Crop Profile for Potatoes in Pennsylvania

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General Production Information

- 17,000 potato acres under very slow decline.
- Pennsylvania Growers planted 17,000 acres of potatoes in 1996, down from 18,000 acres in 1995.
- Pennsylvania Potato acreage has declined approximately 10% during the 1990s.
- The State's growers have enjoyed higher than average yields during the 1995 & 1996 seasons of 240 cwt./acre and 255 cwt./acre average yields respectively.
- The average yield per acre for Pennsylvania potato production in the 1990s is 230 cwt./acre.
- Preliminary estimates indicate that the production value of the 1996 crop was over $30 million.

Production Regions

Geographically disparate counties lead the state's production.

Pennsylvania's potato crop is well distributed in pockets throughout regions of the state. Erie County (the state's northwestern-most county) is the largest single potato producing county with 3500 acres, followed by the central county of Cambria (2500), the east central county of Schuykill (1500), the southeastern county of Lancaster (1400), and the north central county of Potter (1300). These regionally disparate counties, and their neighboring counties, account for over 80% of the planted acres.

Insect Pests

The most economically important insect pests in Potatoes includes:

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Colorado Potato Beetle

Potato Leafhopper

Aphids

European Corn Borer

Colorado potato beetles remain the most important and destructive insect pest in Pennsylvania potato production. From plant emergence until the pre-harvest vine desiccation process begins, potato acreage is under continual threat of complete defoliation from Colorado potato beetles. Part of the difficulty in controlling this insect is its ability to develop resistance to chemical compounds quickly. For this reason, chemical control agents must be continually rotated and tank mixed within and between chemical classes to avoid resistance.

Each year, during spring and early summer, upper-air jet streams from the south carry the potato leafhopper to Pennsylvania. These insects damage the plant by extracting juices from the potato vine and, in the process of feeding, prevent photosynthate from getting to the tubers. They are present from late June through the practical life of the potato foliage.

Potato aphids begin the economically destructive phase of their life cycle during late July. These insects can become abundant enough to weaken and stunt the plant. However, if left unchecked, their most economically damaging effect is the spread of potato disease, including potato leafroll virus.

Chemical Controls:

The development of imidacloprid has recently made the adequate control of potato insects possible at an overall reduced cost. However, this is only possible by using this compound within the framework of a total program that includes organophosphates and pyrethroids.

The vast majority of the potato seed pieces planted in Pennsylvania is treated with *imidacloprid*. According to retail chemical dealers, the development of this treatment has cut overall potato insecticide use in half. Prior to the registration of this treatment, high rates of several conventional products, tank mixed together, gave only fair to poor control. When applied as a seed treatment, imidacloprid will effectively control Colorado potato beetles for approximately two months. After this effective window, organophosphates, cydodienes and pyrethroids can be used within an effective resistance management program. This imidacloprid treatment has resulted in improved efficacy of several of the conventional organophosphates, cydodienes and pyrethroids throughout the growing season. Imidacloprid is available,

but seldom used, as a foliar spray. Although effective, it has a minimum 12-month corn rotation interval and many growers perceive that multiple applications within the growing season would promote resistance.

Potato leafhoppers migrate at the approximate time that the imidacloprid seed treatment is concluding it's effective window. At this time, growers will begin a rotation of organophosphates and pyrethroids. For ease of application, growers will attempt to synchronize the insecticide and fungicide treatments. Many fungicide treatments have insecticides tank mixed with them. The following compounds are rotated and used in combination to delay Colorado potato beetle resistance for as long as possible:

Organophosphates Pyrethroids

Azinphos-Methyl Esfenvalerate

Carbaryl Permethrin

Dimethoate

Methamidophos

Methyl Parathion

During late June or Early July, aphids begin the destructive portion of their life cycle. At this time, *endosulfan* is rotated with the Organophosphates to manage colorado potato beetle, potato leafhoppers and aphids. At this time of the season, the Pyrethroids have normally become ineffective as a broad-spectrum compound. Applications that are rotated between endosulfan and the organophosphates continue until pre-harvest vine desiccation.

Desiccants and Growth Regulators:

The natural vine desiccation of the potato vine is nearly always artificially speeded up by diquat dibromide. This allows the harvest to proceed much sooner and decreases the time that the weakened plant is susceptible to disease.

Potatoes that are to be stored may receive one of many generically available sprout inhibitors approximately 4 weeks prior to vine desiccation.

Diseases

Foliar:

- Early Blight
- Late Blight

Tuber Storage:

- Pythium Leak
- Pink Rot
- Late Blight Rot

Foliar Diseases:

Even when growers employ non chemical disease control practices such as crop rotation and proper sanitation, disease pests are a costly and sometimes perilous part of the production process. Potato plants need protection from early blight beginning shortly after ground cracking (4 weeks after planting). This protection must continue until potato vines are completely desiccated in preparation for harvest. This necessitates protectant fungicide sprays on a 3-10 day schedule, which is dependent on weather conditions. This typically translates to 15-20 protectant fungicide applications during a production season.

Adequate control of late blight is typically attained through early blight treatments, with a few compounds added to these applications.

If the potato crop is not adequately protected against foliar diseases, the potato foliage becomes infected and dies. Dead or dying foliage slows or halts potato tuber formation.

Tuber Storage Diseases:

Potatoes that are to be stored over the winter, even in temperature and humidity controlled storage

facilities, are subject to diseases that rot the tubers in storage. Applications must be made during the growing season, which will translocate into the tubers, protecting them while stored. If this is not possible, even small amounts of foliar spore formation must be prevented. Pink Rot, Pythium Leak, and Late Blight Tuber Rot will all literally rot the potatoes in storage, making them unusable.

Chemical Disease Controls:

While EBDC protectant fungicides are the cornerstones of most foliar disease management programs, the Pennsylvania potato crop cannot be adequately protected every year without other synthetic protectant fungicides, such as chlorothalonil.

EBDC protectant fungicides, such as *mancozeb*, are the most economical, widely used, and cost effective method for foliar disease control. Growers begin applying mancozeb shortly after foliage emergence and apply the compound at 3-10 day intervals until the legal season limit for EBDC applications is reached. The weather determines the stage of the growing season that this legal limit is attained. During wet conditions, growers may need to apply protectant fungicides every three days to adequately protect the foliage from disease. During dry conditions, a treatment may be needed every ten days. Every year growers lose this important tool at a different time of the season.

After the EBDC limit is reached, growers normally begin *chlorothalonil* early blight treatments at the same, or slightly longer, intervals than previous EBDC treatments. These effective, but expensive, treatments continue until foliage is completely desiccated and harvest is imminent.

During periods of minimal late blight pressure, regular EBDC and chlorothalonil early blight treatments at 8-10 day intervals are adequate to control late blight. During moderate pressure, these treatments must become more frequent and are supplemented with metallic based compounds, such as *copper hydroxide* and *triphenyltin hydroxide*. During periods of heavy late blight pressure, EBDC or Chlorothalonil treatments are made every 3-5 days, supplemented with metallic based compounds, and Section 18 compounds may be used. Current Section 18 compounds available to control late blight include *dimethomorph* and *propanocarb+mancozeb* pre-mix. These highly effective and expensive section 18 compounds have rarely been necessary over the past two seasons due to favorable weather conditions.

Historically, *metalaxyl* premixes have been highly effective in controlling foliar late blight and nearly all economically important storage diseases. However, recently metalaxyl resistant strains of Phythopthora have surfaced, causing metalaxyl resistant foliar late blight, metalaxyl resistant pink rot, and metalaxyl resistant late blight tuber rot. These metalaxyl-based compounds are still used by some growers to delay the onset of late blight symptoms and for pythium leak control. However, this recent resistance has placed greater emphasis on protectant sprays to avoid the cultivation of disease spores.

Seed Treatment:

Fusarium and Damping-off can cause disease at potato emergence under cool wet conditions. Some growers use Captan, the lone treatment available for these diseases, on earlier planted potatoes to prevent emergence-related diseases.

Weeds

Economically important weed pests in Potatoes can be divided into five categories:

1. Annual Grasses
2. Annual Broadleaves
3. Sedges
4. Perennial Grasses
5. Perennial Broadleaves

Annual grasses and broadleaves are the most common weeds in potato production, effecting nearly every acre. These weeds are easily controlled through a combination of pre-emergence chemical treatments and regular post-emergence mechanical cultivation.

Yellow nutsedge, part of the sedge category, is also quite common. High populations of this weed present significant control challenges.

Perennial grass and broadleaf weeds are less common but much more difficult to control. Where present, perennial weeds require post emergence, selective herbicide treatments and intensive chemical and non-chemical management outside of the normal potato production cycle.

Chemical weed controls:

Pre-emergence treatments of metribuzin effectively control most annual broadleaves and some annual grasses. Pendimethalin is used to control broadleaves that have become resistant to metribuzin. Metolachlor is used to treat yellow nutsedge, most annual grasses and some broadleaves. This three way combination is used on the vast majority of the state’s production.

Pre-emergent use of three compounds control the majority of the state's weeds in potato production.

Metribuzin is routinely used to control annual broadleaf weeds. It has been a standard treatment for many years and is extremely cost effective.

However, many broadleaf weeds have built up triazine resistance. These weeds are heartier and more difficult to control. It is usually assumed that all lambsquarters, most pigweed and some common ragweed in Pennsylvania crop production is triazine resistant. For this reason, *pendimethalin* is often used to control triazine resistant lambsquarter in concert with metribuzin. There are currently no alternatives to pendimethalin for pre-emergent triazine resistant lambsquarter control in potatoes.

Annual grasses are easily controlled with a pre-emergence application of *metolachlor*. Light populations of yellow nutsedge are easily controlled by this treatment. However, high populations of yellow nutsedge present significant control challenges for *metolachlor*. There are currently few practical alternatives for pre-emergence annual grass and nutsedge control. *Diprophlthiocarbamate* is one alternative that is little used because of the sensitivity of certain varieties to the compound and the compounds need to be immediately incorporated.

The majority of Pennsylvania's potato acreage is treated with a three-way mix of metolachlor, metribuzin and pendimethalin prior to plant emergence.

Perennial grass and broadleaf weed control takes three forms:

- First, perennial grasses are often controlled with post emergence applications of *sethoxydim*, currently the only effective post emergence rescue treatment for grass weeds.
- Second, fall applications of *glyphosate* are often used after the previous crop is harvested, to get a complete kill of the entire perennial weed system.
- Finally, perennial weeds are managed through more consistent tillage and chemical weed control in rotation crops.

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