Crop Profile: Cucumbers in New York

Introduction: Cucumbers are a key fresh market vegetable crop for NY producers, and are produced for local direct-to-consumer sales and for large wholesale markets in the eastern US. Some processing production also occurs. Because of the lack of registered herbicides, weeds are probably the most important pest of cucumber production; the industry has a critical need for more registrations of weed control products. Like other cucurbits, cucumbers are susceptible to a very wide range of diseases, and along with plant host resistance and cultural practices, fungicides are important disease management tools. Several new fungicides have recently been registered for use. Cucumber beetles and aphids can cause economically significant damage by direct feeding and by vectoring diseases. Methomyl is an important tool in aphid control; a new effective aphicide will be needed if methomyl loses its registration.

Registration of new materials by the EPA, even those designated as "low risk", does not guarantee that NY growers will have immediate access to them. The New York State Department of Environmental Conservation conducts its own in-depth reviews before registering new pesticides for use in NY, and may or may not register new materials for portions of or for the entire state.

I. Profile Prepared By:

Lee Stivers
Cornell Cooperative Extension
249 Highland Ave
Rochester, NY 14620
716-461-1000
email) ljs14@cornell.edu

II. Basic Commodity Information

State Rank: 7th
% U.S. Production: 6%
Acres Planted: 3,400
Acres Harvested: 3,300
Cash Value: $14,124,000 (1997 figure: average of 995-97 is $9,297).
Yearly Production Costs: Not available
Commodity Destination(s):
Fresh Market: 95%
Processing: 5% (pickles)

Production Regions: Production is scattered throughout all major growing areas of the state. Major counties include Genesee, Monroe, Ontario, Orleans, and Suffolk.

Cultural Practices: Cucumbers for early harvest are started as transplants while later plantings are direct seeded. Wind combined with low air temperatures can severely damage vine crops, retarding maturity and reducing yields. Soil temperatures below 50° F also slow growth. For these reasons, plastic mulch and row covers are often used for early crops. Direct seeded cucumbers are planted in 5-6' rows with 10-15 inches between plants. Cucumbers are frequently irrigated during dry seasons in New York. Both fresh-market and pickling cucumbers are picked by hand four to five days apart depending on weather conditions. A field can generally be picked 10-15 times. Some cucumbers are field packed, but most are transported to a packing shed where they are cooled, washed, sized, sorted, and packed. Edible waxes are often used to prolong shelflife of cucumbers destined for shipping. Quality standards, including cosmetic standards, are extremely high for cucumbers sold on the wholesale market.

Note on Pesticide Use Information: Pesticide use practices vary considerably among cucumber producers due to differences in scale, local and yearly pest pressures, and target market. A "typical" use pattern for a particular pest or set of pests does not exist. To reflect this variability, numbers in tables in the following sections are given as estimated ranges based on grower surveys as well as expert opinion.

III. Pest Information: Insects

1. Seedcorn maggot (*Delia platura*)

Frequency of Occurrence: Sporadic.

Damage Caused: The larvae or maggots of this fly burrow into cucumber seed, often destroying the germ, which causes seed death or poor germination. Injury is more prevalent during cool, wet weather.

% Acres Affected: 1-2% per year.

Pest Life Cycles: The seedcorn maggot is common throughout the northeastern US, where it overwinters primarily as a puparium in the soil. During spring planting time, the first generation of flies begins to emerge. They lay eggs one to two weeks later just below the surface of recently plowed ground. High crop residue and fresh manure also attract flies which feed on the organic matter. The maggots hatch in four to seven days and feed primarily on decaying organic matter. After feeding for seven to 21 days, the larvae pupate in the soil, usually near the place of larval feeding. The entire life cycle is completed in three to four weeks.

Timing of Control: Preplant.

Yield Losses: Stand losses can reach as high as 30%.

Cultural Control Practices: The following cultural practices help minimize losses from this insect: incorporating crop residues well before planting; avoiding manure applications before planting; avoiding low, wet areas; and shallow planting to speed emergence. No resistant varieties are available.

Regional Differences: None.

Biological Control Practices: Naturally occuring predators, parasitoids, and pathogens, including nematodes, may help suppress infestations.

Post-Harvest Control Practices: None.

Chemical Controls: No insecticides are currently registered for use on cucumbers or cucumber seeds for this insect pest.

Alternatives: Thiamethoxam (trade name Adage), a new insecticide from Novartis, may be an effective alternative, but trials have yet to be conducted.

2. Cucumber Beetles (various spps.)

Frequency of Occurrence: Annually.

Damage Caused: Early in the growing season when cucumber plants are small, heaving feeding by the striped or spotted cucumber beetle can kill a plant in a few days. The beetles like to feed on the thick and fleshy cotyledon leaves. Later in the season the striped cucumber beetle will feed on stems, foliage and fruit, while the spotted cucumber beetle feeds primarily on the leaves. The striped cucumber beetle larvae can feed on the cucumber roots causing stunted plants and delayed fruit development. Cucumber beetles also carry the bacterium that causes bacterial wilt and squash mosaic virus.

% Acres Affected: 100%

Pest Life Cycles: Striped cucumber beetle (*Acalymma vittatum*), spotted cucumber beetle (*Diabrotica undecimpunctata howardi*), and western corn rootworm (*Diabrotica virgifera virgifera*) all attack vine crops in NY. Striped cucumber beetles overwinter as adults and rapidly convene on newly emerged plants. The other two species occur later in the season and damage more mature plants. Eggs of striped cucumber beetles are laid in soil near the base of the plant, and larvae feed on the root and stem of cucurbit plants.

Timing of Control: crop emergence

Yield Losses: up to 100% in heavily infested, untreated areas

Cultural Control Practices: use of trap crops or yellow mulches to aggregate overwintering adults. Row covers will provide protection early in the season, but they must be removed when blossoms appear. Some tolerance has been seen in certain varieties.

Regional Differences: None

Biological Control Practices: None

Post-Harvest Control Practices: Deep plowing and clean cultivation after harvest may reduce overwintering populations.

Other Issues: Research has recently been conducted on methods to trap beetles and/or use bait stations.

Foliar Insecticides for Control of Cucumber Beetles, Aphids, and Squash Bugs:

Pesticide	Target Pest[1]	% Trt.	Type of Appl.	Typical Rates lbs ai/acre	Timing	# of Appl.	PHI[2] days	REI hours
carbaryl *(Sevin)*	CB SB	1-5	foliar	1.0	seedling through fruit set	1-2	3	12
endosulfan *(Thiodan)*	CB, A SB	10-15	foliar	0.5-0.75	seedling through fruit set	2-3	3	24
esfenvalerate *(Asana)*	CB SB	65-70	foliar	0.04	seedling through fruit set	2	3	12
azinphos-methyl *(Guthion)*	CB	1-5	foliar	0.5	seedling through fruit set	1-2	3	48
permethrin *(Ambush)*	CB, A SB	1-5	foliar	0.125	seedling through fruit set	1	3	12
methomyl *(Lannate)*	A	5-10	foliar	0.675	midseason through fruit set	2	3	48
oxydemeton-methyl *(Metasystox-R)*	A	<1	foliar	0.5	midseason through fruit set	1	21	48

1. Key to Target Pests: CB=cucumber beetles, SB=squash bug, A=aphids

2. PHIs in this and all tables in this document indicate the shortest actual number of days between application and harvest, and not label PHIs.

Use in IPM Programs: Use of all 4 materials consistent with Cornell IPM recommendations. Scouting thresholds have been established.

Use in Resistance Management: None reported.

Alternatives: Research in Pennsylvania indicates that imidacloprid is effective against cucumber beetles. IR-4 petitioned EPA for a Section 3 label in 1996, but no decision has been made. Adios, a commercial attractant/feeding stimulant/insecticide is available but has not been widely adopted by producers, and research has shown it to be relatively ineffective.

3. Aphids (primarily *Aphis gossypi*)

Frequency of Occurrence: Can be found in most growing areas in all by the wettest years.

Damage Caused: Aphid infestestions usually occur on the undersides of leaves where they extract plant sap with their sucking/piercing mouthparts. Infested leaves will twist, pucker, or cup. heavy infestations can cause severe leaf distortion. Aphids excrete honeydew which gives the leaves a glossy appearance. Sooty mold may build up on honeydew resulting in cosmetic damage to fruit at harvest. Aphids also vector plant viruses.

% Acres Affected: 100% at risk of infestation. Typically 10-30% of acres affected.

Pest Life Cycles: Aphids live in colonies on the undersides of leaves. They feed on sap from the leaves which can weaken a plant and reduce fruit production.

Timing of Control: When runners are present.

Yield Losses: Usually small.

Cultural Control Practices: Plant late-season fields as far away from existing cucurbits as possible. Planting resistant varieties is the primary means of controlling viruses vectored by aphids. Where feasible, reflective mulches may repel aphids. Direct seeding through the foil is recommended for maximum protection.
Regional Differences: None.
Biological Control Practices: None.
Post-Harvest Control Practices: None.
Chemical Controls: See "Cucumber Beetle" section above for pesticide use patterns.
Use in IPM Programs: As-needed use of insecticides is consistent with Cornell IPM recommendations. A scouting protocol and economic thresholds have been established.
Use in Resistance Management: None reported.
Alternatives: Pymetrozine (Fulfill; Novartis) is a new aphicide that may be an effective alternative.

4. Squash bug (*Anasa tristis*)

Frequency of Occurrence: Frequently found, but not always at economically significant levels.
Damage Caused: Leaves fed upon by squash bugs first develop small specks, which turn yellow and later brown, vines will wilt from the point of the attack to the end of the vine, and affected parts become black and crisp. Small plants can be killed by squash bug feeding. Adult squash bugs live on the underside of leaves and are difficult to kill. These bugs also feed directly on developing fruit.
% Acres Affected: 100% at risk of infestation, but typically 1-20% affected per year.
Pest Life Cycles: Adults are flat, grayish or yellowish brown, about 5/8 inch in length. Eggs are reddish orange and laid in clusters on the upper leaf surface. Nymphs are pale green, and darken as they mature. Young nymphs feed in clusters. Adults and nymphs feed on leaves and stems, and directly on developing fruit. Adults overwinter in crop debris and other sheltered places.
Timing of Control: Beginning when plants develop runners, through harvest.
Yield Losses: Up to 20% in severely affected fields.
Cultural Control Practices: None.
Regional Differences: None.
Biological Control Practices: Naturally-occurring predators, parasitoids, and pathogens help suppress infestations. A tachinid fly parasitoid is very common.
Post-Harvest Control Practices: Removal or thorough destruction of crop debris and other field trash will remove overwintering shelter. Deep tillage will bury and kill overwintering adults.
Other Issues: None.
Chemical Controls: See "Cucumber Beetle" section for pesticied use patterns.
Use in IPM Programs: As-needed use of insecticides is consistent with Cornell IPM recommendations. Scouting thresholds have been established.
Use in Resistance Management: None reported.

5. Symphylans (*Scutigerella immaculata*)

Growers in certain areas in western NY have a continuing problem with garden symphylans, a soil-dwelling arthropod. Symphylans are small, white, centipede-like creatures. Little is known about the biology of this pest. No insecticides are currently labeled for its control, and no cultural practices are known to be effective.

IV. Pest Information: Diseases

1. Powdery mildew (*Sphaerotheca fuliginea*)

Frequency of Occurrence: Occurs annually throughout the state, but usually at low levels.

Damage Caused: The fungus on the foliage and young stems first appears as white talcum-like spots of fungal growth on the plant surfaces. Later the spots turn brown and dry, and plants may appear stunted. Fruit may be sunburned because of the loss of foliage. Left untreated, plants infected early tend to produce smaller fruit.

% Acres Affected: 100% at risk; up to 10% affected.

Pest Life Cycles: The causal fungus can be introduced by wind from areas with relatively warm winters where the fungus overwinters. A white talcum-like growth appears on the foliage after infection. Periods of high temperatures favor disease development.

Timing of Control: from fruit initiation to end of season

Yield Losses: up to 75% in severely affected fields.

Cultural Control Practices: Most commercial varieties of cucumbers are resistant.

Regional Differences: None.

Biological Control Practices: None.

Post-Harvest Control Practices: None.

Other Issues: Research on chemical and non-chemical strategies for managing powdery mildew is ongoing (Zitter; McGrath) and includes screening of new fungicides for efficacy and crop tolerance.

Foliar Fungicides for Cucumber Disease Control:

Pesticide	Disease[1]	% Trt.	Typical Rates lbs ai/acre	Timing	# of Appl.	PHI days	REI hours
benomyl *(Benlate)*	An, GSB, PM, U	1-5	0.125	fruitset through harvest	1-2	1	24
chlorothalonil *(Bravo)*	An, BR, DM, GSB, PM, U	65-70	1.5	fruitset through harvest	2	1	48
thiophanate-methyl *(Topsin-M)*	An, GSB, PM	1-3	0.175-0.35	fruitset through harvest	1	1	12
maneb *(Maneb)*	An, GSB, U	<1	0.75-1.5	fruitset through harvest	1	5	24
mancozeb *(Dithane)*	An, GSB, U	5-10	1.5	fruitset through harvest	1	5	24
copper compounds	ALS	65-70	varies with formulation	fruitset through harvest	1	1	12
azoxystrobin[2] *(Quadris)*	PM, An GSB, BR	1-5	0.18-0.25	fruitset through harvest	1-2	1	4
triademefon[3] *(Bayleton)*	PM	1-5	0.125	fruitset through harvest	1	1	12
myclobutonil[2] *(Nova)*	PM	1-5	0.125	fruitset through harvest	1-2	1	48

1. Key to diseases: An=Anthracnose; GSB=Gummy stem blight; PM=powdery mildew; U=Ulocladium leaf spot; BR=Belly rot; DM=Downey mildew; ALS=Angular leaf spot.
2. Azoxystrobin is expected to be labeled in NY by the summer of 1999, and myclobutonil by EPA by the end of 1999. They were both available to growers in 1998 through a Section 18 label (except azoxystrobin was not allowed on Long Island); a Section 18 request has been filed for myclobutonil use in 1999.
3. Use is being cancelled by manufacturer. Existing stocks may be used.

Use in IPM Programs: Cornell IPM recommendations call for the use of fungicides on a 7-10 day schedule beginning when powdery mildew or gummy stem blight is first found in the field. Because control hinges upon getting fungicide on the underside of the leaves and on the lower leaves, it is recommended to use a systemic fungicide in combination with a contact fungicide (chlorothalonil or fixed copper) and to maximize spray coverage.

Use in Resistance Management: Pathogen strains have become resistant to triademeton (no longer used) and benomyl or thiophanate-methyl, and therefore it is recommended to alternate fungicides during the season.

Alternatives: Recent registration of azoxystrobin (in all of NY except Long Island) and myclobutonil provide very useful tools in controlling this disease and in managing resistance. Cyprodinil (Vangard) and trifloxystrobil (Flint), new fungicides from Novartis, may also be good alternatives for powdery mildew control.

2. Bacterial wilt (*Erwinia tracheiphila*)

SEE ALSO DISCUSSION UNDER CUCUMBER BEETLES

Frequency of Occurrence: Annually

Damage Caused: This bacterium is xylem-limited but becomes systemic in these tissues throughout the plant. Wilting of the plant is the general symptom, since bacterial multiplication causes plugging of the xylem elements. Symptoms also consist of interveinal chlorosis and marginal necrosis of the leaves, with the leaves eventually becoming totally brown (frosted) and standing upright. Internodes may be stunted and leaves take on a "tufted" appearance, because they are underdeveloped. Pumpkin plants may survive initial infection, but are stunted and produce underdeveloped and unmarketable fruit.

% Acres Affected: 100% at risk; up to 20% affected per year.

Pest Life Cycles: Survives in the body of the adult cucumber beetle (primarily the striped). Perennial weeds apparently do not serve as host reservoirs of the bacterium. Therefore beetle control is the only current method of control. The bacterium is not seedborne.

Timing of Control: Early (emergence) to midseason.

Yield Losses: Up to 100% in severely affected fields.

Cultural Control Practices: See comments under Cucumber beetles.

Regional Differences: None.

Biological Control Practices: Greenhouse studies on pumpkins at Cornell (Zitter) established the efficacy of Messenger (Eden Bioscience product), which has systemic acquired resistance properties, as a deterrent to beetle feeding and injury. Additional tests are under way to determine if Messenger (also called harpin, under license from Cornell) could have a direct effect on the bacterium. Registration of this product by EPA is pending.

Post-Harvest Control Practices: See "Cucumber Beetle" section above.

Chemical Controls: See "Cucumber Beetle" section above. Disease control is obtained through controlling the insect vector. No pesticides are effective in controlling the disease directly.

3. Gummy stem blight/Black rot (*Didymella bryoniae* and *Phoma cucurbitacearum*)

Frequency of Occurrence: Usually found in growing regions.

Damage Caused: Gummy stem blight refers to the foliar and stem-infecting phase of the disease, and black rot to the fruit rot phase. Gummy stem blight causes leaf and stem necrosis and tissue death. Infected fruit rot either in the field or after harvest.

% Acres Affected: 100% at risk; up to 20% affected per year.

Pest Life Cycles: The gummy stem blight fungus is both seed- and soil-borne. The pathogen may be carried in or on infected seed. In the absence of host plants, the fungus can overwinter for a year and a half or more on infected crop residue. Infection occurs when temperatures are warm and moisture is available. Wounding, insect damage, and powdery mildew infection predispose plants to infection with gummy stem blight. Cucumbers are less susceptible than some other cucurbits.

Timing of Control: Mid-July through season.
Yield Losses: 100% at risk; can be up to 25% in severely affected areas.
Cultural Control Practices: Two year crop rotation away from cucurbits. Use disease-free seed treated with fungicide. Some tolerant varieties are available. Avoid injury to the fruit at harvest.
Regional Differences: None.
Biological Control Practices: None.
Post-Harvest Control Practices: Destroy crop debris after harvest to remove this source of inoculum.
Other Issues: Research on gummy stem blight and other foliar diseases of cucurbits is ongoing in NY (Zitter).
Chemical Controls: See table in "Powdery Mildew" section, above, for pesticide use patterns of labeled fungicides. In addition, seed treatment with thiram (see "Soilborne Diseases and Seed Decay" section, below) provides some protection against the seed-borne phase of this disease.
Use in IPM Management: Use of fungicides is consistent with Cornell IPM recommendations.
Use in Resistance Management: Gummy stem blight isolates from NY have been identified as being resistant to both benomyl and thiophanate-methyl, and it is recommended to use these products in combination with a protectant fungicide (chlorothalonil). Resistance is more widespread for thiophanate-methyl.
Alternatives: Recent registration of azoxystrobin by the EPA provides a very useful tool in controlling this disease. Trifloxystrobin (Flint), a new fungicide from Novartis, may also be an effective alternative.

4. Anthracnose (*Colletotrichum orgiculare*)

Frequency of Occurrence: Can be found most years in at least some part of the state.
Damage Caused: Symptoms on leaves begin as water soaked spots. These become circular, tan areas which expand into characteristic brown spots with light centers. Infected petioles can become girdled. Infected fruit develop circular, sunken, watersoaked areas, which can ooze under humid conditions.
% Acres Affected: 100% at risk of infection; up to 15% affected per year.
Pest Life Cycles: The fungus survives from one season to the next on infected plant tissue and may survive up to two years in the absence of a host. Spread of the disease can occur by slplashing rain, irrigation water, insects, workers, or equipment. Disease development is favored by warm, humid weather. The fungus can be seedborne as well.
Timing of Control: During warm, most seasons.
Yield Losses: Can be up to 50% in severely affected fields.
Cultural Control Practices: Resistant varieties should be used whenever possible. Use a minimum of two year rotation with unrelated crops. Use commercially-produced, disease-free seed.
Regional Differences: None.
Biological Control Practices: None.
Post-Harvest Control Practices: Crop debris should be destroyed as soon as possible to remove this source of disease for other plantings and to initiate decomposition.
Chemical Controls: See "Powdery Mildew" section, above.

5. Downy mildew (*Pseudoperonospora cubensis*)

Frequency of Occurrence: Sporadic but can spread quickly.
Damage Caused: This fungus causes heavy blighting of the leaves. Severe infection results in defoliation, stunted plants and poor fruit development.
% Acres Affected: 100% at risk of infection; usually up to 10% of acreage affected per year.
Pest Life Cycles: Like powdery mildew, the causal fungus overwinters in areas with mild winters and is carried by wind to other areas. Periods of moist weather favor disease development.
Timing of Control: Mid-July to end of season.
Yield Losses: Up to 50% in severely affected areas.
Cultural Control Practices: None.

Regional Differences: This disease is much more prevalent in eastern growing areas of the state, and is less common in central and western counties.
Biological Control Practices: None.
Post-Harvest Control Practices: None.
Other Issues: None.
Chemical Controls/Use in IPM Programs: See "Powdery Mildew" section, above, for pesticide use information.
Use in Resistance Management: None reported.
Alternatives: Trifloxystrobin (Flint), a new fungicide from Novartis, may be an effective alternative.

6. Angular Leaf Spot (*Pseudomonas syringae* pv. *lachrymans*)

Frequency of Occurrence: Sporadic
Damage Caused: Leaf lesions caused by this disease turn necrotic, and the centers fall out, leaving a tattered appearance. Infections of stems, petioles and fruits develop watersoaded spots which enlarge and become covered with a white crust. Infection of young fruit may result in curved or deformed fruit later. Secondary soft rots usually develop on infected fruit.
% Acres Affected: 50% at risk of infection; typically between 1-2% of acreage affected in any given year.
Pest Life Cycles: This bacterial pathogen survives on crop debris and is also seed-borne.
Timing of Control: At planting.
Yield Losses: Up to 50% in severely affected fields. More typical losses are 1-10%.
Cultural Control Practices: This disease is managed in cucumbers primarily through the use of resistant varieties.
Regional Differences: None.
Biological Control Practices: None.
Post-Harvest Control Practices: Crop debris should be destroyed after harvest.
Chemical Controls: See "Powdery Mildew" section, above.

7. Belly Rot (*Rhizoctionia solani*)

Frequency of Occurrence: Can be found in most growing areas in most years.
Damage Caused: Symptoms occur on fruit surface in contact with soil. Water-soaked decay turns from tan to dark brown. Small cracks may occur in rotted areas. Infected fruit are unmarketable.
% Acres Affected: 100% at risk of infection. Typically 10-50% of acreage actually affected per year.
Pest Life Cycles: The fungus causing belly rot (Rhizoctonia solani) is a very common soil fungus with a very wide host range. Belly rot is tranmitted rapidly at high temperature and humidity.
Timing of Control: when vines begin to run.
Yield Losses: up to 50% in cases of severe infection.
Cultural Control Practices: No resistant varieties are available. Because of the ubiquitous nature of the fungus, rotation does not eliminate the potential for disease occurance. Avoid soils that do not drain quickly.
Regional Differences: None.
Biological Control Practices: None.
Post-Harvest Control Practices: Leave infected crop debris in the field.
Chemical Controls: See "Powdery Mildew" section, above.

8. Ulocladium Leaf Spot (*Ulocladium cucurbitae*)

Frequency of Occurrence: Can be found in most growing areas in most years.
Damage Caused: Leaves develop spots with beige centers and brown rings. Lesions may also occur on the stems, but no fruit lesions occur. Leaf spotting weakens and stunts the plant, decreasing fruit set and yield.
% Acres Affected: 100% at risk of infection. Typically 10-50% of acreage actually affected per year.
Pest Life Cycles: The fungus causing this disease is only observed on cucumber foliage. It overwinters in infected crop debris.
Timing of Control: when vines begin to run.

Yield Losses: up to 30% in cases of severe infection.
Cultural Control Practices: Resistant varieties are beginning to become available. Minimum two year rotation out of cucumbers.
Regional Differences: Mostly found in central and western NY.
Biological Control Practices: None.
Post-Harvest Control Practices: Crop debris should be plowed under in the fall to aid decomposition.
Chemical Controls: See "Powdery Mildew" section, above.

9. Soilborne Diseases and Seed Decay (*many types*)

Many seedborne and soilborne fungi can cause early seedling death. This can occur early in the season as damping-off or later as stem cankers. Seed treatments are the most cost-effective method of control. Cultural practices that also aid in disease management include selecting well-drained fields, and avoiding planting into cool wet soils.

Chemical Controls:

Pesticide	% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI days	REI hours
captan *(Captan)*	90-95	commercial seed treatment or planter-box	label rates	before planting	1	45	--
thiram *(Thiram)*	70-75	commercial seed treatment	label rates	before planting	1	45	--
mefenoxam[1] *(Ridomil Gold)*	<1	soil	1-2 pts product/acre	at planting	1	40	48

1. Also used to control cottony leak disease of cucumber fruit caused by *Pythium* spp.

10. Viruses (*four principal*)

A number of viruses infect cucumbers, including cucumber mosaic virus, watermelon mosaic virus, papaya ringspot virus, and zucchini yellow mosaic virus. All are transmitted by aphids in a nonpersistent manner. (Squash mosaic virus is beetle-transmitted, seedborne, and is principally a problem for melon and some squash varieties). These viruses cause mosaic, distorted growth, stunting, distortions in leaf coloration, and small, misshapen and poorly-colored pumpkin fruit. No pesticides are available to control viruses; controlling the aphid vectors with insecticides is usually ineffective for controlling virus spread. Growers rely on the following cultural control practices: choosing resistant varieties when possible, choosing tolerant varieties, isolating late plantings from early plantings, use of specialized reflective mulches, weed control, and the use of row covers. These have limited value because of the spreading nature of most cucumber vines.

V. Pest Information: Weeds

1. Annual Broadleaves and Grasses

Frequency of Occurrence: Annually.
Damage Caused: Reduced yields from weed competition, and loss of efficiency in harvesting. Weeds can interfere with pesticide applications.
% Acres Affected: 100%
Pest Life Cycles: Annual and perennial weeds such as ragweed, lambsquarters, redroot pigweed,

nightshade species, Galinsoga, yellow nutsedge, annual and perennial grasses, mustards, and others, are a problem throughout the growing season.

Timing of Control: Preplant, preemergence, and postemergence.

Yield Losses: As high as 100% in severely infested fields.

Regional Differences: None.

Cultural Control Practices: Due to very few herbicides being registered on cucumbers, and their narrow weed control spectra, cultivation is necessary for cucumber production in NY. In addition, growers frequently rely on expensive hand weeding (hoe crews) to clean up weed escapes.

Regional Differences: Weed species spectra may vary regionally, but weeds are a major pest throughout the state.

Biological Control Practices: None.

Post-Harvest Control Practices: Cultivation. Post-harvest application of herbicides to control perennial weeds.

Chemical Controls:

Pesticide	% Trt.	Type of Appl.	Typical Rates lbs ai/acre	Timing	# of Appl.	PHI days	REI hours
DCPA[1] *(Dacthal)*	<1	soil surface	6.0	preemerge or postemerge	1	35	12
paraquat *(Gramoxone)*	5-10	soil surface	1.0	preplant	1	45	12
bensulide *(Prefar)*	1-2	soil surface or incorporated	--	preplant or preemerge	1	45	?
naptalam *(Alanap)*	1-5	soil surface	4.0	preemerge or postemerge	1	35	?
ethalfluralin[2] *(Curbit)*	30-40	soil surface	1.125	preemerge or banded postemerge	1	40	12
glyphosate *(Roundup)*	10-15	soil surface	1.0	preplant	1	45	4
sethoxydim *(Poast)*	1-5	soil surface	0.28	postemerge	1	14	12
trifluralin *(Treflan)*	1-5	soil incorporated; between rows	0.75	postemerge	1	30	12

1. Manufacturer has discontinued production. Existing stocks may be used.

2. May be applied to seeded crops no later than 2 days after planting or banded between rows after corp emergence or transplanting. This is an SLN registration.

Efficacy Issues: DCPA and bensulide are effective on annual grasses and most broadleaves. Ethalfluralin is effective on annual grasses. Glyphosate and paraquat are broad spectrum, and are used with the stale seedbed technique. The industry is in great need of more weed control options such as bentazon for this economically important crop.

Alternatives: Research has indicated that bentazon (Basagran) can be a very effective postemergence herbicide for cucumbers, but the manufacturer is not interested in pursuing a label for cucurbits. IR-4 is conducting residue trials on methoxyfenozide in 1999; efficacy trials need to be conducted.

VI. State Contacts

Dr. Tom Zitter
Dept. Plant Pathology
Cornell University
Ithaca, NY 14850
607-255-7857
taz1@cornell.edu

Dr. Margaret McGrath
Cornell University
Long Island Horticulture Research Laboratory
Riverhead, NY
516-727-3595
mtm3@cornell.edu

Carol MacNeil
Cornell Cooperative Extension
480 N. Main Street
Canandaigua, NY 14424
716-394-3977
crm6@cornell.edu

Dale Moyer
Extension Educator
Suffolk County CCE
246 Griffing Ave
Riverhead, NY 11901
516-727-7850
ddm4@cornell.edu

Dr. Robin Bellinder
Dept. Fruit and Vegetable Sciences
Cornell University
Ithaca, NY 14853
607-255-7890
rrb3@cornell.edu

Dr. Michael Hoffmann
Dept. Entomology
Cornell University
Ithaca, NY 14853
607-255-1327
mph3@cornell.edu

Dr. Mike Orfanedes
Extension Specialist
Cornell Cooperative Extension
21 South Grove St. Suite 240
East Aurora, NY 14052
716-652-5400 x139
mso3@cornell.edu

VII. References

1. *The 1997 Census of Agriculture.* US Department of Commerce, Bureau of the Census. February 1998. http://www.nass.usda.gov/census/census97

2. *Pest Management Recommendations for Commercial Vegetable and Potato Production, 1999.* Cornell Cooperative Extension, Cornell University.

3. *Vegetable Production Handbook.* 1994. Cornell Cooperative Extension, Cornell University.

4. *New York Agricultural Statistics. 1996-1997.* New York Agricultural Statistics Service, New York State Department of Agriculture and Markets, and USDA NASS.

5. *Agricultural Chemical Usage—Vegetables. 1996.* National Agricultural Statistics Service, Economic Research Service, USDA.

6. *Cucmbers in Ohio.* 1998. USDA Office of Pest Management Policy Crop Profile. http://ipmwww.ncsu.edu/opmppiap/proindex.htm

7. Information for and review of this Crop Profile were provided by producers, consultants, researchers and Extension Educators. Pesticide use information was gathered through a survey of twenty-five cucumber growers in the state.