Crop Profile for Pumpkins in Kentucky

Prepared: September, 2001

General Production Information

Production Statistics

The total acreage in Kentucky was estimated to be approximately 2,000 acres in 1998. The pumpkin production in Kentucky during 1998 was estimated to be valued at US $2,800,000. Pumpkins are marketed on a wholesale and retail basis.

Production Regions

Pumpkin production generally occurs on small farms scattered across the state. The map below indicates the commercial pumpkin acreage by county reported for USDA 1997 Ag. Census and listed 1998 by the Purdue University Center for New Crops and Plant Products. Pumpkin acreage varies considerably from year to year because the crop can be grown almost anywhere with only a small capital investment.
Cultural Practices

Crop rotation is an important consideration when growing pumpkins as with any vegetable crop. Most problems with pumpkins are caused by diseases that affect foliage and fruit. Disease control must start before planting. Land should be selected that has not been in pumpkins, other vine crops, peppers or tomatoes for at least three years. All of these crops are susceptible to some of the same diseases. Also be aware of the possibility of herbicide carry over from the previous crop. Sites with good air and water drainage also help reduce potential disease problems. Poorly drained, heavy soils or hardpan soils should be avoided. Sandy loam or clay loam soils, high in organic matter are very desirable. Prepare a good seed bed by plowing deep. Avoid plowing when soil is too wet, which may result in a very cloddy condition and soil compaction. Weed control is more difficult in cloddy soil.

Pumpkins are a warm season crop and do not do well until soil and air temperatures are above 60°F. The days to harvest to determine when to plant pumpkins for Halloween. It is usually best to aim for a mid to late September harvest date. Varieties maturing in 90-95 days should not be planted until early to mid June. Varieties that take 100 to 115 days to mature should be planted between late-May and early June. If planted too early pumpkins may rot before Halloween.

Pumpkin seeds are planted one to two inches deep. Some growers have successfully grown pumpkins using a no-till system by seeding into stubble of a rye or rye-legume cover crop that has been killed with a herbicide. This can eliminate the need for washing pumpkins prior to marketing and may reduce fruit rots.

A source of supplemental water is beneficial for increasing yields most years in Kentucky. There will usually be a period of two to four weeks when plants are stressed from lack of adequate moisture. One to two inches of water each week during these droughty periods is very beneficial in increasing overall yields and fruit size.

It may be necessary to harvest and hold pumpkins in storage for two to four weeks before they are marketed. Tobacco
barns are usually a good place for storage. Pumpkins should not be stored on bare ground after harvest; therefore, spread out a layer of dry straw or hay and set the pumpkins on this. Keep the pumpkins dry. Good air circulation will help reduce rotting. Pumpkins should be harvested and stored before temperatures drop to the 30’s and 40’s.

Recommended Pumpkin Varieties

**Large size (20 lb range)**

- Appalachian
- Big Autumn
- Gold Standard
- Pro Gold 500
- Pro Gold 510
- Jackpot
- Gold Strike
- Magic Lantern
- Merlin
- Howden’s Field
- Gold Rush

**Medium size (10 lb range)**

- Lumina
- Spookie

**Small (2 to 4 lb range)**

- Jack Be Little
- Spooktacular
- Baby Boo
- Touch of Autumn
- Baby Bear
- Oz

**Extra Large (exotic type)**

- Atlantic Giant
- Burpee Prize Winner
- Big Moon PVP

Insect Pests

The most common insect problems are cucumber beetles, squash bugs and squash vine borers. If bacterial wilt susceptible cultivars are grown, cucumber beetle control should begin as soon as plants emerge, otherwise control only
when moderate populations are present. Control of squash bugs and vine borers should start when pumpkin vines begin to run and should continue on a regular basis.

**Squash Vine Borer**

*Melitia cucurbitae*

The squash vine borer is a key pest of pumpkins in Kentucky. Unfortunately, it is usually noticed only after it has done its damage. Symptoms appear in mid-summer when a long runner or an entire plant wilts suddenly. Infested vines usually die beyond the point of attack. Sawdust-like frass near the base of the plant is the best evidence of squash vine borer activity. Careful examination will uncover yellow-brown excrement pushed out through the holes on the side of the stem at the point of wilting. If the stem is split open, one to several borers usually are present. The caterpillars reach a length of 1 inch and have a brown head and a cream-colored body.

The adult squash vine borer is a stout dark gray moth with ‘hairy’ red hind legs, opaque front wings and clear hind wings with dark veins. Unlike most moths, they fly about the plants during the daytime, appearing more like a paper wasp than a moth.

The insect overwinters as a full grown larva or a pupa one to two inches below the soil surface. If it has not already done so, the larva pupates in the spring. Adult moths begin to emerge about the time the plants begin to run, and moth flight continues through mid-August.

The small brown eggs, laid individually on leaf stalks and vines, hatch in 7 to 10 days. Newly hatched larvae immediately bore into the stem. Larvae feed for 14 to 30 days before exciting the stem to pupate in the soil. There are 1 to 2 generations per year in Kentucky.
Controls

**Biological:** No effective naturally occurring biological control.

**Cultural:** After harvest is complete, deep tillage or removal of crop residue will help to delay and/or reduce infestation the next spring.

**Monitoring:** The key to squash vine borer management is controlling the borers before they enter the stem. Therefore, they must be controlled on a preventive basis; once inside the vine, insecticidal control is ineffective. Poor timing of sprays is the usual cause of inadequate control. Monitor plants weekly from mid-June through August for initial signs of the borer’s frass at entrance holes in the stems. Very early signs of larval feeding indicate that other eggs will be hatching soon. Use two to three insecticide applications 7 days apart to control newly hatching larvae and continue to monitor for additional activity. A second approach is to initiate a weekly application of an insecticide starting when vines begin to run. Sprays need to penetrate the canopy to cover the vines to be effective.

**Application Alternatives Used in Kentucky:**

- **Ambush 2 E** (permethrin)- Apply as a foliar treatment at 6.4 to 12.8 fl oz per acre to a limit of 102.4 fl oz per acre per season.

- **Asana XL** (esfenvalerate)- Apply as a foliar treatment at 5.8 to 9.6 fl oz per acre to a limit of 48 fl oz per acre per season.

- **Thiodan 3EC** (endosulfan) - Apply as a foliar spray at 1-1/3 to 2-2/3 pint per acre to a limit of 6 applications or 4 qt per acre per season.

- **Pounce 3.2 EC** (permethrin)- Apply as a foliar treatment at 4 to 8 fl oz per acre to a limit of 64 fl oz per acre per season.

- **Sevin 80 WSP** (carbaryl)- Apply as a foliar treatment at 1-1/4 lb per acre to a limit of 6 applications per acre per season. Allow at least 7 days between sprays.

**Squash Bug**

*(Anasa tristis)*

The squash bug is a common pest of pumpkins. While all of the cucurbit crops can be attacked, it shows a preference for squash and pumpkins. This insect can be very difficult to control. Squash bugs damage plants by removing sap,
causing leaves to wilt and collapse. Young plants and infested leaves on older plants may be killed.

Only unmated adults overwinter in Kentucky with flight into fields beginning about the time the plants begin to run. They remove plant sap with their piercing-sucking mouth parts. Soon after beginning to feed. They start laying eggs, primarily on the undersides in the angle between veins. The bronze eggs are football-shaped and lie on their sides in groups of 12 or more. Eggs hatch in one to two weeks. Initially the larvae are dark red with a light green abdomen. Older nymphs are light gray in color with black legs. Young nymphs are gregarious and feed in groups. Nymphs require five to six weeks to mature into adults. Squash bugs spend most of their time around the base and stems of the plants and on the undersides of leaves.

**Controls**

**Biological**: No effective biological control

**Cultural**: After harvest is complete, deep tillage or removal of crop residue will help to delay and/or reduce infestation the next spring.

**Monitoring**: Timing is the key to successful squash bug control. Insecticide sprays should target adults and small nymphs early in the season when the plants are small. It is much more difficult to control large numbers of older nymphs and adults later in the season when the plant canopy is dense. Treat with a recommended insecticide if overwintering adults are causing seedlings to wilt.

Squash bugs may begin to appear in squash and pumpkin fields about the same time vines begin to run. Monitor for squash bug egg masses from prebloom through early flowering. Treat when egg mass numbers exceed an average of one per plant. Make insecticide applications to control young nymphs, they are much easier to control than larger nymphs or adults.

**Application Alternatives Used in Kentucky:**

**Ambush 2 E** (permethrin)- Apply as a foliar treatment at 12.8 fl oz per acre to a limit of 102.4 fl oz per acre per season.

**Asana XL** (esfenvalerate)- Apply as a foliar treatment at 5.8 to 9.6 fl oz per acre to a limit of 48 fl oz per acre per season.

**Thiodan 3EC** (endosulfan) - Apply as a foliar spray at 1-1/3 to 2-2/3 pint per acre to a limit of 6 applications or 4 qt per acre per season.

**Pounce 3.2 EC** (permethrin)- Apply as a foliar treatment at 4 to 8 fl oz per acre to a limit of 64 fl oz per acre per season.

**Sevin 80 WSP** (carbaryl)- Apply as a foliar treatment at 1-1/4 lb per acre to a limit of 6 applications per acre per season. Allow at least 7 days between sprays.

**Cucumber Beetles**

(*Acalymma vittatum, Diabrotica undecimpunctata*)
Striped and spotted cucumber beetles can cause serious losses in pumpkins. Cucumber beetles are a major concern because they vector the pathogen that causes bacterial wilt of cucurbits. While the adults feed mainly on foliage, pollen and flowers, their feeding on pumpkin rinds late in the season may reduce market quality. Larvae of these insects feed on roots and stems, but this damage is minimal compared to the potential losses due to bacterial wilt.

Cucumber beetles overwinter as adults in protected areas near buildings, in fence rows, or wood lots. They become active in mid-spring, when temperatures begin to increase. Currently, there is no good method for predicting when activity will begin. Beetles quickly locate host plants in the spring. The adults feed and females deposit eggs in cracks in the soil at the base of plants. The eggs hatch and the larvae feed on the roots. These larvae will pupate in the soil, later in the summer the next generation of beetles will emerge. These beetles will also feed on pumpkins and overwinter until the next spring.

Transmission of Bacterial Wilt

The bacterium that causes bacterial wilt overwinters in the gut of some of the striped cucumber beetles. When beetles become active in the spring and begin feeding, they spread the bacterium either through their feces or from contaminated mouthparts. Chewing damage on young leaves or cotyledons open entry points for the pathogen. Once inside the plant, the bacterium multiplies quickly in the vascular system, producing blockages that cause the leaves to wilt. Beetles are attracted to infected plants and can pick up the bacterium and move it to healthy plants.

The first symptom of bacterial wilt on cucumber and muskmelon is a distinct flagging of lateral and individual leaves. Beetle feeding is not always obvious on wilted leaves. Soon, adjacent leaves and finally the entire vine will wilt. The wilting spreads as the multiplying bacteria move within the vascular system of the plant. Eventually, the entire plant wilts and dies.

Controls
**Biological**: For the striped cucumber beetle, the tachnid, *Celatoria setosa*, and the braconid, *Syrrhizus diabroticae*, are important natural enemies. The spotted cucumber beetle has the tachnid, *Celatoria diaboticae*, as its substantial predator.

**Cultural**: Plant late on land which has been plowed early in the spring or in the fall and cultivate frequently before planting so that all vegetation has been kept down.

**Chemical**: Begin cucumber beetle control as soon as seedlings emerge. Early treatment is essential. Repeated applications of contact insecticides are necessary to protect plants from beetle feeding and transmission of bacterial wilt. There is usually be a peak in beetle activity each spring that lasts two to four weeks. This is the most important time to control them. Applications of foliar insecticides may be required twice per week during peak beetle activity.

**Application Alternatives Used in Kentucky:**

- **Admire 2F** (imidacloprid) - Applied as a post transplant drench at a rate of 16 to 24 fl oz per acre.

- **Ambush 2 E** (permethrin) - Apply as a foliar treatment at 6.4 to 12.8 fl oz per acre to a limit of 102.4 fl oz per acre per season.

- **Asana XL** (esfenvalerate) - Apply as a foliar treatment at 5.8 to 9.6 fl oz per acre to a limit of 48 fl oz per acre per season.

- **Pounce 3.2 EC** (permethrin) - Apply as a foliar treatment at 4 to 8 fl oz per acre to a limit of 64 fl oz per acre per season.

- **Sevin 80 WSP** (carbaryl) - Apply as a foliar treatment at 1-1/4 lb per acre to a limit of 6 applications per acre per season. Allow at least 7 days between sprays.

**Squash Beetle**

*(Epilachna borealis)*

The squash beetle occasionally feeds upon the leaves of pumpkin. This member of the lady beetle family can be abundant enough to injure plants. Most others are beneficial and devour aphids and scale insects. The squash beetle
hibernates in sheltered places and emerges to lay its eggs in June on the underside of the leaves. Both adults and larvae feed on the leaves. The larvae usually appear about the middle of July. They are about 5/8" long, bright yellow with six rows of long, black, branched spines. The adult is dull yellow and marked with 12 black spots. There is one generation each season. Control is not usually necessary.

**Biological:** No effective biological control

**Cultural:** After harvest is complete, deep tillage or removal of crop residue will help to delay and/or reduce infestation the next spring.

**Monitoring:** Population assessment and timing are the keys to successful squash beetle control. Treatment is justified only occasionally, and if needed, should target adults and small larvae. It is much more difficult to control large numbers of older larvae and adults later in the season when the plant canopy is dense. Treat with a recommended insecticide if significant feeding damage is seen and the insects are present on the foliage.

**Application Alternatives Used in Kentucky:**

**Ambush 2 E** (permethrin)- Apply as a foliar treatment at 6.4 to 12.8 fl oz per acre to a limit of 102.4 fl oz per acre per season.

**Asana XL** (esfenvalerate)- Apply as a foliar treatment at 5.8 to 9.6 fl oz per acre to a limit of 48 fl oz per acre per season.

**Pounce 3.2 EC** (permethrin)- Apply as a foliar treatment at 4 to 8 fl oz per acre to a limit of 64 fl oz per acre per season.

**Sevin 80 WSP** (carbaryl)- Apply as a foliar treatment at 1-1/4 lb per acre to a limit of 6 applications per acre per season. Allow at least 7 days between sprays.

**Diseases**

Diseases can be very serious on Kentucky-grown pumpkins in recent years have been seedling damping-off, gummy stem blight (or black rot of the fruit), powdery mildews, downy mildew, fusarium, anthracnose, bacterial wilt, viruses and fruit rots. So far, *Phytophthora* blight has not been an identified problem here, but it is very common in states to our north. Regular fungicide and insecticide sprays are needed to successfully produce pumpkins in Kentucky. Growers should be prepared with the proper spray equipment and have the appropriate chemicals on hand.

**Anthracnose**

*Colletotrichum lagenarium*

Anthracnose can be very destructive on many cucurbits but pumpkin usually is affected only where overripe fruit is left in the field. Losses during storage or shipment can occur when freshly harvested fruit becomes infected.

The causal fungus survives between crop seasons in infected plant debris, as well as on and in seed. The disease develops rapidly when moisture is high, and the spores are spread from plant to plant by splashing rain, cultivating tools, clothing and insects. The spores can infect any exposed part of the plant and symptoms usually develop within a
few days.

All above-ground portions of the plant may be affected, although the symptoms vary somewhat on different cucurbits. Brown, angular to roughly circular spots develop on a vein and expand rapidly. The spots sometimes become as large as 1/4 to ½ inches. When infection occurs on fruits approaching maturity, circular, sunken, water-soaked areas develop. Often the fruit spots contain fungal fruiting bodies that appear as black specks in the diseased tissue. Salmon pink spore masses ooze from the fungal bodies in humid weather.

**Cultural:** Rotate to unrelated crops for 2 or more years. Use western-grown, disease free seed. Clean up cucurbit fields at the end of the growing season by removing and destroying or plowing under crop debris.

**Application Alternatives Used in Kentucky:**

Anthracnose can be controlled with the black rot/gummy stem blight program described below.

**Damping Off Seedling Rots**

*Pythium*

**Cultural:** Purchase fungicide-treated seed. Planting into warm, well-drained soils greatly reduces the risk of seedling death.

**Application Alternatives Used in Kentucky:**

Treat small amounts of seed with thiram at ½ teaspoon per pound of seed.

Pythium can be controlled with preplant applications (broadcast or band) of fungicides

**Ridomil Gold 4 EC** (mefenoxam) - Apply as a preplant broadcast or banded soil treatment at 1 to 2 pts per acre.

**Bacterial Wilt**

*(Erwinia tracheiphila)*

The bacterium that causes bacterial wilt overwinters in the gut of some striped cucumber beetles. When beetles begin feeding in the spring, they spread the bacteria either through their feces or from contaminated mouth parts. Beetles feeding on young leaves or cotyledons open entry points for the pathogen. Once inside the plant, the bacterium multiplies quickly in the vascular system, causing blockages that lead to the leaves wilting. Beetles are attracted to infected plants and can pick up the bacterium and move it to healthy plants. The first symptom of bacterial wilt on cucumber and muskmelon is a distinct flagging of lateral and individual leaves. Pumpkins are susceptible to this disease while small, but once they pass through the first true leaf stage, their susceptibility declines.

**Cultural:** Plant late on land which has been plowed early in the spring or in the fall and cultivate frequently before planting so that all vegetation has been kept down.

**Monitoring:** Begin monitoring for cucumber beetles as soon as seedlings emerge. There is usually a peak in beetle activity each spring that lasts two to four weeks. This is the most important time to control the beetles. Since pumpkins
are not as susceptible to the wilt disease, protection is necessary only when plants are small and beetle populations are high. As the fruit begin to develop, monitor for cucumber beetles and treat as necessary to prevent feeding damage (scarring) to the fruits. Sevin and the pyrethroid insecticides provide effective control of cucumber beetles.

**Application Alternatives Used in Kentucky:** See insect control section.

### Bacterial Leaf Spots and Fruit Rots

Bacterial spots (of leaves and fruits) are on the increase with some very serious cases observed in recent years—especially the fruit rot phases. It appears that most cultivars are susceptible to the fruit rot phase, even when only mild symptoms are associated with the foliage.

**Cultural:** Avoid fields with a history of this disease, using a 3-4 year rotation from all cucurbits. These diseases are seedborne so use clean seed lots and do not save seed. Even when the foliar symptoms are mild, an abundance of inoculum is often available for fruit infections. Preventing this build up of bacteria is important.

**Monitor:** To control the fruit phases of the disease, scout fields at least weekly and start weekly sprays of copper-containing bactericides/fungicides when symptoms first appear but no later than when fruits are forming. If transplants are being used, copper sprays are needed in transplant production.

**Application Alternatives Used in Kentucky:**

To control the fruit phases of the disease, scout fields at least weekly and start weekly sprays of copper-containing bactericides/fungicides when symptoms first appear but no later than when fruits are forming. If transplants are being used, copper sprays are needed in transplant production.

### Bacterial Wilt

*(Erwinia tracheiphila)*

The term "wilt" perfectly describes this disease. Individual leaves become dull green and wilt soon after infection. These first symptoms are often associated with insect feeding damage. As the disease progresses, more leaves wilt and eventually the entire vine is affected. Finally, the leaves and vines shrivel and die. Even the fruit on affected vines shrivels.

The bacterial wilt organism is of special interest because it overwinters in the bodies of both the striped and spotted cucumber beetles. The beetles hibernate through the winter under leaf litter and in other protected sites, becoming active again once temperatures stay above 55°F in the spring. They are active for about 6 weeks, so weekly sprays are needed to control new insects flying onto the plants. As soon as cucurbits begin to break through the ground, the beetles move in and feed on young leaves, cotyledons and tender shoots. While feeding they deposit the bacterial wilt organism into the plant tissues. Once the bacteria invade the plant's water conducting vessels (xylem), they can spread to other parts of the plant. The slime produced by the wilt bacterium is thought to stop water movement in the xylem vessels, thus causing the wilt symptoms.

Bacterial wilt is much less severe on pumpkin than other cucurbits, although the incidence and severity vary from year to year. This disease increases in importance over time with pumpkins, probably because strains more virulent on squash and pumpkins are developing.
**Application Alternatives Used in Kentucky:** Control is based on reducing the numbers of insect vectors in the field. See insect controls for details.

**Black Rot or Gummy Stem Blight**

This disease can be very serious on pumpkins during wet seasons, especially the fruit rot phase (black rot). Major losses in pumpkins occur especially in seasons when other foliar diseases are also serious. Wet weather favors gummy stem blight development and failure to control foliar diseases leads to the fruits being more susceptible to black rot.

**Cultural:** Field observations suggest significant tolerance exists in Small Sugar, Spookie, Thompson Halloween, and Howden pumpkin cultivars. Avoid fields with a history of gummy stem blight on any cucurbit crop and practice crop rotation (3 to 4 years) to noncucurbits to reduce buildup of the pathogen. Plant western-grown certified seed.

Handling during and after harvest greatly impacts the susceptibility of winter squash and pumpkins to black rot. Wounding can negate a good fungicide program. Allowing fruits to be exposed to cool temperatures (below 50°F) in the field or during storage greatly increases susceptibility in some cultivars. Do not allow fruits to be exposed to frost.

**Application Alternatives Used in Kentucky:** Fungicide sprays should be maintained starting with vining and continued until harvest.

**Bravo** (chlorothalonil) Apply 2 to 3 pts per acre for flowables or 1.5 to 2.5 lbs per acre for dry formulations (WP, DF, DG). Begin applications when plants are in first true leaf stage or when conditions are favorable for disease development. Repeat at 7-day intervals or sooner under severe disease conditions.

**Maneb** (maneb) 80 WP at 2 to 3 lbs per acre for dry formulations (WP, DF, DG) or at 2 to 3 pts per acre for flowables. Addition of Benlate or Topsin M to the spray schedule for powdery mildew control should increase the control of black rot.

**Quadris** (azoxystrobin) apply at 11-15 oz per acre black rot control. Alternate with either chlorothalonil or mancozeb. Do not apply more than 1.92 qts per acre. Do not apply within 1 day of harvest.

**Blossom Blight and Choanephora Fruit Rot (Wet Rot)**

**Choanephora**

Blossom blight and associated fruit rot can be serious problems in some years. The fungus colonizes senescent blossoms and grows into developing fruits causing a wet rot covered with dark fungi. This fungus is not sensitive to the fungicides being used for other diseases and no specific fungicide is labeled for its control. The disease is promoted by high moisture conditions and frequently occurs when accompanied by conditions that delay pollination resulting in blossoms remaining longer on the plants. It is not easily controlled but steps taken to reduce moisture and improve aeration should be helpful (raised beds, wider spacings, weed control, etc).

**Downy Mildew**

Downy mildew usually appears each year in late summer (after August 15—although it can develop earlier) causing tiny yellow spots on leaves; these spots quickly expand to blight the entire leaf. The disease can be very damaging during prolonged foggy or humid periods; it can strike very rapidly. If growers are following a regular and well-applied fungicide spray program for black rot and anthracnose control (see those sections), they should only need to shorten the
spray interval to weekly applications to maintain control of downy mildew.

**Monitoring:** Tobacco blue mold (which is downy mildew of tobacco) advisories in the area are a good indication that conditions also favor downy mildew development on other crops. These advisories can be especially helpful in alerting one about possible outbreaks occurring before mid August, but they have limited value later because the tobacco crop is far enough along that few of the blue mold advisories are reported locally. The Kentucky Blue Mold Warning System is now linked to a national effort to forecast downy mildew outbreaks in cucurbits.

**Application Alternatives Used in Kentucky:** If downy mildew appears prior to the start of the regular fungicide spray program, use

**Ridomil Gold Bravo** (mefenoxam + chlorothalonil) Apply at 1.5 to 3.0 lbs per acre alternating weekly with one of the fungicides listed under black rot. Do not make more than 4 applications of Ridomil Gold Bravo to minimize resistance and do not use Ridomil Gold Bravo unless downy mildew is active.

**Flint 50 WDG** (trifloxystrobin) Apply at 4 oz per acre beginning when conditions are favorable for disease. May be applied up to day of harvest. Do not apply more than 8 oz per acre.

**Quadris** (azoxystrobin) apply at 11-15 oz per acre. Alternate with either chlorothalonil or mancozeb. Do not apply more than 1.92 qts per acre. Do not apply within 1 day of harvest.

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**Fusarium Crown, Foot, and Fruit Rots**

*(Fusarium solani)*

Plants affected by Fusarium crown and root rot usually show stunting and wilting of the leaves and death a few weeks later. Close examination of the parts of the plant covered with soil should reveal a rot. This fungus will also cause a fruit rot, especially in wet seasons, with the rot usually starting on parts of the fruit in contact with the soil. Some major losses have occurred from this phase of the disease, especially when August and September are wet. These diseases are controlled through a rotation of four years to crops other than cucurbits and by using disease-free seed. A complex of other Fusarium species is associated with pumpkin fruit rots in Kentucky. This disease complex is very limited. Most species have not been highly pathogenic when introduced into sound fruit but will rot immature or weakened fruits. Be very careful to have fruit rots properly diagnosed since there are several other pathogens that can cause fruit rots.

**Cultural:** Rotation has not proven effective, especially when the fruit load is heavy in wet seasons and the foliage has been destroyed by diseases. Many of these fungi are probably attacking weakened plants. In most cases it appears that infections occur in the field or through wounds (mechanical, insect, or disease). Avoid wounding and predisposition to rot with careful handling of fruit.

**Application Alternatives Used in Kentucky:** Fungicide sprays with materials effective against the fungus have not proven adequate; this is probably related to inadequate coverage of the fruit. Taking steps to control insects and other diseases during production and until harvest and is suggested.

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**Microdochium Blight**
This is a newly recognized disease in the area, although it has probably been present for a long time. We had been including it with the Fusarium complex, in part because Fusarium often invades these lesions with time. It occurs as white dashes, flecking, and etching (russetting) of stems and fruit surfaces. In experimental plots in 1999 however, we observed a serious foliage blight that could easily have been confused with gummy stem blight. Symptoms on Howden pumpkins were petiole and leaf-vein cankers blighting leaves and white to tan spindle-shaped cankers girdling the main stems. The main impact is usually on fruit appearance although we are finding evidence to suggest it may be playing an important role in other fruit rots. Fungicides recommended for black rot control should give adequate protection during most seasons. Buyers can use the presence of this disease on the fruit as a good indication that the spray program was probably not adequate to control black rot.

**Powdery Mildew**

*Erysiphe cichoracearum*

Powdery mildew is the most important disease of late summer and fall cucurbits in Kentucky. It appears as a white powdery growth on leaves that in time blights the foliage. Crown leaves that are infected first may wither and die. Powdery mildew is a problem to some degree every year in nearly every pumpkin planting in Kentucky, often present from mid-July to frost. Its control is critical to successful production in Kentucky nearly every year. Unfortunately, the mildew fungi have developed resistance to many of the systemic fungicides.

**Cultural:** Control weeds near fields and gardens to help reduce the overwintering population of the powdery mildew fungus. Resistant varieties are being developed that may help in control until different races of the fungus become a problem. However, be very careful in selecting a variety based only on its reaction to powdery mildew; horticultural characteristics are of primary importance and fungicides will still be needed for control of other diseases.

**Monitoring:** Poor spray coverage and poor timing of fungicide applications are the major reasons this is such an important disease in Kentucky. Plantings should be scouted for the first signs and symptoms of powdery mildew at least weekly starting in mid-July. With the first evidence of powdery mildew (usually late July or early August), initiate a more aggressive and effective fungicide program.

**Application Alternatives Used in Kentucky:** Strains of this pathogen resistant to Reach (triadimefon) and Benlate and Topsin (benzimidazoles) have been confirmed in Kentucky with triadimefon resistance being very common.

**Bravo** (chlorothalonil) applied in a weekly spray program for other diseases will slow powdery mildew development but is ineffective if poorly applied.

**Flint 50 WDG** (trifloxystrobin) Apply at 2 oz per acre beginning when conditions are favorable for disease. May be applied up to day of harvest. Do not apply more than 8 oz per acre.

**Quadris** (azoxystrobin) apply at 11-15 oz per acre. Alternate with either chlorothalonil or mancozeb. Do not apply more than 1.92 qts per acre. Do not apply within 1 day of harvest.

The systemic options include

**Benlate 50 SP** (benomyl) Apply at 0.5 lbs per acre when disease appears or when runners form. Repeat at 7 to 14 day intervals. 1 day harvest interval.
**Topsin M 85 WDG** Apply at 4 oz per acre at 7 to 14 day intervals.

**Sulfur** is labeled for powdery mildew and it will do an excellent job when applied correctly. However, cucurbits can be very sensitive to sulfur, especially during hot (90°F or higher), humid weather. The amounts needed for full season control can lower soil pH.

Sulfur will not affect other diseases that need to be controlled at this time.

**Virus Complex**

A variety of viruses are common and often severe in Kentucky. This virus complex can be a limiting factor to fall production on farms where spring or summer crops of cucurbits are also present. Consider using the new resistant varieties but check current market requirements or restrictions regarding transgenic resistant varieties.

**Cultural:** In pumpkins, earlier planting can reduce losses by allowing fruit to set and color before high virus loads are present, assuming that the variety will set fruit under higher temperatures. Locate sequential plantings of cucurbits as far away from each other as possible to reduce spread. Eliminate broadleaf weeds within 150 feet of the planting or surround the crop with barrier plantings of nonhosts. Avoid a series of subsequent plantings adjacent to each other to reduce movement from plants with high concentrations of virus to newly planted crops. Prevent aphid buildup on tobacco; observations suggest that aphids moving from tobacco can acquire and transmit many of these viruses. Remain alert to new and changing variety options.

**Weeds**

As with many other Kentucky crops, weed control in pumpkins presents an ongoing management problem. For economy and efficiency, pumpkin growers should view weed pests as a complex. Specific plant pests which interfere with pumpkin production are both diverse and unpredictable. A specific plant or two may present more of a challenge for a period of time only to be replaced by another dominant pest or a mixture of weeds with individually low populations.

Overall, thinking in terms of creating a good field management history is central to making decisions about addressing the weed population presented during any specific year. Pumpkin production needs to be supported by a balance involving intelligent cultural practices and modest chemical weed control practices.

Beyond the obvious issue of pest presence, a farmer's decisions are strongly impacted by costs. Many farmers, knowing that they can neither afford to apply herbicides for each and every significant plant pest nor expect weed free fields, are strongly impacted by manufacturer's marketing strategies.

**Common Weeds in Kentucky Pumpkins**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Life Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monocots: Grasses and Grass-like Plants</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadleaf Signalgrass</td>
<td>Brachiaria platyphylla</td>
<td>A</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Crabgrass, Large</td>
<td>Digitaria sanguinalis</td>
<td>A</td>
</tr>
<tr>
<td>Foxtail, Giant</td>
<td>Setaria faberi</td>
<td>A</td>
</tr>
<tr>
<td>Johnson grass</td>
<td>Sorghum halepense</td>
<td>P</td>
</tr>
<tr>
<td>Fall Panicum</td>
<td>Panicum dichotomiflorum</td>
<td>A</td>
</tr>
<tr>
<td>Ryegrass, Italian</td>
<td>Lolium multiflorum</td>
<td>A</td>
</tr>
<tr>
<td>Shattercane</td>
<td>Sorghum bicolor</td>
<td>A</td>
</tr>
</tbody>
</table>

**Dicots: Broadleaf Plants**

<table>
<thead>
<tr>
<th>Burcucumber</th>
<th>Sicyos angulatus</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocklebur, Common</td>
<td>Xanthium strumarium</td>
<td>A</td>
</tr>
<tr>
<td>Milkweed, Honeyvine</td>
<td>Ampelamus ambidus</td>
<td>P</td>
</tr>
<tr>
<td>Morningglory, Bigroot</td>
<td>Ipomoea pandurata</td>
<td>P</td>
</tr>
<tr>
<td>Morningglory, Ivyleaf</td>
<td>Ipomoea hederacea</td>
<td>A</td>
</tr>
<tr>
<td>Pigweed, Smooth</td>
<td>Amaranthus hybridus</td>
<td>A</td>
</tr>
<tr>
<td>Pokeweed, Common</td>
<td>Phytolacca americana</td>
<td>P</td>
</tr>
<tr>
<td>Ragweed, Giant</td>
<td>Ambrosia trifida</td>
<td>A</td>
</tr>
<tr>
<td>Trumpetcreeper</td>
<td>Campsis radicans</td>
<td>P</td>
</tr>
</tbody>
</table>

(A = annual and P = perennial)

**Controls**

**Cultural:** Practice clean cultivation and destroy crop residues after harvesting.

**Application Alternatives Used in Kentucky:**

**Curbit 3E** (ethalfluralin) Apply 3 to 4.5 pts /ac to soil surface after seeding but before crop emergence or as a directed spray between rows after transplanting. Shallow cultivation, irrigation, or at least ½ in. rainfall is needed within 5 days for good weed control. Heavy rains may cause crop injury. Do not use under mulches, row covers, or hot caps.

**Prefar 4E** (bensulide) Apply 5 to 6 qt /ac Apply and incorporate immediately before planting. See incorporation directions on label. To avoid injury, wait 13 months before planting crops not listed on the label.

**Command 4EC** (clomazone) Apply 0.5 to 1.5 pt /ac. Incorporate to a depth of 1 inch or less before seeding. Controls many broadleaves and grasses. Place the seed below the chemical barrier when planting. See label for important rotational crop restrictions.

**Poast 1.5E** (sethoxydim) Apply 1 to 1.5 pt / ac Apply to actively growing grasses. Include 1 qt crop oil concentrate per acre. Maximum total of 3 pt per acre per season. 14 day pre-harvest interval.
**Gramoxone Extra** (paraquat) Apply 2 to 3 pts /ac before planting or after planting but prior to crop emergence. Use higher rate for heavy weed infestations.

**Roundup** (glyphosate) Apply 2 to 3 qt / ac to emerged perennial weeds at least 3 days before planting the crop in the spring. Include 1 pt non ionic surfactant per acre.

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**References**