Washington State University • Long Beach
Cooperative Extension
2907 Pioneer Road
Long Beach WA 98631

CRANBERRY VINE

April 2000

MEETINGS

Pesticide Safety, Cranberry Insect Pest Egg Development, Pollination, Backpack Sprayer Calibration and Frost Protection. April 17, 7:00 - 9:00 p.m. at the North Beach Grange in Grayland; April 21, 8:30 a.m. at the WSU - Long Beach Research Station, PCCRF on Pioneer Rd. This will be run with the Long Beach Cranberry Growers bog tour. Pesticide credits will be given.

Long Beach Cranberry Growers' Bog Tours. The April 21 bog tour will be held at PCCRF at 8:30 a.m. The May 19 bog tour will be held at Cranguyma Farms on Sandridge Road at 8:30 a.m.. The June 16 bog tour will be held at Cranmore Farm, in Seaview, Highway 101 at 8:30 a.m.

Cranberry Field Day. Monday, July 31, 8:30 -2:30, at the PCCRF on Pioneer Road in Long Beach.

CUTTING ON FUNGICIDES

With the current price of cranberries, the rule for fungicide use is simple: unless you have cottonball, twig blight or heavy fruit rot or are growing fresh fruit, you may not need to spray fungicides. Cottonball is one disease, however, that should be controlled even in tough economic times. The incidence of cottonball has been increasing in the Long Beach area for several years and all cultivars are susceptible. The pathogen persists for years (nobody knows exactly how many) as "mummies" near the soil surface. If mummies accumulate over the next few years, you will be fighting cottonball for the rest of the cranberry bed's or your life, whichever is shorter. Deciding on a course of action depends on disease pressure. Determine disease pressure by scouting beds (especially areas where the disease has occurred before) at first bloom and look for tip blight (the primary infection stage). Disease pressure also depends on bed history: Low pressure - cottonball never or only rarely detected or tip blight not found after 10-15 minutes. Moderate pressure - bed has a history of cottonball (1-10% berries infected), or tip blight found after 5-10 minutes of searching. High pressure - bed has a history of severe cottonball (> 10% fruit infection) or tip blight found within a few minutes of scouting. Recommendations: Low - do not spray. Moderate - spray 1-2 times during bloom; if only 1 spray, make it at 10-20% bloom. High - spray twice during bloom at the higher rate.

We are hoping for a Section 18 for Orbit in 2000. Unless we obtain one, you are limited to applying Mancozeb, which is not as effective as Orbit. For other suggestions to save on fungicide cost on other diseases see Table 1. Dr. Bristow suggests spraying only for Rose Bloom if incidence is medium to high. To assess incidence, scout beds in early May and look for the young pink abnormal branches and spray when their surface start to turn white (when fungus begins to form on the surface of the branches). For Fruit Rot, the big question is: Are you growing fresh fruit? Since this is the only bright spot for crop prices, normal sprays should be considered. For processed fruit follow table recommendations. Half rates of Mancozeb are an option to help replace cost under moderate fruit rot pressure. Examine your packout records to get an indication of your average fruit rot. Twig Blight is one disease which can cause serious loss if not treated and you must spray if infestation is severe.

Table 1. Suggestions to minimize costs of fungicide by applying fungicide according to the level of disease pressure.

Disease	Disease Pressure	Fungicide: Kocide	Mancozeb	Bravo	Disease Control Cost/ac
Rose Bloom	Low				0
Rose Bloom	Med-High	1x			$15
Fruit Rot	Low		1x		$6-15
Fruit Rot	Med		2x		$30
Fruit Rot	High		2x	1x	$67
Fruit Rot,+ twig blight	Low-Med, Low		3x		$45
Fruit Rot + twig blight	High, Med-High		1x	2x	$89

Cottonball section adapted from Patty McManus, Extension Plant Pathologist, UW-Madison

OTHER IDEAS FOR RESOURCE SAVING

- Do not over irrigate.
- Do not cut back on scouting so far to the point that outbreaks are missed.
- Evaluate everything in an IPM approach (benefit vs cost).
- Use the lowest cost fungicides for fruit rot control and apply them based on keeping quality forecast, rot history, and wet vs dry harvest.

- Do not use CaB unless you suspect poor fruit set is a problem.
- Do not use SulPoMag unless you have stressed (crunchy) vines or if soil tests show low K or Mg. If you do use it, 100 lb/A should suffice.

FROST PROTECTION AND DRAINAGE adopted from Bruce Lampinen, University of Mass.

An important consideration during frost season is maintaining adequate drainage in the root zone. As extensive frost protection leads to water logged conditions on many beds well into the period when root growth begins (>50° F soil temperature). Many beds that show water stress related damage during the summer have very shallow (~0.5 inch) root development. This shallow rooting is likely the result of saturated conditions resulting from frost protection and or rainfall. Roots will not grow in anaerobic conditions, and will stop growing at about 2-3 inches above the water table. It is important to try to maintain drainage in the root zone during the May/June period to establish adequate rooting depth.

STINGER -SECTION 18 FOR 2000

Stinger is a very potent herbicide and should be used on a spot treatment basis only. Growers who use stinger may have some crop injury and yield reduction in treated areas. However, in some cases where weeds are severe, injury in the short run will be compensated by long-term weed reductions. To minimize crop injury use the proper timing and low rates.

Before using stinger on cranberries growers must have the 2000 Section 18 label in their possession and sign a waiver of liability. If you need a copy of this waiver please contact me.

New Changes to the Stinger Section 18: Additional broadcast treatment can be made after fruit set up to 60 days before harvest using 1/4 to ½ pint per acre as spot treatment in 20 to 40 gallons of water per acre. For new or nonbearing beds apply Stinger at 1/3 to ½ pint per acre. New beds are more susceptible to Stinger damage, so use low rates.

Important Considerations when applying Stinger: Follow all the recommendations of the Section 18, do not apply Stinger with a surfactant. Do not spray once bud scales have separated and the growing point is visible. Do not apply to weeds tolerant to Stinger such as silverleaf, yellow loosestrife, false-lily-of -the-valley, buttercup, tussock, sedges, grasses, and violets. Make spot applications only through a spray nozzle or a calibrated boom.

Use the following guidelines for determining how much Stinger to use in a back pack sprayer. Remember the rate you use is proportional to the spray volume. The more you spray, the lower the rate of stinger you need. Spray to mist or wet is recommended, not runoff.

	Stinger Rate		
	1/3pt/ac	½ pt/ac	2/3 pt/ac
Spray Volume	Teaspoons per gallon		
mist - 40 gpa	0.40	0.60	0.80
wet - 100 gpa	0.16	0.24	0.32
runoff - 400 gpa	0.04	0.06	0.08
	Teaspoons per 3 gallons		
mist - 40 gpa	1.2	1.8	2.4
wet - 100 gpa	0.5	0.7	1.0
runoff - 400 gpa	0.12	0.18	0.24

WSDA Compliance Program for Section 18 Pesticides

To help protect salmon and salmon habitat, WSDA is instituting a compliance program for all Section 18 pesticides for the 2000 crop year. This program will impact many berry growers whose fields fall within the designated watersheds. Fortunately, the Willapa is not one of these watersheds. It is likely, however, that cranberries will see a Section 18 compliance for 2001. This compliance program requires pre-notification and record keeping. The "pre-notification" part requires growers to notify WSDA 48 hours before each application of Section 18 pesticide, like Stinger. The record keeping part does not require applicators to keep any additional records above what is now required. The WSDA will conduct a random call-in of application records.

ON MARGINALITY taken from Ed Jesse, Extension Ag. Economist, UW-Madison

An often-overlooked economic concept is equating marginal revenue with marginal cost to optimize economic use of production inputs. Each additional pound of fertilizer you apply, for example, results in smaller and smaller increases in yield. This is sometimes called the law of diminishing returns. Taken to the extreme, additional fertilizer will eventually reduce yields. The increase in cranberry yield from an additional pound of fertilizer multiplied by the price of cranberries is the marginal revenue from that particular pound of fertilizer. The higher the cranberry price, the higher the marginal revenue from additional fertilizer. The marginal cost of fertilizer is the price of an additional unit of fertilizer. Unlike marginal revenue, the marginal cost of fertilizer doesn't change as more is applied and is not affected by cranberry price. So the marginal cost of fertilizer is a constant, a target to which marginal revenue is driven. Equating marginal revenue and marginal cost in this case means applying fertilizer only so long as the dollars received in additional cranberry revenue are greater than the dollars you spend to buy the fertilizer. The difference between marginal revenue and marginal cost is the contribution of another unit of fertilizer to your profits. For example, you know from experience that if you bump fertilizer use from current levels by 1,000 lbs/ac you can expect to increase cranberry yields by 5 barrels/ac. If the fertilizer you're using costs $400/ton or $200/ac in marginal cost for the increased use, at a cranberry price of $50/barrel, you're generating $250/ac in marginal revenue by putting on that extra half-ton of fertilizer (5 barrels/ac× $50/barrel = $250). The extra fertilizer adds $250to revenue and $200 to cost and $50 to your bottom line. Good decision; apply even more fertilizer since marginal revenue exceeds marginal cost at this level of use! If the cranberry price is $20/barrel, then the extra $200 worth of fertilizer would bring you only $100 in additional revenue, resulting in a $100/ac loss in profit. Not a very good decision; cut back on fertilizer use since marginal revenue is less than marginal cost. In real life, the yield response to fertilizer, pesticides, and other production inputs depends on a host of factors and cannot be precisely specified. Moreover, some input expenditures incurred this year have carryover benefits in subsequent years, which complicates the decision. There are also environmental factors to consider in determining chemical use. Ask Extension specialists to provide you with some reasonable yield response guides to help gauge marginal revenue. This is not the year to be caught with your marginal revenues falling short of your marginal costs!

DEMONSTRATION AND ASSESSMENT OF BIORATIONAL PEST MANAGEMENT

At 9 commercial cranberry farms in 1999, we implemented a program to manage blackheaded fireworm (BHFW) using primarily biorational pesticides. The program involved applications of a *Bt*-based pesticide (Mattch, Dow Agrosciences) or Confirm (Rohm and Haas) against first and second generation larvae and a sprayable microencapsulated female pheromone (MEC, 3M Canada) to disrupt mating. The sampling program was more intensive, and the action thresholds to cue pesticide application were slightly higher than those used for the conventional program (Fig 1). During April, we searched the undersides of cranberry leaves for overwintering BHFW eggs to estimate potential BHFW pressure. As eggs began to hatch, we sampled early instar larvae using random samples of cranberry uprights and sweep nets. We also dissected infested (webbed) uprights to determine larval size, but depended more on number larvae per sweep to decide whether or not to spray. Percentage infested uprights is a better indicator during mid-season, when sweeping may remove flowers and fruit. Infested uprights should be closely examined, however, to distinguish second generation damage from older damage caused by the first generation. During mid to late season, we collected fruit, both randomly and from any infested patches, to measure percent infestation.

To better compare pesticide effects, small areas in some bogs were left untreated. Pheromone traps were placed during early June to determine when male BHFW emerged and to measure mating disruption at farms where we used MEC. We baited one of two sticky traps with a cap of normal strength (10X virgin BHFW female moths) and the other with a 'decoy' cap (1X virgin female moth). We switched the traps weekly to ensure that any affects were not due to trap location.

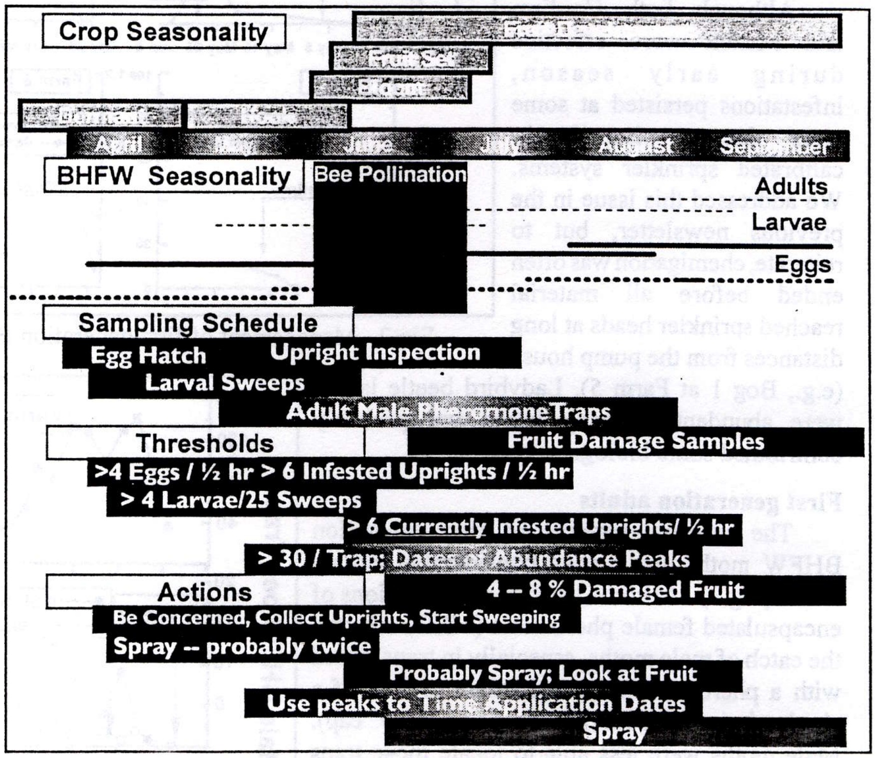

Fig 1. BHFW sampling schedule, infestation threshold levels, and suggested actions relative to crop and pest seasonality. Follow the Sampling Schedule for each life-stage and carry out the Action if Threshold is exceeded.

First generation larvae.

Early season trials against first generation BHFW larvae were especially variable, both among and within farms (Fig 2). At Farm 1, for example, larvae appeared early in the season at only 1 of 7 bogs. We applied Confirm to that bog alone by handgun, a 4 person-hour procedure. Biorational pesticides were applied according to the normal recommended schedule (2 applications 14 days apart) at other bogs and farms when 4 larvae per 25 sweeps were found or if the farm had a history of heavy infestation. At Farms 2 or 3, hardly any larvae were found, so no insecticides were applied during early season.

In almost all cases, larvae declined in treated, but not in untreated areas. Unfortunately, a third pesticide spray was required at many farms, even those managed using conventional pesticides. Temperatures were much cooler than average last spring, and BHFW egg hatch extended into June.

Although both Confirm and Mattch were effective during early season, infestations persisted at some sites due to improperly calibrated sprinkler systems. We addressed this issue in the previous newsletter, but to reiterate, chemigation was often ended before all material reached sprinkler heads at long distances from the pump house (e.g., Bog 1 at Farm 5). Ladybird beetle larvae were abundant at many farms and probably contributed some biological control.

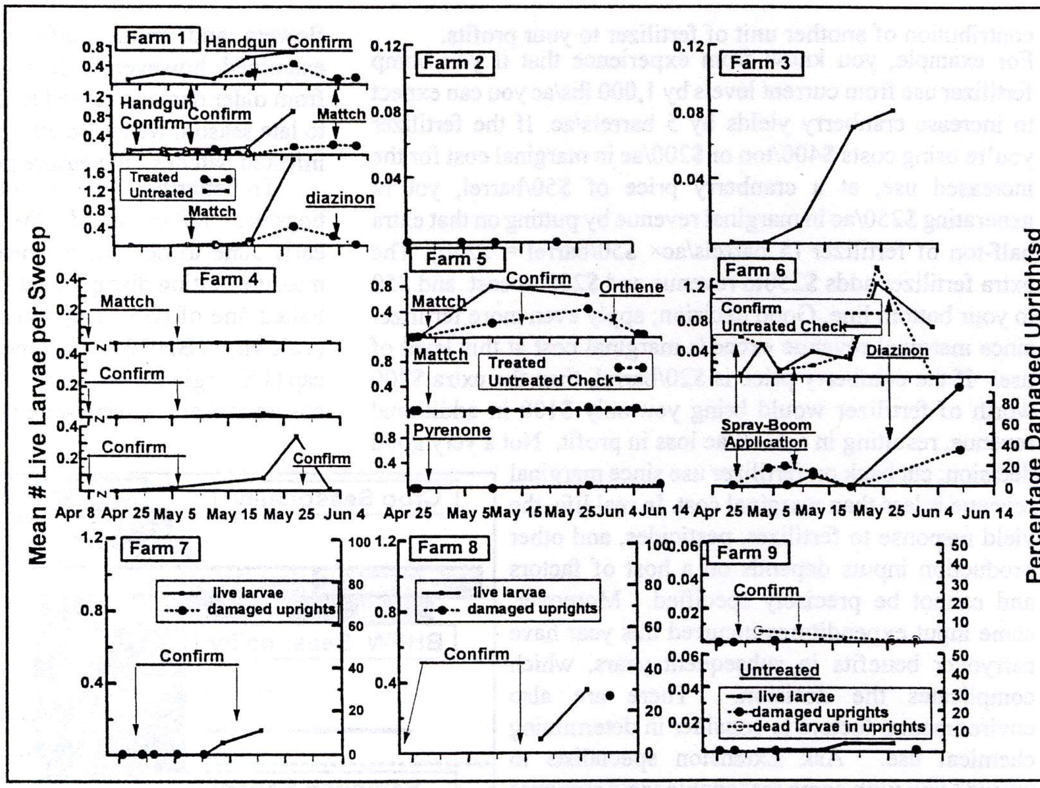

Fig 2. Management of first generation BHFW larvae at 9 commercial cranberry farms, 199

First generation adults

The seasonal patterns of first generation BHFW moths also varied considerably among farms (Fig 3). At some locations, applications of encapsulated female pheromone (MEC) affected the catch of male moths, especially in traps baited with a pheromone dose equivalent to that of a single virgin female BHFW (e.g., a 'decoy' cap). Male moths were less able to locate those traps compared to 'standard' traps, indicating successful mating disruption. This premise was tested at Farm 7, where MEC was not applied and just as many moths were caught with the 'decoy' baits as with the standard.

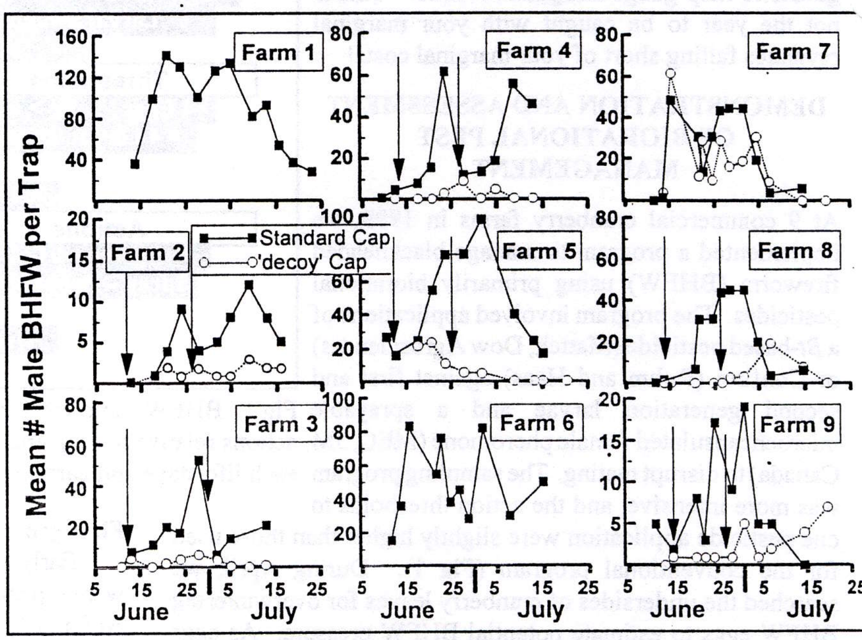

Fig 3. Seasonal abundance of male BHFW moths at 9 commercial cranberry bogs. Pheromone traps were baited with caps of standard strength or a concentration equivalent to a single virgin female BHFW moth ('decoy'). Arrows indicate applications of sprayable female BHFW pheromone.

Second generation BHFW larvae and other insect pests.

Table 1 summarizes cranberry insect pest management in mid to and late season at the 9 demonstration farms. All insecticides applied against BHFW were biorational (MEC and Confirm) except at Farm 6, where only one Confirm spray was made in late June, so diazinon was applied in July. Fruit damage due to BHFW remained below 5% at all other treated sites. Comparisons with untreated check plots demonstrated the biorationals as effective. Lorsban was applied at Farm 9 against tipworm and diazinon was applied during late season at Farm 2 against an unforeseen cranberry fruitworm (CFW) infestation.

Pheromone traps for CFW were placed at several sites in Long Beach during mid-June. A few male moths were captured in early July but larvae were not observed until August 7. Diazinon was applied at Farm 2 on August 16, but the infestation remained. We applied Confirm to Farm 3 on August 22 and CFW damage declined somewhat in September.

Because CFW is recently reintroduced to the region after an absence of 30 years, its local seasonality is not well known. In contrast to BHFW, which lays its eggs mostly in response to temperature, CFW females also respond to the size and color of the berry ("BB" size). In other parts of the country, this stage coincides with second generation BHFW larvae, so pesticides targeted against that pest may also suppress CFW. This may be the case here, as CFW was mostly a problem at sites where summer pesticides were omitted due to very low levels of BHFW. In addition, low quality commercial pheromone caps may have reduced the catch of CFW males. The relationship between number and date of trapped moths and the size and date of CFW infestation needs to be better understood, especially in the PNW.

Table 2. Mid to late season management of insect pests at 9 commercial cranberry farms.

Farm	Date	Bogs	Area (ac)	Pesticide	% Upright Damage	% BHFW Fruit Damage	% CFW Fruit Damage
1	10 Jul	1,4	2.4	Confirm			
	22 Jul	2,3,5,6	5.2		5.9		
	23 Jul	all	7.6	Confirm			
	30 Jul	2,3,5,6			3.9	0.5	0
		check			17.0	0	2.1
	19 Aug	1,4				2.4	4.8
		2,3,5,6				3.6	4.5
2	13 Jun	1,2 only	3.9	MEC			
	26 Jun			MEC			
	23 Jul				0		
	7 Aug					0	1.7
	14 Aug					0	6.0
	16 Aug			diazinon			
	2 Sep					0	14.0
3	13 Jun	all	3.5	MEC			
	29 Jun			MEC			
	19 Jul			Confirm			
	30 Jul				1.0		
	7 Aug				2.1		
	22 Aug			Confirm		0	1.7
	21 Sep					0	7.7
	5 Oct					0	6.3
4	14 Jun	all	7.4	MEC			
	27 Jun			MEC			
	19 Jul			Confirm			
	30 Jul	2,3	5.2		1.0		
		4	1.2		2.7		
		Mac	2.7		0.9		
	2 Aug	all		Confirm			
	7 Aug	2,3			0	0.3	1.1
		4			2.4	2.4	2.7
	18 Aug	2,3			0.1	1.1	1.1
		4			1.8	1.9	3.8
		Mac			0	0	0
5	12 Jun	all	8.5	MEC			
	26 Jun	all	8.5	MEC			
	17 Jul	1,2,4,5	4.2	Confirm			
		3,5,6,7,8	5.3	pyrenone			
	29 Jul	1,2,4,5	4.2		1.3		
					0.6		
	7 Aug				0.7	1.3	
					1.3	1.7	
	17 Aug				2.0	1.7	

Assessing the biorational program

The primary criterion for a successful pest management program is the ability to maintain pests below levels which are economically unacceptable in terms of inputs (both material and labor costs) and return (yield). In terms of materials, we successfully lowered overall seasonal costs of the biorational program by reducing the number of sprays at some farms, or at some bogs within farms. In terms of labor, the biorational program definitely costs more than conventional programs using fewer monitoring techniques (Table 3). In terms of yield, the slightly higher action thresholds we used for the biorational programs seemed acceptable. We did not have the time or the resources to thoroughly address the relationship between pest infestation and yield, but at the infestation levels of these studies (~5%) they did not appear strongly related. Dozens of factors contribute to yield and it is difficult to determine relative importance, but, if many of the other components of yield in cranberry (weeds, diseases, pollination, soil structure) are favorable, acceptable yields may be obtained despite low levels of insect damage. In some of our studies, overall percent upright damage decreased, even as larval abundance increased, because cranberries were growing so rapidly.

Monetary costs of all material used in the biorational programs are not available (e.g., MEC), but costs of Confirm and

Mattch ($20 and $15/ac/application, respectively) are not too far removed from the costs of conventional materials, diazinon and Orthene ($10 and $15/ac/application). Costs can be further reduced by eliminating unnecessary sprays. The monitoring program used at the demonstration sites was more intensive than those used in conventional programs (Table 2), but may be cost-effective if sprays can be skipped.

Farm	Date	Bogs	Area (ac)	Pesticide	% Upright Damage	% BHFW Fruit Damage	% CFW Fruit Damage
6	29 Jun		6.5	Confirm	0		
	5 Aug				0		
	17 Aug				6.1	16.5	
		untreated			12.5	22.6	
	27 Aug					12.1	
		untreated				56.6	
	29 Aug			Diazinon			
	2 Sep					15.0	
		untreated				16.9	
7	29 Jul		1.4		0		
	4 Aug			Confirm	0		
	5 Aug				1.4		
		untreated			19.6		
	17 Aug			Confirm		11.1	
	27 Aug					8.4	
						4.8	
	2 Sep					4.7	
		untreated				13.9	
8	14 Jun		6.5	MEC			
	26 Jun			MEC			
	29 Jul				0		
	5 Aug				0		
	17 Aug					0	
	27 Aug					0	
	2 Sep					0	
9	14 Jun		1.7	MEC			
	27 Jun			MEC			
	19 Jul			Lorsban			

Table 3. Approximate time (hours) to monitor a 5 ac bog managed with biorational or conventional pesticides at different BHFW densities: low (l), medium (m), high (h) [a].

	Dormant (Oct-Apr)			1st Gen (late Apr-						2nd Gen (late Jun --late Aug)												Total		
	eggs			larvae			moths			larvae			adults			uprights			fruit					
Program	l	m	h	l	m	h	l	m	h	l	m	h	l	m	h	l	m	h	l	m	h	l	m	h
Biorational	1	2	1	1	2	1.5	0.2	0.4	0.6	1	2	1.5	0.2	0.4	0.6	0.5	1	1	1	1.5	1	4.9	9.5	7.2
Conventional	0	0	0	1	1	0.5	0.2	0.4	0.6	1	1	0.5	0.2	0.4	0.6	0	0	0	0.5	0.5	0.5	2.9	3.3	2.7

[a] low (l): 0-3 eggs/hr, 0-3 larvae/25 sweeps, <10 moths/trap
medium: (m): 4-8 eggs/hr; 4-8 larvae/25 sweeps, 10-30 moths/trap
high (h): 8-16 eggs/hr; 9--15 larvae/25 sweeps, 30-60 moths/trap

Spartina biocontrol insect will not feed on cranberries.

Fritzi Grevstad, University of Washington

This summer, an insect will be introduced into the Willapa Bay area from California for biological control of *Spartina alterniflora*, the grass invading the mudflats of Willapa Bay. The selected insect is a planthopper, *Prokelisia marginata*, which sucks the sap from the grass. In order to ensure that this insect would not harm other plants in the area, scientists at the University of California performed extensive feeding trials using non-target plants. Cranberries were among the plants tested and were completely rejected by Prokelisia. Greenhouse facilities for rearing of insects prior to their release are located at the WSU Research and Extension Unit in Long Beach.

WEATHER

Month	Rainfall (Inches) 2000	1999	1998	1997	20 yr average	Growing Degree Days 2000	1999	1998	1997	10 yr average
January	10.7	15.5	18.5	14.9	10.8	5	14	58	43	40
February	7.0	21.2	11.4	5.6	9.3	40	10	69	21	55
March	7.9	12.0	10.2	16.2	9.5	25	36	97	38	72
April		3.6	3.0	6.5	5.6		87	99	91	116
May		4.4	3.8	4.7	3.8		180	265	344	216
June		4.0	1.8	5.1	2.8		329	350	362	323
July		1.9	1.1	1.2	1.9		376	476	476	421
August		1.9	0.2	2.7	1.7		474	484	543	440
September		0.6	0.7	6.9	4.1		333	369	477	363
October		5.6	6.2	15.6	6.5		193	244	229	217
November		16.3	19.6	6.5	11.4		138	99	144	99
December		16.0	20.3	9.0	12.6		39	34	38	41
TOTAL		103.0	96.8	94.7	80.5		2209	2644	2806	2402

COOPERATIVE EXTENSION

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