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This newsletter is published by the University of California Kearney Plant Protection Group and the Statewide IPM Project. It is intended to provide UC DANR personnel with timely information on pest management research and educational activities. Further information on material presented herein can be obtained by contacting the individual author(s). Farm Advisors and Specialists may reproduce any portion of this publication for their newsletters, giving proper credit to individual authors.

James J. Stapleton, Charles G. Summers, Beth L. Teviotdale, Peter B. Goodell, Timothy S. Prather, Editors

IN THIS ISSUE

IPM NOTES

UCIPM IMPACT PROGRAM ON WORLD WIDE WEB, *Joyce Strand, Statewide IPM Project, U. C. Davis*

IMPACT is continuing its move to the World Wide Web (http://www.ipm.ucdavis.edu). Resources currently accessed on the UC IPM computer, like weather, pest management guidelines, pesticide use summaries, and the degree-day calculator are in the process of being converted to work on the Web. The pest management guidelines are already on the Web, and full implementation of the WWW site is planned for late this summer. The IMPACT computer will be available through September.

The move to the Web will not immediately affect the kinds of resources available from IPM, but rather how the resources are accessed. We will discontinue our direct dial up service. Instead, users will need to access the Internet and the Web through an "Internet service provider."

Under the new system users will

- dial a local number for access
- no longer have a UC IPM-issued user code and password
- use a Web browser to locate and read information, instead of CALLIPM
- pay a monthly connection fee to an Internet provider
- have access to information throughout the world, provided by universities, companies, and individuals on the Internet

Pete Goodell (209-891-2500) and Joyce Strand (916-752-8350) are available to answer questions about the changes. Also, planning for training sessions in each Cooperative Extension region is underway, for advisors, PCAs and growers. Notices will be sent out as the dates are set.

University of California and the United States Department of Agriculture cooperating

Cooperative Extension • Agricultural Experiment Station • Statewide IPM Project

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UPDATE ON NATIONAL IPM INITIATIVE AND DRAFT RFP FOR PHASE II GRANTS

P. B. Goodell and F. G. Zalom, U. C. Kearney Agricultural Center and Statewide IPM Project

The National IPM Initiative has been discussed in PPQ several times over the past year (January 1995, July 1995). The Initiative seeks to increase IPM adoption to meet and to achieve the national goal of IPM implementation on 75% of crop acres by the year 2000. The IPM Initiative reflects redirection and combination of old and new resources of USDA and Land-Grant University programs into a single coordinated and cooperative effort with farmers, private consultants, and industry to address important pest control problems. To achieve the goals of the Initiative, budget augmentations have been requested.

The Initiative is divided in three phases:

I. Phase I: Formation of IPM teams
II. Phase II: Proposals developed by IPM teams will be submitted for funding through a competitive process in fiscal 1997, should the Initiative be funded.
III. Phase III: Privatization of IPM system in production region.

Phase I: Formation of IPM teams. Farmers, consultants, research and extension staff and state, federal agencies and others identify priority needs in a production region. In 1996, 23 IPM teams identified prioirity research, education, and technology transfer needs and developed implementation plans for specific production regions. These projects include :

I. Strategies for IPM Implementation in corn and soybean (11 states)
II. Pest management strategies for dryland wheat systems (5 states)
III. Improving forage legume persistence through ecologically-based IPM (12 states)
IV. High plains irrigated crop IPM implementation (3 states)
V. Integration of host plant resistance and natural enemies for pest management in wheat and barley (3 states)
VI. Irrigated alfalfa-grass mixtures for pesticide reduction and development of expanded hay markets (1 state)
VII. Cotton IPM in transitions (Opportunities for biologically intensive IPM) (4 states)
VIII. Integrated crop management for small grains in mid-Atlantic region (2 states)
IX. Partners in IPM: a shared mission to ensure a safe and sustainable food and fiber system (2 states)
X. Development and implementation of an expanded IPM program for grapes in the Great Lake States (4 states)
XI. Implementation of a multi-state IPM program for widely scattered apple growers in the mid-Mississippi River watershed (9 states)
XII. Implementation and development of IPM practices for apples in the southeastern US (3 states)
XIII. Research, extension, and implementation of IPM in major apple growing regions of NY (1 state)
XIV. A process to identify opportunities for and barriers to implementation of biologically-based IPM systems for diversified farms in the northeastern USA (11 states)
XV. Implementing IPM in nurseries and landscapes in the northeastern and north central regions of the US (11 states)
XVI. IPM of arthropod pests in urban environments (3 states)
XVII. Greenhouse IPM in northern New England: Economic analysis and planning for IPM implementation (3 states)
XVIII. Strategic whole farm planning to enhance IPM adoption in processing vegetable crops (3 states)
XIX. Integration, assessment, and IPM action teams: Multiple pest suppression using cereal residues and cultural practices in snapbean, sweet corn, and cucurbit cropping (1 state)
XX. Developing a strategy for area-wide IPM on potato in the Pacific northwest (4 states)
XXI. Development of IPM implementation strategies for tomato in southeastern region (6 states)
XXII. Implementation of IPM systems for cucurbit crops in south-central USA (2 states)
XXIII. IPM for diversified fresh market vegetable producers (1 state)

Phase II:
These teams can develop specific proposal requests and compete for funding during Phase II in fiscal year 1997, **should the Initiative be funded**. Funding is anticipated to be up to $500,000 per year per project for up to 6 years, with a mid-point review. A plan to assess the impacts of IPM implementation and privatization must be included in the proposal. <u>Teams other than those developed during 1995 can submit proposals if they can document that similar developmental steps were conducted.</u>

A draft RFP was circulated in June 1996 to provide an alert for **potential** funding. According to Dr. Barry J. Jacobsen, USDA IPM Program Coordinator, the **DRAFT** Request for Proposals (RFP) is "to assist in planning the development of a Phase II grant proposal. This is only an early "heads up," not a formal RFP. The actual RFP will hopefully be released in late summer, with a due date in November/December." The following highlights are from Dr. Jacobson's draft of 5/28/96 with bold type added for emphasis:

> Proposals are invited for competitive grant awards under the USDA IPM INITIATIVE GRANTS Program. The purpose of this request for proposals is to fund IPM research and extension programs based on needs identified by IPM planning teams that implement IPM practices on 75 percent of the acreage in a specific crop production region or in pest management systems in urban areas. Proposals should; 1) provide for reduced reliance on single pest management tactics such as pesticides or resistant varieties by developing and implementing new technologies and strategies for managing pests, and 2) provide for reduced risk to the environment and human health while addressing economic needs of producers. The ultimate purpose is to provide new IPM systems based on identified needs and to provide the basis for privatization of IPM systems in a production region.
>
> **Subject to appropriation by Congress**, a total of $8.0 million ($4.0 million PL89-106 IPM and Biological control Research and $4.0 million Smith - Lever IPM Education) is available for grants in FY 1997. Proposals should be submitted and budgeted for three years with a plan of work and estimated budget that extends for no more than a six years. Projects should be of a scale not to exceed a budget of no more than $500,000 per year.
>
> Proposals submitted to the National IPM Initiative Grants Program for development and implementation of IPM systems for crop production regions should: 1) Describe a process with milestones to address research and extension education needs identified by planning teams for implementation of IPM practices. Proposals for implementation must address research and extension education needs identified by state and production region IPM planning teams consisting of farmers, agribusiness, crop consultants, land-grant university research and extension scientists, appropriate state and state-based federal agency personnel, public policy interest groups and others. Funding of a production region planning team in Phase I of the Initiative **is not prerequisite** to submission of a Phase II proposal to this program, if similar developmental steps can be documented. 2) **Clearly present the process used to develop the proposal by the IPM planning team.** While there is no required matching requirement, proposals should identify non-federal (existing and potential) funds and their sources that will contribute to project goals. 3) Describe elements of the proposed and existing IPM system. 4) Present a precise and prioritized set of research, extension education, training, and technology transfer objectives. New pest management technologies or strategies to be developed and implemented should also be identified and described. 5) Identify indicators that will be used to measure the levels of IPM in the production region including as appropriate, the economic, environmental and public health impacts of the proposed development and implementation project; and sociological variables that influence adoption of IPM methods. 6) Present a timeline for specific activities and a plan that identifies responsibilities for specific activities including privatization of the IPM system.
>
> Each project will include an **impact assessment component** and identify team members with documentable expertise in project impact assessment. The impact assessment component of each project will have four objectives: (1) to clearly identify project objectives and expected economic, environmental, public health and social benefits justifying public support; (2) to assess, at the project level, the economic, environmental and public health impacts of the IPM technologies being developed and implemented by the project; (3) identify and track sociological variables that are associated with adoption of IPM methods and (4) to provide data in a standard format to the Program-Level Impact Assessment Team to be used in an overall national assessment of the impacts of the National IPM Initiative. It is anticipated that roughly five to ten percent of a project's budget will be allocated to the assessment component. Projects should make every effort to utilize existing data sources to minimize the burden of the data collection process. Further, to the extent possible National Agricultural Statistics Service (NASS) surveys will be modified to assist in data acquisition.

Further information on assessment can be found in the appendix.

A complete draft can be obtained from State IPM Coordinators P.B. Goodell or F.G. Zalom. It is important to note the requirement for active participation by end-users in developing and delivering IPM technologies. As stated, if Congress approves budget augmentation for the IPM Initiative, a formal RFP will be released in late summer. Dr. Jacobson's announcement is to provide some time for planning and preparing the IPM teams and associated needs assessments.

ABSTRACTS

ENTOMOLOGY CONFERENCE, Riverside, CA, March 27, 1996

<u>A Comparison of Methods for Detecting Pesticide Resistant California Red Scale</u>

Y. Ouyang, R. Striggow, and E. Grafton-Cardwell, U. C. Kearney Agricultural Center

The armored scale insects California red scale, *Aonidiella aurantii*, and yellow scale, *A. citrina*, are key pests of citrus in the San Joaquin Valley. Currently, the majority of citrus growers use organophosphate (methidathion [Supracide] and chlorpyrifos [Lorsban]) and carbamate (carbaryl [Sevin]) insecticides to control armored scale. In fact, growers have used organophosphates and carbamate insecticides for more than 30 years. When these products were first used, growers made single applications every 2 years. Recently, some growers have had to make 2 to 4 applications during a single season and still did not achieve economic control of the scale.

During 1990, we began to monitor for pesticide resistance in armored scale from San Joaquin Valley citrus orchards. Our standard monitoring technique has been to dip scale-infested green fruit into containers of pesticide and examine the 1st instar scale for mortality after 10 days. We use concentrations of each of the pesticides that should cause more than 90% mortality of susceptible scale.

During 1990-95 we tested scale from >100 citrus orchards in Madera, Fresno, Tulare, and Kern counties and detected Lorsban, Supracide, and Sevin resistance in many of these orchards. We tended to see more resistance to the organophosphates than the carbamate. However, where we saw resistance to one pesticide we tended to see at least low levels of resistance to the other two pesticides. This is not surprising, since insects tend to use the same mechanism of resistance for organophosphate and carbamate insecticides. Resistance was more common in yellow scale than California red scale. We found that resistance was greatest in regions of eastern Tulare and Kern counties where pesticide use has been heavy. But there were many orchards in the Valley that have susceptible scale. Thus, pesticide resistance is not a Valley-wide problem yet.

Although our fruit dipping method has helped us detect resistant scale in citrus orchards, it has limited us in several ways. First, because we use 1st instar scale on green fruit for the bioassay, we are limited to testing fruit from July through October. We are not able to test scale for resistance before the field season starts and so we can not tell the grower ahead of time what chemical will be effective. Secondly, because we need heavily infested fruit, we tend to bias our sampling towards pesticide resistant populations of scale. Thus, we have not been able to get a clear view of the distribution of resistance. We know that resistance is not a Valley-wide problem. Yet, there seem to be pockets of resistance where we can't define the edges because we can only test the orchards that have high densities of scale. Finally, we have to wait a full 10 days until the scale molt to know if they are dead. Thus, the test for pesticide resistance is a slow one. It has been clear to us from the beginning that we need to develop a faster method of detecting resistance using individual scale so that we can test scale from any orchard.

During 1995, we began adding synergists (chemicals that block different groups of enzymes) to our standard bioassay to find out what mechanism(s) of resistance the California red scale might be using to resist the pesticides. These experiments suggested that esterase enzymes are important in California red scale resistance. We then began using electrophoresis to measure the general esterase enzymes in scale. In electrophoresis, we squash individual scale on a coated plastic plate, then set the plate in a liquid buffer and pass an electrical current through it. The chemicals in the liquid and the electrical current move enzymes from the body of the scale across the plate. After we soak the plate in a stain that is specific for esterase enzymes we see a pattern of bands on the plate. The different bands represent different esterase enzymes. We compared pesticide resistant and susceptible scale and looked for different banding patterns or different degrees of band darkness. We found that pesticide resistant California red scale have darker bands, or more esterase enzymes, than susceptible scale.

We are also using a colorimetric test to measure esterase enzymes in individual scale. With the colorimetric test we can take individual 3rd instar female scale and squash them and place them in different wells of a plastic plate in the presence of various chemicals. The chemicals turn very dark if the scale have high levels of esterase enzymes, a microtiter plate reader can measure the color differences, and we can find out how many individuals from each site are highly resistant to pesticides.

During 1995 we collected scale-infested fruit from 40 commercial citrus orchards in the San Joaquin valley and tested the scale using the standard fruit dip bioassay as well as the electrophoretic and colorimetric tests that measure esterase enzyme levels. There was a good correlation in the level of resistance measured in scale between the different tests, especially for the organophosphate insecticides Lorsban and Supracide. We suspect that the scale are using more than one group of enzymes or more than one method to resist the carbamate Sevin.

The biochemical tests work at the level of the individual insect and hence allow rapid and easy identification of resistance in the field population early in the year. The disadvantage of the biochemical methods of resistance detection is that they do not differentiate between Lorsban, Supracide and Sevin resistance. The biochemical methods simply give us an indication that there is resistance to one or more of these pesticides. However, our standard bioassay has shown us that, in most orchards, when scale develop resistance to one pesticide, they usually have at least a low level of resistance to the other two pesticides. So switching from one of these pesticides to another is not going to solve the resistance problem. Our data also indicate that resistance does not subside very quickly when growers stop using these pesticides. Thus, where resistance is detected, growers need to cease using the organophosphate and carbamate insecticides and rely instead on biological control in the form of *Aphytis* and *Comperiella* wasps.

PACIFIC BRANCH ENTOMOLOGICAL SOCIETY OF AMERICA, Big Sky, MT, June 24-26, 1996

Phototactic Response Of Silverleaf Whitefly Crawlers

Charles G. Summers, U. C. Kearney Agricultural Center

Silverleaf whitefly, *Bemisia argentifolii* Bellows & Perring, crawlers were positively phototactic on an artificial substrate and a host plant. Crawlers placed on black construction paper in a light tight arena with a light source at 90 or 270° had a significant ($P < 0.05$) mean angular dispersion toward the light. Crawlers illuminated with uniform overhead light or maintained in darkness moved at random. Crawlers moved either up or down the petiole of cheeseweed, *Malva parviflora* L., with equal facility toward a light source placed either above or below the leaf blade. Response was always toward a light source (positive phototaxis) and there appeared to be no response to gravity. Once on the leaf blade, crawlers appeared to become negatively phototactic and settled on the leaf surface away from the light source. This orientation could, however, have resulted from the pubescence of the petiole and leaf blade. In the artificial and plant substrate experiments, crawlers maintained in darkness moved a significantly ($P < 0.05$) shorter distance from their point of origin than did those exposed to light. It is thought that some minimal light intensity is necessary to stimulate crawler activity.

Controlling California Red Scale Using Novel Insecticides

Chris Reagan and Beth Grafton-Cardwell, U. C. Lindcove and U. C. Kearney Agricultural Center

Resistance of California red scale (*Aonidiella aurantii*) to commonly used broad spectrum organophosphate (Lorsban, Supracide) and carbamate (Sevin) insecticides is a growing problem in California's San Joaquin Valley orchards. This has forced many citrus growers to use multiple insecticide applications where once only one application was necessary. Citrus growers have an urgent need for insecticides which are effective in controlling the armored scale, yet compatible with natural enemies. We conducted experiments to determine the best rates, timing, and method of application of insecticides which have novel modes of action. We compared the efficacy of imidacloprid (Admire, Provado), and three insect growth regulators: pyriproxyfen (Knack), buprofezin (Applaud), and diofenolan (Eclipse). Our research has demonstrated that all of these new chemicals can be effective in controlling armored scale on citrus. Field population monitoring showed that none of the newer insecticides demonstrated significant adverse effects on adult populations of beneficial insects including *Aphytis melinus*, *Comperiella bifasciata*, and *Euseius tularensis*. However, laboratory bioassays did indicate that all of the IGRs as well as imidacloprid inhibited larvae of the predatory beetle, *Rhyzobius*, from molting into viable adults.

Factors Influencing Adoption of IPM in San Joaquin Valley Citrus

Elizabeth Grafton-Cardwell, U. C. Kearney Agricultural Center

Citrus thrips and California red scale are the key pests requiring pesticidal control in San Joaquin Valley citrus. In this region, biological control has not always effectively controlled California red scale, because cold winters result in distinct cohorts of scale in the spring. The parasitoids prefer to attack specific stages of scale and these stages are not always available. Consequently, growers have traditionally controlled these pests with organophosphate and carbamate insecticides. Research has shown that various populations of both citrus thrips and California red scale are developing resistance to these insecticides. Increasing resistance is a strong motivating force for growers to learn to use biological control and less effective, but more selective pesticides, to control pests in citrus. While many growers have shifted part or all of their acreage to a softer pesticide program, there are several stumbling blocks to the widespread acceptance of IPM in San Joaquin Valley citrus. The primary problems are that biological control in conjunction with selective pesticides are not always effective in preventing economic damage to the fruit. Also, IPM pest monitoring methods are labor intensive and require a higher level of knowledge of the pests and beneficials.

<u>Ovicidal Effect of a Horticultural Mineral Oil on Navel Orangeworm</u>

J. E. Dibble, Emeritus, U. C. Kearney Agricultural Center

Adult female navel orangeworm moths are attracted to and lay eggs in almond hulls usually as they start to split prior to harvest. Recommended sprays normally supplied at this time are directed at emerging larvae. Oil treatment at this time would be primarily as an ovicide rather than a larvacide. Timing is therefore extremely important. Monitoring for egg laying determines application timing. The oil targeting egg kill must be applied just before or after the peak. There is essentially no residual value as with standard treatments on later larval stages. Some initial activity is apparent on emerging first instars.

Results obtained from earlier laboratory and micro field tests showed good oil ovicidal activity. Recent individual tree tests were run with Orchex 796 oil, Imidan and Azinophos applied at 50 gpa. The oil was also applied at three rates of 3, 4, & 5 gpa in both 50 and 400 gpa. Applied at 5-10% hullsplit all treatments were the same showing approximately the common commercial results of 50% control. A double oil application and Imidan at 3 lbs AIA were better. Large block treatments showed the same degree of control.

AMERICAN PHYTOPATHOLOGICAL SOCIETY, Indianapolis, IN, July 27-31, 1996

<u>A New Aflatoxin-producing Species In *Aspergillus* Section *Flavi*</u>

M. A. Doster, P. J. Cotty, and T. J. Michailides, U. C. Kearney Agricultural Center and USDA Southern Regional Research Center

Since 1991 an unusual aflatoxin-producing *Aspergillus* has been isolated occasionally from nut orchards in California. The colony color of this unusual *Aspergillus* Czapek solution agar and on Czapek yeast extract agar was grayish-green or olive; that is, more yellowish in hue than the other aflatoxin-producing species. The roughness of the conidium ornamentation was intermediate between that for *A. flavus* and *A. parasiticus*. No sclerotia formed on the surface of media, but small sclerotia (mean diameter <500 ìm) formed embedded in the agar. Furthermore, these unusual isolates differed from *A. flavus* in having predominantly uniseriate sterigmata, producing G aflatoxins but not cyclopiazonic acid, and growing poorly at 42^{o}C; from *A. parasiticus* in having taller conidiophores (typically >0.7 mm); and from *A. nomius* in having predominantly uniseriate sterigmata. This unusual *Aspergillus* differed morphologically and physiologically from other previously described species and might represent a new aflatoxin-producing species.

<u>Effect Of Snail (*Helix Aspersa*) Damage On Botrytis Gray Mold Caused By *Botrytis Cinerea* In Kiwifruit</u>

T. J. Michailides and D. P. Morgan, U. C. Kearney Agricultural Center

At commercial harvest in 1991 to 1993, kiwifruit with and without characteristic damage (removal of sepals) by the garden brown snail (*Helix aspersa*) were harvested from two vineyards and stored in controlled-atmosphere cold storage (CA). After 3- to 5-month storage, fruit with snail damage consistently had significantly higher incidence of Botrytis gray mold than fruit not damaged by snails. In separate studies, kiwifruit caged with snails developed more gray mold after 3- to 5-months in CA storage than fruit caged without snails. In two vineyards, removal of sepals by hand did not consistently increase gray mold in CA storage. Significantly more viable propagules of *B. cinerea* and other mycoflora were recovered from fruit that had snail slime than fruit without slime. Although snail slime did not affect the germination of *B. cinerea* conidia on acidified PDA (nutrient rich medium), on acidified water agarose (nutrient poor medium) snail slime increased germination of *B. cinerea* conidia to more than 50% as compared to 1 to 2% germination without slime. These results suggest that wounds caused by snails eating the sepals around the receptacle area of kiwifruit and/or stimulation of conidial germination by snail slime may lead to more infections by *B. cinerea*.

Resident Fungi Of Stone Fruits Mummified By *Monilinia Fructicola*

C. X. Hong, T. J. Michailides, and B. A. Holtz, U. C. Kearney Agricultural Center and U. C. Cooperative Extension, Madera County

Stone fruits mummified by *Monilinia fructicola* can produce either conidia or apothecia (releasing ascospores) serving as primary inoculum of brown rot. This inoculum source might be affected greatly by resident fungi via interacting directly with *M. fructicola* or decomposing mummies. Thirty-two isolates, representing 16 genera and 21 species of fungi, were obtained from peach, nectarine, plum and prune fruits mummified by *M. fructicola* in 1995. The fungi were tested in vitro for antagonism against two isolates of *M. fructicola*, using a modified dual culture system. The resident fungi were grouped into three categories according to their interaction with *M. fructicola*. Four isolates of *Trichoderma* spp., three of *Trichothecium roseum*, three of *Penicillium* spp. and one *Epicoccum nigrum* isolate suppressed *M. fructicola* on acidified potato dextrose agar plates at 25^{o}C. These isolates reduced the radial growth of *M. fructicola* from 32 to 53% even though they were placed 2 days after *M. fructicola* inoculum was applied onto the plates. These results suggest that some of the resident fungi of mummified fruits could be used for future biocontrol studies.

Survival of *Monilinia Fructicola* In Mummified Fruits In San Joaquin Valley of California

C. *X. Hong, T. J. Michailides, and B. A. Holtz, U. C. Kearney Agricultural Center and U. C. Cooperative Extension, Madera County*

Mummies were sampled biweekly starting from November 1995 to February 1996 from both trees and the ground in eight orchards at four locations. Isolations were made by plating either the inner tissue of these mummies or washings (after shaking five mummies in 300 ml deionized water for 2 h) onto acidified potato dextrose agar plates. Washed mummies were rinsed with tap water, then incubated at >95% RH, 20^{o}C for 3 days to induce sporulation. The frequency of *Monilinia fructicola* recovered from the mummies collected on the ground was lower and decreased more rapidly as winter progressed than that from the mummies on the trees. No *M. fructicola* was recovered by plating washings of mummies from any samples after November. However, 50% of the washed mummies sampled in December produced *M. fructicola* conidia. The incidence of sporulating mummies decreased substantially after December. With the exception of one site (Parlier), no sporulation was observed on the mummies of any samples in February. These results suggest that conidia from mummies are unlikely to serve as a source of primary inoculum in spring in the San Joaquin Valley.

AMERICAN PHYTOPATHOLOGICAL SOCIETY, Pacific Division, Fresno, CA, May 30-June 1, 1996

Survey of Primary Inoculum Sources of Brown Rot In Stone Fruit Orchards In The San Joaquin Valley of California

C. X. Hong, T. J. Michailides, and B. A. Holtz, U. C. Kearney Agricultural Center and U. C. Cooperative Extension, Madera County

In March 1996, five trees each in 28 orchards were surveyed for *Monilinia fructicola* infected and mummified stone fruits hanging on trees or fallen to the ground. The incidence of *M. fructicola* conidial sporulation developing on mummies was recorded. Blighted twigs and peduncles were also examined for conidial sporulation. The orchard floor was also examined for apothecia on both the north and south sides of the irrigation berm. Mummified fruits were found still hanging on trees in only nine orchards at a mean of 7 mummies per tree. In 27 orchards more mummies were found on the ground at a mean of 34 per tree. None of the mummies, twigs, and peduncles surveyed had any *M. fructicola* sporulation. Apothecia of *M. fructicola* were observed in 25% of the surveyed orchards. The apothecia were only found in orchards where there was either a cover crop or natural vegetation between tree rows. Apothecia were not found in orchards that had been recently disced, rototillered, or completely sprayed with a herbicide. Significantly more apothecia were found on the north side (4.3 apothecia/tree) when compared to the south (0.3 apothecia/tree). These results suggest that apothecia could be the most important, if not the sole, primary inoculum source of brown rot of stone fruits in the San Joaquin Valley of California.