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

CRANBERRY VINE

March 1994

THE STATION/PCCRF

Ambitious plans are being developed by the PCCRF for new bogs, a variety trial, conversion to wet harvest, pond enlargement, new pump, revamped irrigation system and ditch lining. Many of these are already in full swing.

Visiting Faculty. Dr. Rod Macfarlane, scientist from New Zealand, has returned for six more months of bumble bee and cranberry pollination research.

MEETINGS

Long Beach Bog Tours. The March bog tour will be held on March 11 at 9:00 a.m. at the Clyde Sayce bog north of Nahcotta off of Joe Johns Road.

Additional bog tours are slated for April 15, May 13 and June 10 at 9:00 a.m. Locations will be announced or call the station at 642-2031 for details as the dates approach.

Frost Protection/Irrigation Fine Tuning. Tom Ley, WSU Irrigation Extension Specialist in Prosser, will come to our area to talk about basic frost protection principles, maximizing frost protection, fine tuning irrigation systems and new irrigation design options: in Grayland, April 11, 7:00 p.m. at the North Willapa Grange; and in Long Beach, April 12, 8:30 a.m., at the Ocean Spray Receiving Station. Bring your questions.

1994 Cranberry Field Day. Field Day this year will be held on July 29 at the Cranberry Research Station on Pioneer Road in Long Beach WA.

WEATHER

	Rainfall (Inches)					Growing Degree Days				
Month	1994	1993	1992	1991	20 yr av.	1994	1993	1992	1991	10 yr av.
January	8.1	8.7	14.4	8.1	10.8	76	22	69	36	40
February	12.1	1.4	6.0	10.1	9.3	26	63	118	110	55
March		8.1	1.7	6.6	9.5		94	145	92	72
April		10.3	9.9	9.0	5.6		147	189	122	116
May		5.9	0.9	3.1	3.8		360	296	198	216
June		3.3	1.4	1.8	2.8		386	388	285	323
July		1.8	0.4	0.6	1.9		458	486	423	421
August		0.7	1.3	5.3	1.7		478	477	437	440
September		0.3	2.6	0.2	4.1		359	314	465	363
October		2.9	5.2	2.4	6.5		249	194	214	217
November		5.0	11.0	10.2	11.4		23	69	102	99
December		14.0	8.3	7.7	12.6		35	4	55	41
TOTAL		62.5	63.1	65.1	80.5		2674	2749	2409	2402

INSECT CONTROL

Black-Vine Weevil. One of the keys to weevil control is early detection. By the time the bog starts dying, it is too late to bring weevil populations down to low levels. Night sweeping in April and early May will help detect over-wintering adults and give a good indication of potential population levels. An Orthene spray on a warm night in early May for adult weevils will suppress them and double as a fireworm spray. Although Orthene is only marginally effective for weevil control, it is the best we have to date.

DISEASE CONTROL

Fungicide Optimization. Several growers have asked for more details from Dr. Bristow's fungicide optimization research program. Details of this research are summarized at the end of the Cranberry Vine.

WEED CONTROL

Soggy Soil and Herbicides. The 12 inches of rain this February will cause some problems with herbicide application. Herbicides put out before the rains are likely to lose some of their effectiveness. Thus, you may want to consider a second application. If you haven't applied anything yet, take care to avoid putting out herbicides where there is standing water or totally saturated soils. There is a tendency for some compounds, such as Evital, to move laterally and accumulate in the low spots of the bog. This is especially true with new or young bogs which don't have the vine coverage to impede lateral movement of the granules.

Weeds and Soil pH. In 1991 and 1992 we sampled 160 bogs for soil pH in Long Beach, Grayland, North Beach, and Warrenton. We then correlated the soil pH with the populations of various weed species. Weed populations of silverleaf, purple aster, yellow weed and lotus all increased with increased soil pH; while horsetail and lily-of-the-valley increased as soil pH decreased.

What is most relevant is the cut-off point in soil pH below which you don't find a particular weed species to be a big problem (<5% coverage). For those sites, we did not find any significant lotus or yellow weed and only 3 sites with significant silverleaf below pH 4.75. This illustrates the important role soil pH plays in controlling weeds. If you have a few hot spots for the above weeds, you may want to test the soil pH.

Buttercup control. A heavy (100+#/ac) application of Devrinol mid-winter usually will markedly suppress buttercup, but the longer you wait, the more difficult the control. Furthermore, lurking under every buttercup are 25 silverleaf plants waiting to take its place. Controlling one without the other may do little good. I would suggest following up bad buttercup spots with split applications of Casoron to help suppress silverleaf.

Lotus control. By now you should be able to easily see lotus starting to grow as it is getting ready for an all-out frontal assault on your bog. A heavy Devrinol application in late February/early March, followed by a second application a month later, will suppress lotus at least until bloom, after which, wiping, cutting and pulling will keep it down until harvest. If your infestation is severe enough you may quickly lose the bog.

Silverleaf control: Despite my best intentions we are still a little way from completely resolving this problem. What do we know to date? 1) Casoron too early (before mid-February in most years) does not help much. 2) Control varies by bog. A 50 lb. split application may work perfectly on a moderately infested bog with a thin duff layer, but doesn't touch a totally infested bog with thick duff on peat. 3) 2,4-D in the Casoron mix sometimes helps, but not always. Regardless, the beneficial effects are usually subtle at best. 4) Split applications reduce phytotoxicity and improve control over single applications. 5) A late application is necessary to provide any residual control. The definition of "late" varies by year and variety. This may be late March for Stevens during a warm spring and early May for McFarlin during a cool spring. 6) The best rates for serious infestations is currently beyond the label rates, which states that we cannot exceed 100#/A in the spring. We will attempt to get a modification in the label for next year. 7) For severe infestations, I would suggest 2 applications, 60 and 40 pounds spaced 3 to 4 weeks apart, combined with 2,4-D at a 5:1 ratio, with the last application as late as possible.

Calibrating Those Belly Grinders. How do you know what rate of herbicides you are putting out? A rather common response is, "By figuring out how many sacks it took to cover the bog". What about spacing between each pass? Are you sure you are getting uniform coverage? The following methods for calibrating granular spreaders are

straight forward and highly recommended. You may be surprised by the results. (excerpted from WSU Extension Bulletin Misc 170 "Turf and Ornamental Weed Management Principles", C. Boerboom et al.)

Many product suppliers furnish recommended settings and swath widths. These are as precise as the manufacturer can make them, but many factors can contribute to significant rate variations. Use the gate setting on the product label only as the initial setting for calibration trials prior to large-scale use.

The easiest way for an operator to check the delivery rate of a drop spreader is to put a weighed amount of product in the spreader. Apply the material over a measured area, preferably at least 1,000 sq. ft. for a drop spreader and at least 5,000 sq. ft. for a rotary spreader (belly grinder); then weigh the product remaining in the spreader to determine the rate actually delivered.

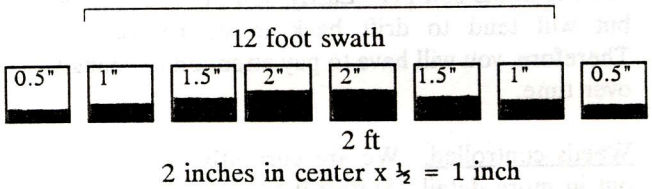
If you prefer not to apply the pesticide to an area during a calibration trial, use one of two other procedures. For drop spreaders, mount a pan beneath the gate, collect the granules, and weigh them. Otherwise place a plastic tarp on the ground. Apply the product onto the tarp. Collect the granules from the tarp and weigh them.

To calculate the application rate, first determine the size of the test area (length x width = rectangle area in sq. ft.). Divide the amount of pesticide applied (in pounds) by the area of the tarp (in sq. ft.) and multiply by 1,000 to get an answer in lbs/1,000 sq. ft., or by 43,560 for lbs/acre.

For example, if you laid out a 50 x 100 ft. plastic tarp and made your application to the tarped area, then weighed the granules deposited on the tarp and found 4.5 lbs. of product, you would calculate as follows. The area of the tarp is 5,000 sq. ft. Dividing the 4.5 lbs. of granules by 5,000 sq. ft. = 0.0009 lbs. per sq. ft. Therefore, the delivery rate of the applicator as you used it was 0.0009 lbs. per sq. ft. To determine application rate per 1,000 sq. ft., multiply 0.0009 lbs. x 1,000 = 0.9 lbs./1,000 sq. ft. To calculate rates in lbs/acre, multiple 0.0009 lbs. x 43,560 sq. ft. = 39.2 lbs/acre.

When using rotary spreaders, check and correct the distribution pattern. Lay out a row of shallow cardboard boxes on a line perpendicular to the direction of travel. Boxes 1 to 2" high, with an area of about 1 sq. ft., spaced on 1 ft. centers are good. The row of boxes should cover 1½ to 2 times the anticipated effective swath width.

To conduct the test, pour some product into the spreader and set it at the label setting for rate and pattern. Make 3 passes over the boxes, operating in the same direction each time. Weigh the material caught in each box and plot a distribution pattern. A simpler procedure, however, is to pour the material from each box into a test tube, vial, or small bottle. When the bottles stand side by side in order, a plot of the pattern is visible. Use this method to determine swath width. The effective swath width is twice the distance from the center to the point where the rate equals ½ the average rate at the center. For example, if the center 2 bottles have material 2 in. deep, and the bottles from the 6 ft. positions (6 ft. left of the spreader centerline and 6 ft. right of the spreader centerline) have material 1 in. deep, the effective swath width is 12 ft.



2 inches in center x ½ = 1 inch

Using sulfur on cranberry bogs:

Phytotoxicity. Sulfur is a double-edged sword. It can be employed to lower soil pH, which will improve control of some weeds. We have noted on several occasions, however, that it may also cause vine damage. Based on my observations, the extent of damage has always been associated with a combination of too much sulfur and very wet soil conditions. What sort of wet soils? If your bog is a well drained sandy bog that never has free standing water for more than a few hours there appear to be few problems. Bogs which have standing water for weeks on end are usually damaged by moderate sulfur applications (greater than 100#/A). Avoid using sulfur on these bogs, improve drainage, or wait until summer when it dries out some.

Lowering soil pH. Sulfur lowers pH when it is oxidized by microorganisms. Since this is temperature dependent, you will get a greater reduction in soil pH per pound of sulfur if you apply it in the summer rather than the winter. However, it is important that the soil pH be reduced before the weeds grow rather than afterwards. Therefore, use

sulfur during the summer for weed control in the following year or apply early enough to help suppress weeds this year. We have had good results when we have combined herbicides for early weed suppression with late spring sulfur for summer weed suppression. It also has been noted in the past that since this process is dependent on soil bacteria, the response may vary among fields. I have had plots in the field where I have gotten little, if any, response to sulfur and others which dropped soil pH very fast. If the appropriate soil bacteria in this process are not in your soil then poor results can be expected. Most of these bacteria are inducible, that is, you can build up their populations with repeated applications of sulfur. Sulfur products make a difference. The finer the particle size, the quicker the response. I have seen some sulfur granules lie around for years without breaking down. As far as rates are concerned, we suggest multiple applications of sulfur at 100 to 150#/A every month or two. Two-hundred to 700 lbs. may be needed to bring a pH down to 4.5, depending on soil texture and the initial soil pH. Lastly, soil pH is not static, but will tend to drift back to its natural pH. Therefore, you will have to pay attention to changes over time.

Weeds controlled. We are currently working this out in more detail. Suffice it to say that lotus can be controlled over time. Clover, silverleaf and aster also appear to be controllable, but less reliably so. Much of the question in my mind involves interactions with herbicides. There is evidence to suggest that weed control with many cranberry herbicides can be improved by lowering soil pH, but more evidence is required.

Weed control on new bogs: The only labelled herbicide for new bogs in Washington and Oregon is Evital. This compound works all right but misses several weed species and is hard on Stevens on sand. Devrinol is labelled only for established bogs. We are trying to change that label to include new bogs but it is still pending. Even with Devrinol, weed control on new bogs can be difficult if weed seed inoculum levels are high. We have had best results with a combination of both compounds, applied after planting. Several growers have recently sworn by Vapam as a preplant field clean up. It gets a lot of the weed seeds and roots of silverleaf and other perennial weeds. Rates should be about 40 to 60 gallons per acre. Read the label carefully as Vapam is very hazardous and tricky to use. It may not work well if it is not watered in per label instructions. Also be sure to give it time to diffuse out of the soil prior to planting (30+ days). Don't go by time alone as temperature and moisture will affect longevity of the compound in the soil. If you can't smell it, or if you germinate a radish seed in an enclosed jar of treated soil, it is likely safe to plant. Vapam will not kill everything so a little preemergent herbicide after planting is advised. Vapam should also kill any weevil larvae in the soil.

BOG MANAGEMENT

Yellow Vine Syndrome. (excerpted and modified from U of Massachusetts Cranberry Station Newsletter, C. DeMoranville, November 1993.)
Patches of bog with leaf yellowing along the outer margins and between the leaf veins are not uncommon. The yellow leaves first occur at the base of the upright in the old growth and then move up, in some cases all the way to the upright tip.

Leaf samples collected from these bogs may show a deficiency of magnesium (Mg), zinc (Zn), no deficient elements, excess of potassium (K) and in some cases, excess manganese (Mn). One sample even showed a low reading for iron (Fe), which is almost unheard of for a cranberry bog. All of this presents a bit of a puzzle. How could so many nutritional problems all show the same visible symptom?

The answer seems to be that the problem is NOT nutritional, at least not directly. After consultations with cranberry researchers from all over North America at a meeting in British Columbia in September, Carolyn came to the conclusion that the problems leading to yellowed vines were caused by stress. Lloyd Peterson, from the University of Wisconsin, has researched the visible symptoms of mineral deficiencies for cranberries. None of the elemental deficiencies which he has induced in cranberry plants show the yellow vine pattern that was found in Massachusetts this summer.

So what exactly is going on? Areas of your bogs which were previously stressed (picking injury, winter injury, herbicide stress, weevil damage) are most susceptible. The bogs which tested positive for nutritional deficiencies or imbalances most likely have these problems due to the inability of the stressed plants to take up and use nutrients in a 'normal' manner. In other words, there were enough of the elements present in the soil, but the plants couldn't use them properly. For this reason, foliar supplements may

have corrected the symptoms on some bogs but may have had no effect on others. In the first place, not all yellow-vine bogs had the same nutritional problems. Secondly, if the injury and/or stress was severe enough, corrective action might only prevent the spreading or intensifying of the yellowing but might not reverse any yellowing that already existed.

What should you do now about bogs which still show yellow vine symptoms? Try to minimize further stress. This means being especially careful in the management of the winter flood and being conservative in the use of herbicides next spring. Run a soil test in the spring to confirm that the soil contains sufficient mineral levels. If you collected a tissue sample from these bogs last August or September, be cautious about acting on the results. Deficiencies seen in the yellow vines may not exist in new growth next season. These tissue tests should be interpreted in conjunction with a spring soil test and a visual examination of the state of the vines after bud break in May. Minor element supplements are normally applied from after bud break until hook stage, so there is no need to rush into any corrective measures this spring. If you have not confirmed a Mg or other deficiency on your bog, the application of supplements is unnecessary and could actually lead to further problems. The use of SulPoMag (or equivalent) in the spring should assure the proper balance between K and Mg in the soil.

My thoughts on this subject. There is no single solution to this problem. There is some evidence to suggest that high soil pH or bicarbonate levels will also promote yellow vine syndrome. Check the pH of the soil and irrigation water to be sure they are not too high. If you are using well water for irrigation, it can be high in bicarbonate. You may want to run a complete analysis. Some growers claim to have had success in temporarily improving the yellow vine syndrome with potassium sulfate, sulfur applications, and/or ammonium sulfate.

New bogs. During the past few years I have observed several new plantings that failed to do well. The cause of this was due, in part, to planting in too dense sand. Some sands may pack very tight. Dense soil reduces root growth and may prevent the disking of vines to the correct depth. It is critical that vines be disked a few inches into the soil and are not just lying in the top ½ inch after planting.

PESTICIDES

Laundering of Pesticide-Contaminated Clothing. (Excerpted from Pacific Farmer, "Use caution laundering contaminated clothing" by Rebecca Robison, December 1993.) Illness and chronic health problems in farmers can be traced back to improper handling and laundering of pesticide-contaminated clothing. Also, by contaminating the washer and dryer, future wash loads can be contaminated, spreading the health risks to the whole family.

Launder only clothing that has been contaminated with water-soluble, low-toxicity pesticides. A greater percentage of the chemical will be removed if the garments are laundered within 8 hours. Discard all clothing contaminated with more toxic pesticides.

Contaminated clothing should never be prerinsed in the washing machine. Use a washtub or pail. Prerinsing is a very important step which will reduce the amount of pesticide in contaminated clothing before laundering. It also minimizes the risk of contaminating laundry equipment, which could then contaminate future wash loads.

Always launder contaminated clothing separately. Hot water is most effective. Use the longest wash cycle. Repeated wash cycles help in removing pesticide residue. Use heavy-duty liquid detergents. Run the washer empty to assure there is no residue before using for family clothes.

Pesticide Licensing. If you have new people applying pesticides or you are a new grower, call Robbie (206-642-9331 or 206-875-9331) at South Bend, WSU Cooperative Extension, to arrange to take the pesticide license test. This will save a trip to Olympia. We have the new study materials available. If you have any questions regarding pesticide licensing, call the WSDA at 206-902-2010. Remember, if you're going to be using any aquatic herbicide (Rodeo), you will also need an aquatic license.

EPA Worker Protection Standards. Starting this April, we all will be under the new worker protection standards. These laws, in general, are meant for large agriculture industries and not small cranberry farms but many sections are pertinent for us. There could be serious liability problems for those of you who fail to comply. The laws are broken down into those for workers and those for pesticide handlers.

What are the basics of the worker protection standard? 1) Information displayed at a central location including, a) pesticide application details (location, product, when applied, reentry interval), b) emergency information, c) pesticide safety poster. 2) Pesticide safety training for workers and handlers using worker protection standard training material (verification required). 3) Decontamination site for washing off residue (water, soap, towel, and clean clothes for handlers). 4) Posting and notification of application. If you did not attend the workshop on this subject in February, I have extra books with all the details. Please ask for a copy.

Cholinesterase Testing. Pre-season cholinesterase tests are recommended for anyone who may be exposed to organophosphate insecticides or carbamate fungicides. The effects of these chemicals can be life-threatening and every effort should be made to prevent exposure.

Devrinol 50 WP Label: Has anyone noticed that cranberries are not on this label? We do have, however, a 24C for this product in Washington State. If you are using this and want to be legal, call me and I will send you a copy of the 24C.

Roundup Label Modification. I have managed to get a slight modification (2EE) in the Roundup label from Monsanto, as follows.

"Roundup Herbicide for Woody Brush Control in and Around Cranberry Bogs

"This product may be used as a tree injection or cut stump treatment to control woody brush and trees in and around cranberry bogs. Refer to the Cut Stump Treatments or Injection and Frill Applications sections of the Roundup label for specific application instructions.

"For applications within cranberry bogs, do not make applications within the 30 day period prior to harvest.

"Follow all other precautions, restrictions and limitations listed on the Roundup label."

The protocol described above is somewhat labor intensive. Its main use on bogs is to get rid of pesky blackberries before they become major weeds. Cut back all the shoots of the plant a few inches above the ground and apply from 50 to 100% Roundup. You should get pretty good kill, especially if you treat every shoot on the plant. This is easier said than done. High rates of Roundup work best. As I've mentioned in the past, using lanolin as part of the mix may help control.

In 1995 we will get another label change for Roundup, allowing us to wipe before fruit set. Until then, we must stay within the window between fruit set and 30 days before harvest.

MISCELLANEOUS

Cranberry Beer? Several U.S. microbreweries are using a special process to brew fruit beers, including blueberry, cranberry and banana. Boston Beer Company and Yakima Brewing and Malting Company are two that will begin to supply upscale grocers and gourmet stores.

Wetland Permits. Old U.S. Army Corps of Engineers regulations permitted excavation of wetlands for building of ponds, etc., as long as you did not fill any wetlands with the dredged material. New regulations now require a permit for excavation regardless of what you do with the fill. Call me (206-642-2031) or Corps Headquarters (206-764-3495) for more information.

RESEARCH

Cranberry Varieties. Shakespeare said, "A rose by any other name is still a rose." This is not the case with the McFarlin variety. Drs. Nick Vorsa and Richard Novy at Rutgers University have DNA fingerprinted 45 Washington McFarlin's. Their results may come as no surprise, but what we have is a massive case of imposters. The mix-up is rather confusing; what is very interesting is that the DNA from the "true" McFarlin matches the DNA from the Massachusetts and Wisconsin McFarlin. What we have instead is usually a composite of Early Black, Howes, and assorted other varieties. So what! In the likely event you are stuck with an inferior type of McFarlin, no amount of fertilizer or snake oil will improve its bearing potential. It may be prudent to start over with Stevens. A new variety plot that we have just started will help us select better varieties, over the long term, for Washington.

Cranberry Carbon Budget. Dr. Teryl Roper has been doing some excellent research on finding out what makes cranberries tick. (The following was modified from the Wisconsin Cranberry IPM Newsletter, vol. VII, No. 8, August 20, 1993.)

Teryl has investigated how much carbohydrate is available for vegetative growth or fruit growth. He measured photosynthesis at intervals throughout the season and used that information to estimate how much carbon an individual upright can "fix" during a season. This amount is roughly the amount available for upright and fruit growth. He compared this to the amount of carbon found in a typical fruit to see how many fruit could be supported by an average upright. For Stevens, he found that a typical upright captures about 0.45 grams of carbon during the course of a year with about 0.36 grams of this carbon available for fruit growth. A typical Stevens berry weighs about 1.5 grams and has about 0.22 grams of carbon.

The amount of carbon available per upright compared to the amount of carbon required to grow a fruit allows for production of about 2 fruit per upright. The point of this exercise is to attempt to show that carbohydrates are likely the limiting factors for fruit set. A typical upright has enough carbon to support about 2 fruit.

If his estimates are correct, can you increase yield and fruit set by adding fertilizer? **NO!** Once the tissue has adequate amounts of fertilizer, adding more is wasteful, not helpful. What can you do to increase photosynthesis? You can manage pests, keep weeds from competing (particularly early), make sure your fertility program is adequate and you can hope for cooperative weather. Good overall management will provide maximum photosynthesis.

Further notes on this subject. The mean light levels available in Wisconsin for photosynthesis are greater than in Washington. My research strongly suggests that light is the major limiting factor for cranberry production in Washington.

Optimizing Fungicide Use - Results of a multi-year Study - Peter Bristow, WSU - Puyallup.

Yield. For all years, yield for the complete schedule (8 fungicide applications) was higher than the untreated check at the Grayland (Table 1 and Figure 1) and Long Beach (Figure 2) test sites. Only results from the Grayland site are presented in the rest of this report. The highest yields have been associated with schedules which included the late-hook stage application of Kocide. Interpretation of yield data for 1993 was complicated by twig blight which killed uprights in one end of the experimental area again this year (Table 1). The disease reduced yield in untreated check plots within the affected end by 58%. As in past years, yield losses due to twig blight were correlated with disease incidence. Rose bloom was the only other noticeable disease but its incidence was too low to have a significant impact on yield.

Twig blight. The disease was controlled by those schedules which included applications during July or August. Fungicides applied before July were ineffective.

Rose bloom. The late hook (May 26, 1992) application of Kocide continued to effectively control this disease. Disease incidence went up for the partial schedule (M) that omitted this application. The timing of this application coincided with spore production on the fleshy abnormal branches.

Fruit rot. The incidence of fruit rot was higher in 1993 than in any previous year. Even then, only 7.1% of the berries rotted by harvest in the untreated check (UTC) (Table 1). None of the single application schedules reduced rot at harvest (Figure 3). The proportion of rotten berries caused by a fungal rotting organism was lower the closer a fungicide was applied to harvest. For example, a fungus was recovered from over 90% of the rotten berries in the untreated check but only 66% of the rotten berries from plots treated with Bravo in mid-August. Fruit sprayed closer to harvest may have had higher residues than that treated earlier in the summer. As with the single application schedules, none of the partial schedules lowered rot at harvest (Figure 4; for the partial schedules, the date listed beneath each bar designates the application(s) that was omitted). The partial schedule that left out the two Bravo applications (8/4 and 8/17) had the highest proportion of fungal rot. The main message is that, during 1993, none of the schedules (single, partial or complete) significantly reduced the amount of rot at harvest compared with the untreated check.

Once the rotten berries were sorted out, the remaining healthy fruit was held in refrigerated (38° F) storage for 8 weeks and then reevaluated for rot. In the untreated check about 20% of the berries rotted during storage and of those that rotted 60% yielded a fungus (Figure 5). None of the single application (Figure 5), partial (Figure 6) or complete schedules reduced losses during storage.

Summary. Based on data from this multi-year study, it appears that the dormant and delayed dormant applications were of little value. Conversely, an application of Kocide at the late hook stage of development is associated with yield increases the following year. Analysis of yield components suggest that the higher yields were due to an increase in the total number of uprights per unit area. Surprisingly, none of the applications from flowering on had any impact on either the amount of rot at harvest or after refrigerated storage.

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.

WSU Cooperative extension provides educational opportunities in agriculture and natural resources, family living, youth and community development in cooperation with the USDA. Extension helps you put knowledge to work.

Extension is happy to serve you by sending the enclosed information. Extension information and programs are available to all citizens of Pacific County without discrimination. We would welcome your suggestions to improve educational programs offered through this division of Washington State University.

COOPERATIVE EXTENSION
Washington State University
Long Beach Research and Extension Unit

Dr. Kim Patten
Associate Horticulturist

Table 1. Results for the dry-harvested bog (Grayland site), 1993.

Stage		Dormant	Delayed dormant	Bud break	Late hook	Bloom	Post bloom-1	Post bloom-2	Post bloom-3
Fungicide		Lime sulfur	Bordeaux	Kocide	Kocide	Mancozeb	Fermate	Bravo	Bravo
Date	1992>	Jan 17	Mar 20	May 1	May 26	Jun 23	July 7	Jul 21	Aug 4
	1993>	Feb 10	Mar 23	May 5	Jun 3	Jul 1	Jul 15	Aug 4	Aug 17

Treatment	Yield, bbl/A*					
	All blocks	Blocks w/out twig blight	Blocks with twig blight	Twig blight DIR**	Rose bloom DIR***	% fruit rot at harvest****
Untreated check						
A	147	158	131	3.8	2.1	7.1
Complete schedule						
B	225	174	310	1.0	1.0	4.9
Single applications						
C	168	171	162	3.3	2.7	5.0
D	189	212	151	3.3	2.2	4.6
E	184	228	111	3.7	2.4	6.7
F	170	201	118	2.8	1.2	12.0
G	174	191	147	1.8	2.5	7.7
H	181	188	169	1.5	2.5	10.8
I	159	123	218	1.8	2.5	7.5
J	150	151	147	1.3	2.4	9.5
Partial schedules						
K	245	250	220	1.2	1.0	4.6
L	213	175	275	1.0	1.2	5.4
M	175	133	244	1.0	1.9	3.6
N	223	221	227	1.0	1.1	5.1
O	218	224	209	1.5	1.1	5.1

Treatment	Dormant	Delayed dormant	Bud break	Late hook	Bloom	Post bloom-1	Post bloom-2	Post bloom-3
B	X	X	X	X	X	X	X	X
C	X							
D		X						
E			X					
F				X				
G					X			
H						X		
I							X	
J								X
K		X	X	X	X	X	X	X
L	X			X	X	X	X	X
M	X	X	X		X	X	X	X
N	X	X	X	X			X	X
O	X	X	X	X	X	X		

* Berries picked by hand on Sep 14-15, 1993.

** DIR = disease incidence rating (1-4): 1 = least disease; 4 = most disease (Blocks I-III only). 22 April 1993.

*** DIR = disease incidence rating (1-3): 1 = least disease; 3 = most disease. Mean from May 25 and Jun 8 evaluations.

**** Based on number of berries.

Fig. 1 Yield
Grayland

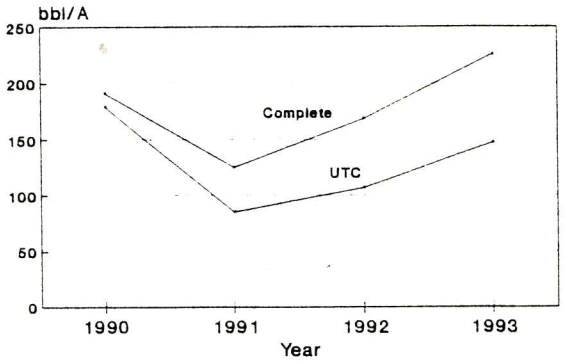


Fig. 2 Yield
Long Beach

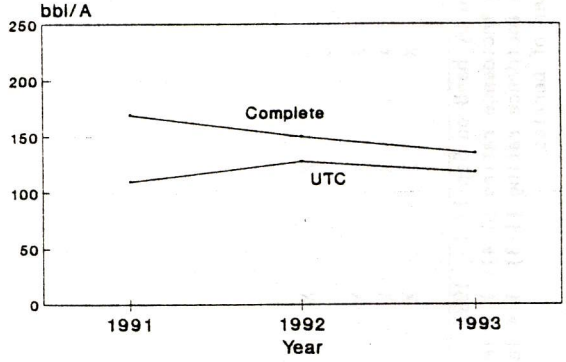


Fig. 3 Rot at harvest
Single application schedules

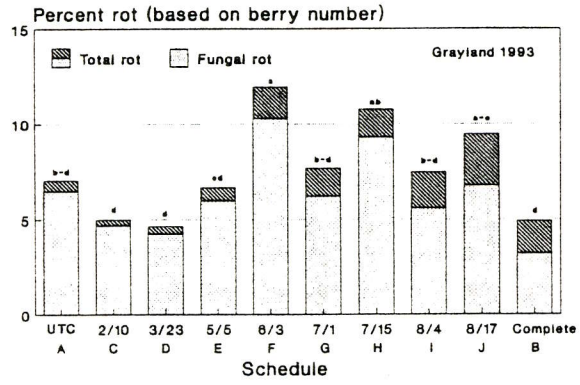


Fig. 4 Rot at harvest
Partial schedules

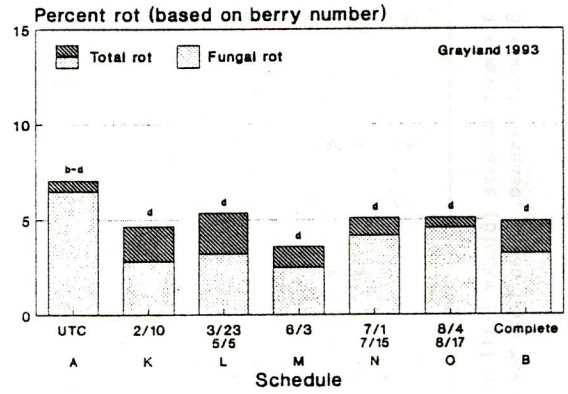


Fig. 5 Rot at 8 weeks
Single application schedules

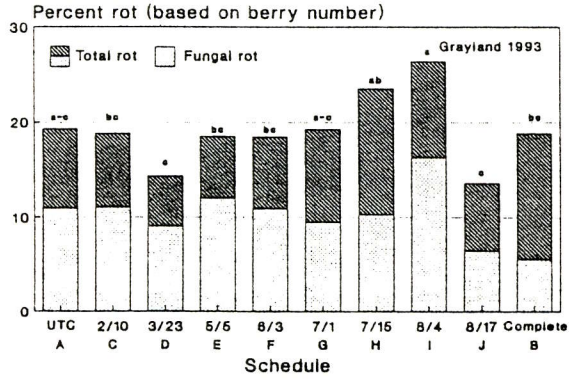


Fig. 6 Rot at 8 weeks
Partial schedules