



# Ornamental Horticulture Program Research Project Sheet

<http://ir4.rutgers.edu/Ornamental/ornamentalProjectInformationSheets.cfm>

**Project Name:** White Grub & Root Weevil Efficacy

<b>New</b>	<b>Ongoing</b>	<b>Completed</b>	X	<b>Duration if ongoing or completed:</b>	2004-2009, 2010, 2012
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**Project Description:**

White grubs and root weevils are cryptic pests in that most of their life cycles are spent below the surface of the soil feeding on plant roots. Often times, the adults are only visible during mating periods unless growers expose the roots to determine the cause of unthrifty plants. Preventative applications are timed for during peak adult flights since materials tend to be more efficacious on younger instars. This project arose from the need to screen a wider array of materials to broaden the available MOA.

**Research Project Abstract (if available):**

**Abstract from 2014 Coleopteran Efficacy Summary**

Collectively, managing coleopteran insects can be challenging because the adult and larval stages may both cause damage and sometimes occur on different hosts or on different plant parts. While organophosphates, pyrethroids, and neonicotinoids can provide good to excellent control of coleopteran insects, not all products work equally well in all situations. Treatments for borers are very different than treatments targeting white grubs. Developing newer classes of chemistry are important to reduce the environmental consequences and to minimize the development of resistance. Starting with the 2004 Annual Workshop, screening a number of products to manage coleopteran insects became one of the high priority projects for entomology. From 2005 through 2013, 57 products representing 37 different active ingredients were tested for management of adult and larval stages of coleopteran insects. In addition, 10 products representing 10 active ingredients were evaluated for lepidopteran clearwing borers in 2008 and 2009. These products represented both biological and chemical tools. Some products were already registered but more data were needed or they were considered standards to measure the level of efficacy achieved with other materials. Other products were in development but have not yet been registered with the EPA. While a number of coleopteran and lepidopteran species were tested, only enough experiments were able to be completed on the coleopteran species black vine weevil, Japanese beetle, oriental beetle and viburnum leaf beetles to recommend actions to register or amend labels for these pests.

**Target Species (Phytotoxicity, or common and Latin name of arthropod, pathogen, weed):**

Black Vine Weevil (*Otiorhynchus sulcatus*)                      Strawberry Rootworm (*Paria fragariae ssp. Fragariae*)  
 Oriental Beetle (*Anomala orientalis*)

**Target Crops (list tested crops if ongoing or completed project)**

Arborvitae ( <i>Thuja sp.</i> )	Rose ( <i>Rosa sp.</i> )
Azalea ( <i>Rhododendron sp.</i> )	Spruce, White; Cat ( <i>Picea glauca</i> )
Dogwood, Kousa ( <i>Cornus kousa</i> )	Stonecrop ( <i>Sedum spurium</i> )
Holly ( <i>Ilex sp.</i> )	Strawberry (Non-Bearing) ( <i>Fragaria sp.</i> )
Lilac, Common ( <i>Syringa vulgaris</i> )	Turf (Turf)
Lilac ( <i>Syringa chinensis</i> )	Yew ( <i>Taxus media</i> )
Oak, White ( <i>Quercus alba</i> )	Yew ( <i>Taxus sp.</i> )
Rhododendron ( <i>Rhododendron sp.</i> )	

**Target Product(s) (list tested products or numbered compounds if ongoing or completed project)**

A16901B 45WG	Celero 16WSG	Hachi-Hachi	Met52	Safari 20SG
Acelepryn 1.67	Discus	Hexacide	NI-CH001	Safari 2G
Arena 50WDG	Dylox 80	Mach 2 Liquid	Ornazin 3%EC	Talstar Flowable
AzaGuard	Flagship 0.22G	Marathon 1% G	Orthene TTO 97	Insecticide/Miticide
BAS 320i	Flagship 25WG	Marathon 60WP	Precise Acephate	Talstar NG
BotaniGard ES	Grandevo	Marathon II		TickEx EC

Product Registration and Research Status			
	Fully Screened (also includes standards)	Partially Screened through IR-4 <sup>1</sup>	Need Data Across Species ?
Labeled Generally & Commercialized	Discus <b>Safari 20SG *</b> Safari 2G		Grandevo
Labeled Generally But NOT Commercialized			
Labeled for Specific Insects & Commercialized	Flagship 0.22G <b>Flagship 25WG *</b> Marathon 1% granular Marathon 60WP Marathon II Orthene Talstar		<b>Met52 *</b>
Labeled for Specific Insects but NOT Commercialized			
Not yet registered or Labeled		A16901B 45WG	Hachi-Hachi Hexacide NI-CH001 Ornazin TickEx
No longer available for development		<b>Acelepryn *</b> BAS 320i <b>Celero 16WSG *</b>	Mach 2 Liquid
* IR-4 Data contributed to registration decision – either adding pest to label or not pursuing further research			
1 At least one species screened fully			

Project Pros	Project Cons
<ol style="list-style-type: none"> <li>1 A new active ingredient is available in new MOA class</li> <li>2 Regulatory concerns</li> <li>3 Not many options</li> <li>4 Grubs challenging for Christmas tree growers especially on sandy soil (Pacific Northwest)</li> <li>5 Need for mating disruption products for beetles (oriental beetle MD is working well)</li> </ol>	<ol style="list-style-type: none"> <li>1 Many classes are currently available for growers</li> </ol>

IR-4 Efficacy Trials to Date
<p>Average rating on a scale of 1 – 5 with 1 = 0 to about 50% efficacy (not effective) and 5 = 95 to 100 efficacy (very effective); minimum to maximum rating; number of trials (See table on next page). For product/insect combinations that are blank, IR-4 has not screened this combination.</p> <p>'Labeled' indicates that this insect species or genera is listed on the label. A rating of 2 or lower is considered unacceptable efficacy (<i>red text</i>). A rating of 3 or higher is considered commercially acceptable (black text). Non-labeled, completed product/insect combinations (3 or more trials) with an average rating of 3 or higher are highlighted with <i>green text</i>. For insect/product combinations that are blank, IR-4 has not screened this combination.</p>

Product (Active Ingredients)	Black Vine Weevil ( <i>Otiorhynchus sulcatus</i> )	Oriental Beetle ( <i>Anomala orientalis</i> )	Strawberry Rootworm ( <i>Paria fragariae ssp. Fragariae</i> )
A16901B 45WG (Cyantraniliprole + thiamethoxam)		4.5 (4 - 5) n2	
Acelepryn (aka DPX-E2Y45) 1.67 (Chlorantraniliprole)	3.4 (1 - 5) n8	4.2 (3 - 5) n6 Labeled	
Arena 50WDG (Clothianadin)	3.0 (1 - 5) n2		
AzaGuard (Azadirachtin)		1.0 (1 - 1) n1	
BAS 320i (Metaflumizone)	5.0 (5 - 5) n5	2.3 (1 - 5) n3	
BotaniGard ES (BioWorks) (Beauveria bassiana)	1.0 (1 - 1) n2		
Celero 16WSG (Clothianidin)	4.0 (1 - 5) n4 Labeled	3.0 (3 - 3) n2 Labeled	
Discus (Imidacloprid + cyfluthrin)	1.0 (1 - 1) n1 Labeled	2.7 (1 - 5) n3 Labeled	
Dylox 80 (Dimethyl)		4.0 (4 - 4) n1 Labeled	
Flagship 0.22G (Thiamethoxam)		1.8 (1 - 3) n4 Labeled	
Flagship 25WG (Thiamethoxam)	3.0 (1 - 5) n2 Labeled	3.3 (1 - 5) n8 Labeled	1.0 (1 - 1) n1
Grandevo (MBI 203 DF) (Chromobacterium subtsugae NRRL B-30655)		1.0 (1 - 1) n1	
Hachi-Hachi (Tolfenpyrad)	1.0 (1 - 1) n1		
Hexacide (Rosemary Oil)		1.0 (1 - 1) n1	
Mach 2 Liquid (Halofenazide)	1.0 (1 - 1) n1		1.0 (1 - 1) n1
Marathon 1% granular (Imidacloprid)	3.0 (3 - 3) n1 Labeled		
Marathon 60WP (Imidacloprid)			1.0 (1 - 1) n1
Marathon II (Imidacloprid)		4.0 (4 - 4) n1 Labeled	
Met52 (Metarhizium anisopliae strain F52)	1.2 (1 - 2) n5 Labeled	1.0 (1 - 1) n1	
NI-CH001 (NI-CH001)		1.0 (1 - 1) n1	
Ornazin 3%EC (Azadirachtin)			1.0 (1 - 1) n1
Orthene TTO 97 (Valent) (Acephate)			5.0 (5 - 5) n1 Labeled
Precise Acephate (Acephate)	1.0 (1 - 1) n1 Labeled		
Safari 20SG (Dinotefuran)	3.4 (1 - 5) n10 Labeled	5.0 (5 - 5) n3 Labeled	
Safari 2G (V-10112 2G) (Dinotefuran)	3.0 (1 - 5) n2 Labeled	1.0 (1 - 1) n1 Labeled	
Talstar Flowable Insecticide/Miticide (Bifenthrin)			4.0 (4 - 4) n1
Talstar NG (Bifenthrin)	2.3 (1 - 5) n3 Labeled	5.0 (5 - 5) n1 Labeled	
TickEx EC (Metarhizium anisopliae)		1.0 (1 - 1) n1	

Soil Applied Insecticides* (active ingredients)	IRAC Class	Registered Use Site(s)	REI	Efficacy					
				Asiatic Garden Beetle **	Black Vine Weevil	European Chafer **	Japanese Beetle	May/June Beetle **	Oriental Beetle
Acephate 97, Precise, etc. (acephate)	1B	G, N	24 h	?	P	?	P	?	?
Azatin Molt-X, etc. (azadirachtin)	18B	G, I, N, S	4 h	?	?	?	?	?	P
BotaniGard, Naturalis L, etc. ( <i>Beauveria bassiana</i> )	M	G, I, N, S	4 h	?	P	?	?	?	?
Discus Tablet (cyfluthrin+imidacloprid)	3A + 4A	N	12 h	?	P	?	?	?	P
Duraguard, Dursban (chlorpyrifos)	1B	G, N	24 h	?	?	?	?	?	?
Ecotrol (rosemary and peppermint oils)	?	G, N	0 h	?	?	?	?	?	?
Flagship 25WG (thiamethoxam)	4A	G, L, N, S	12 h	P	P-F	P-E	P-E	E	P-E
Grandevo DF	-	G, N	4 h	P	?	G	G	?	P
Marathon, etc. (imidacloprid)	4A	G, I, N	12 h	P-E	P	G-E	G-E	P-E	F-E
Millenium ( <i>Steinernema carpocapsae</i> )	-	G, I, N	0 h	?	?	?	?	?	?
Safari 20SG (dinotefuran)	4A	G, N	12 h	?	P-E	?	P-E	?	P-E
Scimitar GC (lambda-cyhalothrin)	3A	G, N, S	24 h	?	?	?	?	?	?
Talstar, etc. (bifenthrin)	3A	G, I, N	12 h	?	P-E	?	P	?	E
Experimental Products									
A16901 (cyantraniliprole+thiamethoxam)	28 + 4A	TBD	12 h	?	?	?	?	?	F-E
Acelepryn,DPX-E2Y45 (chlorantraniliprole)	28	TBD	4 h	G-E	P-E	P-E	P-E	E	P-E
Arena, Celero (clothianidin)	4A	TBD	12 h	E	P-E	P-E	P-E	P	P-E
BAS 320i (metaflumizone)	22B	TBD	?	?	E	?	P	?	P-E
Hachi-Hachi EC (tolfenpyrad)	21A	TBD	12 h	?	P	?	?	?	
Hexacide (rosemary oil)	-	TBD	0 h	?	?	?	?	?	P
Mach 2 (halofenozide)	18	TBD	12 h	?	P	F-E	P-E	P	F-E
Met 52, Tick Ex ( <i>Metarhizium anisopliae</i> F52)	-	TBD	4 h	?	P	?	P	?	P
NI-CH001	-	TBD	?	?	?	?	?	?	P
Venerate, MBI-206 ( <i>Burkholderia</i> sp. strain A396)	-	G, N	4 h	?	?	?	?	?	?

Registered Use Sites: G = Greenhouse; L = Lath House; I = Indoors; N = Nursery; S = Shade House; TBD = To Be Determined

Application Method: D = Drench; S = Spray

Efficacy: P = Poor (< 70% control); F = Fair (70% to 85% control); G = Good (85% to 95% control), E = Excellent (>95% control) of larvae approximately 1-4 months after applic.

\* Soil applied through Drench, Soil incorporation, Broadcast and irrigated, etc.

\*\* Efficacy data from AMT turf trials

Residual Control taken from product technical and label information recommendations on earliest application intervals; Efficacy taken from 15 IR-4 efficacy trials and 45 AMT turf trials; No biological control agent for grubs and root weevils listed in Koppert and Biobest websites.