

The Pest Control Circular

NO. 545

SUNKIST GROWERS, INC.

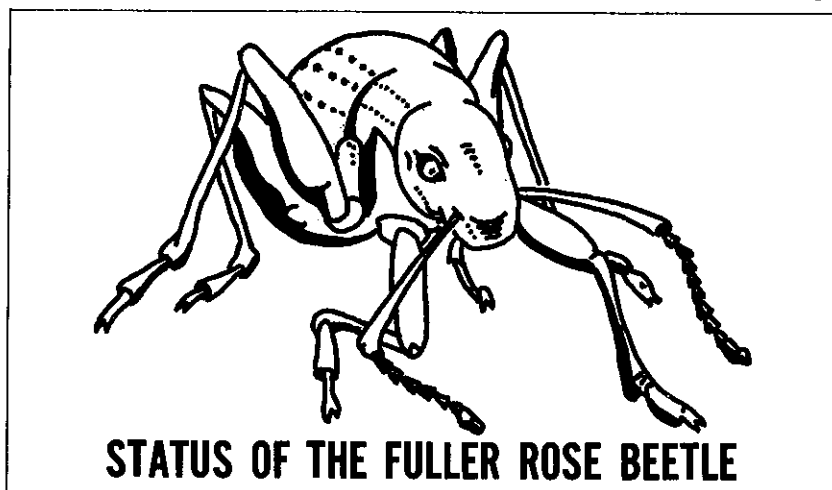
JUNE, 1986

The Fuller rose beetle, *Pantomorus cervinus* (Boheman), which has long been regarded by growers as a minor pest of citrus, has now become a key limiting factor in the export of fruit to Japan. The reason for this sudden change of pest status stems from the fact that Japanese quarantine inspectors in early 1985 found unhatched and viable eggs of this beetle species under the calyxes or buttons of imported fruit. The Japanese confirmed this by rearing adults from these eggs and having them identified. This economic pest is not known to be present in Japan or in any of its neighboring countries. Thus, the California-Arizona citrus industry is confronted with a valid and enforceable quarantine restriction.

Verification of this is given by the statement of the principal quarantine officer in Washington that if the circumstances were reversed, he would have to impose and maintain a similar quarantine treatment requirement — in this case, dock side fumigation with methyl bromide of contraband fruit shipments. The extensive damage to fruit surfaces and loss of shelf-life caused by this treatment — as high as 15 percent or more on oranges and grapefruit and peaking above 60 percent on lemons — coupled with the fumigation and other handling charges, jeopardize the profitability of this export market which is of vital importance to the California-Arizona citrus industry.

While a number of research projects in progress, both here and in Japan, are exploring the possibili-

ties of modifying this quarantine treatment to minimize fruit damage without the loss of efficacy against the Fuller rose beetle eggs, no encouraging developments have been reported to date. Other efforts to minimize or circumvent this export problem have also been unsuccessful. Major help has been provided by a pre-clearance inspection program on lemons. Japanese quarantine officers cer-



tify the acceptability of loads for shipment to Japan when no Fuller rose beetle eggs are found in a representative sample. Certified shipments are not reinspected for the beetle eggs upon arrival in Japan and are not fumigated with methyl bromide. This program has proven to be most helpful to lemon growers but there is no certainty as to how long the Japanese government will make this service available. On the other hand, future pre-clearance programs would have limited usefulness unless the populations of this pest are greatly reduced in citrus orchards in the coming months.

Thus, for the foreseeable future, widespread and rigid control of the Fuller rose beetle at the orchard level will be mandatory to meet the marketing and income expectations of the individual grower

who is concerned to have fruit exported to Japan. Further, in most cases the disqualification of fruit for export to the Japanese market will predictably have an adverse effect on the opportunities for favorable domestic marketing.

The ensuing discussion is an endeavor to acquaint growers and orchard managers with the available knowledge concerning the life history and habits of the Fuller rose beetle and about control practices that can be used to limit or prevent egg depositions on fruit. Unfortunately, very little research effort has been expended on this species since the injury to citrus caused by the feeding of the larvae and adults on roots and leaves respectively has seldom

been of great concern except on newly-planted trees. Life history information is incomplete and no trials with control treatments have been conducted in California in recent years.

Life History and Habits

With regard to the biology of the Fuller rose beetle it is well established that the unmated female is capable of laying viable eggs and deposits them in cracks of the bark, under loose bark, or in other small niches as well as under the calyxes of fruit. The egg masses may contain 30 or more eggs and are covered by a protective substance of unknown composition. Each female beetle produces upwards of 200 eggs during her life span.

The pale yellow eggs which are elliptical in shape and approxi-



mately one millimeter in length normally hatch in about three weeks and the newly emerged larvae or grubs fall to the ground. The legless grubs manage to move downward in the soil to feed on plant roots, including those of citrus trees. Instar development is slow with the last instar pupating in an earthen cell near the surface of the ground. Upon emergence the gray-brown adult beetle, which is flightless and largely nocturnal in its habits, moves into the tree by any available access to feed on the foliage and periodically lay eggs.

The most detailed studies completed under California conditions (in San Fernando and Fillmore) indicated the development of a single generation per year. However, Woglum (1) observed that there may be two broods each year, one in the spring and one in the fall, and that each brood required a full year for development. The presence of adult beetles and eggs this spring either supports this observation or suggests the overwintering of adults as a result of mild climatic conditions.

In any event, adults associated either with a single yearly generation or with the fall brood of two broods can be expected to appear as early as July and emergence will probably peak in September.

Control Measures

Capitalizing on the fact that the Fuller rose beetle adult is flightless, it is possible to prevent the deposition of eggs on fruits in an orchard by skirt pruning of the trees so there is only trunk contact with the ground and by installing a trunk barrier which the beetles cannot cross.

The skirting of trees approximately 18 inches above ground level entails the actual pruning and brush removal costs, the probable loss of some crop the first year, and the continuing costs of monitoring and maintaining the contact-free condition. The later costs

would normally be expected to be relatively insignificant and yield records currently available on Valencia oranges in an Orange County test plot indicate an evening out of production in pruned and unpruned plot areas over the course of a five or six-year period.

It should be noted that skirt pruning has long been practiced in some citrus-producing areas with no indication that yield loss is a negative factor. Certain advantages of bottom pruning under California conditions have been cited recently by Griffiths, et al (2). The more important inclusions in their listing cite the helpfulness of skirt pruning in the control of snails,

A Message To Growers

This circular, prepared by Dr. Glenn E. Carman, professor emeritus at the University of California, Riverside and consulting entomologist for Sunkist Growers, Inc., contains the latest information available to us on the problem of the Fuller rose beetle. We urge you to study it carefully and to apply the portions which are applicable to your situation to your own pest control program. It is obligatory that every Sunkist grower take steps to bring this problem under control in order to protect the position of California-Arizona citrus in export markets which are vital to the continuing success. Russell L. Hanlin, President

ants, Fuller rose beetle, a number of other insect pests such as grasshoppers, earwigs, and beet armyworm, brown rot, gummosis, weeds, including Bladder pod vine, and gophers and for the installation and monitoring of irrigation systems, navel girdling, and trunk painting. Their listing mentions a number of other possible advantages.

While an indication of the actual acres already skirt pruned at this time in the California-Arizona citrus areas is not available, a trend in that direction has been evident in the last few years in the coastal and interior areas of Southern California.

Growers are encouraged to consider this approach to the control of the Fuller rose beetle but the availability of an effective, safe, and otherwise practical trunk barrier has not been established. The earlier use of bands of cotton batting was relatively ineffective but favorable results were reported for barriers of highly viscous materials. Many such materials contain polybutene or other hydrocarbon materials and if applied directly to trunk surfaces may cause bark damage or even cause girdling.

No viscous material should be applied directly and annularly to the trunks of citrus trees unless the manufacturer provides a written guarantee that bark damage will not occur. Samways and Tate (3), in reporting on their studies of barriers for ant control on citrus in South Africa, voice an additional concern in their statement that "polybutene compounds applied direct on the tree trunk (or onto porous polyester fibre) can cause severe bark damage. At one site, polybutene-induced damage occurred even in the shade of a good canopy."

Their currently recommended trunk barrier for ants consists of an approximately four-inch wide band of a polyester fiber overlaid with a similar width of Gladwrap upon which a viscous polybutene compound is applied. The polyester fiber is placed around the trunk with a one to two-inch overlay and care is taken to plug any opening caused by crevices or trunk fluting with wads of the same material prior to applying the trunk wrap. Using a banding material with a soft and weather-proof lining in contact with the trunk helps to create an effective seal. The Gladwrap film is then wrapped around the fiber band two or three times and tightly stretched with the free end smoothed flush with the previous encirclement. Gladwrap cannot be applied directly to the trunk as such an impermeable wrap could lead to gumming under the band.



Since most viscous compounds will tend to "curtain down," they then apply an inch wide band of the sticky barrier near the top border of the Gladwrap band.

U.S. manufacturers that market sticky materials which may be suitable for barriers include the following:

Seabrite Enterprises
4026 Harlem Street
Emeryville, California 94608

Tanglefoot Company
314 Straight Street, S.W.
Grand Rapids, Michigan 49502

It is not known at this time whether copper bands as used to restrict snail movements or other structured barriers would be effective in preventing Fuller rose beetle from reaching the fruiting areas of trees and, additionally, whether slurries or sprays of any currently available insecticides applied to the trunk area of skirted trees would function as effective barriers.

On the other hand, skirt, trunk, and ground litter sprays of certain materials are known to be relatively effective control treatments. The Citrus Research Center at Riverside recommends a malathion spray in the 1984-1986 Treatment Guide for California Citrus Crops. (4) The specification is for the application of one pound of the 25 percent wettable powder formulation per 100 gallons of spray. Past experience indicates that 200 to as much as 350 gallons per acre would be required on mature trees as a skirt, trunk and ground litter spray and that the recommended thorough distribution coverage would only be receded on newly-planted or small trees.

Cryolite was possibly the first material used in California for Fuller rose beetle control but was not included in the current University recommendations because of a gap in its availability on the market. It is now federally registered as Kryocide® with a label specification for Fuller rose beetle control

of 25 to 50 pounds of the 96 percent wettable formulation per acre applied as a spray or a dust.

In a field test Elmer (5) found Cryolite applied at the rate of three pounds of a 90 percent wettable powder per 100 gallons at 200 to 350 gallons per acre with thorough coverage in the lower part of the tree to be totally effective in eliminating Fuller rose beetle as evaluated during an approximate two-month post-treatment period. Aldrin, chlordane, dieldrin, endrin, and toxaphene were all equally effective in the test but none of those com-

could be undesirable for inclusion in integrated pest management programs, cryolite used as a stomach poison at the lower-than-label rate tested by Elmer could be relied upon to provide adequate control potential without being as disruptive to natural enemies. Historically, cryolite has been most heavily relied upon in California for Fuller rose beetle control.

While based on undocumented observations of researchers and orchard managers, it is reported that Fuller rose beetle is not occurring in noticeable numbers in groves that have been treated in succes-

TABLE 1. Duration of toxicity of several wettable-powder (WP) insecticides to the Fuller rose beetle on small citrus trees in the greenhouse.

Material and Formulations	Actual Toxicant/100 Gallons of Spray (Oz.)		
	4	2	1
Dieldrin, 50% WP	9-10 Weeks ^a	9-10 Weeks	7-8 Weeks
Guthion, 25% WP	8-9	7-8	6-7
Malathion, 25% WP	7-8	2-3	1
Chlordane, 50% WP	6-7	7	4
Chlorthion, 25% WP	4-5	2-5	3-4
Cryolite, 90% WP	4-5		
DDT, 50% WP	4-5	4-5	4
Endrin, 50% WP	4-5	4-5	3-4
Parathion, 25% WP	3-4	2-3	3-4
Sevin, 50% WP	2-3	2	1
Trithion, 25% WP	2	1-2	1
Diazinon, 25% WP	1	1	0
Dipterex, 50% WP	1	1	0
Kelthane, 18.5% WP	0	0	0
Chlorobenzilate, 25% WP	0	0	0
Phorate, 25% WP	0	0	0
Untreated Check	0	0	9

^aWeeks after treatment until introduced beetles successfully survived residues.

pounds are still available for use.

In the same paper, Elmer provided the results of greenhouse studies as shown in the table reproduced above.

It is interesting to note that under Florida conditions Bullock (6) found single foliar sprays of azinphos-methyl (Guthion®), malathion, carbophenothion (Tri-thion®) and parathion ineffective against Fuller rose beetle adults. The results reported by Elmer actually suggest that azinphos-methyl and malathion may be the most effective materials currently available for use on citrus in California and Arizona but since both

sive years with chlorpyrifos (Lorsban®). This material, along with other untested materials registered for use on citrus, will be included in the field and laboratory trials of University projects recently funded by the Citrus Research Board. Foliar sprays, trunk and ground litter sprays, granular distribution, and soil treatments are expected to be evaluated in these trials but complete test results may not be available in time to provide definitive guidance for control efforts by growers this season.

Therefore, growers are urged to undertake control measures that have already been shown to be ef-



fective in earlier trails or to consider the possibility of installing trunk barriers on bottom-pruned trees. The latter should be in place by mid-July to prevent early emerging adults from entering trees.

Timing

Spray treatments should preferably be applied by early August with the prospective requirement of a follow-up treatment if beetles are detected in the trees. Additionally, if a spring brood emerges during the late spring period or if overwintering adults continue to lay eggs during the spring period, additional treatments could be required. More precise information on the preferred timing of the initial treatments will be determined by the emergence pattern of adult beetles during July and early August.

Failure by a grower this season to prevent the Fuller rose beetle from laying eggs under the calyxes of his fruit either by the exclusionary procedure of skirt pruning coupled with a trunk barrier or by the use of a sustained chemical control program will predispose his crop to rejection for the export market in Japan, or to significant profit losses when his fruit is fumigated with methyl bromide upon arrival in Japan. Quarantine standards are exceptionally rigid and non-negotiable. Until improved and reliably effective control procedures can be recommended, growers are urgently advised to monitor their orchards closely for the appearance of leaf feeding in the lower and more shaded tree areas and for the presence of beetles in the trees, and to implement presently available control measures on a timely basis.

References

1. Woglum, R.S. 1939. *Exchange Pest Control Circular No. 60*, California Fruit Growers Exchange, Los Angeles, California.
2. Griffiths, H., A. Hardison, J.G. Morse, and R.F. Luck. 1986 "Fuller Rose Beetle: A Practical Solution." *Citrograph*, 71 (7): 139-40.
3. Samways, M.J. and B.A. Tate. 1985-86. "A Highly Efficacious and Inexpensive Trunk Barrier to Prevent Ants from Entering Citrus Trees." *Citrus and Subtropical Fruit Journal*, No. 662: 12-13, 18.
4. Morse, J.G. and J.B. Bailey (Editors). 1983. *1984-86 Treatment Guide for California Citrus Crops*, Division of Agricultural Science, University of California. Leaflet 2903, pp. 1-107.
5. Elmer, H.S. 1960. "Evaluation of Insecticides for Control of the Fuller Rose Beetle on Citrus in California." *Journal Econ. Ent.*, 53 (1): 164-65.
6. Bullock, R.C. 1965. "Effectiveness of Foliar Sprays for Control of Fuller's Rose Beetle on Florida Citrus." *Florida Entomology*, 38 (3): 159-161.



SUNKIST GROWERS, INC.
Research and Development Division
Sunkist Research Center
760 East Sunkist Street
Ontario, CA 91761

Maury Johnson,
Vice President, Research and Development

Chuck Orman
Manager, Fruit Sciences

Dr. G. E. Carman
Consulting Entomologist

FIRST CLASS MAIL
U.S. POSTAGE
PAID
VAN NUYS, CA
PERMIT NO. 31