

Virus Detection and Elimination in Blackberry Cultivars Grown in the Mid South, Mid Atlantic and Southeastern United States

Principal Investigators: Gina E. Fernandez¹, Zvezdana Pesic-VanEsbroeck¹, and Tania Guzman¹,

Cooperators: John Clark², Herb Stiles³, Guido Schnabel⁴, and Rose Gegerich²

¹North Carolina State University, Raleigh, NC

²University of Arkansas, Fayetteville, AR

³Virginia Tech University, Blacksburg, VA

⁴Clemson University, Clemson, SC

Objectives

Our objectives were threefold. The first objective was to determine whether or not viruses are present in the major blackberry production sites in North Carolina, South Carolina and Virginia. Our second objective was to prepare clean stock of cultivars from the University of Arkansas, NCSU and other public breeding programs. Our final objective was to determine resistance/susceptibility of the University of Arkansas and cultivars from other breeding programs to a series of viruses known to occur in blackberries.

Justification and Description

The demand for fresh blackberries has increased dramatically in the past 5 years. In conjunction with the increased demand, the number of acres in production has grown in the southeastern United States. In North Carolina alone, the amount of acres planted in blackberries has increased approximately 50% since 1996. This is corroborated regionally by the royalty income from the University of Arkansas breeding program, where sales from 1996-2000 increased 62% over that of the period from 1991-1995, and the income reflecting sales increased 320% from 1990 compared to 2000.

Along with this increase in production, routine field visits by NCSU Extension and research personnel indicated that there was an increase in incidence of plants infected with viruses. Virus and virus-like diseases have an enormous impact on berry production throughout the world. They are responsible for many of the special management methods used by nurseries to provide growers with certified planting stock from virus-tested sources. The incidence of blackberry viruses in the eastern and southern regions of the U.S. was considered relatively uncharacterized.

Methodologies and Results

Objective 1. A survey was conducted during the summers of 2001 and 2002 to determine the extent of virus incidence in blackberry cultivars commonly grown in the region at grower locations and research stations. We (Fernandez, Pesic-VanEsbroeck and Guzman) visited or received samples from 10 locations in North Carolina, South Carolina and Virginia. At each site leaf samples were collected from plants showing virus-like symptoms and asymptomatic plants. Samples were tested with DAS-ELISA Pathosreen kits from AG Dia, Inc Elkhart IN. Results of the survey are summarized in the attached poster which was presented at the International Society of Horticultural Science meeting in Toronto Canada in August 2002.

Objective 2. The NCSU Micropropagation Unit has signed an agreement with the University to process the Arkansas genotypes through its meristem-tip culture and virus-indexing

program. This process is well underway and all of the patented genotypes have been established in culture and will be ready for planting in field trials in the spring of 2003. This material will be evaluated for trueness-to-type by Dr. John Clark and other cooperators prior to its release as patented varieties for propagation by certified nurseries. One grower in NC has agreed to become a licensed nursery and is in the process of increasing plant numbers. Foundation plants will be inspected by NC Crop Improvement Association, Inc., and distributed by NC Foundation Seed Producers, Inc

Objective 3. The third component of this project was to determine resistance/susceptibility of blackberry cultivars to ToRSV. Virus-indexed plants were be inoculated with ToRSV using nematode vectors in December 2002. Infected plants will be evaluated under the greenhouse and field conditions in Jan 2003.

Conclusions and Impacts

During the past several years an increase in the number of plants with virus-like symptoms and decline in berry and yield quality in cultivated blackberry genotypes was observed by researchers and growers in blackberry plantings in North Carolina, South Carolina, Arkansas, Virginia and Mississippi. In some cases severe symptoms and plant decline were observed in plantings 2-4 years after establishment. One of the reasons for the widespread blackberry decline was the extensive use by growers of non-certified plants which were not tested for viruses, and therefore may have been infected with one or more viruses at the time of planting in commercial berry fields. In the past 2 years, we have identified at least 5 viruses in commercial or research station plantings in North Carolina, South Carolina and Virginia. This knowledge will help us to determine epidemiology and cultural practices that can abate this emerging epidemic.

Tobacco ringspot virus (TRSV), *Tomato ringspot virus* (ToRSV), *Raspberry bushy dwarf virus* (RBDV) and *Impatiens necrotic spot virus* (INSV) were detected by a serological assay (ELISA) in one or more of the following twelve cultivars: Apache, Arapaho, Black Satin, Choctaw, Chickasaw, Chester, Kiowa, Lochness, Navaho, Rosborough, Shawnee and Triple Crown. TRSV and INSV were the most prevalent viruses, and INSV was also detected in blackberry cultivars in all three states. Incidence of TRSV in Arapaho and Apache was 50% or higher in most locations. Mixed virus infections with different combinations of viruses (TRSV, ToRSV and INSV; TRSV and INSV; and TRSV and ToRSV) were detected in multiple locations and cultivars in North Carolina and South Carolina. TRSV was also detected in blackberry seed collected from TRSV-infected plants. INSV was detected for the first time in blackberries and because of its widespread incidence it should be considered as an emerging virus. Its impact on cultivated blackberries is unknown.

One of the first steps in abatement of these viruses is the use of clean plants. In The NCSU MPU has produced certified virus tested plants from most of the Arkansas patented cultivars and has NCSU and AR advanced selections in the clean-up process. In cooperation with NC Crop Improvement Association, Inc., and NC Foundation Seed Producers, Inc , NCSU is developing a nursery certification program in North Carolina.

Our next steps are to identify vectors, modes and rates of infection. Concomitantly with the above, we will develop cultural practices that will keep the blackberry plantings free from viruses through the expected lifetime of the planting (8-10 years).