Influence of Dew on Downy Mildew of Cantaloups in South Texas

Claude E. Thomas

Research Plant Pathologist, Southern Region, Agricultural Research Service, U.S. Department of Agriculture, Weslaco, TX 78596.

Accepted for publication 21 April 1977.

ABSTRACT

THOMAS, C. E. 1977. Influence of dew on downy mildew of cantaloups in South Texas. Phytopathology 67:1368-1369.

Dew periods were the determinant factor for the onset of downy mildew on cantaloups in South Texas. Epiphytotics did not occur until dew periods were of at least 5-6 hr duration even though inoculum was present and temperatures were favorable. By monitoring dew periods, the efficiency of timely application of preventive fungicides might be maximized.

Additional key words: *Cucumis melo*, cucurbits, *Pseudoperonospora cubensis*, epidemiology.

Downy mildew, *Pseudoperonospora cubensis* (Berk. & Curt.) Rostow., is the most severe and production-limiting disease of cantaloups, *Cucumis melo* L., in South Texas. Much research has been done on the epidemiology of downy mildew of cucurbits in different geographical areas (1, 2, 4, 5, 6, 7, 10). However, the work of Godfrey (6) on relative humidity and Thomas (10) on sporulation on watermelon represent the only available information on the epidemiology of this disease in the concentrated cantaloup production area of South Texas. Thus, the present study was undertaken to elucidate further the epidemiology of the disease in this area.

MATERIALS AND METHODS

A Hirst spore trap with the orifice 1 m above ground level was set up in the center of a 0.45-hectare plot of cantaloups (cultivar Perlita) and operated continuously during April, May, and June 1969 and May, June, and July 1970. This trap permitted determinations of both hourly and daily concentrations of downy mildew sporangia over the plots throughout the test periods. Counts were made of sporangia per cubic m of air per hour and per day. Temperatures were recorded for 15 min of each hour from thermocouples placed within the plant canopy. At the same intervals dew points were recorded within the plant canopy from a dewpoint hygrometer. Wind velocity was recorded by an anemometer and rainfall by a rain gauge located about 200 m from the test plots.

Plots were examined at 2-day intervals until downy mildew symptoms were first evident on the leaves. Then, the vines were rated weekly for disease development. Disease development was evaluated on a 0-5 scale: 0, healthy plants with no downy mildew; 1, a trace of infection which was evident only by close examination; 2, moderate infection in which scattered lesions were easily discerned; 3, moderate infection in which lesions were uniformly distributed and concentrated on the crown leaves of the plants along the center of the row; 4, defoliation had occurred in the crowns of the vines; and 5, vines were almost completely defoliated, and had only a few living green leaves near the tips.

RESULTS AND DISCUSSION

In 1969, initial infection was not detected within the plot until mid-May even though a few air-borne downy mildew sporangia had been detected since early April. Schenck (8) did not detect spores until the disease was already established in the field. That spores were detected in this study prior to the establishment of infection is probably due to the relative efficiencies of the spore traps utilized. Temperature conditions were favorable for the establishment of an epiphytotic but dew of at least 5-6 hr duration was not present. After dew periods were sufficiently long (Fig. 1), an epiphytotic was established during the period of mid-May to mid-June with peak

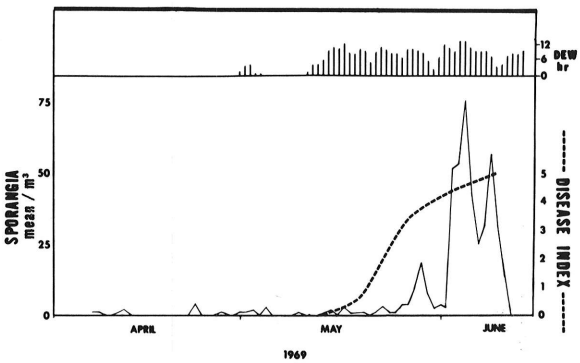

Fig. 1. Effect of spore counts and dew periods on cantaloup downy mildew disease index for April, May, and June 1969. Disease index was rated on a 0-5 scale of increasing severity.

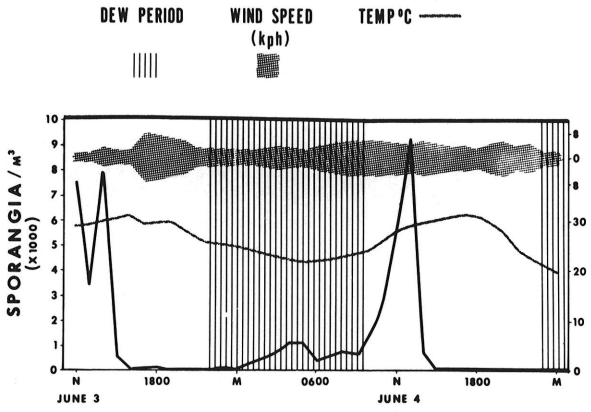

Fig. 2. The interaction of temperature, dew, and wind on spore dispersal of *Pseudoperonospora cubensis* on cantaloup for 3 and 4 June 1969.

sporulation during early June when the infection in the plot had reached the disease index of 4. The pattern was similar in 1970, but favorable dew periods, with the subsequent epiphytotic, did not occur until early June.

Figure 2 shows the interaction of environmental factors in the epidemiology of the disease when sporulation of the fungus was at its peak in the plots. The onset of dew was at about 2100 hours on 3 June and persisted until about 0930 on 4 June. Air temperature during this period dropped to 22-27 C, a favorable level for sporulation of the pathogen. Wind speed also decreased and relatively few spores were trapped during this period and then only toward the end of it.

With the increases in wind velocity and temperature, the conditions within the canopy favored spore release beginning about 1000 hours and peaked at 1300 hours. The prolonged dew periods favored additional infections by the dispersed spores. The effects of wind, temperature, and dew cycles and their subsequent interaction on sporulation and infection by the fungus were observed throughout the study.

These results suggest that the onset of dew periods is the limiting factor in the establishment of epiphytotics of downy mildew of cantaloups in South Texas. This conclusion is supported by the observation that epiphytotics did not develop in the absence of dew periods, even though diurnal temperatures necessary for an epiphytotic were present.

In Israel, night temperatures were the limiting factor in the establishment of downy mildew epiphytotics, even though dew periods were of sufficient lengths (3). In South Texas, Godfrey (6) showed that outbreaks occurred when relative humidity averaged 86.5%. A period of such a high relative humidity probably would be one of prolonged dew periods.

Both Walker (11) and Nusbaum (7) point out that all environmental factors must coincide for the epidemic and geographical spread of the disease. In this study, proper diurnal temperatures, but not dew, were present early in the crop season. Onset of the disease was delayed until dew of sufficient duration was present. If periods of dew were monitored during the growing season, application of fungicides might be timed to give most economical and effective control of downy mildew of cantaloups. Schenck (9) found no significant difference in control of downy mildew on watermelon in Florida in plants sprayed prior to symptom appearance. In his study, however, meteorological conditions were not monitored, but spores over the field were. Again spores were not detected until visible symptoms of the disease were evident, possibly due to the trapping efficiency of the spore trap that was utilized or to the fact that spores were not blown into the area from local commercial fields as they are in South Texas. Currently experiments are underway to determine the efficacy of downy mildew control in South Texas by timing fungicidal applications on cantaloup both in a regular interval spray schedule as well as a schedule based on the occurrence of dew in sufficient quantity to allow for the establishment of an epiphytotic.

LITERATURE CITED

1. BOELEMA, B. H. 1967. Downy mildew of cucurbits. Farm. S. Afr. 43:3,9.
2. CLINTON, G. P. 1905. Downy mildew, or blight, Peronoplasmopara cubensis (B&C) Clint. of muskmelons and cucumbers. Conn. Agric. Exp. Stn. Ann. Rep. for 1904. 28:329-362.
3. COHEN, Y., and J. ROTEM. 1969. The effects of lesion development, air temperature and duration of moist periods on sporulation of Pseudoperonospora cubensis in cucumbers. Israel J. Bot. 18:135-140.
4. COHEN, Y., and J. ROTEM. 1971. Field and growth chamber approach to epidemiology of Pseudoperonospora cubensis on cucumbers. Phytopathology 61:736-737.
5. DORAN, W. L. 1932. Downy mildew of cucumbers. Mass. Agric. Exp. Stn. Bull. 283. 22 p.
6. GODFREY, G. H. 1954. Cantaloup downy mildew in the Lower Rio Grande Valley of Texas and its relation to relative humidity. Plant Dis. Rep. 38:616-619.
7. NUSBAUM, C. J. 1944. The seasonal spread and development of cucurbit downy mildew in the Atlantic coastal states. Plant Dis. Rep. 28:82-85.
8. SCHENCK, N. C. 1968. Incidence of airborne fungus spores over watermelon fields in Florida. Phytopathology 58:91-94.
9. SCHENCK, N. C. 1968. Fungicidal control of watermelon downy mildew and its relationship to first infection in the field. Plant Dis. Rep. 52:979-981.
10. THOMAS, C. E. 1970. Sporulation of Pseudoperonospora cubensis on watermelon. Plant Dis. Rep. 54:108-110.
11. WALKER, J. C. 1952. Diseases of vegetable crops. McGraw-Hill, New York. 529 p.