

Outbreak of Verticillium Wilt of Strawberries in Central Florida

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ABSTRACT

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Verticillium wilt of strawberries (*Fragaria* × *ananassa*) was found in central Florida for the first time in 1981. Surveys showed that all infected plants came from two nursery fields in Michigan. The greatest percentage of wilt occurred in plants that were grown in soil that had grown potatoes (*Solanum tuberosum*) the previous year and was fumigated with 98% methyl bromide + 2% chloropicrin rather than 67% methyl bromide + 33% chloropicrin before setting the strawberries. A formulation of 50% methyl bromide + 50% chloropicrin at 420-470 kg/ha is recommended for control.

Verticillium wilt, caused by *Verticillium albo-atrum* Reinke & Berth., has been recognized as a serious and widespread problem on strawberry (*Fragaria* × *ananassa* Duch.) and other crops in the calcareous soils of southeast Florida since the early 1960s (9). Prior to 1981, it had not been found on any crop in the major strawberry-producing area of central Florida. During late fall and early winter of the 1980-1981 fruiting season in Florida, where the annual hill system of strawberry culture is used, strawberry plants in several fields in central Florida began to wilt and die slowly. These plants

were somewhat stunted, wilting, and had marginal burn of the older leaves. Over a period of weeks, wilting became more severe, and the marginal leaf burn progressed to successively younger leaves until the affected plants died. Six to 10 wilting plants were chosen at random from each of six fields where wilting was present. Isolations from petioles from each of these plants yielded *V. albo-atrum*.

The strawberry plants from all fields in which Verticillium wilt was occurring had been produced in Michigan by two Florida growers in an effort to escape anthracnose, which is caused by *Colletotrichum gloeosporioides* (Penz.) Sacc. (= *C. fragariae* Brooks). The teleomorph is *Glomerella cingulata* (Stonem.) Spaulding & Schrenk (3,10). Anthracnose has been a serious problem in Florida (3,4,7) and Louisiana (5,6) for many years. When the California cultivars, most of which are highly susceptible to the anthracnose pathogen, gained favor for commercial fruit

production in central Florida in the early 1970s, anthracnose completely eliminated summer transplant production of these cultivars in Florida for several years.

As plant production moved further north to escape the hot, humid Florida summer weather, which favors anthracnose development, methods were devised for control of the disease on these cultivars in the summer nurseries in Florida (*unpublished data*). These methods result in reduced plant production because of late (mid-June) planting and low soil fertility in midsummer. They are also expensive because very frequent fungicide applications are necessary to control anthracnose. Therefore, some Florida growers began looking for plant production areas in the cooler northern states where anthracnose has not been a problem. The two growers referred to in this paper had moved their plant production operations to Michigan during the summer of 1980 even though *C. dematium* (Pers. ex Fr.) Grove has been reported occasionally to cause strawberry anthracnose there (2). Transplants were dug from the Michigan nurseries in October 1980 and set in fruit production fields in Florida during October and early November 1980.

About 4 million transplants, enough to set about 80 ha (200 acres) of fruiting plants, were grown in these two nurseries and sold to eight or 10 different growers in Florida. A survey of six fields (three from each nursery) was done on 2 February 1981 to determine the percentage of plants from each of the two

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nurseries showing Verticillium wilt. The survey was accomplished by randomly choosing 10–20 rows, depending on the size of the particular field, and checking the first 200 plants at the edge of the field in each row to determine the numbers of wilting plants. A total of 21,000 plants was observed. An estimate of the percentage of Verticillium wilt in each field was then calculated.

The percentage of wilting plants from one nursery source varied from 0.5 to 1.2%, which would result in little loss in fruit production. Wilting of plants from the second nursery varied from 8.7 to 12.5%, which would result in significant loss in fruit production. The previous cropping history and soil fumigants used in the two different Michigan fields where the plants were grown could account for the difference in percentages of Verticillium wilt in plants from the two nurseries.

The previous cropping history of the first nursery site (0.5–1.2% wilt) was unknown except that no potatoes (*Solanum tuberosum* L.) or tomatoes (*Lycopersicon esculentum* Mill.) had been grown in this field for at least the previous 4–5 yr. This field was fumigated with 67% methyl bromide + 33% chloropicrin (MB-C 67-33) at the rate of 448 kg/ha (400 lb/acre) immediately before the strawberries were set. No obvious problems were noticed in this nursery during the summer.

In the second nursery site (8.7–12.5% wilt), potatoes had been grown at least during the preceding year. This field was

fumigated with 98% methyl bromide + 2% chloropicrin (MB-C 98-2) at the rate of 448 kg/ha (400 lb/acre) before the strawberries were set. Problems with poor plant production and some dying of plants were noticed in areas of this nursery during the summer, but the grower thought this was caused by carryover of herbicides that were used on the potatoes.

The difference in wilt of plants from the two nurseries may have resulted from a difference in *V. albo-atrum* infestation of the two sites, the difference in the amount of chloropicrin used, or a combination of these two factors. It is known that methyl bromide alone does not control *V. albo-atrum* adequately (8,13) but that chloropicrin (1,11) or mixtures of methyl bromide with sufficient quantities of chloropicrin (13) do. Wilhelm and Paulus (12) state that in California MB-C 50-50 is used at the rate of 420–470 kg/ha (375–420 lb/acre) the first year to control Verticillium wilt and that in subsequent years MB-C 67-33 is used at lower rates to maintain plant vigor.

Thus, we are recommending to Florida growers who decide to grow transplants in areas with which they are unfamiliar that they make every effort to determine the previous cropping history of the site, to avoid fields where Verticillium wilt is suspected to have occurred or where crops that are susceptible to the Verticillium wilt pathogen (especially potatoes or tomatoes) have been grown previously, and to fumigate the soil in whatever site they choose with MB-C

50-50 rather than MB-C 98-2 or MB-C 67-33.

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