

**Forum in Plant Diseases:
Rhizomania and Cercospora Leaf Spot
Resistance**

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American Society of Sugar Beet Technologists Forum on Plant Disease, March 4th, 2005.

Cercospora Leaf Spot (CLS) Resistance and Resistance Management Forum Discussion;

Weather Derived Fungicide Application Prediction Model (Dr. Ron Pitblado).

- A. Disease warning models in CLS and other crops.
- B. Incorporation of leaf wetness sensor data into a CLS model.
- C. Consideration of current fungicide efficacies and genetic resistance into a model.
- D. Disease Severity Value derivation through the model.

***Cercospora beticola* Sensitivity to Foliar Fungicides. (Dr. Gary Secor)**

- A. Review of the CLS pathogen and current registered fungicides for control of CLS.
- B. Currently registered fungicide Modes of Action (MOA).
- C. Resistance risk by fungicide class.
- D. Results of the 2004 CLS spore survey in Minnesota and North Dakota.

***Cercospora beticola* Fungicide Resistance and Management. (Dr. Mohamed Khan)**

- A. History of the introduction and use of various CLS fungicides classes.
- B. Objectives and management of FRAC (Fungicide Resistance Action Committee).
- C. History of CLS fungicide resistance.
- D. CLS fungicide MOA's and respective resistance management recommendations.

The Forum on CLS Fungicide Resistance at Palm Springs, CA followed the outline above. Each speaker provided a brief discussion on an element of the topic and discussion took place at the end of the presentations. Dr. Ron Pitblado initiated the presentations with discussion on a weather model that incorporates both temperature and leaf wetness that has been used in other crops and is now being used to determine CLS fungicide application initiation and interval timing in the Michigan Sugar growing area.

Dr. Gary Secor discussed CLS spore collection and fungicide tolerance testing in the sugar beet growing areas of Minnesota and North Dakota. Triphenyl Tin Hydroxide (TPTH) tolerance has virtually disappeared in Minnesota and North Dakota. Tolerant spores to TPTH are weak and easily controlled with use of current alternative fungicide classes. He cautioned that the Strobilurin chemistry has potential to have CLS develop resistance based upon its use in other crops. He indicated that "Eminent" of the triazole family of fungicides, has been stable but there has been a slight increase in the number of tolerant spores in the survey that should be considered in management of this product.

Dr. Mohamed Khan discussed the history of CLS fungicide usage and the development of CLS resistance to many previous classes of fungicides. He cautioned that this pathogen has proven to be diverse in its ability to acquire resistance to fungicide MOA's and that current fungicide products should be used with resistance management as a primary consideration. He also presented the purpose and constituency of the FRAC group. He incorporated some of the FRAC ideas and concerns into a set of recommendations that he provided to the Forum in regard to CLS fungicide resistance management.

Rhizomania and Rhizomania Resistance-Breaking Strains Forum Discussion:

Overview of Rhizomania and Variability in BNYVV. (Dr. Charlie Rush)

- A. Life cycle of *Polymyxa beta* and epidemiology of BNYVV.
- B. Variability within *Beet necrotic yellow vein virus* (BNYVV).
- C. BNYVV strain types, distribution, and strain determination.

Resistance-Breaking (BNYVV) Isolates in California. (Dr. Hsing-Yeh Liu)

- A. Incidence and distribution of the IV-BNYVV isolates since identification in 2002.
- B. Characterization of IV-BNYVV isolates based on biology and molecular biology.
- C. Exploration of the evolution of the resistance-breaking isolates.
- D. Future Research on the IV-BNYVV isolates.

The Rhizomania Situation in Idaho and Current Management. (Dr. John Gallian)

- A. Occurrence and spread of rhizomania in Idaho.
- B. Grower education.
- C. Influence of rotation length, green manures, tillage and compaction, and surfactants on rhizomania severity.

Identifying New Sources of Resistance to the IV-BNYVV Strain. (Dr. Robert Lewellen)

- A. ELISA results of Variety by Sterilized-, A-Type-, and IV- soil greenhouse tests.
- B. Testing resistance from wild beet (*Beta vulgaris* subsp. *maritima*) & R_z2 source.
- C. Implications of the research conducted on resistance sources to IV-BNYVV.

Dr. Charlie Rush began by introducing the life cycle of the vector, *Polymyxa betae* and the epidemiology of the viral pathogen. He finished by reviewing the data he has accumulated regarding the presence and/or expression of the *Rz1* gene in “blinker” occurrences and the implications of the presence of minor genes on *Rz1* expression.

Dr. Hsing-Yeh Liu discussed characterizing the resistance-breaking IV-BNYVV strain. In 2002, cultivars containing *Rz1* grown in the Imperial Valley of CA were observed with severe rhizomania symptoms, suggesting that *Rz1* conditioned resistance had been compromised. He concluded that resistance-breaking IV-BNYVV isolates had likely evolved from the original and existing A-Type from a selection process.

Dr. John Gallian discussed rhizomania in Idaho. Since 1992, it has covered nearly every growing area in Idaho. Educating growers of management strategies regarding resistant and vigorous varieties, host crop rotation intervals, irrigation management, and tillage has been important in dealing with the disease.

Dr. Robert Lewellen discussed identifying new sources of rhizomania resistance. He has screened varieties to both the Type-A and IV strains. ‘Angelina’ that contains two resistance genes to rhizomania performed best in field and greenhouse tests involving IV-BNYVV, but was still moderately susceptible. New sources of rhizomania resistance show promise but may be several years away. The role of minor genes in disease expression was discussed and felt to be important.