

EVALUATION OF FUNGICIDE PROGRAMS FOR MANAGING POWDERY MILDEW OF PUMPKIN, 1998: A field experiment was conducted at the Long Island Horticultural Research Laboratory in Riverhead, NY, on Haven loam soil. Fertilizer (1000 lb/A of 10-10-10) was broadcast and incorporated on 23-24 Jun. Pumpkin seed were planted on 29 Jun at 24-in. within row plant spacing and 68-in. between row spacing. Herbicides, Curbit (1 pt/treated A) and Command (4 pt/treated A), were applied in a 10-inch band over the planted rows on 2 Jul. To manage *Phytophthora* fruit and crown rot, Ridomil Gold (1 pt/A) was broadcast over the entire field then incorporated on 25 Jun before planting, a low area in the field center was not used for the experiment, and soil drainage was improved by subsoiling between rows on 27 Jul. Plots were located around the low area which was planted to sorghum sudangrass. Plots were thinned by hand to obtain about 39 plants in three 27-ft rows. There was 10 ft between plots. Cucumber beetles were managed by applying Sevin 80S (1.25 lb/A) on 18 Jul and Asana XL (9.6 oz/A) on 30 Jul. Aliette 80WDG (4.5 lb/A) was applied on 17 Sep to control downy mildew. Average monthly high and low temperatures (F) were 77/60 in Jun, 85/66 in Jul, 86/66 in Aug, and 79/61 in Sep. Rainfall (in.) was 6.72, 3.16, 2.28, and 3.03 for these months, respectively. The field was irrigated (approx. 1.0 in.) 5 times on 15 Jul, 30 Jul, 6-7 Aug, 16 Aug, and 1-2 Sep. Plants were sidedressed with ammonium nitrate at a rate of 30 lb N/A on 28 Jul. Urea at a rate of 10 lb N/A was applied to leaves on 31 Aug. The eKsPunge treatments and the Champ program were preventive treatments. An IPM schedule was used for the other treatments. It was initiated on 13 Aug after detecting powdery mildew in 57 of these 60 plots at one leaf with symptoms out of 50 old leaves examined, which was shown previously to be as effective as using a preventive schedule (Plant Dis. 80:910-916). Fungicides were applied with an Airtac tractor-mounted air assist sprayer operated at 20 gpa and 45 psi on 27 Jul (just eKsPunge treatments), 4 Aug (eKsPunge treatments and Champ program) and on 13, 20-21, 29 Aug; 6 and 14 Sep to all. WECO 143 is a natural, organic-based product that reportedly induces plant resistance. A randomized complete block design with four replications was used. Upper and lower (under) surfaces of 15-50 leaves in each plot were examined weekly for powdery mildew beginning on 11 Aug. Initially, 50 older leaves were examined in each plot. Young and mid-aged leaves were also examined beginning on 28 Aug. Powdery mildew colonies were counted; severity was assessed when colonies could not be counted accurately because they had coalesced and/or were too numerous. Average severity for the entire canopy was calculated from the individual leaf assessments. Fungicide sensitivity of the pathogen population was assessed before and after treatment. Isolates were collected on 26 Aug from nontreated plots and on 1 Oct from plots treated with Nova+Bravo. Fungicide sensitivity of each isolate was assessed using fungicide-treated leaf disks (Plant Dis. 80:633-639). Concentrations tested were 200 ppm benomyl (a.i. in Benlate), 50 ppm triadimefon (a.i. in Bayleton), and 0.2, 2, 20, and 80 ppm myclobutanil (a.i. in Nova). Defoliation was assessed on 18 Sep. Fruit quality was evaluated in terms of handle (peduncle) condition in early Oct. Individual fruit were weighed for the nontreated control and five treatments.

All treatments provided some control based on AUDPC values, which were significantly lower than nontreated control for all. Best control was achieved with Nova+Bravo applied in alternation with a strobilurin fungicide (Sovran or Quadris), Nova+Bravo applied weekly, Flint weekly (strobilurin fungicide) and Microthiol Sulfur. Sovran was significantly better than Quadris based on AUDPC for lower leaf surfaces. Quadris applied alone was not very effective most likely because the spray interval (14-day) was too long, thereby confirming the need for a 7-day interval (as on the label). This treatment was included to compare with the eKsPunge+Quadris treatment. Flint was quite effective when applied alone weekly and when applied with Actigard in alternation with Ridomil Gold Bravo. eKsPunge alone or with WECO 143 was moderately effective. It was similar in effectiveness to Kocide 2000 (no significant differences between eKsPunge and Kocide 2000). eKsPunge + Quadris was significantly better than either eKsPunge or Quadris alone based on AUDPC for upper leaf surfaces (mildew severity was lower but not significantly different for most assessment dates). Microthiol Sulfur was more effective than the four coppers tested (Champ, Kocide 2000, GX-569, and GX-270). It was one of the best treatments tested (mildew severity was among the lowest 7 of the 19 treatments tested). Coppers were moderately effective. Champ and Kocide 2000 were not significantly different on any assessment date. The Champ program with Bravo+Nova+Topsin M (six sprays with first before disease detection) was not significantly better than Champ alone (five sprays with first after disease detection) for controlling mildew except for AUDPC values for lower (but not upper) leaf surfaces. Mildew was less severe with Nova+Bravo than with Champ+Bravo, but this difference was not significant except on 11 Sep. The nine treatments with an AUDPC value for upper leaf surfaces of 130 or less controlled powdery mildew sufficiently to maintain enough living foliage (rated as % defoliation on 18 Sep) that fewer vines died back to the fruit resulting in rotten handles by early Oct as compared to the nontreated control (presented as % solid handles in table). Treatments with a higher AUDPC value did not differ significantly from the nontreated control in terms of defoliation and/or handle condition. No significant differences were detected in average fruit weight or percentage of fruit weighing at least 10 lb; however, these values were lowest for the nontreated control. Most isolates (80%) collected on 26 Aug from nontreated plots were resistant to both Bayleton and Benlate. Percentage of isolates able to tolerate 20 ppm myclobutanil was 53% in nontreated plots on 26 Aug and 56% in Nova+Bravo-treated plots on 1 Oct. One of 18 isolates collected on 1 Oct was able to tolerate 80 ppm myclobutanil.

(Continued)								
Treatment and rate/A (application time) ²	Powdery mildew severity (% leaf coverage)						Defolia- tion (%)	Fruit handle condition (% solid)
	upper leaf surface ¹			lower leaf surface ¹				
	4 Sep	18 Sep	AUDPC	4 Sep	18 Sep	AUDPC		
Nontreated Control	46.3 a ³	56.8 a	964 a	55.0 a ³	85 a	1262 a	88 a	50 f-h
Bravo Ultrex 1.8 lb (3,5,7) + Nova 40W 2.5 oz (3,5,7) + Quadris F 11 fl oz (4), 15.4 fl oz (6) ⁴ ..	4.1 ef	5.7 gh	64 i	13.9 f	47 f-h	532 ef	41 f-h	86 a
Bravo Ultrex 1.8 lb (3-7) + Nova 40W 2.5 oz (3-7)	0.4 f	2.6 h	25 i	12.4 f	60 d-f	539 ef	41 f-h	80 ab
Bravo Ultrex 1.8 lb (3-7) + Nova 40W 2.5 oz (3,4)	2.0 ef	8.0 f-h	93 f-i	17.9 d-f	78 a-c	671 cde	60 c-f	79 a-c
Bravo Ultrex 1.8 lb (3,5,7) + Nova 40W 2.5 oz (3,5,7) + Sovran 3.2 oz (4,6) ⁴	0.5 ef	2.6 h	26 i	7.8 f	28 ij	286 g	32 gh	88 a
Flint WG50 2 oz (3-7)	2.6 ef	18.4 d-f	130 f-i	9.3 f	28 j	273 g	21 h	86 a
Ridomil Gold/Bravo 2.12 lb (3,5,7) Actigard WG50 1 oz (4,6) Flint WG50 3 oz (4,6)	3.1 ef	12.6 e-h	88 ghi	16.9 d-f	35 h-j	436 fg	49 e-g	78 a-c
Microthiol Special 80DF 4 lb (3-7)	1.2 ef	4.2 gh	36 i	14.6 ef	43 g-i	465 efg	52 c-g	80 ab
Microthiol Special 80DF 2 lb (3-7) Topsin-M 8 oz (3-7)	2.6 ef	12.5 e-h	74 ghi	16.5 d-f	65 c-e	580 ef	51 d-g	76 a-d
Champ 2F 2 pt (3-7)	7.1 d-f	15.1 d-g	199 d-g	27.3 c-e	72 a-e	822 bcd	68 a-e	60 d-f
Champ 2F 2 pt (3-7) + Nova 40W 2.5 oz (3-7)	4.3 ef	6.8 gh	140 e-i	20.4 d-f	41 h-j	655 def	72 a-c	68 b-e
Champ 2F 1.5 pt (2-6), 2 pt (7) + Topsin-M 8 oz (2,3) + Bravo Ultrex 1.8 lb (4-6), 2.7 lb (7) + Nova 40W 2.5 oz (4-7)	1.5 ef	8.0 f-h	108 f-i	16.4 d-f	57 e-g	588 ef	61 c-f	73 a-d
Kocide 2000 24 oz (3-7)	13.2 cd	15.2 d-g	268 de	39.3 bc	84 ab	1009 b	71 a-d	49 f-h
GX-569 14.4 oz (3-7)	6.7 d-f	8.9 f-h	172 e-h	30.6 b-d	71 a-e	876 bc	69 a-e	52 e-h
GX-569 28.8 oz (3-7)	5.5 d-f	7.0 gh	137 f-i	39.1 bc	67 c-e	965 b	71 a-d	53 e-h
GX-270 21.6 oz (3-7)	6.0 d-f	21.7 c-e	216 def	43.9 ab	76 a-c	1011 b	71 a-d	54 e-h
eKsPunge 8 lb (1-2), 25 lb (3-7) ⁴	16.2 bc	20.9 de	324 cd	42.7 ab	70 b-e	964 b	82 ab	37 h
Quadris 11 fl oz (3,5), 15.4 fl oz (7) ⁴	8.6 c-e	43.4 b	429 c	15.6 ef	85 ab	675 cde	62 b-e	62 c-f
eKsPunge 8 lb (1-2), 25 lb (4,6) ⁴ + Quadris 11 fl oz (3,5), 15.4 fl oz (7) ⁴ ..	3.6 ef	24.5 cd	189 e-h	11.4 f	76 a-c	619 def	49 e-g	55 e-g
eKsPunge 8 lb (1), 25 lb (3,5,7) ⁴ + WECO 143 10 ppm (1,3,5,7)	21.3 b	32.7 bc	570 b	37.1 bc	74 a-d	1003 b	82 ab	42 gh
P-value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

¹ Exact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1%.
² Rate of formulated product/A. Application times were: 1=27 Jul, 2=4 Aug, 3=13 Aug, 4=20-21 Aug, 5=29 Aug, 6=6 Sep, and 7=14 Sep.
³ Numbers in a column with a letter in common are not significantly different according to Fisher's Protected LSD (P=0.05).
⁴ Applied with NuFilm P (6 oz/A).