

PUMPKIN (*Cucurbita pepo* 'Appalachian')
 Powdery mildew; *Sphaerotheca fuliginea*
 Phytophthora fruit rot; *Phytophthora capsici*

M. T. McGrath
 Department of Plant Pathology
 Cornell University, LIHREC
 3059 Sound Avenue, Riverhead, NY 11901

EVALUATION OF PLANT GROWTH ENHANCERS PLUS A FUNGICIDE TO MANAGE POWDERY MILDEW AND PHYTOPHTHORA FRUIT ROT OF PUMPKIN, 2000: The objectives of this study were to examine the benefits of weekly applications of Auxigro or Greenstim with Bravo Ultrex for disease control and yield enhancement. Auxigro, marketed by Auxein Corp., is a 'plant metabolic primer' that has been shown to enhance growth and development of numerous plant species. Active ingredients are gamma aminobutyric acid (GABA) and L-glutamic acid. Greenstim, a 'nutrient induced resistance system' that promotes vigorous plant growth, contains macro and micro nutrients, sea plant extracts, carbohydrates, and a multi-vitamin component. It is marketed by Miller Chemical & Fertilizer Corp. A field experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead, NY, in a field (Riverhead sandy loam soil) where Phytophthora fruit rot of pumpkin had developed in 1994 and 1996 through 1999. A similar experiment was conducted in this field in 1999 (F & N Tests 55:251). Fertilizer (1000 lb/A of 10-20-20) was broadcast and incorporated on 8 May. Pumpkin seeds were planted on 22 Jun at 24-in. within row spacing and 68-in. between row spacing. Weeds were controlled by applying Curbit EC (1 pt/treated A) + Command 4EC (4 pt/treated A) in a 10-inch band over the planted rows on 22 Jun; these were incorporated by irrigating. Mechanical cultivation and hand weeding were also done. Soil drainage was improved by subsoiling on 19 Jul between rows before vines grew over. Cucumber beetles were managed by applying Sevin XLR (1 qt/A) on 20 Jul and 9 Aug. Lannate (3 pt/A) was applied on 29 Aug to control aphids. Average monthly high and low temperatures (F) were 81/61 in Jun, 81/64 in Jul, 81/65 in Aug, 76/59 in Sep, and 66/48 in Oct. Rainfall (in.) was 4.24, 4.7, 2.42, 3.92 and 0.46 for these months, respectively. The field was irrigated (approx. 1.0 in.) on 8 Jul when soil was dry due to inadequate rainfall. The field was irrigated frequently and often excessively (more than 1 in.) beginning in late Aug to create conditions favorable for Phytophthora fruit rot development by saturating the soil. Irrigation dates were 28 Aug, 5 Sep, 11 Sep, 12 Sep, and 2 Oct. Plots were three 26-ft rows with 14 ft between plots. Treatments were applied on 4, 10, 17, and 25 Aug; 1, 9, 18, and 30 Sep; and 12 Oct with a tractor-mounted boom sprayer equipped with D3-45 hollow cone nozzles spaced 11 in. apart that delivered 100 gpa at 200 psi. The 7-day application interval could not be maintained after 9 Sep because of windy conditions and sprayer malfunction. A randomized complete block design with five replications was used. Upper and lower (under) surfaces of 5 to 25 leaves in each plot were examined on 7 and 21 Aug; and 6 Sep. Defoliation, due predominantly to powdery mildew, was assessed on 22 Sep. Fruit were examined weekly for symptoms of Phytophthora fruit rot and other diseases. A nondestructive procedure was used to estimate fruit weight so that fruit could be left undisturbed for disease development. Weight was estimated from width X length using a linear regression equation derived using fruit from the non-plot areas of this field. Fruit width and length were measured on 25 Sep.

All treatments provided good control of powdery mildew on upper leaf surfaces, but only some control on lower leaf surfaces and only early in the epidemic. Neither Auxigro or Greenstim applied with Bravo improved control over Bravo alone, based on ratings of powdery mildew severity on leaves; however, only pumpkins treated with these growth enhancers had significantly more fruit with good, solid handles on 25 Sep than nontreated pumpkins. Very few fruit developed symptoms of Phytophthora fruit rot (5.5%). Most symptomatic fruit could not be confirmed as having Phytophthora fruit rot because visible signs of the pathogen did not develop before affected fruit completely rotted. There were no significant differences in percentage of fruit with Phytophthora fruit rot. In sharp contrast, most fruit were affected and had visible sporangia during the previous experiment in this field with the same cultivar (F & N Tests 55:251). Environmental conditions in this field in 2000 should have been favorable for disease development as Phytophthora fruit rot with good sporulation occurred in other experiments with this cultivar at LIHREC. Subsoiling may have affected disease occurrence by improving drainage; however, this practice was used in the other experiments and the low section of the field had standing water after irrigating to enhance disease development. Decline in incidence and severity of Phytophthora fruit rot also occurred in another LIHREC research field during several consecutive years of research on this disease. There were no significant differences among treatments in percent defoliation on 22 Sep, number of fruit, and average fruit weight. Estimated weight of mature fruit per plot was lowest for nontreated pumpkins, however these differences were not significant.

Treatment and rate/A ²	Powdery mildew severity (% coverage)				Fruit handle condition (% solid)	Fruit with Phytophthora fruit rot (%)	Healthy Fruit (%)		Fruit weight (lb/plot)
	upper leaf surface ¹		lower leaf surface ¹				2 Oct	25 Oct	
	21 Aug	6 Sep	21 Aug	6 Sep			25 Sep	25 Oct	
Nontreated	8.8 a ³	56.5 a	11.1 a	47	17 a	5	58 b	38	332
Bravo Ultrex 2.7 lb	0.0 b	3.0 b	4.4 b	55	46 ab	3	47 b	31	513
Auxigro 1 oz + Bravo	0.2 b	2.5 b	7.3 ab	76	74 b	9	83 a	60	382
Greenstim 1-2 qt + Bravo	0.3 b	6.0 b	6.5 b	67	72 b	5	65 ab	43	430
<i>P</i> -value	0.0009	0.0001	0.0255	0.056	0.0071	0.46	0.0143	0.13	0.24

¹ Colonies were counted when possible; 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.

² Rate of formulated product/A. All Bravo treatments were Bravo Ultrex applied at 2.7 lb/A. Greenstim was applied at 2 qt/A for the last three applications.

³ Numbers in a column with a letter in common are not significantly different according to Fisher's Protected LSD (*P* = 0.05).