

## **Washington Blueberry Commission**

**Title:** Identification and Transmission of the Causal Agents of Blueberry Fruit Drop and Mosaic Diseases and Blueberry Scorch Virus Testing

**Year initiated: 2007; Current Year 2008, Terminating Year 2009**

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### **Justification:**

During the last few years a new disease of blueberry referred to as Blueberry Fruit Drop has been observed in Oregon, Washington and B.C. The disease was first recognized in B.C. and early efforts examined pollination and nutrient problems. The primary symptoms of the disease are dropping of fruit when it develops to about 3-4 mm in diameter or a poor fruit set. The fruit drops prior to harvest and once a bush is completely infected the fruit drop is near 100%. These symptoms have been observed in Bluecrop and the rate of disease spread varies considerably between fields. In some cases only a few new bushes are identified in a field each year. In other cases the disease is spreading rapidly and fields have been removed due to this disease. Early in the season there is a candy striping of the corolla of the flower much like that observed with Blueberry shoestring virus and the newly emerging leaves have reddish colored veins in early spring. After bloom the plants appear normal until the fruit drops. At harvest the plants are upright compared to healthy bushes since there is no fruit weighting the bushes down. With fewer resources going into fruit production, the plants are generally more vigorous than surrounding healthy plants.

We have been able to isolate double stranded RNA (dsRNA) from infected blueberry plants on one occasion but numerous additional attempts have failed. With very few exceptions dsRNA is not found in healthy plants and its presence is indicative of a virus infection. Partial sequence was obtained from the limited dsRNA that was purified and was used to develop an RT-PCR test for the virus. Testing of young leaves, or thoroughly washed leaves gave positive tests with the RT-PCR test developed. In addition to this fungal virus in blueberry, in collaboration with colleagues in Arizona and Arkansas we have recently identified similar viruses in tomato and redbud, respectively. The question arises if these are fungal viruses that have made the jump to plant hosts? If so, what is the fungal host? If there is a fungal host, is the fungus a plant pathogen that is also the vector for transmitting the virus from plant to plant?

**Relationship to WBC Research Priority(s):**

The project relates to the priority for control and management of scorch virus and in addition looks at two new virus diseases of blueberry, fruit drop and mosaic.

**Objectives:** 1 & 2 were completed in 2007. Objectives 3-5 will continue in 2008. 6 is new this year in response to findings in 2007.

1. Attempt to purify the virus from infected blueberries, normally this is difficult, but it has been done successfully with Blueberry scorch and Blueberry shoestring viruses. (Tried in 2007 without success)
2. Use broad spectrum fungal primers to test tissue culture material and washed newly emerging leaves for the presence of fungi. Also, carry out electron microscopy on infected tissues to look for virus particles in diseased bushes, the reason for this is that the virus we have partial sequence for is most closely related to fungal viruses. (completed in 2007)
3. Establish soil transmission trials with soil from a field where the disease is spreading and with potting mix. (Trials initiated in 2007 will continue 2008 and 2009)
4. Test cultivars other than Bluecrop adjacent to infected fields for the presence of the virus we have associated with the disease. Are there cultivars that are tolerant of infection? Is there a latent period from time of infection to development of symptoms? (Symptomless Duke identified adjacent to infected Bluecrop fields, these plants will be followed for symptom development).
5. Continue blueberry scorch testing as needed with a concentrated effort along the B.C. border, since we know the virus is present within a mile of the border.
6. Identify virus associated with large molecular weight dsRNA in plants with fruit drop symptoms (is there a virus complex?)

**Procedures:**

Infected tissue will be collected early in the season (bloom time) and in June, July and August for virus purification. Some viruses build slowly during the year while others are at the highest concentration in the host early in the season. Infected plants will be used as a source of material for grafting onto the most popular 10 blueberry cultivars grown in the PNW. Samples for electron microscopy will be obtained from fields in Oregon and B.C., the samples will be prepped at the Electron Microscopy facility at Oregon State Univ. then examined by their technician and ourselves for the presence of fungi or virus-like particles. Grafting will be done at the USDA-ARS-HCRL facility in Corvallis and plants maintained in a greenhouse to prevent transmission of the disease agent to other blueberries.

Attempts to identify a vector will center on fungal vectors, since the virus is related most closely to fungal viruses. Multiple (4-6) healthy plants will be potted into large pots with

an infected plant. This is being done in B.C. using soil from a field where the disease is spreading quite rapidly. If any transmission is obtained, fungi will be isolated from the soil and tested for the presence of the virus. Infected fields will also be sampled for nematodes and potential nematode vectors tested in greenhouse studies.

**Anticipated Benefits and Information Transfer:**

The work on Blueberry Fruit Drop should lead to an understanding of what causes the disease, the types of symptoms in various cultivars, and the development of a better test for detection that can be used in certification programs and eradication efforts. Identification of a vector should lead to development of effective control measures.

**Budget: 2008 2009**

Salaries (summer students,  
and undergraduate students)

Time-slip 5,500 6,000

Goods and Services 2,000 2,500

Benefits (10%) 550 600

Total 8,050 9,100

Funding will also be requested from the B.C. Blueberry Industry Development Council, and the Oregon Blueberry Commission.