

## W 1008 - Onion IYSV & Thrips Annual Meeting

January 16, 2008

7:30 AM

La Quinta Inn & Suites, Denver, Colorado

Chair: Howard Schwartz, CSU

Vice-Chair: Chris Cramer, NMSU

Secretary: Stuart Reitz, USDA ARS

Howard Schwartz, Committee Chair, opened the meeting with introductions and welcome from Lee Sommers (Administrative Liaison) who could not attend due to a conflict. Howard reviewed the 2-year evolution of the W 1008 Committee (WDC7, WTemp2081) with its formal approval in October of 2007. Howard noted that the number of objectives in the project plan was reduced from 5 to 3, and asked that participants update their NIMMS profiles to reflect these 3 objectives. Travel dollars are available for committee representatives from the participating experiment station projects around the U.S. The committee also helps justify allocation of time and effort by experiment stations to onion research. Members were urged to invite colleagues to join the W1008 Committee, and contact list provided by Howard in the packet of handouts and other information. One of the benefits of this type of regional committee is that it raises the profile of onion thrips/IYSV problems to Congress and the USDA.

### List of Participants:

Howard Schwartz	Colorado State University
Mike Bartolo	Colorado State University
John Lambert	JL Computing (web site specialist)
T.X. Liu	Texas A&M
Hanu Pappu	Washington State University
Stuart Reitz	USDA-ARS, Tallahassee
Mike Edwards	DuPont Crop Protection
Krishna S. Mohan	University of Idaho
Christy Hoepting	Cornell University
Chris Cramer	New Mexico State University
Dan Drost	Utah State University
Brian Nault	Cornell University
Lynn Jensen	Oregon State University
Lindsey du Toit	Washington State University
Morgan Reeder	producer, Utah
Wade Norman	producer, Utah
Les Watada	Logan Zenner Seed Company
Larry Duell	Champion Seed Company
Tony Shelton	Cornell University
Robert T. Sakata	Colorado Onion Association President and producer
Wayne Minninger	National Onion Association Executive Vice President
Laura Quackenbush	Colorado Department of Agriculture

### I. Wayne Mininger. NOA report

A. Tried the last two years to get \$ for IYSV/Thrips research initiative (3 new USDA-ARS positions, research grants) at \$ 7 million over 5 years. Finally got \$250,000 in language but was axed at the last minute. Conferencing is going on now and does have specialty crop research money. NOA is supportive of this program. With too many onions it's tough to sell the need of the initiative, but Wayne would appreciate any support that we can give. He also mentioned that the data and photographs (of rapid disease progression) that Lindsey du Toit presented today would be helpful to demonstrate impacts.

Wayne then provided the NOA annual meetings schedule.

Summer 08: July 23-26, Pasco, WA

Winter 08 city and dates, FL

Summer 09 July xxx, Montreal, Quebec

Winter 09, month and dates, San Antonio, TX

Howard Schwartz briefly reviewed the request for the initiative and that the requested budget would support three ARS staff (Category-1 scientists) and research projects. Ideas on how to update the proposal are welcome.

## II. Reports from Onion Organizations

### A. Colorado Robert T. Sakata, COA

Colorado saw moderate IYSV but extreme thrips pressure.

### B. Utah: Wade Norman

Utah didn't have too much thrips pressure or IYSV pressure.

(Note: <http://www.alliumnet.com/index.htm> is a good resource, coordinated by Howard Schwartz. Howard asked for any relevant articles that could be posted on Allium.net)

## III. Report from International Allium Conference, held in the Netherlands in fall 2007.

Lynn Jensen was disappointed because it was mainly USA report with limited participation from other countries. Of particular interest to this group was the ongoing research in New Zealand using transgenics to address pungency; maybe this can lead to transgenic work for thrips and/or IYSV resistance. Krishna said that he has talked with researchers in the Netherlands and IYSV, though first reported in the Netherlands, does not seem to be a problem. Wayne Mininger commented that due to the location and different climatic conditions, IYSV could be less of a problem in that part of the world. Lynn noted that it is present in the Mediterranean countries but has not received much attention. So overall it was a disappointing conference with respect to IYSV research. With upcoming NARC meeting (Savannah, GA in December, 2008), should they have a special session on IYSV? The committee indicated that it would be a good idea. The executive committee would follow up with the NARC organizing committee to see if a half day session dealing with thrips/IYSV could be included in the 2008 program, and if the W 1008 could coordinate their annual meeting with the NARC meeting.

## IV. Regional Research Reports.

### 1. Colorado

#### A. Dr. Howard Schwartz, Mike Bartolo

#### B. IYSV vector is *Thrips tabaci*

#### C. Confirmed in all western states, MI, NY, TX, GA, Ontario, Canada, and Mexico

#### D. Looking at edge effect: geospatial work

distribution patterns, soil, water, & nutrient effects on plants and thrips

#### E. In Colorado we see edge effects. Thrips coming in from small grains, alfalfa.

#### F. Incidence vs Thrips #. Moderate

#### G. There was both positive and negative relationships with nutrients: N and P

#### H. Overall looking at stressors

#### I. Plant Population and IYSV.

1. Uniform plant stand helped decrease IYSV incidence.

J. Volunteer Onions carrying IYSV and/or thrips early in the season could be a potential source.

K. In 2006, we studied the localization of the virus in different parts of the plant. . Used ELISA and found from leaves to root system. Pre-bolting: leaves 71%, neck 29%, bulb 16%, basal plate 40%, root system 20%. Post-bolting, only in scape 40%, umbel 56% and none in rest of the plant. But 2007 testing only found the virus in infected leaves, not in other plant tissue.

L. From 2004-2007 transplants from southwest arrived with contamination. Anywhere from 0.4% to 5.0% incidence; most contamination from California sources, less from Arizona.

M. Transplants coming in with thrips; 3 to 275 thrips/200 plants. This may be where fipronil seed treatment could help in the future. Arizona sources are the cleanest. California had the the highest (Imperial Valley), Krishna Mohan commented that he saw symptomatic plants in Imperial Valley as early as 1989 but IYSV was not recognized as the causal agent at that time. Next step would be to survey transplant seedlings at the growing location and see what conditions are. Also to identify what if any insecticide treatment was made at seedling production site.

N. Alternate hosts: Several weed species tested positive for IYSV by ELISA. Redroot pigweed 2%, Kochia 3%, Common purslane 0-88%, flixweed 6%, Sowthistle 100%, gray rabbit brush 56%, buckhorn plantain 86%, red stem fliaree 23%. Most of these weeds did not have symptoms of IYSV. Not found in grasses tested to date. Several questions were raised by the participants and discussion followed.

1. Are some weeds more important than others?
2. How does this affect production onions?
3. Do thrips attack/colonize these plants?
4. Tony Shelton: onion thrips do prefer onions as primary host

O. Acibenzolar-S-methyl (Actigard): Early research indicated the potential for 10%-25% increase in yield (2003). 2005-2007 have variable results.

1. Effective against Xanthomonas (foliar diseases). But requires 4 applications so very expensive. Laura Quakenbush wanted Howard's information for Section 18 label request to EPA. Potential cost of Actigard is \$200/acre. But the effect in reducing IYSV incidence was not consistent. The time and application method could be critical. Question about end of season expression of IYSV because in Tomato spotted It virus, late season disease occurrence was seen as Actigard's effectiveness declines as the plants mature. IYSV may have a very long incubation period; could be 4 – 6 weeks from late vegetative to mid bulb stages of growth, and possibly shorter as the onion bulb approaches maturity later in the season.

P. Straw Mulch

1. Single application at 4-6 leaf stage @ 500-1000 lbs of shredded straw (4-6" pieces). No difference in final IYSV incidence but the main improvement was thrips reduction of 30%-60%. Variable yield results probably by reducing stress, with lowering soil temperatures and higher moisture content. Haven't seen increase in beneficial insects or thrips predators in mulch. At one time a predatory mite was observed, but not consistent.

Q. Variety Trial Data:

1. Green leaf color had less virus and greater jumbo yield vs blue green color Lindsey mentioned the use of living mulch for wind protection in PNW region; similar use in eastern Colorado. Dan mentioned his plans to use Buckwheat, kimbleweed, carrots, as a potential trap crop for thrips.

Mike Bartolo asked if varietal trial evaluations should include thrips. Also mentioned the early drop of tops because of IYSV and direct thrips feeding. Lindsey mentioned experience with severe IYSV in 2007 in Washington State; premature shutdown has caused sunken dry necks.

2. University of Idaho, Krishna Mohan

A. Evaluating varietal trials based on symptoms was done under natural conditions. 2006 had high IYSV incidence in commercials. A few varieties had less symptomatic plants in variety trials. In 2007 very little disease was observed in test plots but it was seen in production areas. So no good data on variety responses.

B. Surveying crops in the valley for hosts in collaboration with Hanu Pappu of Washington State: 40 different species that included crops and weeds were collected and tested for IYSV. Samples were collected based on the presence of thrips feeding damage Volunteer onions were also tested. All volunteer onions were positive. Even though high ELISA readings were obtained in many plant species most of them could not be verified by PCR This seems to be a real problem with weeds. Hanu will talk more about this discrepancy. The five weeds that were confirmed to be infected with IYSV were redroot pigweed, puncture vine, kochia, prickly lettuce, and common lambsquarter. In 2007 we expanded this effort and now going to compare the two ELISA kits (AGDIA and DSMZ [Germany]) with PCR results. More than 100 plants and leaves and roots sampled in 2007; working on analyzing the data and running PCR now. All sampling of yellow nutsedge has been negative for IYSV to date.

C. Found lots of powdery mildew with symptoms similar to those caused by IYSV. Powdery mildew is favored by hot dry weather; this powdery mildew develops internally in the leaf and creates lesions similar to IYSV. Seen during late stages of onion; more of a problem on glossy-leaved varieties. Not an economic problem yet because it infects so late. You have to use a microscope to see the large spores, and look for any fuzziness. If the lesions show no spores then analyze for IYSV. Lindsey said, "there are more reports of this and higher incidence in red varieties."

### 3. Washington State University: Hanu Pappu

A. Identifying IYSV reservoirs in other plants. In collaboration with Krishan Mohan at University of Idaho, Parma.

#### B. Topovirus Genome Structure and Organization

1. Three RNA complex sequences
2. This virus is very unusual as it can replicate in insects as well as in plants
3. Cloned sequence and made antibodies to NSs and N proteins
4. Real time PCR was developed, useful for quantifying the viral RNAs but may not be practical for large scale testing for routine diagnosis.

C. Looked at virus isolates for genetic variation: formed a "family" tree of isolates

1. This helped with the tracking of infections
2. Example, IYSV isolates in Georgia were similar to those from Peru

D. IYSV N gene was cloned and plant transformation constructs were made which will be used to transform onion. This is to introduce virus resistance through virus-induced gene silencing. This approach worked in the case of Tomato spotted wilt virus in peanut, tobacco and tomato.

F. Actigard with *Tomato spotted wilt virus* has good results. Actigard seems to prevent systemic spread of TSWV in tobacco.

1. Looked at mRNA to see what genes were activated with Actigard application.
2. This could be helpful to better understand when Actigard application was optimized.
3. Actigard is phytotoxic to tobacco (and onion with multiple high rates), so an ideal dosage had to be determined that would result in least amount of toxicity and greatest level of virus suppression), onion rate needed to be determined.

G. Antibodies to NSs (nonstructural gene coded by IYSV to find out what thrips were transmitters. The virus has to replicate for the thrips to transmit. ELISA assay using this NSs - specific antibody can help with seasonal dynamics. Discussion followed and several questions were asked. Brian asked about the testing of weeds vs onions, and correlation with ELISA test and PCR. Hanu explained that one of the questions that needs to be answered is if the PCR negative result is because of insufficient extraction rather than non existence of the virus particles.

H. More than 5000 types of thrips. Highly sophisticated receptor specific for IYSV

I. Chris asked about the origins of IYSV. Sounds like it has co-evolved with thrips.

J. Uncoating of the virion is critical for infection of the plant.

#### 4. New York

##### A. Christy Hoepting

NY production: 13,500 acres, 6th in nation mostly grown on muck soils. Only about 50% irrigated, if that. Most direct seeded, 13% transplanted and increasing. IYSV status: 2006 90% of fields surveyed in western NY, in 2007 78% of fields surveyed in Oswego County and 80% of fields surveyed in Orange County with lots (30 – 50%) of no detects. First find was on scape tissue of volunteer onions in a cull pile; in bulb crops, the lesions are nondescript and less distinct. IYSV confirmed on onion, leek, shallot and *Allium fistulosum*. Also confirmed IYSV in Ontario, Canada in two isolated locations where onions were grown from dried sets and in the Holland Marsh. Krishna brought up a point about who should be notified when a pathogen is detected in new areas. At present, no uniform protocol exists.

##### B. Brian Nault, distributed a hand out summarizing his research results.

1. Potential sources of virus: transplants, volunteer onions, weeds, bulbs
2. Transplants analyzed in 2007: 5400 plants were tested, no positives
3. Volunteer onions: 355 plants 5 positives
4. Weeds: 9 of 29 varieties/species tested positive; included dandelion, common ragweed, common burdock – returned to '06 + plants in '07 and + again
5. Thrips density: studied the cumulative effects of thrips counts as IYSV predictors, with evidence that cumulative thrips counts correlate with IYSV incidence.
6. In 2007 only late maturing direct seeded was affected by IYSV. Early season transplanted crops may be harvested before IYSV becomes problem.
7. Thrips Management
  - a. Information in Hand out
    - 6 applications, 100 gal/acre
    - results: best to worse: Radiant, Movento, Carzol, Agrimek
    - Movento may only control larvae? Because there was end of season thrips. Comments from group: doesn't work in Oregon, but works in TX.

##### C. Tony Shelton

1. Variety evaluation for resistance to OT (onion thrips) IYSV
  - a. scale of 1-9 with 1 = no damage, to 9 = plant death
  - b. Red Wing high damage. OLYS05N5 & Colorado 6 with low damage
  - c. Thrips counts correlated to leaf damage
2. Measuring Impact of OT and IYSV
  - a. Millenium expressed highest damage and Colorado 6 was one of lowest.
3. Conclusions: possible resistance, antixenosis (preference), antibiosis (physical)
4. IYSV had no correlation with thrips numbers. Very little expression of IYSV
5. Future work for 2008
  - a. Behavioral studies on OT in green house
6. Straw Mulches
  - a. 2006 in Yates County, 2007 also in Potter and Elba
  - b. 750 kg/hectare rate
  - c. Didn't work where there was too much wind
  - d. Also investigated value of kaolin clay; probably not a good solution because of rain; it makes the plant white; hard to apply and must be re-applied often (at least in rainy areas).
  - e. OT was reduced in 3 out of 4 fields. The fourth field is the one where the mulch blew away
  - f. Ground predators were not different

- g. OT emergence was reduced by 54% in straw mulch treatment in lab
- h. Thrips may be going into ground and not able to get out onto plants again.
- i. Looked at size of bulbs...2006 bigger but not in 2007
- j. Looking at resistance to insecticides; TIBS - Thrips Insecticide Bioassay System. 2003 data detected much variation both geographically and temporally. But data also indicates that resistance could build up in a very short time...45 days. Conclusion is that resistance is not regional, but occurs almost field to field. Could TIBS be commercialized so to not waste money on application of material that the thrips are resistant to?

#### 5. New Mexico: Chris Cramer

Haven't seen a lot of IYSV in commercial fields. Mainly in plots that he has been using for disease testing. Screening cultivars for tolerance. Intermediate spring varieties are the most susceptible. Surround the screening plot with infected bulbs and even dispersed with fall seeded plants to encourage infection. Also taking reading weekly on fixed plants to see disease progression.

#### 6. Texas: T. X. Liu

A&M "AgriLIFE" is new name; TX is 6th 16,000 acres. Texas A&M breeding program has not been able to develop thrips resistant varieties. No realistic threshold for control, i.e., 1 per plant; Normally find IYSV this time of year in TX. They are scouting now. Only found IYSV in purslane using PCR. Thrips species studied. Varies from year to year between onion vs western flower thrips. Western flower thrips have become the predominant species recently. Plant Growth Regulators: Stoller Company - "Root Power" compound, good results. Overhead irrigation can reduce thrips, but it is expensive and may enhance foliar pathogens.

#### 7. Oregon: Lynn Jensen

- A. Need to get all variety trial protocols the same. This is one of the W1008 objectives. Ad hoc Committee was formed to work on this:  
Members: Lynn Jensen, Mike Bartolo, Chris Cramer, Linsdey du Toit, Tony Shelton, Dan Drost, Hanu Pappu will work on this
- B. Onion stress trial. Of four varieties with varied irrigation types, nutrients, etc.
- C. Efficacy trial. AgriMek, Radiant, Carzol  
2 applications of Azidirect then Lannate, Carzol, Lannate  
Movento and Assail didn't look good.  
Application methods;  
cone and double flat fan better than single flat fan  
60 gpa was better than 30 gpa  
time of day and sprayer pressure didn't matter  
Carzol; one week interval was critical. Higher interval didn't work  
higher rates were some what better  
Pyrethroid-only: had higher thrips count than control  
Antagonistic effect on thrips  
Regent (Fipronil) as a seed treatment. Good control into July in 2006, used last years seed and this year it didn't work as well.  
8 oz Carzol every other week didn't get thrips control that they were shooting for but the yield was the highest. Didn't see it with Lannate even though it is also a carbamate.

#### 8. DuPont Crop Protection: Mike Edwards

##### Handout

During 2004 - 2006 looked at Vydate which acts like a PGR, and how to work with it. Use it with drip or overhead irrigation, with other application specifics. Lannate: start early, 4 thrips per plant, use 50 psi with 50 gpa, and use 3 pints/A! Compared mixtures with alternating chemicals;

they will continue to look at this. Will continue screening of active ingredients and look at the program in total, rates, formulations, AI, application details, etc. Discussion focused on value and threat of mixing versus alternating products.

#### 9. Washington: Lindsey du Toit

During 2006 heat stress caused major losses; dense production of seed and bulb onions caused problems. Onion seed production has been really affected by IYSV. The worst case scenario is to have seed and bulb production in the same area. They are even thinking about moving some to the western part of Washington. But IYSV has been found but not as much thrips

Actigard trial - Talon was most susceptible to IYSV!; Always see an edge gradient

Summary of Actigard treatments; 0.25 - 1.00 oz per acre

Early symptoms at bulb initiation on June 20, 2007

0 to 6 rating system; didn't rate thrips damage

stopped water 3 weeks early because tops stopped growing

No treatment seemed to make any difference

Location and layout of plot was more of a factor due to edge effect rather than treatments; Howard suggested co-variance analysis

Onion Sets. They may look at role of sets to see if they can transmit IYSV. There was some discussion on IYSV/Thrips risk of these dried sets versus green transplants, and the added value to reducing labor costs with more mechanized systems. Wayne and Howard relayed information from a major set producer, Dave, and both felt that this technology and plant source offered some potential. Lindsey cautioned that these sources (and others) should be closely monitored, especially if produced in IYSV-prone areas like the western U.S.

#### 10. Utah, Dan Drost

Morgan Reeder has found that low N inputs has reduced thrips and reduced IYSV; and provided yields of 1600 bags/acre (= 800 cwt/A). This observation needs to be further explored Will slow release N make a difference? What is the value and role of manure? Reeder's experience: 110 units of N/acre and haven't had to spray for thrips. Start with 10:34:00; 300 lbs of ammonia sulfate, 20 units in water later, 20 units in water again later depending on leaf color and soil EC. Wade is also trying this program.

Questions asked: What is mineralization rate, and residual N after harvest

Wade also stated that onions had lighter green color, and that lighter green plants had fewer thrips than blue green. In general, red varieties seem more attractive to thrips.

#### 11. Florida, Stuart Reitz

Northern Florida. Have recently found IYSV near Quincy although no commercial onion production within 200 miles

#### V. Comments from seed industry people

Les Watada: Blue green varieties seem to really attract thrips, and have more IYSV. Front Range of Colorado changed to mostly green varieties. Gets hard to recommend varieties because of all of the different variables involved in different production regions of each state.

#### VI. Business Matters

##### 1. Election of a new Secretary

Christy Hoepfing, New York, was unanimously elected. She will assume those duties at the next meeting when secretary Stuart Reitz succeeds Chris Cramer as Vice – Chair who succeeds Howard Schwartz as Chair of the W 1008 Committee.

2. Hold next W 1008 meeting with the NARC. Dec 11-13, 2008 in Savannah, GA: Motion unanimously approved. The committee will work with NARC to combine, and request 1/2 day for the W-1008
3. No request for a formal progress report this year, but will need to next year.
4. Look at milestones for proposal and need to work towards those and the 3 objectives.
5. Insecticide dialog Ad Hoc committee was formed (potential members could include Lynn Jensen, Brian Nault, Whitney Cranshaw, Mike Edwards, Charlie Hicks, Pete Forster, Gordon Hankins, Paul Ogg) and Howard will coordinate.

Submit the minutes to Lee Sommers and other participants; needs to be done within 60 days. Howard and Stuart will draft the minutes; Robert Sakata later shared his detailed notes.

Hanu Pappu made a motion to express the group's appreciation for all of the effort of Howard Schwartz to organize the W 1008 Committee and to help the committee members assist the onion industry with these important pest issues. The motion was passed unanimously.

The meeting was adjourned by Howard Schwartz at 1:30 PM. The minutes compiled by Robert Sakata, Howard Schwartz and Stuart Reitz (01/22/08)

Respectfully submitted by Stuart Reitz