

An Old Enemy Re-emerges

Downy mildew rears its ugly head on cucumber, impacting growers up and down the Eastern U.S.

By Gerald Holmes, Todd Wehner, and Allan Thornton

It was late May 2004 and cucumber growers in North Carolina were looking at their best crop in 20 years. Spring temperatures were above average and rainfall came at all the right times. As growers monitored the crop's progress, it was obvious that a bumper crop was in the making.

While growers marveled at the status of the crop, a problem appeared in a few fields. The lush green foliage was blighted down the center of the row. The blight had occurred so rapidly that it was thought to be herbicide injury. Within days the blight was reported from many fields and the Cooperative Extension ser-

vice was called in to identify the problem: downy mildew.

As diseases go, it's easy to identify. It causes angular, yellow spots on leaves and produces a downy fungal growth on the leaf underside. Under the microscope, dark lemon-shaped spores are striking.

Downy mildew is no stranger to cucurbits in North Carolina. What was so unusual about these particular outbreaks was that they were found on cucumber, about two months earlier than normal, and causing severe damage to the crop. Downy mildew is an annual problem on cucurbits up and down the Eastern U.S., but cucumber is the one cucurbit crop for which growers have relied on cultivar resistance to control the disease. In fact, resistance has been so good that growers



Photos courtesy of Gerald Holmes

An expected bumper crop of cucumbers in North Carolina takes a turn for the worse. Downy mildew was often first misdiagnosed as herbicide injury.



Downy mildew causes angular yellow spots on the leaf surface. Purple-gray downy growth only develops on the underside of leaves. The best time to find this is in the early morning hours when leaf dew is still present.

have not used fungicides to control downy mildew since the late 1960s.

Within a few days, there was scarcely a field in eastern North Carolina without the disease. Downy mildew was progressing rapidly and the idea of a bumper crop soon turned to fear of a total loss. The problem soon spread to the cucumber growing areas of Delaware, Maryland, and Virginia (commonly known as Delmarva) with the same result. At the close of the season growers estimated that they lost, on average, roughly 40% of their crop (approximately \$20 million) for North Carolina and Delmarva combined.

Downy mildew is different from most foliar diseases of cucumber. The pathogen (*Pseudoperonospora cubensis*) only survives on a living plant and does not produce overwintering structures. This means that in areas where hard frosts occur, the disease must be re-introduced each year.

What Goes Up Must Come Down

Was the 2004 epidemic a fluke or would it repeat in 2005? It had been sev-

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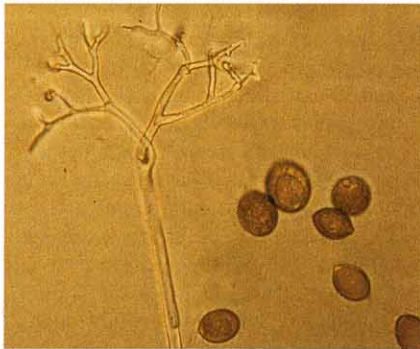
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The fungus-like *Pseudoperonospora cubensis* is the causal agent of downy mildew. The unique branching pattern of the spore bearing apparatus (sporangiophore) and the dark, lemon-shaped spores make for easy diagnosis.

eral decades since growers had seen this level of destruction from downy mildew. Many speculated that it would not repeat any time soon. With such tremendous losses in 2004 and knowing

how the disease spreads, we expected the disease to move south as Florida began its winter production. If this occurred it would be a clear indication that North Carolina and Delmarva could expect similar problems in 2005.

Florida did experience severe downy mildew outbreaks on cucumber early in 2005. The biggest surprise in 2005, however, was that the disease spread as far north as Michigan and Ontario, Canada. Once again the disease struck rapidly, progressed quickly, and caused severe losses. Loss estimates are not yet available.

Michigan is the top cucumber-producing state in the U.S. with 35,000 acres of pickling cucumbers and 7500 acres of slicing cucumbers grown in 2004. We are apparently dealing with a more virulent type of pathogen than in previous years. Whether or not this is a new race or pathotype is currently under investigation.

Resistant Cultivars

In the 1940s and before, downy mildew was the most important disease of cucumber. This changed with the release of cultivar Palmetto in 1948, which had moderate disease resistance. In 1966, cultivar Poinsett was released with high resistance to downy mildew. This disease resistance has been bred into most of the popular cultivars in use today and in most cases has effectively controlled the disease without fungicide use.

This changed in 2004 when resistant cultivars became severely diseased. Evaluation of cultivars in North Carolina in 2004 and 2005 has shown that susceptible cultivars such as Straight 8 and Wisconsin SMR 18 get disease earlier in the spring and have more severe damage than in previous years. Resistant cultivars are still "resistant," meaning that they are less damaged by the disease than the susceptible cultivars.

So far, we have not identified any cultivars that are immune to the "new" downy mildew. Most processing and fresh-market cucumber cultivars are resistant. What has changed since 2004 is that now cultivar resistance must be aided by fungicides in order to control the disease. **AVG**

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