transplanted spend 2 to 6 weeks of their growth in seedling trays, thus depend solely on this limited environment for their moisture and nutrition. In most cases where poor seedlings are produced, the lack of nutrition seems to be a major contributing factor, which may or may not be connected to over watering and consequent nutrient leaching. A trial was conducted on Moloka'i to determine if a media mix could be developed that would require only a ONE time slow release 14-14-14 Osmocote and Sulfur coated fertilizer treatment to sustaine the seedling's nutritional requirements over a 4 to 6 week period. Various rates of Osmocote and Sulfur coated fertilizer were used and mixed in Sunshine growing media. The best seedling result was obtained from an Osmocote mix.

Simple Media Mix for Vegetable Seedlings
4 - 5 cups 14-14-14 Osmocote to
50 qt (25 lbs) All Purpose Sunshine Mix

Spraying programs for cucurbits

Anthracnose: This fungus is spread mostly by rain and overhead irrigation, but can also be spread by wind, machines, and by workers in the field. Temperatures in the 70s and 80s, and humid, rainy weather are favorable for disease spread and development. Lesions in pumpkin begin as orange or pink spots on leaf veins. The first lesions are seen on the leaf underside. Initial symptoms in watermelon include irregular-shaped brown leafspots and sunken lesions on vines and stems. The leafspots, usually associated with the veins, usually have pointed margins and the center of the lesion may fall out. Lesions on vines and petioles are oval, sunken and a color that ranges from tan to salmon. At harvest time, dramatic sunken lesions on the cucumber and watermelon fruit surface will be observed along with a cluster of collapsed vines. The lesions, an inch or more in diameter, become black and following moist conditions produce salmon pink spores in the center of the lesions. Controls include 2-3 year rotations, use of resistant cultivars (cucumber and watermelon), and fungicides. Chlorothalonil (Bravo or Terranil), mancozeb (Dithane, Manzate, or Penncozeb), and Topsin, applied on a regular basis, can effectively control anthracnose. Good coverage and repeated applications is important for effective anthracnose control. Copper fungicides are not very effective against anthracnose. For control it is also important to plow the crop soon after the last harvest, to use clean seed, and to follow at least a one-year rotation.

Gummy stem blight (GSB): Gummy stem blight is more severe in watermelons than on muskmelons. Under warm, wet, and irrigated conditions, the incidence of gummy stem blight will probably be high. In this case weekly spraying may be necessary when the plants start to vine. Fungicides used for alternaria, also control GSB. In pumpkin start treatments when fruits begin to enlarge or about 6 weeks after seeding. Topsin M is effective for gummy stem blight control. Pumpkin growers often follow a 4-6 spray schedule to prevent serious losses from black rot (fruit rot).

Powdery mildew: Optimal conditions for powdery mildew development include temperatures in the low 80s and moderate to high relative humidities. Infection can occur at relative humidities as low as 46%. Because older leaves are more susceptible, the disease normally develops first in the center of the hill. The first sign of infection is a whitish powdery growth, seen on the leaf underside of crown leaves. Begin fungicide applications after disease detection. Scout fields weekly for symptoms of powdery mildew and downy mildew. Sampling involves examination of the upper and lower surface of 5 older leaves at up to 10 sites in the planting blocks. Topsin M, Bayleton, and Reach are effective for powdery mildew. In muskmelon one application of Bayleton when the disease first appears, and a second application about 2-3 weeks later, may be effective for control of powdery mildew. Topsin requires more frequent applications than Bayleton, and it will not be as effective in eradicating established infections. In muskmelons, as a rule-of-thumb fungicide treatments for powdery mildew control should be made 7-10 days before harvest, and again about 2 weeks later, in fields that will be harvested for a month or longer.

Downy mildew: Ridomil/Bravo or Ridomil/Copper and Aliette are effective for downy mildew. These treatments should be effective if made when symptoms of the disease first apper in the field. Some cultivars of melons and cucumbers have high levels of resistance to downy mildew.

Fusarium and Verticillium wilt
These two fungi cause vascular diseases in the cucurbits. The fungi live in the soil and infect plants through the roots. Initial symptoms are the yellowing and wilting of leaves on one or more laterals, starting at the base of the crown and progressing toward the tips. Both diseases also develop a discoloration of the vascular tissues in the base of the plant, seen when cutting with a knife a lengthwise slice through the stem. The vascular discoloration in Fusarium infected plants tends to be reddish, while that for Verticillium is usually more gray, but these symptoms alone are not always definite diagnostic signs. Both diseases are usually seen in 'hot-spots' in the field (a few affected plants, close together) which will not readily spread to other plants in the field. For a definite diagnosis diseased samples need to be sent to the UH Agricultural Diagnostic Service Center (tel. 808-956-5434, ta_svccntr@avax.ctahr.hawaii.edu).

Alternaria leaf blight

Alternaria develops as circular spots on the leaves. Symptoms develop on the older leaves first. In muskmelon the lesions are brown or light brown and can reach up to one-half inch in diameter. In watermelon the lesions are about one-third inch in diameter and darker in color. A diagnostic feature for Alternaria are the concentric rings that develop in the lesions. In contrast to gummy stem blight, Alternaria does not develop symptoms on stems or petioles. Chlorothalonil (Bravo, Terranil, etc.) is effective, while mancozeb (Dithane, Manzate, Penncozeb) is moderately effective against Alternaria (as well as against gummy stem blight). Copper is not as effective as Bravo or Mancozeb. Chlorothalonil treatments will also provide good control for gummy stem blight and anthracnose. Applications are begun when vines from adjacent rows begin to touch, or earlier if symptoms develop before this time, and are continued at regular intervals (7-14 days).

Phytophtora blight

Phytophthora blight is a serious disease in peppers, and it has a wide host-range including pumpkin and winter squashes. In pepper, symptoms include general wilting of the plant, dark brown lesions that girdle roots, stems, and branches, brown-tan spots on leaves, and fruit rots characterized by a white mold cover during moist weather. The disease is normally seen first in moist parts of the field such as in "low-spots," or in shaded-areas. It may be possible to protect the crop from heavy losses if only a few isolated diseased clusters are found in the field. Careful watering, and growing plants in raised-beds, to improve drainage, should be part of the management program to control Phytophthora. Fixed copper may be effective to manage phytophthora. Use protective sprays if the field has a history of the disease, or if phytophthora outbreaks have occured nearby. Ridomil 2E applications at the base of young plants in raised beds may be effective to prevent phytophthora outbreaks. Fruit rots are often associated with phytophthora infection in pumpkin. Likely infection points are depression points close to where the fruit is attached to the stem, and where moisture tends to accumulate. Protectant fungicides such as chlorothalonil (Bravo) and mancozeb are the most effective to manage this disease. Copper is only marginally effective.

Fruit rots in pumpkin

Growers need to intensify their field scouting for diseases when pumpkin fruits begin to set and develop, and consider the use of protectant fungicides. The organism that causes gummy stem blight in the foliage of cucurbits, causes black rot on the pumpkin fruits. Protectant fungicides such as chlorothalonil (Bravo, Terranil), and mancozeb (Dithane, Manzate, Penncozeb) when disease symptoms are first observed on stems and leaves, will help to reduce incidence of black rot later in the season. These treatments, when applied at or prior to the fruit-setting stage, will also help to control fruit rots caused by Fusarium and Phytophthora.

Poor fruit set?

Poor fruit set may be caused by:

i) High daytime and nighttime temperatures may interfere with the pollination process;

ii) Poor bee activity due to high daytime temperatures; Remember that many pesticides applied at the wrong time (morning till early afternoon) will also kill bees in the field. Some of these pesticides, with the residual effect on parenthesis include: Cygon (Dimethoate, 3 days residual effect), Guthion (2.5 days), lannate (+1 day), Lorsban (4-6 days), Sevin WP (3-7 days), and Thiodan (8 hrs).

iii) Any stressfull period that occurs after fruit set may result in abortion of the younger fruit.

iv) Virus infection early in the growing stages, or early in the fruit development stage, may result in less fruits produced by the plant. Those few fruits actually produced will likely be of poor quality.

Watermelon fruit disorders

√ Hollow-heart- When opened, the center of the fruit is hollow. In the early stages cracks encircle the heart, and major cracks run through the flesh. As varieties vary in their tendency to develp hollow-heart, consider changing varities if this disorder is a problem in your farm. Excessive nitrogen and watering may be the cause for hollow heart. Other tips: hollow-heart is more likely to occur early in the season; fruit close to the crown are more susceptible; seedless watermelons appear to be more susceptible; and poor pollination, especially with seedless varieties, may result in a higher incidence of hollow-heart.

√ Splitting and bottle-necking: Splitting often occurs when rainfalls follow a dry spell, and is more prone in overmature fruit. Poor pollination may result in bottle-necks, were fruit is more norrow at the stem-end. Re-evaluate your pollination program in fields with high incidence of bottleneck.

Fungicide application programs

Apply fungicides every 7-10 days. Each application should include a broad-spectrum fungicide such as chlorothalonil, maneb, or fixed copper. These fungicides will help to manage powdery mildew, downy mildew, scab, anthracnose, and gummy stem blight. For effective control, maximum coverage is important to reach the leaf undersides and fruits low in the canopy. To improve coverage use a high pressure above 200 psi, apply at least 75 gallons per acre, and use nozzles that produce uniformly small droplets.

Using systemic fungicides

Systemic fungicides can effectively improve your disease control program. Practices to follow to minimize disease resistance to these systemic materials include: mixing them with contact fungicides, to minimize over-exposure; use them only at the onset of disease development; use the highest rates as indicated by the label; and rotate between systemics with different modes of action. Benlate and Topsin M have the same mode of action. Bayleton and Reach also have the same mode of action.

When to start the spraying program?
In general starting spraying programs for such diseases as alternaria, anthracnose, and gummy stem blight is recommended when the vines from adjacent plants, within rows, start to touch. However sprays may have to start soon after transplanting if the field has history of disease or if a cucurbit crop has recently been grown in the same field. When the plants are young band the protective sprays on the row.

Watermelon Fruit Blotch (not yet detected in Hawaii, but potentially serious disease)

Bacterial fruit blotch in watermelon, *Pseudomonas pseudoalcaligenes* subsp. citrulii Schaad et al (not yet determined for certain), was first detected in the Marianna Islands in 1987. In the US, the disease was almost simultaneously detected in 1989 in Florida, South Carolina, Indiana, and other eastern states. The disease is still mainly concentrated in eastern states, but already reached Arkansas, Iowa, and is widespread in Oklahoma. In August 1994 Asgrow, Petoseed, Rogers, and Harris Moran suspended sales of watermelon seed in the US due to bacterial fruit blotch, which can be transmitted by seed. A national committee was then assembled which got all parties together and allowed continuation of seed sales, along with proper labels warning growers of the potential risks with fruit blotch. The best method currently available is testing of 10,000 seeds from each seed lot, but no tests can guarantee 100% non-infection.

Fruit blotch factoids
√ Seedborne, transmitted by water, implements, transplants, and cultural practices.
√ First symptoms are small greasy-looking, watersoaked areas a few millimiters in diameter. Lessions with irregular margins expand rapidly into large dark-green watersoaked lesions several centimeters in diameter. The entire fruit surface, except the ground spot, may be covered within a few days. A white bacterial ooze may be seen exuding from the fruit.
√ Symptoms also appear on watermelon seedlings, as irregularly shaped lesions along the midrib, progressing toward the cotyledon margins. Small brown lesions may occur on small true leaves.
√ Management includes close monitoring and copper sprays at first sign of infection. Treatments are 3-4 copper sprays at first flower, fruit set, and two weeks after that.
√ Proactive treatments include weekly copper sprays at half the recommended label rates.
√ Fruit blotch also attacks muskmelon.
√ Leaf lesions don't cause defoliation but act as bacteria reseirvoirs for fruit infection.

References
1. Aylsworth. 1994. Am. Veg. Grow. Oct. pg. 28,30-32.
2.Cook and Latin. 1994. Am. Veg. Grow. Oct. pg. 30.
3. Hopkins 1991. Proc. Florida State Hort. Soc. 104:270-272.
4. Killebrew and Fox. 1993. Vegetable Press, MSU. Vol 93 No. 4. pg. 1-2.
5.Latin and Rane. 1991. Amer. Veg. Grower. April. pg. 78.
6. Rane and Latin. 1992. Plant Dis. 76:509-512.

Crop Rotation
Crop Rotation is an important cultural tool available to decrease pressure for the following cucurbit diseases: Alternaria leaf blight, anthracnose, gummy stem blight, scab, angular leaf spot, and many of the fruit rots of pumpkins (Darin M. Eastburn, Ed., Illinois Fruit and Vegetable News, Vol. 3, No. 4, April 2, 1997).

Seed-born diseases
The following seed-born diseases occur in the cucurbits: bacterial fruit blotch, angular leaf spot, and some of the foliar fungal diseases. To eliminate the spread of seed-borne diseases seed needs to be treated appropriately with chemicals or hot-water treatments, or seed must be purchased from reputable sources that routinely test seed for freedom of specific diseases (Darin M. Eastburn, Ed., Illinois Fruit and Vegetable News, Vol. 3, No. 4, April 2, 1997).

Cucumber varieties for Hawaii: Standard cucumber varieties grown in Hawaii include 'Burpee Hybrid II', 'New Market #2', 'Sweet Slice Hybrid', 'Lani' and 'Hilo' UH hybrids, 'Dasher II', 'Sakata #69', and 'Slicemaster'. Other for-trial varieties which look promising include 'Genuine', 'Spring Swallow', 'Soarer', 'Southern Delight', 'Pegasus', Green Knight', 'Tokyo Slicer', 'Conquistador', and 'Brocade.'

Cucumber varieties grown in Hawaii

Cucumber, Western Slicing		
Sweet Slice	Twilley	Oahu
Burpee Hybrid II	Burpee	Oahu
New Market II		Oahu
Slicemaster	PetoSeed	Oahu
Super Sett	PetoSeed	Oahu
Genuine	Know-You	Oahu
Lani	UH	Hilo[1]
Burpee II	Burpee	Hilo
Milo	UH	bush culture[1]
Dasher II	PetoSeed	Kula
Sakata #69	Sakata	Kamuela
For Trial: 'AC 1810', 'UH Ohia', 'Slicenice', 'Spring Swallow', 'Soarer' and 'Pegasus'		
Cucumber, European		
Deliva		
Toska 70		FT
Farbio	Stokes	
Uniflora W		FT
Cucumber, Oriental Slicing		
Progress	Takii	Oahu
Tasty Gem		Oahu
Burpless 69	Sakata	Oahu
Spring Swalloy	Know-You	

Pumpkin		
Tetsukabuto	Takii	FT, Kamuela[1]
Delica		
Japan Cop		
Sweet Mauna		
Squash, Italian		
Ambassador	Twilley	Maui, Hilo, Oahu
Burpee	Burpee	Hilo, Oahu
Elite		
Spineless Beauty		
Squash, Yellow		
Gold Rush		
PetoSeed		
Kula		
Watermelon		
Crimson Sweet	Willhite, Sun	Oahu, Kamuela, R[1]
Golden Kyokuto	Mikado	FT, Kamuela, Y[1]
Au Producer	Willhite	FT, Kamuela, R[1]
Top Yield	Twilley	Oahu
Glory	Takii	Oahu
Sugar Baby	Green Barn, Sun	Oahu
Summer Festival	Green Barn	Oahu

Curbit herbicide use guides
Curbit is applied preemergence on seeded pumpkin and squash or post directed between rows of transplanted pumpkin or squash for control of several broadleaved and grass weeds. Curbit should not be incorporated after application prior to planting because crop loss can occur. Heavy rainfall or excessive irrigation can result in crop injury. (see: Michael D. Orzolek PENN ST HORTICULTURE VEGETABLE NEWSLETTER, Vol. 6, No. 5, 1994)

Aphid control in cucurbits
Insecticide treatments for aphid control will not effectively reduce losses from aphid-transmitted viruses in the cucurbits. Effective insecticides for aphid control include Thiodan, Cygon (dimethoate) and Metasystox-R. Dimethoate can be used in melons but not on squash, pumpkins, or cucumbers. Thiodan is also effective against several aphid species. Organic growers can apply M-pede insecticidal soap. M-Pede will only kill those aphids it comes in contact with, while still wet. To improve coverage, especially for Thiodan and M-Pede, use ground sprayers, high water volumes, and high application pressures that will stir the leaves and cover the leaves undersides. Prior to spraying watch for the activity of beneficials such as lacewing eggs, lady bug and lacewing larvae, syrphid fly larvae, and for parasitized aphids (Darin Eastburn, Illinois Fruit and Vegetable News, Vol. 1, No. 17; August 9, 1995; Jerry Brust, Purdue VEGETABLE CROPS HOTLINE, ISSUE 318, JUNE 27, 1996).

Leafminer control
Leafminers have traditionally been considered secondary pests in cucurbit crops. Populations are normally maintained below damage thresholds by populations of beneficial organisms, especially tiny parasitic wasps, but outbreaks occur if insecticide applications kill these beneficials. Entomologists recommend holding the trigger on the insecticide gun to allow for the establishment of natural leafminer control mechanisms. Insecticide treatments may be ineffective because the larvae is protected inside the leaf. However, systemics such as dimethoate may effectively control both larval and adult stages. The insect growth regulator, Trigard, produced by Cyga-Geigy is also available for leafminer control, with repeated applications required at 7-day intervals. In Arizona, an emergency exemption was obtained in 1995 allowing the use of Agri-Mek for leafminer control on melons. In Florida trials with celery, effective leafminer control was obtained with Agri-Mek, Trigard and also with the Bt products Javelin and Dipel.

Recommended Cultural Practices for Cucumber Production in Molokai.
1. Seeding. Seed in trays, transplant just before the seedling roots fill the tray cell, approximately 14-16 days after seeding. Seeds can also be direct seeded, 2 seeds per hill. All seed should be treated with a fungicide but most commercial seed is pre-treated.
2. Mulch. Mulch rows with 3-4 feet plastic mulch.
3. Irrigation. Drip tube beneath the plastic mulch.
4. Trellis and netting. Use 6'6" metal tee, placed 10 ' apart in rows, and through mulch 11 gauge wire with nylon mesh net, 2 strands of wire are used to stretch the netting.
5. Plant spacing. 12-18 inches between plants, 5-6 feet between rows.
6. Fertilization. Preplant 800-1000 lbs/Acre 10-30-10 placed under mulch. Liquid feed through the irrigation system, 10-15 lbs/Acre 20-20-20 every other week.
7. Training vines on trellis. Vines should be placed or trained on trellis netting at least 3 times per week and daily during periods of vigorous growth.
8. Pest Control. Insecticide treatments may be required for melon fly, leafminers, whiteflies, thrips and aphids. Inspect plants for presence of insects before spraying. Even if insects are present it does not mean they will cause economic damage. Try as much as possible to gauge their density, and spray accordingly, to maintain an insect population density below economic damage levels.

Remember: there is a population of beneficial insects in the field most of the time, helping to control harmful insects. It has been documented that insects DO develop resistance to persistently applied chemicals. Some scholars believe that it is only a matter of time before insects build resistance to particular insecticides.

Fungicide treatments may be required for powdery mildew management.
9. Irrigation. When the first fruit has formed, water moisture in the soil must be maintained close to field capacity at all times. Cucumbers have high water demand during fruit production. Approximately 93-97 percent of the fruit is water plus transpiration rates are high during this active growing state.
10. Harvest. During peak periods pick daily. At other times harvest is conducted at no less than every other day. It is important to remove all mature and damaged fruits from the plants all the time, in order to maintain plant vigor.
see: VEG CROPS UPDATE MARCH 1995

Cutworm control
Insecticide treatments are warranted if cutworms are feeding on more than 1% of plants in the field. One or more pyrethroid applications (Ambush, Pounce, or Asana) are usually effective for cutworm control (PURDUE UNIVERSITY VEGETABLE CROP HOTLINE, June 2, 1995, No. 301).

Spider mite control

Mite populations normally explode during periods of hot (>90F) and dry weather. Mite damage almost always starts in the edge of the field or near grassy areas, and the crown leaves are normally affected first. The mites then progressively move out from the center of the plant. It may take 1-2 weeks for mites in the field borders to reach the center of the field. Like with leafminers, a number of beneficial organisms maintain mite populations in check, unless the beneficials are killed by insecticides. Don't spray for mites unless their presence has been confirmed. Products effective for mite control include Agri-Mek, dicofol (Kelthane), malathion, diazinon, and dimethoate. Kelthane is effective for two-spotted mite control. Coverage on both sides of the leaf is necessary for good control. Read product labels for details on crop registrations and other usage restrictions (J. P. Harris, 1994. Vegetable Press Newsletter. Miss. State Univ. Vol. 93 No. 8; Jerry Brust, Purdue VEG CROPS HOTLINE, ISSUE 319, JULY 11, 1996).

Stinkbug control
Stinkbugs should be controlled when they first appear. Nymphs are easier to control, as they are less mobile. Adults may live for 40-60 days. Damage from stink bugs may be heavier in weedy fields or near field borders. During the hot part of the day, stinkbugs may be found in the lower canopy. Application threshholds in some southern states call for treatments if counts exceed 1-6 per plant when fruit is present. Sevin XLR, Thiodan 3EC, Pounce, Ambush, Penncap M and Rotenone provide effective control. The pyrethroids Baythroid, and Warrior, registered for control of earworms and other caterpillars in some crops, will also kill stinkbugs. In Indiana Thiodan is recommended for stinkbug control on tomato, while Asana has been found to be relatively ineffective. Insecticide mixtures may provide added control. Read pesticide labels for crop, and application restrictions (Darin Eastburn, ILLINOIS FRUIT AND VEGETABLE NEWS, Vol. 2, No. 23 , October 11, 1996, and Vol. 2, No. 19, August 14, 1996; P. Harris, Miss. State Veg. Press, 95(9), 1993, and 94(8), 1994; Rick Foster, VEGETABLE CROP HOTLINE PURDUE UNIVERSITY, No. 305, July 28 1995)

Sevin label changes
Several changes have been made to the Sevin (carbaryl) label, as part of the re-registration process. These include changes in the pre-harvest interval for cucurbits from 0 to 3 days. You do not have to follow the new restrictions if using an older product. Carefully read the label of old and new products to assure that you are following label application guidelines.

Biocontrol notes
Vesicular-Arbuscular Mycorrhiza (VAM) helps control Pythium in greenhouse cucumbers.
Root colonization by VAM fungi has been shown to improve the uptake of phosphorus in some plants. This may increase crop yields in phosphorus deficient soils because the VAM fungi improves the plant overall phosphorus uptake efficiency.

Several studies conducted in the 1980s also showed that root colonization by VAM fungi can decrease plant diseases by fungal root pathogens. In some cases a reduced disease incidence was observed only after the VAM fungi had been established in the root system. In other cases, however, reduced damage also occurred when both the disease and the VAM fungi were established concurrently.

A study conducted with greenhouse cucumbers in Denmark, showed that simultaneous inoculation of the vesicular-arbuscular mycorrhizal (VAM) fungi Glomus spp. with the root pathogen Pythium ultimum resulted in a reduced disease incidence. The protective mechanism provided by the VAM fungi is unknown but two possible mechanisms have been suggested: 1) Production of inhibitory metabolites in the host plant (cucumber) as a response to VAM initiation; and 2) Direct inhibition of the pathogen by compounds liberated from the VAM spores or mycelium (Rosendahl and Rosendahl. Symbiosis. 9,363(1990)).

Thrips
Insecticides that may be helpful to manage thrips populations include insecticidal soap, and malathion. In Hawaii, Thiodan may be ineffective for control of melon thrips, while Vydate and AgriMek may be somewhat useful. In Florida, a tank mix of Vydate and Guthion was found to be effective for thrips control, but the spray treatment had to be applied "perfectly." For thrips management in strawberry Lorsban and Thiodan were found to be effective. Lorsban has less utility for thrips management in strawberry due to the 21 day pre-harvest interval application restriction. Align or Neemix, two neem products would be recommended during the blooming period, to prevent bee kills. (Pundt, L. 1994, Amer. Veg. Grower April. 42(4):37-39.; Anon., Am. Veg. Grower. May 1991; Darin M. Eastburn, ILLINOIS FRUIT AND VEGETABLE NEWS, Vol. 1, No. 5, May 17, 1995, and Rick Weinzierl, Vol. 2, No. 8, May 22, 1996).

Admire for whitefly and aphid control
Admire, imidacloprid, is a systemic insecticide recently registered for use on melons and when used correctly effectively controls whiteflies and aphids. It may also control flea beetles, leafhoppers, and thrips, among other pests. Admire can be applied at planting time, drenched, through drip-irrigation, or in a narrow band along the seed line. It may also be applied in the transplant trays before they are taken to the field. When applied in the transplant trays (about 1 oz per 1000 plants) application rates will be equivalent to 2-4 ounces per acre compared to 16-32 oz/acre recommended for field applications. Admire, belonging to the chloronicotinyl chemical family, is characterized by a low use rate, low mammalian toxicity, and for its high efficacy. Optimum results with Admire were obtained when applied 1.5-3 inches below the seed or just below the transplant plug, obtaining whitefly control for 30 to 50 days. The key for effectiveness was to maintain the pesticide in an aqueous solution within the root zone. Although quite effective, resistance to admire will develop if it is used exclusively for the management of a particular pest. Be aware of the plant-back restrictions listed on the label when using Admire in fields were several crop species are regularly planted. Also Admire is reportedly incompatible in tank-mixes with Benlate 50WP, calcium nitrate, Epsom salts, Kelthane 35WP, malathion WP (in concentrate), Omite 30WP, Penncozeb 80WP, Sevin 50WP, zinc sulfate, and Penncap-M2E.

List of arthropod species found in Hawaii's cucurbit crops

BITTERMELON

Bemisia argentifolii (Gennadius)	silverleaf whitefly (formerly sweetpotato whitefly)
Trialeurodes vaporariorum (Westwood)	greenhouse whitefly
Ceratitis capitata (Wiedemann)	Mediterranean fruit fly
Bactrocera cucurbitae (Coquillett)	melon fly
Bactrocera dorsalis (Hendel)	oriental fruit fly
Polyphagotarsonemus latus (Banks)	broad mite
Saissetia coffeae (Walker)	hemispherical scale
Aphis gossypii Glover	melon aphid

CUCUMBER

Aphis gossypii Glover	melon aphid
Apomecyna saltator (Fabricius)	cucurbit longicorn
Bemisia argentifolii (Gennadius)	silverleaf whitefly
Bactrocera cucurbitae (Coquillett)	melon fly
Empoasca solana DeLong)	southern garden leafhopper
Frankliniella occidentalis (Pergande)	western flower thrips
Hercinothrips femoralis (Reuter)	banded greenhouse thrips
Hylemya (Delia) platura (Meigen)	seedcorn maggot
Liriomyza sativae Blanchard	vegetable leafminer
Liriomyza trifolii (Burgess)	chrysanthemum leafminer
Nysius nemorivagus White	a lygaeid bug
Polyphagotarsonemus latus (Banks)	broad mite
Pycnoderes quadrimaculatus Guerin-Mene.	bean caspid
Thrips palmi Karny	melon thrips
Thrips tabaci Lindeman	onion thrips
Trialeurodes vaporariorum (Westwood)	greenhouse whitefly

HYOTAN

Bactrocera cucurbitae (Coquillett)	melon fly
Liriomyza sativae Blanchard	vegetable leafminer
Thrips palmi Karny	melon thrips

LUFFA (ANGLED AND SMOOTH)

Bemisia argentifolii (Gennadius)	silverleaf whitefly
Bactrocera cucurbitae (Coquillett)	melon fly
Pycnoderes quadrimaculatus Guerin-Mene.	bean caspid

SQUASH (SUMMER, ZUCCHINI)

Aphis gossypii Glover	melon aphid
Bactrocera cucurbitae (Coquillett)	melon fly
Macrosiphum euphorbiae (Thomas)	potato aphid
Trialeurodes vaporariorum (Westwood)	greenhouse whitefly
Bemisia argentifolii (Gennadius)	silverleaf whitefly

SQUASH (WINTER, TOGAN)

Bactrocera cucurbitae (Coquillett)	melon fly
Liriomyza sativae Blanchard	vegetable leafminer
Thrips palmi Karny	melon thrips

SQUASH (ALL)

Bactrocera cucurbitae (Coquillett)	melon fly
Liriomyza sativae Blanchard	vegetable leafminer
Nysius nemorivagus White	a lygaeid bug
Pycnoderes quadrimaculatus Guerin-Mene.	bean caspid
Rhopalosiphum maidis (Fitch)	corn leaf aphid
Thrips hawaiiensis (Morgan)	Hawaiian flower thrips
Thrips palmi Karny	melon thrips

Resources:

CTAHR Knowledge Base computer Program. CD-Rom with a vast amount of information dealing with pest management for diversified crops in Hawaii.

Available from the Hawaii Farm Bureau Federation (tel. 808-848-2074).

Valenzuela, H.R., R. Hamasaki, and S. Fukuda. 1994. Field cucumber production guidelines for Hawaii. Univ. Hawaii Coop. Ext. Serv. RES 151.

For beginning farmers: Video-tape, Production of Fruit Vegetables, by H.R. Valenzuela, 1996, 1 hr.

Previous Newsletter issues: Seedling Diseases (March '97); Ag Resources for new farmers (Dec. '96); Plasticulture (Aug. '96); and Drip Irrigation (March '94).

References: Information sources for this issue included American Veg. Grower Mag.; Cornell Univ.-Suffolk County Veg & Fruit Update; Univ. Illinois Fruit and Vegetable News; Univ. Hawaii Kaneohe Veg. Grower News; Maui Veg News; Purdue Veg Crops Hotline; and Western Fruit Grower Mag. For a complete list of references used contact H. Valenzuela at 808-956-7903, hector@hawaii.edu.

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Reference to a company or product name does not imply approval or recommendation of the product by the Cooperative Extension Service, College of Tropical Agriculture and Human Resources, the University of Hawaii and its employees, or the United States Department of Agriculture, to the exclusion of others which may be suitable.

The pesticide information provided here should be used only as a guide. This is not a recommendation; consult an expert. Before purchasing a pesticide, the user should carefully read the entire label to determine if the pesticide is appropriate (legal) for the particular use. Labels frequently change without notice.

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