

Southern Region IPM Downy Mildew Project
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Project Director

Cooperators:

Delaware: Bob Mulrooney, Ed Kee and Emmalea Ernest,
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Other cooperating states included Florida, Georgia, South Carolina, New York and Michigan

Two Part Project:

- Pathotype determination of *Pseudoperonospora cubensis*, the causal agent of downy mildew of cucurbits
- Determination of fungicide resistance in this new strain which infects cucumbers

Pathotype Determination

Objective: To determine which cucurbit hosts are infected and to pinpoint the time of infection on these hosts.

Methods:

Seed of 12 cucurbit differentials was sown (Table 1) in peat pots soil-less potting mix in early June. Depending on the number of seeds we had per differential we planted extra seeds to give us enough for 5 good transplants per differential. Transplants were set in the field when plants had 2 true leaves in late June. Plants were spaced 2 ft apart within rows and rows were spaced 20 ft apart with 20 ft alleys between plots. The plots were established in Newark on the Experimental Station Farm and in Georgetown at the Carvel REC.

Results:

Newark

Infection on cucumber 'Marketer 430' - September 7

Georgetown

Infection on cucumber 'Marketer 430'- Aug 6

Infection on Cucurbita pepo var. Texana- Sept 6

Infection on Curcubita maxima var. Goliath- Sept 6

Table 1. Cucurbitaceae differential set for the determination of pathogenic variability in *Pseudoperonospora cubensis* (from Lebeda , A. and Widrlechner, M.P. 2003)

No.	Taxon	Cultivar name	Common name	Expected growth habit	Country of origin
1	<i>Cucumis sativus</i>	Marketer 430	Slicing cucumber	Compact	USA
2	<i>C. melo</i> subsp. <i>melo</i>	Ananas Yokneam	Cantaloupe	Compact	Israel
3	<i>C. melo</i> var <i>conomon</i>	Baj-Gua	Honeydew	Compact	Japan
4	<i>C. melo</i> var <i>acidulous</i>		Bitter melon	Compact	Myanmar
5	<i>Cucurbita pepo</i> var. <i>pepo</i>	Dolmalik	Squash	Med. Vine	Turkey
6	<i>Cucurbita pepo</i> var. <i>texana</i>	NA	Squash	Med. Vine	USA
7	<i>C. pepo</i> var. <i>fraterna</i> *	NA	Squash	Med. Vine	Mexico
8	<i>C. maxima</i>	Goliáš	Winter squash	Med vine	Czechoslovakia
9	<i>Citrullus lanatus</i>	Malali	Watermelon	Med vine	Israel
10	<i>Benincasa hispida</i>	NA	Wax gourd	Long vine	USA
11	<i>Luffa cylindrica</i>	NA	Luffa	Long vine	?
12	<i>Lagenaria siceraria</i>	NA	Bottle gourd	Long vine	?

NA = Not available; ? = Unknown

Fungicide Resistance :

Objective: To document the field performance of pyraclostrobin- and mefenoxam-based fungicides. Laboratory studies are being conducted towards the same end.

Results: full report follows.

CUCUMBER (*Cucumis sativus* ‘Lafayette’)
Downy mildew; *Pseudoperonospora cubensis*

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Evaluation of fungicides for control of downy mildew on hand-harvested pickling cucumbers, 2007.

The experiment was conducted on a Pepperbox loamy-sand soil at the Carvel Research and Education Center near Georgetown, DE. The experiment was arranged as a randomized complete block design with four replications. Cucumbers were direct seeded in rows spaced 5 ft apart and 20 ft long with 3 in. between plants within the row on 5 Aug. Fungicide applications were initiated on 14 Aug (first true leaf expanded) before any symptoms were seen on the plants, but present in an adjacent field. Downy mildew was observed at low incidence on 23 Aug. Subsequent applications were made on 23, 30 Aug and 6, 11, 17 Sep using a backpack CO₂ pressurized sprayer that delivered 30 gal/A at 52 psi. Applications were made with a broadcast boom equipped with 4 hollow cone nozzles (D4 disks, no. 45 cores) spaced 18 in. apart. Each plot was bordered by an untreated row. Disease severity was measured on 11 Sep and at the last harvest on 26 Sep by estimating the percent of infected leaf area per plot. A 15 ft-long section of the plot was hand harvested on 17 and 26 Sep. Cucumbers were graded according to size and quality. The weight of crooks and nubs (small and misshapen fruit) was subtracted from the total yield weight to obtain marketable yield. The average minimum and maximum temperatures during the trial were 64°F and 85°F respectively. The plot received a total 3.8 inches of rainfall, and supplemental overhead irrigation was provided as necessary.

Despite periods of hot, dry weather during the trial, downy mildew severity was very high by harvest time and the yields of the untreated control plots reflected that. One of the goals of the test was to verify that the new strains of downy mildew that are present in DE are resistant to mefenoxam (Ridomil Gold) and pyraclostrobin (Cabrio). This test was conducted in conjunction with other cooperating states in the US to ascertain the distribution of these fungicide resistant strains of *P. cubensis*. There was no control provided by either of these two fungicides. The other two fungicide alternations tested were very effective in protecting plants and producing good yields and are industry standards where these resistant strains are present. There were no symptoms of phytotoxicity for any treatment.

Treatment and rate/A	Marketable Yield (bu/A)	Total Yield (bu/A)	% Crooks & nubs *	% Infected foliage	
				11 Sep	26 Sep
Previcur Flex 6F 1.2 pts + Bravo Weather Stik 6SC 2.0 pts alt. w/ Ranman 3.33 SC 2.75 fl oz + Bravo Weather Stik 6 SC 2.0 pt	203.8 a **	281.9 a	40.0 b	16.2 a	23.7 a
Tanos 50 DF 8 oz + Manzate Prostick 75 DG 3.0 lbs alt. w/ Previcur Flex 6F 1.2 pts + Manzate Prostick 75 DG 3.0 lbs	225.0 a	306.5 a	40.0 b	12.5 a	25.0 a
Ridomil Gold 4EC 4.0 fl oz	0.5 b	43.2 b	99.5 a	43.7 c	82.5 b
Cabrio 20 EG 14.0 oz	2.3 b	49.7 b	96.2 a	32.5 b	83.7 bc
Control	0.2 b	31.3 b	99.2 a	43.7 c	88.7 c
LSD (<i>P</i> =.05)	31.5	41.2	4.8	5.8	5.0

* Data were transformed from percentages by arcsin√, analysis of variance was performed and means were converted back to the percentages which are represented in the table.

**Mean values within a column followed by the same letter are not significantly different according to Fisher’s protected least significant difference (LSD) test.