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The ALTER-RATER, A New Weather-Based Model for Timing Fungicide Sprays for Alternaria Control[1]

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Control of Alternaria brown spot is difficult, especially on highly susceptible varieties such as Minneola and in disease-prone areas. Applications need to be timed as effectively as possible to produce high quality fruit without excessive numbers of sprays. Over the last several years, studies in the laboratory and the field have determined the environmental factors that are most closely related to the development of Alternaria brown spot. From these data, we have developed a system which we have designated the ALTER-RATER to aid in spray timing.

The ALTER-RATER is a weather-based point system to assist in the timing of fungicide applications for control of Alternaria brown spot. The system was developed based primarily on the amount of infection which occurred on susceptible trap plants placed in a heavily infested Minneola tangelo grove for 24-hour periods and supplemented with data from lab studies. Rainfall was an important factor affecting disease incidence, but the amount of rainfall was not highly significant as long as it was more than a trace. Days with leaf wetness durations of more than 10 hours had more disease than days with fewer numbers of hours. Alternaria infection was high over a wide range of temperatures but did diminish if the average daily temperature was above 83 or below 68°F.

To use the system, points are assigned to each day based on the rainfall, leaf wetness and average daily temperature as shown in Table l. The daily point scores are totaled and a fungicide application is made when the selected threshold value is reached. Threshold values need to vary with the susceptibility of the variety and the disease history in each grove. Suggested threshold values are given in Table 2. However, with experience in a particular grove, the threshold value should be adjusted to suit the situation.

In using this system, the first fungicide spray should be applied when the spring flush reaches 2-3 inches in length. Thereafter, all sprays should be based on the weather, that is, the accumulated point score. In the example in Table 3, if the first spray was applied on March 14, then the second application would be applied after March 28 if the 50-point threshold is being used or after April 15 if the 100-point threshold is used. Each time a spray is applied the score returns to zero. The example in

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Table 4 assumes a spray was applied on May 14. Thereafter, a spray would be needed after May 23 if the threshold of 50 is used, after May 30 if the 100 threshold is used, and after June 11 if the 150 threshold is used. No sprays are recommended after July 15 by which time the fruit should be resistant to infection.

Table 5 illustrates the number of sprays that would have been required using the ALTER-RATER in Lake Alfred, the Green Swamp and in Immokalee in different seasons as well as the intervals between sprays. All of the weather data used in Table 5 was from Adcon weather stations. Ft. Pierce is not illustrated but it was virtually the same as Immokalee.

It is apparent that use of this model will not necessarily reduce the number of sprays applied and in some cases may actually increase the number used. It should help avoid applications during dry periods when disease pressure is minimal. It is apparent from this work that most growers are probably not spraying frequently enough during the summer rainy season. In cases where it rains every day, the 50-point threshold can be reached in 5 days. Use of the ALTER-RATER will hopefully produce cleaner crops of fruit of susceptible varieties.

It is evident from the large number of applications predicted for the Immokalee area that production of highly susceptible varieties in low, wet areas may not be feasible. Data was available for that area only in 1999 and thus may not be totally representative. However, experience would also indicate that brown spot is very severe in wet areas.

Currently, copper fungicides, Trilogy, and Abound are registered and recommended for disease control. No more than 2 lb of metallic copper should be applied per acre per application even with average quality products. When applications are being made frequently and high quality copper fungicides are used, rates as low as 0.75 lb of metallic copper per acre should provide good control. Trilogy at 1% of the spray volume and Abound at 12-15 oz/acre can be substituted for copper fungicides and are especially recommended in June and July. Copper products applied when temperatures are high can cause fruit injury and darken existing blemishes. Abound probably should be alternated with other products since resistance can develop to this product.

Table 1. The number of points assigned to each day with ALTER-RATER according to the environmental conditions on that day. Daily point scores are added until the selected spray threshold is reached.

Rainfall >0.1 inch	Leaf Wetness >10 h	Avg. Daily Temp. (°F)	Daily Points Assigned
+	+	68-83	11
+	+	>83	8
+	+	<68	6
+	–	68-83	6
+	–	>83	4
+	–	<68	3
–	+	68-83	6
–	+	>83	6
–	+	<68	4
–	–	68-83	3
–	–	>83	0
–	–	<68	0

Table 2. Suggested threshold scores to be used in different situations with the ALTER-RATER.

Suggested Threshold Scores	Situation
50	Heavily infested Minneola, Dancy, Orlando, Sunburst; many flatwoods groves, east coast and SW Florida
100	Moderately infested Minneola or Dancy, many Murcotts; Ridge and north Florida groves
150	Light infestations, any variety, mostly Ridge and north Florida groves

Table 3. ALTER-RATER scoring example, May-June.

Date	Rain	Leaf Wetness >10 h	Avg. Daily Temp. (°F)	Daily Score	Cumulative Score
3/15	–	–	<68	0	0
3/16	–	–	<68	0	0
3/17	–	+	68-83	6	6
3/18	–	+	68-83	6	12
3/19	–	+	68-83	6	18
3/20	–	+	68-83	6	24

Table 3. ALTER-RATER scoring example, May-June.

Date	Rain	Leaf Wetness >10 h	Avg. Daily Temp. (°F)	Daily Score	Cumulative Score	
3/21	–	–	<68	0	24	
3/22	–	+	68-83	6	30	
3/23	–	–	68-83	3	33	
3/24	–	–	68-83	3	36	
3/25	+	–	68-83	6	42	
3/26	–	–	68-83	3	45	
3/27	–	–	68-83	3	48	
3/28	–	–	68-83	3	51	X
3/29	–	–	68-83	3	54	
3/30	–	–	68-83	3	57	
3/31	–	–	<68	0	57	
4/1	–	–	<68	0	57	
4/2	–	–	<68	0	57	
4/3	–	–	<68	0	57	
4/4	–	–	<68	0	57	
4/5	–	–	68-83	3	60	
4/6	–	–	68-83	3	63	
4/7	+	+	<68	6	69	
4/8	–	–	68-83	3	72	
4/9	–	–	<68	0	72	
4/10	–	–	68-83	3	75	
4/11	+	+	68-83	11	86	
4/12	–	–	68-83	3	89	
4/13	–	–	68-83	3	92	
4/14	+	+	<68	6	98	
4/15	–	–	68-83	3	101	X

Table 4. ALTER-RATER scoring example, March-April.

Date	Rain	Leaf Wetness >10 h	Avg. Daily Temp. (°F)	Daily Score	Cumulative Score	
5/15	–	+	68-83	6	6	
5/16	–	+	68-83	6	12	
5/17	–	+	68-83	6	18	
5/18	–	+	68-83	6	24	
5/19	–	+	68-83	6	30	
5/20	–	–	68-83	3	33	
5/21	–	–	68-83	3	36	
5/22	+	+	68-83	11	47	
5/23	–	–	68-83	3	50	X
5/24	–	–	68-83	3	53	
5/25	+	+	68-83	11	64	
5/26	+	+	68-83	11	75	
5/27	–	–	68-83	3	78	

Table 4. ALTER-RATER scoring example, March-April.

Date	Rain	Leaf Wetness >10 h	Avg. Daily Temp. (°F)	Daily Score	Cumulative Score	
5/28	–	+	68-83	6	84	
5/29	+	+	68-83	11	95	
5/30	–	+	68-83	6	101	X
5/31	–	+	68-83	6	107	
6/1	–	–	68-83	3	110	
6/2	–	–	68-83	3	113	
6/3	–	–	68-83	3	116	
6/4	–	–	68-83	3	119	
6/5	–	+	68-83	6	125	
6/6	–	–	68-83	3	128	
6/7	–	–	68-83	3	131	
6/8	–	+	68-83	6	137	
6/9	–	+	68-83	6	143	
6/10	–	+	68-83	6	149	
6/11	+	–	68-83	6	155	X
6/12	–	–	68-83	3	158	
6/13	+	–	68-83	6	164	
6/14	+	+	68-83	11	175	
6/15	–	–	68-83	3	178	

Table 5. The number of sprays that would have been needed in Lake Alfred, the Green Swamp and in Immokalee assuming different threshold scores.

Threshold Score	Year	No. of Applications (minimum and maximum spray intervals in days)					
		Lake Alfred		Green Swamp		Immokalee	
50	1997	11	(7-15)	11	(9-17)		--
	1998	8	(12-30)	10	(7-21)		--
	1999	9	(11-22)	10	(8-26)	15	(5-14)
100	1997	6	(15-28)	6	(18-29)		--
	1998	5	(19-45)	5	(22-38)		--
	1999	5	(17-40)	5	(15-43)	8	(12-24)
150	1997	4	(31-43)	4	(26-44)		--
	1998	3	(46-56)	4	(35-46)		--
	1999	3	(40-54)	4	(25-55)	6	(18-31)
10-day program	--	13	(10)	--			--
14-day program	--	9	(14)	--			--
21-day program	--	6	(21)	--			