REPORT TO THE AGRICULTURAL RESEARCH FOUNDATION
FOR THE OREGON PROCESSED VEGETABLE COMMISSION
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Project Title: Ascospore Trapping of *Sclerotinia sclerotiorum* in Snap Bean Fields

Principal Investigator: Cynthia M. Ocamb, Ext. Specialist & Associate Professor
Botany and Plant Pathology, OSU - Corvallis
Telephone: (541) 737-4020
ocambc@science.oregonstate.edu

Postdoctoral Research Assistant and Co-author: Nathan Miller, BPP, OSU

Cooperators: David H. Gent, USDA-ARS, Corvallis
Robert B. McReynolds, North Willamette Research & Ext. Center, OSU

Background and Justification: A polymerase chain reaction (PCR) assay specific to *S. sclerotiorum* has been developed by Gent et al. and was successfully used during 2008 to detect ascospores of *S. sclerotiorum* on glass rods (Rotorod spore trap) in experimental bean plantings on the OSU-BPP farm. Knowing whether spores are present or absent during the growing season allows for the development of a predictive model for ascospore production and release as well as periods of high infection risk. Successful prediction of periods with high or low infection risks would enable better timing of protective fungicides. If the absence of the ascospores could be predicted within a snap bean field, then a 1-spray fungicide program could be utilized with greater confidence and a lower risk of catastrophic losses.

Objectives for 2009:

1. Evaluate ascospore detection of *S. sclerotiorum* using multiple Rotorod spore traps.
2. Monitor environmental conditions within bean fields to begin model development of ascospore detection events.

Procedures: The snap bean variety '91G' was planted at two different sites of Chehalis silt loam soil on the OSU Botany Farm. Pathogen populations of *S. sclerotiorum* were amended by addition of sclerotia to both fields during 2007 and 2008. Each field was split into two plantings and the four plantings were sown approximately three weeks apart; hereafter referred to as Fields 1 through 4. Fields 1 through 4 were established May 28th, June 18th, July 10th and August 5th using a 15-in. row spacing and approximately 206,000 seeds/A. 400 lb/A of 12-29-10-8 fertilizer was broadcast at planting followed by 100 lb/A of 40-0-0-6 broadcast at the second to third trifoliolate leaf stage. Eptek 7EC (3.5 pt/A) and Trifluorolin (0.5 pt/A) were broadcast and incorporated 4 days before planting; Basagran (2 pt/A) and Poast (2 pt/A) were applied 24 days after planting. Asana XL (8 oz/A) was applied one week after 10 % bloom for control of cucumber beetles. The field was sprinkler-irrigated weekly with 1 to 1.5 in. of water. Rotorod spore traps were moved among fields in order to monitor just prior to 10 % bloom through the following 3 weeks in each field. Rods were replaced every 48 hours, and subsequently tested for the presence of ascospores using polymerase chain reaction (PCR) specific to the pathogen. Up to four Rotorod spore traps were in the fields at one time but usually there were fewer, due to traps being moved between fields and mechanical failure of traps. Environmental data was collected from a HOBO U30 Data logger (Onset, Cape Cod Mass). Air temperature, relative

humidity and leaf wetness were monitored within the canopy. Soil temperature was monitored at 1 and 3 inch depths, and soil moisture was monitored at the 3 inch depth. This equipment was moved between fields to obtain data during crucial white mold development times. Data was also obtained for Corvallis from AgriMet (http://www.usbr.gov/pn/agrimet/).

Results and discussion: Spores of *S. sclerotiorum* were detected on 128 of 169 rotorod samples. There were two sampling dates when no ascospores were detected on any Rotorod trap (June 19th and June 23rd). Lack of ascospores seemed to occur during the earlier part of crop development. In Field 1 (Fig. 1), 21 of the total 25 PCR negatives (no ascospores) occurred on or before 10 % bloom, compared to 12 PCR positives detected over 9 sampling periods (18 days). After July 10th, there were only four negatives compared to 35 positives in field 1. Field 2, which is immediately adjacent to Field 1, had spore traps placed within it only after the 10% bloom date, and all but one sample were positive (Fig. 2). For Field 3, the first four sampling dates were negative and most of PCR negative samples were collected before the 10% bloom date (Fig. 3). Field 4, which was immediately adjacent to Field 3, had only one spore free period before 10 % bloom (Fig. 4). The close proximity of Field 1 to Field 2 as well as Field 3 to Field 4 probably resulted in ascospore movement from the older planting to the younger stand. When fields have a mix of PCR positives and negatives on the same date, it may be indicative of relative spore density being less at these times compared to dates when all traps are positive.

Temperature within the canopy was cooler than the temperatures recorded by AgriMet. From July 27th to the 29th, Corvallis temperatures reached 100ºF, according to AgriMet, while temperatures in our bean planting reached a maximum of approximately 90ºF. There was only one negative in field 1 on July 28th, which was immediately before harvest but which occurred during this hot snap, while the other samples during this period were positive. The apparent temperature buffering capacity of the bean plantings may account for the ascospore positives that were found during and after this particular heat event. However, the 2009 growing season was not a particularly hot one and while we suspect that high temperatures may halt or delay ascospore release, more data are needed from more typical growing seasons (relatively speaking).

These findings confirm that Rotorod spore trapping with subsequent PCR testing can detect ascospores of *S. sclerotiorum* in the field. The data also suggest that multiple spore traps are needed to accurately determine spore presence. The development of a quantitative PCR analysis or other quantitative system could be very useful in providing more information to use in modeling infection risk periods.

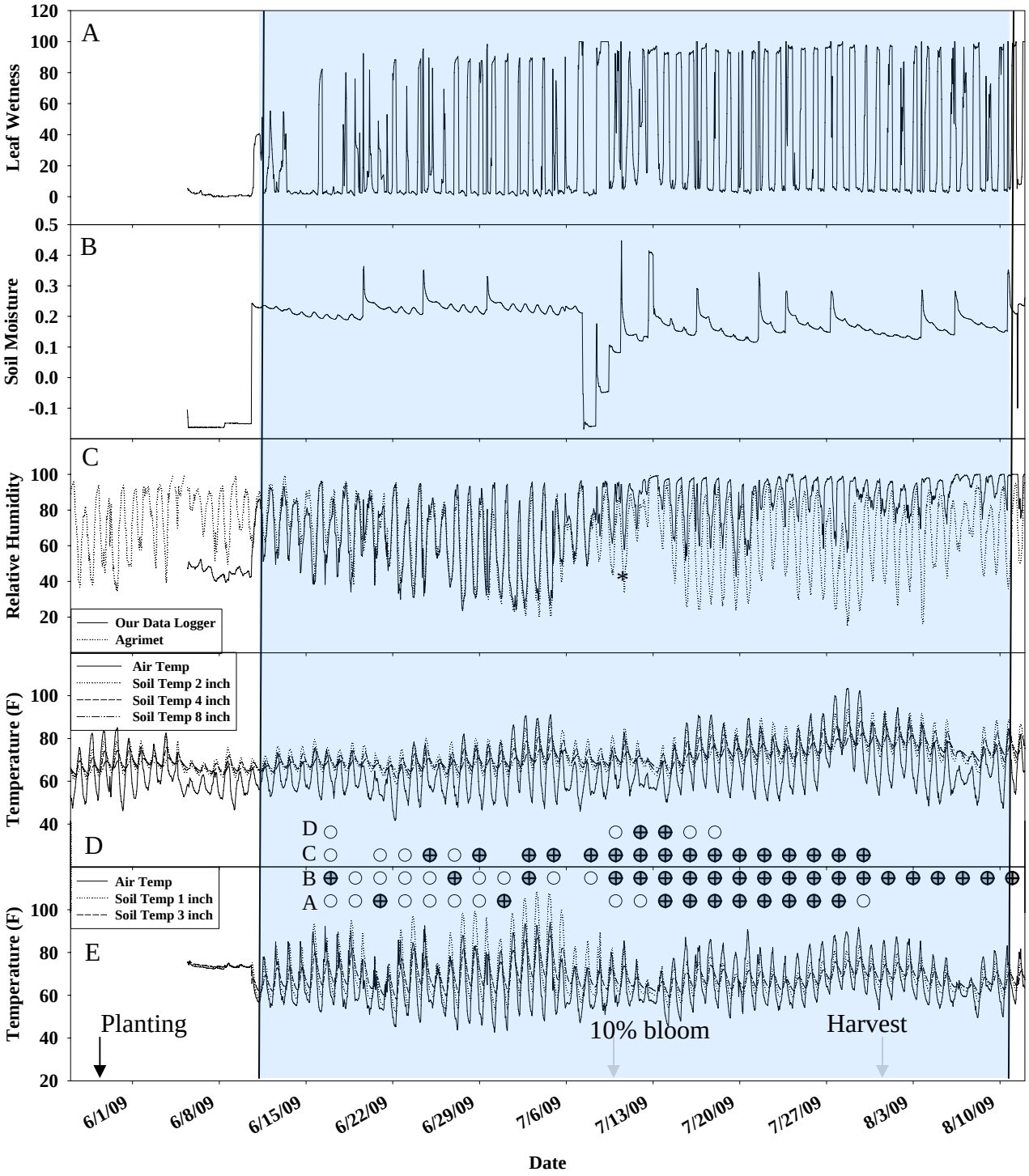

Figure 1. Environmental data and *Sclerotinia sclerotiorum* detection data in snap bean field 1. Gray circles with a plus indicate a positive PCR detection of *S. sclerotiorum* and empty circles indicate a PCR negative. Temperature data in plot (D) come from the Corvallis station on the AgriMet website while plot (E) shows the data from the in field recording equipment. * The soil moisture probe was temporarily removed for the soil when pipe was moved by the farm crew. The shaded region indicates the time when weather monitoring equipment was in this field.

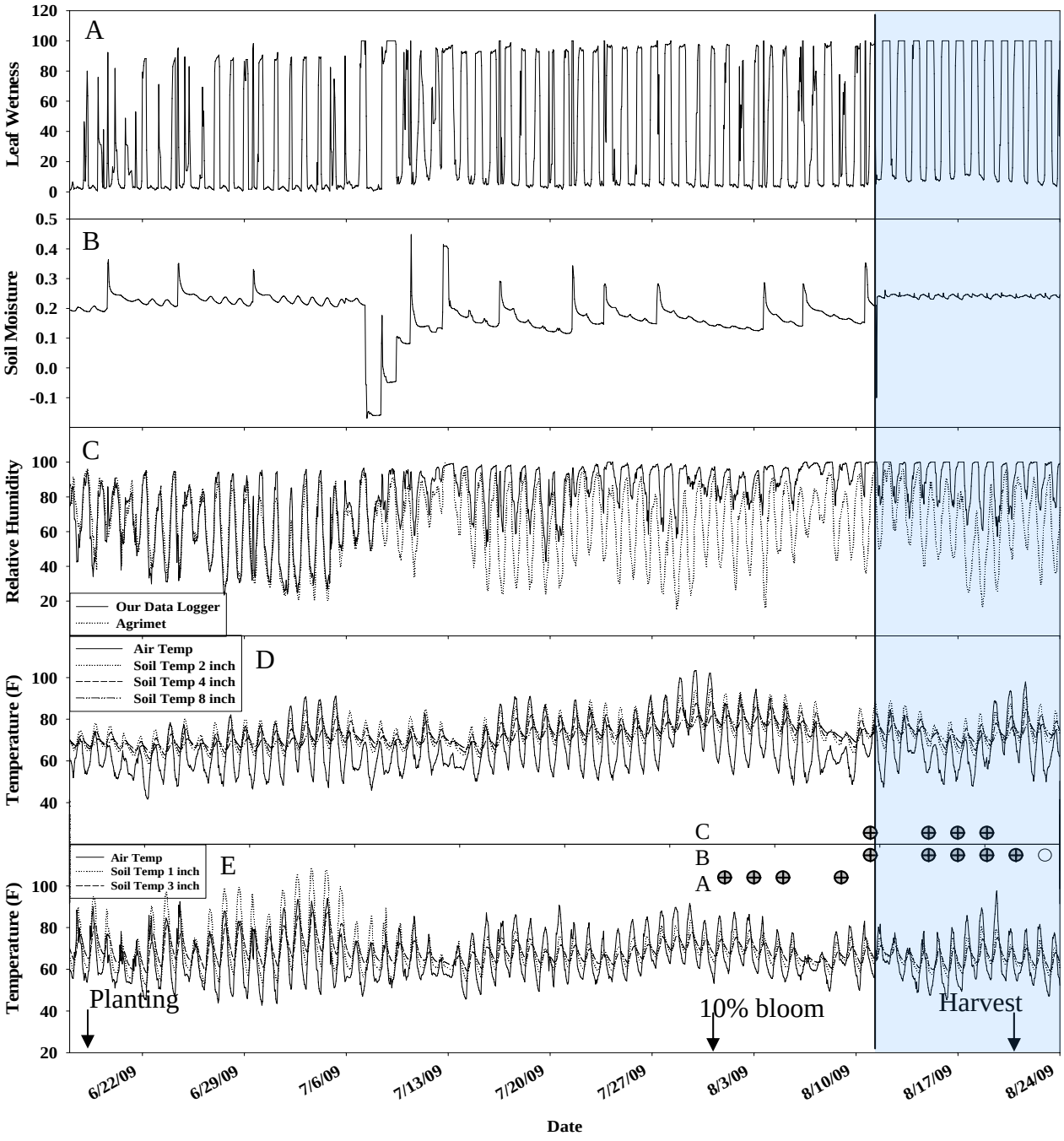

Figure 2. Environmental data and *Sclerotinia sclerotiorum* detection data in snap bean field 2. Gray circles with a plus indicate a positive PCR detection of *S. sclerotiorum* and empty circles indicate a PCR negative. Temperature data in plot (D) come from the Corvallis station on the AgriMet website while plot (E) shows the data from the in field recording equipment. The shaded region indicates the time when weather monitoring equipment was in this field.

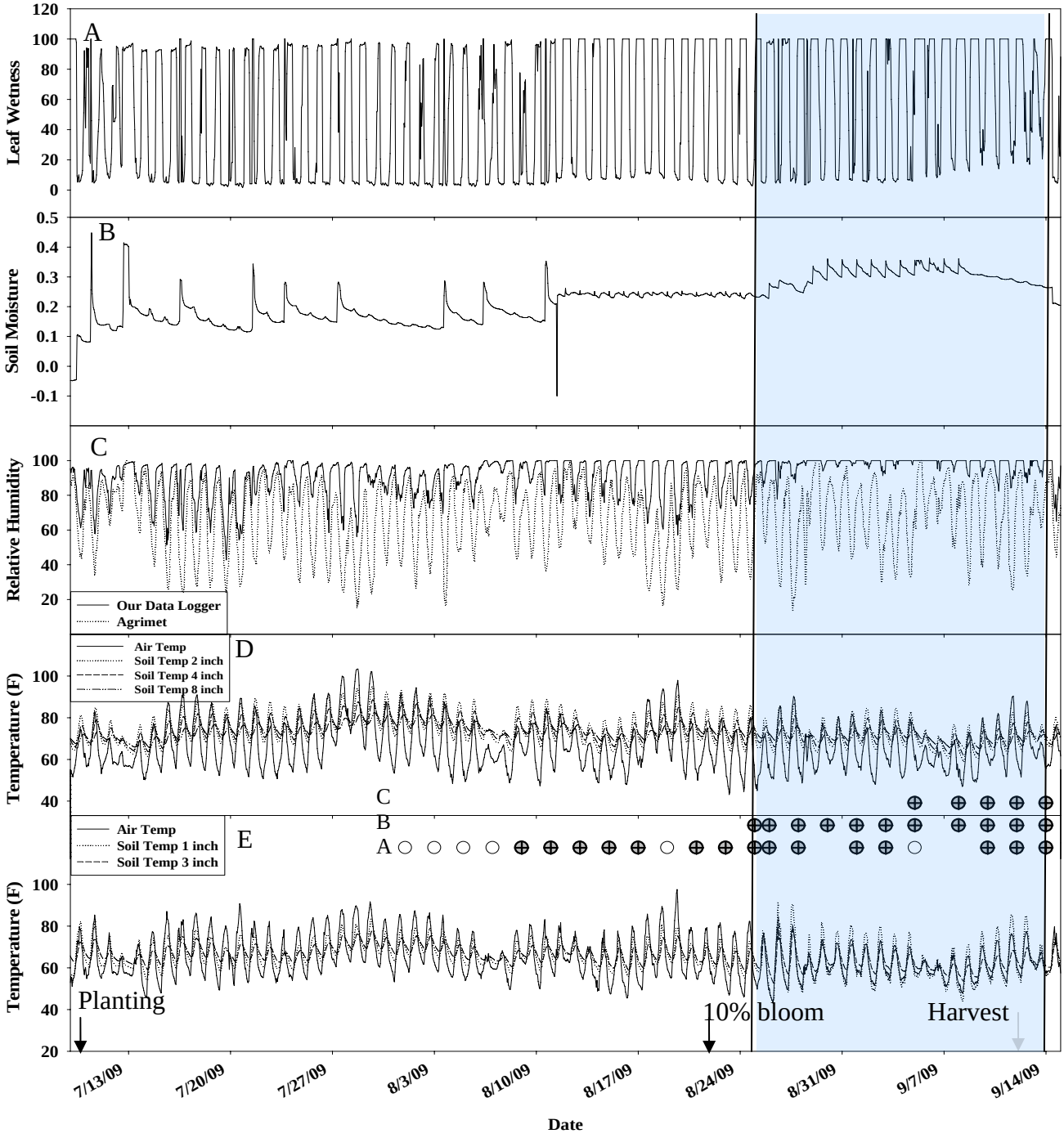

Figure 3. Environmental data and *Sclerotinia sclerotiorum* detection data in snap bean field 3. Gray circles with a plus indicate a positive PCR detection of *S. sclerotiorum* and empty circles indicate a PCR negative. Temperature data in plot (D) come from the Corvallis station on the AgriMet website while plot (E) shows the data from the in field recording equipment. The shaded region indicates the time when weather monitoring equipment was in this field.

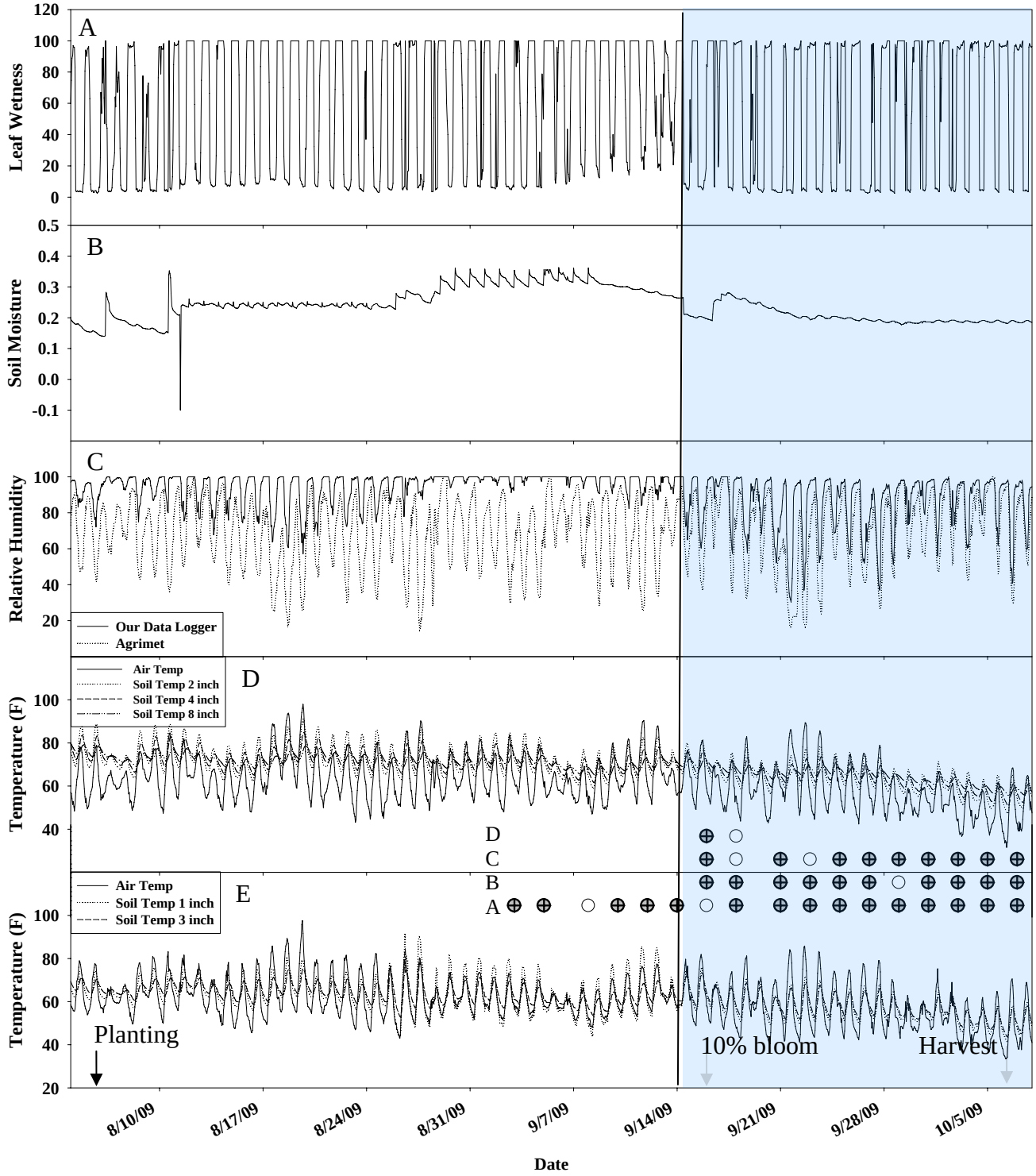

Figure 4. Environmental data and *Sclerotinia sclerotiorum* detection data in snap bean field 1. Gray circles with a plus indicate a positive PCR detection of *S. sclerotiorum* and empty circles indicate a PCR negative. Temperature data in plot (D) come from the Corvallis station on the AgriMet website while plot (E) shows the data from the in field recording equipment. The shaded region indicates the time when weather monitoring equipment was in this field.