

EVALUATION OF CORAGEN 20SC INSECTICIDE TREATMENTS ON FALL STAKED TOMATOES IN VIRGINIA - 2007

Tom Kuhar and Helene Doughty

Eastern Shore Agricultural Research and Extension Center,
Virginia Tech, Painter, Virginia

Introduction

The tomato Fruitworm, also known as corn earworm and cotton bollworm, is a primary pest of tomatoes. Many insecticide applications are often needed to obtain adequate, continuous control of this lepidopteran pest. To date, the insecticides of choice have been primarily pyrethroids (Warrior ZT, Mustang Max, Asana XL) as well as other broadspectrum insecticides (Baythroid, Capture, Lannate, Spintor). Applying these insecticides as foliar sprays often leads to secondary pest outbreaks due to the destruction of beneficial/predatory insects and undoubtedly increases the financial input for the crop. The objective of this experiment was to evaluate the efficacy of a novel insecticide, Coragen 20SC, applied through drip irrigation in fall tomatoes.

Experimental design & materials

Field Trial:

The experiment was conducted at the Virginia Tech ESAREC, Painter, VA on 'Florida 47' tomatoes. Tomatoes were transplanted on plastic rows on 13 Jun using a commercial transplanter. Plastic rows were equipped with Eurotape drip tape placed on the soil surface delivering $\frac{1}{2}$ g/min/100 ft for emitters spaced 12 in apart. Plants were spaced 18 in. apart. The experiment consisted of 7 treatments arranged in a RCB design with 4 reps. Plots were 1 row x 30 ft long and rows were spaced 6 ft apart. All drip irrigation treatments were applied just before flowering with the use of Chemilizer HN55 chemical injectors. Treatments were made at 10 day interval beginning on 10 Aug (see application schedule in Table 1). Each insecticide amount was diluted in 150 ml of water, poured into the injector's feeding tube and flushed with an additional 300 ml of water. Irrigation events followed each chemical application for approximately one hour. Foliar treatments were applied at 22 GPA with a 2-nozzle boom equipped with D4 tips and 45 cores powered by a CO₂ backback sprayer delivering 40 PSI. Treatment were applied in two passes for each row plot holding the boom sideways to cover each side of the tomato row. A total of 6 foliar applications was made on a weekly basis beginning at flowering (10, 17, 24, 31 Aug and 7, 17 Sep).

Laboratory Assay:

Laboratory assays were concurrently conducted with additional rows planted for the sole purpose of collecting leaves and fruit. 6 rows, 190 ft in length, were set up for a total of 6 treatments (the foliar treatment was omitted from the laboratory assay). All parameters and injection schedule and methods were maintained as described in the above section.

Procedures

Field Trial:

The number of lepidopteran larvae per 2 beat sheets per plot (6 ft) was recorded on 21 Aug (Table 2). On 21 Sep and 2 Oct, 50 fruits of varied sizes were harvested from all plots and assessed for lepidopteran larvae damage as well as stink bug and thrips damage (Table 1).

Laboratory Assay:

Laboratory assays were also conducted on 14 Aug (4DAT), 17 Aug (7DAT), 24 Aug (14 DAT) and 1 Sep (22 DAT) (Table 3). Insecticide efficacy was tested through the use of leaves on all dates while blossoms and fruit were only used on 24 Aug and 1 Sep.

Procedures with leaves: Compound leaves from the upper and lower canopy of 8 different plants were collected from each plot in 2 different locations (back and front) (particular attention was made to not collect the very young, not fully expanded terminals or the oldest, potentially senescing leaves). Leaflets from each treatment were removed and placed in one individual cell tray lined with agar to conserve freshness. Each tray contained 16 cells for a total of 4 trays per treatment (Upper canopy-front; upper canopy-back; lower canopy-front; lower canopy-back). One laboratory-raised tomato fruitworm was placed in each cell. Mortality was recorded at 72 hr.

Procedures with blossoms: 32 blossoms were randomly collected from each treatment (2 per evenly spaced plant). Blossoms were placed in individual cell trays as described above (2 blossoms per cell) with one tomato fruitworm per cell. Mortality was recorded at 72 hr.

Procedures with fruit: 30 small fruit were collected from each treatment row and placed in a container with two tomato fruitworms on 24 Aug and one tomato fruitworm on 1 Sep. Mortality and the presence of scarring and tunneling on the fruit were recorded at 72 hr.

All data were analyzed using analysis of variance procedures. Means were separated using Fisher's LSD at the 0.05 level of significance. Data were sqrt transformed to normalize when necessary.

Results

Lepidopteran pest pressure was moderate to heavy with the percentage of damaged fruit in the untreated checks for both harvest dates being 23.1 and 15.5. There was a significant treatment effect on fruit damage on both harvest dates.

All insecticide treatments except the lowest rate of Coragen applied once and applied twice had significantly less fruit damage than the UTC on the first harvest. The high rate of Coragen applied once and applied twice, the low rate of Coragen applied 3 times and the Mustang max/Spintor foliar rotation provided the best control with no significant differences between them.

On the second harvest, all treatments except the low rate of Coragen applied once had significantly less fruit damage than the UTC.

No significant differences were observed between all treatments and the UTC for the control of stink bugs and thrips on both harvest dates.

No visible sign of phytotoxicity was observed from any treatment.

Similar results were found in the laboratory assays with all treatments providing significant control for the leaves and blossoms up to 66 days after treatment. The insecticide is however not found in the fruit with no significant differences recorded compared to the UTC.

Table 1. Summary of Coragen 20SC Insecticide Treatments applied through Drip Irrigation for the Control of Lepidopteran Pests in Fall Tomatoes, ESAREC, Painter, VA 2007

Treatment	Rate / acre	Application timing	Mean no. lepidopteran larvae* / 2 beat sheets	Harvest 1 - 21 Sep			Harvest 2 - 2 Oct		
				% lepidopteran damage	% stink bug damage	% thrips damage	% lepidopteran damage	% stink bug damage	% thrips damage
UTC			3.3 ab	23.1 a	8.5	3	15.5 a	5.5	0.0
Mustang Max rotated with Spintor 2SC	3.2 or 6 fl. oz	every 7 days	0.5 bc	0.5 c	5.5	6	0.0 b	3.5	0.0
Coragen 20SC	7.67 fl. oz	twice at 10 day interval	0.3 c	2.6 bc	9	3	0.5 b	9.0	0.5
Coragen 20SC	5.07 fl. oz	3 times at 10 day interval	1.0 bc	1.7 bc	6.5	2	1.5 b	9.5	3.0
Coragen 20SC	5.07 fl. oz	twice at 10 day interval	0.3 c	7.1 abc	12	3.5	1.0 b	5.0	0.5
Coragen 20SC	7.67 fl. oz	once	0.0 c	2.7 bc	5.5	5	0.5 b	7.5	1.0
Coragen 20SC	5.07 fl. oz	once	5.0 a	15.2 ab	8.5	4	18.0 a	8.0	0.0

* beet armyworm, yellow-striped armyworm, soybean loopers, tomato hornworms.

Table 2. Summary of Laboratory Assay Results for the Efficacy of Coragen 20SC Insecticide Treatments applied through Drip Irrigation in Fall Tomatoes, ESAREC, Painter, VA, 2007

Leaves:

Treatment	Rate / acre	Application Timing	% dead or down CEW						% defoliation					
			4 DAT	7 DAT	14 DAT	22 DAT	51 DAT	66 DAT*	4 DAT	7 DAT	14 DAT	22 DAT	51 DAT	66 DAT*
UTC			3.1 d	18.8 b	18.8 c	10.1 c	18.8 c	25.0	50.0 a	42.5 a	50.0 a	67.5 a	32.5 a	25.0
Coragen 20SC	7.67 fl. oz	twice at 10 day interval	87.5 ab	75.0 a	100.0 a	97.9 a	100.0 a	100.0	3.3 bc	14.3 b	2.8 b	6.3 cd	0.0 b	0.0
Coragen 20SC	5.07 fl. oz	3 times at 10 day interval	65.6 c	93.8 a	95.3 ab	92.2 a	100.0 a	100.0	2.5 bc	8.8 b	1.6 c	2.5 d	0.0 b	0.0
Coragen 20SC	5.07 fl. oz	twice at 10 day interval	81.3 bc	82.8 a	98.4 ab	79.7 ab	100.0 a	91.0	5.0 b	7.0 b	2.5 bc	11.3 c	0.0 b	0.0
Coragen 20SC	7.67 fl. oz	once	95.3 a	87.5 a	96.9 ab	75.0 ab	79.7 b	59.4	2.5 bc	5.0 b	0.0 c	15.0 bc	2.5 b	5.0
Coragen 20SC	5.07 fl. oz	once	87.5 ab	70.3 a	92.2 b	70.3 b	96.9 a	72.0	1.3 c	14.8 b	2.5 bc	28.8 b	0.0 b	2.5
<i>P-Value from Anova</i>			0	0.0044	0	0	0	na	0	0.004	0	0	0	na

*Upper Canopy leaves only, Data highlighted in yellow denote 2 applications

Blossoms:

Treatment	Rate / acre	% dead or down CEW	
		14 DAT	22 DAT
UTC		0.0	6.3
Coragen 20SC	7.67 fl. oz	81.3	81.3
Coragen 20SC	5.07 fl. oz	87.5	75
Coragen 20SC	5.07 fl. oz	93.8	62.5
Coragen 20SC	7.67 fl. oz	75.0	62.5
Coragen 20SC	5.07 fl. oz	50.0	68.8

Data highlighted in yellow denote 2 applications

Fruit:

Treatment	Rate / acre	% dead or down CEW		% fruit with scarring		% fruit with tunnels	
		14 DAT (2 CEW/ fruit)	22 DAT (1 CEW/ fruit)	14 DAT (2 CEW/ fruit)	22 DAT (1 CEW/ fruit)	14 DAT (2 CEW/ fruit)	22 DAT (1 CEW/ fruit)
UTC		50.0	16.7	86.7	70.0	100.0	86.7
Coragen 20SC	7.67	75.0	36.7	63.3	76.7	93.3	90.0
Coragen 20SC	5.07	55.0	26.7	90.0	53.3	96.7	80.0
Coragen 20SC	5.07	68.3	16.7	70.0	86.7	93.3	86.7
Coragen 20SC	7.67	76.7	20.0	70.0	93.3	86.7	86.7
Coragen 20SC	5.07	58.3	10.0	76.7	76.7	93.3	96.7

Data highlighted in yellow denote 2 applications