

**California Red Scale**

**Biofix (beginning of male flight):** March 22-March 29, 1999 in Tulare and Kern Counties

**Lower developmental threshold:** 53°F

**Current Accumulated Degree Day Units (as of July 12, 1999):**

**Kern:** 2147 DD

**SW Tulare:** 1963 DD

**NE Tulare:** 2047 DD

**Fresno:** 1935 DD

**Madera:** 1660 DD

**First crawler activity began:** 550 DD

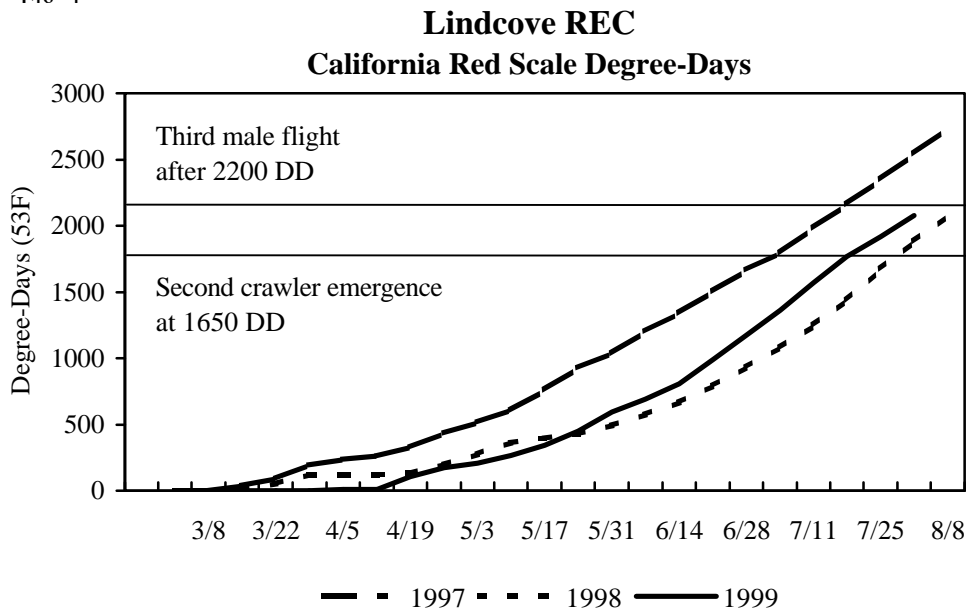
**Second crawler activity begins:** 1650 DD

**Peak second crawler emergence:** approximately 1750 DD

**Third male flight occurs:** 2200 DD

California red scale is developing at a fairly consistent rate with this hot weather. With the current highs (90s) and lows (60s) we are now accumulating 20-25 degree-days each day. The second generation crawlers have been active for about 2 weeks in Kern and Tulare counties. At this time of year, the third flight of males occurs simultaneously with the second generation of crawler activity. Peak crawler activity has already occurred in Kern and much of Tulare County and should arrive soon in the northern

Fig 1

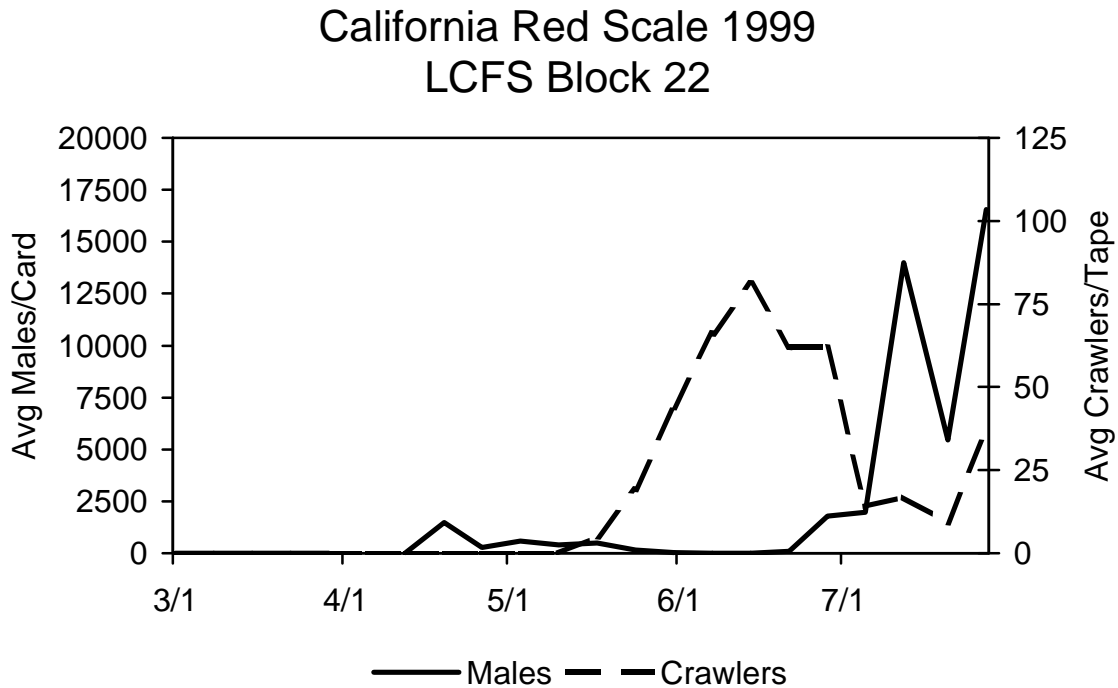


regions. As the graph in Figure 1 shows, we are now midway between the extraordinarily warm season of 1997 and the much cooler season of 1998. See our website at [www.uckac.edu/citrusent](http://www.uckac.edu/citrusent) for weekly updates on California red scale activity throughout the San Joaquin Valley.

Organophosphate (Lorsban and Supracide) and carbamate (Sevin) insecticides work best if applied when the crawlers have just settled. Therefore, the best timing for these pesticides is just after peak crawler activity has occurred, usually 1-2 weeks after the crawlers begin to emerge. Crawler emergence can be monitored using double-sticky tape wrapped around branches and changed weekly to catch crawlers as they move along the branch (Fig. 2). You can also use degree-days and wait until 1750 to 1800 degree-days after the first generation of males began to fly before you spray (or 550-degree days after the second generation of males began to fly). The organophosphates and carbamates will also kill

most of the scale if they are sprayed at other times of the year. However, the pesticides do a better job when applied while most of the population is a young stage.

Fig. 2



The insect growth regulators Esteem (Knack) and Applaud kill the scale as it molts and so are best applied when the crawlers settle down as white caps. Oil smothers the insect and so the best application timing for this pesticide is also when the scale has settled as whitecaps. For these insecticides, you want to wait longer before you spray than you would for the organophosphates and carbamates. A good way to evaluate the scale for this spray timing is to watch for white caps on old fruit (shiners) or on new fruit in the orchard. The insect growth regulators will not kill crawlers or whitecaps, so don't expect these stages to die and go away.

### Cottony Cushion Scale

Cottony cushion scale has become a very serious problem in many orchards throughout the San Joaquin Valley during the past month. One of the reasons is that the extra moisture and cool spring and early summer in 1998 and 1999 were perfect for soft scale growth and development. Another reason is that vedalia beetle is very sensitive to some of the insecticides that we are using for citrus thrips and California red scale control. I collected foliage from trees sprayed with various citrus thrips treatments and found that Baythroid is very toxic to vedalia beetles. It kills the beetles and prevents them from laying eggs for 3 weeks or more during the period when vedalia are needed for cottony cushion scale control. In contrast, Veratran, Agri-Mek, and Success do not seem to have any noticeable effect on vedalia beetles. The vedalia beetle is even more sensitive to the new insect growth regulators, Esteem (=Knack) and Applaud, which are applied for California red scale control. The insect growth regulators prevent vedalia from pupating and emerging as adults and Esteem prevents the adults from laying fertile eggs. A sign that the insect growth regulators are killing vedalia is the presence of dead vedalia pupae. Pest control advisors saw a lot of dead vedalia pupae in the San Joaquin Valley during July.

Esteem and Applaud will also kill cottony cushion scale, but they do it very slowly. The orchards that are experiencing the worst cottony cushion problems are not the orchards that were sprayed with these insecticides, but the nearby orchards. This is because the spray drift from the IGR-treated orchard

killed the vedalia beetle but not the cottony cushion scale. The effects of these insecticides are long lasting (4-6 months). Live vedalia beetles could not be found in the San Joaquin Valley in citrus during the fall of 1998 and they did not return to citrus until March-May of 1999. The current spraying should prevent them from returning for at least four months.

The vedalia beetle is the best method of controlling cottony cushion scale. Vedula are very fast growing, they can complete 4 generations in the time it takes cottony cushion scale to complete one generation. They consume huge numbers of cottony cushion scale eggs and nymphs in a very short amount of time. When vedalia beetles arrive in an orchard they can clean up a nasty problem in 3-4 weeks. Insecticides such as malathion or Supracide are often not as effective as vedalia beetle and are very toxic to natural enemies such as *Aphytis* needed for California red scale control. Esteem and Applaud do help to kill cottony cushion scale, but they work very very slowly and the drift can cause the cottony cushion scale in the neighboring blocks to blow up.

In 1999, I recommended that growers avoid Baythroid for citrus thrips control and vedalia arrived in March-May and cleaned up cottony cushion scale in many blocks. During June and July growers began applying Esteem and Applaud for California red scale. Just in the last few weeks (mid-to-late July) we began to see sick and dying vedalia pupae in orchards throughout the valley. It is likely that the insect growth regulators are killing the pupae even in orchards that are several miles from sprayed blocks. The beetles seem to be extremely sensitive to very low rates of pesticide drifting through the air. The vedalia beetle is not likely to be effective in controlling cottony cushion scale from this point on. These blocks are likely to need an organophosphate application to control the cottony cushion scale. We are currently conducting research to learn how to 1) control cottony cushion scale better chemically, 2) see how long the insect growth regulator residues kill the vedalia beetles, and 3) see if we can mass-rear and release vedalia beetles into orchards that are heavily infested with cottony cushion after the IGR spraying stops.

Beth Grafton-Cardwell  
University of California  
Cooperative Extension  
[Bethgc@uckac.edu](mailto:Bethgc@uckac.edu)  
(559) 646-6500

Greg Montez  
[Gregm@uckac.edu](mailto:Gregm@uckac.edu)