Crop Profile for Beets in New York

Prepared: January, 1999

General Production Information

NY produces 2700 acres of beets annually, virtually all for processing. Root rot, pocket rot, damping-off and seed rots, caused by Rhizoctonia, Pythium, Phoma and other fungi, are serious diseases of beets. Control of annual and perennial weeds is another significant pest management challenge. Insect damage to beets is not usually an economic problem. Without the registration of new, effective materials to replace them, the loss of thiram, captan, and mefenoxam (all as seed treatments); cycloate and pyrazon preplant herbicides; and the postemergence carbamate herbicides phenmedipham and desmedipham would have significant impacts on production and profitability.

Basic Commodity Information

- **State Rank:** 2
- **% U.S. Production:** 34%
- **Acres Planted:** 2700
- **Acres Harvested:** 2700
- **Cash Value:** $2,620,000
- **Yearly Production Costs:** $860 (estimated)

Production Regions

Beets are grown primarily in the Finger Lakes (Wayne, Ontario and Yates counties) and Lake Plains regions (Genesee and Orleans counties).

Cultural Practices

Well drained, sandy loam to silt loam soil is preferred for best growth and quality. A soil with good physical structure is highly recommended. Beets are planted on 15 or 24 inch rows, primarily in May and June. Seeding rates are 15-25 lbs/acre for processing beets and 8-10 lbs/acre for fresh market. Overhead irrigation is sometimes used if dry conditions exist during root enlargement. A fresh market crop is usually harvested in 60-85 days. The processing crop is harvested at 90-110 days, but may be held in the field much longer as needed. Processing beets are usually harvested until mid-November. Yields for fresh market beets range from 8-12 tons/acre and 15-20 tons/acre for processing. Processing beets are mechanically harvested; fresh market beets are hand harvested and are often marketed in bunches with the tops remaining. Topped beets can be stored for several months at temperatures near 32º F and high humidity.

Commodity Destination(s)

- Processing: 95%
- Fresh Market: 5%

Insect Pests

1. Spinach Leafminer (*Pegomya hyoscyami*)

- **Frequency of Occurrence:** Sporadic.
- **Damage Caused:** Larvae bore into the leaves producing characteristic slender, winding mines and blister-like blotches on the leaves.
- **% Acres Affected:** 1%
- **Pest Life Cycles:** Overwintering adults emerge in late May and early June and lay small clusters of eggs on the undersides of leaves. Newly hatched larvae bore into leaves.
- **Timing of Control:** From emergence through harvest.
- **Yield Losses:** Usually minimal, except in high infestations of fresh market crops. Only a pest if infested leaves are to be harvested or if beets are to be sold in bunches. Infestations do not reduce yields, or cause any damage to beets grown for their roots.
- **Regional Differences:** None.
- **Cultural Control Practices:** Destruction of weed hosts and crop rotation can help reduce risk of infestation. The use of protective crop screens or covers can prevent infestation. No resistant varieties are available.
- **Regional Differences:** None.
- **Biological Control Practices:** None
- **Chemical Controls:**

diazinon

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
<1	foliar, ground	.25-.5 lbs ai/acre	As needed	1	14 days	24 hours

- **Alternatives:** Unknown.

Diseases

1. Cercospora Leaf Spot (*Cercospora beticola*)

- **Type of Pest:** Fungus
- **Frequency of Occurrence:** Disease can be found during all but the driest seasons, but usually not at economically damaging levels. There is a lower tolerance for fresh market beets due to the cosmetic damage to the leaves.
- **Damage Caused:** Leaves become covered with brown lesions surrounded by purple halos approximately 1/8 inch in diameter. As the lesion matures, the center becomes gray and brittle. Severe infections can stunt plant growth and decrease yields.

- **% Acres Affected:** 75%
- **Pest Life Cycles:** The disease is most prevalent in mid-season when daytime temperatures are 75-80º and long periods of high humidity. Weed species belonging to the Chenopodiaceae family can act as a source of inoculum.
- **Timing of Control:** Mid-season through harvest.
- **Yield Losses:** Usually minimal, except in high infestations of fresh market crops. Severe infestations can result in harvest losses in processing crops.
- **Cultural Control Practices:** Two-year rotation with nonhost crops; selecting fields with good air movement and drainage; increasing nitrogen fertilizer applications to promote faster leaf regrowth.
- **Regional Differences:** None.
- **Biological Control Practices:** No resistant varieties are currently available.
- **Post-Harvest Control Practices:** Crop debris should be destroyed to remove inoculum source.
- **Chemical Controls:**

fixed copper compounds

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
<5	foliar, ground	Varies with formulation and manufacturer.	Copper may be applied if prolonged cool wet weather causes severe infections.	1	14 days	24 hours

- **Use in IPM Programs: Use on an as needed basis is consistent with Cornell IPM recommendations.**
- **Efficacy Issues: Copper applications can be effective in slowing the spread of infection, but will not provide complete control. A new, effective fungicide is needed to provide commercially acceptable levels of control when outbreaks occur.**
- **Use in Resistance Management: No resistance has been reported.**
- **Alternatives: Potential alternatives for foliar application include tebuconazole (currently in IR-4 schedule), azoxystrobin, myclobutanil, propionazole, fenbuconazole, and kresoxim-methyl.**
- **Other Issues: Research is currently being conducted on efficacy of materials listed in AAlternatives@ section under NY conditions (Abawi).**

2. Pocket Rot (*Rhizoctonia solani* and its sexual stage *Thanatephorus cucumeris*)

- **Type of Pest: Fungus**
- **Frequency of Occurrence: The disease is usually found in all but the driest seasons.**
- **Damage Caused: Pocket rot is characterized by black cankers on the lower petioles and the crown area as well as dry, black-rotted portions of the fleshy beets. Lesions may also be found on leaves. With favorable conditions, infections progress from plant to plant, resulting in open areas (pockets) of various length in a row.**

- **% Acres Affected: 100%**
- **Pest Life Cycles: The pathogen survives in the soil and on infected crop debris, and has a wide host range.**
- **Timing of Control: At planting to control seedling infections; and close to the first cultivation to control crown and foliar infections.**
- **Yield Losses: Can be as high as 75% in severely affected fields.**
- **Regional Differences: None**
- **Cultural Control Practices: Rotate with non-host plants for a minimum of two years. Avoid rotation with legumes. Select sites that are well drained and have good soil structure. Minimize throwing soil on crown tissues during cultivation. No resistant varieties are available.**
- **Biological Control Practices: None**
- **Post-Harvest Control Practices: Plowing under infected crop debris to remove inoculum is a useful practice.**
- **Chemical Controls: None available at this time.**
- **Efficacy Issues: Seed treatments will only reduce seed and seedling infections by Rhizoctonia, thus reducing inoculum for pocket rot. The industry has a critical need for getting one or more new, effective fungicides registered to control this disease, beyond what can be done with the use of seed treatments.**
- **Alternatives: Potential alternatives include foliar applications of azoxystrobin, tebuconazole (currently in IR-4 schedule), and kresoxim-methyl. Maxim (fludioxonil) seed treatment will also help control this disease.**
- **Other Issues: Research is currently being conducted on efficacy of materials listed in "Alternatives" section under NY conditions (Abawi).**

3. Seed Rot, Damping-off, and Root Rot (*Pythium ultimum*, *Rhizoctonia solani*, and others)

- **Type of Pest: Fungus**
- **Frequency of Occurrence: The disease is usually found in all but the driest seasons.**
- **Damage Caused: Poor emergence, uneven growth, dead seedlings, wire-stem symptoms, and reddish discoloration of aboveground plant parts appear in patches and low spots. Infected plants develop abnormal, fleshy roots with constrictions and rotted areas of various shapes and sizes.**
- **% Acres Affected: 100%**
- **Pest Life Cycles: This disease complex is primarily caused by *Pythium ultimum and Rhizoctonia solani*, however *Aphanomyces cochlioides* and *Phoma betae* can also be involved. These are all soil-borne fungal pathogens, which survive in soils and on infected crop debris. Pythium and Rhizoctonia have a wide host range.**
- **Timing of Control: Pre-treatment of seeds prior to planting is critical for control.**
- **Yield Losses: Can be up to 75% in severely affected fields. The tolerance for root rot infected beets at the processing plant is currently 4%.**
- **Cultural Control Practices: Minimum two-year rotation away from all host crops including many commonly grown vegetables. Chose sites that are well drained and with good soil structure and minimum soil compaction. No resistant varieties are currently available.**

- **Regional Differences: None**
- **Biological Control Practices: None**
- **Post-Harvest Control Practices: Plow under infected crop debris.**
- **Chemical Controls:**

mefenoxam

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
100	seed treatment	0.25 oz ai/cwt seed; or 0.05 oz ai/acre	before planting	1	60 days	NA hours

thiram

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
100	seed	4 oz ai/cwt seed; or 0.8 oz ai/acre	before planting	1	60 days	NA hours

captan

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
<5	seed treatment	1.3 oz ai/cwt seed; or 0.3 oz ai/acre	before planting	1	60 days	NA hours

- **Use in IPM Programs: IPM recommendations call for use of commercially treated seed.**
- **Efficacy Issues: Beets cannot be grown commercially in NY without the use of combination seed treatments, such as mefenoxam and thiram. Mefenoxam is highly effective against Pythium; thiram is effective against Phoma. None of the three have much activity on Rhizoctonia. The industry has a critical need for getting one or more new, effective fungicides registered to control these diseases, beyond what can be done with the use of seed treatments.**
- **Use in Resistance Management: No resistance has been reported.**
- **Alternatives: Because it is effective on Rhizoctonia, Maxim (fludioxonil) could be a very useful alternative. However, its efficacy on Phoma is unknown. Azoxystrobin used as a foliar application may also help control these diseases. T-22 (*Trichoderma harzianum*) has been shown to have some efficacy, but not at a commercially acceptable level when used alone.**
- **Other Issues: Research is currently being conducted on efficacy of most of the materials listed in "Alternatives" section under NY conditions (Abawi).**

4. Sugar Beet Cyst Nematode

- **Type of Pest: Nematode**
- **Frequency of Occurrence: Sporadic, but difficult to monitor. Improved rotation practices have made this a minor pest compared to fifteen years ago.**
- **Damage Caused: Infected plants are stunted, wilt at mid-day, and produce small beets.**
- **% Acres Affected: <1%**
- **Pest Life Cycles: The sugar beet cyst nematode is a soil dwelling plant pathogenic nematode that attacks a number of vegetable crops. The eggs are enclosed in brown, leathery, lemon-shaped cysts, 1/40 inch in length. When first evident on the root surface, females are white or cream colored.**
- **Timing of Control: Before planting.**
- **Yield Losses: Usually minimal.**
- **Cultural Control Practices: Beets should be rotated with nonhost crops for a minimum of four years to control this nematode. Plants in the Chenopodiaceae (spinach and lambsquarters) and Brassicaceae (crucifers) are hosts and should not be planted in the rotation.**
- **Regional Differences: None**
- **Biological Control Practices: No resistant varieties are available.**
- **Post-Harvest Control Practices: Crop debris from infested plants should be destroyed as soon as possible after harvest.**
- **Chemical Controls:**

fenamiphos

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
<1	in furrow drench	3 lbs ai/acre	at planting	1	60+ days	48 hours

- **Use in Resistance Management: No resistance has been reported.**
- **Alternatives: Certain strains of cruciferous cover crops, when incorporated into the soil still green, have been shown to lower cyst nematode populations in Europe. Has not been tested in NY.**

Weeds

1. Broadleaf and Grass Weeds

- **Frequency of Occurrence: Annually.**
- **Damage Caused: Reduced yields from weed competition, and loss due to interference with harvesting equipment.**
- **% Acres Affected: 100%**
- **Pest Life Cycles: Common lambsquarters, redroot pigweed, common ragweed and velvetleaf are predominant**

weed species, according to a recent survey of NY beet fields. Additional species that are control problems include hairy galinsoga, mustard spp., yellow nutsedge and nightshade spp.

- **Timing of Control: Preplant, pre-emerge, and postemergence. Herbicide efficacy is determined by timely precipitation for activation of the primary broadleaf herbicide, Pyramin. In 1998, this occurred in approximately 60% of fields. The number and timeliness of subsequent cultivations and applications of postemergence herbicides determines the final weediness of fields and yield reductions.**
- **Yield Losses: Average yield reduction due to weed competition was 13% (ranging from 0 to 65%) as measured in a 1998 study. This represents a dollar loss of approximately $150/acre. Weed control costs are estimated to be $100/ acre, and represent 12% of the total cost of production.**
- **Cultural Control Practices: Cultivation is useful in beet weed control, and most fields are cultivated two or three times during the growing season. Before harvesting a field, growers first mow weedy fields to the height of the beet tops to facilitate harvest.**
- **Regional Differences: None.**
- **Biological Control Practices: None.**
- **Post-Harvest Control Practices: Cultivation and post-harvest application of herbicides to control perennial weeds.**
- **Chemical Controls:**

cycloate

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
99	ground	3.75 lbs ai/acre	preplant incorporated	1	110 days	12 hours

- **Use in IPM Programs: Use is consistent with Cornell IPM recommendations.**

pyrazon

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
95	ground, banded	1 lb ai/acre*****	Banded at planting. A postemergence rescue treatment may be used after beets have at least two true leaves.	1	110+ days	12 hours

- ***calculated on a *per crop acre* basis. Growers apply pyrazon in a band 7-10 inches wide over beet rows (15 or 24 inch row spacing). Calculated on the basis of *treated acres*, the typical rates range from 3.2-3.7 lb ai/acre.**
- **Use in IPM Programs: Use is consistent with Cornell IPM recommendations.**
- **Efficacy Issues: Efficacy is notoriously moisture dependent.**

phenmedipham

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
9	ground	0.5 lb ai/acre	Postemergence, when weeds have fewer than two true leaves and beets have 4-6 true leaves.	1	60 days	24 hours

- **Use in IPM Programs: Postemergence application supports the use of scouting and as-needed treatments. 2 (ee) recommendations are in place for the use of phenmedipham at lower rates (0.25 and 0.38 lb ai/acre) at earlier timings (between cotyledon and four leaf stages) for use in combination with desmedipham.**

desmedipham*

% Trt.	Type of Appl.	Typical Rates	Timing	# of Appl.	PHI	REI
23	ground	0.25-0.5 lb ai/acre	post emergence, banded	1	90 days	24 hours

- ***available under a Section 18 registration**
- **Use in IPM Programs: Postemergence application supports the use of scouting and as-needed treatments.**
- **Alternatives and Other Issues: Research is being conducted on the following potential alternatives (Bellinder):**
    - **Betanex (desmedipham). Available under Section 18 registrations. Residues have been run by IR-4, and registration packet is in preparation.**
    - **Dual Magnum (metolachlor). Not labeled; under research. Some early season injury; beets recovered. Effective against hairy galinsoga, Eastern black nightshade, redroot pigweed, yellow nutsedge, and annual grasses.**
    - **Frontier (dimethenamid). Not labeled; under research. Some early season injury; beets recovered. Effective against hairy galinsoga, Eastern black nightshade, redroot pigweed, yellow nutsedge, and annual grasses.**
    - **Nortron (ethofumasate). Not labeled; under research. Some early injury observed. Residues have been run by IR-4 and registration packet is in preparation.**
    - **Reflex (fomesafen). Not labeled; under research. Significant crop injury but beets recover. Effective on a variety of weeds but does not control lambsquarters.**
    - **Stinger (clopyralid). Not labeled; under research. Significant crop injury but beets may recover. IR-4 is scheduled to conduct residue trials.**

***While sethoxydim herbicide will become available for use in the 1999 season, there is still a need for an herbicide that is effective on perennial grasses such as quackgrass.**

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5. **Bellinder, R. B. 1998. Will Loss of Phenmedipham, Desmedipham, and Cycloate Impact Weed Control in Red Beets? Progress Report submitted to NE-PIAP and NAPIAP. Dept. Fruit and Vegetable Sciences, Cornell University.**

6. **Members of the New York State Table Beet Advisory Committee, comprised of producers, processors, consultants, researchers and Extension Educators, provided detailed information on pesticide use and usage patterns in NY beets. In addition, they provided perspective on industry needs, and reviewed drafts of the Crop Profile.**

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