MELCAST

MELON DISEASE FORECASTER

BP-64-W

Purdue Extension

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Melcast uses hourly leaf wetness and temperature data to help melon growers schedule fungicide applications for managing Alternaria leaf blight, anthracnose, and gummy stem blight. The system is based on models that were developed through research in controlled environment facilities and were validated with field research. The models translate hourly temperature and leaf wetness duration data into environmental favorability index (EFI) values. Fungicide applications are advised at intervals defined by epidemiological time (EFI values) rather than by chronological time (days or weeks). Data may be acquired by custom-built instruments, or estimates may be purchased from weather data services. Since 1996, Indiana growers who used Melcast to help schedule fungicide applications reduced their fungicide use by 10-20% without increasing disease risk.

This publication is targeted towards individuals who operate or consult with large scale commercial melon production operations in areas where Alternaria leaf blight, anthracnose, and gummy stem blight are common management concerns. However, information also may be useful to other clientele including Extension educators and agricultural industry representatives. The publication is organized as follows:

I. Muskmelon and Watermelon Diseases
- A general description of disease symptoms, characteristics, and management options for pertinent diseases.

II. Scheduling Fungicides Based on Weather Conditions
- A brief introduction to the Melcast concept.

III. Using Melcast
- Acquiring Environmental Data - A description of data requirements for running Melcast.
- Translating Environmental Data into EFI Values - Tables for muskmelon and watermelon.
- Scheduling Fungicides with Melcast - Season-long data examples that demonstrate how fungicides are scheduled for muskmelons and watermelons.

Muskmelon and Watermelon Diseases

An elementary understanding of the diseases addressed by the forecasting system is essential for its most effective use. The narrative below includes a description of disease symptoms and a brief discussion of disease characteristics and management concerns.

Alternaria leaf blight is a much greater threat to muskmelons than watermelons. The disease is caused by a fungus (*Alternaria cucumerina*) that can rapidly defoliate plants, causing reductions in bulk yield. Melons on defoliated vines ripen prematurely and result in lower quality fruit compared to melons produced on healthy vines. Yield losses greater than 50% will occur in situations where the disease is established early in the season and weather conditions throughout the summer are favorable for disease spread. Alternaria infections occur only on leaves. Petioles, stems, and fruit are not directly affected by the pathogen (Figure 1). Lesions begin as small, tan or brown spots that may appear watersoaked on the underside of leaves. Older lesions

Figure 1.

are generally round, brown, and may be surrounded by a halo of yellow tissue (Figure 2). Within the brown areas of Alternaria lesions are characteristic concentric circles that resemble the growth rings of a tree (Figure 3).

Gummy stem blight (GSB) is caused by a fungus (*Didymella bryoniae)* that attacks muskmelons, watermelons, and other cucurbits. It causes the disease known as “black rot” on pumpkins and squash. Yield loss due to GSB occurs as a result of rapid defoliation of vines. Symptoms of GSB on leaves often appear as irregularly shaped brown areas that often first occur in the “palm” of the leaf, where it attaches to the petiole (Figure 4). Infected petioles and stems first appear watersoaked. As the infection progresses, an elongated, tan-colored lesion develops. Mature GSB lesions on plant stems appear corky and cracked and often exude an orange-red-brown gummy substance (Figure 5). The key diagnostic feature of GSB is the presence of small black fungal structures called pycnidia embedded in the diseased tissue. Pycnidia are smaller than a period printed on this page and often occur in groups or clusters within the lesion (Figure 6). A 10x hand lens should be used to view the pycnidia clearly.

Anthracnose is caused by a fungal pathogen (*Colletotrichum orbiculare*) that can affect both muskmelons and watermelons. Severe anthracnose epidemics can result in near total losses. Rapid defoliation of vines reduces bulk yields. Fruit infection results in unmarketable melons. Anthracnose infection can occur on stems, leaves, and fruit. Leaf symptoms include irregularly shaped, dark brown lesions. Lesion growth often is limited by leaf veins, giving the lesion an angular or jagged appearance (Figure 7). As lesions expand and their diameter approaches 1/2 inch, the dead brown tissue often cracks and may leave a split or a hole within the lesion. Muskmelon stem infections result in sunken, tan-colored cankers (Figure 8). Lesions on watermelon stems are somewhat oval and tan colored, usually with a brown margin (Figure 9). Fruit lesions are round, sunken, and orange- or salmon-colored and most often occur on the sides of infected fruit of muskmelon (Figure 10) and watermelon (Figure 11).

Disease Characteristics and Management Options

Alternaria leaf blight, anthracnose, and gummy stem blight also have similar disease cycles. The pathogens overwinter associated with infested crop debris in local fields. All three

Figure 2.

Figure 3.

Figure 4.

Figure 5.

Figure 6.

pathogens are spread by means of conidia that may be rain-splashed and windblown to extend the disease threat to unprotected plants within the field and in adjacent fields. *Colletotrichum orbiculare* and *D. bryoniae* also may be seed transmitted. Introduction of contaminated seed into transplant production facilities will result in greater incidence of infection in the field early in the season, increasing the threat of serious epidemics and substantial losses.

Management options for Alternaria leaf blight, anthracnose and gummy stem blight are limited. Little or no measurable genetic resistance to these diseases exists in commercially preferred varieties. Also, cultural practices, such as crop rotation, cannot stand alone to limit the incidence and severity of disease outbreaks. Therefore, growers must rely on repeated applications of fungicides to avoid serious disease-related losses. Effective fungicides registered for control of these three diseases on muskmelons and watermelons include chlorothalonil, mancozeb, azoxystrobin, and trifloxystrobin. Regardless of whether the products are classified as contact fungicides or have systemic properties, they will be most effective if used preventatively, i.e., applied before symptoms within the field are obvious.

Traditionally, fungicides have been applied at 1-2 week intervals, without regard for environmental conditions that favor disease development. Melcast provides decision support in scheduling fungicides at the most appropriate times, based on local weather conditions.

Scheduling Fungicides Based On Weather Conditions

As with other disease forecasting systems, the objective is to schedule fungicide applications based on the weather conditions and the need for chemical protection. Instead of applying fungicides on a 7-day or 14-day schedule, the Melcast system uses cumulative environmental favorability index (EFI) values to determine the interval between sprays. There are different suggested spray intervals for each of the two Melcast models. Fungicide applications are advised at 20 EFI intervals for muskmelons and 35 EFI intervals for watermelons. The suggested intervals were determined after repeated testing at university experimental research farms and have been used commercially by Indiana melon farmers since 1996.


Figure 7.


Figure 8.


Figure 9.


Figure 10.


Figure 11.

No fungicide program will provide satisfactory results if serious disease outbreaks occur before chemical protection is in place. **Therefore, initial fungicide sprays on melons should occur between the time that plants are beginning to vine and the time that vines of adjacent plants within rows begin to make contact with each other.** Subsequent sprays should be applied according to Melcast (20 EFI intervals for muskmelon and 35 EFI intervals for watermelon).

Using MELCAST

Melcast can be used by anyone who is interested in acquiring the appropriate environmental data and using the tables provided below to determine daily EFI values. The text and tables below demonstrate how to acquire environmental data, translate the data in daily EFI values, and schedule fungicide sprays based on cumulative EFI values for muskmelons and watermelons.

Acquiring Environmental Data

In order to use Melcast, specific kinds of environmental data are required.

The data requirements include:

- hourly air temperatures (ºC) for each day
- estimates of the number of hours that leaves are wet for each day

The "hourly" data are essential for each day because the EFI values are calculated from the leaf wetness duration (number of hours leaves are wet) and the average temperature during the hours of leaf wetness. The data may be acquired from environmental sensing instruments located in or near a field, or from a weather data service that will provide hourly estimates of essential data each day.

The on-site instruments probably provide better accuracy for the fields in which they are located. They are relatively inexpensive ($1,000-3,000) and normally pay for themselves within 1-3 years depending upon the melon acreage and the extent of fungicide reduction each year. However these instruments are not without their drawbacks, which include variation among sensors, maintenance and repair, and inconvenience associated with visiting the instrument and acquiring the data each day.

The purchase of hourly data estimates from a weather data service is convenient and reliable (data are sent to an e-mail address each morning). The estimates probably will not be as accurate as finely tuned instruments located in the field. However, whether or not the variance is large enough to affect the timing of fungicide sprays throughout the entire growing season has yet to be determined. Melcast has been offered to Indiana growers since 1999 using weather data estimates with no apparent reduction in the level of disease control. Costs for such weather data range from $30-75 per month, making the service very economical for growers.

Figure 12 shows an example of environmental data for one day (July 12) obtained from a weather data service. The column highlighted in yellow provides mean temperatures (ºC) for each of the 24 hours. The column highlighted in orange contains estimates of leaf wetness for each hour (an hour of leaf wetness is indicated by a "1" in the column). The number of times that "1" appears in that column represents the leaf wetness duration for the day. In this example, leaves were wet for 13 hours, and the average temperature for those hours was 23˚C.

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Translating Environmental Data into EFI Values

The Melcast system was developed from polynomial models that define the influence of leaf wetness duration and temperature on the development of muskmelon and watermelon diseases (1,2). The models were used to generate tables that assign an EFI value for each day. The daily values range from 0-10, where an EFI value of 0 indicates that conditions are not favorable for disease; an EFI value of 10 indicates the weather conditions are ideal. Figure 13a shows the matrix for determining daily EFI values for the muskmelon (Alternaria leaf blight) model. In the example data given in Figure 12, where the leaf wetness duration was 13 hours, and the average temperature while leaves were wet was 23˚C, the daily EFI value is 1. This matrix is used to determine daily EFI values for any combination of hours of leaf wetness and temperature for the Melcast muskmelon model.

E-WEATH SERVICE HOURLY PRODUCT
For: IN-SW PURDUE AG CENTER Date: WED 12-Jul-00

Date YYMMDD	Time LST	Data Type	TEMP (C)	RH (%)	PRECIP (in)	LW	WSPD (mph)	RAD (ly)
712	1	OBS	22	93	0.07	1	3	0
712	2	OBS	22	94	0	1	3	0
712	3	OBS	22	93	0	1	5	0
712	4	OBS	22	96	0	1	5	0
712	5	OBS	22	93	0	1	2	0
712	6	OBS	22	92	0	1	3	1
712	7	OBS	22	91	0	1	3	6
712	8	OBS	23	89	0	1	5	16
712	9	OBS	23	86	0	1	6	24
712	10	OBS	24	84	0	1	6	29
712	11	OBS	25	80	0	1	5	38
712	12	OBS	26	77	0	1	3	48
712	13	OBS	27	76	0	1	5	52
712	14	OBS	27	74	0	0	5	53
712	15	OBS	28	74	0	0	5	58
712	16	OBS	28	73	0	0	2	57
712	17	OBS	28	74	0	0	3	45
712	18	OBS	28	74	0	0	3	32
712	19	OBS	28	78	0	0	3	17
712	20	OBS	26	84	0	0	2	4
712	21	OBS	26	89	0	0	2	0
712	22	OBS	24	92	0	0	1	0
712	23	OBS	24	94	0	0	1	0
712	24	OBS	23	95	0	0	1	0

Figure 12. *An example of hourly environmental estimates generated by a weather service for a single day (July 12). Such data are received via e-mail daily. Temperature and leaf wetness duration data are used to calculate daily EFI values.*

Figure 13b shows the daily EFI values for the watermelon (anthracnose and gummy stem blight) model. Compared with Alternaria leaf blight, these diseases are favored by higher temperatures during the leaf wetness period. This is characterized by the different placement and shape of the red-colored areas within the matrix. Using the same example data given in Figure 12 (Leaf wetness = 13 hours, Temperature = 23ºC), the daily EFI value for the watermelon model is 5.

LEAF WETNESS DURATION	Hours/°C	TEMPERATURE 12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	7	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	8	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	9	0	0	1	1	2	2	2	1	1	1	1	1	0	0	0	0	0	0	0
	10	0	1	1	2	2	2	2	2	2	1	1	1	0	0	0	0	0	0	0
	11	0	1	1	2	2	3	2	2	2	1	1	1	1	0	0	0	0	0	0
	12	0	1	2	2	3	3	3	3	2	2	1	1	1	0	0	0	0	0	0
	13	0	1	2	3	3	4	4	3	3	2	1	1	1	0	0	0	0	0	0
	14	0	1	2	3	4	4	4	4	3	2	2	1	1	1	0	0	0	0	0
	15	0	1	2	3	4	5	5	4	3	3	2	1	1	1	0	0	0	0	0
	16	0	1	3	4	5	5	5	5	4	3	2	2	1	1	1	0	0	0	0
	17	1	1	3	4	5	6	6	5	4	3	3	2	1	1	1	0	0	0	0
	18	1	2	3	5	6	7	7	6	5	4	3	2	1	1	1	1	0	0	0
	19	1	2	3	5	6	7	7	7	5	4	3	2	2	1	1	1	0	0	0
	20	1	2	4	5	7	8	8	7	6	5	4	3	2	1	1	1	1	1	1
	21	1	2	4	6	7	8	8	8	7	5	4	3	2	2	1	1	1	1	1
	22	1	2	4	6	8	9	9	8	7	6	4	3	2	2	1	1	1	1	1
	23	1	3	5	7	8	9	9	9	8	6	5	4	3	2	2	1	1	1	1
	24	1	3	5	7	8	9	10	9	8	7	5	4	3	2	2	1	1	1	1

Figure 13a. *Muskmelon EFI matrix. Daily EFI values for combinations of leaf wetness duration (1-24 hours) and average temperature (12-30˚C) while the leaves were wet for the **muskmelon** model.*

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LEAF WETNESS DURATION	TEMPERATURE																		
Hours/°C	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0
2	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0
3	0	0	0	0	0	1	1	1	1	2	2	1	1	1	1	0	0	0	0
4	0	0	0	0	0	1	1	1	2	2	2	2	1	1	1	0	0	0	0
5	0	0	0	0	0	1	1	2	2	2	2	2	2	1	1	0	0	0	0
6	0	0	0	0	0	1	1	2	2	2	2	2	2	2	1	1	0	0	0
7	0	0	0	0	1	1	1	2	2	3	3	3	2	2	1	1	0	0	0
8	0	0	0	0	1	1	2	2	3	3	3	3	3	2	2	1	1	0	0
9	0	0	0	0	1	1	2	2	3	3	3	3	3	2	2	1	1	0	0
10	0	0	1	1	1	1	2	3	3	4	4	4	3	3	2	1	1	0	0
11	0	0	1	1	1	2	2	3	4	4	4	4	4	3	3	2	1	0	0
12	0	1	1	1	1	2	3	3	4	4	5	5	4	4	3	2	1	1	0
13	1	1	1	1	1	2	3	4	4	5	5	5	5	4	3	2	1	1	0
14	1	1	1	1	2	2	3	4	5	5	6	6	5	5	4	3	2	1	0
15	1	1	1	1	2	3	4	4	5	6	6	6	6	5	4	3	2	1	0
16	1	1	1	2	2	3	4	5	6	6	7	7	6	6	5	4	2	1	1
17	1	1	1	2	2	3	4	5	6	7	7	7	7	6	5	4	3	1	1
18	2	2	2	2	3	4	5	6	7	7	7	7	7	7	6	4	3	2	1
19	2	2	2	2	3	4	5	6	7	8	8	8	8	7	6	5	3	2	1
20	2	2	2	3	4	5	6	7	8	8	8	8	8	8	7	5	4	2	1
21	2	2	2	3	4	5	6	7	8	8	9	9	9	8	7	6	4	3	1
22	3	2	3	3	4	6	7	8	8	9	9	9	9	8	8	7	5	3	1
23	3	3	3	4	5	6	7	8	9	9	9	9	9	9	8	7	5	3	1
24	3	3	3	4	5	6	7	8	9	10	9	9	9	9	9	9	6	4	2

Figure 13b. *Watermelon EFI matrix. Daily EFI values for combinations of leaf wetness duration (1-24) hours and average temperature (12-30ºC).*

Scheduling Fungicide Sprays with Melcast

In order to schedule fungicide sprays using Melcast, a running total (or accumulation) of daily EFI values must be kept throughout the season. Figure 14a represents a record of daily and cumulative EFI values for 3 months of a muskmelon crop. The example presumes that seedlings were transplanted and data collection began on May 1. The "Fungicide Application Notes" column contains a record of each fungicide application. The initial spray (Bravo Ultrex) was applied on May 21, after the vines of adjacent plants within rows began to make contact, and when the cumulative EFI value was 26. The second spray (Dithane M-45) was applied 6 days later, on May 27. More importantly, the second spray was applied when the cumulative EFI values reached 46, exactly 20 EFI values after the initial spray. The third application was made on June 10. Although only10 EFI values accumulated since the previous spray, it is recommended that the interval between sprays not exceed 14 days, especially during a time of rapid vine growth (new growth is unprotected and therefore more vulnerable to infection). The fourth spray was applied on June 18, when 21 EFI values accumulated since the June 10 spray. The fifth spray was applied on June 28, at the time, cumulative EFI values reached 96. Five days later, more fungicide was applied; the interval between the fifth and sixth sprays was 17 EFI. A seventh spray was applied when cumulative EFI value reached 122, an interval of 19 EFI and 14 days. The eighth and final spray was applied at 139 EFI, just prior to a period of disease favorable weather.

Using the Melcast schedule, 8 fungicide sprays were applied during the 3 months of crop growth. If a weekly spray schedule had been followed for the same 3 months, 10 fungicide sprays would have been applied. It is important to note that although less fungicide was used with the Melcast schedule, no fungicide sprays were "skipped." Based on the Melcast model, all sprays were applied at the most appropriate times, thereby eliminating the risk of disease-related losses while using less fungicide.

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Date	Muskmelon Daily EFI	Muskmelon Cumulative EFI	Fungicide Application Notes
1-May	0	0	
2-May	1	1	
3-May	2	3	
4-May	4	7	
5-May	3	10	
6-May	3	13	
7-May	1	14	
8-May	0	14	
9-May	2	16	
10-May	0	16	
11-May	0	16	
12-May	0	16	
13-May	2	18	
14-May	0	18	
15-May	0	18	
16-May	0	18	
17-May	0	18	
18-May	0	18	
19-May	8	26	
20-May	0	26	vines begin to touch
21-May	0	26	1st / Bravo Ultrex 2 lb
22-May	5	31	
23-May	3	34	
24-May	2	36	
25-May	0	36	
26-May	3	39	
27-May	7	46	2nd / Dithane M-45 2 lb
28-May	5	51	
29-May	1	52	
30-May	1	53	
31-May	0	53	

Date	Muskmelon Daily EFI	Muskmelon Cumulative EFI	Fungicide Application Notes
1-Jun	0	53	
2-Jun	0	53	
3-Jun	0	53	
4-Jun	0	53	
5-Jun	3	56	
6-Jun	0	56	
7-Jun	0	56	
8-Jun	0	56	
9-Jun	0	56	14 day rule
10-Jun	0	56	3rd / Quadris 2.08 12 oz
11-Jun	1	57	
12-Jun	0	57	
13-Jun	0	57	
14-Jun	0	57	
15-Jun	1	58	
16-Jun	3	61	
17-Jun	8	69	
18-Jun	8	77	4th / Bravo Ultrex 2.5 lb
19-Jun	3	80	
20-Jun	1	81	
21-Jun	2	83	
22-Jun	2	85	
23-Jun	1	86	
24-Jun	3	89	
25-Jun	2	91	
26-Jun	4	95	
27-Jun	1	96	
28-Jun	0	96	5th / Quadris 2.08 12 oz
29-Jun	2	98	
30-Jun	3	101	

Date	Muskmelon Daily EFI	Muskmelon Cumulative EFI	Fungicide Application Notes
1-Jul	2	103	
2-Jul	0	103	
3-Jul	0	103	6th / Bravo Ultrex 2.5 lb
4-Jul	2	105	
5-Jul	2	107	
6-Jul	1	108	
7-Jul	1	109	
8-Jul	1	110	
9-Jul	2	112	
10-Jul	0	112	
11-Jul	2	114	
12-Jul	2	116	
13-Jul	1	117	
14-Jul	1	118	
15-Jul	1	119	
16-Jul	1	120	
17-Jul	2	122	7th / Bravo Ultrex 2.5 lb
18-Jul	1	123	
19-Jul	3	126	
20-Jul	3	129	
21-Jul	2	131	
22-Jul	0	131	
23-Jul	2	133	
24-Jul	2	135	
25-Jul	0	135	
26-Jul	2	137	
27-Jul	2	139	8th / Dithane M-45 3 lb
28-Jul	4	143	
29-Jul	7	150	
30-Jul	5	155	
31-Jul	5	160	

Figure 14a. *A three month record of daily and cumulative EFI values calculated according to the muskmelon model. Fungicide sprays scheduled at weekly intervals (10 total) occur on dates highlighted in yellow. Applications scheduled according to Melcast (8 total) are sprayed at intervals of 20 EFI (approximately) as indicated in the cells highlighted in blue. See text for a complete explanation of Melcast scheduled sprays.*

Daily and cumulative EFI values computed according to the watermelon model are shown in Figure 14b. Again, using the Melcast schedule, 8 fungicide sprays were advised for this 3 month watermelon crop. Note that the application intervals occurred at approximately 35 EFI. This represents a 20% reduction in fungicide compared with the traditional 7-day interval application schedule.

Date	Watermelon Daily EFI	Watermelon Cumulative EFI	Fungicide Application Notes
1-May	1	1	
2-May	0	1	
3-May	5	6	
4-May	3	9	
5-May	7	16	
6-May	7	23	
7-May	6	29	
8-May	0	29	
9-May	4	33	
10-May	0	33	
11-May	0	33	
12-May	2	35	
13-May	1	36	
14-May	0	36	
15-May	0	36	
16-May	0	36	
17-May	2	38	
18-May	3	41	
19-May	5	46	
20-May	0	46	vines begin to touch
21-May	0	46	1st / Dithane M-45 2 lb
22-May	5	51	
23-May	4	55	
24-May	3	58	
25-May	0	58	
26-May	4	62	
27-May	10	72	
28-May	3	75	
29-May	1	76	
30-May	0	76	
31-May	0	76	

Date	Watermelon Daily EFI	Watermelon Cumulative EFI	Fungicide Application Notes
1-Jun	1	77	
2-Jun	0	77	
3-Jun	0	77	
4-Jun	2	79	2nd / Dithane M-45 2 lb
5-Jun	3	82	
6-Jun	0	82	
7-Jun	0	82	
8-Jun	0	82	
9-Jun	0	82	
10-Jun	2	84	
11-Jun	6	90	
12-Jun	3	93	
13-Jun	2	95	
14-Jun	2	97	
15-Jun	4	101	
16-Jun	9	110	3rd / Bravo Ultrex 2.5 lb
17-Jun	9	119	
18-Jun	9	128	
19-Jun	3	131	
20-Jun	6	137	
21-Jun	5	142	
22-Jun	3	145	4th / Dithane M-45 3 lb
23-Jun	3	148	
24-Jun	9	157	
25-Jun	6	163	
26-Jun	9	172	
27-Jun	4	176	
28-Jun	1	177	
29-Jun	2	179	
30-Jun	1	180	5th / Quadris 2.08 12 oz

Date	Watermelon Daily EFI	Watermelon Cumulative EFI	Fungicide Application Notes
1-Jul	2	182	
2-Jul	2	184	
3-Jul	4	188	
4-Jul	9	197	
5-Jul	8	205	
6-Jul	4	209	
7-Jul	3	212	
8-Jul	2	214	6th / Bravo Ultrex 2.5 lb
9-Jul	3	217	
10-Jul	0	217	
11-Jul	8	225	
12-Jul	7	232	
13-Jul	6	238	
14-Jul	4	242	
15-Jul	2	244	
16-Jul	2	246	7th / Bravo Ultrex 2.5 lb
17-Jul	4	250	
18-Jul	6	256	
19-Jul	4	260	
20-Jul	3	263	
21-Jul	2	265	
22-Jul	0	265	
23-Jul	1	266	
24-Jul	1	267	
25-Jul	0	267	
26-Jul	2	269	
27-Jul	4	273	8th / Dithane M-45 3 lb
28-Jul	9	282	
29-Jul	10	292	
30-Jul	9	301	
31-Jul	9	310	

Figure 14b. *A three month record of daily and cumulative EFI values calculated according to the watermelon model. Fungicide sprays scheduled at weekly intervals (10 total) occur on dates highlighted in yellow. Applications scheduled according to Melcast (8 total) are sprayed at intervals of 20 EFI (approximately) as indicated in the cells highlighted in blue.*

Selected References

Evans, K.J. and Latin, R. 1993. A model based on temperature and leaf wetness duration for establishment of Alternaria leaf blight of muskmelon. Phytopathology. 82:890-895.

Monroe, J.S., Tikhonova, I. and Latin, R. 1997. A model defining the relationship between temperature and leaf wetness duration and infection of watermelon by *Colletotrichum orbiculare*. Plant Disease. 81:739-742.

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