

CARROT (*Daucus carota* 'Canberra')
Alternaria leaf blight; *Alternaria dauci*
Powdery Mildew, *Erysiphe heraclei*

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Evaluating organic fungicides for the control of foliar blights of organic carrot, 2023.

This trial was established in sandy soil, previously planted to soybeans, at a grower-cooperator's field in Oceana County, MI. Carrot ('Canberra') seed was sown 1.5-in apart in single rows on 9 and 10 May. Each treatment plot encompassed a 20-ft long row with a 5-ft buffer between treatment plots within a row. Four replicates were established for each of the 6 treatments and the untreated control, arranged in a randomized complete block design. Insecticide, fertilizer, and other non-fungicide maintenance, except for treatment applications during the trial period, were provided by the grower cooperators according to commercial production standards. The trial was initiated 13 Jul prior to symptom development. Applications were made with a backpack sprayer calibrated to 35 PSI with two XR8003 flat-fan nozzles spaced 12-in apart, delivering approximately 50 gallons per acre. Applications were made every 9 to 11 days. Application dates were 13 and 24 Jul; 3, 16 and 24 Aug; 5, 14 and 26 Sep. Disease assessments were made on 16 and 24 Aug; 5, 14 and 25 Sept; and 3 Oct. Visual assessment of foliar blight severity was made using a 0 to 100% scale, where 0 = 0% foliar blight and 100 = 100% foliar blight. On 3 Oct, a single 5-ft row of carrots was harvested from each plot; carrots were topped and weighed. Individual ratings of foliar blight were used to calculate area under disease progress curve values. Data were analyzed using an analysis of variance (ANOVA) with means separation performed using Fisher's protected least significant difference (LSD) using the statistical software RStudio v4.1.1.

Disease pressure was high in this trial as disease severity reached 63% in the untreated control by the end of the trial (3 Oct). There was no significant difference in yield among the treatments and untreated control. On 24 Aug, all treatments performed better than the untreated control with the exception of Theia. On 5 Sep, all treatments performed better than the untreated control. On 14 Sep, all treatments performed better than the untreated control with the exception of Howler EVO 1.25 lb. On 25 Sep, all treatments performed better than the untreated control. On the final rating date, MilStop alternated with Kocide 3000-O was the most effective treatment, significantly reducing disease severity compared to the untreated control and all other treatments. Kocide 3000-O and LifeGard alternated with Kocide 3000-O had a lower final rating than the untreated control. Badge X2 alternated with Kocide 3000-O, Howler EVO 1.25 lb + Kocide 3000-O, Howler EVO1.25 lb, Theia, and Howler EVO 2.5 lb were all similar to the untreated control at the last rating date. According to AUDPC data, all treatments performed better than the untreated control. Among the most effective treatments were MilStop alternated with Kocide 3000-O, Badge X2 alternated with Kocide 3000-O, Kocide 3000-O, Howler EVO 1.25 lb + Kocide 3000-O, and LifeGard alternated with Kocide 3000-O. No phytotoxicity was observed in any of the treatments. The tested organic fungicides can be used to reduce foliar blight in organic carrot fields, the implementation of promising fungicides could enable fewer applications of copper.

Treatment and rate ^{y/A} , application schedule, applied at 9-11 day intervals	Yield (lb) ^x	Foliar Blight Disease Severity (%) ^z					AUDPC ^w
		24 Aug	5 Sep	14 Sep	25 Sep	3 Oct	
Untreated	19.5 a ^v	8.0 a	41.3 a	47.5 a	57.5 a	63.7 a	1770.8 a
MilStop SP 5 lb, apps A,C,E,G -alt- ^u Kocide 3000-O DF 1.5 lb, apps B,D,F,H	22.5 a	1.8 d	9.8 c	9.5 d	31.3 d	45.0 c	688.0 d
Badge X2 DF 3.57 lb, apps A,C,E,G -alt- Kocide 3000-O DF 1.5 lb, apps B,D,F,H	20.8 a	3.3 b-d	12.0 c	15.0 cd	36.3 b-d	55.0 ab	869.3 cd
Kocide 3000-O DF 1.5 lb, apps A-H	20.9 a	3.0 b-d	11.5 c	21.3 b-d	33.8 cd	50.0 b	880.6 cd
Howler EVO WP 1.25 lb + Kocide 3000-O DF 0.76 lb, apps A-H	19.4 a	2.5 cd	11.3 c	20.0 b-d	35.0 cd	56.3 ab	894.8 cd
LifeGard WG 2.25 oz, apps A,C,E,G -alt- Kocide 3000-O DF 1.5 lb, apps B,D,F,H	19.8 a	4.3 b-d	14.5 bc	27.5 bc	33.8 cd	50.0 b	985.0 cd
Howler EVO WP 2.5 lb, apps A-H	19.5 a	2.5 cd	15.0 bc	28.8 bc	42.5 bc	60.0 a	1105.0 bc
Theia WP 1.5 lb, apps A-H	21.3 a	5.5 ab	16.3 bc	30.0 bc	38.8 b-d	60.0 a	1131.9 bc
Howler EVO WP 1.25 lb, apps A-H	18.6 a	4.5 bc	25.3 b	34.5 ab	45.0 b	60.0 a	1319.8 b
<i>P-value</i>	n.s	<0.01	<0.001	<0.01	<0.001	<0.01	<0.001

^z: Based on a visual estimation of the foliage diseased (%)

^y: apps = applications. Application dates: A=13 Jul, B=24 Jul, C=3 Aug, D=16 Aug, E=24 Aug, F=5 Sep, G=14 Sep, H=25 Sep

^x: Data from single 5-ft row of carrots harvested from each plot on 3 Oct

^w: AUDPC = Area Under Disease Progress Curve

^v: Columns with letters in common are not statistically different from each other (LSD t-test; $P=0.05$)

^u: -alt- = alternate