

Managing Bacterial Diseases of Vine Crops

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There are a number of serious bacterial diseases of vine crops, most of which are seedborne. Bacterial diseases are very difficult to manage in vine crops in the field, therefore practices that prevent the establishment of these diseases are critical. Of the most serious diseases, angular leaf spot, *Xanthomonas* leaf spot, and watermelon fruit blotch are seedborne, while bacterial wilt is vectored by cucumber beetles. Yellow vine decline is a sporadically occurring bacterial disease of vine crops that is transmitted to plants by squash bugs.

Bacterial leaf spot. This disease is caused by a species of *Xanthomonas*, and has become a serious problem in some pumpkin-growing areas in the Midwest, but the disease can also cause significant damage on other vine crops. Lesions on the leaves range from small and irregular to large and angular. Centers become necrotic and lesions are surrounded by a chlorotic halo (Fig. 1A). Leaf marginal necrosis can also occur.

Lesions on fruit are raised and scabby, and often on the top of the fruit (Fig. 1B). Flat, water-soaked areas on fruits may also be observed (Fig. 1C).

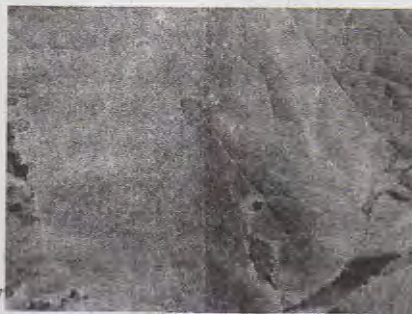


Figure 1A. Bacterial leaf spot on a pumpkin leaf



Figure 1B. Raised, scabby spots on fruit



Figure 1C. Water-soaked lesions on fruit.

Bacterial fruit blotch. Bacterial fruit blotch is caused by a pathogenic bacterium (*Acidovorax avenae* subsp. *citrulli*). This is mainly an economic disease of watermelon, although other vine crops can be affected. Symptoms on leaves are often inconspicuous. On seedlings, water-soaked lesions on the underside of the cotyledons become necrotic. The typical symptom of fruit blotch is a dark olive green spot on the upper surface of the fruit. The spot starts small but rapidly increases in size to cover the most of the fruit surface within approx. 10 days. Secondary microbes then invade and result in fruit rotting.

Angular leaf spot. Angular leaf spot is caused by *Pseudomonas syringae* pv.

Lachrymans, a bacterial plant pathogen that is favored by cool, wet conditions. It is a very serious problem in cucumbers and other vine crops. Symptoms on leaves include angular necrotic lesions surrounded by a chlorotic halo and sunken spots on fruit. The spots

begin as small water-soaked lesions that expand on the surface and also extend well into the fruit, eventually reaching the seeds.



Figure 2A. Angular leaf spot lesions on a pumpkin leaf.

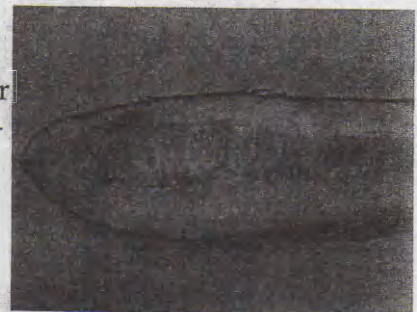


Figure 2B. Infection of cucumber fruit.



Figure 3A. Young pumpkin with early bacterial wilt symptoms.

Bacterial wilt. This disease is often observed on sunny days after vines begin to run. Individual leaves begin to droop or flag (Fig. 3A), but the plant recovers at first (see OSU Fact Sheet HYG-3121-96; <http://ohioline.osu.edu/hyg-fact/3000/3121.html>). Eventually the vine wilts and the entire plant dies. Cucumber and cantaloupes are often affected, but squash, pumpkins and less often, watermelon, are also attacked. This disease is caused by *Erwinia tracheiphila* and is moved from plant to plant by striped (Fig. 3B) and 12-spotted cucumber beetles. In the spring, the beetles emerge from the ground and feed on young plants, introducing bacteria into the leaves or stems and spreading the pathogen from plant to plant. The bacteria reproduce in the water-conducting vessels, producing gums that interfere with water transport. A diagnostic test for bacterial wilt is the observation of sticky ooze between cut pieces of stem after touching them together then gently pulling them apart (Fig. 3C).



Figure 3B. Striped cucumber beetle.



Figure 3C. Bacterial ooze test to confirm diagnosis of bacterial wilt

Bacterial Disease Management Steps

Bacterial diseases generally can't be controlled once they are established in a field and weather conditions are favorable. Therefore prevention is critical, from seed purchase through field production.

1. Purchase seed that has been tested and shown to be negative for seedborne bacterial pathogens. This is not a guarantee that plant pathogenic bacteria are absent since low populations may be undetectable. However, using tested seed is the first line of defense against bacterial diseases. Some seed companies advertise partial resistance in some varieties to angular leaf spot.
2. If seed has not been tested, consider seed treatment with hot water. This is somewhat risky since in large-seeded vegetables germination may be reduced. The following method is suggested by researchers in Australia (R. G. O'Brien and Christine Horlock, Agency for Food and Fibre Sciences, Horticulture):

If seed has not been rated disease free, an effective seed treatment has been developed. Both internal and external contamination can be eliminated by soaking seed for 25 minutes in a water bath maintained at 55 °C. After treatment, place seed in running tap water to bring the temperature down quickly, then dry seed without delay. Seed should be sown within 2 days. Note that this treatment may lower the germination of some seed lots. Test a sample before committing large quantities of expensive seed.

3. Do not over-water seedlings in the greenhouse; try to keep the tops as dry as possible. Minimize touching and handling the plants. Scout seedlings for small, water-soaked spots; if water-soaked spots are observed, send a sample to a reputable lab for diagnosis. If bacterial disease is confirmed, throw away all flats containing symptomatic seedlings. Apply copper-based fungicides to seedlings in the greenhouse.
4. For field production, select growing sites with good drainage and airflow, full sunlight and low humidity.

5. Avoid overhead irrigation to prevent leaf wetness.
6. Insure adequate, but not excessive fertility.
7. Protect plants from cucumber beetle feeding at least until the 4th true leaf stage to reduce the risk of bacterial wilt. Floating row covers can provide a barrier between plants and the beetles that carry the bacteria. The covers also protect plants from squash bugs that may transmit the yellow vine decline pathogen. Foliar applied insecticides may also be used – for pumpkins insecticides should be applied after seedling emergence if the threshold of 0.5 beetles per plant at the cotyledon stage or 1 beetle per plant at the 1st or 2nd leaf stage is exceeded. Pre-plant insecticide application (seed treatment or in-furrow) is also effective.
8. If early in a disease epidemic, removal of infected plants may help to slow the spread of disease. When doing this, make sure not to spread the disease by hand or infested equipment. Diseased plants must be burned (depending on local ordinances) or buried. Cull piles only serve to spread diseases.
9. Spray plants with copper-based fungicides to slow progress of the disease.
10. Destroy foliage and vines as soon as possible after harvest to help manage yellow vine decline.

Managing the Disease that Won't Go Away: Downy Mildew

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Cucurbit downy mildew is most serious on cucumbers, but can damage other vine crops including pumpkins. Changes in the strain types (more aggressive and overcoming cultivar resistance) and early appearance in the northern parts of Ohio (usually in late June) combine to increase the risk of economic loss due to downy mildew.

The causal agent of downy mildew, *Pseudoperonospora cubensis*, is a plant pathogen in the water mold family, which survives only associated with living cucurbit tissue. Therefore it does not survive the winter in the Midwest and must be re-introduced each year. Counties in northern Ohio and southeast Michigan appear to bear the brunt of early introductions from the north (possibly from northern cucumber production greenhouses, which may serve as a "green bridge" for the pathogen), while areas further south generally don't see the disease until late July or August. This may be due to spread from northern areas as well as introduction from the southern US. There are several different pathotypes of the downy mildew pathogen that affect vine crops differently. For example, several do not attack watermelon, pumpkins and squash, while others attack all vine crops. The types we have been seeing in the early introductions appear to be consistently aggressive on cucumber and less so on melons, pumpkins, squash and watermelon. Later introductions from the south may be more aggressive on pumpkins, squash and melon than those from the north.



Figure 1. Sporangia on the underside of a cucumber leaf.

Sporangia, the reproductive as well as wind borne transport structures, are produced on the undersides of the leaves when conditions are humid

and night time temperatures are between 55 and 75 degrees F. The transport and survival of these sporangia is highly dependent on weather conditions. Cloudiness is especially important as direct sunlight can cause the sporangia to dry out in transport. Rainfall can wash sporangia out of the air and deposit them in production fields. Upon deposition of the sporangia on a leaf surface, the absence of free moisture on the leaf may prevent infection, though only 2-6 hours of free moisture are required. Likewise, temperatures outside of the acceptable range for infection (41-82 F) may also inhibit infection.

In cucumber, water-soaked lesions on the underside of the leaf are often observed first. Yellow, irregularly shaped lesions confined by the small leaf veins appear soon after on the top of the leaf (Fig. 2A). These lesions then turn brown and may drop out of the leaf. The "checkerboard" arrangement of lesions is characteristic of cucumber downy mildew. Symptoms normally appear 4-12 days after infection. On cantaloupe, the somewhat angular lesions tend to have a yellow halo around them (Fig. 2B).

On watermelon, the spots may or may not be angular, normally turning brown or black with the leaf developing an upward curl. On pumpkins and winter squash, the symptoms may resemble powdery mildew, causing yellow spotting that tends to brown out. As the lesions age, they usually become necrotic on all types of cucurbits and the leaves often senesce. This dieback is normally first noticed on the oldest leaves near the center of the plant. Regardless of the variability in appearance of the leaf lesions among the different cucurbits, the one similarity and diagnostic sign is the presence of purplish-gray sporangia on the bottom side of the leaf within the lesions (Fig. 1). These are most readily observed when conditions are cool and moist, with or without the aid of a hand lens. They

may also appear when an infected leaf is placed in a closed plastic bag with a damp paper towel for 12-24 hours. The leaves are the only portion of the plant directly affected by downy mildew, though the resulting loss in leaf surface can cause loss of yield, misshapen fruit and sunscald.

Managing Downy Mildew in Pumpkins

1. While some degrees of partial resistance to downy mildew can be found in cucumbers, downy mildew-resistant pumpkin cultivars are not available.
2. Select growing sites with good drainage and airflow, full sunlight and low humidity.
3. Avoid overhead irrigation to prevent leaf wetness.
4. Insure adequate, but not excessive fertility.
5. Monitor the crop frequently – scouting is one of the most important things you can do to combat downy mildew economically. Make use of the Cucurbit Downy Mildew ipmPIPE (<http://cdmipmpipe.org>) to monitor reports of downy mildew throughout the country.



Figure 2A. (above) Early symptoms of downy mildew on pumpkins



Figure 2B. Symptoms of down mildew on (left) cucumber, (middle) melon, and (right) watermelon.

Local updates on downy mildew and other diseases are also available on university IPM websites:

- OSU VegNet: www.vegnet.osu.edu
 - Purdue Vegetable Crops Hotline: www.btny.purdue.edu/pubs/vegcrop/index2009.html
 - MSU Vegetable CAT Alert: ipmnews.msu.edu/vegetable/
6. Fungicides are required to control downy mildew. When to start applying them and which products to use will depend on your location and weather conditions. Warm, bright sunny days are not conducive to downy mildew as the sporangia are killed by UV light. In areas in which downy mildew typically arrives early, start scouting pumpkin fields for downy mildew by late June, and apply protectant (contact) fungicides containing chlorothalnil (e.g. Bravo, Echo, Equus) or mancozeb on a 7-10 day schedule. Use the shorter schedule under cool, wet conditions. Once downy mildew has been found nearby, add the more effective (but more expensive) fungicides such as Presidio, Ranman, Tanos and Previcur Flex to the program.

Remember to tank mix the latter fungicides with a contact type fungicide and alternate products with different modes of action. Growers in areas where downy mildew typically appears in August or September should also scout regularly but may be able to delay application of fungicides until early August.

2017 Season Dream Year !!!

By Joe Jutras

It's been a dream of mine from 2007 after I grew the 1689 WR pumpkin 126.5" WR Long Gourd in 2006 I thought I would try for the Trifecta green squash which seemed like it shouldn't be that hard to grow, but it wasn't that easy.

At first I only grew two squash plants each year and back then I had a lot of trouble setting fruit. Maybe because of genetics or most likely soil conditions. After a lot of mistakes and networking with other squash growers I learned a lot of tricks of how to grow.



As noted on the next page I started 21 Squash plants, and was able to get 4 to produce Green Squashes.

Keep your fruit covered from the sun and keep it cool. I think most of all have your phosphorus leaves up high and fertilize with a bloom booster fertilizer before and during pollination. That seemed to make the biggest difference for me. I have come close before to winning with a 4th place and 3 2nd places, but always a little short of my goal. Squash have come a long way in the past 10 years that I have been growing them. Biggest being they have been crossed with pumpkins. Why mainly because of size and shapes and soundness of fruit becoming the most important factors. There are thousands more pumpkins grown than squash, so there is a much larger gene pool to select from. Some of the pumpkin genetics that are in the 1844.5 Holub came right from my back yard. Yes, the 1689 well not exactly, but the male pollen from it did. You have heard of the 1386 Jutras that was grown by Christy Harp and selfed it, becoming the 1725. Ron Wallace grew it and it became the 2009. Here's where it became tricky.

Matt Debacko took cuttings and made clones from Ron's 2009 plant, shipped it to Joe Scherber and he grew it to 282 lbs., for seeds that was

2017	2118 Jutras (*1844.5 Holub x*1844.5 Holub)
2016	*1844.5 Holub (1060 Holub x 1060 Holub)
2015	1060 Holub (1478.5 Holub x 1478.5 Holub)
2014	1478.5 Holub (282 Scherber x 615 Cantrell)
2013	615 Cantrell(*913 Boyce x*1221.5 Robinson)
2012	*1221.5 Robinson(*996 Haight x1807.5 Stelts)
2011	*913 Boyce *800 Neily x 1634 Werner)

selfed again. This chart (*=SQ) shows where Scott Holub started his SUPER HYBRID cross from, in 2014, with that 282 lb. pumpkin. So enough of the Super SQ Cross from Scott and Dave Cantrell. Here's how we grew it. Biggest factor I think was from resting the soil and cover cropping for 2 years with Winter Rye and Mustard. Last year Steve Sperry Ron Wallace and I tried solarizing our patch's. My patch was 60x120 (7200 Sq. Ft. It started off with a full crop of Mustard, which was tilled in before a hard frost. In the Spring of 2016 I replanted mustard, and tilled it in with 2 1/2 yards of composted Chicken Manure per 1000 sq. ft., in the 2nd week of June and watered it in good. We then covered the entire patch with 2 mil clear plastic.

The hard part was to seal the edges of the plastic to make it Air-tight. When reading about solarization they recommended thin mil plastic, and using two layers with an air space in between. But that was out of the question in a large area like we had. We opted for 2 mil, but the widest we could get was 20 ft. wide rolls that were 200 ft. long. Cheapest price I could find was Uline. This meant we had to use 2 sheets with wooden beams on top to secure the edges. See picture. On the outside a edges we shoveled soil on top to hold it down tight. That worked very well. You could tell it was composting and fumigating by the smell, and boy was it stinking up the back yard for almost 3 weeks. The hottest I recorded was 135F at about 6-8 inches deep. We left the plastic on for 9 weeks. By that time the plastic was starting to deteriorate, and I had to take it off. I replanted the Mustard one more time and noticed it was the strongest healthy crop I have ever grown, in that patch by far. Soil tests came back fine I thought, but I always seem to be low on Manganese, Copper, and Zinc on my Tissue tests so I added some of these micronutrients to my soil. Amendments were added in April 13th all at once. I usually like to only amend where my portable mini greenhouses are, and wait until they are removed to do the entire garden. This year was a little different because I grew so many squash plants



Solarization cover on my patch in 2016

Western Laboratories, Inc.
 P.O. Box 1030 • 211 Highway 65 • Parma, ID 83650
 208-752-6564 • 800-436-3956
<http://www.westernlabs.net>

Lab No: 2476

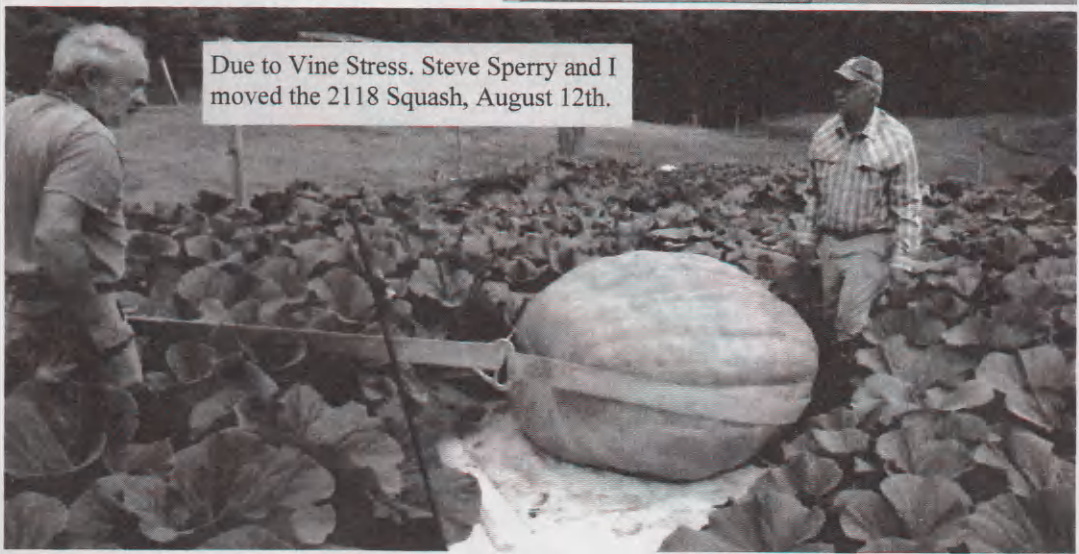
Test # 11
 Reported: 7/14/2017
 Grower: Joe Jutras
 Sample ID: Pumpkin
 Irrigation:
 Crop: Atlantic Giant Pumpkin

Dealer No: PD
 Dealer: Joe Jutras
 Address: 16 Rocky Hill Rd

Saltate RI 02857

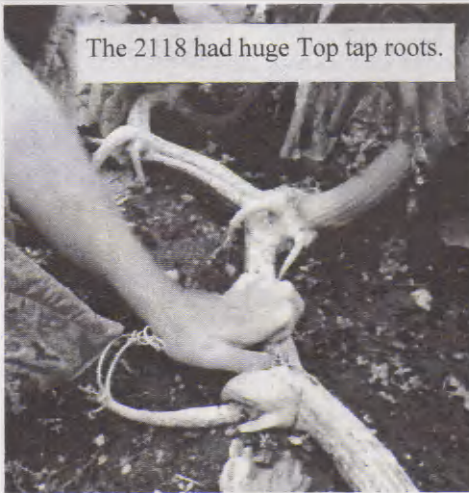
PLANT ANALYSIS REPORT

PLANT NUTRIENTS	SUFFICIENCY RANGE	YOUR TEST RESULTS	NUTRIENT SUGGESTIONS IN POUNDS PER ACRE		
			FOLIAR	INJECTION OR WATER RUN	YOU APPLIED
NITRATE NO ₃ - ppm	5785	5364			
NITROGEN N - %	-		7	20	
PHOSPHORUS P - %	0.81 - 1.2	1.05			
POTASSIUM K - %	7.5 - 12.0	11.47			
SULFUR S - %	.23 - .5	0.31			
CALCIUM Ca - %	.5 - 2.25	0.82			
MAGNESIUM Mg - %	.25 - .48	0.36			
ZINC Zn - ppm	42 - 75	61			
MANGANESE Mn - ppm	25 - 75	17	0.2	0.25	
COPPER Cu - ppm	13 - 45	15			
IRON Fe - ppm	75 - 500	173			
BORON B - ppm	24 - 70	21	0.1	0.2	
CHLORIDE Cl - ppm	-				
SODIUM Na - %	-	56.00			



Due to Vine Stress. Steve Sperry and I moved the 2118 Squash, August 12th.

My initial thought was to grow 4 Squash Plots, each being 30 ft. x 40 ft., and triple plant each site with 3 Green houses (with two plants in each). Reason being, is that I was trying Scotts 1060 hybrid cross with only 1 in 4 odd's of getting a green fruit. Out of (12) 1060 plants I got only one green one, the rest were orange.... that's why I'm not a gambling man, when it comes to Squash.



The 2118 had huge Top tap roots.

I planted 5 1844 and 3 1445, ending up keeping 2 1844's and one of my 1445 Squash plants.

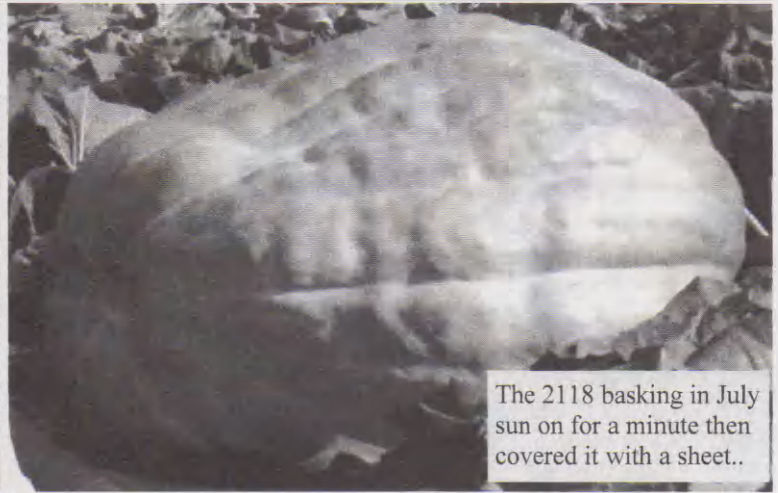
By starting with so many plants, I thought I would try something different and start them in the house like I normally do in Quart sized pots, then moving them to the 2 gallon pots would take a lot of room, so I put them in a Greenhouse on wheels, moving them in the garage at night and back outside during the day. I like the way they harden up and they were always in natural light.

Our June was cold, wet and overcast. The early fruit were malformed, turned yellow and weren't ones you would want to keep. All my fruit were at least 16 to 22 ft. out on the Main Vine. My 2118 was at 16 ft. on Jun2 27th. Eight side vines on the right side and 9 side vines on the left. It was the first fruit set on the Main vine on that plant. I had another fruit, next fruit down but decided to keep the first one, because it had a lot longer stem. And that's what you like to see on a Squash to minimize potential of stress later in the season. I guess I got lucky on that one. The first 3 side vines on each side of the main were terminated at 15 ft., then the others were Spider Vined to go around the fruit. One thing I did different was to use a tertiary vine as the spider part of that vine running the length of the patch. I would let the side vine grow about 4 leaves past where I want it to aid letting it root down, then cutting it back to where the tertiary vine would run. By doing this you are slowing down the plant growth keeping the plant younger in late August and September. Most of all stronger roots.

Shown is my weight gain chart for the 2118. Note there was no measurement change from Sept 23 to the Weigh-off on Oct 8th, so I guess it was adding weight inside.

Fertilizers I used are started when plants are set in the pots, where I use a Seaweed and Fish ferts. Then when I plant outside, I add a high phosphorous Bloom Booster as they start to run. I use WOW Pumpkin Pro Mykos with some bone meal from Miracle Grow. It has 6% N, 8% Phosphorous, and 7% Calcium. Also under, and on top of every leaf node, Root Shield and some powdered AZOS is added, for Pythium protection. I estimate the percentage I add is 65% Pumpkin Pro, 20% Root Shield and 10% Bone Meal, 5% AZOS. I use TKO early to help with Ph. When the plant starts to really kick in with Rapid Growth, I fertilize every day. Remember that less is more but keep them leaves and the plant looking good. And happy. Some of the Weekly ferts are Seaweed, Fish and Seaweed, Humic Acid, Epsom Salts, borax, calcium, 10/10/10, 12/12/12 or 15/2/15 Manganese. The one I use the most is the Seaweed at 3 times a week. All are applied as a foliar application at around 5pm. Maybe next year I'll wash off most of the high salt ferts, like the Growth Products 10/10/10 and others. My leaves looked a little old earlier than I thought they should have. I know Steve Sperry's

2118 Growth Chart		
Date	Weight	Ave/Day
7/23	371	----
7/30	635	37
8/7	951	39.5
8/13	1186	39
8/20	1446	37
8/27	1660	30
9/3	1768	15
9/10	1868	14
9/17	1938	10
9/23	2009	11



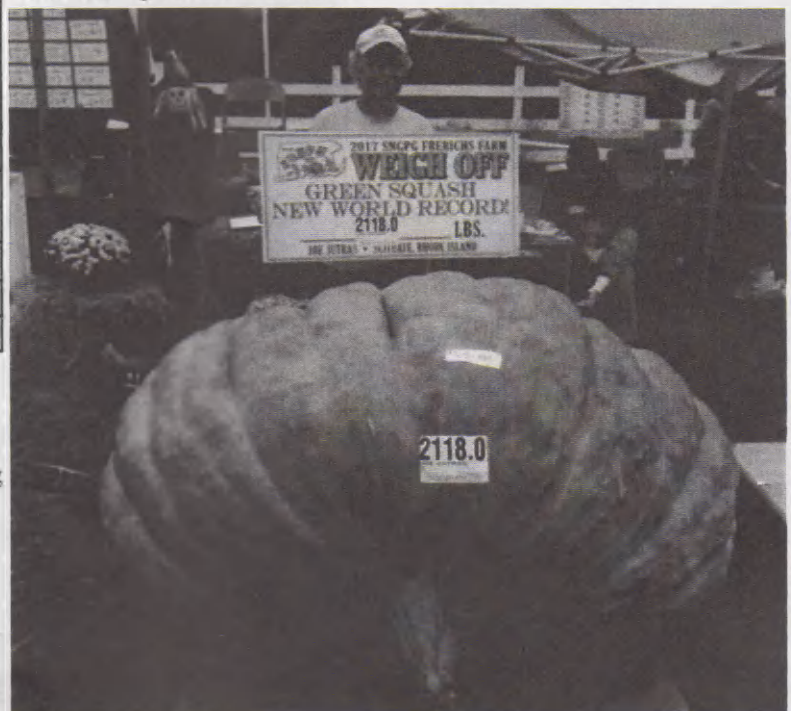
The 2118 basking in July sun on for a minute then covered it with a sheet..

plant leaves looked much better than mine in September, and he did a lot more watering after fertilizing.

Spraying is the least liked job in the patch, but it's one of the most important jobs there is. The health of your plant depends on it. You must be proactive about this rather than reactive. I spray faithfully every week. I use Warrior and Merit insecticides. Fungicides are changed weekly Bravo to Manzate, Pristine, Eagle, Sarran, TKO or Cleary's.

Soil Drenches I started the first week of June with Companion, Actinovate and WOW Wonder Brew Tea. Starting in Early July and rotating biweekly with Subdue, Medallion, Terrazole **Watering** in the season is done out of a black drum with temper water. Later when the temperatures warm up it's not necessary to have warm water. I have an Aquat meter by McCormeter. It monitors soil moisture. We have found 45% is the maximum level to try to maintain. This is very helpful when you receive heavy rains to know when to start watering again. Overhead water on timers starting at 9am and then again at 11am. I then finish watering by hand on areas that look like they need it. I would say 100-150 gallons could be used on a long hot spell, or windy days. Later in the season you can get by with 50 gallons when temps cool down, and the plants grow slower

New things for next year. I'll be trying two much larger green houses, big enough for a 24 ft. wide by 20 ft. long plant. Hopefully this will help me get a faster start and a bigger healthier plant. Plus, I'll try to start a fruit 15-18 ft. out on June 20th- 24th. Also, I'll be cutting off the first couple side vines from the Main Vine. I want to thank Scott Holub for his Hybrid Supper Cross 1844.5 SQ seeds. They made my goal attainable and then some. Wishing everyone a great growing season in 2018. All my best.... Joe Jutras.



HOW I GREW THE 2,363 POUND PUMPKIN

(2145.5 McMullen x 2261 Wallace) Cross

By Joel Holland

Early Season and Patch Preparation 2017 was a year of contrast. Late Winter and Spring brought us record rains. In June the weather changed abruptly from cool and wet to warm and dry. In July and August we set a record of 55-days in a row without measurable rain. We received just .03-inches in the official rain gauge at Sea-Tac Airport that stopped the record, and then we went almost another rainless month. We really need it to be warm and dry here in Western Washington in order to be nationally competitive. When we have a wet summer it can stay cloudy and cool for extended periods, resulting in slow fruit growth. When I had the World Record in 1992, the summer was very similar to what we had in 2017.

Early on, I was behind, as evidenced by a 10-day delay in getting the cover crop turned under. I like to have the cloches set up on prepared soil before I start my seeds indoors. This season, because of the weather it was just

not possible. I went ahead and started my seeds on April 18th, hoping for a dry spell in order to work the soil and erect the cloches before my usual set-out date of around May 5th.

One change I made in order to save time was to abandon the use of the 16' X 16' cloches. I decided to go with some pre-built 7' X 10' PVC frames that require less prepared soil area and also go up very quickly. The drawback to using these smaller units is that the plants outgrow them before the weather is conducive to

having a plant out in the open. Soil heating cables helped overcome cool soil conditions.

I realized I had a special opportunity with the 2,145 McMullen plant. The plan for this plant was to prepare the soil around its 7' X 10' enclosure as soon as possible, and then construct a larger cloche over the top. The weather allowed me to accomplish this and the smaller cloche was removed and carried out one end of the larger temporary greenhouse.

About the middle of June it was as if a switch had been thrown, the days suddenly became warm and dry. I was still about a week behind in plant development. The decision was made to just set the 1st female on the main of each of my 6 plants and just go with that pumpkin, rather than proceed with a selection process. All females on the laterals were removed before opening. Once I was reasonably sure that the 1st female on the main was set, I removed subsequent females on that vine as well. Because I was able to set up the one larger cloche over the 2,145 plant, a nice early pollination date of June 24th was achieved about 10-feet out on the main. We have cool nights in Western Washington and the pumpkins typically start out slowly and take longer to

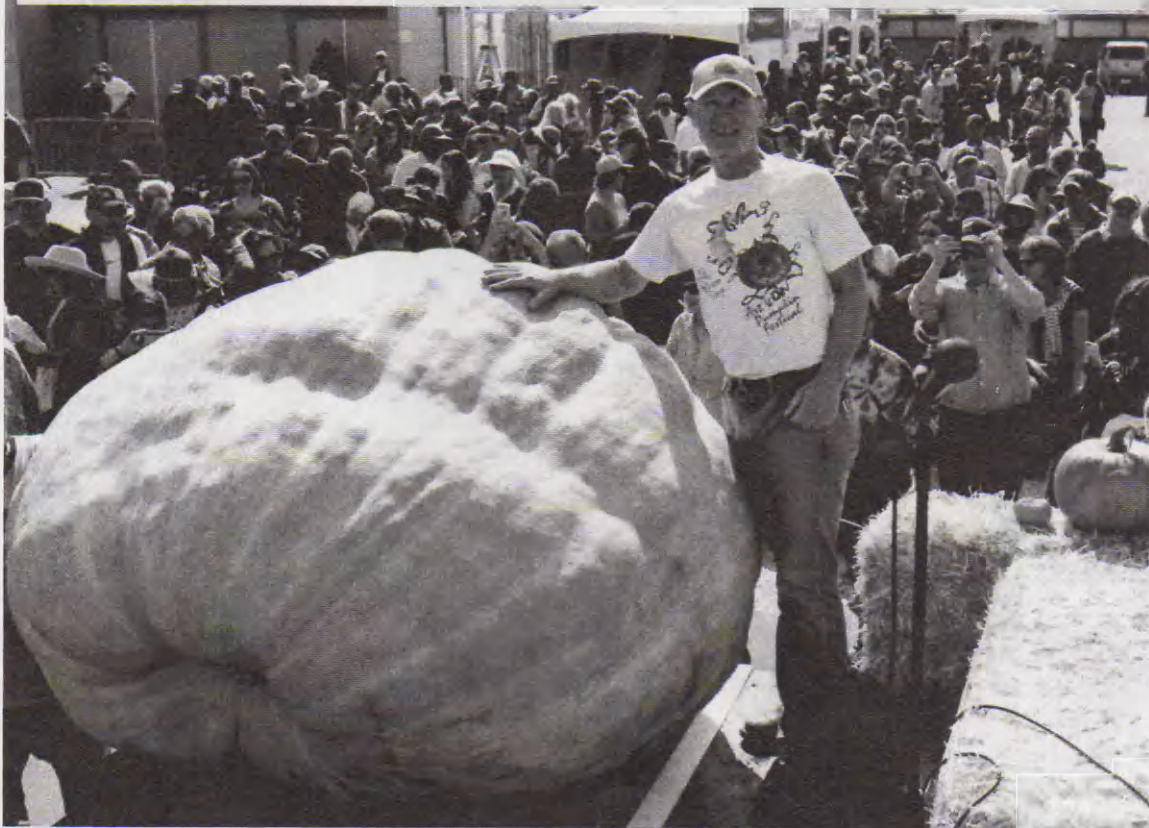
reach maturity. Our warmest monthly average night lows are in July at 55.3-degrees and August at 55.7-degrees. This year we had many more nights in the low 60's than most seasons.

Plant Pattern and Spacing The 6 plants were grown in a modified Christmas tree pattern. The plants were on 27-foot centers with 1-foot paths between each. This allowed laterals of 13-feet on each side of the mains that grew east to west. There was 10-feet of space behind the plant or to the East. The first set of laterals were each allowed to grow 3 or 4 tertiary vines and these filled in that space. The first set of laterals were actually angled back towards the east, so the tertiaries were shorter the farther they were out on those laterals. I feel having this 10-feet of cultivated fertilized soil allows more root development than when plants are back-to-back, or have a walkway or uncultivated area close behind the plant. I use a 16" X 8-foot strip of 5/8-inch outdoor plywood to access the east end of the plant.

In front of the plant, or in the direction in which the main vine was

growing there was 35-feet of cultivated area. Each plant didn't entirely use all of this space, but averaged between 900 and 1,000 square feet. Generally I turn the main at some point to grow south and treat it as the final lateral on that side. I keep each lateral between the base of the plant to near where the pumpkin is set and take every other one off past the pumpkin. I pinch the lateral bud that wants to grow right where the pumpkin is set right away, as

Joel, with his 2363 lb. winning Pumpkin, at Half Moon Bay in California.



well as the first one on each side of the fruit. I let the second lateral on either side of the pumpkin grow out 3 to 4-feet before heading them back. They will need to come off at some point, but early on they provide some shade for the small pumpkin. I feel taking every other lateral on each side off past the pumpkin helps transition the plant from vegetative growth and more into fruit development.

Weed control early on is accomplished by tilling out ahead of the plant in strips where Pumpkin Power and Mycorrhizae are added. I am careful to stay well out from where roots are developing and we have a segment on one of our DVDs concerning this. Later on and in between the laterals I use a scuffle hoe with about an 8-inch blade that can be run back and forth just under the surface. The weed free compost material I use to cover the vines also is helpful. I plant a winter cover crop so we don't get a lot of over-wintering type weeds and grasses.

Fertilizer Program I decided to modify the fertilizer program that I have used for years, partly because I started out behind, and also knowing I had an excellent opportunity with the 2,145 McMullen seed. The plan was to increase the application rates on most

of the granular products by 25% to 40%. I also intended to increase the frequency of my foliar applications from weekly to every 5-days, and also step-up the concentration by the same 25% to 40%. I used the fertilizer schedule as posted on our website, www.hollandsgiants.com, but with those modifications I have discussed. My soil is naturally lower than optimal in Potassium, Calcium, Magnesium, Sulphur, Boron and Manganese, so I addressed these issues over and above the fertilizer schedule. The Calcium and Magnesium were boosted with Dolopril Super Sweet at 3-pounds per 100-square feet. Our soil also tends to be acidic, so this helped raise the pH to be close to my target of 6.8. At this pH (potential Hydrogen) nutrient, availability is ideal and Mycorrhizal Fungi activity is strong at just under a neutral soil pH. Langbeinite was used at 2-pounds per 100-square feet to improve levels of Potassium, Magnesium, and Sulphur. Manganese and some additional Sulphur was supplied with an application of our Manganese Sulphate granular at 1-pound per 1,000-square feet. Boron was added to the foliar schedule, for this I used Solubor. Rather than apply it as a stand-alone spray, I combined it with every other application of Soluble Calcium Spray, as it

helps with the uptake of this vital element. Because Manganese and Boron are micro-nutrients I didn't increase the concentration levels. The other foliar ingredient that didn't get a boost in concentration was the Amino-Acid Bio-Activator. Since it was being applied more frequently with the turbo-charged foliar regimen, I left the concentration at label recommendation. The Pumpkin Power 9-3-4 All-Organic was tilled into the growing beds at 2.5-pounds per 100-square feet. In the trench it was increased slightly from 1/4-cup per 3-feet of vine to 1/3-cup. I sometimes combined sprays if time was short.

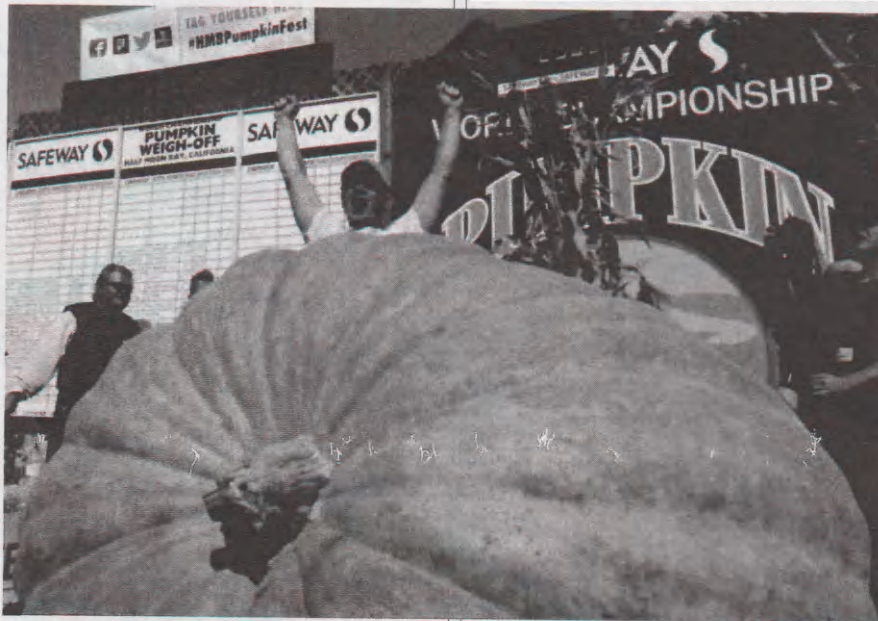
The Soluble Seaweed Power 1-1-17 seemed to team up well with either the Soluble Calcium Powder or the Soluble Fish Powder 12-1-1. Normally I taper off with the Soluble Fish and start with the Blossom Booster & Fruit Finisher 0-52-34 on June 10th. As I was still running behind on plant size, I continued with Soluble Fish Powder 12-1-1 until June 20th. I slightly over-lapped and phased in the 0-52-34 beginning on June 15th.

Pests and Disease We are fortunate in the Northwest as far as insect pests go. We have no squash vine borers, squash bugs and very few cucumber beetles. Black aphids can be a problem but they are easily controlled with our all-organic garlic based Bio-Repel, or the plant oil based Pest Out. Our program for disease control centered on alternating sprays of Soluble Companion Powder, Actinovate and Fosphite. The Fosphite is known as a "Reduced Hazard Fungicide". Fosphite, a J.H. Biotech product that we distribute, is much more concentrated than products called Phosphites. Our Mycorrhizal Fungi program and Rootshield rounded out our strategy against disease. I did work more BioGrow Endo Plus, 4-species Myco into the soil than normal as well. Initially I tilled in 4-pounds per growing area. Whenever I tilled the soil out ahead of the plant I worked in BioGrow Endo Plus at 2-pounds per 100-square feet. In the trenches I used 2-Tablespoons at each leaf axil.

This season I made more use of our premium 9-species Soluble Myco called Soluble Maxx. On my plants that grew the 2,363 and the 1,790 I also wet down the trench area with the Soluble Maxx in addition to using the BioGrow Endo Plus at each leaf axil. All plants were

watered in when set out with Soluble Maxx, which contains 9-species of Mycorrhizal Fungi in a matrix of fine Soluble Seaweed Powder. The Granular Rootshield was working into the soil at 2-pounds per planting site, plus 2-Tablespoons in each planting hole. Two weeks after the plants were set out, a drench with the Soluble Rootshield was done around each small plant.

Watering We had both soaker hoses under the 2,145 plant, plus Whizzers and Perfect Pin Nozzles above the canopy. Watering is accomplished with the use of a 1,550-gallon black plastic tank. The last thing I need is 55-degree F. water on the plants when it is more often than not, too cool to begin with! The black tank is a passive solar collector, but I have an active component as well. I position a submersible pump near the bottom of the tank. The water is circulated through about 400 feet of black or dark colored garden hose and then right back into the tank. The garden hose is laid out in a serpentine pattern along the edge of our long black asphalt driveway. In this way we can usually water the plants with 75-80-degree water. The tank itself is plumbed so water can be circulated by my 2-horse electric motor as well. The



water in the tank tends to stratify, becoming over 100-degrees at the top, but remaining cool near the bottom. This circulating feature evens out the water temperature and also is useful in mixing water soluble fertilizers, fungicides or pest controls. Our DVDs show in detail how the plumbing and pump are set up to accomplish these tasks. A pressure modulating valve is part of the system as well. I can use the 2 horsepower motor to supply just a single sprinkler head by returning the excess flow right back to the tank, or flow 20 heads or more utilizing the full capacity of the pump which runs on 220 volts. A decision

whether to use the overhead sprinklers or the soaker hoses was based on intuition. Early in the day, early in the season, during very warm weather, and whether I wanted to apply something to the leaves were factors in support of overhead. Later in the day, cool weather, and later in the season were considerations that favored use of the soaker hoses.

My sincerest hope is that some tidbit of information either from this article, or from one of our DVDs serves to help growers reach their goals and be successful in the pursuit of growing a giant pumpkin or squash.

It's difficult to cover everything in one article. We do have a 2-hour DVD coming out this winter that will show our methods and procedures in more depth and clarity. Our new DVD will also show our amazing experiences in Half Moon Bay, California and New York City with the 2,363 lb. pumpkin.

I would like to give a special Thank You to my wife Mari Lou. As some of you know, I have also become interested in collecting and showing classic cars. Many weekends I was showing either our 1960 Imperial Crown Convertible or the 1957 Ford Skyliner Retractable Hardtop. Obviously on many of these days watering or foliar feeding had to be done. Mari Lou did an excellent job in caring for the plants in my absence.

Please visit our website www.hollandsgiants.com to see our complete fertilizer schedule, the products that we offer and use, plus nearly 100 pictures of giant pumpkins and their growers from all over North America and other continents as well.

Thank you, Joel Holland