

Alternative fungicides to Bravo evaluated on pumpkin cultivars differing in susceptibility to powdery mildew, 2001.

Genetic and chemical controls were evaluated alone and in combination using a factorial treatment arrangement. A powdery mildew tolerant/resistant (PMR) cultivar (Magic Lantern) and a PMR experimental (HMX 6687) from Harris Moran Seed Company (Ted Superak) were compared with susceptible Wizard. HMX 6687, which has resistance from both parents, is more resistant to powdery mildew than Magic Lantern (B&C Tests 15:187 and F&N Tests 2001:V77). There were three fungicide programs plus a nontreated control. The standard fungicide program was Quadris F (15.4 oz/A) applied in alternation with Nova 40W (5 oz/A) + Bravo Ultrex 82.5WG (2.7 lb/A). Potassium bicarbonate formulated as Kaligreen 82SP (4 lb/A) and copper hydroxide formulated as Kocide 2000 53.8DF (1.5 lb/A) were used in place of Bravo in the Bravo alternatives fungicide program. The biocompatible fungicide program consisted of fungicides currently or potentially acceptable for organic production: sulfur formulated as Microthiol Disperss 80DF (4 lb/A), Kaligreen, and Kocide. Fungicides were applied with a tractor-mounted boom sprayer equipped with D3-45 hollow cone nozzles spaced 11 in. apart that delivered 88 gpa at 200 psi. This experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead, NY, in a field with Haven loam and Riverhead sandy loam soil. Fertilizer (666 lb/A of 15-15-15) was broadcast and incorporated on 7 Jun. Transplants were seeded in the greenhouse on 24 May. On 26 Jun, seedlings were transplanted with starter fertilizer (15-30-15) into black plastic mulch at 24-in. plant spacing and 68-in. row spacing. Plants were watered using drip irrigation as needed based on irrometer readings. Weeds between rows were controlled by applying Gramoxone Extra EC (2 pt/treated A) with a shielded sprayer on 3 Jul and hand-weeding. Cucumber beetles were managed with a seedling drench of Admire 2F (0.02 ml/plant) on 20 Jun and a foliar application of Asana XL (9.6 oz/A) on 14 Jul. To manage *Phytophthora* fruit and crown rot, Ridomil Gold EC (1 pt/A) was broadcast over the entire field then incorporated on 8 Jun, and Acrobat 50WP (6.4 oz/A) was applied on 31 Aug and 7 Sep. Average monthly high and low temperatures (F) were 80/63 in Jun, 80/63 in Jul, 84/68 in Aug, 75/59 in Sep, and 66/50 in Oct. Rainfall (in.) was 6.08, 3.43, 4.86, 2.98 and 1.97 for these months, respectively. A randomized complete block design with four replications was used. Plots contained 12 plants in three rows. Upper and lower (under) surfaces of 5 to 50 leaves in each plot were examined on 9, 14, 22, and 29 Aug and 5, 13, and 24 Sep. Initially, 50 older leaves were examined in each plot. As disease progressed, leaves of other age classes and fewer total leaves were examined. The number of leaves examined was adjusted based on the incidence of affected leaves in a plot. Mid-aged leaves and young leaves were also examined beginning on 29 Aug. Powdery mildew colonies were counted. When colonies could not be counted accurately because they had coalesced and/or were too numerous, severity was estimated. Average severity for the entire canopy was calculated from the individual leaf assessments. Defoliation, predominantly due to powdery mildew, was assessed on 6, 11, 17, and 24 Sep and 2 Oct. Fruit quality was evaluated in terms of handle (peduncle) condition on 25 Sep, 5 Oct, and 15 Oct. Fruit width and length were measured on 2 Oct. Weight was estimated from width X length using a linear regression equation derived using 40 representative fruit of each cultivar.

Genetic control with the highly resistant hybrid HMX 6687 was more effective than chemical control. Compared with fungicide-treated Wizard, powdery mildew on nontreated HMX 6687 was significantly less severe on lower leaf surfaces and equally severe on upper surfaces for most assessments. Control was not as effective with Magic Lantern. Mildew was more severe on nontreated Magic Lantern than nontreated HMX 6687 beginning with the 22 Aug assessment. Nontreated Magic Lantern became severely infected late in the growing season. It was not significantly different from nontreated Wizard for several assessments (5 Sep upper surfaces, 13 Sep lower surfaces (data not shown), and 24 Sep both surfaces). Chemical control was more effective than genetic control with Magic Lantern. Mildew was significantly more severe on nontreated Magic Lantern than fungicide-treated Wizard for most assessments beginning on 29 Aug, particularly for the Bravo alternatives and standard fungicide programs. The fungicide programs reduced mildew severity in Magic Lantern beginning on 22 Aug for upper surfaces and on 29 Aug for lower surfaces. A fungicide benefit was not detected with HMX 6687 until 29 Aug and 24 Sep for upper and lower leaf surfaces, respectively. The three fungicide programs were equally effective when applied to HMX 6687. For Wizard and Magic Lantern, the Bravo alternatives program was as effective as the standard program except for a few assessments. The biocompatible program was less effective than the standard program for most assessments on lower leaf surfaces, including AUDPC, and for a few assessments on upper surfaces. Mildew was generally less severe on pumpkin fruit handles of nontreated HMX 6687 and Magic Lantern than fungicide-treated Wizard. All treatments had significantly more fruit with good, solid handles (75 to 94%) than nontreated Wizard (54%) except Wizard receiving the biocompatible program (70%) on 15 Oct. Fungicide treatment did not affect number of mature or green fruit/plant or fruit weight for any cultivar. Magic Lantern fruit were heavier than those of Wizard and HMX 6687 (14.5, 11.1, and 12.0 lb/fruit, respectively).

Cultivar, Treatment ^b	Powdery mildew severity (% coverage) ^a						Fruit handles	Defoliation (%)
	upper leaf surface			lower leaf surface				
	29 Aug	5 Sep	AUDPC	29 Aug	5 Sep	AUDPC		
Wizard, No Fungicide	69.46 a ^c	68.24 a	1550 a	77.56 a	80.20 a	2475 a	10.3 bc	28 ab
Wizard, Standard Fungicide	2.72 def	2.74 cd	119 de	10.43 c	36.70 cd	1168 c	14.5 ab	20 abc
Wizard, Bravo Alternatives	12.11 c	10.98 b	286 c	6.64 c	30.90 de	1074 c	18.3 a	33 a
Wizard, Biocompatibles	9.63 cd	7.52 bc	310 c	36.46 b	56.08 bc	1859 b	8.1 de	23 abc
Magic Lantern, No Fungicide	30.98 b	44.77 a	793 b	36.65 b	57.93 b	1691 b	0.8 e	23 abc
Magic Lantern, Standard Fungicide	0.42 f	2.94 bcd	58 ef	5.18 c	11.77 ef	389 de	0.7 e	14 bcd
Magic Lantern, Bravo Alternatives	7.77 cde	9.75 bc	222 cd	5.04 c	8.75 f	584 d	3.1 de	12 bcd
Magic Lantern, Biocompatibles	1.27 ef	4.99 bc	114 de	4.52 cd	33.54 d	1153 c	4.9 cde	22 abc
HMX 6687, No Fungicide	8.17 cde	7.27 bc	169 cd	1.42 cd	7.20 f	389 de	0.4 e	8 cd
HMX 6687, Standard Fungicide	0.08 f	0.04 d	11 f	0.00 d	0.00 f	33 f	0.2 e	5 cd
HMX 6687, Bravo Alternatives	0.04 f	0.02 d	14 f	0.00 d	0.00 f	43 f	0.4 e	1 d
HMX 6687, Biocompatibles	0.00 f	0.21 d	9 f	0.01 d	0.77 f	244 ef	0.5 e	7 cd
P-value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0313

^a Exact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1%. A square root transformation was used when needed to stabilize variance. The table contains de-transformed values.

^b Applications were made on 15, 22, 30 Aug; 6 and 13 Sep. Standard program: Quadris (week 1,3,5), Bravo+Nova (week 2,4).
Bravo alternatives: Quadris (1), Kaligreen + Nova (2), Quadris (3), Kocide + Nova (4), Quadris (5).
Biocompatible fungicides: Sulfur (1), Kocide (2), Kaligreen (3), Kocide (4), Kaligreen (5).

^c Numbers in a column with a letter in common are not significantly different according to Fisher's Protected LSD ($P = 0.05$).