

Factors Considered When Making Corn Foliar Fungicide Application Decisions in Illinois

Carl A. Bradley

Extension Plant Pathologist
Department of Crop Sciences
University of Illinois
Urbana, Illinois
carlbrad@illinois.edu

Abstract: *Foliar fungicide use on corn in Illinois has increased drastically beginning in 2007. In an effort to better understand the factors considered in corn fungicide application decisions, attendees of a series of meetings in Illinois were surveyed. Results indicate that disease pressure was the most important factor considered by the greatest percentage of survey respondents (38%). Factors not related to disease or disease risk were considered the most important factor for 23% of the respondents. These results indicate that additional Extension programming is needed to teach the importance of considering disease and disease risk when making a fungicide decision.*

Introduction

In 2007, approximately 11 to 14 million acres of corn out of 76 million acres grown in the Midwest were sprayed with a foliar fungicide. This included 3 to 4 million out of 13 million acres grown in Illinois (Munkvold, Doerge, & Bradley, 2008). Aggressive commercial advertising campaigns that promote foliar fungicides for corn have become common in Illinois.

Although foliar diseases such as gray leaf spot (caused by *Cercospora zea-maydis*) and northern leaf blight (caused by *Exserohilum turcicum*) may cause economically damaging yield losses in Illinois corn fields in some years and on some hybrids (Munkvold, Martinson, Shriver, & Dixon, 2001; White, 1999), these advertisements focus primarily on the potential of yield increases with the use of fungicides, with less emphasis on foliar disease management. Increased marketing and sales of foliar fungicides also have occurred in other midwestern states and on crops besides corn (Conley, Krupke, Santini, & Shaner, 2007). The practice of applying a foliar fungicide in hopes of yield enhancement, without giving any consideration to foliar diseases, does not fit within an integrated pest management (IPM) strategy, which would call for using a foliar fungicide only when necessary based on economic disease threshold levels.

The objective of the study reported here was to develop a better understanding of the factors considered by corn producers, company representatives, crop consultants, and others in the decision-making process of whether a foliar fungicide should be applied to a cornfield.

Methodology

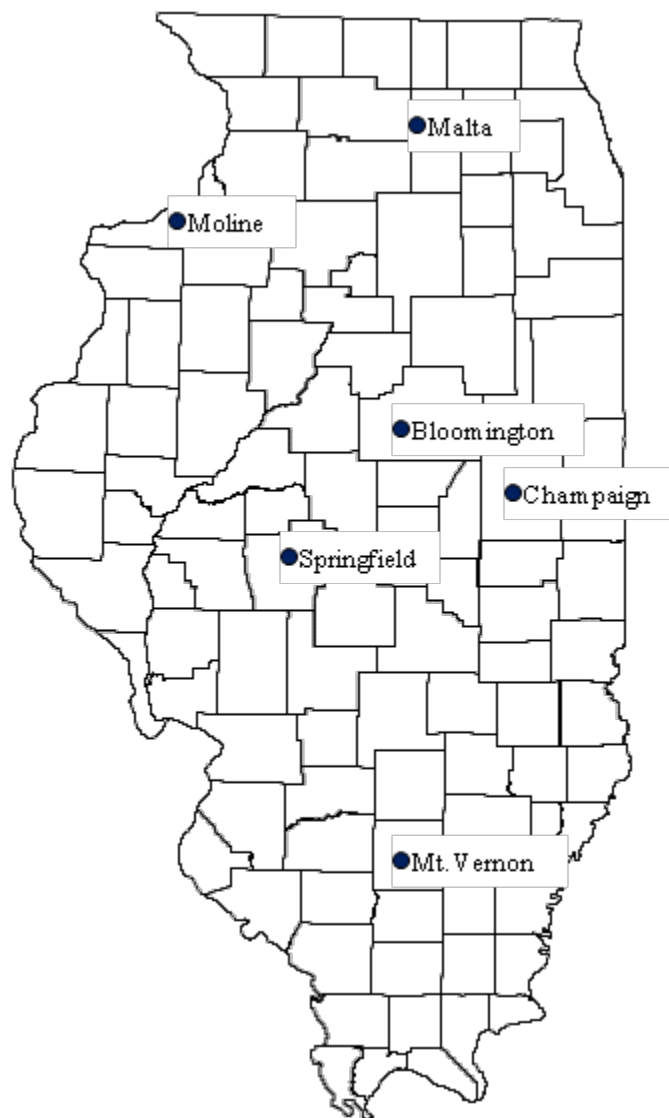
A series of University of Illinois Extension meetings known as the "Corn and Soybean Classics" was held at six locations in Illinois during January 2009 (Bloomington, Champaign, Malta, Moline, Mt. Vernon, and Springfield, IL) (Figure 1). Audience members were asked a series of questions, and responses were collected using a TurningPoint audience response system (Turning Technologies, LLC, Youngstown, OH). Audience members were asked which of the following described their primary occupation: producer, ag input supplier (retailer), ag chemical company representative, seed company representative, consultant, or other. In addition, the audience was asked if they had applied or recommended applying a foliar fungicide to corn during the 2008 growing season and which of the following was the most important factor that was considered when making a foliar fungicide application decision: marketing price of the crop, amount of

disease pressure, susceptibility of the hybrid to diseases, the weather, or the potential for higher yields with no other considerations.

Respondent data were compiled, and % respondents were calculated for each response for each location. The % respondents for the "most important factor" data were statistically analyzed using the general linear models procedure with SAS software version 9.2 (Littell, Freund, & Spector, 1991). Locations were used as blocks, and data were analyzed as a randomized complete block design. Fisher's protected least significant difference test was used to compare the mean % respondents ($\alpha = 0.05$) (Littell et al., 1991).

Figure 1.

Locations for the 2009 University of Illinois Corn and Soybean Classics Meeting Series



Results

In total, 905 meeting attendees responded to the question that asked them to select their primary occupation ($n = 186, 171, 110, 105, 104,$ and 229 for Bloomington, Champaign, Malta, Moline, Mt. Vernon, and Springfield, respectively). At all locations except Springfield, the largest percentage of the audience was producers, ranging from 30% to 50% (Table 1). At all locations except Champaign, the least percentage of the audience was agrichemical company representatives, ranging from 2% to 5%. Combining all locations, the greatest percentage of respondents was producers (36%) followed by ag input suppliers (25%), seed company representatives (21%), other (10%), consultants (5%), and ag chemical company representatives

(3%).

Table 1.
Primary Occupations of Respondents

Occupation	Bloomington		Champaign		Malta		Moline		Mt. Vernon		Springfield		All Locations	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Producer	71	38	65	38	37	33	34	32	52	50	68	30	327	36
Ag input supplier (retailer)	49	26	23	14	33	30	30	28	14	13	72	31	221	25
Ag chemical company representative	6	3	9	5	2	2	3	3	4	4	4	2	28	3
Seed company representative	31	17	43	25	24	22	25	24	15	14	52	23	190	21
Consultant	9	5	5	3	10	9	4	4	7	7	11	5	46	5
Other	20	11	26	15	4	4	9	9	12	12	22	9	93	10

Note: N=186, 171, 110, 105, 104, 229, and 905 for Bloomington, Champaign, Malta, Moline, Mt. Vernon, Springfield, and All Locations, respectively.

At all locations except Mt. Vernon, over 50% of the respondents applied or recommended applying a foliar fungicide to corn during the 2008 growing season, with the percentage of respondents ranging from 56% to 77% at these locations and 35% at Mt. Vernon (n = 186, 171, 110, 105, 104, and 229 for Bloomington, Champaign, Malta, Moline, Mt. Vernon, and Springfield, respectively) (Table 2). Averaged across all locations, 63% of the respondents applied or recommended applying a foliar fungicide to corn during the 2008 growing season (n = 905).

Table 2.
Respondents Who Applied or Recommended Fungicides

Location	Respondents that applied or recommended applying a fungicide to corn in 2008	
	No.	%
Bloomington	141	76
Champaign	104	61
Malta	71	65
Moline	81	77
Mt. Vernon	36	35
Springfield	134	56
All Locations	567	63

Note: N = 186, 171, 110, 105, 104, 229, and 905 for Bloomington, Champaign, Malta, Moline, Mt. Vernon, Springfield, and All Locations, respectively.

At all locations except Moline, the greatest percentage of respondents indicated that disease pressure was the most important factor considered when making a foliar fungicide application decision, ranging from 35% to 43% (n = 185, 160, 108, 113, 99, and 213 for Bloomington, Champaign, Malta, Moline, Mt. Vernon, and Springfield, respectively) (Table 3). At Malta, susceptibility of the corn hybrid to diseases was tied with amount of disease pressure in receiving the greatest percentage of responses (37%). At all locations, the least percentage of respondents indicated that weather was the most important factor considered when making a foliar fungicide decision, ranging from 4% to 7%. At Moline, marketing price of the crop was tied with weather in receiving the least percentage of responses (5%).

Combining all locations, the greatest percentage of respondents indicated that the amount of disease pressure was the most important factor (38%), followed by the susceptibility of the corn hybrid to diseases (34%), the potential for higher yields with no other considerations (14%), the marketing price of the crop (9%), and the weather (5%) (n = 878). When statistically analyzed across all locations, disease pressure and corn hybrid susceptibility to diseases had the greatest % respondents and did not significantly differ from each other.

Table 3.
Most Important Factor Considered by Respondents When Making a Corn Foliar Fungicide Application Decision

Factor	Bloomington		Champaign		Malta		Moline		Mt. Vernon		Springfield		All Locations	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Marketing price of the crop	15	8	17	11	10	9	6	5	6	6	24	11	78	9 c
Amount of disease pressure	80	43	58	36	40	37	40	35	40	41	79	37	337	38 a
Susceptibility of corn hybrid to diseases	48	26	51	32	40	37	48	43	35	35	73	34	295	34 a
Weather	11	6	7	4	7	7	5	5	5	5	14	7	50	5 c
Potential for higher yields with no other considerations	31	17	27	17	11	10	14	12	13	13	23	11	119	14 b

Note: N = 185, 160, 108, 113, 99, 213, and 878 for Bloomington, Champaign, Malta, Moline, Mt. Vernon, Springfield, and All Locations, respectively. For % respondents in the All Locations column, numbers followed by the same letter are not significantly different according to Fisher's protected least significant difference test (alpha = 0.05).

Discussion

When evaluating survey responses by region (northern Illinois = Malta and Moline; central Illinois = Bloomington, Champaign, and Springfield; and southern Illinois = Mt. Vernon), the majority (65%) of the respondents at the southern Illinois meeting *did not* apply or recommend a foliar fungicide application to corn during the 2008 growing season. Conversely, the majority of respondents at the central and northern Illinois meetings *did* apply or recommend applying foliar fungicides. The majority of respondents at the southern Illinois meeting were producers (50%), whereas producers made up only 30% to 38% of the respondents at the central and northern Illinois meetings. Respondents who were producers likely would represent or be responsible for fewer total acres than respondents who were ag retailers, company representatives, or

consultants. Because each respondent represents a different size of corn acreage, these results should not be used to estimate the percentage of corn acreage sprayed with a foliar fungicide in Illinois in 2008.

In general, the majority of survey respondents indicated that the amount of disease pressure and the susceptibility of the corn hybrid to diseases were the most important factors considered when making a corn foliar fungicide application decision. Both of these factors are related in that the susceptibility of the corn hybrid to diseases will influence the level of disease pressure. Working with gray leaf spot, a major foliar disease of corn in Illinois, Paul and Munkvold (2004) reported that the gray leaf spot resistance rating of a corn hybrid was one of the most important pre-planting predictors of gray leaf spot severity. In addition, Munkvold et al. (2001) reported that the highest probability for profitable fungicide use in corn occurred when hybrids susceptible to gray leaf spot were sprayed.

Of the other three factor choices presented to respondents (marketing price of the crop, weather, and potential for higher yields with no other considerations), only weather would influence disease levels. The other two factor choices have no relationship with plant disease pressure, yet 23% of the respondents overall chose either marketing price of the crop or the potential for higher yields with no other considerations as the most important factor to consider. The marketing price of the corn is an important consideration in that the potential yield damage and economic loss caused by the disease must be greater than the cost of an effective fungicide treatment, and this consideration should be made prior to applying a fungicide. Under low disease severity, corn yield increases with foliar fungicides are unlikely (Bradley & Ames, 2010; Paul et al., 2011). Thus, justifying corn fungicide applications in hopes of higher yields without considering disease or disease risk will likely not be profitable.

Czapar, Curry, and Gray (1995) reported on results of a 1994 survey of IPM practices that was mailed to central Illinois farmers. Although the surveyed farmers were not asked about disease control considerations, results of that survey did indicate that "economic threshold" received the greatest percentage of responses (34%) when farmers were asked about their basis of insect control decisions. This is similar to the results of the 2009 survey reported herein, where 38% of the respondents chose the amount of disease pressure as the most important factor considered when making a fungicide application decision. These results indicate that although many in Illinois are considering pest or disease levels when making management decisions, additional Extension programming should be developed that focuses on the importance of considering disease and disease risk when making a corn foliar fungicide decision.

Acknowledgments

Appreciation is given to the other members of the 2009 University of Illinois Corn and Soybean Classics Meeting Team (F. Fernandez, T. Gleason, D. Good, M. Gray, A. Hager, E. Nafziger, T. Niblack, S. Osterbur, G. Schnitkey, and K. Steffey) for planning, coordinating, and conducting the series of meetings, and to T. Niblack for summarizing question responses.

References

- Bradley, C. A., & Ames, K. A. (2010). Effect of foliar fungicides on corn with simulated hail damage. *Plant Disease* 94:83-86.
- Conley, S. P., Krupke, C., Santini, J., & Shaner, G. (2007). Pest management in Indiana soybean production systems. *Journal of Extension* [On-line], 45(4) Article 4RIB8. Available at: <http://www.joe.org/joe/2007august/rb8.php>
- Czapar, G. F., Curry, M. P., & Gray, M. E. (1995). Survey of integrated pest management practices in central Illinois. *Journal of Production Agriculture* 8:483-486.
- Littell, R. C., Freund, R. J., & Spector, P. C. (1991). *SAS system for linear models* (3rd ed.). Cary, NC: SAS Institute Inc.
- Munkvold, G. P., Doerge, T., & Bradley, C. (2008). IPM is still alive for corn leaf diseases: Look before you spray. *Proceedings of the 62nd Annual Corn & Sorghum Research Conference* Chicago. CD-ROM, American Seed Trade Association, Alexandria, VA.

Munkvold, G. P., Martinson, C. A., Shriver, J. M., & Dixon, P. M. (2001). Probabilities for profitable fungicide use against gray leaf spot in hybrid maize. *Phytopathology* 91:477-484.

Paul, P. A., Madden, L. V., Bradley, C. A., Robertson, A. E., Munkvold, G. P., Shaner, G., Wise, K. A., Malvick, D. K., Allen, T. W., Grybauskas, A., Vincelli, P., & Esker, P. (2011). Meta-analysis of yield response of hybrid field corn to foliar fungicides in the U.S. Corn Belt. *Phytopathology* 101:1122-1132.

Paul, P. A., & Munkvold, G. P. (2004). A model-based approach to preplanting risk assessment for gray leaf spot of maize. *Phytopathology* 94:1350-1357.

White, D. G. (Ed.). (1999). *Compendium of corn diseases* (3rd ed.). St. Paul, MN: The American Phytopathological Society.

[Copyright](#) © by *Extension Journal, Inc.* ISSN 1077-5315. Articles appearing in the Journal become the property of the Journal. Single copies of articles may be reproduced in electronic or print form for use in educational or training activities. Inclusion of articles in other publications, electronic sources, or systematic large-scale distribution may be done only with prior electronic or written permission of the [Journal Editorial Office](#), joe-ed@joe.org.

If you have difficulties viewing or printing this page, please contact [JOE Technical Support](#).