BASIL (*Ocimum basilicum* 'Sweet Basil Italian Large Leaf')
Downy mildew; *Peronospora belbahrii*

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Evaluation of biopesticides for managing downy mildew in basil, 2010.

To provide a source of natural inoculum within the experimental area, basil was transplanted into spreader rows about 4 weeks before plants were scheduled to be transplanted into the plots. These rows were adjacent to rows of sorghum-sudangrass planted earlier to provide a more favorable environment for downy mildew to become established by creating shade and blocking air movement thereby promoting a more humid area. These plants were not inoculated. Biopesticides were evaluated in a replicated experiment with field-grown plants of basil. Basil was seeded on 5 Jul in trays in a greenhouse and transplanted on 10 Aug into black plastic mulch with drip irrigation in a field with Haven loam soil at the Long Island Horticultural Research and Extension Center in Riverhead. A late planting date was used to increase the likelihood of downy mildew developing during the experiment. The primary source of initial inoculum in this area is considered to be wind-dispersed spores from affected plants in another area. Each plot had 26 plants in two 10-ft rows on black plastic mulch with 9-in plant spacing and 9-in row spacing. The plots were 6 ft apart in the row. A randomized complete block design with four replications was used. Fungicides were applied weekly for 7 weeks beginning before symptoms were observed in plots using a CO_2-pressurized backpack sprayer and a hand-held boom equipped with a single-nozzle boom operated at 45 psi. A twinjet 8002E nozzle delivering 30 gal/A was used on 26 Aug, 2 Sep, and 9 Sep. An 8006E nozzle delivering 40 gal/A was used on 16, 23, and 29 Sept and 7 Oct. Rates were applied lower than intended on the first three dates due to a calculation error. The number of plants affected and percentage of leaves affected on up to 10 plants was determined at each assessment. Incidence and average severity on affected plants was used to calculate overall severity for the canopy of each plot. Area Under Disease Progress Curve (AUDPC) was calculated for canopy severity. A destructive sampling was done at the end of the season on 13 Oct. Similar assessment of downy mildew incidence and severity was done with these plants, then they were held enclosed in a plastic bag at 60 F for 7 days before re-assessing them to determine residual control. Average monthly high and low temperatures (^{o}F) were 83/67 in Aug, 77/62 in Sep, and 66/50 in Oct. Rainfall (in.) was 2.02, 2.87, and 3.32 for these months, respectively.

Symptoms of downy mildew were first observed in this experiment on 16 Aug on one leaf in a spreader row. Symptoms were not found in plots until 20 Sep, which was after the fourth application. Few significant differences were detected among treatments. The conventional fungicide, Revus, was not significantly better than most of the biopesticide treatments. It was not as effective as expected based on previous evaluations conducted in FL. Results may have been affected by the fact disease onset was late in the season and occurrence remained low. While there were few significant differences among treatments, the biopesticide that appears to be the least effective (Oxidate) is one of the two products currently labeled for managing downy mildew in organically-produced crops. However, it was not possible to follow the 5-day spray interval specified on the label for this use. At the first assessment only one treatment, ProPhyt, had no symptoms in all four replicate plots. These two possible results are in agreement with observations of substantial differences in control made by a NY grower who used Oxidate and a phosphorous acid fungicide in his organic and conventionally-managed, respectively, greenhouse-grown basil. The treatment with the lowest AUDPC value was a tank-mix of low label rates of Organocide and copper.

	Plants affected by downy mildew (%)			Severity	Post harvest	
Treatment (rate) [z]	24-Sep	6-Oct	13-Oct	AUDPC [y]	Plants affected (%)	Incidence (%)
Non-treated control…….	12.66 abc[x]	34.36 ab	49.96	50.65 ab	53.61	2.83
Oxidate (128 fl oz/100 gal water)……...…..…..	25.08 a	56.96 ab	57.32	104.00 a	71.94	10.49
Regalia (1% v/v)……..	3.26 c	43.00 ab	47.02	74.58 ab	67.50	8.85
Actinovate (12 oz/A)……...	12.73 abc	41.37 ab	45.79	70.31 ab	74.17	9.50
Organocide (2 oz/gal)……..	5.62 bc	27.87 b	69.03	66.89 ab	50.83	2.36
Sporatec AG (1 qt/A) + (BioLink at 2 fl oz/gal)……	7.34 bc	44.19 ab	36.48	64.86 ab	56.67	10.44
Sonata ASO (3 qt/A) + (BioLink 2 fl oz/gal)……..	21.21 ab	33.84 ab	41.54	62.90 ab	55.95	5.03
Companion (1 gal/A)……..	5.80 bc	37.60 ab	52.78	60.52 ab	53.61	7.07
Timorex Gold (0.75% v/v)……..	14.15 abc	29.13 b	35.70	48.13 ab	77.78	7.31
ProPhyt (4 pt/A)……..	0.00 c	22.34 b	58.19	44.49 b	36.11	4.35
Revus (8 fl oz/A)[w]……...……	5.30 bc	20.29 b	56.59	42.97 b	33.33	7.32
Organocide (1 oz/gal) + NuCop HB (1.0 lb/A)……...	5.01 bc	23.30 b	45.38	35.72 b	32.78	6.07
P-value (treatment)	0.0003	0.0010	0.3934	0.0173	0.0947	0.4519

[z] Rate of formulated product/A. Applications dates were 1=24 Aug, 2=1 Sep, 3=6 Sep, 4=14 Sep, 5=22 Sep, 6=28 Sep, and 7=7 Oct. Treatments listed after the control in order based on AUDPC values.

[y] AUDPC calculated from plant severity data.

[x] Means in a column followed by the same letter or no letter are not statistically different from each other (Tukey's HSD, P=0.05).

[w] Conventional fungicide standard was Revues (8 fl oz/A).