Cooperative Extension
Coastal Washington Research & Extension Unit
Long Beach, WA 98631

CRANBERRY VINE

February 1996

THE STATION/PCCRF

Great new strides continue to be made. A new 1+ acre parcel will be ready for spring planting. If you have good vines to donate, please contact Malcolm McPhail at 360-642-4938. Thirty-two acres north of the bogs were logged and the proceeds are being used to build a 30′ x 48′ pole building for equipment and fertilizer storage. Construction is nearing completion. Historical displays are being assembled with funds from a Cheney Foundation grant. The Templin Foundation has awarded a $47,250 grant for enlargement of the warehouse. We have received the building permit and have called for bids. Rick Cordell is a new PCCRF director from Grayland; he joins Marty Paulson. Additional directors include Jack Hackett and Delmer Robison--Bandon, Jack Raine and Peter Dhillon--British Columbia, and Kyle Brewe and Malcolm McPhail--Long Beach.

MEETINGS

PCCRF Work Day. Friday, March 1, 9:00 a.m. Plans include ditch lining, work on the museum, transferring equipment and fertilizer to the new metal building and tearing down the old storage building. We'll have a great lunch and a lot of fun. Please mark your calendars!

Spring Grower Workshop Meeting. Monday, April, 7-9:00 p.m., North Beach Grange, Grayland; Tuesday, April 2, 8:30-10:30 a.m., Ocean Spray Receiving Station, Long Beach. Dr. John Stark, Entomologist and Environmental Toxicologist, WSU - Puyallup: mode of action of insecticides, fate of pesticides in the environment, new product chemistry, and environmental toxicology. Kim Patten: microclimates of cranberry bogs as related to frost protection.

WEATHER

	Rainfall (Inches)					Growing Degree Days				
Month	1996	1995	1994	1993	20 yr av.	1996	1995	1994	1993	10 yr av.
January	9.83	14.9	8.1	8.7	10.8	51	108	76	22	40
February		7.4	12.1	1.4	9.3		84	26	63	55
March		8.3	6.4	8.1	9.5		90	137	94	72
April		7.4	5.6	10.3	5.6		133	164	147	116
May		2.8	3.4	5.9	3.8		280	276	360	216
June		3.0	2.9	3.3	2.8		372	340	386	323
July		0.9	0.7	1.8	1.9		516	440	458	421
August		1.6	1.4	0.7	1.7		418	503	478	440
September		3.9	1.8	0.3	4.1		514	439	359	363
October		10.0	8.5	2.9	6.5		268	171	249	217
November		17.3	17.0	5.0	11.4		183	25	23	99
December		13.7	17.6	14.0	12.6		82	15	35	41
TOTAL		91.2	85.5	62.5	80.5		3048	2612	2674	2402

Weather Forecast Station. NOAA will begin the agriculture frost forecast for cranberries on March 18. Forecasts will be out of the Astoria station only. Because of federal closure, April 19 will be their last day. However, thanks to grants from Ocean Spray, the Washington Cranberry Commission, and modern technology, all growers will have access to the weather stations at Grayland and Long Beach via telephone to gather current weather information. We will have more information within the next month on how to access this, once it becomes operational.

WEED CONTROL

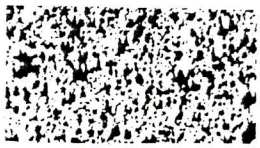
Label changes. The manufacturer is withdrawing Fusilade. Use up existing stock.

New products. Roundup Ultra is replacing Roundup. The new Roundup is touted as requiring a much shorter drying time and does not require or recommend use of a surfactant with it.

Calibration of a backpack sprayer for spot treatment. Spot treating weeds with post-emergent herbicides requires calibration which is a little different than normal. The most common question I get is, how much of herbicide "X" should I put in my backpack sprayer? Because the applicant is usually not moving but holding a nozzle over the weeds, the gallons per acre (gpa) application rate can vary, depending on how long one spends at each weed. This may seem trivial but if you are spot spraying Poast @ 1.5% solution to the point of coverage by a light mist, spraying to coverage (50-100 gpa) or spraying to runoff (200 gpa) you will get a marked difference in active ingredient per acre, weed control, and crop phytotoxicity. Therefore, if you are spot spraying a solution with a percentage rate, it is vital to know the actual application rate in gallons per acre (gpa). There are 3 ways to determine that value.

The easiest (least accurate) is visual, based on amount of solution on the leaf. A very light coverage which is barely discernable is about 10-20 gpa. Spraying to leaf coverage is about 100 gpa. Spraying to runoff is about 200 gpa. See figures below to visualize spray volume. They were created by spraying a dye on paper.

10 gpa



20 gpa

100 gpa

200 gpa

The second method involves a few calculations. First you need to know gallons per minute (gpm) of your nozzle. Most nozzles have a number written on them indicating the spray angle and volume for 40 psi. For example, an 8002 means 80° spray pattern at 0.2 gallons per minute @ 40 psi. An 11004 means 110° spray angle @ 0.4 gallons per minute @ 40 psi. To convert this to gpa for a backpack sprayer, you need to know the pressure at which you are spraying. This is usually 20 psi. You can look at a nozzle performance chart to get real output or take 70% of the output @ 40 psi. Therefore, an 8004 @ 20 psi gives 0.28 gallons per minute. For adjustable nozzles or those that have no number, catch your spray volume for 1 minute. Use the following formula to get gallons per acre:

gpa = gpm x 5,940÷mph x w.

MPH = walking speed (usually 1-2 mph when spraying)

w = width of spray in inches.

For example, consider a 8006 @ 20 psi w/18" swatch at 1 mph

0.6 gpm x 70% = 0.42 gpm

0.42 gpm x 5,940÷1 mph x 18" = 138 gpa

The third method requires measuring out a known volume of water into the tank and spraying that over a given area using your typical spray method. Convert those numbers to gpa.

General rules of thumb for herbicides on new plantings.

1. Devrinol is sensitive to sunlight and under high sunlight intensity in the summer, slightly over 50% loss by photodecomposition may occur 4 days after application. Under winter conditions the loss is about 30% in 8 days. At least 1 inch of rainfall or irrigation within one day after application is necessary for weed control and to prevent herbicide breakdown by sunlight.
2. Weed control will be reduced when soil is heavily covered with leaves or trash.
3. Tolerant weed species for Devrinol are shepherds-purse, mustards, henbit, black nightshade, smart-weed, ladysthumb, and all established weeds.

4. Weed control with Devrinol is temporary at best (4-6 weeks); therefore, timing is critical--too early and control will be lost prior to the main weed germination window, too late and too many weeds will have already germinated.
5. Continuous use or use on soils with a history of Devrinol reduce its longevity.
6. Weed control with Devrinol is poor on soils with over 10% organic matter.
7. Avoid too high rates of Evital on sandy soils, especially if beds have poor drainage. Wet spots are notorious for collecting Evital and showing herbicide phytotoxicity.
8. Evital lasts longer than Devrinol and shows good efficacy if weed pressure is moderate. Make sure it will control the desired species (see Weed Control Table at end).
9. Combinations of both herbicides appear to work better than a single high rate of either herbicide alone. These do not have to be applied at the same time.
10. Start with clean vines and clean soil to minimize weed seed contamination.
11. Fumigation of soils with Vapam or methyl bromide does not eliminate the need for pre-emergent herbicides.

New and under-utilized products. Poast & Prism as post-emergent grass herbicides are a must have for cranberry farming. Poast is labeled for non-bearing and bearing cranberry and Prism only for non-bearing cranberry. Prism controls several species (annual bluegrass, fine fescue) that Poast does not and, overall, is a great grass herbicide. Their use is detailed below.

Poast. This herbicide selectively controls many annual and perennial grass weeds when applied on foliage at the optimum growth stage. Poast does not control broadleaf weeds and sedges. It is most effective on actively growing grasses before they reach the maximum size (generally 6 to 12 inches tall).

Use 0.188 to 0.478 lb ai/A (1.0 to 2.5 pints product/A). Apply the lower rate on grasses up to 6 inches tall and the higher rate on grasses that are 6 to 12 inches tall. Erratic control often occurs when grasses are stressed from drought, low fertility, or temperature extremes. Repeat applications if new germination or regrowth occurs. Poast does not control annual bluegrass and the fine fescues. It is also weak on quack grass. Do not apply when rainfall is expected within 1 hour. Use with too much crop oil can cause crop injury. I have not had any damage, however, as long as I stayed within the label rate. Growers should evaluate the injury potential by treating a small area first then waiting a week before treating the rest of the cranberry bed. Consult label about Poast application with other herbicides and pesticides.

Prism. This is a selective post-emergence herbicide for controlling annual and perennial grasses. Grass needs to be actively growing at the time of application. Prism does not control sedges or broadleaf weeds. Treated grasses will show symptoms in 7 to 14 days. These symptoms include reduction in vigor and chlorosis/necrosis of younger plant tissue, and are followed by a progressive collapse of the remaining foliage.

Use 0.10 to 0.25 lb ai/A (13 to 34 ozs product/A). Rates depend on weed species, stage of growth, weed pressure, and environmental conditions. Apply under favorable conditions of soil moisture and humidity, which exist within a few days after rainfall or within 7 days after irrigation. Always use 1% volume by volume (v/v) crop oil concentrate containing at least 15% emulsifier (but not less than 1 pint/A) to finished spray volume.

Use only on non-bearing cranberries. Do not apply when plants are under stress from drought, excessive water, extreme temperature, or low humidity. Applying Prism under conditions that do not promote active grass growth will reduce herbicide effectiveness. Do not apply if rain is expected within 1 hour of application as control may be unsatisfactory.

1995 - WSU Cranberry Weed Control Results. My annual progress report was handed out as part of the package at the winter workshop. If you did not get a copy and want one, please call me, 360-642-2031.

Section 18. Thanks to all those who provided me with information on weed coverage. The final tally on percentage weed coverage for Washington was 4, 7, 3% for lotus, purple aster and clover, respectively. This translates into over a million dollars in crop loss per year. No telling, however, if we will obtain the Section 18.

Lotus Control. Several options are available for lotus, none of them perfect. Improving drainage and lowering soil pH are two cultural practices that are very useful in helping with long-term control. The former does not provide control but it is necessary to avoid phytotoxicity when controlling by lowering the pH and/or via heavy rates of herbicides. As I have stated in the past, lotus is manageable with soil pH reduction, but this is not necessarily an easy or quick process. Too much sulfur will cause phytotoxicity, especially on heavy or poorly drained soils or in areas with standing water. Spreading out sulfur applications over several years, improving drainage, avoiding application in areas of standing water, and monitoring soil pH are all methods that should be employed if sulfur is used. In general, the lower the pH, the less herbicide you will need in order to control lotus. From an herbicide perspective, Devrinol will work for suppression if you have not used it in the past; however, repeated use reduces its effectiveness. Casoron plus Devrinol appears to work quite well. Devrinol and Casoron do not necessarily have to be applied together but their combined use does seem to be necessary if total control is desired.

Silverleaf Control. Sandy textured soils with good drainage require a somewhat different approach than peat soils. The lack of high organic matter to interact with the herbicide makes results much more predictable. Weeds can be killed with 5 to 10-fold less Casoron in a sand than in a peat soil. However, herbicides have a very short half-life on sand, frequently less than a month. On peat, high herbicide residues can be found a year after treatment. Therefore, sand beds need lower rates, great emphasis on split applications, and precise timing. For controlling silverleaf on sand, we have had good results with Casoron or Casoron:2,4-D (5:1) applied when the majority of silverleaf shoot tips just begin to show and again 4 to 5 weeks later. The rate of Casoron is dependent upon vine development. The first application should be 50#/A, the second may have to be reduced if vines have progressed too far.

Control of silverleaf on peat is going to range from poor to good depending upon treatment, organic matter content of the soil, age of the infestation, and timing. Basically, the 100#/year limit for Casoron is inadequate to kill silverleaf on peat. Therefore, a grower is forced to use whatever additional herbicides are available. This doesn't leave many options. All of the following treatments have provided reasonable control in our research trials: Casoron:2,4-D (5:1) 90# early March and 30#/A early April; Casoron:2,4-D (5:1) 60#/A early March and early April and Devrinol 75#/A early to mid-April; Casoron 50#/A early March and early to mid-April + 100-150# Devrinol early February; Casoron 50#/A early March and mid-April; or Casoron:Devrinol (1:1.5) 100-110#/A early March and mid-April. Extreme care should be taken to avoid late application on Stevens (past mid-April in Washington). As I have said, there is a lot of variability with field results. In general, the above treatments usually perform fairly similarly, but one or two may be superior in some beds.

Soil pH management appears to help with silverleaf control on sandy soils, but I have not had the same luck on peat soils. Therefore, caution is advised.

Purple aster control. Based on surveys, aster appears to be one of the weeds most difficult to control. None of my trials have been tremendously successful. Basically, you can use the same approach for aster as you use for silverleaf. A wiping program with 20% Roundup and good coverage is also highly recommended.

Arrowgrass control. Two applications of 2,4-D at 20#product/A, one in November and one in April, appear to reduce this plant by 40-50%. Combining that with your normal pre-emergent herbicide (Casoron or Devrinol) appears to enhance control. This species takes several years to control.

Aquatic weed control. Farmers are caught in a catch 22 in terms of aquatic weed control. Because all surface water belongs to the state, all aquatic herbicide use must have a short-term water quality permit. For small water bodies with no discharge, a general short-term water quality modification permit has already been issued for Rodeo on weed control and copper sulfate on algae control. To use these compounds, all you need is an aquatic weed control license. To use the other compounds, although they may be labeled for aquatic weed control, requires that you obtain a specific short-term water modification permit through the State Department of Ecology. Call Mike Templeton, Southwest District Director, 360-407-6295, for information on this process.

BOG MANAGEMENT

Winter injury & spring frost protection. We have been re-evaluating the old hardiness data to determine differences between Stevens and McFarlin and the time of the season when we should begin to be concerned about frost protection. I collected buds from 6 Stevens bogs between November and the end of March and evaluated hardiness by visually examining the browning of the buds and comparing that to how they flowered after damage. We will collect additional data this year. Figure 1 shows average hardiness values for the average-sized buds across all those Stevens bogs. Figure 2 shows hardiness for the largest buds found at that sampling time.

Figure 1. Average hardiness values of the mixed terminal buds on the given date taken from 6 Stevens bogs (Cranguyma, Shier, Brewe, Lillegard, Marks, and Piukkala). Error bars show the standard error of the mean.

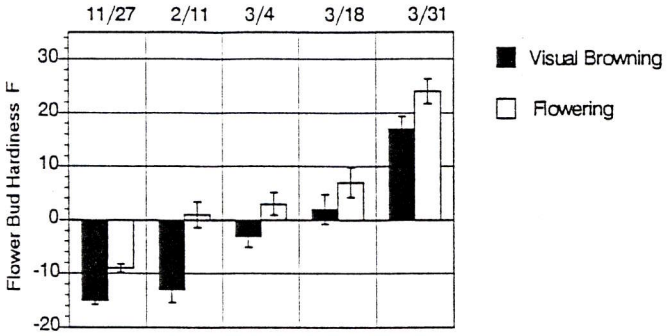
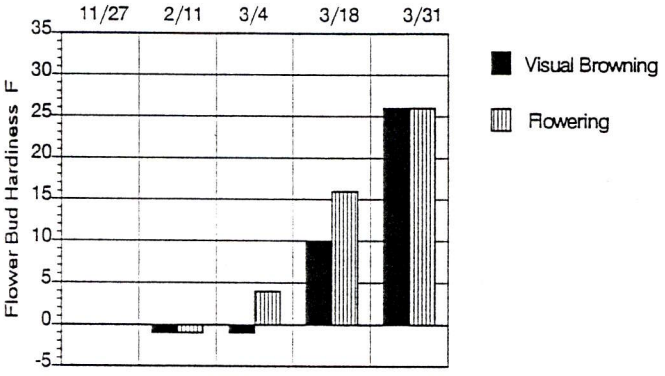


Figure 2. Hardiness values of the largest terminal mixed bud on the given date at the Shier Stevens bog in Long Beach.



You can use these figures as general guidelines for hardiness. In addition, several things are apparent. First, frost protection does not appear to be very critical until mid-March. Second, if you want to protect for the largest bud on the bog, you will need to adjust your protection level upwards. Third, there is a lot of variation in the system. Dead florets were common, even in the control. Fourth, I was surprised by the difference in hardiness between evaluation systems. By rooting and growing the upright out, we were able to determine a lot of subtle changes at different temperatures, such as changes in vigor. That is, damage is expressed in several tissues other than flowers. Fifth, although not shown here, McFarlin was much more hardy than Stevens. This was expected since Stevens buds were more advanced. If you are protecting only McFarlin and all the buds are of uniform size, they should be hardy well into March. The largest buds, however, were more sensitive.

The above data mainly demonstrates hardiness in the early stage of bud development. After that period is over, any minor frost can cause serious damage.

One of the biggest problems with frost is that the temperature profile on a cranberry bed is very dynamic and varies from the place where the sensor is and the upright tips are. This is so important that I urge you to read this section twice! I have been running temperature profiles in various bogs during frost events for the past year. In one experiment, I put the sensors at 2″ height intervals up to 1′. Figures 3 & 4 show a sample of that data. This was on 2 different nights--one, a hard frost where the low at tip level was 22° F for 60 minutes; the other, a light frost where the minimum was 29° for 9 minutes. Figure 3 shows the temperature inversion profile during a single moment in time. In both cases a few inches in height dramatically affect the temperature by several degrees. Figure 4 shows the difference in time it took to reach a certain minimum temperature for each of the heights. During a hard frost, the difference in time to reach 32° was minimal (less than 30 minutes) but during that same night the difference in time it took to reach 26° was more dramatic. An exposed sensor @ 8″ did not reach 26° until 1.5 hours after the vine tips reached 26°. The biggest difference, however, was on an evening of light frost. On this night, the minimum temperature was 29° for 2 minutes. It did not reach 32° at the 4″ height until 1.5 hours after the vine tips were at 32° and it was 4 hours later when the 6″ height reached 32°. What does this mean to the cranberry grower? First, a few inches difference in sensor height placement can make all the difference as to when

your irrigation system comes on. On nights of a hard frost, this is not as critical since there is less differential in temperature at the different heights. But on light frost nights, sensor placement at vine tip is absolutely essential to pick up on subtle temperature differences with height. I am convinced that significant crop loss occurs every year on nights of light frost because of this.

Figure 3. Temperature difference in height above the vine at a specific time during two frost events.

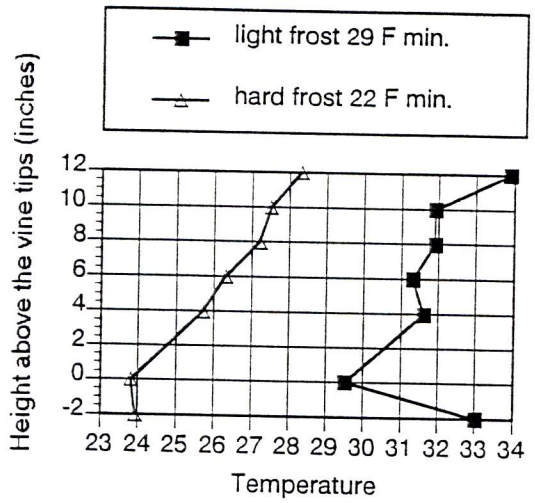
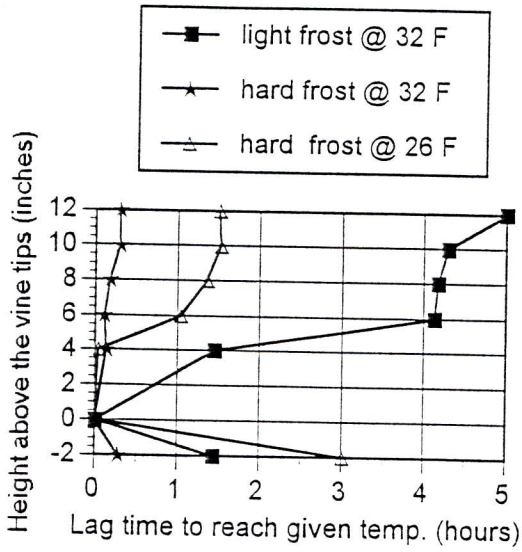


Figure 4. Lag time required to reach a given temperature for different heights above the canopy during two frost events.



Sensor height is also relevant in regard to bog elevation. Cold air always drains to the lowest area of the bog. A few inches difference in bog elevation could be critical. Also, when a series of beds are separated by dikes, cold air drainage is not predictable since it is blocked by the dike. Beds at a slightly higher elevation may get colder than where your sensor is located if they are in a position to trap cold air because of diking.

An example of bog elevation effect was noted in one of our studies where I had sensors within 20 feet of each other, all at vine level. The sensor at a slightly lower elevation (next to the ditch) reached 31.9° while those 20 feet away only got to 35°.

A final point has to do with sensor microclimates. I frequently see sensors in shelters of wood or PVC and/or exposed but above bare ground or next to the pond. Bare ground does not behave like a cranberry bed and reradiates stored heat to the sensor, thus keeping it slightly warmer than it would be over a cranberry bed which has an insulative cover of vines over it. If the sensor is covered by a shelter, especially from above, that further reradiates ground heat back to the sensor, it will keep it even warmer. How much warmer? In a series of tests on frosty nights, we found that a sensor at 6" height sheltered with a 2" piece of PVC cut in half with the top of the sensor shielded reached 28° 2 hours after the sensor at vine level and averaged 4° warmer during the night. For a 3-sided wooden shelter this difference in temperature was even greater. The take home message is that you can compensate for all of the above by setting your sensor to go off at 40° rather than 34°, or a much better way is to put your sensors exposed to the open at vine level at the lowest elevation in the bog in an area of thick canopy coverage. Multiple sensors may be necessary when bog systems are separated by dikes and roads or have different elevations or cold air drainage patterns.

PUBLICATIONS

Federal Income Tax Management for Farmers and Ranchers - WREP 0148. This publication is available at our office for $1.50.

MISCELLANEOUS

Buying Used Equipment. Ten tips for spotting cover-ups: (from Univ. of Calif. Small Farm Handbook.)
1. Fresh paint gussies it up. A new coat of paint does wonders to make equipment look good.

2. Glitz! Look for new parts, especially seats, starters, batteries, steering wheels. Ask what happened to the old parts. Ask for maintenance records.
3. Is the product identification number (PIN) visible?
4. Too clean?
5. How do the components fit together? Look for kinked hoses or sloppily fitting bushings and bearings.
6. Watch for tricks with oil. Thicker oils may be added to crankcases to reduce leakage.
7. "It was just overhauled." Ask for details on exactly what was overhauled.
8. Is the salesperson reputable?
9. Was it used for contractors' equipment. Transmissions, frames, front axles and bearings, brakes and hydraulic systems are far more severely strained in this type of service than in farm use.
10. Run it and drive it. On a diesel, if the glow plug or starting fluid are needed for a mild day, there will be complications. Don't be afraid to ask for owner's manuals, service manuals and maintenance records.

BOG MANAGEMENT

Native Pollinators. A recent report by Dr. Gary Nabhan addresses the importance of native bees for pollination by citing an example with cranberries. "In 1970 widespread organophosphate spraying (mostly fenitrothion) for spruce budworms decimated native bee populations, causing cranberry yields to plummet from 5.5 million pounds in 1969 to 1.5 million pounds in 1970." The take home message is that all insecticide applications should be done with the thought of protecting bumble bees.

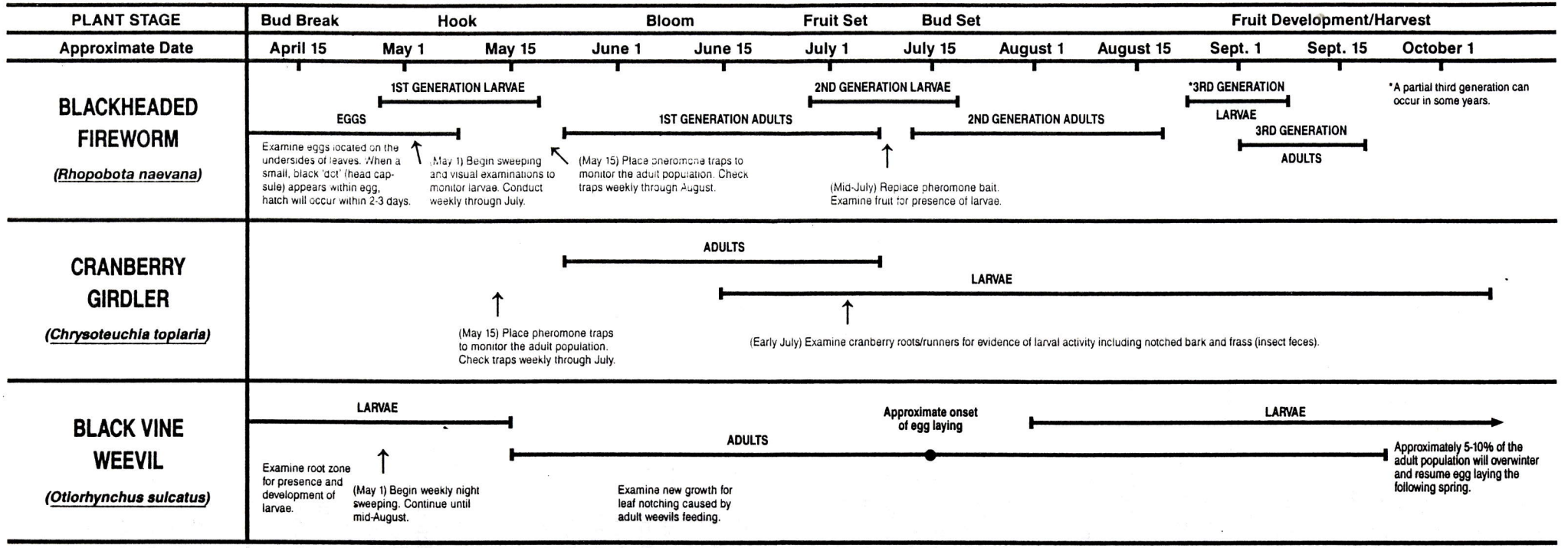
CAVEAT: The information in this newsletter was selected with good intentions by the editor. To simplify the presentation of information, it is sometimes necessary to use trade names. No endorsement of product is intended nor criticism implied. Where pesticides are mentioned, be sure to follow the labels exactly. If you have comments or suggestions regarding the newsletter, please write to the editor.

COOPERATIVE EXTENSION
Washington State University
Long Beach Research and Extension Unit

Dr. Kim Patten
Associate Horticulturist

CRANBERRY INSECT IPM GUIDE FOR WASHINGTON

By: Andy Broaddus, Production Specialist, Ocean Spray Cranberries, Inc.



NOTE: Not all insect life stages are shown.

PHEROMONE TRAPS: Pheromone traps are used to monitor the adult flights of cranberry girdler and blackheaded fireworm. This information is used to predict dates of peak egg hatch for improved spray timing. Place 1 trap per 5-7 acres. Place the trap bottoms level with the vine tips. Check the traps at weekly intervals. Clean the insects from traps each week so counts begin from zero. Replace the sticky traps as required, usually at approximately 2-week intervals. If possible, traps should be placed on the upwind side of the bog so the scent tends to blow across the bog.

Blackheaded Fireworm — Place traps in areas of known fireworm activity or at bog edges and corners where spray coverage may be less complete. Peak egg hatch occurs approximately 2-3 weeks following the first generation peak flight. Determine larval population numbers and degree of insect development with visual examinations and sweeps.

Cranberry Girdler — Place traps in areas of known or suspected girdler activity. Girdler has many alternate host plants such as grasses and conifers. To avoid attracting girdler from alternate host plants located off the bog, place traps towards the interior of the bog. Peak egg hatch occurs approximately 2 weeks or 150-200 degree days (base 48° F) following peak flight.

SWEEPING: Sweeping is an excellent method to monitor certain cranberry insect pests. Sweeping can help determine if an insect population is at a level requiring treatment and if treatments were effective. One sweep set is composed of 25 individual sweeps. At least 2 sets of sweeps should be taken per acre. In general, sweeping should be conducted weekly, however, sweeping may be conducted more or less frequently depending on pest development and crop stage. Use both hands on the net and make 180° sweeps into the vines. Avoid weedy patches as these are not representative of the bog.

Blackheaded Fireworm — Sweeping is used to monitor the larval population level. Sweep primarily at bog edges, corners and between sprinkler heads where spray coverage may be less complete. The economic threshold (population level at which control is justified) for fireworm larvae is 2 per 25 sweeps. The fireworm population should also be monitored visually by examining tips for the presence of webbing and larvae.

Black Vine Weevil — Sweeping is used to monitor adult population levels. Since adults are nocturnal, sweeping must be conducted at night, before dew forms to avoid sweeping wet vines. Sweep for adult weevils at the edges of previously weevil-damaged areas, areas with notched new foliage (caused by adult feeding), at bog edges, and on higher, well-drained areas of the bog. During the day, mark areas of the bog to be swept at night with flags for easier location in the dark. (Also, be on the lookout for fireworm and black cutworm larvae while night sweeping.) TRAP BOARDS (1-2 sq. ft. in size) can also be used to monitor the adult population. They should be placed at the edges of weevil-damaged areas and checked every few days. They tend to be more effective on cool, cloudy days.

IMPORTANT NOTES:
Keep in mind that pest development can vary considerably between bogs and crop years. This publication is to be used only as a general guide for the Washington state coastal cranberry growing area.

Contact private or university extension personnel for more specific information.

Always read and follow the pesticide label.

Avoid applying pesticides which are hazardous to pollinators during bloom.

HERBICIDE EFFECTIVENESS ON WEEDS IN CRANBERRIES [1]

1-96

		Soil Applied Herbicides					Postemergent Herbicides			
WEED FAMILY		Princep	Evital	Casoron	Devrinol	2,4-D	Roundup	2,4-D	Poast	Prism[2]
Amaranth(Pigweed)	Pigweed, redroot	G	F	G	G	G	G	G	P	P
Buckwheat	Dock, broadleaf	P		G			G	G	P	P
(Knotweed)	Knotweed	G	G	G	F	F	G	P-F	P	P
	Smartweed	G	F	F-G	G	F	G	G	P	P
	Sorrel, red		G	G	G	F	G		P	P
Buttercup	Buttercup	P	P	F	G	F	G	F-G	P	P
Composite	Aster, purple			F-G	F				P	P
	Dandelion[3]	*	*	G	*P	G	G	G	P	P
	Goldenrod, western				P		G		P	P
	Groundsel, common	F	F	G	G		G	G	P	P
	Hawksbeard, bristly			G	P		G	P	P	P
	Pineappleweed	F	G	G	G	F	G		P	P
	Prickly lettuce	G		G	G		G	G	P	P
	Ragweed, common	G	F	G	F		G	G	P	P
	Salsify, western				P				P	P
	Sowthistle	G	F	G	G		G	G	P	P
	Spanish Needle (beggarstick)	G	P	G	P		G		P	P
	Tansy ragwort			G	P		G	G	P	P
	Thistle, common	*		G	P	F	G	G	P	P
	Thistle, Canada	P	G	F	P	F	F	P	P	P
Evening Primrose	Fireweed	G		G	P		G	F	P	P
	Yellow weed			F-G	P	P	G	G	P	P
Ferns	Bracken fern	P	P	F	P	P	F-G	P	P	P
	Sword fern	P	P		P	P	P-F	P	P	P
Figwort	Speedwell					P	G	F	P	P
	Toadflax			P	P		P	P	P	P
Geranium	Geranium, cutleaf			G	G		G	F	P	P
Goosefoot	Lambsquarter	G	G	G	G	G	G	G	P	P
Grass (annual)	Barnyardgrass	F	G	G	F	P	G	P	G	G
	Bluegrass, annual	G	G	G	G	P	G	P	P	G
	Bromes, annual[3]	G	G	G	G	P	G	P	F-G	G
	Velvetgrass	P	G		P	P		P	F-G	P
Grass (perennial)	Bentgrass	*	*	G	*	P	G	P	F	G
	Rice cutgrass	P	G	F	G	P	G	P	F	G
	Saltgrass	P	F-G	P-F	P	P	G	P	F-G	G
	Quackgrass	P	P-F	G	P	P	G	P	P	G

WEED FAMILY		Soil Applied Herbicides					Postemergent Herbicides			
		Princep	Evital	Casoron	Devrinol	2,4-D	Roundup	2,4-D	Poast	Prism[2]
Horsetail	Field horsetail	P	P	G	P	P	P	G	P	P
	Scouring rush	P	P-F	G	P	P	P	G	P	P
Madder	Bedstraw		G				P	P	P	P
Mint	Henbit	G	G	G	P	F	G	F	P	P
Legumes	Clovers[3]	P	P	F	F-G	P	F	P-F	P	P
	Lotus/brdsft trefoil	P	P	P-F	F-G	P	P	P-F	P	P
Mustard	Bittercress, little	F	G	G	G		G	G	P	P
	Cress, hoary	*		G					P	P
	Pepperweed	*		F-G		G	G	G	P	P
	Mustard, wild	G	G	G	G		G	G	P	P
	Shepherdspurse	G	G	G	P	G	G	G	P	P
Nightshade	Nightshade	G	G	G	P		G	G	P	P
Pink	Chickweed	G	G	G	G	F	G	G	P	P
	Corn spurry	G		G	G		G	P	P	P
Plantain	Plantain	P	G	G	P-F	G	G	G	P	P
Purslane	Minerslettuce	G	G	G	P		G	G	P	P
	Purslane, common	G	F	G	G	F	G	F	P	P
Rose	Silverleaf	P	P	P-F	*	P-F	F-G	G	P	P
Sedge	Sedge species[3]	P	F	G	P	P	F	P	P	P
	Nutsedge/yellow	F	G	P	G	P	P-F	P	P	P
Rush	Arrowgrass	P	P	P	P	F		G	P	P
	Rush species[3]	P	F-G	F-G	F	F	F-G	G	P	P
	Lousegrass/toadrush		G	G	F		G	G	P	P
St. Johnswort	St. Johnswort			G	P		G	F	P	P
Woody Plants	Alder	P	P	P	P	P	G	G	P	P
	Blackberry[3]	P	P	P	P	P	G	F	P	P
	Poison oak	P	P	P	P	P	G	F	P	P
	Salal	P	P	P	P	P	P	F	P	P
	Salmonberry	P	P	P	P	P	G	P	P	P
	Scotchbroom & gorse	P	P	P	P	P	G	G	P	P
	Willow[3]	P	P	P	P	P	F-G	F-G	P	P

[1] This chart is intended only for planning your weed control program. Weed control will depend on timing, rates, environment and stage of weed development. Use herbicides with care; always check the label before using. Apply only to plants and sites listed on the label and use only the application methods and rates listed on the label. Herbicides listed are those registered for cranberries in Washington and Oregon for 1996. It is advised to use up existing stock of Princep as use in future years may be cancelled.

[2] Herbicide registered on non-bearing bogs only.

[3] There are numerous species of this plant. Herbicide effectiveness will depend upon which species is being treated; some species may be resistant.

(*) = Seedling control only; G = good (80-94%); F = fair (60-79%); P = poor (less than 59%)