RESEARCH REPORT TO:

THE AGRICULTURAL RESEARCH FOUNDATION FOR 2005

TITLE: **VEGNET ~ Regional Pest Monitoring**

RESEARCH LEADER: Daniel McGrath

PHONE NUMBER: 503-931-8307
E-MAIL: daniel.mcgrath@oregonstate.edu
FAX: 541-967-9169
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COOPERATORS: Cindy Ocamb, Bob McReynolds, Alex Stone, and Ed Peachey, OSU
Manuel Silveira, NORPAC, Jayson White and Neil McInnes, National Frozen Foods, Kurt Metzger and Joh Brown, Truitt Bros.

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Part One – Bean Mold Project

Introduction

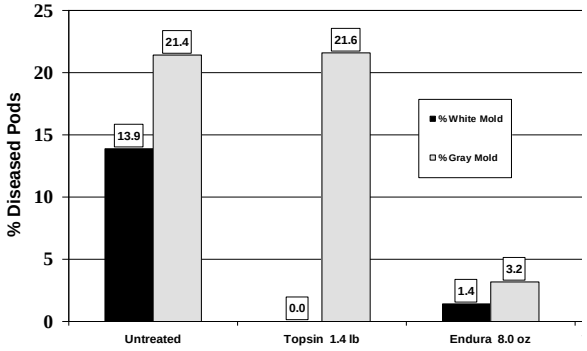
The Willamette Valley processed vegetable industry in cooperation with the Oregon Processed Vegetable Commission, Oregon State University, and the American Farmland Trust formed a Bean Mold Task Force in the spring of 2005 to respond to the loss of Ronilan fungicide for control of white (*Sclerotinia sclerotiorum*) and gray mold (*Botrytis cineraria)* on snap beans. Use of Ronilan will not be permitted in the 2006 and will be removed from the market place. The work of the thirty five member task force focused on two questions.

- **What is an effective alternative to Ronilan for control of gray and white mold in snap beans when mold pressure is severe?**

- **When can we use a less expensive single fungicide application without putting the bean crop at significant risk?**

Alternative materials such as Topsin control white mold but fail to control gray mold (Figure One). Gray mold has developed resistance to Topsin. When we add Topsin and Endura together, we get excellent control of both gray and white mold.

Figure One – Impact of Fungicide Tank Mix on White Mold in Snap Beans



All fungicide treatments were applied twice
Cornell, New York, Dillard, 2004

Topsin, Endura, and Rovral are primarily protectants. Unlike Ronilan which has a curative effect, the alternative fungicides must be on the blossom at the moment of infection. This has a significant effect on application timing. The alternative fungicides must be applied earlier than Ronilan.

In an experiment conducted in New York, white mold spores were applied at first blossom (Figure Two). Either Ronilan or Topsin were applied at day zero (inoculation day) or two, four, or six days later. The Ronilan was effective even when it was applied six days after blossom infection.

Topsin was effective at controlling white mold when it was present on the blossoms at the time of infection (day 0). Topsin applied several days after infection was not effective because it did not cure the infected blossoms. Using currently available alternatives to Ronilan, the fungicides must be applied much earlier because they do not have the "kick back" of Ronilan (Figure Three).

Figure Two – Impact of Application Timing

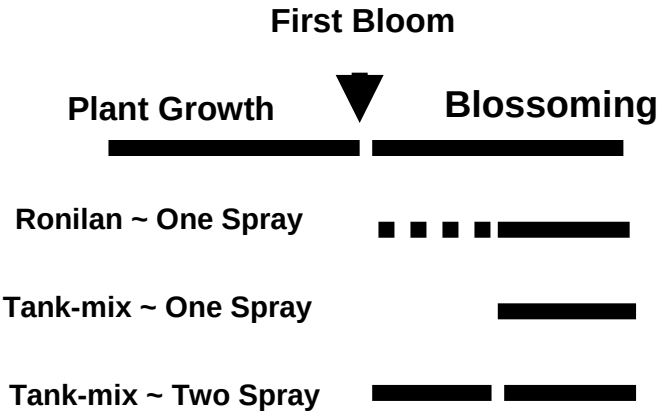
Treatment	Spray Day	%White Mold
Ronilan	**0**	**1.6 fg**
	2	**0.6 g**
	4	**2.2 fg**
	6	**3.0 efg**
Topsin	**0**	**1.2 fg**
	2	**2.8 fg**
	4	**7.2 def**
	6	**15.6 bc**
Untreated		**33.4 a**

Beans were inoculated with white mold spores on day zero,
Ludwig, 1989

If mold infections begin at first blossom, a two spray program is required. In a two spray program, for example, the first fungicide application is made with ten percent of the plants have one blossom open (popcorn stage). The second application is made five to ten days later.

Fungicide trials conducted in other states in years past helped the task force to develop a list of possible treatments that were tested during the 2005 growing season.

Figure Three



Operating assumptions

1) Topsin is provides excellent control of white mold but poor control of gray mold
2) Rovral and Endura provide moderate to good control of gray and white mold, but their performance has been inconsistent across trials, crops, and production areas.
3) A tank mix of Topsin plus either Rovral or Endura is effective at controlling both white and gray mold.

Treatments

1) Ronilan EG @ 1.0 lb product/A

2) Topsin 4.5 FL @ 28 fl oz product plus Rovral 4F @1.5 pints product/A

3) Topsin 4.5 FL @ 28 fl oz product plus Endura 70WP @ 8.0 oz product/A plus methylated seed oil @ 0.5%

4) Topsin 4.5 FL @ 40 fl oz/A (single application)

The tank mixes were applied either once or twice with the first spray at first bloom. Single applications of Ronilan, Topsin, and the two tank mixes were applied once at the rates listed above, five to seven day after first bloom.

Spray Timing

Two Spray Program:

First spray applied when ten percent of the plants (1 out of 10) have a single open bloom ("popcorn")

Second spray applied 5 to 7 days later (Topsin PHI = 14 days)

One Spray Program:

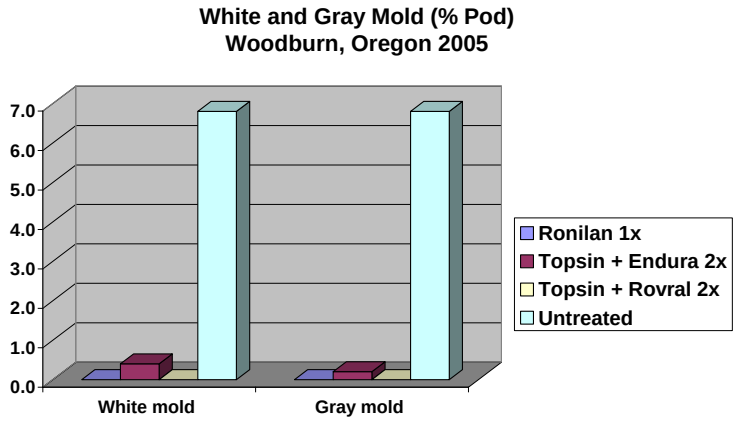
Single spray applied 5 to 7 days after popcorn

Results - Oregon Fungicide Trials 2005

Oregon State University working closely with the bean mold task force conducted thirty three fungicide trials during the 2005 growing season. The fungicide trials were conducted at three levels of resolution. Four trials involved detailed variations in fungicides, fungicide combinations, rates, spray timings, adjuvants, etc. Eighteen replicated small plot trials were conducted on farms with registered materials. They were focused on Topsin used in combination with either Rovral or Endura in a one or two spray program. Finally, there were eleven grower managed large plot simple paired comparisons of Ronilan versus Topsin/Rovral or Topsin/Endura in one or two spray programs.

- **Four detailed, replicated small-plot spray trials (Ocamb et al)**
- **Eighteen on-farm, replicated small-plot spray trials (McGrath et al)**
- **Eleven on-farm un-replicated large strip paired comparisons (Stone et al)**
- **Thirty-five grower and industry cooperators**

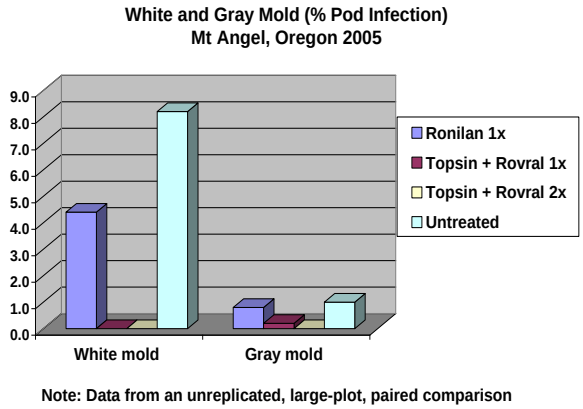
Figure Four



Note: Data from an unreplicated, large-plot, paired comparison

Figure Four shows data from a large plot, unreplicated comparison. In this experiment, either Topsin/Endura or Topsin/Rovral tank mixes provided excellent control of both white and gray mold, even though the mold pressure was severe. Figure Five shows data from another large plot, unreplicated comparison. In this trial, two applications of Topsin/Rovral were more effective than a single application of Ronilan. There did not appear to be a difference between a one or two spray program using the tank mix.

Figure Five



Note: Data from an unreplicated, large-plot, paired comparison

Figure Six

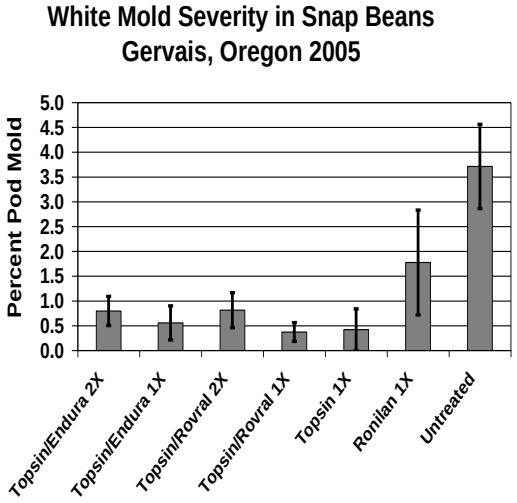
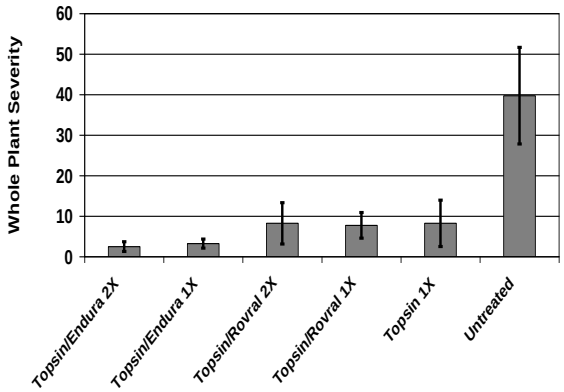


Figure Seven - White Mold Control in Snap Beans
Silverton, Oregon 2005



Figures six and seven show data from replicated, randomized, complete block design trials that validate the results of the large plot comparisons for white mold.

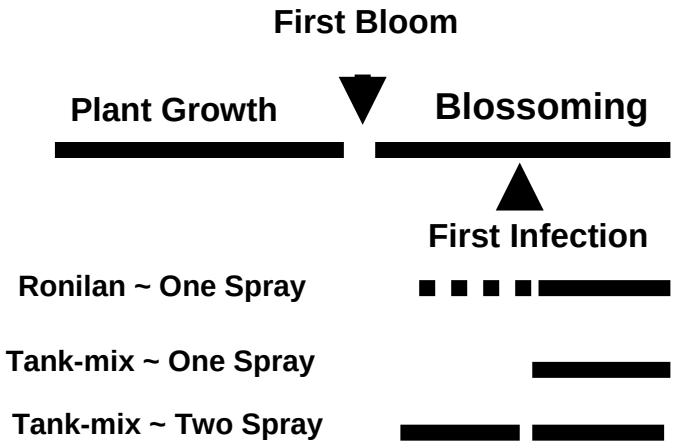
- Two applications of a tank mix of either Topsin/Endura or Topsin/Rovral consistently provides excellent control of white mold.
- In some cases, a single application of either tank mix is adequate to control white mold.
- In some cases, a single application of Topsin alone controls white mold.

So the question that rises is, "Do we need to spray twice?"

The answer is it depends on when the mold develops in a field. If the weather is dry and the canopy is open prior to first bloom, mold may not develop for several days following first bloom (Figure Eight).

Mold may not develop until the canopy closes. In this case, a single fungicide application may be all that it needed. How do we determine the risk of mold in making a one versus two spray decision?

Figure Eight



One versus Two Spray Decision

There are several factors that influence mold development in snap beans (Table One).

- **White mold occurs every year, but not in every planting.**
- **Gray mold occurs when the summer weather is cold & rainy.**
- **Risk factors that determine if two sprays are needed include: field history, variety, weather <u>prior</u> to first bloom, and canopy closure at first bloom**

Decision at planting

If the field has had a lot of bean crops in its rotation and/or a history of mold problems, it is a high risk field. If you are planting a high risk bean variety (Italian, Yellow Wax) into a high risk field, you should plan on a two spray program.

Decision at first bloom

If the weather has been wet leading up to first bloom, then the white mold mushrooms have probably formed. If the bean canopy is closed at first bloom, then the humidity surrounding the first bean blossoms rises dramatically. If the weather prior to first bloom has been wet and the canopy is closed at first bloom, you should plan on a two spray program.

We do not recommend a zero spray decision, regardless of the planting and environmental conditions. A single application of a tank mix Topsin/Rovral or Topsin/Endura may be justified under the certain conditions See the One Spray Check List. A single fungicide application should be made prior to canopy closure, prior to the pre harvest interval (Topsin PHI = 14 days), five to ten days after first bloom. If you are considering a one spray program for a given planting, consider the following.

One Spray Decision Check List

- ✓ **No field-history of mold problems**
- ✓ **Low risk bean variety**
- ✓ **Dry weather prior to first bloom**
- ✓ **Open canopy (6-12 inches) at first bloom**
- ✓ **No evidence of mold found in field based on field scouting (see below)**

Field Scouting

Field scouting for gray mold point sources and white mold mushrooms (apothecia) is labor intensive and should be avoided if possible. If you are considering a one spray program, however, we recommend you scout the field.
Scout at the popcorn stage (one out of ten plants has a single open blossom) just prior to the one versus two spray decision as follows. If you find evidence of white or gray mold, choose a two spray fungicide program and use a tank mix, either Topsin/Rovral or Topsin/Endura.

Scout for White Mold: 1) Choose three places in field that are most likely to have white mold (wet spots, shady spots, low spots, spots where white mold has developed in the past. 2) Concentrate your scouting in those three spots, turning over vines, looking for white mold on the plants or white mold mushrooms on the soil surface at the base of the plants.

Scout for Gray Mold: 1) Gray mold forms on black berry fruit on the edge of the field. 2) Gray mold infects the seed leaves (cotyledons) of emerging bean plants and kills the plants. 3) Gray mold forms on

injured plant tissue. Walk along wheel tracks and other areas of the field where plants are mechanically injured.

Fungicide Rotation

The two tank mixes, Topsin/Endura and Topsion/Rovral can be rotated. They are both effective at controlling gray and white mold when applied in a two spray program. Fungicide rotation will delay development of gray mold resistance to Endura and Rovral.

Table One - Bean Mold Risk Assessment Data 2005

Farm	Planting Date	Variety	Mold History (Yes/No)	Wet Prior to 1st Bloom (Yes/No)	Row Spacing (Inches)	Open Canopy @ 1st Bloom (Yes/No)	Mold Field Scouting (Yes/No)		% Mold in Untreated Plots (Ave ± SE)	
							WM	GM	WM	GM
Cook	4/21/05	91G	No	Yes	30	Yes	No	No	1.5 ± 0.5	3.3 ± 1.3
Cook	5/12/05	91G	No	Yes	30	Yes	No	No	0.0	0.0
Cook	7/05/05	Sav.	No	No	30	Yes	No	No	2.8 ± 1.3	0.0
Dickman	6/30/05	91G	Yes	No	20	Yes	No	No	0.3 ± 0.3	0.0
Gray	6/04/05	91G	No	No	24	Yes	No	No	0.0	0.0
Gray	7/03/05	Sav.	No	No	24	Yes	No	No	0.3 ± 0.3	0.0
Haener	5/25/05	Tapia	No	Yes	24	Yes	No	No	3.5 ± 1.2	2.8 ± 0.5
Hendricks	5/13/05	91G	No	Yes	30	No	No	Yes	14.7 ± 3.5	5.3 ± 2.1
Hendricks	5/25/05	Tapia	No	Yes	30	Yes	No	No	0.5 ± 0.3	1.8 ± 0.6
Kenagy	5/29/05	91G	No	No	30	Yes	No	No	0.0	0.0
Kenagy	6/29/05	91G	No	No	30	Yes	No	No	0.8 ± 0.5	0.0
Pearmine	5/13/05	91G	No	Yes	20	Yes	No	No	8.8 ± 2.6	0.5 ± 0.5
Pearmine	6/14/05	91G	No	No	20	No	No	No	22.0 ± 4.7	0.0
Pearmine	6/24/05	91G	No	No	20	No	No	No	0.8 ± 0.5	0.0
Sweeney	6/08/05	91G	No	No	20	Yes	No	No	0.3 ± 0.3	2.0 ± 0.9
Roth	7/13/05	91G	Yes	No	30	No	No	Yes	59.0 ± 23.1	0.5 ± 0.5
Graffenberger	NA	Sav.	Yes	No	30	No	No	No	0.0	0.3 ± 0.3

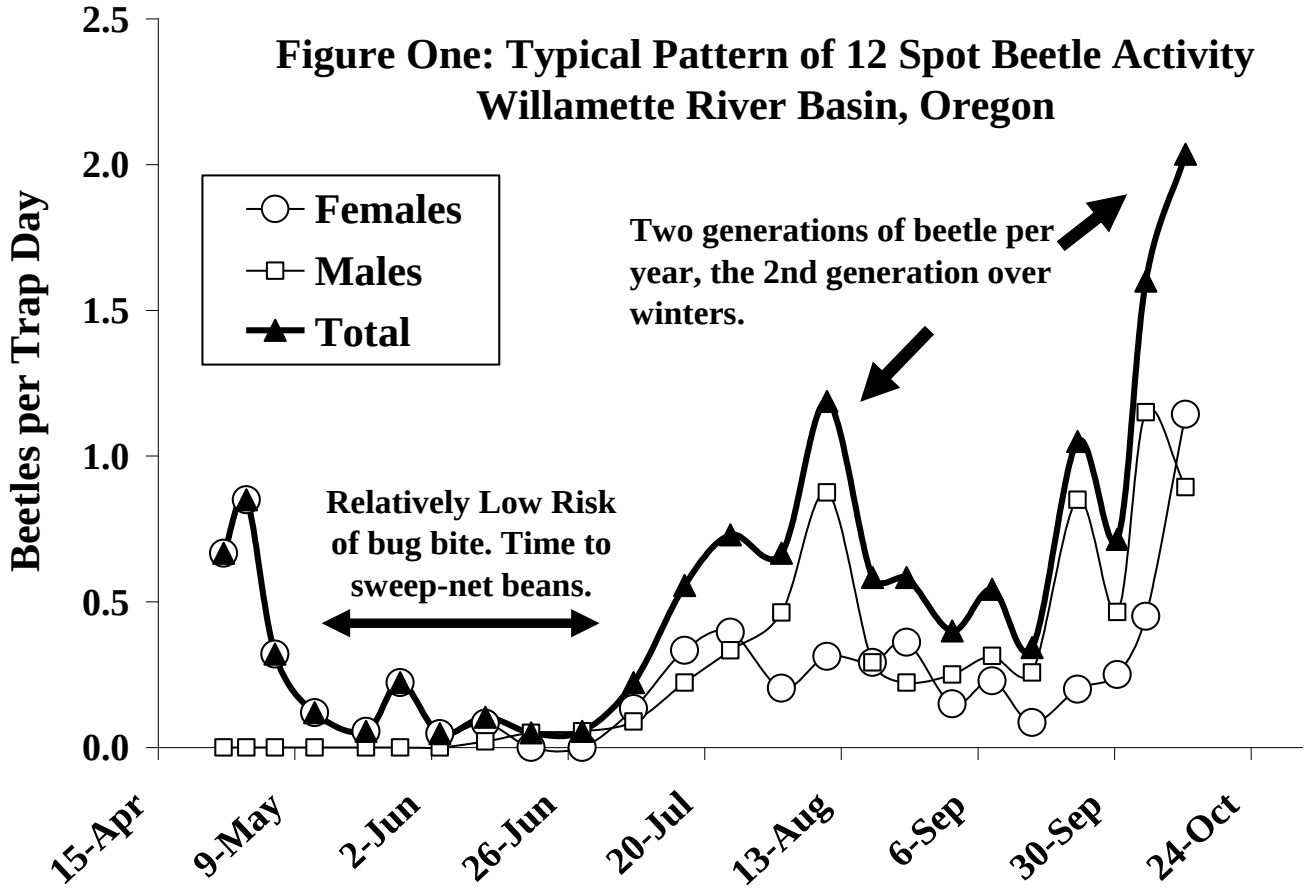
Part Two – 12 Spot Beetle Project

Introduction

Field scouting for 12 spot beetles using a standard sweep net technique and an action threshold is labor intensive. During the later part of the growing season when the grass seed field dry down, beetles concentrate in irrigated crops. It is frustrating to sweep and sweep and end up with an ambiguous, spray-anyway decision. By tracking the regional population trends for the twelve spot beetle, we can reduce field scouting. Regional population trends tell a grower or agricultural professional when it pays to sweep and reduces risk of a no spray decision. If there are not beetles active in the Willamette Valley, if there are not beetles active in neighboring farms and fields, and there we do not find any beetles when we sweep the field, it is safe to skip a spray. By applying IPM techniques, population monitoring, fields scouting, and action thresholds, we add credibility to our stewardship marketing claims.

Results 2005 – 12 Spot Beetle

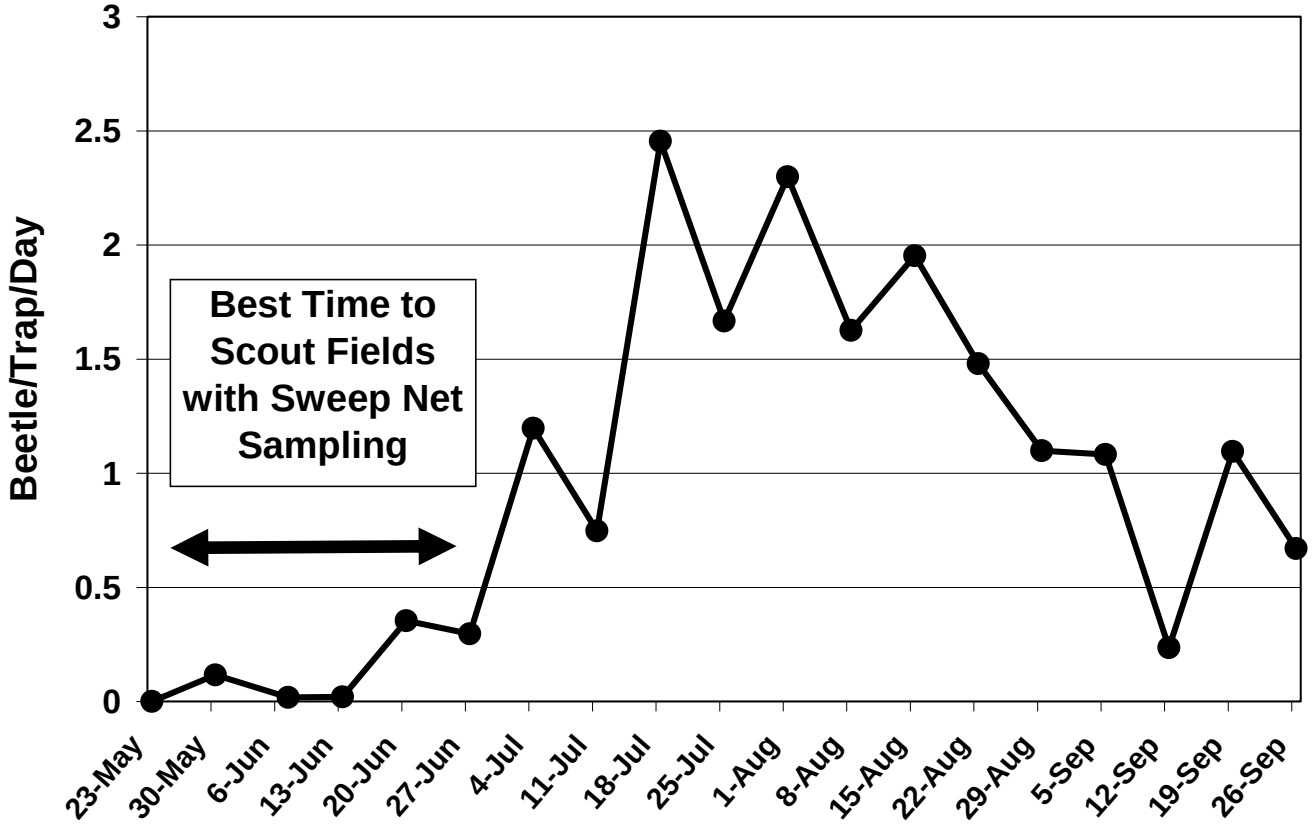
The 2005 growing season was a relatively low pressure year for 12 spot beetle in the Willamette Valley (Figure Two). This, however, varied according to the site. There some hot spots.



The overall pattern of beetle activity was normal. 1) Over wintering female beetles lay their eggs in corn and other crops. 2) For several weeks, the above ground 12 spot beetle population is very low. The

population has essentially gone under ground. 3) The first summer generation emerges and the grass seed field dry down. Beetles concentrate in irrigated fields. 4) Beetle numbers remain relatively high on a regional basis for the rest of the summer. 5) The second summer generation emerges in the fall. These beetles over winter.

Figure Two - Average Regional Trap Counts 12 Spot Beetle Willamette Valley 2005



During the period of low activity, we sent out notices to the grower community and to agricultural professionals with the VEGNET system in May and June. The messages included: 1) The over all valley wide trend for 12 spot beetle is declining. 2) The valley wide population pressure is low. 3) Now is a good time to sweep net your bean fields.

Several cooperating growers who had never used a sweep net on their bean fields did so for the first time. They found very few beetles. They generally choose a conservative action threshold of two beetles per ten arcs of the sweep net (2 beetle per 10 arcs). Other growers with more confidence in sweep net sampling used three or four beetles per ten arcs of the sweep net (3-4 per 10 arcs). In some cases, they choose to not apply insecticide.

Later, when the first summer generation began to emerge from the soil, above ground beetle counts rose dramatically. Several cooperating growers stopped sweep net sampling and returned to their normal spray program. Other growers with more confidence in the sweep net sampling procedure continued to scout their fields for the entire growing season.

- **The combination of regional 12 spot beetle population monitoring and field scouting reduces risk when making a no spray decision.**

- **The combination of regional 12 spot beetle population monitoring reduces cost of fields scouting by informing growers and ag professionals when to concentrate their field scouting efforts.**

		12 Spot Data @ 1st Bloom			
Farm	Planting Date	YST Count x/Day	Sweep Net Ave x/10 Arcs	Regional YST x/Day	% Bug Bite @ Harvest in Untreated Plots (Average by Pod Ct)
Cook	04/21/2005	.11	2.0	.13	0.0
Cook	05/12/2005	0.5	1.2	1.7	1.0
Cook	07/05/05	0.8	1.2	10.9	2.3
Dickman*	06/21/05	0.4	0.8	10.8	1.3
Dickman	06/30/05	0.2	2.4	0.0	1.5
Gray	06/04/05	0.7	0.5	13.1	1.5
Gray	07/03/05	1.3	2.4	14.6	.75
Haener	05/25/05	.14	1.0	8.7	2.8
Hendricks	05/13/05	0.3	0.4	8.7	5.7
Hendricks	05/25/05	0.3	0.3	8.7	2.0
Kenagy	05/29/05	0.9	1.0	8.7	23.0
Kenagy	06/29/05	0.4	0.5	12.3	0.5
Pearmine	05/13/05	.14	0.0	1.7	0.3
Pearmine	06/14/05	0.8	3.2	13.1	1.5**
Pearmine	06/24/05	0.7	2.2	12.3	0.0
Sweeney	06/08/05	0.7	2.6	13.1	7.8
Roth	07/13/05	0.2	0.8	10.9	2.5**
Graffenberger	07/06/05***	0.0	0.1	.14	1.3

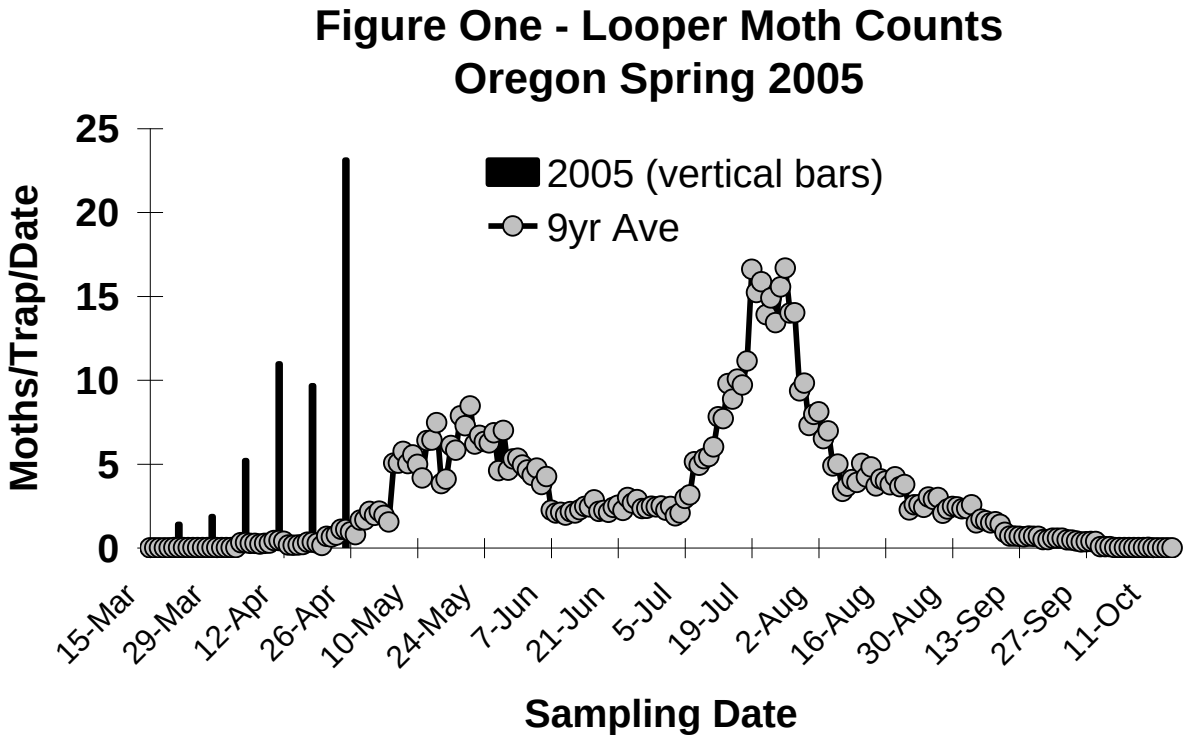
Table One – Comparison of Region and Local Yellow Sticky Trap (YST) Beetle Counts to Average Sweep Net Counts (beetles /10 arcs) and Percent Bug Bite in Untreated Snap Beans at Harvest

Part Three – Regional Pest Montoring

Introduction

Pest monitoring stations were established and maintained on farms in the major vegetable production regions of the Willamette Valley. Pest population trends were communicated to growers and agricultural professionals by fax and email as needed (See VegNet).

The 2005 growing season witnessed an unprecedented cabbage looper (*Trichoplusia ni*) outbreak (Figure One). Cabbage looper is a major contaminant of broccoli. Every commercial broccoli grower in the Willamette Valley received a personal letter warning them of the outbreak. Repeated warning were made by email and fax during the early growing season. The outbreak was confirmed by independent pest management consultants. Additional warnings were sent out by vegetable processors.



In many cases, grower and agricultural professionals headed the warning and adjusted their spray programs. In a few cases, growers ignored the warnings and several growers had loads of harvested broccoli rejected by processor. The decision by growers to ignore the looper outbreak warnings was unfortunate and needs to be carefully studied to prevent losses in the future.

Acknowledgements

I would like to thank all of the agricultural professionals and growers who helped to make this bean mold project a success. Specifically, I would like to thank our host growers: Kenny Hendricks, Dennis Peitrok,

Gary and Matt Cook, Richard Haener, Mark and Mike Dickman, Skip Gray, Brian Graffenberger, Peter Kenagy, Bill and Fred Gerschwell, Dan Hammelman, Ron and Larry Pearmine, Jeff and Doug Roth.

VegNet July 29, 2005

VegNet is a pest and disease monitoring and reporting network serving the processed vegetable industry, provided by the Oregon State University Extension Service, and funded by the Oregon Processed Vegetable Commission. VegNet is available on the net: http://extension.oregonstate.edu/linn Go to commercial vegetables then VegNet. If you have questions or suggestions, and if you would like to add or remove your name from this newsletter mailing list, Contact: Dan McGrath, OSU Extension, 3180 Center St. NE, Salem, OR 97301, phone (503) 931-8307; email daniel.mcgrath@oregonstate.edu

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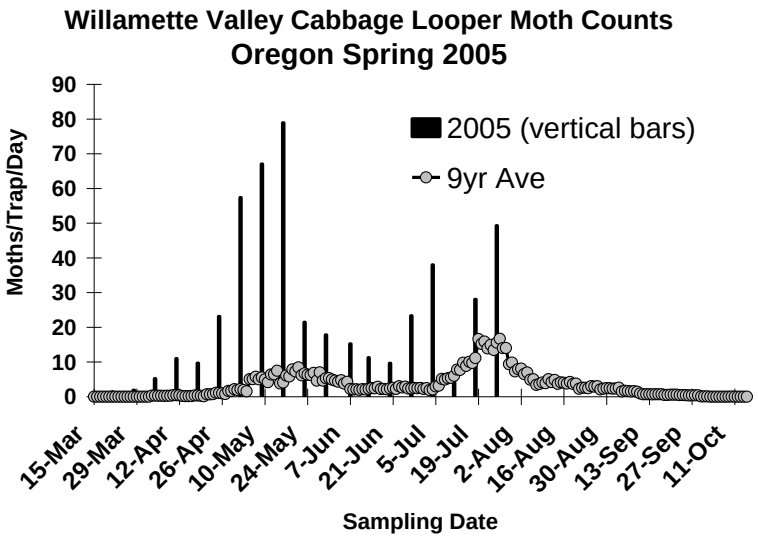
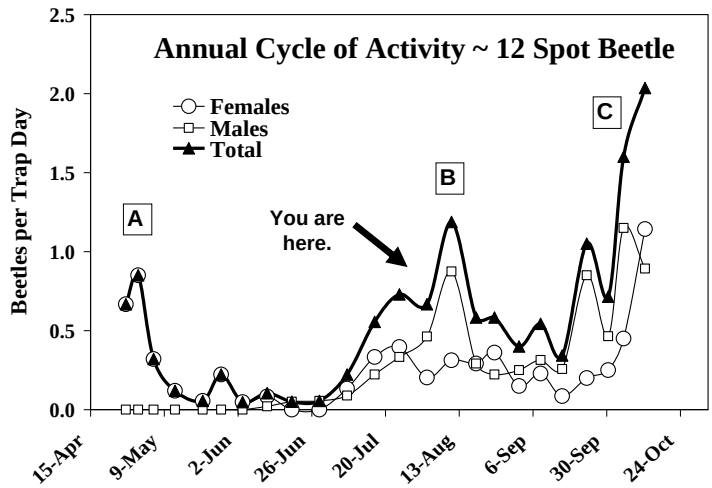


Cabbage Looper & Diamondback

(*Trichoplusia ni & Plutella xylostella*) Several growers had broccoli loads rejected by the processor during the early harvest period. In some cases, they got behind in their insecticide program. Once loopers or diamondback moth larvae move up into the broccoli heads, it is too late to control them.

We are at the peak of the second flight (See figure). Looper pressure varies around the valley, but in general moth trap counts are very high. Broccoli may need an insecticide application at the button stage followed by 2 or 3 clean-up sprays prior to harvest. Scout after you spray. Make sure you got the job done. Watch out for spray skips. Broccoli may also need an insecticide application between harvests. Insecticides are about 98% effective. In a normal year, the two percent that survive is negligible. In an outbreak year, the residual two percent can cause a load to be rejected. This is why more than one preharvest clean up spray may be required in broccoli.



Twelve Spot Beetle

(*Diabrotica undecimpunctata)* Beetles continue to emerge from the soil. At the same time, grass seed fields are drying down and causing the beetles to concentrate in irrigated crops. Beetle trap counts are increasing. Beetle sweep-net counts are mostly above the action threshold for snap beans (2 beetles per 10 sweeps). We are

approaching the peak of the first summer generation. Expect relatively high beetle numbers for the rest of the season.

Corn Earworm Corn earworm moth counts are normal. Fresh sweet corn growers generally apply the first insecticide spray for earworm at first silk followed by a second application 5-7 days later. Additional insecticide applications are based on trap counts using an action threshold of five moths per trap per day.

Week of July 29, 2005 Willamette Valley, Oregon

	Aurora	Dayton	MtAngel	Gervais	Stayton	Dever	Corvallis	Monroe
BCW	0.0	1.1	0.0	1.4	0.8	0.0	0.0	0.0
CEW	0.0	0.0	0.0	0.0	2.2	0.8	0.8	1.8
PHX	0.0	0.0	0.3	0.1	0.0	0.2	0.0	0.0
12S-YST	2.1	1.3	0.0	0.8	0.2	1.5	5.5	0.4
12S-SN	2.6	na	0.8	4.2	0.6	na	7.6	na
CL	68.0	43.7	25.2	8.3	23.7	83.3	17.2	125.0
AL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DBM	14.3	13.8	31.5	na	28.7	12.0	35.3	5.9
BAW	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00
VCW	0.0	0.0	0.0	0.4	0.7	0.0	0.5	0.0
CWB/2min	1.0	1.0	1.0	2.0	1.0	2.0	0.0	3.0

Willamette Valley 7day Ave Week of July 29th

Insects	5-Yr Ave.	2004	2005	Note
BCW	0.84	0.3	0.4	Normal risk
CEW	0.20	0.4	0.7	Normal risk
PHX	0.06	0.0	0.1	Normal risk
12S/YST	0.85	1.1	1.5	High
12S/SN	na	na	3.2	High
CL	14.83	28.4	49.3	Very High
AL	1.32	0.2	0.0	Low
DBM	8.70	12.8	20.2	Very High
BAW	na	0.02	0.02	Normal risk
VCW	0.70	2.9	0.2	Low
CWB/2min	2.50	19.8	1.4	Low

VegNet Key

BCW = Black Cutworm Moths **CEW = Corn Earworm Moths**
PHX = False Corn Earworm Moths **12S = 12 Spot Beetle**

CL = Cabbage Looper Moths
AL = Alfalfa Looper Moths
DBM = Diamondback Moths
BAW = Bertha Armyworm Moths
VCW = Varigated Cutworm Moths
CWB/2min = Cabbage Butterflies
YST = Yellow Sticky Trap Counts
SN = Sweep Net Counts