CENTRAL COAST AGRICULTURE HIGHLIGHTS

SANTA BARBARA COUNTY MAY 2009

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Flaming for Weed Control on Small Farms and Orchards

Mark Gaskell

Weed Flaming is a valuable tool for use on small farms concentrating on organic production or pesticide free production or who have limitations of any type for spraying or herbicide use. Flaming of weeds typically is done by passing a flame – usually using propane as a fuel - quickly over small plants to steam or boil the water in the plant cells causing the membranes to rupture. It is not necessary typically, to burn the plant but rather the steam explodes the cells and the plant dies.

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Arroyo Grande vegetable grower Jerry Rutiz flames emerging weeds during asparagus harvest. March 2009.

Machine cultivation and hand weeding are some of the most commonly used physical alternatives across fruits, vegetables and other row crops. But today there are wide array of weed flamers from very small single handled canister-fed units to mult-burner tractor mounted units and all sizes and configurations in between these extremes. Differently configured row crop tool bar mounted flamers are available with multiple settings for different row crops and stage of growth. Smaller ATV mounted multiple row units are also available and single burner units with back pack, wheel car,t or ATV mounted propane tanks are also available. There are special configurations for perennial vegetables such as artichokes or asparagus and other systems that work best for orchards and vine crops. In some cases systems are designed also for non-cop wild settings or for suburban landscape designs.

Small scale growers find them useful and economical in many situations where smaller configurations of a few rows of different vegetable or flower crops and mixtures in the same field prohibit chemical use and may favor smaller-scaled ATV equipment or hand operations.

Flaming as with many weed control practices works best on very small weeds and broadleaf weeds overall are more easily controlled than grasses and the grasses may require retreatment for best results. Annual weeds can be controlled relatively easily but perennial weeds will likely come back and require subsequent re-treatment. But repeated flaming in trials in Nebraska has successfully controlled even aggressive weeds such as Canadian thistle. Young, tender well-watered weeds are killed more easily with flaming than older weeds. Typically control and efficiency improves with practice as the exact distance, position, and timing needed varies by type of crop, bed or row configuration, weed type, surface conditions, etc. One reference suggests rubbing flamed weeds between finger tips to see if green plant fluid stains the fingers to determine if the flaming as been effective. Results may otherwise take 1-3 days to appear.

Several studies have evaluated ways to control weeds without damaging the crop. There are different types of specialized equipment available for different crops and conditions and it is possible to also adjust propane volume and pressure and ground speed to improve effectiveness. Different reports suggest that depending on conditions and the predom11inant weeds present, between 8 and 35 gallons of propane are needed per acre per flaming and propane is currently approximately $1 per gallon.

Several additional references regarding flaming for weed control can be found on the Internet. An interesting film illustrating weed flaming in an almond orchard is available at: http://massaorganics.blogspot.com/2009/03/flaming-weeds-in-orchard.html

Red Dragon Products has an Agricultural Flaming Guide on their website at: http://www.flameengineering.com/Agricultural_Flaming_Guide.html

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Wilting weeds is asparagus bed shortly after flaming.

New Strawberry and Vegetable Advisor

ANR Report January 2009

Dara appointed strawberry and vegetable advisor

Surendra Dara has been appointed strawberry and vegetable crops advisor for Santa Barbara County with cross-county responsibilities for San Luis Obispo County, effective Jan. 8. He previously worked as the quality control manager and ISO coordinator at Certis USA, a biopesticide company.

Dara, a native of India, earned his bachelor's and master's degrees in Entomology from Andhra Pradesh Agricultural University. He received a Ph.D. in Entomology from Virginia Tech. He also has a postgraduate diploma in Applied Information Technology from Canada, where he worked as an independent software consultant.

Dara has worked as an entomopathologist at the International Institute of Tropical Agriculture in western Africa, a postdoctoral fellow at the University of Houston and an assistant project scientist at UC Davis.

He has extensive experience in the microbial control of arthropod pests including ants, aphids, hoppers, Lygus bugs and mites. At UC Davis, he studied microbial control of the glassy-winged sharpshooter, Lygus bug and leafhoppers. He recovered several insect pathogenic fungal isolates from pest habitats and identified the ones with biocontrol potential.

"Surendra, with his diverse background and education, is an excellent addition to the team of farm advisors already serving the Central Coast," said Richard Enfield and Mark Gaskell, acting co-directors for Santa Barbara and San Luis Obispo counties, in a joint statement.

Dara can be reached at (805) 934-6240 and skdara@ucdavis.edu.

Lygus bug and Mites on Strawberries

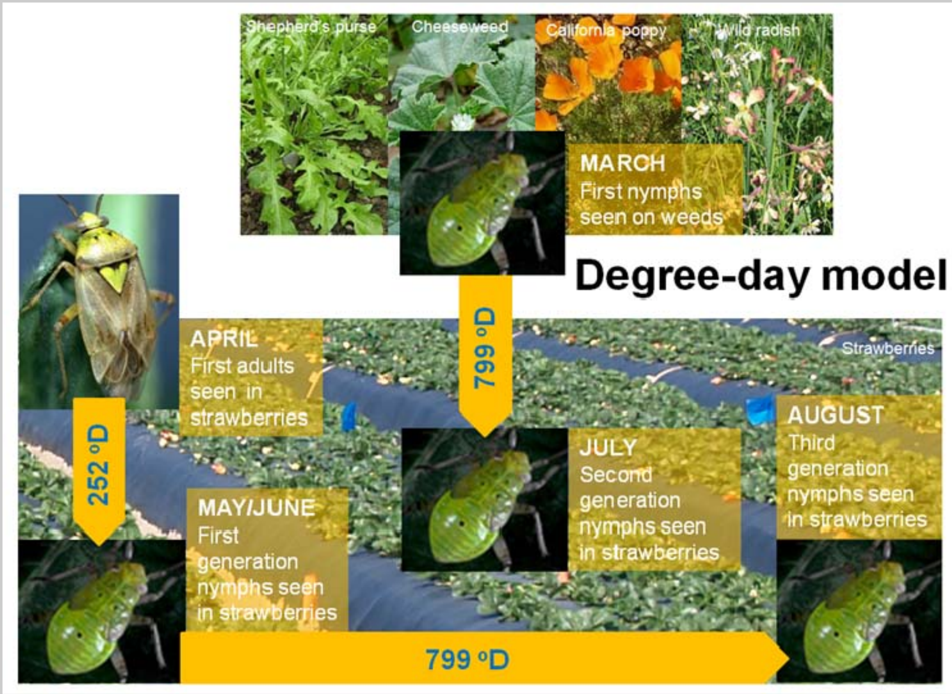
Surendra Dara

Lygus Bug

Western tarnished plant bug or Lygus bug, *Lygus hesperus* is a major pest of strawberries in many regions in California. Feeding damage to achenes causes deformation of fruits called cat-facing and reduction in yield and quality. Overwintering adults lay eggs on flowering weed hosts which are the main source of later infestation on strawberries. In the Central Coast area, three generations of nymphs can be seen in a season. The first in May or early June, the second in late June or early July and the third in July or August.

Management of weeds in winter and monitoring for nymphs on weeds and adults on strawberry are important for Lygus bug control. One of the approaches is to calculate degree-days to estimate when nymphs or adults can be seen. Degree-day is the unit of measurement for physiological time for insect maturity. In other words, it is the time an insect takes from one point to another point in its life cycle depending on the temperature. The amount of heat accumulated in 24 hours when the temperature is one degree above the lower developmental threshold is a degree-day (^oD). Lygus bug requires 252 ^oD (in Fahrenheit) for egg stage and 371 ^oD for nymphal stages. Adults require 176 ^oD before they start laying eggs. So, it takes a total of 799 ^oD from egg to next generation egg. By monitoring the presence of Lygus and daily temperatures, degree-days can be calculated to make treatment decisions against nymphal stages following UC IPM guidelines. This is especially important as many of the available insecticides are not effective against adults.

For example, if Lygus nymphs are first seen in March on weed hosts or adults are first seen in strawberries in April, degree-day model predicts that first generation nymphs from adults can be seen in strawberries around May-June after accumulating 252 ^oD. Second generation nymphs, from the nymphs on weeds, can be seen in July in strawberries after accumulating 799 ^oD. The third generation nymphs from first generation can also be seen after 799 ^oD in August.



LIFE STAGES ON STRAWBERRIES	DD (°F)	DD (°C)
Eggs	252.0	140.0
Nymphs	371.0	206.1
Generation time from egg to adult	623.0	346.1
Pre-egg laying adults	176.0	97.8
Generation time from egg to egg	799.0	443.9
Biofix (starting point)– when first Lygus nymph is found in weeds		
Next generation nymphs start hatching (Treat 5-7 days later)	799.0	443.9
Biofix (starting point)– when first Lygus adult is found in strawberries		
Nymphs hatching from eggs laid by first adults (Treat)	252.0	140.0
Next generation nymphs will be hatching (Treat)	1051.0	583.9

Natural enemies of Lygus include big-eyed bug (*Geocoris* spp.), minute pirate bug (*Orius* spp.), damsel bug (*Nabis* spp.), various species of spiders that attack nymphs and an egg parasitoid, *Anaphes iole*.

Degree day information can be found at:
www.ipm.ucdavis.edu/PHENOLOGY/ma-lygus_bug.html

UC IPM guidelines for strawberries can be found at:
www.ipm.ucdavis.edu/PMG/selectnewpest.strawberry.html

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Two-Spotted Spider Mite

Mites

Two-spotted spider mite (*Tetranychus urticae*) is a major pest on strawberries in coastal California. A closely related species, *T. turkestani*, which resembles *T. urticae* may also be present among spider mite populations, but prefers warmer climates. The life cycle includes egg, larva, protonymph, deutonymph and adult. Larvae have three pairs of legs while other mobile stages have four pairs. The duration of the life cycle depends on the temperature. The ratio between male and female mites depends on various factors, but it is usually 1 male for every 2 or 3 females.

Spider mite feeding causes reduction in fruit size and yield. Strawberry plants are very sensitive to mite damage within 2 to 5 months after transplanting. Infestation of 1 mite per leaflet can result in substantial yield reduction during this period. Plants are less sensitive to mite damage after initial berry set. However, substantial losses can occur with 15-20 mites per mid-tier leaflet during this period. Highest infestations can be seen after peak spring harvest after which populations rapidly decline.

Proximity to second year plantings with mite infestation, presence of infested fields upwind, inadequate chilling of day-neutral varieties, dusty conditions and water stress are some of the factors that contribute to mite problems.

Depending on the region and time of the year, monitor for mites every week or every other week. When populations are low, check for the presence or absence of mites by randomly sampling 10 leaflets per acre. When infestation is high 5-10 leaflets per acre can be randomly sampled for counting mites.

Among the predatory mites, *Phytoseiulus persimilis* is effective early in the season. *Neoseiulus californicus*, which tolerates high temperatures and wide range of humidities, is a predominant species later in the season. Chemical control can be achieved by using UC IPM guidelines. Oberon, Zoro, Agri-mek, Fujimite and Acramite are among effective chemicals in a research study conducted in Watsonville by UC entomologist, Frank Zalom.

Recommended management practices include:

- Promoting vigorous plant growth through adequate chilling, water and nutritional management.
- Avoiding practices that disrupt natural enemy populations and using miticides that are safe to natural enemies.
- Alternating different chemicals to reduce the risk of resistance development where strawberries are continuously grown.
- Slow driving, use of low fences and watering roadways to prevent dusty conditions.

Differential Piece Rate Design

(Reprinted from Fresh Fruit and Raisin News-August 2007)

Gregorio Billikopf

Man's creativity knows no bounds, but that is not always a good thing. In the past, I have written much about avoiding the *hourly pay plus piece rate bonus* design (Billikopf 1994, 2003, 2004, 2007). Growers reason that if hourly pay yields better quality work and piece rate generates higher productivity, why not combine both and get the best of two worlds? When doing so, growers end up rewarding workers in an inverse order to their performance level. In other words, the greater the worker productivity, the less they get paid per effort (i.e., per vine pruned, fruit tree thinned, box picked or pound processed). The faster workers, then, subsidize the slow ones. (By the way, this also happens when a grower has piece-rate paid workers who are not making the minimum wage.)

Few employers have done the math, and even fewer have designed such pay schemes on purpose: to try and punish their best employees. Crew workers are dissatisfied with the hourly pay plus piece rate design, even though they might find it difficult to verbalize the exact reason for their discontent. In an on-going research project we have successfully made the switch from such a system to a straight piece rate approach, with great benefits to both the worker and grower.

When growers see the numbers—and get the message—they often ask about *differential piece rate* designs. How about paying a straight piece rate up to minimum wage (or some such standard), followed by a greater piece rate after that (often called the Frederick W. Taylor approach)? Or, how about a more elegant tactic: a lower piece rate for the slow workers, an average piece rate for the average employee, and a high piece rate for the most productive ones (known as the Dwight Merrick method)? Would these differential piece rates not motivate worker performance in the right direction? Perhaps doubly encourage slow workers to be more productive? Actually, the opposite is true.

A grower regrettably credited a conversation we had on the hourly pay plus piece rate bonus as a trigger to implement a differential piece rate approach. I am grateful for this grower's willingness to have me share the details, so we could analyze this case and reason together. He paid employees who were crushing and packing walnuts a straight piece rate until they reached the minimum wage—and a piece rate that was 33% higher for any production over that. This producer reported great success and happy employees who, said he, "thought it was only fair to get paid a little extra for the additional effort." Forty percent of the employees at the packing shed were making at least some amount of their earnings at the higher piece rate level.

Despite the workers initial enthusiasm, may I suggest that the differential piece rate—based on *worker productivity*—is flawed? (This is not the case for many other types of variable piece rates, such as those based on achieving a quality goal, or those that pay different amounts based on the difficulty of the task.)

It has been said that "where you stand depends on where you sit". A good exercise is to determine the rules before we know where we will sit. If there is only one piece of cake left, and we both want it, it seems fair that one of us will cut the piece in two and the other will select the desired piece. Under this differential piece rate system, will we be the farm owner, or the farm worker? If a farm worker, will we be fast, average or slow? Such reasoning can help us discover and repair pay for performance design flaws.

A differential piece rate, if it did not lower worker morale, would only have a minor disadvantage for the employer. It is a little harder to calculate actual costs, in contrast to a straight piece rate. Worker morale, nevertheless, does suffer:

1. All workers, regardless of productivity level, are paid less for working up to the higher cutoff piece rate. Workers may come to feel that they are being taxed for the right to earn more. Simplicity and clarity is valued, and it certainly is more transparent for the grower to pay a fair, straight piece rate.
2. Slow workers subsidize the wages of the most productive ones. This is the most fundamental defect of a differential piece rate. While the literature on differential piece rates often suggests that employees are motivated by this system to reach higher levels of productivity, it obscures the fact that great differences in ability exist among workers. Slow workers are simply not capable of performing at the speed of the fast ones (Billikopf 1988, 1994, 2003).

Conclusions

Just because crew workers may not immediately know how to verbalize their dislike for a poorly designed piece rate system, it does not mean that they like it. Piece rate designs where some workers subsidize the earnings of others are demoralizing to employees.

A well constructed piece rate is one where 1) capable employees are selected; 2) workers are rewarded for both quantity and quality; 3) the piece rate varies depending on the difficulty of the task; 4) employees take a short break, without loosing the equivalent earnings for the time taken (normally, hourly paid workers rest on the employer's dime, but piece rate paid employees rest on their own time); and 5) employees come to understand—and trust—that the more they make the better it is for the farm enterprise.

This last point merits being underscored. All too often farm employers panic when some of the crew workers make a lot of money and succumb to the appalling practice of cutting the piece rate. Such a practice is not always overt, and it can be quite subtle indeed. Farmers who feel pressured to maintain a competitive posture will not increase the piece rate when minimum wage goes up, surrendering to a form of wage compression between piece rate and hourly paid jobs.

No wonder so many crew workers feel they have been burnt by piece rate pay. Many think of it as a game played between management and labor (Billikopf 1996). Employees are often conditioned not to do their best for fear of having the piece rate altered. In the language of the early 1920s, "…in the past one means by which an employee has been able to keep his head above water and prevent being oppressed by the employer has been that *the employer didn't know just exactly what the employee could do*." (Taylor & Alifas, 1921, emphasis added).

Only when there is a mutual valuing of inputs can piece rate be trusted and help both the farm owner and farm worker. Growers should consider how their costs per acre pruned, box picked, or task performed is being affected. If these costs are within the budgeted projections, and if the farm enterprise is improving its bottom line, why should the employer worry because employees go home with their pockets full of money? Such farm enterprises are likely to have a waiting list of excellent people who wish to work for them and have little to worry when talk of labor shortages are raised.

For more information on designing an effective piece-rate or bonus system, go to tinyurl.com/99cq or contact Billikopf at gebillikopf@ucdavis.edu or (209)525-6800. Due to the space, references were left off for print purposes, but they are available upon request.

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FOR IMMEDIATE RELEASE

FREE OAK TREES 2009!

The Santa Barbara County Agricultural Commissioner's Office has FREE native oak seedlings available to local landowners. This year there are Coast Live, Valley, and Blue Oak seedlings. These seedlings were grown from locally collected acorns and were raised by area high school students.

The program was started in 2005, when the Agricultural Commissioner's Office, along with Kevin Merrill, of Mesa Vineyard Management and Premiere Coastal Vineyard, and Jerry Markota, of JM Oak Tree Nursery and Markota Landscaping teamed up with Santa Ynez High School agriculture students in an exciting pilot program. Over 1,000 seedlings, which had been started from acorns by these students, were planted that year. Since then, the program has expanded to include Santa Ynez Valley, Carpinteria, Cabrillo, Santa Maria, and Pioneer Valley High Schools.

This program has been provided FREE to land owners and has been successful because of their participation. Since the program was started in 2005, over 10,000 oak seedlings have been placed with willing local land owners for planting! The program has also been a great learning experience for over 1,000 students.

Take the opportunity to get involved and plant some of the FREE oak seedlings on your property. The seedlings are ready for distribution, so call and reserve yours today. If you are interested in participating, contact Lottie Martin with the Agricultural Commissioner's Office at 805-934-6200, by email at lmmartin@co.santa-barbara.ca.us, or by visiting www.agcommissioner.com.

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