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Crop Notes

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EFFICACY OF VARIOUS PRODUCTS REGISTERED FOR CONTROL OF ORANGE TORTRIX, LIGHT BROWN APPLE MOTH AND OTHER LEAFROLLERS IN BLACKBERRIES

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Introduction

Commercial blackberries grown in Santa Cruz County host a number of tortricid, or leafroller, species, most common of which is the orange tortryx (OT), Argyrotaenia franciscana. Pheromone trapping data indicates adult OT are active in early spring prior to blackberry flower initiation resulting in the presence of larval populations when open flowers appear. OT larval feeding can damage flowers, developing green fruit and sometimes larvae will tunnel into ripe fruit rendering it unmarketable. As spring harvest begins, OT larvae colonizing flowers, fruit or the plant canopy are often dislodged and unintentionally transferred into the clamshell packaging along with fruit packed in the field. For these reasons, springtime pesticide applications should be utilized to prevent or minimize OT-damaged fruit and/or product contamination.

In 2008, the insecticides Delegate and Assail received registration for control of lepidopterous pests on California blackberries. Since these products claim low toxicity to non-target, beneficial organisms such as predators and parasitoids, they offer a good fit for integrated pest management programs.

This article reports on our evaluation of the efficacy of newly registered products and two grower standards for management of OT.

Materials and Methods:

The test plot was established in a three year old blackberry planting maintained under polyethylene-covered hoops. Each treatment was replicated in three 37-ft subplots. Products, rates per acre and application dates are presented in Table 1. Applications were made with a Maruyama MS068 gas-powered backpack sprayer and hand held boom configured with 2, 8002 TeeJet flat fan nozzles run at a pressure 150 psi in an equivalent of 150 gallons water per acre.

Table 1. Treatments for Control of Leafrollers in Blackberry

Treatment	Rate per Acre	Application Dates
Untreated Control	-	-
Assail 70 WP	2.3 oz	4/7, 4/18, 5/2
Dipel	2 lb	4/7, 4/18, 5/2
Entrust (early)	2 oz	4/7, 4/18, 5/2
Entrust (late)	2 oz	5/15, 5/29
Delegate WG (early)	6 oz	4/7, 4/18, 5/2
Delegate WG (late)	6 oz	5/15, 5/29

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Treatment response of OT larval population was evaluated by simultaneously sampling a section of both sides of the treated blackberry hedge using two Tupperware tubs (34x16x6 in) supported by waist-high portable tables positioned of each side of the blackberry hedge row. Each tub was held in place and pressed into the plant canopy by the person sampling while the hedge row was vigorously agitated to dislodge OT larvae into the tub. In all, six evaluations were made over the 63-day course of the experiment, from April 4 to June 6. On four dates, captured leafroller larvae were collected and reared in the lab on Bio-Serve codling moth diet (product F937OB) to adulthood to determine identity to species level.

Pheromone trapping data indicates adult OT are active in early spring prior to blackberry flower initiation resulting in the presence of larval populations when open flowers appear.

Results and Discussion:

Treatment results are summarized in Table 3. Graphs 1 and 2 detail results from early treatments begun 4/7 and late treatments begun 5/15, respectively.

Delegate and Entrust treatments initiated on 4/7 and retreated on 4/18 and 5/7 produced the greatest leafroller control over the duration of the experiment relative to the untreated control. The Dipel treatment initiated on 4/7 treatments also resulted numbers of counted larvae significantly below those of the untreated control.

The Delegate treatment initiated on 5/15 ("late" treatment) was effective in rapidly reducing leafroller populations for the ensuing three weeks. Additionally, the Dipel treatment on this schedule gave significant reduction as compared to the untreated control by the last evaluation.

Assail, relative to the untreated control and the other products, provided the poorest degree of leafroller control.

From leafroller samplings made April 24 to June 6, a subsample of 70 larvae from the total counted were captured and reared in the lab on codling moth diet. 41 larvae pupated and were identified as adult orange tortrix, Argyrotaenia franciscana. No other leafroller species was present. The remaining 29 larvae failed to pupate because they were parasitized by Hymenopteran parasitoids. This is nearly half of the sampled larvae, and underlines the importance of using pesticides which do not interfere with the activities of parasitoids.

On four dates, captured leafroller larvae were collected and reared in the lab on Bio-Serve codling moth diet (product F937OB) to adulthood to determine identity to species level.

Table 3: Numbers of leafrollers counted in each treatment by date.

Rating Date	4/4/2008	4/11/2008	4/24/2008	5/8/2008	5/23/2008	6/6/2008
Trt No. Treatment Name	1	2	3	4	5	6
1 Assail 70 WP	2.67 b	2.67 b	1.33 b	9.00 a	6.67 ab	8.67 a
2 Dipel DF late trt	3.00 b	6.00 a	5.67 b	3.00 b	8.00 b	1.67 b
3 Dipel DF	3.33 b	1.67 a	5.00 b	3.67 b	1.33 bc	3.00 b
4 Entrust 2 oz/A	4.33 b	6.33 a	0.67 b	2.33 b	1.00 bc	0.00 b
5 Delegate WG late trt	3.33 b	4.67 a	7.00 b	12.00 a	2.33 bc	0.33 b
6 Delegate WG	4.33 b	2.33 a	0.67 b	0.00 b	0.00 c	0.33 b
7 UTC	7.67 a	7.00 a	13.67 a	8.00 a	9.00 a	11.67 a
LSD (9=.05) Standard Deviation	2.648 1.512	6.268 3.579	4.804 2.743	4.008 2.289	4.290 2.449	4.712 2.690

Method used to discriminate among means Fisher's least significant difference procedure. Treatments followed by the same letter have no statistically significant differences.

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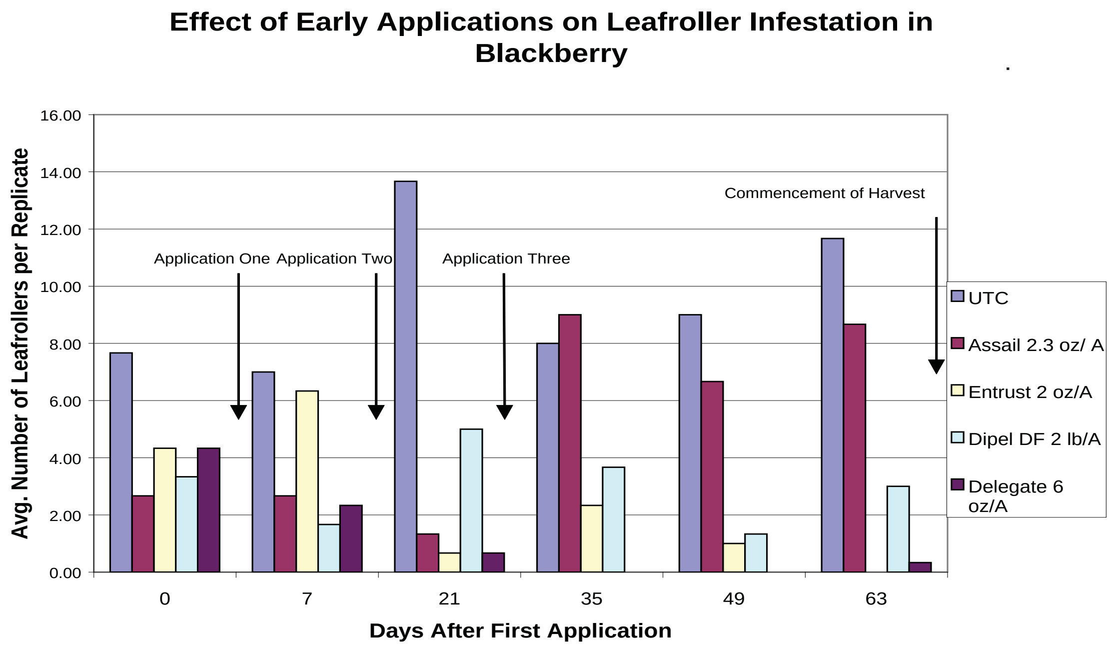
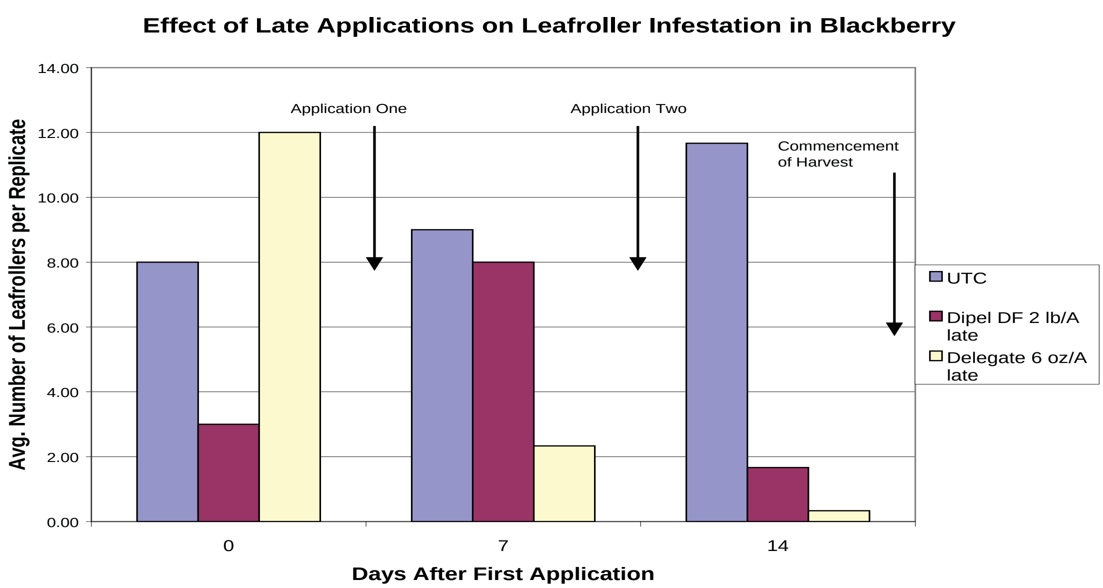
Graph 1.



From leafroller samplings made April 24 to June 6, a subsample of 70 larvae from the total counted were captured and reared in the lab on codling moth diet.

Graph 2.



Graph 3 summarizes the total numbers of leafroller larvae captured in each treatment over the course of the experiment. The graph demonstrates the effectiveness of individual pesticides, as well as the value of starting earlier in reducing total numbers of leafrollers in blackberries.

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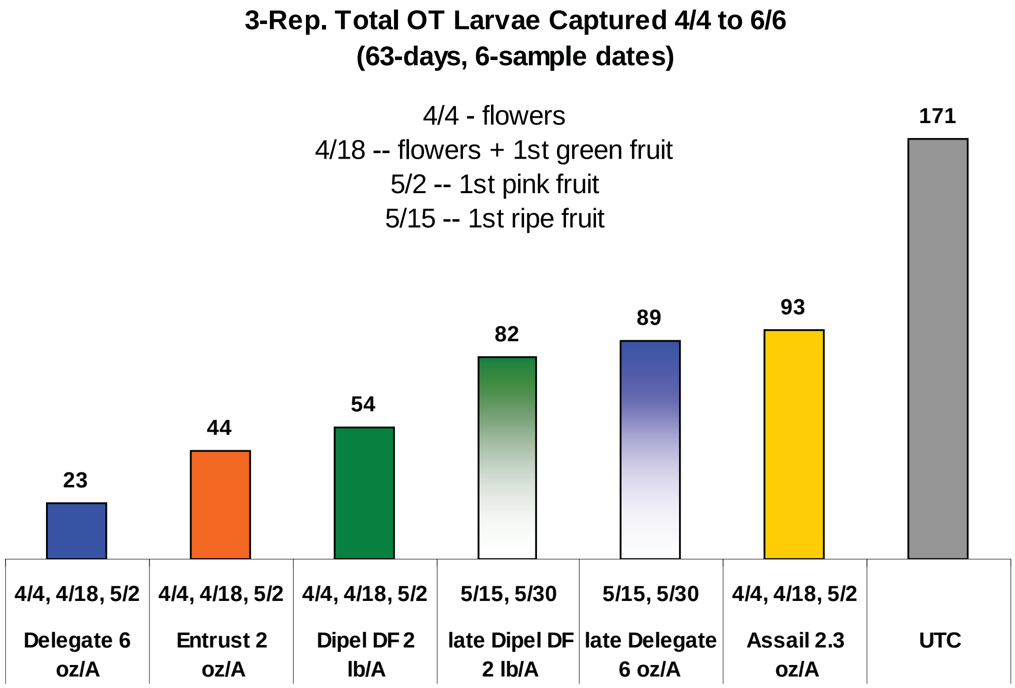
Graph 3.



Although the light brown apple moth (LBAM, Epiphyus postvittana) was not involved in this study, blackberries are listed among potential hosts

Conclusion:
In this study, Delegate, Dipel and Entrust provided highest levels of OT control. Timing of applications was important: best control was achieved when treatments were initiated when OT larvae were first detected, which occurred eight weeks prior to initiation of harvest in this study.

Although the light brown apple moth (LBAM, Epiphyus postvittana) was not involved in this study, blackberries are listed among potential hosts. As long as Santa Cruz County remains under a mandated LBAM quarantine, management of all tortricid species will be an important issue for commercial blackberry producers. Because of the similarities between larval behavior of OT and LBAM, we predict that the most effective strategies for managing OT as described in this report will also prove effective against LBAM.

Remember, before using any pesticides (those mentioned in this article or any others), check with your local Agricultural Commissioner's Office and consult product labels for current status of product registration, restrictions, and use information.

Acknowledgement: We would like to thank Georganne Eiskamp (Driscoll Strawberry Associates, Inc) for her cooperation and support of this project by providing the test plot site.

DOWNY MILDEW OF CORN-SALAD

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Plant Pathology Farm Advisor

Monterey County's Salinas Valley is well known for its extensive vegetable industry which produces large acreages of commodities such as lettuce, broccoli, spring mix, spinach, cauliflower, and celery. In addition to these large-acre commodities, our Valley also grows a wide range of specialty vegetables; these so-called minor crops highlight the agricultural diversity of this region. In recent years, the leafy vegetable called corn-salad has been added to the list of Salinas Valley commodities. Corn-salad (Valerianella locusta and V. olitoria) is also known as lamb's lettuce, field salad, and fetticus. This annual crop is in the Valerianaceae plant family. The term "mache" is a market term applied to corn-salad.

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Corn-salad is one of the many specialty vegetable crops grown in Monterey County

In spring of 2008, corn-salad in the Salinas Valley was found to be infected with a downy mildew disease. Initial symptoms on leaves consisted of irregularly shaped, light green patches that could be seen from both top and bottom leaf surfaces; these lesions later turned yellow. As disease progressed, these yellow patches on the leaves became brown and necrotic. The undersides of affected leaves were heavily colonized by extensive purplish growth characteristic of the downy mildew pathogen. The color and growth of corn-salad downy mildew is similar in appearance to downy mildews of spinach and onion. Symptomatic corn-salad leaves were unmarketable, and diseased portions of plantings were not harvested.

Downy mildew of corn-salad was first observed in 2008.

The purple growth, when examined microscopically, consisted of curved, branched appendages that held the oval shaped conidia, or spores. The spores were lightly pigmented, which accounted for the purple hue of the growth. The brown leaf tissue was found to contain microscopic oospores. Oospores are spherical, thick walled sexual spores of downy mildew pathogens. These structures can resist weathering and assist the pathogen in survival. Based on disease symptoms and morphology of the organism, the pathogen was identified as Peronospora valerianellae. Like all downy mildews, P. valerianellae is no longer considered to be a fungus in strict taxonomic terms. All downy mildews possess features that separate them from the true fungi and align them more closely with certain types of primitive golden algae, diatoms, and giant kelp. Therefore, plant pathologists now categorize downy mildews apart from fungi (there are two suggested taxonomic groups for downy mildews: Kingdom Chromista, Kingdom Straminipila).

Corn-salad downy mildew is favored by the moderate coastal climate of the Salinas Valley.

Like downy mildews of lettuce and spinach, corn-salad downy mildew thrives when temperatures are cool and moisture (rain, sprinkler irrigation water, dew, high humidity) is present. The spores are readily spread by wind currents and can also be dispersed by splashing water. As a group, downy mildew pathogens usually have narrow host ranges. Corn-salad downy mildew will not infect spinach, lettuce, crucifers, onion, or other crops. Likewise, downy mildew of spinach and other crops will not infect corn-salad. Weed hosts of P. valerianellae have not been identified.

The original source of the downy mildew that infected corn-salad in Monterey County is not known. However, researchers in France found that corn-salad seed harbored the oospore resting structure on seed surfaces. Because of this earlier finding, we also tested corn-salad seed for the presence of oospores. We added seed to a dilute Tween 20 solution, stirred the suspension for 3 hours, filtered the solution to remove the seed, and centrifuged the remaining liquid. When we examined the debris and particles recovered from the solution, we did find low numbers of oospore structures. These results provide circumstantial evidence that corn-salad downy mildew might originate from infested seed.

This is the first finding of downy mildew of corn-salad in California. Previously, this pathogen has been reported on corn-salad in England, France, Germany, Scotland, and the Ukraine. Managing corn-salad downy mildew will likely rely on applications of effective fungicides and the use of resistant cultivars, if such are available. The development of oospores in infected leaf tissue may mean that the fungus could survive in the soil between corn-salad crops. Therefore, some consideration should be given to crop rotation so that consecutive corn-salad plantings are avoided or minimized. As with all pesticides, check with product labels and your local Agricultural Commissioner's Office for fungicide use guidelines and restrictions.

2. Branched spore-bearing appendages of downy mildew.

2. Branched spore-bearing appendages of downy mildew.

IMPROVING IRRIGATION UNIFORMITY OF DRIP SYSTEMS ON SLOPED FIELDS

Michael Cahn, Irrigation and Water Resources Advisor

Much of the strawberry and cane berry acreage along the central coast is located on hilly ground. As fields are planted during the fall, growers may want to consider design improvements that maximize the uniformity of their drip systems. Not only is high irrigation uniformity desirable for evenly applying water, but also for evenly distributing fertilizers and pesticides that are injected into the drip system.

Drip can potentially improve irrigation uniformity, but on steep fields, achieving a high uniformity can be challenging. An elevation change of 2.3 feet will cause a 1 pound per square inch (psi) change in pressure in a drip line. Drip tape on a 5% sloped field, would have a change in pressure of about 6 psi along a 300 foot distance. Assuming the drip tape was medium flow tape (0.32 gpm/100 ft), and the pressure at the manifold was 10 psi, then 25% more water would be applied at the lower end of the field compared to the top of the slope. The extra water applied at the lower end of the field may saturate the soil, which may promote soil borne root diseases, as well as increase the amount of fertilizer applied through the drip system.

Because the terrain of each ranch is unique, different solutions must be used to improve drip uniformity. A qualified irrigation system designer can help determine the most economical approach to managing slope effects on irrigation uniformity. The following paragraphs discuss some of the typical methods that a designer may use to increase drip uniformity if elevation varies among irrigation blocks, along the length of the beds, or along the manifold (submain).

Managing elevation change among irrigation blocks

The pressure of the mainline will vary among irrigation blocks located at different elevations relative to the pump or water source. If the block is located far above the water source, the pressure in the mainline may be low, and if the block is below the water source, then pressure in the mainline may be high. Irrigators need to assure that the blocks are adjusted to the same pressure during each irrigation in order to apply the same amount of water per hour. A minimal solution is to adjust the pressure using a gate valve (Figure 1). An accurate pressure gauge should be used to check the pressure of the manifold (submain) periodically during an irrigation in case the upstream pressure changes. As other irrigation blocks are opened and closed the pressure in the mainline frequently varies.

A preferable remedy is to add a pressure regulator after the gate valve. A pressure regulator can be preset to maintain the downstream pressure in the irrigation block independent of changes in the upstream pressure. Keep in mind that pressure regulators can only reduce pressure on the downstream side, so the upstream pressure must be maintained above the desired downstream pressure.

Pressure regulating valves combine pressure regulators with valves so that a gate valve is unnecessary (Figure 1D). Some regulators are preset to a downstream pressure and require no adjustment (Figure 1A and 1B) and other types need to be adjusted to the desired downstream pressure (Figure 1C and 1D). Pressure regulating valves, suitable for pipe of greater than a 3 inch diameter, usually use a pilot regulator to adjust the downstream pressure in the valve (Figure 1D). The use of the pilot minimizes pressure loss that would occur in the valve at high flow rates (> 100 gpm). Recently, several companies have begun marketing plastic pressure regulators for 2 to 4 inch diameter pipe (Figure 1D), which reduces the cost of these regulators relative to cost of steel and brass regulators.

Managing slope along the bed

Orienting beds with the contours of the slope can minimize elevation changes along the bed. Elevation changes should be minimized to less than 10 feet along a bed of a 300-foot length (3.3% slope), which equates to a 4.3 psi difference in pressure between the beginning and the end of the bed. Depending on the flow rate and diameter of the tape, the pressure gain at the bottom of the bed can be offset by a frictional loss of pressure caused by the water flowing against the inside wall of the tape. Frictional losses can be increased by using narrow diameter tape (5/8 inch) and high flow tape (> 0.5 gpm/100 ft). Locating the submain at the low end of the beds is not recommended because the frictional loss in pressure would add to the pressure loss caused by the increase in elevation.

Shortening the length of the beds can also minimize the elevation change along the beds but may be

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Drip can potentially improve irrigation uniformity, but on steep fields, achieving a high uniformity can be challenging.

Irrigators need to assure that the blocks are adjusted to the same pressure during each irrigation in order to apply the same amount of water per hour.

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costly in terms of the extra hardware needed for additional submain components. Increasing the operating pressure of the block can minimize the elevation effects on uniformity because the variation in pressure becomes less relative to the average pressure of the block. However, higher operating pressures may require the use of thick walled tape (> 10 mil) to prevent the tape from bursting, and therefore would significantly add to the drip tape costs.

An additional approach to managing elevation change along the bed is to use pressure compensating tape, which is generally more expensive than non-pressure compensating tape. Pressure compensating tape minimizes the effects of pressure inside the drip line on the discharge rate of the emitters. However, before making the leap to pressure compensating tape, one should consider how well a particular brand of tape compensates for pressure (emitter discharge exponent), the variation in discharge among individual emitters (manufacturing coefficient of variation), and the filtration requirements of the emitters (filtration mesh). A small emitter discharge exponent (<0.2) means the tape compensates better for pressure than a tape with a large emitter discharge exponent. A small manufacturing coefficient of variation means that difference in discharge between emitters is minimal (< 3% variation is recommended). Also, because the tape must operate under higher pressures than non-pressure compensating tape, a thick walled tape is required (usually > 8 mil) to resist bursting.

Pressure compensating tape minimizes the effects of pressure inside the drip line on the discharge rate of the emitters. However, before making the leap to pressure compensating tape, one should consider how well a particular brand of tape compensates for pressure (emitter discharge exponent), the variation in discharge among individual emitters (manufacturing coefficient of variation), and the filtration requirements of the emitters (filtration mesh).

Managing slope along the manifold (submain)

Even with beds oriented along the contours of the terrain, elevation change along the submain can cause pressure to vary greatly between beds at the top and the bottom of a slope. Using small pressure regulators, beds of a similar elevation can be grouped together so that they all have the same pressure (Figure 3). Although a gate valve could be used to adjust the pressure of the group of beds, a preset pressure regulator that can handle flow rates of up to 10 to 20 gpm would automatically hold the downstream pressure independently of changes in upstream pressure (Figure 2B). Another approach would be to position pressure regulators in the submain at locations where the elevation changes by 10 to 15 feet. Again, a preset pressure regulator that fits on a 2 to 3 inch diameter submain would be appropriate for this application (Figure 2A).

Some irrigation designers have successfully used narrow polyethylene tubing (spaghetti tubing) to increase the frictional loss of pressure between the submain and the drip tape. As the pressure in the submain increases towards the bottom of the slope, narrower and/or longer polyethylene tubes are used to connect the submain to drip tape in order to bleed off pressure. The length of the polyethylene tube and the narrow diameter causes pressure loss as the water flows into the drip line.

Pressure compensating (PC) tape can also be used to manage elevation changes along the submain. The same considerations as discussed above should be made in choosing an appropriate PC tape for elevation changes along the submain. However, because pressure differences may be even greater along the submain than along the beds, the tape may need a thick wall to resist bursting under high pressures. For example, if the elevation change were 30 feet along the submain and the pressure of the highest bed was 10 psi, then the pressure of the lowest bed would be 23 psi.

Minimizing drain down on slopes

A common problem when drip systems are on sloped ground occurs after the irrigation ends and the remaining water in the submain and drip lines drains to the low end of the field, saturating the soil. If the slope of the field is oriented along the beds, then adding flush valves to the end of the drip lines can release trapped water (Figure 4). Flush valves can be purchased to close at specific pressures (usually between 2 and 6 psi). As the elevation change becomes greater, one should use valves that close at higher pressures (eg. > 5 psi)

A low pressure release valve can be used to release water trapped in the low end of the submain. The outlet of the low pressure release valve can be fitted with a hose so that water can be drained away from the block (preferably into a retention basin). Low pressure release valves can also be purchased with springs of different release pressures. For a 30 to 50 foot elevation change, the valve should open when the pressure at the end of the submain is below 10 psi in order to drain the lower half of the block.

The outlet of the low pressure release valve can be fitted with a hose so that water can be drained away from the block (preferably into a retention basin).

Summary

Designing drip systems for operation on hilly ground can be challenging and the options for attaining good uniformity is highly dependent on the terrain. Fortunately, new types of components are available, such as pressure compensating tape, inex-

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pensive pressure regulators, and flush valves, that can be used to improve uniformity. With the help of an irrigation designer, one should be able to find an economical solution to attain good irrigation uniformity on hilly land using drip.

Figure 1. A gate valve with a Schrader valve allows pressure to be adjusted and monitored in an irrigation block, but the valve must be adjusted manually to compensate for changes in upstream pressure.

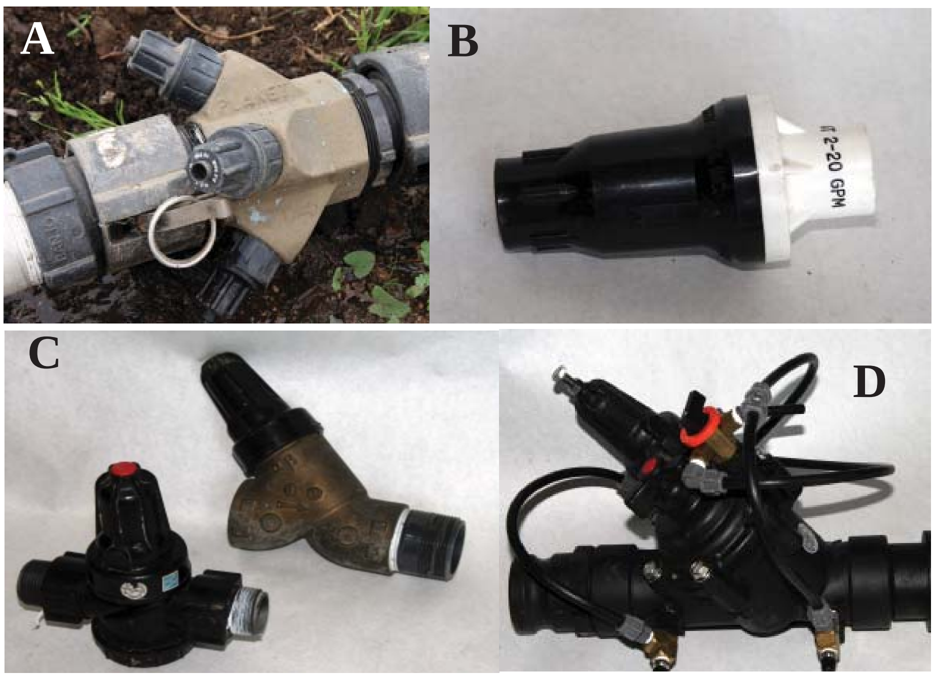

Figure 2. A brass pressure regulator preset for 12 psi can be used on 2 inch diameter pipe for flow rates up to 75 gpm (A), a plastic pressure regulator preset to 15 psi can be used on 1 inch diameter pipe and for flow rates from 2 to 20 gpm (B), adjustable plastic and brass pressure regulators for 1 inch and 1.5 inch diameter pipes, respectively (C), and a plastic pressure regulating valve with pilot for 2 inch diameter pipe (D).

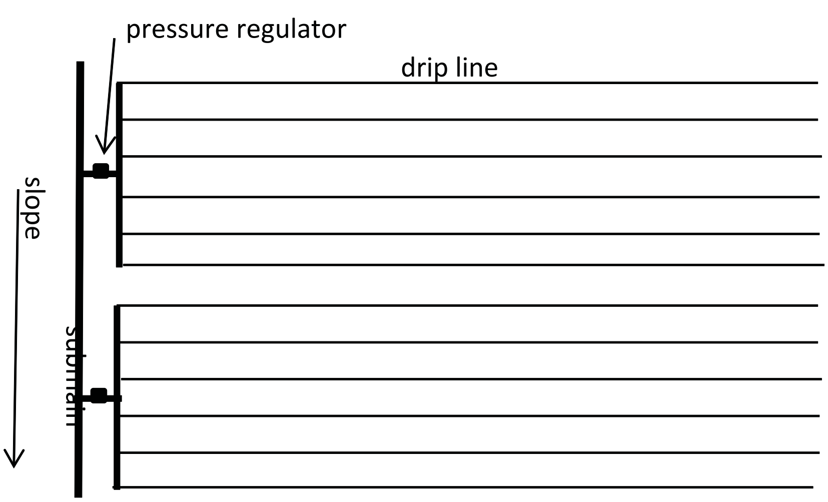

Figure 3. Use of preset pressure regulators on the submain to regulate pressure in groups of drip lines located at similar elevations.

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Figure 4. Flush valves release water trapped in the end of drip lines after the irrigation ends.

LOW RESIDUE WINTER COVER CROPS: AN EVALUATION OF THEIR MANAGEMENT IN WINTER FALLOW VEGETABLE PRODUCTION BEDS IN THE SALINAS VALLEY

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Cover crops grown during the winter fallow period on vegetable production ground in the Salinas Valley provides benefits for crop production and the environment. For instance, we measured increased yield head lettuce in the spring lettuce crop following winter cover crops (Table 1), however, by the second (summer) lettuce crop there was no measurable effect of cover crops on yield. It is unclear why cover crops increase the yield of lettuce, but they clearly provide a benefit to the soil and crop that improves growth. Regarding environmental benefits, cover crops reduced the quantity of runoff and improve the quality water that runs off winter fallow fields during winter storms (Table 2). In this regard, cover crops are a key cultural practice for complying with water quality concerns during the winter for vegetable producers. In spite of the benefits of cover crops, there are serious obstacles to their use in the Salinas Valley. One of the big obstacles is that they increase the risk of getting rained out of the fields in the spring and missing planting schedules. As a result they are used on a small percentage of winter fallow fields.

It is unclear why cover crops increase the yield of lettuce, but they clearly provide a benefit to the soil and crop that improves growth.

We have been working on low residue cover crops to try to overcome the disadvantages of cover crops during the winter fallow period. The concept of low residue cover crops is that they are allowed to grow only until they are large enough to provide water quality benefits (i.e. reduce erosion and nutrient loss), but then killed before they produce too much residue that would impede subsequent planting operations in the spring. In this way, grower can utilize the cover crops as a tool to protect water quality while not running the risk of having too much residue to restrict crop production.

We reported on our first studies last fall (Monterey County Crop Notes, Sept. 2007). In general, low residue cover crops do provide a good measure of the benefits provided by full cover winter cover crops. They reduce sediment and nitrogen in runoff over the bare fallow treatment (Table 2). Low residue cover crops incur extra costs for vegetable growers because they need to be seeded and then killed, once they have produced sufficient growth; as a result, we envision this technique being appropriate for fields that have the greatest erosion risks during the winter.

How much residue is too much was the question that we investigated last winter. We conducted a trial with a cooperating grower on a site with a substantial slope in the Castroville area. We included four treatments: 1) full cover Merced rye sprayed early in the growth cycle; 2) full cover Merced rye sprayed later in the growth cycle; 3) Trios 102 triticale planted on the furrow bottom and sprayed later in the growth cycle; and 4) bare control. The cover crops were planted on November 9, 2007; the grower planned to plant broccoli at the site in late February, 2008 and the cover crop residue was managed to not impede soil preparation for that planting. Merced rye seed was broadcast with a belly grinder seeded at 230 lbs/A and Trios triticale

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seed was spread by hand in the furrow bottom at 71 lbs/A. The seed was incorporated immediately following spreading with a lilliston. A light rain fell on November 10 which initiated germination of the cover crop seed. All cover crops were evaluated for biomass, nutrient content and percent ground cover. The early controlled Merced rye treatment was sprayed with a 2% solution of glyphosate on December 15 (35 days after seeding) and the later controlled Merced rye treatment was sprayed with the same rate of glyphosate on January 3, 2008 (54 days after seeding). The Trios triticale was sprayed with glyphosate on January 17 (68 days after seeding). Each plot was 8 beds wide by the length of the field (app. 700 feet long). Water monitoring flumes were installed at the bottom of the hill to measure runoff and water quality. The plots were not replicated and none of the data presented was subjected to statistical analysis.

Results: Full cover Merced rye grew quickly and provided rapid soil cover. Merced rye that was killed early in its growth cycle (35 days after seeding) disintegrated rapidly; its biomass went from 0.41 T/A on January 3 to 0.13 T/A on January 17 (app. one month after being killed with glyphosate) (Table 3). It also rapidly leaked the nitrogen that it contained in its biomass (Table 4). In addition, it provided 70.4% ground cover on January 3, but had declined to 9.4% by February 7. Evidently, the plant is too succulent at this growth stage and rapidly decomposes.

The Merced rye treatment that was killed when it was 54 days old, was more resistant to rapid decomposition; it had 0.36 T/A of biomass on January 17 when it was sprayed with glyphosate and still had 0.27 T/A on March 11(see photos below); in addition, it provided 57.4% ground cover on January 17 and still had 34.1% on March 11. The Trios triticale had a peak biomass of 0.20 T/A on February 7 that declined to 0.16 by March 11 (see photos below). Its percent ground cover peaked at 65.9% on January 17 and declined to 26.3 on March 11.

Unfortunately, we did not have sufficient rainfall measure runoff in the plots and could not correlate them with the biomass measurements. However, one of the goals of this project was to get grower feedback on the acceptability of the levels biomass provided by the cover crops. The cooperating grower stated that the levels of biomass that were left from the cover crops did not cause disruption to ground preparation and broccoli seeding operations.

Summary: This trial provided an opportunity to evaluate low residue cover crops in an on-farm trial. These results will need to be confirmed in future trials, but some preliminary observations were made:

- Cover crops need to be controlled early in their growth cycle. In this trial, 54 day old Merced rye and 68 day old Trios triticale were sufficiently resistant to decay to provide good measure of cover to the soil
- None of the cover crop scenarios disrupted the subsequent broccoli planting operations

Further studies will be conducted to evaluate these observations and to better understand the benefits and drawbacks of low residue cover crops for proving benefits to water quality during the winter runoff period.

Full cover (killed at 54 days old) on Jan. 17

Close up of rye residue in furrow

In this regard, cover crops are a key cultural practice for complying with water quality concerns during the winter for vegetable producers.

The concept of low residue cover crops is that they are allowed to grow only until they are large enough to provide water quality benefits (i.e. reduce erosion and nutrient loss), but then killed before they produce too much residue that would impede subsequent planting operations in the spring.

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Furrow bottom Trios Feb. 1

Close up of Trios residue in furrow bottom

Table 1. Yield evaluations of the first crop of lettuce following a winter cover crop

Cover Crop Treatments	2004			2005		
	Un-harvested heads (percent)	Yield (tons/acre)	Mean Head Wt (pounds)	Un-harvested heads (percent)	Yield (tons/acre)	Mean Head Wt (pounds)
Cereal Rye 'Merced'	13.9	21.80	1.47	23.55	32.52	2.18
Broccoli 'DiCicco'	16.2	21.60	1.47	21.28	32.15	2.11
White Mustard 'Ida Gold'	16.2	21.43	1.42	18.72	34.50	2.26
Indian Mustard 'ISCI 61'	14.0	22.33	1.53	14.65	34.32	2.22
Bare Fallow	27.3	19.37	1.32	23.97	30.98	2.08
LSD (α=0.05)	6.3	*NS*	*NS*	NS	0.80	0.10

Table 2. Average sediment and nutrient concentrations in run-off from storm events occurring between February 12 – March 12, 2007

Treatment	Total Suspended Solids	Turbidity	Total Phosphorus	Soluble Phosphorus	Total Nitrogen	Ammonum Nitrogen	Nitrate Nitrogen	Run-off	Sediment loss per inch of run-off
	ppm	NTU[x]	-------------------	-------------------	ppm	-------------------	-------------------	% of rainfall[z]	lb/acre
Bare (control)	1419	4449	4.4	1.57	8.0	0.12	7.48	44.9	320.5
Full cover (Rye)	342	917	1.9	1.12	3.0	0.07	0.37	32.5	77.3
furrow bottom (Trios)	841	2377	3.3	1.70	5.7	0.34	2.29	27.9	166.2
furrow dike	978	4296	4.5	1.76	7.9	0.10	6.55	22.6	220.8
F-test ($p > F$)[y]	0.012	0.001	0.001	0.0002	0.004	0.023	0.001	0.038	0.006

[x] low NTU (Nephelometric turbidity units) indicate less turbidity

[y] probability of obtaining an F-statistic greater than the computed value

[z] total rainfall was 1.8 inches.

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(Cont'd from page 11)

Table3. Biomass (Tons/Acre) and percent ground cover of cover crops on five dates.

Variety	Dec. 10 2007		Jan 3 2008		Jan 17 2008		Feb 7 2008		March 11 2008	
	Biomass (T/A)	% Cover	Biomass (T/A)	% Cover	Biomass (T/A)	% Cover	Biomass (T/A)	% Cover	Biomass (T/A)	% Cover
Rye early kill [1]	0.11	37.5	0.41	70.4	0.13	77.4	0.11	9.4	ND	ND
Rye later kill [2]	0.14	30.0	0.13	55.1	0.36	57.4	0.39	46.8	0.27	34.1
Trios	0.02	13.6	0.14	44.3	0.14	65.9	0.20	47.4	0.16	26.3

Table 4. Nitrogen (N) and carbon (C) content of cover crop on five dates.

Variety	Dec. 10 2007		Jan 3 2008		Jan 17 2008		Feb 7 2008		March 11 2008	
	Biomass N (lbs/A)	Biomass C (lbs/A)	Biomass N (lbs/A)	Biomass C (lbs/A)	Biomass N (lbs/A)	Biomass C (lbs/A)	Biomass N (lbs/A)	Biomass C (lbs/A)	Biomass N (lbs/A)	Biomass C (lbs/A)
Rye early kill [1]	13.34	97.66	32.77	285.32	6.58	82.36	2.87	42.97	ND	ND
Rye later kill [2]	17.17	124.86	13.53	115.88	25.25	281.18	14.69	213.46	11.51	167.38
Trios	3.03	21.46	14.74	121.82	15.16	118.13	5.52	95.23	6.07	92.55

1 – rye cover crop killed 35 days after seeding; 2 – rye cover crop killed 54 days after seeding

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FIRST ANNOUNCEMENT

University of California Cooperative Extension, Monterey County Salinas Valley Weed School 2008

Tuesday, October 28
8:00 a.m. to 12:00 noon
Agricultural Conference Room Center
(1432 Abbott Street, Salinas)

Agenda will be sent in a separate mailing

4.0 Continuing education credits have been requested. For more information call Richard Smith (831) 759-7357.

University of California Cooperative Extension
Monterey County

2008 Plant Disease Seminar

Tuesday, November 11, 2008
8:00 a.m. to 12:00 p.m.

****Agricultural Conference Room****
1432 Abbott Street, Salinas, California

This seminar will focus on a broad range of topics dealing with plant pathology and food safety research and information.

8:00 – 8:30	Registration for morning session (no charge).
8:30 – 9:00	2008 plant disease developments in coastal California Steven Koike. UC Cooperative Extension
9:00 – 9:30	Thrips: identification, biology, and management Eric Natwick. UC Cooperative Extension
9:30 – 10:00	Changes in vegetable production and impact on Sclerotinia; Overview of research plans: Verticillium of lettuce, spinach Krishna Subbarao. UC Davis
10:00 – 10:30	Break: Sponsored by CAPCA, Monterey Bay Chapter
10:30 – 11:00	Update on spinach downy mildew outbreak Jim Correll. University of Arkansas
11:00 – 11:30	Testing produce for foodborne pathogens: current technology Trevor Suslow/Suslow Lab. UC Davis
11:30 – 12:00	Update on E. coli field survival research Mike Cahn. UC Cooperative Extension

Continuing education credits have been requested. Please call ahead (at least 24 hours) for arrangements for special needs; every effort will be made to accommodate full participation. For more information, contact Steven Koike (831-759-7350; 1432 Abbott Street, Salinas, California 93901).

Afternoon session hosted by CAPCA, Monterey Bay Chapter.