Research Report 2016: ***Cabbage maggot control and crop safety in radish***

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Justification for Research

The long and mild growing season of the Pacific Northwest is prime for growing brassica crops, but unfortunately also contributes to nearly constant abundance of Cabbage Root Fly (CRF*, Delia radicum*) and other root fly species. High value crops such as turnip and rutabaga are grown for both food and seed in this region, and there is increasing acreage of canola being planted here as well. Seed treatments against CRF are ineffective, and recent studies have demonstrated that insecticide efficacy of some common chemistries such as bifenthrin have as much to do with placement and timing of the insecticide as toxicity to cabbage maggot. Many growers report that chemical control of CRF is nearly impossible, and options continue to be further limited with new EPA regulations on chlorpyrifos. Fipronil, cyazypyr, and clothianidin all have proven to be marginally effective at reducing CRF damage, but potential for injury to salmonids have so far limited wide-scope registration.

The objective of this study was to screen potential alternatives to chlorpyrifos, and to investigate alternative methods of timing and placement on CRF activity in fresh market radish.

Procedures

Red radish (var. Solito) was planted in single rows in 6.6 ft wide beds, and measured 20 ft long. Each plot was separated by 3 ft. buffers. Seed was pre-treated with Thiram, a non-systemic dimethyl dithiocarbamate fungicide. Radish was chosen as a good preliminary test crop due to the short growing season and ability to plant multiple trials within the time frame of spring CRF activity. CRF flights were monitored via yellow pan traps placed at each location. Traps were baited with a volatile lure known to enhance CRF capture at pan traps.

Insecticide treatments listed in Table 1 were applied with a backpack sprayer equipped with 3-XR8003 flat fan nozzles, calibrated to deliver 20 GPA. Foliar applications were made 1WAP, after 80% of the crop had emerged, and in-furrow products (treatments 4 and 5) were applied at plant in a neighboring field location. Fields were planted 20 days apart; successive plantings is the current standard for fresh market radish, and ensures a steady supply. Evaluations of root maggot pressure was conducted at 11 and 20DAP at each site, and was done by pulling, rinsing, and visually examining 10 plugs from within the treated area ("IN"), and 10 plugs outside of the treated area ("OUT"), within each plot. Because there were buffers on each end of each plot, the OUT data were intended as in-situ controls. Crops were harvested 32DAP at both field locations, which coincided with grower harvest. At harvest, all radishes were pulled from within a 0.25m2 quadrant and refrigerated for subsequent analysis.

Table 1. Treatments applied to direct seeded radish near Aurora, OR. 2016.

TX	Product name (active ingredient, registrant)	MoA	Active ingredient	Application placement/type
1	Torac (tolfenpyrad, Nichino)	21	tolfenpyrad	broadcast
2	Mustang Maxx (zeta cypermethrin, FMC)	3	Z-cypermethrin	broadcast
3	Danitol (fenpropathrin, DuPont)	3	fenpropathrin	broadcast
4	Verimark (cyantraniliprole, DuPont)	28	cyantraniliprole	in-furrow
5	Deadlock DLG* (zeta cypermethrin,Wilbur Ellis)	3	Z-cypermethrin	in-furrow
6	Capture LFR (bifenthrin, FMC)	3	bifenthrin	broadcast
8	Radiant (spinetoram, Dow)	5	spinetoram	broadcast
9	Asana (esfenvalerate, DuPont)	3	esfenvalerate	broadcast
10*	Untreated check – whole plot. Additionally, UTCs were left at each 3 ft end of each plot	--	--	--
11	Treated check - standard grower practice = Lorsban on SURFACE just after planting, then Asana + others every week or so	--	chlorpyrifos, esfenvalerate rotation	broadcast

* A true, separate UTC was only possible at the "diamond" field (2nd planting).

Results

Number of roots at harvest was significantly higher in TX 10 than any other treatment, including the grower check ($F=1.85$, $p<0.11$). However, root weight did not differ between treatments.

CRF at harvest (as determined by percent roots infested / total roots per plot) was lowest in plots receiving in-furrow treatments at planting (TX 4 and 5, FIG. 1). In-furrow treatments of cyantraniliprole and z-cypermethrin are not currently registered in radish, but clearly show promise and necessitate further testing. Lorsban in-furrow is registered, but was not conducted as part of this preliminary trial.

Although not shown in FIG. 1, these results hold for in-situ controls ("OUT", see narrative above), with CRF pressure averaging 15% in treatments 4 and 5, and 36% in all other plots. It is unclear whether buffers were not precisely adhered to (drift, error in overspraying, etc.), or if the effect of the chemistry was acting beyond the theoretical 3 ft. unsprayed area.

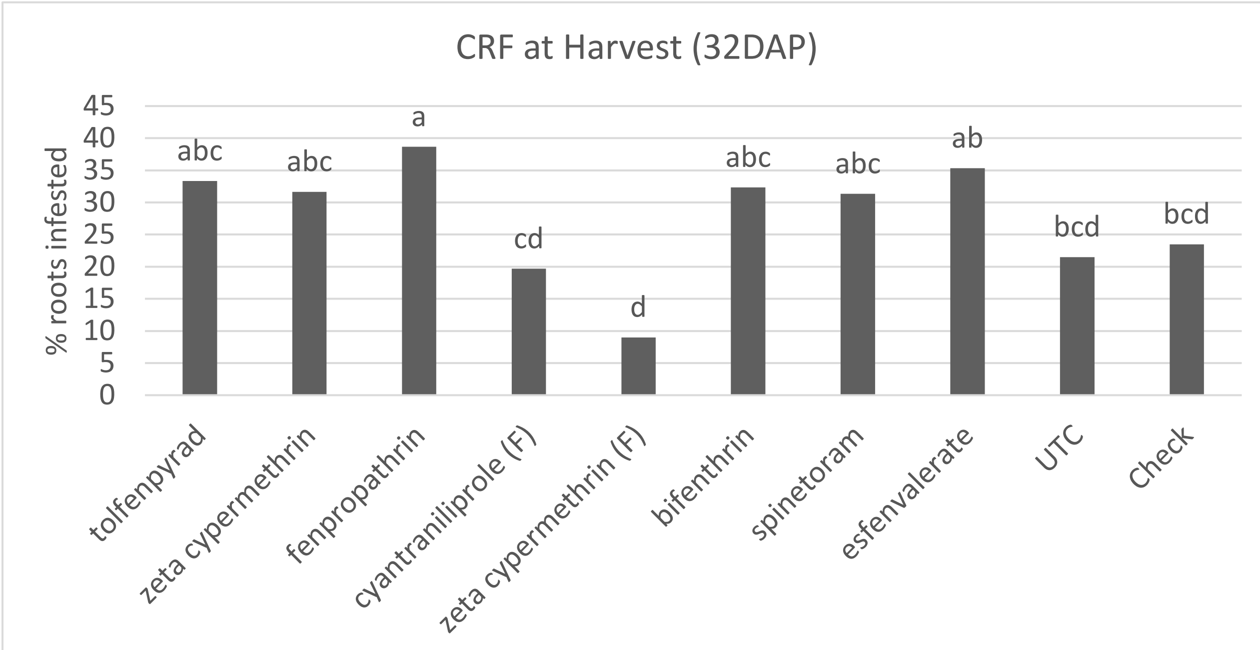

FIGURE 1. Treatments applied to direct seeded radish near Aurora, OR. 2016. In-furrow treatments (F) were applied at-plant, others were broadcast over the top 1WAP. Check refers to current grower practice of a surface application of chlorpyrifos at plant, followed by broadcast rotation with esfenvalerate and others.

FIGURE 2. Direct seeded radish is grown in 6.6 ft beds, and is harvested by hand. These photos show the rapid crop progression from time of application to subsequent evaluations prior to harvest (L to R: 8-APR, 14-APR, 19-APR).