

CERCOSPORA FORUM

Summarized by
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Several discussants provided introductory remarks. Dave Hilde discussed how the Cercospora Leafspot Advisory is used by American Crystal Sugar Company. The model, developed by Shane and Teng at the University of Minnesota, consists of: 1) a Cercospora Advisory in which two day totals of daily infection values (DIV) greater than six (on a scale of 0-14) indicate favorable conditions for infection, and 2) percent disease severity is compared to the calendar date to determine when disease levels are in the caution zone. If disease levels are in the caution zone, the two day DIV are used to determine if a spray is needed. The second part of the advisory model, the field assessment of disease severity, is not used much by American Crystal agriculturists nor by consultants because it takes two hours to walk the field in the manner prescribed by the model, collect the samples and make disease ratings. This is not practical.

In recent years the American Crystal weather stations were integrated into the North Dakota Agricultural Weather Network (NDAWN). A permanent site is maintained for each weather station and a small area of sugar beets is planted near the site so that the probes can be placed in the crop. This is necessary since the model was developed using hygrothermographs located in the sugarbeet canopy. Information from the NDAWN weather stations is downloaded daily by cellular phone and made available through the Data Transmission Network (DTN), through a dedicated telephone line and by personal contact of the agriculturists.

Eric Kerr stated that essentially the same system is used in the panhandle of Nebraska and that less fungicide has been used now that the system is in place.

Lee Panella discussed the use of genetic control of Cercospora. There are four or five major genes and they interact with the environment. Breeding methods are tedious and inbreeding may reduce tonnage and sucrose. Studies of Garry Smith indicated a negative correlation between Cercospora resistance and yield. It may be necessary to form hybrids by combining parents that have Cercospora resistance with parents that have yield components. Varieties now available have better resistance and yield than in the past, and we can expect to see more varietal resistance in the future as there is a greater need for resistance.

Art Lamey discussed the development of tolerance to triphenyltin hydroxide (TPTH) and resistance to thiophanate methyl (Topsin M, a benzimidazole class of fungicide) in replicated plots at Wahpeton, ND, based on the laboratory data from USDA-Sugarbeets in Fargo. Very low levels of TPTH tolerance and benzimidazole resistance were present

in the untreated check or in the plots treated six times with mancozeb. Moderate levels of TPTH tolerance developed in the plots treated with Protex (4 treatments at 10 day intervals), high levels (statistically greater than the untreated) of tin tolerance developed in the plots treated three times with Super Tin (TPTH) at 3.75 oz/A on a 14 day interval and very high (statistically significant) levels of tin tolerance developed in the plots treated three times with Super Tin at 5 oz/A on a 14 day interval. Use of the high rate of Super Tin did not retard the development of tin tolerance; in fact, it may have enhanced it. Moderately high levels of tin tolerance and high levels (both were statistically significant) of benzimidazole resistance developed in the plots treated three times with Topsin M on a 14 day interval. The tin tolerance in the Topsin M plots was surprising since cross resistance appeared to develop where Topsin M was used for the entire season. A tank mix of Super Tin plus Topsin M had high levels of Topsin M resistance and moderately high levels of Super Tin tolerance (both statistically significant), indicating that the tank mix was of little value in protecting against the development of resistance or tolerance to either fungicide.

In the discussion that followed, there was a question about the suitability of the Cercospora advisory system for other areas. Since it was developed on non-irrigated beets in Minnesota and North Dakota and later adapted for irrigated sugar beets in the panhandle of Nebraska, it should work in other areas as well. A published table provides the environmental data for determining DIV, which are calculated based on the average temperature during the period above 90% relative humidity (RH) and the number of hours of high RH. Suitability of the model would need to be tested in a new area, however.

American Crystal still measures RH in the canopy but recently dropped the minimum RH from 90% to 87% for calculating DIV. Southern Minnesota Beet Sugar Cooperative had earlier dropped the minimum RH from 90% to 87% because the model did not predict early infections; although the change was an educated guess and not based on experimental data, it seemed to accomplish the objectives.

Different climatic conditions should be considered as well as inoculum level. In southern Minnesota the question is not if but when to spray. The fungicides and spraying equipment are available in southern Minnesota and the Red River Valley. In other areas where there is less disease pressure and a fungicide may not be needed every year the fungicides and application equipment may not be available on demand.

Do Minnesota and North Dakota growers make more money by spraying less resistant varieties? Growers wanted higher yielding varieties and were willing to take varieties with moderate resistance. There is a trade off between resistance and yield. The standard in Michigan is a lower level of susceptibility than in the Red River Valley, but since different systems of disease evaluation are used no direct comparisons are available.

In a 1996 trial using three varieties of differing susceptibility it was possible to control Cercospora in the Red River Valley using more resistant varieties. However, growers could make more money by spraying the more susceptible varieties. Economics has

driven grower and company decisions on varieties. In the Red River Valley and Southern Minnesota the grower is the company, as these companies are cooperatives. The Michigan varieties did not make as much money in the Red River Valley or Southern Minnesota based on trials at three locations. However, with more inoculum and poorer control from fungicides it has become necessary to move toward more resistance in the future.

The highest allowable average Cercospora rating for approved American Crystal varieties is being changed from a KWS of 5.5 to 5.2. Southern Minnesota is going to a standard of 5.0 for the highest allowable rating. These are based on the coded variety trial at Shakopee, MN, which is inoculated and evaluated seven times during the growing season. The susceptible varieties get high levels of Cercospora sooner than the more resistant ones; the more susceptible varieties reach a KWS of 7 sooner than the others and stay at this level. The most resistant materials may reach a KWS of 6.5 or 7 in late August. The Michigan varieties would reach a level of 3.9 or 4.0 on the same scale.

One discussant did not believe in averages. The question was raised about how much effect a susceptible variety might have on nearby varieties in a variety trial and how to make realistic evaluations. Sporulation from susceptible varieties might overcome resistant varieties and the results might not represent how a resistant variety would perform on a field basis.

Susceptible varieties in the Shakopee, MN trial reach high KWS values early in the season and stay there. This is why averages are used. The system is repeatable over years.

Variety approval in the Red River Valley and Southern Minnesota was seen by some discussants as a political problem and not a plant pathological problem. Growers complain if higher levels of resistance are required, yet if higher levels of resistance were required the disease levels would be expected to decline and disease would start later due to a decline in the primary inoculum.

Cercospora was devastating along the Front Range in Colorado in the 1930's, then the companies shifted to varieties with a KWS rating of 3 and disease levels subsided. Some varieties are now coming into the area that are more susceptible and the Cercospora inoculum is building up again on the Front Range. A variety with a rating of 5.2 is too high, since losses occur above a KWS of 3. Another discussant noted, however, that a KWS of 5.2 at Shakopee, MN is an average of many readings. It is not the same as the Fort Collins, CO scale.

Resistance management, *i.e.* management of resistance to fungicides, should be considered when new fungicides become available. Some growers in eastern Montana have sprayed three times with Benlate in a single year. What are the companies doing to help manage resistance?

Resistance inducing elicitors may help to reduce the inoculum potential when used with fungicides. This needs more investigation.

The resistance/tolerance problem in the Red River Valley and Southern Minnesota developed when growers had a small pool of fungicides available. Growers used the most effective product, the benzimidazole fungicides, until *Cercospora* developed benzimidazole resistance. Then they used the next most effective product, TPTH, until *Cercospora* developed TPTH tolerance. Resistance management strategies need to be developed as new products become available. These strategies might include combinations of products, rotation with unrelated products, use of resistant varieties and use of resistance elicitors.

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Cercospora was devastating along the Front Range in Colorado in the 1930's, then the companies shifted to varieties with a KWS rating of 3 and disease levels subsided. Some varieties are now coming into the area that are more susceptible and the *Cercospora* inoculum is building up again on the Front Range. A variety with a rating of 2.5 is too high, since losses occur above a KWS of 3. Another discussion noted, however, that a KWS of 2.5 at Shakopee, MN is an average of many readings. It is not the same as the Fort Collins, CO scale.

Resistance management, i.e. management of resistance to fungicides, should be considered when new fungicides become available. Some growers in eastern Minnesota have played their cards with Bonlate in a single year. What are the companies doing to help manage resistance?