

W1008 Meeting

Biology and Management of Iris Yellow Spot Virus (IYSV) and Onion Thrips

Oglethorpe AB room at the Savannah Marriot Riverfront Hotel,
Savannah, GA

December 10, 2008

George Boyhan, chair of the organizing committee of NARC-2009 welcomed the attendees of W1008.

The meeting was moderated by Chris Cramer and called to order at 1:00 pm.

Howard Schwartz was recognized by Chris Cramer for his leadership and taking the initiative to organize the W1008.

State research reports:

Colorado. Howard Schwartz, Colorado State University, Fort Collins. In a spatial and temporal distribution of thrips and IYSV study, areas that had higher thrips also tended to have higher IYSV. IYSV is present in all production areas of Colorado. The effect of thrips and IYSV on yield was inconsistent. Relationships between thrips, IYSV and edaphic properties appear to be weak. A poster on this study was presented at the NARC.

Results from Actigard trials were summarized. In general, Actigard applied pre-bulb can reduce the incidence of IYSV. In a commercial field with moderate pressure, IYSV was reduced 4 to 17%, and jumbo yield was increased 11 to 54% by most of the Actigard treatments.

The role of onion transplants in the movement of thrips and IYSV was studied. Thrips were recovered in 56 to 100% the sources examined from Arizona (Phoenix), Texas (southern) and California (Sacramento Valley). Incidence of IYSV in these transplants varied from 0 to 56% (up to 5% of plants within a source). Transplants could serve as potential source of thrips and IYSV. Volunteer onions continue to test positive for IYSV from 2004 to 2008 and may serve as a green bridge for IYSV between seasons.

Studies on the localization of IYSV in onion were conducted. Results showed a great degree of variability for the presence of IYSV in different parts (leaf, neck, bulb, basal plate, and root) showing uneven distribution of the virus within the infected plant.

Bulb-borne infection of IYSV: Bulbs were collected from field-grown, symptomatic plants (19-24 weeks) after bolting. All the foliage was removed, and bulbs were planted in a greenhouse. The resulting plants were positive for IYSV. This suggests possible IYSV transmission through bulb. Discussion followed on how to ensure that the harvested bulbs were completely free of viruliferous thrips before they were planted in the greenhouse.

Studies to identify weed hosts continued in 2008. Several weeds were found positive for IYSV using ELISA and RT-PCR. Weeds found to be positive for IYSV were used as source plants for onion thrips for acquisition. These thrips were able to transmit IYSV to onion. Studies to test if thrips could transmit IYSV from infected onion to weeds are in progress.

Varietal trials. 40 entries were evaluated for thrips infestation and final IYSV incidence. Varieties with blue-green waxy leaves had more thrips than varieties with green leaves (glossy coating). OLYSOS5N5 and Colorado 6 had the lowest thrips throughout the season. White Wing, Arcero and Tequila tolerated a higher number of thrips. RedBull, Granero, Oro Blanco, Vaquero were most susceptible to thrips infestations.

Discussion followed on the spray schedule of Actigard and whether an optimal schedule can be developed that would give maximum suppression of the disease. A question was raised if bulbs showed any symptoms that were suggestive of IYSV infection. No such evidence in Colorado.

Florida: Stuart Reitz, USDA ARS, Tallahassee, FL. Studies on thrips population dynamics are continuing for the purpose of developing thrips management programs. Survey for IYSV was conducted in north Florida. Some samples were found ELISA positive in 2006. The crop was from locally grown transplants. ELISA positives could not be verified by RT PCR.

Georgia. Ron Gitaitis, University of Georgia, Tifton. No yield loss was found due to IYSV infection. The original introduction of IYSV was attributed to culled imported onions from Peru that infected a nearby direct seeded crop. Low incidence of IYSV in GA could be due to several factors: being a winter crop, low temperatures, wet and humid weather could reduce thrips numbers. Differences in thrips species could be another contributing factor. Onion thrips is displaced by tobacco thrips in Georgia. Although, recently, onion thrips have made a comeback in the Vidalia region, which was presented by Stormy Sparks at the NARC. Whether tobacco thrips can transmit IYSV remains to be seen. Crop is exclusively grown under overhead irrigation, which may contribute to thrips control. Preventing the culls from sprouting could be beneficial in reducing the virus inoculums. Culls need to be shredded, not just buried. Harrowing did not seem to work in reducing the sprouting. Sowthistle was found positive. A poster on the distribution of IYSV-positive sowthistle in Georgia was presented at the NARC.

Idaho: Krishna Mohan and Ram Sampangi, University of Idaho, Parma, ID. Several weeds growing in and around onion fields in the Treasure Valley were sampled and tested for IYSV. Many of them were positive by ELISA but could not be verified by RT PCR. ELISA testing will be repeated using kits from different commercial sources including Germany to determine if there is a difference in the results of testing weeds. Seasonal dynamics of thrips populations were studied. A poster was presented at the NARC.

Mike Thornton, University of Idaho, Parma. Insecticidal treatments including fipronil and Cruiser were evaluated for thrips control and their effect on final IYSV incidence. Carbamate insecticides like Carzol and Lannate were evaluated for potential plant health benefits on onion. It appeared that carbamate insecticides had no effect on plant health. This project was presented at the NARC.

Discussion followed on the severity, incidence and impact of IYSV in onion. IYSV seems to be spreading judging by the new reports from different parts of the country. Severe damage resulted in the Treasure Valley in 2005 and 2006; with least damage in 2007. IYSV occurs more consistently among all regions with up to 20% yield loss. In Idaho, distribution of IYSV is erratic among fields and within fields. Most severe damage tends to be associated with poor thrips control (i.e. under power lines where insecticide coverage is poor) and where a bulb crop is grown in close proximity to a seed crop. There seems to be strong correlation between symptom severity and yield.

New Mexico: Chris Cramer, New Mexico State University, Las Cruces. Generally, very little IYSV occurs in NM. Short and intermediate-day varieties are seeded in October, over-wintered and harvested in May, before thrips get going. It is the earlier spring-seeded, intermediate-day varieties that get the most thrips pressure, later-maturing varieties get more rain. Screening of varieties and germplasm continued in 2008. Disease development over time and correlation between symptom expression and virus titer was studied. A strategy to ensure high disease pressure was developed which was found useful for screening varieties and germplasm for IYSV resistance. IYSV spreads from seed onions to autumn-sown onions to spring-sown test plots, thrips are not controlled. Varieties with semi-glossy, light green leaves tend to have less thrips, but eventually exhibit IYSV symptoms too. It is difficult to rate plants for IYSV when plants are near maturity because they start to senesce naturally at that time.

New York: Brian Nault, Cornell University, Geneva. NY projects include 1) studying the epidemiology of IYSV (presented at NARC), 2) survey of potential sources (volunteer onions in fields and cull piles, imported transplants and weeds), 3) insecticide screening, threshold and sequence trials for control of onion thrips, 4) studying the spread within plants, and 5) screening for varietal tolerance. In NY, IYSV was not detected in transplants, but was detected at low levels in volunteers in fields and in cull piles, and in weeds. This was presented at the NARC. Radiant and Movento were the most effective insecticides for controlling thrips. It is suspected that Movento only controls larvae, not adults. Lannate is losing ground and MSR does not provide adequate control. With most insecticides, it requires 2 sequential applications before a knockdown to below threshold levels (i.e. 1 thrips per plant) is achieved. For Radiant and Carzol, control can be achieved by waiting until the 3 thrips per leaf threshold before spraying. For less effective materials like Lannate, sprays need to be applied at the 1 thrips per leaf threshold. Further investigation of tank mixes of two non-stand-alone products (e.g. Assail + acephate) that are different classes than what is being sprayed may be useful.

Cynthia Hsu, Cornell University NYSAES, Geneva. A protocol was developed to inoculate an onion plant in a certain location and then monitor how the virus moved within the plant. Outer onion leaves were inoculated by sealing vials of IYSV-infected thrips onto the leaves. Individual leaves were destructively sampled to test for IYSV using DAS ELISA after 2, 7, 14, 21 and 28 days post inoculation. Preliminary results demonstrated that this technique has potential, 13% of the plants inoculated tested positive for IYSV. Only leaves younger than the leaf that was inoculated tested positive, suggesting a systemic nature to IYSV infections. There were cases where the inoculated leaf tested negative and interior leaves tested positive, and cases where the IYSV infection skipped leaves in sequence.

Oregon Treasure Valley: Lyn Jensen, Oregon State University, Ontario. IYSV is erratic, but can be severe. In 2008, there was a lot of thrips damage, but not much expression of IYSV. Lynn presented his

insecticide trial work at the NARC. Clint Shock, Oregon State University, is studying moisture and heat stress on yield and IYSV. These factors have been manipulated, but research plots have not been hit hard with IYSV. In the absence of IYSV, marginal stress can result in big yield reductions. In variety trials, when IYSV is high, there are no differences among varieties.

Utah: Dan Drost, Utah State University, Logan. A statewide IYSV survey was conducted where fields were scouted every 2-3 weeks and samples collected. Symptomless plants tested positive for IYSV via ELISA tests in July, but symptoms did not show up until August. A weed survey was conducted in collaboration with Hanu Pappu. Two new weed species were identified as hosts of IYSV including a type of salt bush, Atraplex, and a Foxtail, which is the first detection of IYSV in a grass species. This stresses the importance of keeping voucher specimens of weed hosts. A major effort is underway to investigate reduced nitrogen applications in combination with crop rotations and use of composts and other additives that increase the biological activity of the soil to reduce onion thrips and IYSV. In Utah, some growers have adopted a rotation which includes 5 years of alfalfa, 1 year of field corn and 1 year of wheat before planting onions. Ninety units of nitrogen are used per year. In this system, the grower went from using 10 insecticide sprays per season to 1 in 5 years to control thrips. Onions look paler green and yield about 10% less, but the savings in fertility and insecticide inputs more than make up for the lower yield, economically. In another project, trap crops including buck wheat and carrots are being investigated to reduce onion thrips populations.

A discussion resulted about whether onion crops are being babied to death. Similar observations were noted across the country where onion crops with reduced fertility for various reasons had fewer than expected thrips. Several theories were presented as to why this may be occurring.

Washington: Hanu Pappu, Washington State University, Pullman. New records of IYSV include Mason Valley in Nevada, and new regions in Northern California. New hosts include garlic, spiny sowthistle and foxtail. Work to develop a procedure for mechanical transmission of IYSV into onion is underway, which would be useful for screening for resistance. Some progress has been made, but high efficiency is lacking. The NSs antibody is useful in quickly identifying IYSV transmitters among thrips, as not all thrips carrying the virus can transmit it. Then, it can be determined when most of the viriliferous thrips are entering or present in the field. Molecular typing of new isolates continues. Western blots are being investigated for improved accuracy of identifying IYSV in weeds, as there continues to be discrepancy between ELISA strongly testing positive and PCR testing negative in weeds.

Reports from other countries:

Ontario, Canada: Mary Ruth McDonald, University of Guelph, Guelph. IYSV was first detected in 2007 in set onions in remote areas and in the Holland marsh. In 2008, it was confirmed in all major onion growing regions in Ontario. It occurs at very low levels with no reports of yield reduction.

New Zealand: Stephen Ogden, Market Access Solutionz, Wellington. Onions are New Zealand's third largest export to European markets. In 2004, import requirements were tightened up in response to the onion industry's concern about introducing IYSV. Loads, especially reds, imported from the US were visually inspected for onion thrips, 33% of consignments were infested with onion thrips, only 7 were fumigated. A pathway analysis was initiated in October 2006. Once IYSV was found in 2007, there was no point in trying to regulate its introduction. IYSV is now widely distributed throughout several onion

growing regions in NZ. IYSV in New Zealand reported to be most closely related to strain from the Imperial Valley of California. There have been some losses in seed crops, where thrips control is difficult due to restrictions on what can be used with pollinating bees. Major problems in bulb crops have not been observed.

Industry Reports:

Bayer CropScience: Charlie Hicks, Livermore, CO. There are three products in the pipeline that will help with onion thrips management: 1) Admire Pro (a.i. imidacloprid) to be applied as a drip or in-furrow application for early season control; 2) Sepresto seed treatment (a.i. imidacloprid + chlothiadin) for early season control of thrips and maggot; and 3) Movento (a.i. spirotetramat), which has a new unique mode of action. A presentation on Movento for thrips control was given at the NARC.

TKI Nova Source: Kurt Volker, Yakima, WA. Surround is a kaolin clay based product that provides sunscald protection in onions, and modifies the behavior of onion thrips so that they cause less damage. It is unknown whether Surround has an effect on IYSV. A poster was presented at the NARC.

Nunhems USA: Peter Rogers, Brooks, OR. IYSV is very important to the seed production industry. The available insecticides are an issue because of bee toxicity. A tremendous amount of effort is being invested into breeding for resistant varieties; the lack of reliable inoculation techniques makes this a very slow and challenging process.

Grower report:

Kerrick Bauman, Connel, WA. IYSV has impacted everything we do. Seed cost has doubled within the past 5 years, it is hard to find seed growers. We do not want seed growers in our area, because they provide a green bridge to harbor IYSV and serve as a source to infect our bulb crops. The insecticides that are effective at controlling thrips, Carzol and Radiant, are very expensive, and with IYSV in the mix, managing thrips has become more important than ever.

Other business:

Howard Schwartz shared with the group the Specialty Crops Research Initiative for 2009-2012, "Ensuring US Onion Sustainability Breeding and Genomics to Control Thrips and IYSV". The director for this project is Mike Havey, USDA-ARS and University of Wisconsin with project co-PDs, Foo Cheung, J. Craig Venter Institute, Chris Cramer, New Mexico State University, Hanu Pappu, Washington State University and Howard Schwartz, Colorado State University. It consists of a multi-state approach with several extension, research and outreach projects, and collaboration with onion seed companies and growers.

Check out the Alliumnet website, <http://alliumnet.com/>, and let Howard Schwartz know if any suggestions for improvement or additions to the member directory.

Chris Cramer nominated and Howard Schwartz seconded the motion for Hanu Pappu to serve as secretary for 2009. Stuart Reitz will serve as Chair and Christy Hoepting as Vice-Chair.

It was voted that the next W1008 meeting will be held in conjunction with the National Onion Association Annual meeting in San Antonio, Texas during the first week of December in 2009.

The meeting was adjourned at 5:55 pm.

Respectively submitted by:

Christine Hoepting
Cornell Cooperative Extension Vegetable Program
Albion, NY