OVERVIEW OF OUR FIRST SEASON'S EXPERIENCES TO CHEMICALLY MANAGE THE SPOTTED WING DROSOPHILA THROUGH LAB AND FIELD RESEARCH ON RED RASPBERRY IN WESTERN WASHINGTON

L. K. Tanigoshi, B. S. Gerdeman and G. Hollis Spitler
Washington State University
Mount Vernon Northwestern Research and Extension Center
Mount Vernon, WA 98273-4768
360-848-6152
tanigosh@wsu.edu, mitehunter1@hotmail.com, spitler@wsu.edu

Clean-up application prior to machine harvest

Following a clean-up spray on a mature 'Meeker' field on 24 June 2010 by a Skagit County grower using Brigade® WSB (bifenthrin) at 0.1 lb(AI)/acre and fifty ripe berries were sampled after 1 and 3 days posttreatment. These fruits were isolated individually in 2 oz condiment containers and mortality measured 24 hours later. On 5 July 2010, a Whatcom County grower applied a tank mix of 0.1 lb(AI)/acre Tundra® (bifenthrin) and 1.5 lb lb(AI)/acre Malathion® 8EC in 135 gallons/acre, 350 psi and 3 mph with a 300 gallon hydraulic sprayer. Fifty ripe berries were sampled after 1, 3 and 8 DAT and isolated in ventilated condiment containers as above. Both grower applied fields indicated precision applications with our field-based bioassays measuring 70 and 100 percent mortality for the Skagit County site and 94, 98 and 70 percent mortality for the Whatcom County site.

Laboratory 5 sec fruit dip bioassay procedure

Months of lab conducted dip bioassays with multiple iterations of arena designs and ventilation systems, have provided us with a reliable laboratory protocol method which provides a natural environment for the very active and vagile SWD adults during testing when confined to 2 and 4 oz condiment arenas. Based on fall, 2009 studies, we have focused our field efficacy trials on 11 different insecticides. These include the OP Malathion, three pyrethroids (Brigade, Asana®, Mustang Max), three neonicotinoids (Provado®, Actara®, Assail®), the spinosyn Delegate®, the anthranilic diamide (Altacor®) and two experimental combinations of a neonicotinoid and pyrethroid (Endigo, Leverage). The pyrethroids, Malathion, Delegate and both experimental combination formulations consistently performed better than the other compounds as contact and ingestion toxicants (Table 1). The use of adulticidal neonicotinoids, although slow, is justified due to their potential curative activity, targeting SWD eggs and larvae inside the red raspberry that could potentially compliment or synergize their combination with other mode of action compounds.

Table 1. Red raspberry fruit dip bioassay

		% Mortality	
Treatment/formulation	Rate product/acre	1 DAT	7 DAT
Brigade EC	6.4 fl oz	100a	80ab
Asana XL	9.6 fl oz	100a	80ab
Mustang Max EC	4 fl oz	100a	100a
Provado 1.6F	8 fl oz	100a	80ab
Actara 25WG	3 oz	20b	60abc
Assail 30SG	5.3 oz	80a	40bcd
Delegate WG	6 oz	100a	60 abc
Malathion 8EC	64 fl oz	100a	80ab
Altacor 35%	4.5 fl oz	0	20cd

Leverage 2.7SE	5.1 fl oz	100a	20cd
Endigo ZC	4.6 fl oz	100a	100a
UTC		20b	0

Means within columns followed by the same letter are not significantly different by Fisher's protected LSD, $P<0.05$, PRC ANOVA SAS.

Precision applications of insecticides in the field

Because of the anticipated risk from SWD infestations, commercial growers were hesitant to collaborate with our plans for large-sized research plots in 2010. As a result, field trials were performed in the WSU NWREC red raspberry block on 10 foot long plots arranged in a RCBD. For these tests, mature 'Meeker' were treated with a CO^2 backpack sprayer equipped with a 4.5' boom, and 4 nozzles (8002vs) at 60 psi and 110 gpa. The adjuvant R-56 was used at 0.5% v/v with all treatments except Altacor. The lab bioassay treatments mentioned above, were randomly replicated four times to sections of row showing good clusters of ripening red raspberries. Treatments were applied on 20 July. Ripening fruit from each flagged sector was selected after 1 and 6 DAT. Five berries from each plot were individually placed in 2 oz ventilated condiment arenas and infested with five lab reared SWD adults and evaluated after 24 hours. Results of field-aged residues on red raspberry fruit were extremely variable. Perhaps residue persistence was affected someway by the late maturity of these fruit and intermittent summer rainfall. Adult mortality trends for field aged residues indicated similar trends shown from precision fruit dip bioassays.

Fall red raspberries were treated on 9 September with eight registered insecticides on the WSU NWREC plots with a CO^2 backpack sprayer as above. Treatments were replicated three times and five fruits were randomly collected from each plot and infested with five SWD adults from the WSU NWREC laboratory colony. Malathion (100%) and Mustang Max (73%) provided quick knockdown at 1 DAT while Delegate showed 67% and 80% at 7 DAT. The generally slow acting Altacor provided 60% mortality at 1 DAT and Brigade WSB unexplainably performed very poorly with only 13% and 7% mortality after 1 and 6 DAT. The field aged contact activity of the neonicotinoids showed modest toxicity for these late season red raspberries.

Curative activity of neonicotinoids on SWD larvae

Maturing red raspberry fruit were taken from fall bearing varieties grown at the WSU NWREC on 26 August 2010. Fifteen berries per treatment were dipped for 5 seconds in aqueous solutions of Actara, Assail, Provado, experimental Scorpion® and UTC. These fruits were held for 15 days to measure number of fruit infested with larvae or emerged adults. Compared with the UTC which yielded 78% infested fruit, the bioassay indicated curative control of SWD at 36%, 7%, 0 and 7% for Actara, Assail, Provado and Scorpion, respectively.