

CABBAGE: *Brassica oleracea* L. 'Gideon'
**EVALUATION OF SURFACTANTS AND INSECTICIDES FOR CONTROL OF
LEPIDOPTERAN PESTS IN MINNESOTA IRRIGATED CABBAGE, 2001**

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Imported cabbageworm (ICW): *Pieris rapae* (L.)

Cabbage looper (CL): *Trichoplusia ni* (Hübner)

Diamondback moth (DBM): *Plutella xylostella* (L.)

'Gideon' was seeded 19 May at the University of Minnesota Agricultural Experiment Station at Rosemount, MN. Treatment arrangement consisted of a RCB design with 4 replications. Plots consisted of 3 rows, 25 ft (7.6 m) long with 40 inch (1.02 m) row spacing. Each replicate was separated by a 5 ft (1.52 m) alley. Overhead lateral irrigation was used to apply irrigation. Irrigation was applied with the following schedule: 17 Jul: 1 in (2.54 cm); 21 Jul: 1 in (2.54 cm); 10 Aug: 0.75 in (1.91 cm); 13 Aug: 1 in (2.54 cm). Treatment applications were made with a CO₂ pressurized backpack sprayer using a 10 ft boom with 6 nozzles (XR-Teejet 8002 flat fan, with no screen). The sprayer was calibrated to deliver 20 gpa (187.04 l/ha) at 35 psi (242 kPa). SpinTor 2SC was added to all treatments at the 0.094 lbs AI / acre rate. Treatments were applied on 18, 25 Jul, 3, 13, 17 Aug. Treatments were evaluated for CL, ICW and DBM larval infestation 20 Jul (2 days after 1st application), 27 Jul (2 days after 2nd application) and 21 Aug (4 days after 5th application). All larval counts were taken from the middle row of each plot. Plots were harvested 23 Aug. In each treatment, 10 consecutive heads, with 4 wrapper leaves on each head, were harvested from the middle row and evaluated for feeding damage using Greene's rating scale (J. Econ. Entomol. 1969 62: 798-800), where: 1= no feeding damage; 2= minor feeding damage on the wrapper leaves (0-1% eaten) with no head damage; 3= moderate feeding damage on the wrapper leaves (2-5% eaten) with no head damage; 4= moderate feeding damage on the wrapper leaves (6-10% eaten) and minor feeding scars on the head; 5= moderate to heavy feeding on the wrapper leaves (11-30% eaten) and moderate feeding scars on the head; 6= greater than 30% of the wrapper leaves eaten and numerous feeding scars on the head. The number of larval contaminants within the 4 wrapper leaves and head were also noted.

Preliminary larval counts were taken 13 Jul. Preliminary counts consisted of 5.75 small CL and 1.25 total DBM per 10 heads. The 1st sample on 20 Jul was taken after 2 days after the 1st application, the 2nd sample was taken on 27 Jul 2 days after the 2nd application, and the 3rd sample was taken 4 days after the 5th application. Throughout this study, CL densities were exceptionally high. On the 1st sample date, treatments did not significantly reduce densities of total ICW and DBM, which were low through out the entire study, or small CL compared with the untreated check. All treatments significantly reduced densities of medium, large, and total CL compared with the untreated check. On the 2nd sample date, significant differences were found only for medium and total CL where all treatments

significantly reduced densities compared with the untreated check. On the 3rd sample date, for total ICW, total DBM, and small CL no treatment was significantly different from the untreated check. However, for medium, large, and total CL all treatments significantly reduced densities compared with the untreated check. All treatments significantly reduced the number of larval contaminants and increased the marketability of the heads, except for LI-700 and Bond, both having marketability ratings which were not significantly different from the untreated check. No phytotoxicity was observed.

		20 Jul					
		Larval-pupal density (avg./10 heads)					
Treatment/formulation ¹	Rate	Total ICW ²	Small CL	Medium CL	Large CL	Total CL ²	Total DBM ²
LI-700	8 oz/100gal	0.00	2.75	0.50 b	0.25 b	3.50 b	0.00
Activator 90	16 oz/100gal	0.00	4.25	2.00 b	0.00 b	6.25 b	0.25
Bond	16 oz/100gal	0.00	2.75	1.75 b	0.00 b	4.50 b	0.00
Silwet L-77	8 oz/100gal	0.00	2.00	2.50 b	0.50 b	5.00 b	0.75
Kinetic	8 oz/100gal	0.00	3.25	1.00 b	0.00 b	4.50 b	0.75
SpinTor 2SC	0.094 lbs AI/acre	0.00	3.00	1.75 b	0.25 b	5.00 b	0.00
Untreated check	--	0.00	4.25	6.00 a	2.75 a	13.50 a	0.00
		NS	NS				NS

Means within columns followed by the same letter are not significantly different ($P=0.05$); Ryan-Einot-Gabriel-Welsch multiple range test (REGWQ).
NS = not significant ANOVA.

¹ All treatments included SpinTor 2SC at the 0.094 lbs AI/acre rate.

² Total includes all larval instars and pupae.

		27 Jul					
		Larval-pupal density (avg./10 heads)					
Treatment/formulation ¹	Rate	Total ICW ²	Small CL	Medium CL	Large CL	Total CL ²	Total DBM ²
LI-700	8 oz/100gal	0.00	3.00	0.25 b	0.00	3.25 b	0.00
Activator 90	16 oz/100gal	0.00	1.50	0.75 b	0.25	2.50 b	0.00
Bond	16 oz/100gal	0.00	2.00	0.50 b	0.00	3.75 b	0.00
Silwet L-77	8 oz/100gal	0.00	1.00	0.00 b	0.00	1.25 b	0.00
Kinetic	8 oz/100gal	0.00	1.00	0.25 b	0.25	1.75 b	0.25
SpinTor 2SC	0.094 lbs AI/acre	0.00	1.75	1.00 b	0.25	3.50 b	0.00
Untreated check	--	0.25	3.25	5.50 a	3.00	14.75 a	0.25
		NS	NS		NS		NS

Means within columns followed by the same letter are not significantly different ($P=0.05$); Ryan-Einot-Gabriel-Welsch multiple range test (REGWQ).
NS = not significant ANOVA.

¹ All treatments included SpinTor 2SC at the 0.094 lbs AI/acre rate.

² Total includes all larval instars and pupae.

Treatment/formulation ¹	Rate	21 Aug						23 Aug (Harvest)	
		Larval-pupal density (avg./10 heads)						Avg. larval contaminant / 10 heads ³	Market- ability rating ⁴
		Total ICW ²	Small CL	Medium CL	Large CL	Total CL ²	Total DBM ²		
LI-700	8 oz/100gal	0.00	30.33	25.33 b	3.33 b	59.00 b	0.33	0.75 b	2.23 ab
Activator 90	16 oz/100gal	0.00	16.00	17.33 b	2.33 b	35.67 b	0.00	1.00 b	1.78 bc
Bond	16 oz/100gal	0.00	27.67	23.00 b	1.67 b	52.33 b	0.00	1.00 b	2.00 ab
Silwet L-77	8 oz/100gal	0.00	14.00	10.67 b	1.33 b	26.00 b	0.00	0.50 b	1.48 c
Kinetic	8 oz/100gal	0.00	34.00	33.33 b	4.00 b	71.33 b	0.00	1.75 b	1.95 bc
SpinTor 2SC	0.094 lbs AI/acre	0.00	25.00	28.33 b	3.33 b	56.67 b	0.33	0.25 b	1.75 bc
Untreated check	--	0.00	33.67	72.67 a	22.33 a	132.00 a	2.00	37.00 a	4.40 a
		NS	NS				NS		

Means within columns followed by the same letter are not significantly different ($P=0.05$); Ryan-Einot-Gabriel-Welsch multiple range test (REGWQ). NS = not significant ANOVA.

¹ All treatments included SpinTor 2SC at the 0.094 lbs AI/acre rate.

² Total includes all larval instars and pupae.

³ Larval contaminants include all larval instars and pupae of all three species (ICW, CL, and DBM) found within the head or 4 wrapper leaves.

⁴ Greene's rating system; refer to text. Mean separation test run on rank transformed data; untransformed means are presented.

Part II. Materials Tested for Arthropod Management

EVALUATION OF SURFACTANTS AND INSECTICIDES FOR CONTROL OF LEPIDOPTERAN PESTS IN MINNESOTA IRRIGATED CABBAGE, 2001

SpinTor 2SC, (2((6-Deoxy-2,3,4-tri-O-methyl- α -L-mannopyranosyl)oxy)-13-((5-(dimethylamino)tetrahydro-6-methyl-2H-pyran-2-yl)oxy)-9-ethyl 2,3,2a,5a,5b,6,9,10,11,12,13,14,16a,16b-tetradecahydro-14-methyl-1H-as-indaceno(3,2-d)oxacyclododecin-7,15-dione), spinosad, Dow AgroSciences

Activator 90, alkyl polyoxyethylene ether and free fatty acids, Loveland Industries Inc.

Bond, a mixture of 45% synthetic latex and 10% primary aliphatic oxyalkylated alcohol, Loveland Industries Inc.

Kinetic, Polyalkyleneoxide modified polydimethylsiloxane and non-ionic surfactants, Helena LI-700, phosphatidylcholine, methylacetic acid and alkyl polyoxyethylene ether, Loveland Industries Inc.

Silwet L-77, silicone-polyether copolymer, Loveland Industries Inc.