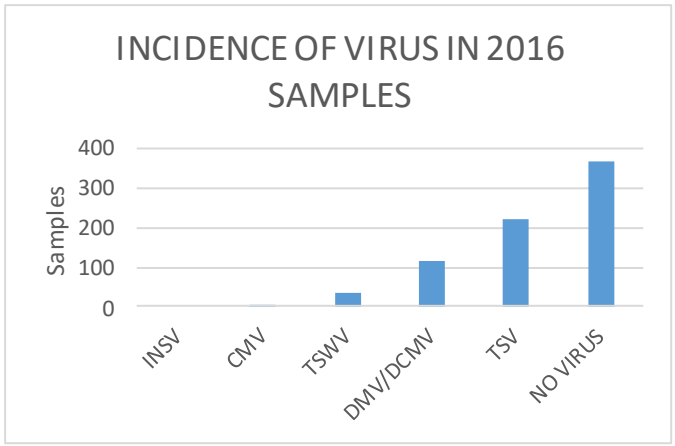


Virus Analyses in Dahlias 2016

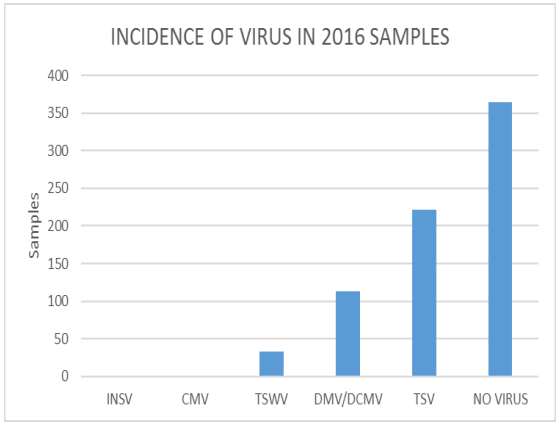
Introduction

Washington State University (WSU) has been doing research on virus in dahlias for about 14 years. The Samuel Smith Professorship was established in 2003 based on contributions by the ADS through a challenge fund in the Evie Gullikson estate. The research effort was given a substantial boost in 2014 by the creation of the Carl F. Chuey Dahlia Virus Research Fund through the generosity of Jim Chuey and the Scheetz-Chuey Charitable Foundation.

In 2015, a pilot program was initiated to look at the extent of the presence of virus in home gardens in NE Ohio. A summary of the results of those tests was presented in the December, 2015, ADS Bulletin and the details of the work are available on the website. With additional support from the Scheetz-Chuey Foundation, WSU was able to initiate a program in 2016 to test samples from gardens all across the country at a nominal cost. The results of those were distributed to the individual gardeners and are summarized here. Pictures and additional details are available on the ADS website, www.dahlia.org.

Results

Leaves from 722 dahlia plants from over 40 gardens were shipped to Professor Pappu's laboratory and tested for six different viruses over the 2016 growing season. About half the samples exhibited one of the viruses, the other half exhibited no virus. A few of the samples exhibited more than one type of virus. No cases of Impatiens Necrotic Spot Virus (INSV) and only one case of Cucumber Mosaic Virus (CMV) were found in the samples. Tobaccoo Streak Virus (TSV) was, by far, the most commonly detected virus. It was found to exist in one-third of the samples tested. A single test was used to check both for Dahlia Mosaic Virus (DMV) and Dahlia Common Mosaic Virus (DCMV).



That is, a positive result from the test would indicate the presence of either or both viruses. Fifteen percent of the samples were positive for these viruses. Tomato Spotted Wilt Virus (TSWV) was detected in 5% of the samples.

With the exception of TSWV, the incidence of the various viruses was largely uniform across the country. In the case of TSWV, however, the largest percentage occurred on the West coast and none was detected on the East coast. The Midwest results were intermediate.

Samples from a few of our most commonly grown cultivars were tested 8 to 10 different times from different gardens. In each case, some of the plants tested positive for virus; others were free of virus. Unfortunately, no individual cultivars stood out as free of virus in all the gardens.

Sample sets were gathered in gardens from as early as mid-July through the middle of October. The percent of virus detected did not significantly change with time through the season.

In order to test the premise that older cultivars would have greater resistance to virus than recently introduced cultivars, the incidences of TSV and DMV/DCMV were examined by their year of introduction. The viruses occurred at similar levels, independent of the date of their introduction.

For most of the samples tested, there was information available to make it possible to separate the quality of the foliage on the plants into three separate categories: Clean, Questionable, and Poor. The table shows that the incidence of virus is lowest for the plants with Clean foliage and highest for plants with Poor foliage. The same trend was observed for each of the individual frequently detected viruses (TSV, DMV/DCMV, TSWV). The plants in the "Poor" foliage category had the largest percentage of positive tests for virus. The plants in the "Clean" foliage category had the lowest percentage of positive tests for virus. Per the analysis of Professor Jerry Moreno, our statistics expert, "Clean foliage results are statistically different from Questionable/Poor foliage. A plant with Clean foliage is almost twice as likely to be determined to be Not Virused (58.3%) than is a plant with Questionable/Poor foliage (29.9%)."

Foliage	Percent Virus Detected
Clean	**41.7%**
Questionable	**65.7%**
Poor	**76.8%**

Included in the 2016 tests were a number of plants grown from tubers that were harvested from plants that were tested for virus in 2015. These tubers were the first generation to be produced from plants known to be free of virus; they were labeled "G1." Because using healthy parent plants is the best strategy to produce healthy plants in the next generation, the properties of the G1 plants are of particular importance. Seventy-four G1 plants were tested; twelve tested positive for DMV/DCMV and twenty tested positive for TSV. No virus was detected in fifty-seven percent of the G1 tubers.

Virus Detected in Plants from G1 Tubers	
DMV/DCMV	**16%**
TSV	**27%**
No Virus	**57%**

Discussion and Conclusions

The key conclusion from the 2015 pilot study is supported by the 2016 results. Of greatest importance is that plants with poor foliage have a significantly higher incidence of virus than those with clean foliage. This conclusion is consistent with the earliest counsel provided by WSU to the ADS: **If in doubt, throw it out!**

It is, nevertheless, significant that a substantial portion of plants with clean foliage tested positive for virus and a substantial portion of plants with poor foliage tested negative for virus. Additional time and effort are required to address the questions raised by these results. Variation in the results is not unusual and could reflect uneven distribution of the virus in the plants. The presence of different or potentially new viruses needs also to be addressed. Stay tuned for more analysis in the June Bulletin. Interim results will be presented on the ADS website, www.dahlia.org., as they become available.

Future Work

Jim Chuey and the Scheetz-Chuey Foundation have agreed in principle to support reasonable and appropriate additional work in the 2017 season. The nature of the future work will depend on the understanding that evolves in the ongoing analysis of the 2016 results summarized here.

Ron Miner, Hanu Pappu with the support of the ADS Virus Team