



## ANNUAL PROGRESS REPORT JUNE 2002

**Project Title:** Assessing the Impact of Floral Crop Species and Control Strategies on TSWV/INSV in Commercial Production

**Researcher/Institution Information:**

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**Industry Needs:**

Tospoviruses remain a significant problem to agriculture in the United States. Tomato spotted wilt virus (TSWV) and Impatiens necrotic spot virus (INSV) have been recurring problems in the floriculture industry for over 15 years. They continue to impact a number of bedding plants and cut flowers grown in greenhouses as well as field grown flowers in selected locations. The widespread use of indexed planting material generated from propagators that follow stringent clean stock programs has reduced the problem from acute to chronic. TSWV and INSV can enter the production system by introducing vegetative propagation material infected with the virus or by the introduction of viruliferous thrips on plant material or from local sources of the thrips. Now that improved diagnostics are available the virus can be accurately diagnosed, however, controls for TSWV/INSV would be greatly aided if some knowledge of the origin of the viruses could be ascertained and also how current practices (crops, vector controls) affect the virus and thus, the probability of subsequent virus epidemics in a greenhouse system. In addition, the efficacy of the controls on the vectors and changes in cropping strategy can also influence or even cause changes in the virus population similar to fungicide induced changes in fungal pathogens. TSWV and INSV are sufficiently variable that we believe that it is possible to determine the origin of the virus based on the characteristic nucleotide sequence of the virus isolate as well as how various factors influence the virus. Thus being able to determine if the virus were introduced locally or brought into a new location from an exotic site is one example of the practical value of this information. This knowledge would allow growers to focus on plant sources introduced from other regions of the country (world) or sources of infection around the greenhouses where the plants are being produced. The overall goal of research on tospoviruses in my research group is the study of viral genetics is influenced by changes in hosts, vectors and control strategies. The USDA SCA funding is allowing us to examine TSWV and INSV at the global level. This (AFE funded project) project is specifically designed to examine how changes in the crop and other control strategies affect the virus and thus can potentially influence future epidemics. We have already shown that this virus can readily adapt to new genotypes in tobacco and tomato. Thus, the goal of this research is to assess the impact of various control strategies on virus populations so as to minimize adaptation to new or alternate crops.

We continue to receive reports of TSWV and or INSV epidemics in floral crop production from Europe, Japan and the US. This year (2002) we have already also observed TSWV to reach epidemic proportions in field crops in the Southeastern United States. This is the first TSWV epidemic in potato in North America; incidence of the virus in excess of 30% is not uncommon. Tobacco, pepper and tomato have also been hit hard with incidence averaging in excess of 25% and fields with 75 to 90% also observed. Infected plants frequently die and fruit, leaves and tubers, if produced, are seldom acceptable. In 2001 peanuts were also severely affected. With the

increasing incidence in field crops, we anticipate that local sources will become of increasing importance to the floral crop industry.

### **Research Summary:**

The objectives of this research are 1) to develop molecular signatures that can be used to follow virus populations and then 2) to test how these populations change due to crops or other control strategies. TSWV and INSV, unlike some other viruses exist in nature as a heterogeneous mixture and thus it will be possible to monitor changes in the population. In the first year we recruited a graduate student, trained her in standard virological techniques and she began characterization of representatives of distinct virus populations. This research was complementary to the USDA grant as personnel worked together in developing these strategies for sequencing large numbers of isolates. During the past year they have completed working out the techniques for genomic sequencing of TSWV and have completed the sequencing of the complete genome of seven TSWV isolates from different locations and hosts in CA (4), CO (1), NC (1), and Spain (1). Previous to this effort only one isolate had been completely sequenced by anyone. We have partial sequence on several other isolates that will be completed as part of the USDA grant. The USDA research and the research funded by AFE will now diverge with this student working on the affects of control strategies and crop on the populations.

This graduate student was recognized for the best research at the departmental symposium for MS students during the last academic year. In addition, she will be presenting this research at the annual meeting of the American Society of Virology in July. Her committee recommended that she be changed from the MS to the PhD program based on the outstanding progress she has made. The specific aspects of her work that have lead to special recognition is that while she is working on an applied problem that has high potential to improve management strategies, she is also making significant contributions to the level of understanding of the evolutionary biology of Tosspoviruses as well as viruses in general.