Section VIII.
Mites & Sap-sucking Insects

DEVELOPMENT OF A NEW INSECT GROWTH REGULATOR (IGR) BIOASSAY TO MONITOR FOR RESISTANCE IN PEAR PSYLLA *CACOPSYLLA PYRICOLA*.

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This research project was designed as a laboratory study of the susceptibility of pear psylla *Cacopsylla pyricola*. It consisted of two major objectives. The first was to develop a bioassay to assess the susceptibility of pear psylla to various insect growth regulators (IGRs). The other was to implement this bioassay on pear psylla using various IGRs under laboratory conditions to establish baseline levels of susceptibility of pear psylla.

The bioassay was developed using pyriproxyfen (Knack) a juvenile hormone (JH) analog. Once developed, the bioassay was used to discover the baseline levels of susceptibility of pear psylla in the laboratory. These levels can be used as a reference point to application levels and their affect. They can also be used in comparison experiments to determine the rates and quantity of resistance to these particular pesticides. The other products that were examined using the newly developed IGR bioassay were two additional JH analogs, fenoxycarb (Comply) and CGA59205 (Diofenalon), and three chitin inhibitors, diflubenzuron (Dimilin), buprofezin (Applaud) and novaluron (Rimon).

Unexposed adult psylla were collected from an untreated orchard at the WSU Tree Fruit Research and Extension Center. These adults were sexed into a one to one sex ratio. Fifty adults were placed into each cage along with untreated pear shoots. This was done with 4 to 5 separate cages for each bioassay. After 24 hours, additional shoots were treated by dipping them into different concentrations (ppm) of the IGRs. The treated shoots were then placed into the cages. The psylla naturally migrated from the untreated to the treated shoots as the leaves on the untreated shoots wilted. After 72 hours of oviposition, the adult psylla were removed and an initial egg count was performed. Ten days later, the final egg count was taken. Mortality was assessed by counting the unhatched eggs and dead psylla nymphs. The results of these counts were examined using probit analysis.

There were from three to six different replicates run for each IGR that was examined. Within each bioassay there were three or four different concentrations, in parts per million, used as treatments. There was also a control used that was treated with tap water.

The goals of the IGR bioassay development were to achieve a probit slope > 1, maintain a low level of variability between the replicates, minimize control mortality and obtain acceptable repeatability amongst the bioassays. Mean slopes of the bioassays for each insecticide were greater then 1. The level of variability among the bioassay replicates was found to be acceptable among the chitin inhibitors. However, with JH analogs a definite pattern emerged. The slopes of the response curve analyzed by the probit analyses were discovered to decrease over time, indicating an increase in the variation of response over time (Fig. 1). Control mortality for all bioassays was at acceptable levels of < 20%. The IGR bioassays were proven to be repeatable from one bioassay to the next, as demonstrated by the LC values (Fig. 2).

The achievement of the overall goals of this study will be increasingly important as IGRs are used more in the future. The bioassay developed will be used to establish baseline levels of susceptibility for other IGRs that have the potential for psylla control. These baseline levels of susceptibility along with those established for the IGRs looked at in this study will be important in resistance risk assessments run in the future. By comparing levels of susceptibility in natural populations to these baseline levels pear system pest managers will be able to make better resistance management decisions.

Future studies will include looking at the effects of both leaf age and female adult psylla age on the effectiveness of the IGRs examined in this study. These are both suspected to have potential effects since they were not as controlled as ideally they could have been in this particular study.

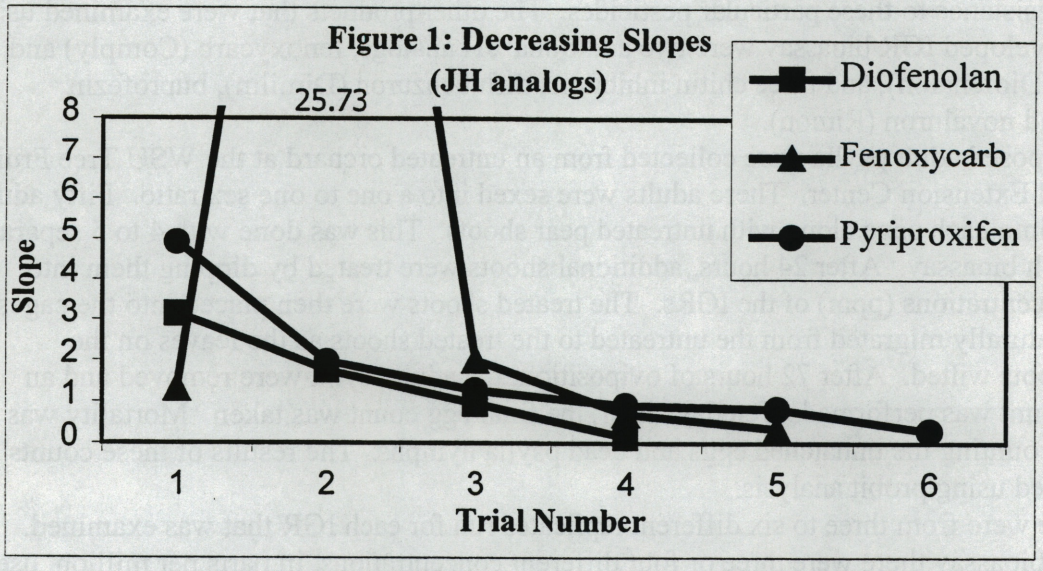

Figure 2	Pooled LC's			Mean LC's		
	LC10 (c.i.)	LC50 (c.i.)	LC90 (c.i.)	LC10 (c.i.)	LC50 (c.i.)	LC90 (c.i.)
Pyriproxyfen	0.66	9.28	130.34	1.04	24.64	185.13
	(.089-1.54)	(5.65-16.72)	(50.29-1290.61)	(0.5)	(15.9)	(119.4)
Fenoxycarb	12.50	46.76	174.89	12.99	91.71	323.19
	(1.8-45.6)	(14.72-103.20)	(30.21-1421.95)	(6.6)	(36.4)	(161.1)
Diofenolan	2.01	22.95	262.27	3.41	24.94	395.65
	(0.64-8.32)	(6.39-83.74)	(84.69-963.42)	(1.6)	(11.1)	(341.5)
Diflubenzuron	4.43	123.60	3444.97	37.60	69.58	135.10
	(0.99-10.13)	(19.99-716.88)	(1019.3-10065.8)	(28.5)	(42.6)	(55.4)
Buprofezin	4.25	78.48	1449.11	7.92	66.21	837.66
	(.04-10.84)	(41.52-949.87)	(275.2-1.4x10′)	(3.2)	(18.7)	(385.2)
Novaluron	4.58	27.98	170.79	5.09	37.46	492.59
	(1.03-14.27)	(9.60-68.33)	(11.9-1679.3)	(1.5)	(10.2)	(315.9)