Results of a New York Blueberry Survey[1]

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Summary

A survey of blueberry plantings was conducted in 2007, 2008, and 2009 for canker fungi and other pest management issues. Phomopsis canker was found most frequently. Botryosphaeria stem blight and was necrotic ringspot (caused by tobacco ringspot virus) were found for the first time on blueberry in NY. Our results have prompted us to consider research on fungicide treatments for Phomopsis canker and to undertake a survey for viral diseases in blueberry.

Well-managed blueberry plantings can remain productive for 25 years or more. Canker and dieback diseases rob plants of fruiting wood and reduce planting longevity. The two most common canker diseases identified by Carroll in specimens submitted to the plant pathology diagnostic lab in the 1980's were Phomopsis canker and Fusicoccum (Godronia) canker, prompting her to undertake a survey for these diseases. While cultural practices to manage these two canker diseases are similar, intensive management to bring the cankers under control in severely affected plantings may need to rely on pathogen-specific fungicide programs over a two to three year period, rather than a one-size-fits-all approach.

Infection by canker fungi causes leaves to turn reddish-brown, wilt and remain attached to shoots. Typically, symptoms first occur when fruit is present and temperatures are warm. Cankers are often found near the base of the affected canes, but can occur higher in the canopy on branches. When pruning out affected canes, look for tan, pink, or brown discoloration in the wood in cross-section. Fungal spores, produced on infected wood, spread the diseases within and among the plants so it is very important to rid the planting of this inoculum.

Fusicoccum spore release occurs during rain events essentially all season long, from bud break to leaf drop, with peak spore production and release during bloom (Caruso & Ramsdell 1995). Phomopsis spore release occurs during rain events from blossom bud swell (pink bud) through late August. As little as 0.15 inch of rain can trigger spore release. Infections occur within 48 hours in the presence of free water, warm temperatures (50F-80F), and susceptible tissues.

Fusicoccum cankers on 1- to 2-yr-old canes typically develop from infections that occurred the previous year, while those from Phomopsis canker can develop in the same year of infection. Wounds are not required for infection by Fusicoccum. Although this is also true for Phomopsis, mechanically wounded or freeze-damaged stems are more prone to Phomopsis infection.

Phomopsis cankers are brownish with a lighter brown center, while Fusicoccum cankers are redder and may have a target pattern of alternating bands of light and dark reddish-brown. As infected stems age, Phomopsis cankers turn gray and the canes become flattened because the infected side of the stem fails to put down wood.

Management relies principally on proper site selection and maintaining vigorous plants: proper soil pH, plant nutrition, irrigation, avoiding frost pockets and winter injury. IPM principals of sanitation and canopy management are paramount. Prune out diseased and dead canes. Remove prunings from the planting and destroy them by chopping or burning. Be mindful of restrictions against burning, but do not neglect the importance of removing prunings from the planting. Manage the planting to allow for rapid drying of the plant canopy after rain: manage weeds, prune out old canes, orient rows with prevailing winds, and select sites with good air drainage.

Survey Methods

Extension educators in each of the growing regions assisted with the surveys and received reports on the results found. Their cooperation is gratefully acknowledged; they included:
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During June and July, 33 farms were visited, 7 in 2007 (Tioga, Orleans, and Niagara counties) (Carroll 2007b), 12 in 2008 (Essex, Washington, Saratoga, Albany, Columbia, and Dutchess counties), and 14 in 2009 (Oswego, Onondaga, and Yates counties). Plantings were traversed randomly, unless specific areas were identified by the grower as having problems, and plants examined.

Suspicious canes were removed and brought back to the laboratory for analysis. Subsamples of the canes and branches were incubated in a moist chamber to encourage sporulation of fungi which were identified microscopically. Identity of fungi was based on characteristic size, shape and color of the fungal fruiting bodies and spores (stroma, pycnidia, acervuli, conidiophores, cirrhi, and conidia) (Caruso & Ramsdell 1995, Farr et al. 1989). Samples with suspected virus infection were tested with virus-specific antisera and via indicator plants.

Results

The farms surveyed ranged in size from under 1 to over 20 acres, with plantings from 1 to over 25 yrs old. One farm, had long-established plantings still producing well that were pushing 100 years old. The majority of the plantings had irrigation. Those with good weed management used sawdust or wood chip mulch within the plant row. Plantings with vigorous, high-yielding plants were pruned primarily to remove old canes, allowing canes to achieve their natural height of 5-8 ft (Pritts and Hancock 1992), had drip irrigation, were mulched, and had excellent weed control.

Figure 1. Highbush blueberry plant with high incidence of Phomopsis canker.

Phomopsis was the most prevalent canker disease in the New York blueberry plantings surveyed, especially in Eastern NY where Fusicoccum was not found. By contrast, in Western NY farms Fusicoccum canker was more frequently found (Table 1). Phomopsis canker was associated with the most severely affected plantings with 10-50% infected plants. Typically, incidence of cankers within a planting was low, ranging from 2-5% infected plants. If canker incidence was ~10% infected plants, growers were concerned. Most often only one infected cane was found per plant, and therefore, the disease would go unnoticed. But, when incidence in the planting exceeded 10%, several canes per plant were infected (Fig 1). Severe Phomopsis canker incidence approaching 50% infected plants was found in three plantings in NY.

Table 1. Prevalence of canker and dieback diseases found in 33 blueberry farms surveyed during the summers of 2007, 2008, and 2009.

Canker / Dieback	W NY Farms	E NY Farms	C NY Farms	Total of Disease
Phomopsis [a]	3	12	8	22
Fusicoccum [b]	5	0	4	9
Anthracnose [c]	2	0	3	4
Botryosphaeria [d]	1	3	0	4
Botrytis [e]	0	2	1	3
Number of Farms	**7**	**12**	**16**	

[a] Phomopsis canker, *Phomopsis vaccinii* Shear.
[b] Fusicoccum canker or Godronia canker, anamorph (conidial stage) *Fusicoccum putrefaciens* Shear and teleomorph (ascospore stage) *Godronia cassandrae* Peck. Ascospore infections are relatively unimportant in the disease cycle.
[c] Twig blight caused by the anthracnose fruit rot or ripe rot pathogens, *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc. or *C. acutatum* J.H. Simmonds.
[d] Botryosphaeria stem blight, putative identification of *Fusicoccum aesculi* Corda (conidial stage) of *Botryosphaeria dothidea* (Moug.:Fr.) Ces. & De Not.
[e] Botrytis blight, *Botrytis cinerea* Pers.:Fr.

Canker incidence varied among cultivars. It is known that certain cultivars are very susceptible to Phomopsis canker (Weymouth, Earliblue, and Berkeley) and to Fusicoccum canker (Jersey, Earliblue, and Bluecrop) (Pritts et al. 2009). While only some growers had good records of which cultivars were found in their plantings, this information can be fundamental to IPM and to advancing blueberry production in NY.

Figure 2. Microscopic view of squashed fruiting body and spores of asexual state of *Botryosphaeria dothidea*. (400X magnification)

Figure 3. Cross-section mummy-berry-infected immature blueberry fruit.

Botryosphaeria stem blight (Fig 2) was tentatively identified from four farms in NY (Table 1). This disease on blueberry had not been previously described from NY. This fungus has a broad host range, attacking deciduous trees and shrubs including maple, birch, sumac, elm, viburnum, apple, buckthorn, etc.) Management practices for this disease would be similar to those for the other canker diseases. Twig blights were found associated with infection by *Colletotrichum* spp. and *Botrytis cinerea*, anthracnose ripe rot and Botrytis blight, respectively, were also found. A Pestalotia-like fungus was found on a small number of samples collected in 2007 and 2008 and may be the same as one reported from blueberry plantings in Chile *Pestalotiopsis clavispora* (Espinoza et al 2008).

Mummy berry primary infections can also cause small twig blight symptoms in the absence of fruit infections. Lack of fruit infection may result from dry, hot conditions following a wet spring, from flowering time not coinciding well with production of spores on blighted leaves and twigs, perhaps from early abscission of infected fruit, or from well-timed fungicide sprays protecting blossoms. In 2009, likely favored by the wet growing season, mummy berry on fruit (Fig 3) was found in half of the plantings visited and affected up to 70% of the fruit in poorly managed plantings. In prior years it was found only in one planting in 2007.

Weed management problems were most frequently encountered in plantings that had recently changed hands, where time allotted to farm management was insufficient, and where herbicide applications were poorly timed or inadequate. Instances where perennial weeds had encroached on plantings, serious economic impact on yield resulted. One interesting weed was found in two well-managed Eastern NY plantings. It was groundnut, *Apios americana*, a perennial vine which grows from edible tubers (Iungerman 2008) (Fig4 ABCD).

Symptoms of viral disease were found on 12 farms surveyed and samples brought back for analysis (Carroll 2007a). Of these, samples from four farms tested positive for the presence of tomato ringspot virus (ToRSV) (Fig 5) and additional samples from one of these four farms tested positive for tobacco ringspot virus (TRSV) which causes the disease known as necrotic ringspot of blueberry (Converse 1987) (Fig 6). Tobacco ringspot was confirmed for the first time on blueberry in NY. The prevalence of virus symptoms in plantings and the concern expressed by the growers and extension specialists has prompted the authors to embark next spring on a statewide survey of viral diseases in blueberries.

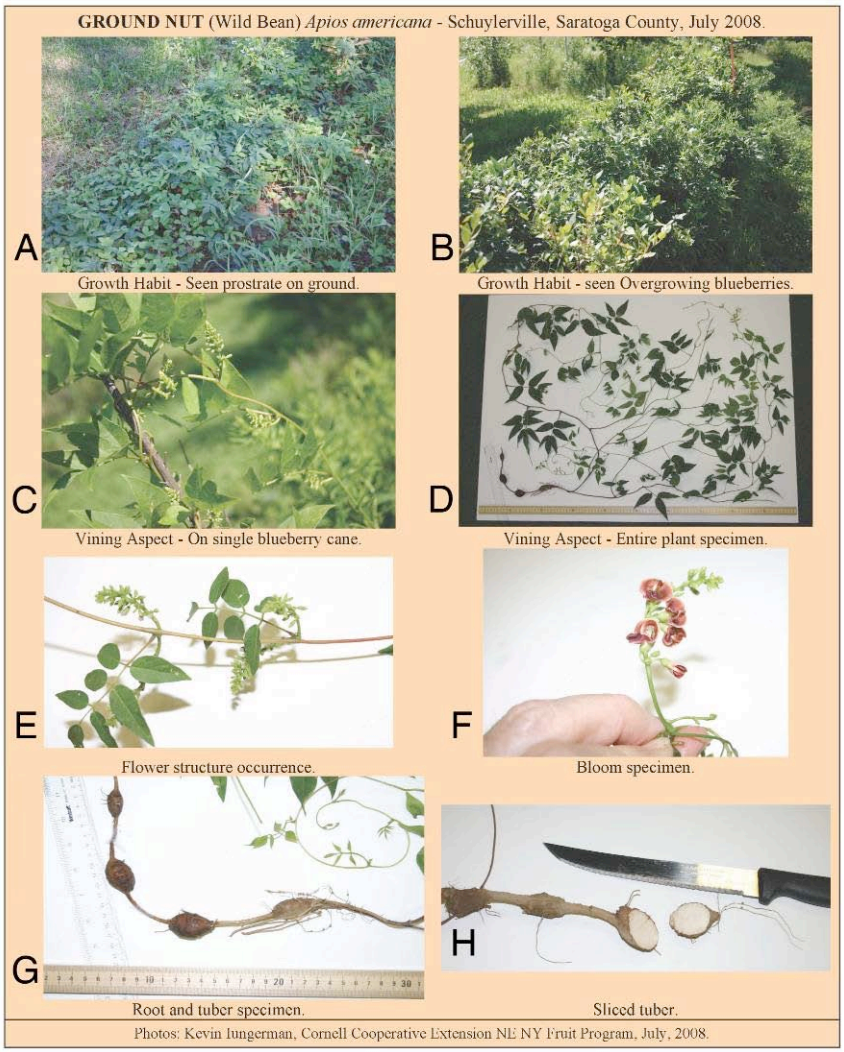

Figure 4. **A, B.** Groundnut vines overgrowing blueberry plants. **C.** Close-up of groundnut vine on blueberry plant. **D.** Entire plant showing length of vine and tubers. **E.** Close-up of inflorescence in leaf axil. **F.** Groundnut flowers. **G, H.** Edible groundnut tubers.

Figure 5. Symptoms on cv. Patriot associated with tomato ringspot virus infection.

Figure 6. Symptoms of necrotic ringspot on cv. Bluecrop associated with tobacco ringspot virus infection.

Conclusions

New York ranked 10th in the nation in blueberry production, with 700 acres producing 1.5 million pounds valued at $1.96 million in 2005 (Anonymous 2006). The demand for blueberry and blueberry products has increased given the interest in foods high in antioxidants. This survey was undertaken primarily to determine the prevalence of canker pathogens in blueberry plantings, but also to survey for other problems impacting blueberry production in NY. It will benefit our blueberry industry to gain knowledge about factors that limit production.

This survey uncovered Phomopsis canker as a principal canker disease in NY, being found more often than other canker diseases and, on three farms, causing severe disease. Canker management relies almost exclusively on proper pruning and plant health maintenance. Although Phomopsis canker can be associated with winter injury, occurring on weakened branches, it can be a serious primary causes of plant damage, as was found on three farms. Intensive management to bring cankers under control in severely affected plantings may need to be supplemented by aggressive fungicide programs over a two to three year period, spanning the disease cycle. Research on specific treatments for managing this disease is needed.

Two diseases in blueberry, previously unreported from NY, were uncovered by this survey: Botryosphaeria stem blight and necrotic ringspot (TRSV). The importance of mummy berry as a limiting factor in blueberry production was also underlined by the survey. Interestingly, while the ringspot viruses are soil born, an IPM practice for mummy berry, that of burying the mummies, could actually contribute to spreading the nematode vector of ToRSV and TRSV within and among plantings. Here is an example of why it is crucial to know the pest complex in your blueberry plantings in order to best apply IPM practices. Virus diseases can be propagated with infected, symptomless blueberry cuttings and lead to serious decline of plantings. Research on the extent and impact of viral diseases in blueberry will be addressed in an upcoming survey in the spring of 2010.

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Photo credits

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