

Iris Yellow Spot Virus in Onions

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Iris yellow spot virus on onion





Iris yellow spot- symptoms on seed field Imperial Valley









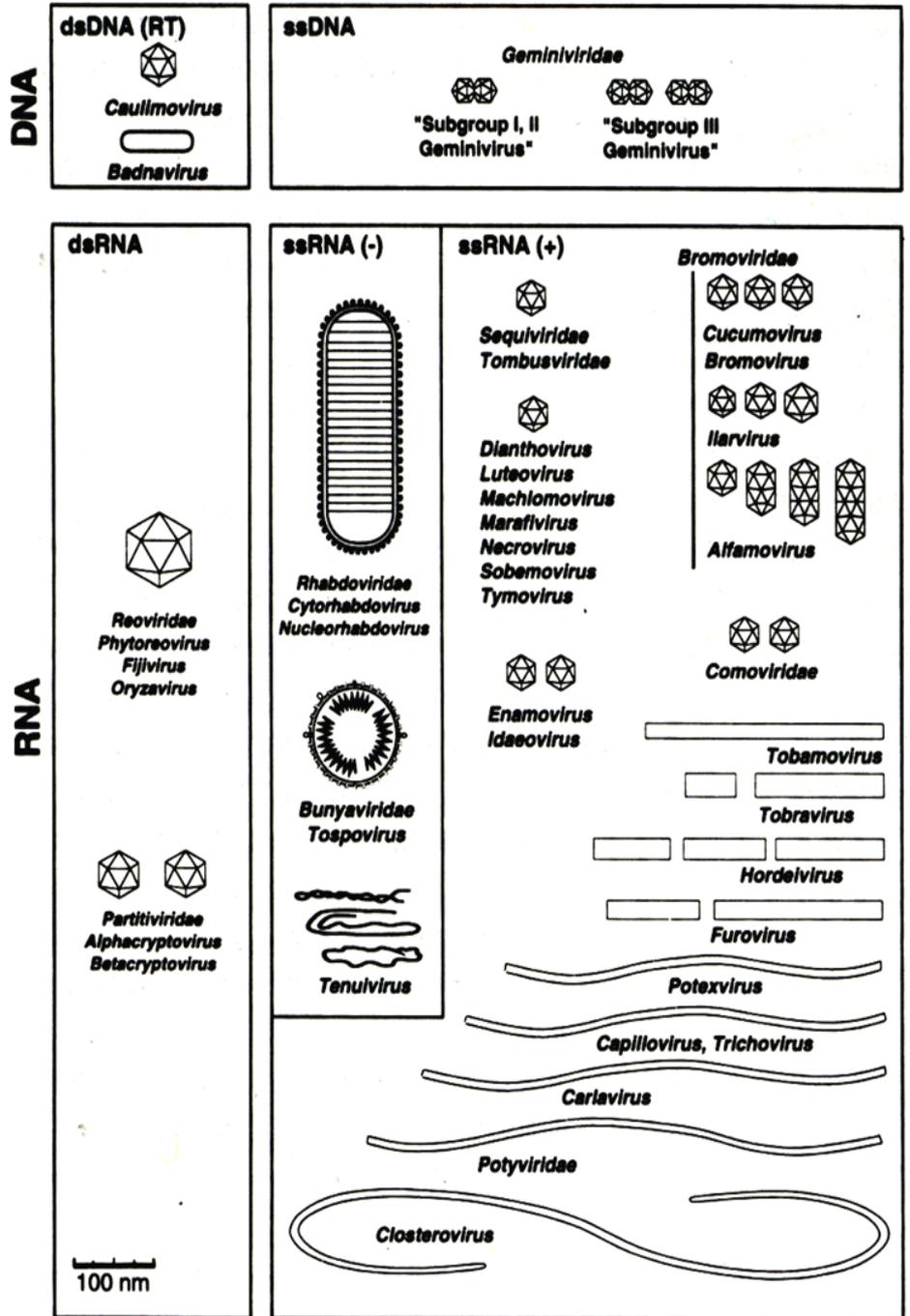
Iris yellow spot- symptoms on leaves







Plant viruses



Plant viruses

DNA

dsDNA (RT)



Caulimovirus



Badnavirus

ssDNA

Geminiviridae



"Subgroup I, II Geminivirus"




"Subgroup III Geminivirus"

RNA

dsRNA



Reoviridae
Phytoreovirus
Fijivirus
Oryzavirus




Partitiviridae
Alphacryptovirus
Betacryptovirus



100 nm

ssRNA (-)



Rhabdoviridae
Cytorhabdovirus
Nucleorhabdovirus



Bunyaviridae
Tospovirus



Tenuivirus

ssRNA (+)

Sequiviridae
Tombusviridae



Dianthovirus
Luteovirus
Machlomovirus
Marafivirus
Necrovirus
Sobemovirus
Tymovirus




Enamovirus
Idaeovirus

Bromoviridae




Cucumovirus
Bromovirus




Ilarvirus






Alfamovirus




Comoviridae



Tobamovirus



Tobravirus



Hordeivirus



Furovirus



Potexvirus



Capillovirus, Trichovirus



Carlavirus



Potyviridae



Closterovirus

Tomato spotted wilt virus



INSV symptoms on pepper and lettuce



Photo by Steve Koike

TRANSMISSION

ACQUISITION BY LARVAE IS CRUCIAL

Egg

TOSPOVIRUS TRANSMISSION CYCLE

Male Adult

1st Instar

2nd Instar

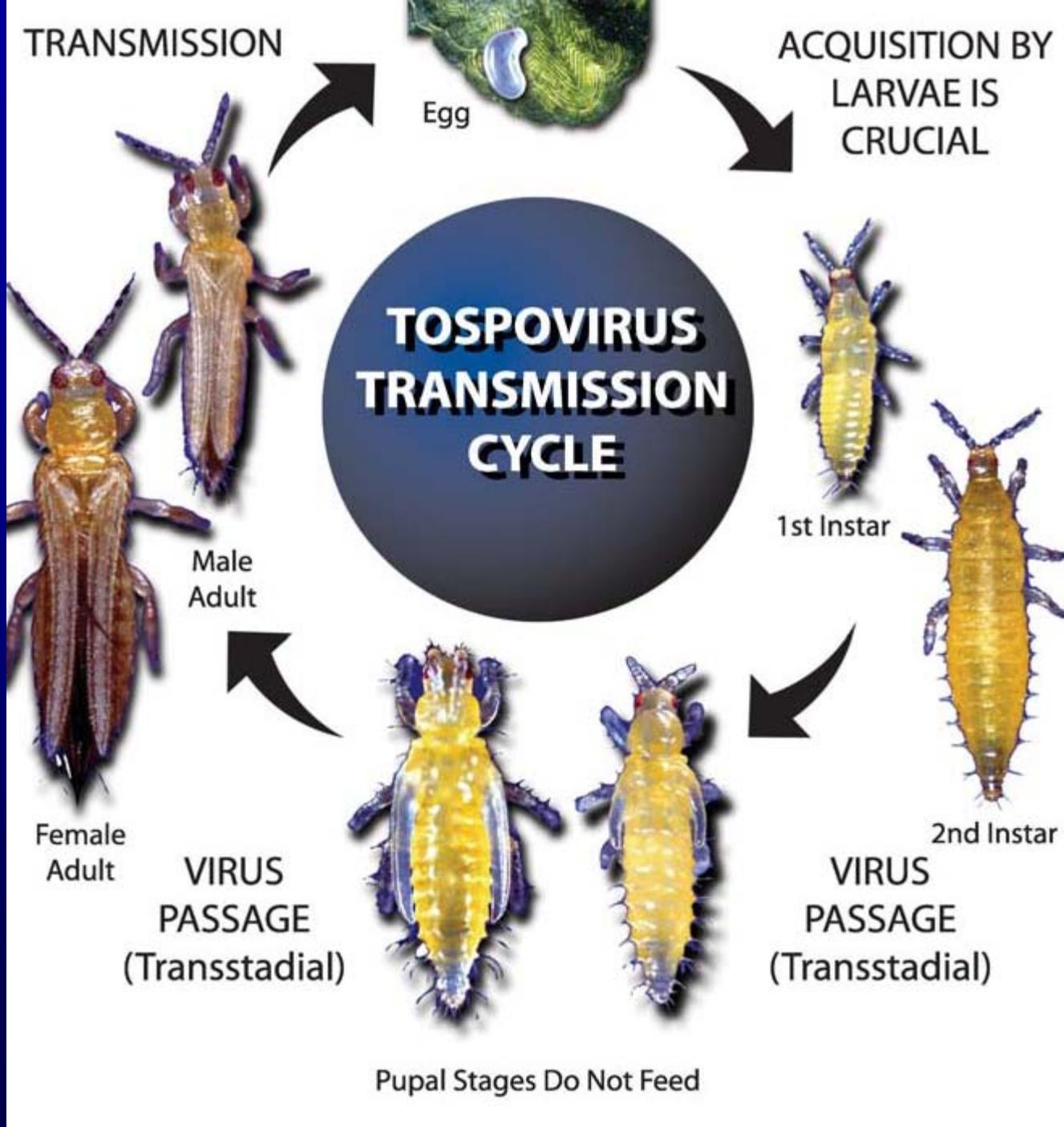
Female Adult

VIRUS PASSAGE (Transstadial)

VIRUS PASSAGE (Transstadial)

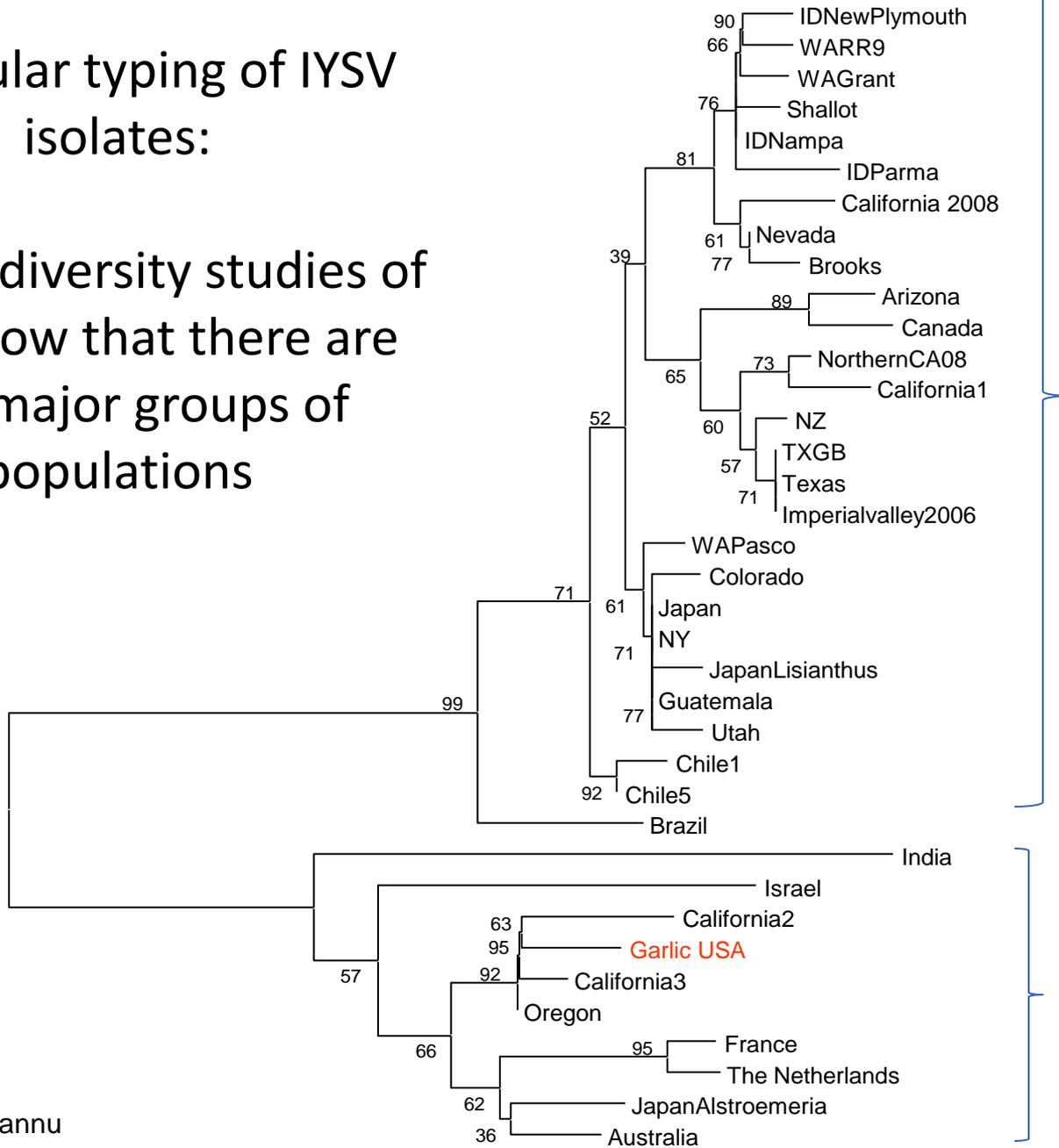
Pupal Stages Do Not Feed

A. E. Whitfield, D. E. Ullman, and T. L. German. 2005. **TOSPOVIRUS-THRIPS INTERACTIONS**. Annu. Rev. Phytopathol. 2005. 43:459-89



Molecular typing of IYSV isolates:

Genetic diversity studies of IYSV show that there are two major groups of populations



Slide provided by Hannu Papu

0.01

IYSV in onion

- Idaho 1993 (51)
- Brazil 1994 (97)
- Israel 1998 (43)
- Japan 1999 (63)
- Slovenia 2000 (70)
- Colorado 2002 (108)
- Arizona 2003 (82)
- California 2003 (82)
- Utah 2003 (1)
- Italy 2003 (19)
- Australia 2003 (21)
- New Mexico 2004 (24)
- Washington 2004 (33)
- Washington 2004 (33)
- Georgia 2004 (85)
- Tunisia 2005 (7)
- Spain 2005 (16)
- Oregon 2005 (25)
- Chile 2005 (105)
- India 2006 (99)
- R union Island 2006 (103)
- Peru 2006 (84)
- Texas 2006 (74)
- Guatemala 2006 (89)
- **New York 2007**
- **Canada 2008**
- **France 2008**
- **Serbia 2008**

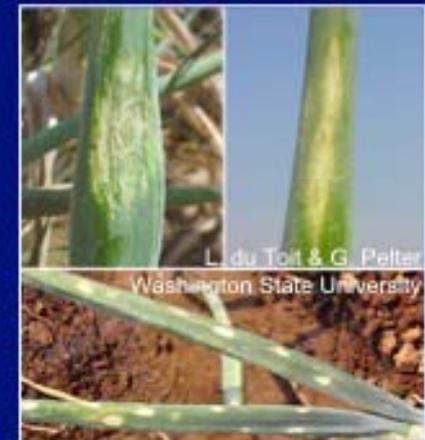
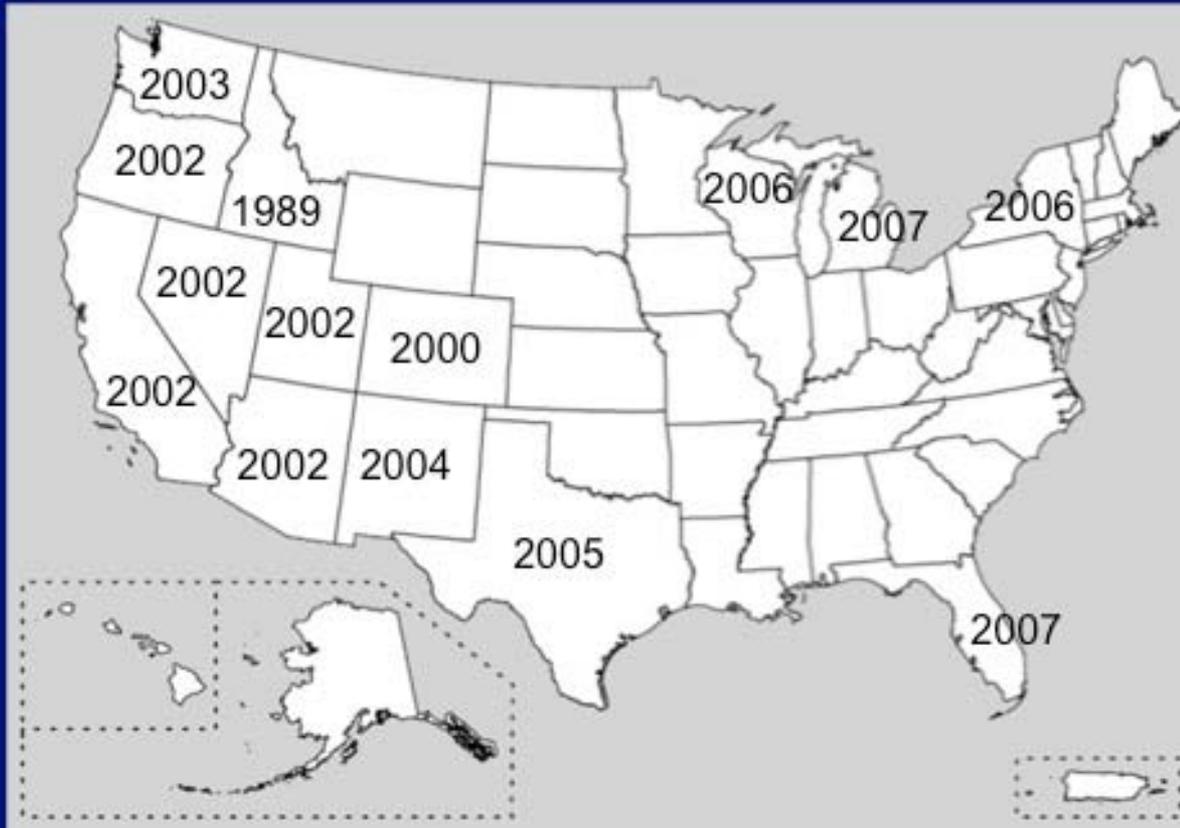
Iris Yellow Spot Virus (IYSV)

1989 – Idaho

Hall, J.M., et al. 1993. *Plant Disease* 77(9): 952

2006 – New York

Hoeping, C.A., et al. *Plant Disease* 91(3): 327





Increased incidence of IYSV in bulb and seed onion in northern CA in summer 2008. Found in several fields in Colusa, San Benito, Sutter, and Yolo counties (surveys by Dr. Mike Davis)

Slide provided by Hannu Papu

Sources of the virus

- Weeds
- Bulbs
 - IYSV detected in volunteer onion plants, originating from bulbs left in the field at harvest in the next season crops
- Detected in transplants moving into CO
(Schwartz, National Allium Meeting, Dec 2008)

Onion Transplant Seedlings

2004 -2008 Surveys

(12 –26 sources annually from AZ, CA & TX)

- *Thrips tabaci* was recovered each year from all sources
- *Frankliniella ewarti*, *F. occidentalis* & *F. schultzei* 4 of 5 years
- IYSV: up to 5% of plants/source

H. F. Schwartz, K. Otto, S. Szostek, C. Boateng,
W. Cranshaw, M. Camper & L. Mahaffey
Colorado State University

Relative thrips susceptibility or tolerance among onion cultivars

- **Leaf color**
 - strong correlation between thrips population densities and onion leaf color.
 - blue hues versus green hues appear to be more attractive to *T. tabaci*
- **Varieties with glossy foliage tend to be more resistant to thrips**
 - Decrease in egg hatching or larval feeding
 - Differences in chemistry of leaf waxes
- **Plant Structure**
 - greater openness between the leaves increases thrips exposure to adverse environmental conditions and natural enemies

Relative IYSV susceptibility of varieties

- No lines immune to IYSV have been reported
- Highly significant differences in incidence of IYS-symptomatic plants are reported
- Varieties with lower incidence have higher yield and higher percentage of jumbo bulbs

Clinton C. Shock, Erik Feibert, Lynn Jensen, S. Krishna Mohan and Lamont D. Saunders. 2008. Onion variety response to Iris yellow spot virus. HortTechnology 18(3)

Du Toit, L. and Pelter, G. 2006. Susceptibility of Storage Onion Cultivars to Iris Yellow Spot in the Columbia Basin of Washington, 2004 [electronic resource]. Vegetable production & marketing news. 2006 Feb., v. 16, no. 2 http://aggie-horticulture.tamu.edu/extension/newsletters/vpmnews/feb06/feb_06_onion_irisyellow_spot.htm

Gent, D. H., Schwartz, H. F., and Khosla, R. 2004. Managing *Iris yellow spot virus* of onion with cultural practices, host genotype, and novel chemical treatments. (Abstr.) Phytopathology 94:S34.

Other factors influencing IYSV severity

- Greater plant stress appears to result in increased severity of IYS-symptoms
- Early maturing varieties may escape the thrips pressure experienced later in the season.
- Higher seed production losses reported in cultivars with long seed stalks

Control

- Elimination of volunteer onion and planting of transplants free of IYSV
- Insecticide control
 - (Kritzmen et al: 2002, Hammon et al: 2004)
- Use of less susceptible varieties
- Systemic acquired resistance materials-Actigard
 - Four applications decreased IYS-symptom incidence and increased number of jumbo grade bulbs (Gent et al: 2004)

Acknowledgements

- CGORAB
- Hanu Pappu - Washington
- Howard Schwartz – Colorado State University
- Michael Davis – UC Davis



Relative thrips susceptibility or tolerance among onion cultivars

- Fournier, F., Boivin, G., and Stewart, R. K. 1995. Effect of *Thrips tabaci* (Thysanoptera:Thripidae) on yellow onion yields and economic thresholds for its management. J. Econ. Entomol. 88:1401- 1407.
- Coudriet, D. L., Kishaba, A. N., McCreight, J. D., and Bohn, W. G. 1979. Varietal resistance in onions to thrips (Thysanoptera: Thripidae). J. Econ. Entomol. 72:614-615.
- Molenaar, N. D. 1984. Genetics, thrips (*Thrips tabaci* L.) resistance and epicuticular wax characteristics of nonglossy and glossy onions (*Allium cepa* L.). Diss. Abstr., B (Sciences and Engineering) 45:1075B.
- Jones, H. A., Bailey, S. F., and Emsweler, S. 1934. Thrips resistance in onion. Hilgardia 8:215-252.



Imperial County Experiments 2007
Effect of Insecticide Treatments and
Actigard on of IYS-symptom
Incidence and Severity

Effect of Repeated Insecticide
Applications (8 Feb to 14 May) on
Thrips Densities and IYSV severity
and incidence

Treatment	IYSV incidence	IYSV everity	SM (thrips/5 plants)
Untreated	19.50 b	1.25	28.1 a
Vydate L	8.00 cd	1.20	8.7 de
Lannate LV + Mustang 1.5EW	11.50 bcd	1.15	7.1 e
Lannate LV + Warrior	5.50 d	1.25	7.7 de
Success + Aza-Direct	15.75 bcd	1.30	11.1 cd
Radiant 120 SC	32.50 a	1.40	12.6 c
QRD 400	16.75 bc	1.10	17.4 b
QRD 400	16.00 bc	1.25	17.6 b
QRD 400 + Success	16.50 bc	1.30	13.2 c
QRD 400 + Lannate LV	11.75 bcd	1.10	10.0 cde

**Effect of Three Actigard
Applications on Incidence and
Severity of Iris Yellow Spot-
Symptoms. Brawley, CA. 2007.**

2007 Plant Activator

Treatments	Incidence	Severity
Untreated control	8.25	1.40
Actigard 50W @ 0.76 oz/A + Latron B-1956 0.06 %	12.25	1.10
Bravo Weather Stik 6 SC 2 pts/A (1,3), Ridomil Gold Bravo 2.0 lbs/a (2)	11.00	1.12
Bravo Weather Stik 6 SC 2 pts/A (1,3), Reason 5.5 fl oz + Induce 0.25% (2)	8.00	1.35
Bravo Weather Stik 6 SC 2 pts/A (1,3), Forum 500SC 6.1 fl oz/A + Prev Am 0.4% (2)	11.25	1.56
LSD _{0.05}	NS	0.41

