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Comments from the Editor

Elsa Sánchez, Department of Horticulture, Penn State University

I want to thank Eric Oesterling for his excellent article, **Perennial Weed Control**. I also look forward to George Perry's article for the April issue. I also want to thank everyone who contributed articles to this issue and I want to encourage others to join us in upcoming issues. As always, the Vegetable & Small Fruit Gazette Team encourages your feedback so that we can better serve your needs and address your concerns.

Schedule for Articles

March – Eric Oesterling	April – George Perry
May – Lee Young	June – Jeff Mizer
July – Tom Butzler	August – Steve Bogash
September – Cheryl Bjornson	October – Scott Guiser
November – John Esslinger	December – Andy Muza

Perennial Weed Control

[Eric Oesterling](#), Extension Educator, Westmoreland County

Perennials are the most difficult weed problems. Weeds like Canada thistle, dogbane, milkweed, horsenettle, bindweed, and others can be a nightmare in vegetable and berry crops. We don't have good selective herbicides that will take out the weeds and not harm the crop. If you discover a perennial weed problem once a crop is planted the best you can do is fight a holding action – trying to beat weeds down enough to allow the crop to grow and produce. Mechanical methods such as hoeing and cultivating or even directed herbicide sprays momentarily suppress perennials but the weeds quickly send up new shoots from roots or rhizomes that have not been damaged. If you could be persistent enough to knock the weeds down every week or two and kept at it for a couple of years you might finally wear them out. But none of us have that kind of time.

The best tools to control perennial weeds are post emergent, leaf absorbed, systemic herbicides like glyphosate (Roundup and the generic products), 2,4-D and dicamba (Banvel or Clarity) which cannot be used over the top of vegetable crops. The key to effective control of perennial weeds with systemic herbicides is to apply the herbicides, at the correct rate, at a time when absorption and movement to the roots is best. Weeds should be healthy and growing vigorously for best absorption and movement within the target weed.

Timing is critical for effective root kill with systemic herbicides. Early in the season weeds are small and all movement of foods within the plant is from the roots up to the growing point. Systemic herbicide applications at that time get relatively small amounts of herbicide absorbed by the weeds and little if any translocated down to the roots. The first good window of opportunity for effective root kill is when weeds are in the bud to bloom stage, early summer for most weeds. At this time stored food reserves in the weeds are near seasonal lows, there are plenty of leaves to absorb the chemicals and they are translocated well to the roots. The second good window is in late summer while weeds are growing well and storing food reserves for winter. Again absorption and movement to the roots should be good. So arranging crop rotations to allow opportunities to treat weeds with systemic herbicides can go a long way to knocking out perennial weed problems. Serious weed infestations are rarely controlled by one application. Some resprouts will occur and follow up treatments will be required to eliminate escapes.

Following an early crop of sweet corn or other early crop you might mow down the residue, then allow 3 or 4 weeks for the weeds to regrow before spraying with a glyphosate/phenoxy herbicide combination in late summer or early fall. The vegetable guide suggests a combination of 1 quart dicamba (Banvel or Clarity) and one quart of 2,4-D amine to suppress or control bitter nightshade, Canada thistle, bindweed, horsenettle. Wait three weeks for each pint of dicamba used before seeding a winter cover crop. Or a general purpose mixture of 1.5 pounds acid equivalent of glyphosate plus one pint of Banvel or Clarity would be a good for a mixture for broadleaf perennials like brambles, milkweed, horsenettle and others as well as perennial grasses. Bindweed, dogbane, Johnson grass, milkweed, nutsedge and poison ivy shut down early in the fall so treat them by early September. Plant wheat or rye as a winter cover. In addition to the many benefits of a grain cover crop it gives you another chance to hit escapes using phenoxy weed killers labeled for use over the cover crop.

So if you have a serious problem with a perennial weed in vegetable fields this year I don't have an easy answer for you. The long term solution is to adjust the rotation to allow opportunities to hit the weeds at a time when they are most susceptible to herbicide applications. Don't let little problems become big problems. Eliminate patches of perennials before they become well established, even if it means sacrificing some of the crop. Well timed applications of systemic herbicides and persistence are the keys to perennial weed control.

Will Stewart's Bacterial Wilt be a Problem This Year?

[Tim Elkner](#), Extension Educator, Lancaster County

Stewart's bacterial wilt of sweet corn could be a potential problem for growers this season. The bacteria that cause this disease (*Pantoea stewartii*, formerly *Erwinia stewartii*) survive the winter in the digestive system of corn flea beetles. When the weather warms the beetles emerge from their overwintering sites and spread the disease to corn seedlings. There are two phases of Stewart's wilt on corn. The first phase, or seedling wilt phase, happens when susceptible sweet corn is infected as young plants. The second phase, or leaf blight phase, occurs when corn plants are infected after tassels emerge. The first phase is the most destructive and yield losses of 40 to 100% can occur when susceptible varieties are infected before the five-leaf stage under epidemic conditions.

Stewart's Wilt of corn is a disease confined to North America, although there have been infrequent reports of the disease occurring outside of this area. The disease is confined to areas where the corn flea beetle occurs – the primary carrier of the disease. In the US this is the Mid-Atlantic and Ohio River Valley regions and the southern portion of the Corn Belt. Once a beetle becomes infected with the bacteria, it will remain a carrier for the rest of its life. Although the disease can be seedborne, this method of spreading the disease is rare.

Why could the 2006 growing season see a large amount of this disease? Blame our warmer than normal winter. A forecast system to predict the occurrence of Stewart's wilt based on winter temperatures was developed by N. E. Stevens in the early 1930's. This was one of the first disease prediction forecast systems developed for plant diseases. G. H. Boewe modified Steven's forecast 15 years later to more accurately predict the leaf blight phase of Stewart's Wilt. Basically the system totals the average winter temperatures for December, January and February and assigns a severity index for the potential occurrence of the disease in both the seedling and leaf-blight phases (Table 1). This information is based on survival of the overwintering beetles. My calculations for Lancaster, PA this winter give an index of 102 (through February 27). This puts us in the potentially destructive and severe phases for seedling wilt and leaf-blight, respectively.

So will we have a disastrous sweet corn crop this season? Probably not. There are many factors that contribute to a disease epidemic and all of the necessary pieces may not fall into place. However, growers need to be aware of the potential for this disease this season and take appropriate steps. Steps to reduce potential losses include the following:

1. Select disease resistant varieties if possible. There are a greater number of later sweet corn varieties with resistance than early selections so growers who use early varieties need to use other methods to reduce potential disease occurrence. For resistance information check the variety listings in your Commercial Vegetable Production Guide, consult your seed supplier or view the results of resistance testing conducted at the University of Illinois at <http://www.sweetcorn.uiuc.edu/> (select 'Disease Nursery Reports').
2. Use commercially treated seed to control early beetle populations, particularly on wilt-susceptible varieties. Treatments (all commercially applied) include Cruiser, Gaucho and Poncho. There are some plant back restrictions when using treated seed so be sure to check the seed label or consult your seed supplier.

3. Use planter box or soil applied treatments to protect seedlings. However – there is a great deal of variability in the length of time these treatments will protect plants. Be sure to consult the label or your supplier for this information. Also note that soil-applied insecticides may not be effective if soil temperatures are cool.
4. Control the beetles with foliar insecticide applications. Start scouting your fields at spike emergence and if more than 5% of plants are infested with beetles then start applications. If your beetle populations are high frequent applications may be necessary to keep newly-developing foliage covered with a protectant insecticide. Again – consult your Commercial Vegetable Production Guide for labeled materials and rates.

Not all overwintering beetles are carrying the wilt bacteria in their system (estimates are up to 20% may be carriers) and the actual number of beetles with the bacteria will be dependent upon the amount of disease present in your area last year. Note that seed treatments are effective through the 5-leaf stage while researchers recommend control through the 7-leaf stage so additional insecticides may be necessary in your fields if beetle pressure remains high. Also – there is no advantage (for beetle control) in using both treated seed and a planter box or soil applied insecticide. Select your insecticides based on the pest(s) to be controlled.

High populations of corn flea beetles can cause severe feeding damage to newly emerged sweet corn plants so even if you do not have a history of Stewart’s Wilt on your farm be aware of the potential for high beetle populations this spring. And if we do have a higher than normal occurrence or Stewart’s Wilt be sure to destroy your sweet corn fields as soon as possible after harvest. This will help to reduce the chances of recently emerged beetles feeding on an infected stalk and becoming disease carriers for next season.

Table 1. Sevens-Boewe forecast for Stewart's wilt. Developed in the 1930s and revised in the 1940s by N. E. Stevens and G. H. Boewe at the Illinois Natural History Survey, University of Illinois.

Winter temp index	Seedling wilt phase	Leaf blight phase
100 or more	destructive	severe
90 to 100	light to severe	severe
85 to 90	nearly absent	moderate
80 to 85	nearly absent	light
below 80	nearly absent	trace

Winter temperature index = sum of average temperature (°F) for December, January, and February.

(Table from “Stewart’s Wilt of Corn” by Jerald K. Pataky, APSnet feature story July-August 2003, <http://www.apsnet.org/online/feature/stewarts/>)

IPM Techniques for Vegetable Producers

[Michael D. Orzolek](#), Department of Horticulture

Pest management in vegetable crops and horticultural crops in general present many challenges, the least of which is vegetables and other horticultural crops are classified as minor crops and have limited labeled fungicides, insecticides and herbicides compared to agronomic crops. Also, there are no weed or insect resistant vegetable varieties like there are commercial disease resistant/tolerant cultivars. Vegetable growers out of necessity have had to practice Integrated Pest Management, but many have adopted only a partial list of IPM practices with the assumption that pest resistance to current vegetable pesticides will not occur in their (growers in the 50 + age group) fields or lifetime.

All vegetable pest management programs in Pennsylvania have emphasized an IPM approach. The programs generally are three areas; cultural, mechanical and chemical controls. Cultural controls would include; liming and soil pH management, banding fertilizer, crop rotation, crop density or population, identifying and treating hot spots of weeds, insects or disease in the field with pesticides, eliminating or reducing weed seed and inoculum levels, and use of plastic mulch, raised beds and drip irrigation. Mechanical controls would consist of tillage methods, cultivation and burning or flaming with propane burners. Chemical control methods would include; proper identification of the problem pest, treating active pest(s) populations in the field, correct choice of pesticide and rate, rotation of chemical families, correct application technique and uniform application in the field

Resistance Management has become an integral part of an Integrated Pest Management program for the last 10 years in Pennsylvania because of the large application of certain pesticides in the field without rotation to different chemical families during the growing season. A good example is weed resistance to atrazine; both common lambsquarters and redroot pigweed have developed resistance to atrazine. Since atrazine is such an inexpensive herbicide to apply, controls a large number of grass and broadleaf weeds, and can be applied either pre or post-emergence, almost all corn (field, sweet, pop and ornamental) growers in Pennsylvania make one application/acre/year. Thus, the challenge for Extension is to provide viable, efficient method(s) of controlling weeds in vegetables by either chemical and/or cultural means and encourage the reduction/elimination of atrazine use in the state while utilizing IPM methods for weed control in vegetables.

Cultural controls can help reduce problem and resistant pest populations in many fields by at least 50% a year. Monitoring (scouting) fields and identifying the different type of pests and population changes that take place each year will help growers to decide what crop(s) to plant in each of his/her fields depending on pest demographics. In addition, some vegetable crops when grown in a no-till system are more competitive than the weeds and compete rather effectively from establishment through harvest.

Crop rotation – Use of legume cover crops (hairy vetch, clovers, etc.) or small grain in a crop rotation program will provide effective pest control of most annual broadleaf weeds such as ragweed, jimsonweed and galinsoga, reduce some soil insect populations and encourage a better soil environment for beneficial fungi and bacteria. Since most minor crops have fewer labeled pesticides, rotating minor crops (horticultural crops) with corn, soybeans and small grains will

increase the number of labeled pesticides available that will control annual and perennial weeds, insects and disease organisms. This will also enable the grower to choose from more pesticide families and reduce the potential for resistance in field pest populations.

Tillage – The use of a moldboard plow in alternate years or at least every third year will provide generally better perennial weed control (for weeds like Canada thistle and horsenettle) than chisel plowing. Moldboard plowing will also bring to the soil surface and expose the large storage organ (root) of many weeds, soil insects, larvae and eggs as well as many microorganisms that cause diseases so that over time the storage roots, insect larvae/eggs and microorganisms desiccate and/or rot during the winter months.

Cultivation – Timely cultivation can effectively control many annual weeds, especially weed populations that have acquired resistance to herbicide(s) or have a very narrow genetic base or variation. Generally, cultivating several times during the growing season in specific crops grown in fields with low weed seed populations will provide effective weed management during the entire growing season. Cultivating or destroying weeds between rows of vegetables in the field also reduces the potential for insects and diseases to use the weeds as hosts or reservoirs. However, the one drawback of relying solely on cultivation for pest control during the growing season is rainfall and wet soils. Extended wet periods can eliminate the use of a cultivator in the production field for several weeks while young weeds are still actively growing.

Banding or injecting fertilizer – Application of fertilizer as a band next to the crop provides nutrients to the crop but not the weeds, especially between crop rows. Likewise, injecting fertilizer in drip irrigation tape will provide nutrients for the crop but not weeds. Banding also helps to reduce the total cost of nutrient application for a vegetable crop.

Plant populations – The higher the plant population per acre, the greater the canopy of the vegetable crop and reduction in the number of weeds that are competitive with the crop due to the lack or reduction in photosynthetic active radiation (PAR). Plant populations can be increased within limits to enhance canopy development of the crop without compromising crop yield or quality. The disadvantage of high plant populations is the potential for greater insect problems unless a thorough scouting program is employed and large, dense canopies that will increase the relative humidity in the plant canopy which in turn will increase the potential for foliar diseases such as powdery mildew.

Eliminating weed seed production – This is the most significant cultural practice that will reap rewards for years to come. The elimination of viable weed seed and/or reproductive structures by either mechanical or chemical means will over time result in much smaller weed seed populations in the soil bank that can actively compete with vegetable crops in the future and act as hosts for insects and disease organisms. Simply mowing weeds and eliminating immature flowers on the weeds is very effective. Some weeds when mature can supply thousands of weed seeds per plant back into the soil bank and be problems for many years in the future.

Treating hot spots – Many weed problems originate in fence-rows near the field with only a few plants or maybe even one. Treating and eliminating weeds, even if only one or two which seem insignificant at the time, in fence rows will help to eliminate future pest problems in your field.

Also, eliminating hot spots in your production field as they become apparent will prevent large scale populations of pest problems in the future.

Use of plasticulture systems for vegetable production – Many vegetables benefit from being grown on raised beds (28” to 30” wide and 6” to 8” tall) covered with plastic mulch and drip irrigation tape buried beneath it in the bed. The plastic film, generally black but can be other colors, not only eliminates weed growth but also increases soil temperature, maintains higher soil moisture levels, reduces leaching of nutrients and other pesticides applied to the bed and retains soil structure throughout the growing season. Mulch color has been shown to reduce some insect problems as well as some disease problems.

If populations of volunteer weeds, insects or disease causing organisms are still present after using several of the cultural controls available for pest management in vegetables, then the use of appropriate pesticides should be considered. However, before applying the pesticide on the problem pest(s), several decisions need to be made by the grower. One, is the pesticide labeled for the intended crop use? Two, will the pesticide provide effective control of the problem pest(s) found in the crop? Three, what rate should be applied and what method of application should be used? Four, are there any sensitive crops being grown near the field where the pesticide will be applied? Five, what is the half life of the pesticide and how long will it last in the field after application? If a grower has answered all these questions to his/her satisfaction, then applying a specific pesticide to a specific vegetable crop to control a specific pest should be made. Of course, it is assumed that: 1) there is negligible wind during application, 2) the sprayer has been correctly calibrated, 3) all nozzles tips and screens have been checked for wear and blockage and 4) both the crop and pest populations are actively growing and not under stress.

As growers become busier tilling fields, planting crops and monitoring pests in the field, they invariably will take short cuts to become more efficient with time and maintain some resemblance of a production plan for the year. However, short cuts lead to mistakes and mistakes can result in the reduction of both yield and quality of most vegetable crops.

The Organic Way - Nutrient Management in High Tunnels

[Elsa Sánchez](#), Department of Horticulture

Tools available for organic nutrient management in the field are also useful in high tunnels including compost, manures, green manures and fertilizers. According to the National Organic Standards, when raw manures are used for crops for human consumption the timing of application is dependent on the edible part of the crop. When the edible part of the crop is *not in* contact with the soil (for example, peppers, caged tomatoes or broccoli) manure must be incorporated into the soil at least 90 days before harvest. When the edible part of the crop is *in* contact with the soil (for example, cucumbers and garlic) manure must be incorporated into the soil at least 120 days before harvest. Raw animal manures can be used when needed for crops not for human consumption, such as green manures. The use of sewage sludge is prohibited in certified organic production.

Compost can be applied as necessary provided it meets carbon to nitrogen (C:N) and temperature requirements and has not been treated with prohibited substances. According to the National Organic Standards, compost must have an initial C:N ratio between 25:1 and 40:1. In addition, when using an in-vessel or static aerated pile system the pile must reach a temperature between 131°F and 170°F for a minimum of 3 days. If using a windrow system the pile must reach a temperature between 131°F and 170°F for a minimum of 15 days and turned a minimum of 5 times during that time. A compost log should be used to document that the composting procedure meets protocol. If compost is purchased, it must also meet these standards.

High tunnels can also be equipped with an overhead irrigation system to aid in establishing green manure crops which can be grown to improve the nutrient status of the soil. Chapter 5 of the [High Tunnel Production Manual](#) contains details on the assembly of such a system.

Some growers have expressed concern about soil tests revealing abnormally high salt levels in the soils of their high tunnels. Investigations concluded that fertilizers, including composts, were applied at excessive rates even though these rates may have been suitable for field production. Nutrient management using composts and animal and green manures can be tricky because of the unique environment within high tunnels. High tunnels exclude environmental factors (such as rain, snow and winds) that facilitate the decomposition of composts and animal manures. This limits mineralization and leaching and may lead to a build-up of minerals that can negatively affect plant growth (Burkhart, 2002). In addition, most high tunnels are equipped with drip irrigation, which also limits leaching.

A nutrient management study evaluated two rates of compost on bell peppers in 12 high tunnels at Penn State's High Tunnel Education and Research Facility (Burkhart, 2002). The compost treatments greatly increased soil nutrient and soluble salt levels and compromised yields. One hundred pounds of nitrogen, 150 lbs phosphorous and 100 pounds potassium per acre are recommended for field bell pepper production (Orzolek, et al., 2005). Applying 1 inch of compost increased soil levels to twice the nitrogen, seven times the phosphorous and 13 times the potassium recommended rates. Applying 2 inches of compost increased soil levels to six times the nitrogen, 16 times the phosphorous and 29 times the potassium recommended rates. The base line soluble salt level was 0.15 mmhos/cm and was increased to 0.81 mmhos/cm after 1 inch of compost was applied and to 1.9 mmhos/cm after 2 inches of compost was applied. Despite these results it was

concluded that the use of compost is promising. However, compost application rates should be lower than rates recommended for field production and applied based on nutrient content rather than by volume.

Soil testing can be used to monitor nutrient and salt levels and to adjust nutrient application rates. Additionally, composts and manures should be tested for their nutrient content prior to applying them. Using a combination of nutrient management tools is likely better than relying on one exclusively for long-term soil health.

Burkhart, E.P. 2002. Utilization of Compost in High Tunnel Cropping Systems: Opportunities and Challenges. M.S. Thesis. The Pennsylvania State University.

Orzolek, M.D., P.A. Ferretti, W.J. Lamont, Jr., T. Elkner, K. Demchak, E. Sánchez, A. A. MacNab, J.M. Halbrendt, S.J. Fleischer, L. LaBorde, K. Hoffman, G. J. San Julian. 2005. Commercial Vegetable Production Recommendations – Pennsylvania. PSU Extension Publication AGRS-28.

The Mid-Atlantic Berry Guide for Commercial Growers

[Kathy Demchak](#), Department of Horticulture

The Mid-Atlantic Berry Guide, long-awaited at least by some, is finally in print! The guide has 37 current contributors from Penn State University, Rutgers University, the University of Delaware, The University of Maryland, Virginia Tech, and West Virginia University. In its 205 pages, site preparation and planning, production systems, cultivars, economics, and pest management (including current pesticides that can be used) for strawberries, blueberries, brambles, and gooseberries and currants are covered. Appendices cover diagnostic services available within the region from University and private laboratories; sources of plants and production supplies, and sources of information that expand on various topics in the guide even more. The price is \$15 plus tax where applicable. Pennsylvania growers can obtain the guide through County Extension offices (call ahead to make sure they have it in stock), or directly from the College of Agriculture's Publications Distribution Center (a \$5 postage and handling fee will be added). Call (814) 865-6713 or (877) 345-0691 to obtain the correct total price. VISA and MasterCard orders are accepted. Growers in cooperating states (Maryland, New Jersey, Virginia, Delaware and West Virginia) should obtain the guides from your state's Extension services. The cooperating Universities in these states were all planning to get a supply of guides for their growers, but you might want to call ahead, since not all states had placed orders for their copies as of this writing (Feb. 27, 2006). Happy reading!

Ohio Berry School

Submitted by [Kathy Demchak](#), Department of Horticulture

(This is open to anyone who is interested, even if you aren't from the Midwest. Note that the emphasis is on blueberry production. – KD).

Writer: Candace Pollock: pollock.58@ag.osu.edu (614) 292-3799

Source: Brad Bergefurd: bergefurd.1@osu.edu (740) 289-2071

PIKETON, Ohio -- Ohio State University Extension and Michigan State University Extension are joining forces to provide Midwest berry growers with an intensive two-day training on berry production and management, with a specific emphasis on blueberries.

The Ohio Berry/Blueberry Grower Training Program will take place March 13-14 at Ohio State University South Centers at Piketon in Piketon, Ohio. Sessions on March 13 will run from 9 a.m. to 5 p.m. Sessions on March 14 will run from 8 a.m. to 5 p.m. Cost of the event is \$100, which includes sessions, notebooks with topics translated in Spanish, hands-on field practice to take place in early summer, and catered lunches. Those who are unable to attend the training program may receive a video of the program, along with the notebook and handouts for the registration fee.

Research specialists from both universities will be on-hand to discuss a wide variety of topics.

Topics will include Integrated Pest Management of insects, diseases and weeds, plant growth and development, insect and disease growth and development, weeds and soils, cross-cultural education, principles of scouting, food safety, pesticide safety and regulations, use and management of insecticides, fungicides and herbicides, leadership training, soil and plant tissue sampling techniques, and monitoring and management of insects, diseases and weeds.

Attendees with Private Applicator licenses may earn Applicator Recertification credits.

For more information, or to register contact Brad Bergefurd or Charity Crabtree at (740) 289-2071, or e-mail bergefurd.1@osu.edu. Additional information can also be found by logging onto <http://southcenters.osu.edu/hort/>.

Update on Waste Plastics

[Jim Garthe](#), Penn State Ag Engineer

GR Technologies plastic-derived fuel burner. We are trying to get the Korean company, GR Technologies, to start a factory in Allegheny County. If the business plan gets some nibbles from investors, there could be a factory built to manufacture burners to heat greenhouses and other agricultural structures. The factory will make the plastic-fueled burners, the boilers, and hopefully even the small pea-sized fuel pellets for combustion in the burner.

Plastofuel plastic fuel nuggets. As part of a Pennsylvania Department of Agriculture research project, we have been designing a 500 lb/hour nugget maker targeted for showing at Ag Progress Days, 2006. It will be housed in a research/demonstration trailer, along with an engine-generator for 220-volt power, and a hydraulic power unit, and the nugget maker. The Plastofuel nugget maker design is 75 percent complete. Over the next few months, the Penn State Engineering Services machine shop will produce the final machine parts using our CAD drawings.

Commercialization of plastic-derived fuel technologies. We are working with a local marketing firm to partner with Penn State and GR Technologies to commercialize both our fuel densification technology and the Korean burner together as a package. This is still in the planning stages.

For county Extension educators. After Ag Progress Days 2006 we should be ready to tow the Plastofuel trailer to demonstration sites in the region. This should encourage grower awareness of issues relating to plastic wastes. You may want to consider this when you hold demonstrations at various grower sites this fall. To schedule the unit for a visit to your area, give Jim Garthe a call at (814) 865-7154.

Bottom line. In the foreseeable future, businesses will evolve to accept and densify your waste plastics into fuel. With the GR Technologies burner, you will then be able to cleanly burn these wastes to heat greenhouses or other structures. It will probably be about 3-5 years before the infrastructure will exist to accept plastics from growers.

Physiological Aging of Potato Seed Tubers

[Bill Lamont](#), Department of Horticulture

Information for this article is reproduced from Dr. Alexander Pavlista, Extension Potato Specialist's, "Nebraska Potato Eyes Newsletter" which can be found at www.panhandle.unl.edu/peyes.htm. It is an excellent site for a wide range of information on potato production.

Physiological aging is affected by two factors influencing internal biochemistry especially hormones: genetic predisposition and environmental stress. Since the potato is grown from cloned stem tissue (tubers), genetic predisposition is at the level of cultivars. Environmental stresses in the field are primarily moisture, temperature, nutrients, pest injury, and mechanical damage. In storage, stresses are temperature, moisture, aeration, bruising, and disease.

The physiological aging that we will look at concerns the viability of tubers used for seed. This is broadly defined as "physiology status of the tuber as it affects productivity" or "internal age of the seed resulting from biochemical changes".

Although physiological aging of tubers may occur during the growing season due to stress, it is poorly understood and not quantifiable. However, tubers from plants that died prematurely tend to be physiologically older. The best general indication is to look at the field history of the seed lot in comparison to previous years' seed lots' performance. However, the major aging of seed tubers occurs during storage.

During tuber storage, the primary influence on physiological aging is temperature. Higher storage temperatures are associated with greater physiological aging. So to determine the age of a seed lot samples are removed and bioassayed for morphological stages of aging.

Stages of Physiological Aging in Tubers

There are five stages of tuber physiological aging based on sprouting.

Dormancy

Dormancy is characterized by a period during which sprouting will not occur even under optimal conditions. Dormancy is broken when the amount of abscisic acid (ABA) in the eyes decreases through metabolic breakdown to a level that allows the eyes to respond to conditions favoring sprouting.

Apical Dominance

Young seed is characterized by the exhibition of a dominant eye over the other eyes that is suppressing the sprouting of the other eyes. The suppressing eye is at the apical end of the tuber or "bud" end which is the furthest eye from where the tuber was attached to the vine. Physiologically young tubers produce one or two main stems or low stem number per acre. There is initially one sprout at the apical end and later a second sprout may appear from the eye furthest from the dominant eye as the IAA level is lower.

Multiple Sprouting

Older seed tubers (middle-aged) are characterized by the loss of apical dominance between eyes, i.e., effective IAA levels in tubers are decreased. This develops gradually in time but the time can be shortened by heat. Or, the dominance can be disrupted by cutting the tuber and thereby breaking the translocation path of IAA in the tuber. Removal of the apical sprout will also disrupt apical dormancy although in young tubers, it may be reinstated by the next eye closest to the apical end. Therefore, this stage is characterized by the appearance of several eyes sprouting along the tuber resulting in several main stems per plant. Main stem number correlates with yields.

Branching

As seed tubers age further, there is a breakdown of apical dominance within the sprout, that is, the dominance effect of the tip of the sprout, where IAA is produced on branch buds below has broken down. The result is that sprouts of physiologically old seed tubers are branched. These branches may be weak, referred to as “hairy”. Or, there may be a proliferation of small stolons and a large tuber set that will be poorly maintained.

Little Tuber Disorder

The IAA mechanism is now so broken down that not only do sprouts proliferate their branches into underground stolons but these do not grow much and form tiny tubers quickly.

Performance and Characteristics

Plants growing from seed tubers of different physiological age perform differently. The following table presents a general rule of thumb.

Characteristic	Young Seed	Old Seed
Emergence	slower	faster
Stand	greater	lesser
Early vigor	greater	lesser
Foliage	more	less
Stems/Plant	less	more
Tuber formation	later	earlier
Formation Period	longer	earlier
Tuber number	less	more
Tuber bulking	longer	shorter
Tuber sizing	larger	smaller
Senescence	later	sooner
Early harvest yield	lower	greater
Late harvest yield	greater	lower

Upcoming Meetings

If you have a meeting you would like to announce, please send the meeting title, date, location and contact information to esanchez@psu.edu.

Local

- ✓ March 7, 2006. **Regional Vegetable Growers' Meeting**, Pottsville, PA. For more information contact George Perry at (570) 622-4225 or gpp1@psu.edu.
- ✓ March 15, 2006. **Erie County Vegetable Growers' Meeting**. For more information contact Andy Muza at (814) 725-4601 or ajm4@psu.edu.
- ✓ March 23, 2006. **Vegetable Growers Day**, Neshaminy Manor Center, Doylestown, PA 18901. For more information contact Scott Guiser at (215) 345-3283 or sxg6@psu.edu.

Regional

- ✓ March 13 – 14, 2006. The **Ohio Berry/Blueberry Grower Training Program** will take place at Ohio State University South Centers at Piketon in Piketon, Ohio. Cost of the event is \$100, which includes sessions, notebooks with topics translated in Spanish, hands-on field practice to take place in early summer, and catered lunches. For more information, or to register contact Brad Bergefurd or Charity Crabtree at (740) 289-2071, or e-mail bergefurd.1@osu.edu. Additional information can also be found by logging onto <http://southcenters.osu.edu/hort/>.

National

International

- ✓ February 27 – March 3, 2006. **Advanced Permaculture Garden Design**, Nuevo Arenal, Costa Rica.
Course Instructors: Daninne Egizio-Hughes and Darrell Frey. This course will focus on applying permaculture design to create gardens and functional landscaping for the Inn. Intensive tropical and forest gardens will be designed to supply fruits, herbs and vegetables for the Inn's visitors. Course Fee: \$1500. Registration includes course fee and lodging at the Red Sunset Inn. Nearby activities include recreation at Lake Arenal, eco-tours and the spectacular Arenal Volcano. For more information contact Darrell Frey at (724) 376-2797 or defray@bioshelter.com.

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The newsletter is also posted within three days on the Department of Horticulture Vegetable program website at: <http://hortweb.cas.psu.edu/extension/veg crops/newsletterlist.html>.

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