

A Survey of Production and Pest Management Strategies Used For Gooseberry Production Throughout Three Regions of the United States

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Twenty-one gooseberry growers, of all sizes, and from three different regions of the United States were surveyed to learn about their production and pest management practices. Growers were interviewed, to identify and understand the pest strategies used today. The data gathered was compiled and analyzed to determine correlations and to determine areas of biological and cultural control of pests where further experimental research is needed. Since *Ribes hirtellum* Michaux (American Gooseberry) and *Ribes uva-crispa* L. (European Gooseberry) are considered a minor berry crop in most states, there is little attention given to integrated pest management for them. There are pest issues facing both large and small gooseberry growers, especially the misidentified small gooseberry sawfly, in the Northeast and the Pacific Flatheaded Borer, in the Pacific Northwest. Some smaller growers are reluctant to use pesticides on their crops. Recommendations are presented for areas of further field and laboratory testing to be done in the increased use of beneficial insects and also in creating natural habitats for these beneficial to cohabitate, such as “beetle banks”. This study serves as a general pest management resource for gooseberry growers that reveals current pest issues and also proposes candidates for additional biological control measures for problem gooseberry pests.

Introduction

Today there is a lack of adequate current published information in the areas of cultural and biological control of gooseberry pests, as well as for other *Ribes* fruit species. Gooseberry production began in Europe around 1700.(1) Disease and adaptation problems led to limited production in North America. There was a federal ban placed on growing *Ribes* crops in the United States in the early 1900's due to the fact that they serve as alternative host of white pine blister rust fungus that attacked a major timber species at that time, white pine.(1). Although the ban was rescinded in 1966, gooseberries have fallen out of favor with the general public due to a lack of substantial production for several generations and thus several generations are unfamiliar with the crop.

There is increasing epidemiological evidence of the benefits of diets rich in fruits and vegetables to reduce the risk of heart disease, cancer and other chronic diseases (2,3). A major benefit from such a diet may be the increased consumption of antioxidants (4). One type of antioxidant is anthocyanic, a compound responsible for the red, blue, and purple pigments in plants. Research has been conducted (5) and is continuing to investigate into the antioxidant quantities of berries, including *Ribes* species.

There is an ever-growing population of healthy eating consumers and there is a need for farmers to have access to alternative methods, both culturally and biologically, to integrate into their current pest management strategies, in order to optimize commercial fruit product to sell.

The object of this research study was to identify and understand the pest issues facing today's gooseberry growers, in order to research and publish prospective recommendations for biological and cultural control measures, to be added to chemical control measures already published, that can be incorporated into existing pest management programs. In order to do this, it was necessary to interview growers from various regions, in order to identify pests and different strategies used to control them. were currently being faced and how they were controlling them. A diversity of gooseberry growers were interviewed and surveyed including small growers with under one acre, medium growers, between one and ten acres, and large growers that had over ten acres. Half of the interviews were in person and the other half were by phone.

Materials and Methods

An interview guide (Appendix A) that included 12 questions was created. Internet site farmers and consumers, called "Local Harvest" (6), was the starting point for this study. Forty growers were contacted from the Local Harvest site that had connections to gooseberries and 21 were interviewed. Growers from three different regions were interviewed in order to compare data gathered. The three regions were the Pacific Northwest, the Central and Midwest, and the Northeast. Referrals from some of the growers helped identify two of the largest gooseberry growers in Oregon. Of the 21 interviewed growers, 18 were classified as small, or under one acre, two were very large, having over ten acres, and one was classified as medium, with five acres. All but one grower had diverse operations which included other berry and vegetable crops. The interview guide was sent to each grower prior to the interview, so that ample time was

given to prepare responses. The distribution of interviews per region can be viewed in Fig. 1.

Secondary research was conducted through a thorough review of current and older literature dated as far back as 1895, on pest management for gooseberries in different regions of the United States. Personal discussions were held and numerous emails were exchanged with experts in the field of *Ribes* production as well as experts in the field of entomology.

Data Analysis

All grower questionnaire responses were compiled by region in a data report. Patterns were then identified and key ideas synthesized and reported as “Findings”. Figures 1 & 2 below briefly summarize data by region.

Fig. 1- Farm Data -2010 Survey of Gooseberry Growers in Three Regions of the US

Region	Number of growers interviewed	Size (in acres of Gooseberries)	Number of Gooseberry cultivars	Common establishment period	Irrigation methods	Fertilization methods
Pacific Northwest	7	Under 1 acre = 5 Over 10 acres = 2	15	3 rd year	<ul style="list-style-type: none"> • Drip • Overhead • None 	<ul style="list-style-type: none"> • In with drip • In with overhead • None
Central and Midwest	9	Under 1 acre – 9	10	2 nd to 5 th year	<ul style="list-style-type: none"> • Drip • Overhead • None 	<ul style="list-style-type: none"> • In with drip • In with overhead • None
Northeast	5	Under 1 acre – 4 5 to 10 acres – 1	11	3 rd year	<ul style="list-style-type: none"> • Drip • None 	<ul style="list-style-type: none"> • In with drip • None

Fig. 2- Farm Data- 2010 Survey of Gooseberry Growers in Three Regions of the US

Region	Current insect pest problems/Controls	Current weed problems / Controls	Diseases / Controls	Pest sampling methods
Pacific Northwest	<ul style="list-style-type: none"> • Aphids / Ladybugs/ diazinon • Fruit Fly-Malathion & Success(spinosad) • Mites/Remove & Burn • CurrantBorer/Lorsban (chlorpyrifos) • Crown borer / Pheromone traps • Flatheaded borer / may also be black gooseberry borer AKA gooseberry rootborer SEE FINDINGS/INSECT PESTS • Imported Currant Worm / Success (spinosad)and Bt (<i>Bacillus thuringiensis</i>) 	<ul style="list-style-type: none"> • Sharppoint fluvellin None- (glyphosate & paraquat not controlling it-very persistent and choking gooseberry plants in some areas of farm) SEE FINDINGS/WEED PESTS • Canada Thistle, sheep sorel-no chemical control method • Keep area in row clean with Paraquat, Round-up,(glyphosate) Casoron(dichlobenil), Karmex,(Dirurin) 	<ul style="list-style-type: none"> • Powdery Mildew / Microthiol sulfur, Kumulus (sulfur) • Leaf Spot / Abound (Azoxystrobin) Rally(myclobutanil) Pristine (pyraclostrobin/boscalid) and lime sulfur 	<ul style="list-style-type: none"> • Direct –just visual-scouting • Use traps
Central and Midwest	<ul style="list-style-type: none"> • Imported Currant Worm / Bt (<i>Bacillus thuringiensis</i>)(ineffective) • Sawfly-Malathion • Green caterpillar / None SEE FINDINGS/INSECT PESTS 	<ul style="list-style-type: none"> • Grasses / Poast (sethoxydim) • Pigweed, ragweed, lambsquarters, Canada Thistle-Round-up (glyphosate)-(not close to gooseberries) Karmex (diuron) Casoron(dichlobenil) 	<ul style="list-style-type: none"> • Powdery Mildew / Bordeaux mix.(copper sulfate & lime), Oxidate(OMRI listed-hydrogen dioxide) • Unknown brown spots-Switching to Cabrio (pyraclostrobin) & Nova (new name is Rally-myclobutanil) 	<ul style="list-style-type: none"> • Direct observation-scouting
Northeast	<ul style="list-style-type: none"> • Sawfly larvae (not Imported Currant Worm) / Insecticidal soap (ineffective)/ Malathion, Success(spinosad) SEE FINDINGS/INSECT PESTS • Japanese Beetle/ remove by hand 	<ul style="list-style-type: none"> • Bindweed, wild grape, poison ivy-no method • Wild morning glory, creeper-vine- greenhouse fabric-Princep(simazine)& Casoron(dichlobenil) 	<ul style="list-style-type: none"> • Powdery Mildew / Fungicides(no specific names listed) 	<ul style="list-style-type: none"> • Direct –just visual-signs of feeding damage & larvae

Findings: Cultivars

A total of 17 gooseberry cultivars were found to be grown in these three regions of the United States. 'Hinomakki Red' and 'Hinomakki Yellow' were preferred in all three regions by 10 out of 21 (48%) of the growers. Some growers mentioned that people preferred them and it gives growers a variety of colored berries to sell. A wholesale nursery grower stated that she had great demand for them and that people really like their taste. One grower said that 'Hinomakki Yellow' had the best flavor of all! Figure 3 lists the cultivars grown by region. 'Tixia' cultivar had mixed responses from growers. A grower in Minnesota indicated that his 'Tixia' were prone to powdery mildew and that caterpillars(growers know that these are not caterpillars- but imported currant worms)) preferred it. A grower in Pennsylvania said that they were very hardy and could survive the harsh winters. An Illinois berry farmer grows 'Tixia' because it is semi-thornless. Another grower in Pennsylvania stated that this cultivar produces more per bush than any other cultivar. Eight out of 21 growers (38%) in all regions grow 'Tixia'. A small grower in Oregon indicated that 'Catherine' was very prone to powdery mildew, so it was removed so powdery mildew would not spread. 'Oregon Champ' is preferred in Oregon primarily due to market demand. A grower in Minnesota stated that 'Oregon Champion' was great and that they resist defoliation by caterpillar (ICWorm) pests. Although seven growers in all regions grow 'Jahn's Prairie', most indicated that it was not the most adapted cultivar. A small Oregon grower said they had poor vigor and very small fruit, and were removed. One berry farmer in Illinois has been growing them because they are winter hardy and hadn't seen any problems yet. 'Poorman' was another popular cultivar with seven out of 21 (33%) growers in all regions producing

them, while only one grower in Illinois indicated it was their best one. ‘Pixwell’ was another common cultivar with eight out of 21 (33%) growers in all regions. One grower stated that they didn’t like it because it had poor vigor, while another, while another grower grows this cultivar exclusively for their farmer’s market venture in Missouri. All cultivars grown by region are listed in Figure 3.

Fig. 3

Region	Cultivars Grown
Pacific Northwest	Poorman, Hinomakki Red, Hinomakki Yellow, Black Velvet, Tixia, Captivator, Invicta, Jahn’s Prairie, Red George, Lepaa Red, Pixwell, Oregon Champion, Achilles, Jeanne, Whineham’s Industry
Central and Midwest	Poorman, Hinomakki Red, Hinomakki Yellow, Black Velvet, Tixia, Invicta, Jahn’s Prairie, Pixwell, Oregon Champion, Welcome
Northeast	Poorman, Hinomakki Red, Hinomakki Yellow, Black Velvet, Tixia, Captivator, Catherine, Invicta, Jahn’s Prairie, Lepaa Red, Pixwell

Findings: Establishment Periods, Irrigation & Fertilization-All Regions

Establishment periods ranged from three to five years with four to five years noted as best for full production. Many growers stated that they could have a commercially productive crop in three years. The average productive life of a gooseberry bush is between 15- 20 years. However a small grower in New York has had her bushes that were handed down to her for over 30 years.

Eleven out of 21 (52%) growers use drip irrigation with two of them only using irrigation during establishment year. Only two growers used exclusively overhead irrigation with one grower using both overhead and drip. Eight growers did not irrigate at all and for various reasons-very moist soil (WA), abnormally high rainfall (IL), and mulch very well (NY). Ten out of 21 (48%) growers fertilize their gooseberries. Of the growers

who fertilize, their choices were: fish emulsion (in drip); nitrogen fertilizer in spring and complete fertilizer in fall or winter; incorporate lime, oyster shell, gypsum, fish meal, KMag, and chicken compost in soil, fish emulsion through drip lines; Triple 16 and wood ash; ammonium sulfate; whatever my raspberries get, which is ammonium sulfate, ammonium phosphate, and potash; ammonium nitrate; compost at planting and occasional foliar feeding of kelp/fish emulsion. Of the growers who fertilize, most did through drip irrigation lines. Most growers did not have any method for scheduling their irrigations other than feeling the dryness of their soil and measuring rainfall. Only one very large grower in Oregon uses lateral line overhead irrigation and schedules his irrigation regularly. Although most growers do not have a specific method, they noted that they made sure the gooseberries received 1-2" of water per week. One grower in Iowa uses a tensiometer and attempts to maintain 50% field saturation. Only one large grower in Oregon used leaf tissue analysis and soil analysis every year to monitor plants nutritional needs, in the winter. The other growers that applied fertilizer at all had scheduled times throughout the year that they applied fertilizer. These scheduling methods varied with the regions. In the Pacific Northwest, Only one small Oregon grower indicated that they fertilized two to three times during the summer. In the Central and Midwest, one small grower in Illinois schedules his fertilizations along with all his berries for April and June. He applies 40 lbs per acre of ammonium sulfate. Another small grower in Ohio fertilizes mostly in late winter with a mineral fertilizer 20-24-24 (N, P, and K). A small grower in Minnesota stated that he fertilizes with whatever the soils lab recommends. In the Northeast region, only two out of five growers interviewed fertilized their gooseberries. A small grower in Pennsylvania stated that they used

fertilizer sparingly depending on the time allotment for the farmer. A small New York grower stated that they placed calcium nitrate around their plants.

Findings: Insect Pest Problems

In the Midwest region, five out of nine (55%) growers commented that they had issues with small green caterpillars, some of which apparently could have been the small gooseberry sawfly, and not the imported currant worm. Only one grower in Minnesota had complete defoliation by caterpillars but not on his 'Tixia' or 'Pixwell' cultivars. In the Pacific Northwest one large grower had a reoccurrence of the Pacific Flatheaded Borer (*Chrysobothris mali*) (7)



Provided by Oregon State University

The beetle emerges March through April and lays eggs at that time. The grower indicated that it was difficult to control because of bee activity and fruit ripening time.

The larvae hatches and bores into the roots, as seen below, and weakens the entire plant. This pest may also be the



Don Mever of Mever Nurseries-Salem, Oregon- 7/20/2010

gooseberry rootborer AKA black gooseberry borer (*Xylocrius agassizi* (LeConte) based on the description and references provided by the grower, Don Meyer, Salem, Oregon. The only other insect pest that was a problem in controlling was the sawfly larvae in the Northeast region. This sawfly larvae is smaller than the imported currant worm with a black head and does not have the characteristic black spots all over the body.



Sawfly larvae-- 7/3/2010 --Linda P. Johnson-Ithaca, New York



Photo from Pacific Northwest Pest Handbook-Ken Gray Collection" Imported currant worm"
<http://www.ipmnet.org/kgphoto/original/images/G277-19.jpg>

The sawfly larvae in the first picture above, dated 7/3/2010 has caused great damage to the organic growers in New York (see picture below) and also a similar green caterpillar was mentioned as a pest in Minnesota. Sawfly damage was indicated in Wisconsin who did not know which sawfly it was and tried Malathion as a control. Figure 2 lists all the pests from each region that were indicated from the interviews and the control measures that were employed. In some cases, it is indicated that the chosen method of control was not effective.

Complete defoliation
of gooseberry plant

Ithaca, New York

7/3/2010

Linda P. Johnson



Findings: Weed Pest Problems

In the Central and Midwest region, Illinois growers had major problems with grasses, due to abnormally heavy rainfall. Of all the states in that region, growers controlled their weeds with a variety of herbicides, which can be viewed in detail in Figure 2. Many growers heavily mulch their plants with woodchips, sawdust or pine needles. There were no common weeds in those states.

In the Pacific Northwest region there were no commonly found weed pests. Weeds indicated by growers are listed in Figure 2 along with the control method employed. One very large grower in Oregon indicated that he had a problem weed that was not controlled by glyphosate or paraquat, and that it was growing around an actually on his gooseberry plants. This weed is sharppoint fluvelin (*Kickxia elatine*). “This weed is spreading into the cropland throughout the Willamette Valley of Oregon.”(13) “Little is known about controlling these weed with herbicides.”(13) “It may be controlled by the herbicides, diuron, simazine, atrazine, and terbacil.”(13). Preliminary trials have shown good control with Ally (sulfonyleurea), Atrazine, Glean (chlorsulfuron), Ignite(glufosinate-ammonium), and Lexone (metribuzin) (13). Unfortunately, none of these herbicides listed are registered for use on gooseberries in Oregon. Diuron listed above as a possibility is labeled for use on gooseberries in Oregon and Washington. Again, a variety of



herbicides were used to keep areas between the rows clean as seen in Figure 2. Some small growers hand cultivated their weeds and also heavily mulched.

In the Northeast region there were no common weed issues. Most growers mulch with wood chips, straw, or leaves. One small grower in New York places heavy greenhouse fabric all around her gooseberry bushes and it works well at controlling weeds as well as keeping moisture in. Two out of five growers specifically mentioned hand-weeding and mowing between rows.

Findings: Disease Problems

All disease issues are listed in Figure 2, along with the method of control. The only major disease indicated was powdery mildew, as expected. Nine out of 21 (43%) growers reported problems, but of the nine with problems, seven spray with fungicides. All fungicides used by growers are listed in Figure 2, by commercial name as the grower indicated and also the referenced chemical name or active ingredient. Only one large grower indicated that powdery mildew could grow on the berry as well as on the leaves (see picture below).

Kraemer
Farms- Mt.
Angel,
Oregon



Findings: Methods Used for Sampling Pests

Of all growers interviewed, only two used an indirect method of sampling for pests and both, in Oregon. Use pheromone traps for the crown borer adult moth. It was noted that the spotted wing drosophila may become a pest concern in the near future. All other growers used visual-direct methods for sampling their pests.

Findings: Rise or Decline in Pest Populations

In the Pacific Northwest region, one large grower mentioned that he had seen a rise in weeds resistant to glyphosate. In the Central and Midwest region, one grower from Missouri commented that he has seen an increase in the imported currant worm. Grass weeds have been on the rise in Illinois due to excessive rain. In Pennsylvania, one grower noted that the currant borer gets quickly out of hand and that Pixwell is particularly susceptible to the currant worm. Pest populations are rising after second year of planting, was stated by the same Pennsylvania grower. There has been a rise in sawflies, and their larvae in New York, with two growers.

Key Research Findings: Pests

The sawfly larvae observed in New York and also mentioned to be in Minnesota and possibly Wisconsin, has been misidentified as, *Nematus ribesii* (Scopoli) the imported currant worm. Extensive research has indicated that this small gooseberry sawfly, *Pristiphoria appendiculata*, (Hartig) is in fact, an old sawfly that has been around since at least 1858. The sawfly is in the sub family Nematinae. Nematinae is one of the largest subfamilies in the sawfly family Tenthredinidae. Nematinae is divided into three groups, Mesoneura, Nematini, and Pristiphorini (8). Nematinae originated 50-120 million

years ago (8). Nematinae larvae rank amongst the principal insect herbivores in many habitats and species associated with trees are considered as serious pests (8).

Description of a “Ohio Currant-fly”, *Prisiphora rufipes*, St. Fargeau (9) from the proceedings of the annual meeting of the New York State Agricultural Society in 1868 indicated the presence of another pest, possibly a sawfly that was again increasing in importance. Another source from 1887 (10) refers to this pest as “The Native Currant Worm”, *Pristiphora grossulariae*, Walsh. “This like the Imported Currant Worm is the larva of a Saw-fly, but of a different genus, distinguished by entomologists of the different veining of the wings. The larva is smaller than the preceding, only half an inch long, and is of uniform pale-green color, without any black dots”(10). Another source, “Pests of Fruit Crops” (11) describes the same sawfly and larva, with accompanying pictures of the adult, the first and final instar that match to previous descriptions. This reference names the sawfly as the “small gooseberry sawfly” (*Pristiphora rufipes*-Lepeletier). Another reference from 1932, Imperial Institute of Entomology (12) described a similar sawfly infesting Ribes as *Pristiphora pallipes*, Lepeletier., fitting the same small green identification. Both *N. ribesii* and *P. pallipes* were reported in pests of gooseberry in Ukraine by Shestopal et al (1999), where Ribes are more widely grown (13). Positive identification was obtained by sending adult sawfly specimens to Dave Smith, sawfly expert and currently a Collaborator for the Systematic Entomology Laboratory, USDA, and Research Associate for the National Museum of Natural History, Smithsonian Institution, Washington, D.C.. Adult female sawfly specimens were validated as *Pristiphora appendiculata* (Hartig), pinned and named as “small gooseberry sawfly” and added to the national collection of sawflies (see picture below).



Adult specimens collected by Catherine Creeger,

Kestral Perch Berry Farm, Ithaca, New York 7/25/2010

Verified by Dave Smith 7/31/2010

Photograph by David R. Smith-National Museum of Natural History



Synonymy of *Pristiphora appendiculata*

Pristiphora appendiculata (Hartig)

Pristiphora pallipes Serville, 1823. Preoccupied in *Pristiphora* by *P. pallipes* Fallen, 1808

Pristiphora rufipes, of authors, not Lepeletier 1823

Nematus flavipes Dahlbom, 1835. *Nomen oblitum*

Tenthredo (*Nematus*) *pallicornis* Harris, 1835. *Nomen nudum*

Tenthredo (*Nematus*) *labrata* Harris, 1835. *Nomen nudum*

Nematus appendiculatus Hartig 1837. *Nomen protectum*

Nematus (*Diphadnus*) *fuscicornis* Hartig, 1837.

Nematus cathoraticus Foerster, 1854.

Nematus pallicornis Norton, 1861

Nematus pallicornis var. *labratus* Norton, 1861

Nematus vitreipennis Kawall, 1864

Pristiphora grossulariae Walsh, 1866

Nematus peletieri Andre, 1880

Nematus pumilus Zaddach, 1884

Nematus ghilianii Costa, 1894

Synonymy provided by David R. Smith-7/28/2010

Possible Biological & Cultural Control Measures for Imported Currant Worm and Small Gooseberry Sawfly

The Spined soldier bug, *Podisus maculiventris*, Say preys on many kinds of caterpillars and grubs. They are the more prominent predatory stink bugs in North America (13) Both adult spined soldier bugs and nymphs feed on many species of hairless caterpillars, including cabbage loopers, fall armyworms, imported cabbageworms, sawfly larvae, and tent caterpillars. (14).



Marlin E. Rice-
Iowa State
University

There is reference to a “cannibal bug” also called the Placid Soldier bug, dated back to 1895 (15) by Otto Lugger, a state entomologist in Minnesota. He states that it is a natural enemy of the imported currant worm. The Placid soldier bug, *Podisus placidus*, Uhler-1870,(see picture below) appears to be very similar to the Spined Soldier bug referred to above the same. Below is a picture of a mating pair devouring a larvae. There is also old literature from 1875 (16) by Missouri state entomologist, Charles V. Riley, that “this species *Podisus placidus*, Uhler, which may be called the Placid Soldier bug is marked with yellowish-brown and dark brown, and



Whitney Cranshaw

attracts the worms (imported currant worm) in the same well known manner in which the Spined Soldier-bug spears and sucks to death the larvae of the Colorado Potato beetle.” (16)

Based on accounts again, from Otto Lugger, 1895 (15) there exists a Tachina fly, that parasitizes the imported currant worm larvae. Experimental research would need to be conducted to determine which species of Tachina-fly would actually parasitize the imported currant worm larvae.

Based on old literature from 1875, Seventh Annual Report on the Noxious, Beneficial and other Insects of the State of Missouri (16), it was stated that “Mr. Walsh bred from this currant worm a small Ichneumon-fly (*Brachypterus micropterus*, Say) which has such small wings that it much resembles an ant.” “Mr. C.J.S. Bethane also reared from its cocoon another Ichneumon-fly (*Hemiteles nemativorus*, Walsh) closely allied to that which infests our common BagWorm.” (16). More research is needed to determine the possibilities of breeding these flies for parasitizing imported currant worms.

An area of integrated pest management that is currently being tested on farms, is the use of “Beetle Banks”. Beetle banks maintain a natural habitat, within the cropping system, for insect predators and reduce the need for chemical use (17). Through collaboration with Oregon vegetable farmers, and the Farmscaping for Beneficials Project at Oregon State University, they are exploring on-farm methods of beetle bank establishment and their effect on ground beetle populations. (18). While the practice is not widespread in this country, researchers say beetle banks show promise as another

tool in the growing sustainable-farming movement to control crop-damaging bug pests and weeds through integrated pest management (19)

Another area for consideration and research would be to experiment on using green sticky cards in gooseberry fields. Experimentation with placing green sticky cards, placed at the height of the gooseberry bushes could possibly trap the adult sawflies early in the spring when they are flying about. Previous research has shown that apple sawflies are attracted to white sticky cards because it resembles the white apple blossoms. This same concept may apply with the small gooseberry sawfly and the imported currant worm sawfly

Experimental field research should also be conducted on the use of greenhouse fabric around gooseberry bushes. Since the last instar, in the fall, from the imported currant worm and also the small gooseberry sawfly larvae, pupate on or near the soil surface, and overwinter there, it is very likely that by inhibiting them from entering the soil, would interrupt their lifecycle at that stage. In the Ukraine, where both of these pests are a problem, it is suggested as a protection measure to place a film application near the bushes, as the majority of larvae (up to 75%) form cocoons near the base of the bush, and are almost absent in inter-rows (13).

Further Research Needed for Pest Issues

Further research needs to be conducted regarding the gooseberry rootborer, AKA, flat-headed borer and also Pacific Flatheaded Borer . that has become a major problem for a large Oregon grower. Control sprays are a problem because the adult beetles emerge March through April or May and lays eggs at that time. This is the time

when there is a lot of bee activity and it is fruit ripening time. There is a need for cultural and biological control measures for this pest as well. Another area of research that should be conducted is in the area of using endopathogenic fungi on gooseberry and other *Ribes* plants, to ward off or kill chewing insects.

Conclusions

There is a definite need for additional methods of biological and cultural controls for the imported currant worm and the small gooseberry sawfly. Most likely, what works for one will work for the other, however their life cycles are similar but not identical.

There is a need for further research to be conducted into creating a *Ribes* Pest & Beneficials Activity Calendar available on-line, such as is done for Apple IPM, by the Ontario Department of Agriculture (please see example below).



Apple Pest & Beneficial Activity in Ontario

The periods of pest and beneficial activity illustrated below are general guidelines based upon both Ontario field experience and pest biology research. The actual period of activity for any given pest will vary significantly from year to year, depending on over-wintering conditions; seasonal temperature accumulation; relative humidity; rainfall; prevailing wind patterns; and other environmental factors.

Click on an insect, disease or beneficial for more information.

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INSECT PESTS	Life stage	# of generations	Half inch green	Tight cluster	Pink	Phenology				
						Bloom	Petal fall (calyx)	Early summer	Mid summer	Pre-harvest
Mullein plant bug	Larvae	2								
Spring-feeding caterpillars	Larvae	Various								
Spotted tentiform leafminer	Larvae in mines	2-3								
Green apple aphid	Colonies	14-15								
Rosy apple aphid	Colonies	3								
Redbanded leafroller	Larvae	2+								
Tarnished plant bug	Adults	2-4								

