

EUTYPA

Bill Moller

Mar 8, 1979

Fresh wounds in Feb, ^{inf.} drops after 2 weeks,
with 2.4% Benlate (10,000 ppm) paint
immediately, drops to half of two
weeks delay.

Thundersjering - Christmas - cots - best time
to prune, low snow load

Age of	Wood	<u>% Inf</u>
inoculated	1	41.5
	2	87.5
	3-4	81.4
	old 1-2 yr cuts	20 A
	2 yr old wood not inoculated	14.5

Control of Phomopsis Cane & Leaf Spot (Dead-arm)

George Leavitt - Farm Advisor - Madera County

William Moller - Extension Pathologist, Davis

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*                               SUMMARY
*
* Due to spring rains favorable to growth and spread
* Phomopsis Cane & Leaf Spot (Dead-arm) is on the in-
* crease. In 1978 trials were established on Grenache
* & Thompson seedless varieties to test the effectiveness
* of all known chemicals registered for Phomopsis control.
* All materials tested were effective in control of the
* disease; however two well timed foliar applications
* at budbreak to 1 inch and 8 days later at shoots 4-6
* inches tended to be superior in control. Application
* of one foliar captan at budbreak equaled dormant treat-
* ment control levels but was not as effective as the two
* treatments. One foliar application at 2-4 inches short
* growth after earlier rains prevented further infections.
* Economic levels of crop loss due to Phomopsis Cane and
* Leaf Spot were measured.
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P R O G R A M

GRAPE PEST MANAGEMENT RESEARCH CONFERENCE

March 7, 1979

University of California Cooperative Extension Building, Fresno County

PROJECT REVIEW AND PLANS FOR 1979:

9:30 am Coffee

10:00 am Integrated Pest Management Studies in Tulare County

Discussion Leaders: Don Flaherty and Bill Peacock

Pesticide Resistance in Mites on Grapes

Discussion Leader: Marjorie Hoy

Integrated Pest Management on Grapes

Discussion Leaders: Hiroshi Kido and Don McLean

Grape Nematology Investigations

Discussion Leader: Mike McKenry

*Temik - Aldicarb only here
other than DRCP*

12:00 Lunch

1:30 pm Pierce's Disease Research

Discussion Leaders: Marjorie Hoy and Sandy Purcell

Powdery Mildew and Bunch Rot Studies 1978

Discussion Leader: Beth Teviotdale

Epidemiology and Control of Eutypa Dieback

Discussion Leaders: Bill Moller and Amand Kasimatis

Other Reports and Business

Discussion Leader: Bill Moller

4:00 pm Adjourn

ABSTRACTS OF
GRAPE PEST MANAGEMENT
RESEARCH PROGRESS

UNIVERSITY OF CALIFORNIA

1978

Prepared for

U. C. GRAPE PEST MANAGEMENT RESEARCH CONFERENCE

Fresno, California

March 7, 1979

Abstracts of Grape Pest Management Research Progress - 1978

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INTEGRATED PEST MANAGEMENT STUDIES IN TULARE COUNTY

D. L. Flaherty, W. Peacock, and L. Bettiga

Chemical Control for Grape Leaf Skeletonizer

A chemical control trial for western grape leaf skeletonizer was set up in the Bianco vineyard near Visalia. This Thompson Seedless vineyard for wine production (60 acres) was completely defoliated in 1977 despite the growers attempt to control the pest with two applications of carbaryl (sevin) dust. These treatments also resulted in an increase of spider mites. In the trial replicated 5 times, Kryocide at 8 lbs per acre was compared to Dimilin at 4 and 8 ounces per acre. Both materials were applied by handgun using 250 gallons per acre on May 16, 1978 (approximately 60% bloom).

All treatments gave effective seasonal control without any noticeable effect on spider mites. Both Kryocide and Dimilin are stomach poisons and unlike contact insecticides such as carbaryl show little effect on predaceous mites. Kryocide is presently registered for control of skeletonizer on grapes. Dimilin is currently unregistered.

Chemical Control of Grape Mealybug

A dormant chemical control trial for grape mealybug was set up at the Westward Farms vineyard near Terra Bella. The Emperor vineyard chosen was heavily infested. Three treatments each replicated 5 times were compared with the replicated check. Parathion 8EC was applied at 2 1/2 lbs (registered rate) and 5 lbs per acre. Pre-merge was applied at 3.5 gallons per acre. Each treatment included 2 1/2 gallons of Volk Supreme Oil per acre. Treatments were applied by handgun using 250 gallons per acre on March 3, 1978. The following results were recorded:

	<u>% Infested Bunches per Treatment</u>
2 1/2 lbs parathion + 2 1/2 gallons oil/acre	7%
5 lbs garathion + 2 1/2 gallons oil/acre	0
3.5 gallons pre-merge + 2 1/2 gallons oil/acre	8%
Check	39%

These results showed that neither the registered amount of parathion (2 1/2 lbs) or the newly registered pre-merge compound effectively control grape mealybug (2% or more infested bunches is considered not economic). Moreover, pre-merge significantly resulted in spider mite increases. The data showed that unlike parathion, pre-merge is not selective for predaceous mites.

Omite Studies

A replicated trial was set up in the Peacock Thompson Seedless vineyard for table grape production near Dinuba to determine the effectiveness and selective action of both high and low rates of Omite. Four treatments each replicated four times were compared with the replicated check. Omite 30W was applied at 8 lbs, 6 lbs, 4 lbs and 2 lbs per acre. Treatments were applied by handgun using 300 gallons per acre to insure good coverage. The treatments were applied on - 6122.

All treatments including the lowest rate of Omite gave effective control with good selectivity. These field results verified the laboratory results of M. Hoy.

Biological Studies of Grape Leaf Skeletonizer

Studies in Tulare County showed three distinct egg laying periods for grape leaf skeletonizer. Thus, three generations are to be expected in the San Joaquin Valley. In some quarters up to 4 generations were thought to occur.

Skeletonizer populations were also observed to repeatedly attack the same vines, particularly in wild grape situations. Completely defoliated patches of wild vines were in close proximity to nearby relatively uninfested vines.

Biological Control Studies of Grape Mealybug

Studies were initiated in 1978 to determine whether parasites of grape mealybug can be monitored to predict whether treatments are necessary. Studies in 1978 indicated that the previous years treatment schedule determined the efficacy of parasites the following season. In two cases where treatments were light the previous year, up to 95% parasitism occurred. Parasitism was less than 1% in two other vineyards where carbaryl and other chemicals were used the previous season.

Biological Control of Spider Mite Studies

Studies over a long period of time in vineyards showed that the distribution of predaceous mites rather than their numbers at any given time governs effectiveness. Thus, a distribution sampling procedure to predict their potential is being developed. Considerable data indicate that when prey and predator populations in a given sample (30 to 50 leaves) are distributed in a ratio of 2 leaves with prey to 1 leaf with predators, the spider mite population will quickly decrease to non-damaging numbers. The data also indicate that a forthcoming 2:1 ratio is predictable 2-3 weeks ahead.

PESTICIDE RESISTANCE IN MITES ON GRAPES

M.A. Hoy, D.L. Flaherty, W.L. Peacock and R.T. Roush

Effective control of spider mites on grapes by the predator, Metaseiulus occidentalis, depends upon factors such as its dispersion in the vineyard, its ability to survive over winter and its tolerance to pesticides used in grape pest management programs.

During 1977 we surveyed vineyards to determine if M. occidentalis is resistant to insecticides used to control the grape leafhopper. Cygon and Lannate were tested, but no resistance to Lannate was found. Moderate levels of resistance to Cygon were found and it was hypothesized that Cygon would be most useful in a grape pest management program since it might not destroy populations of this useful spider mite predator.

During 1978 we evaluated the impact of Cygon on predators and spider mites in two vineyards. In addition, a strain of M. occidentalis that had been selected for increased levels of Cygon resistance was released in the same vineyards to determine if these higher resistance levels conferred higher survival rates. The results indicated that Cygon resistance in both the native and released predator strains was inadequate if the full field application rate was used. Future studies with Cygon are desirable to determine if reduced rates of Cygon will preserve the predators and, at the same time, achieve adequate control of the target insect pests.

During 1978 a selection program with permethrin was begun with M. occidentalis to determine if resistance to this synthetic pyrethroid could be induced. Results indicate a significant response to selection and this could prove useful if permethrin is used in vineyards. Severe outbreaks of spider mites after permethrin use had been observed in San Joaquin Valley vineyards. This can be attributed in part to the mortality of native M. occidentalis but it was also hypothesized that permethrin might stimulate spider mite reproduction as does carbaryl. A laboratory study with the two-spotted spider mite showed that permethrin causes increased dispersal of spider mites, which might make it more difficult for the predator to control the spider mites. The amount of reproductive stimulation observed was minimal.

Sulfur resistance in M. occidentalis was evaluated in a preliminary way and we believe resistant and susceptible populations exist in San Joaquin Valley vineyards. Additional work needs to be done to determine if sulfur applications can be better managed to reduce predator mortality.

Based on the data from a combination of vineyard and laboratory studies conducted to date, fully-satisfactory selective insecticides are not yet available for a grape pest management program. Full application rates of Cygon are too high to allow adequate survival of M. occidentalis in vineyards; Lannate is very toxic to all M. occidentalis populations tested and thus not selective although vineyard trials suggest it is much less disruptive than is the synthetic pyrethroid permethrin. Sulfur also appears to have a detrimental effect on some populations of M. occidentalis tested and future work should evaluate the effects of the fungicides used for mildew control in grape pest management programs.

INTEGRATED PEST MANAGEMENT ON GRAPES

H. Kido, D. L. McLean, D. L. Flaherty, W. W. Barnett and W. L. Peacock

Studies in 1978 showed that vineyard with light initial infestation of the omnivorous leafroller, Platynota stultana Wlshm., can develop into damaging population in late season. A linear relationship between the progress of cluster infestations and periodic examinations of the vineyard presented a method for predicting the damage which will occur at harvest and the necessity for control measures during the season.

GRAPE NEMATOLOGY INVESTIGATIONS

M. V. McKenry

In 1975 we began a major study of DBCP movement in the soil of grape vineyards. This project was designed to last 6 years and involved extensive nematode sampling, DBCP monitoring and comparisons of application methods and timing. The following papers are published or "in press":

McKenry, M. V. and Ferris, H. 1979. Studies on the use of DBCP in Vineyards. I. Two years of efficacy data. Am. J. Enol. Vitic., Vol. 30, No. 1 "in press".

McKenry, M. V. and Ferris, H. 1978. A nematicide application device for established vineyards. Abstract presented at Am. Phytopathological Soc. Mtg. Tucson, Ariz. Nov. 1.

McKenry, M. V. and Naylor P. 1978. Influence of plant roots or liming on DBCP concentrations in soil. J. Nematol. 10:294.

McKenry, M. V. and Naylor, P. 1978. Evaluation of the protective and therapeutic properties of DBCP for control of root-knot nematode on tomato. J. Nematol. 10:307-311.

In late 1978 Dr. Ferris and myself began a project to determine the growth habits of Thompson Seedless roots. The goal will be to develop the biological information necessary to simulate grape root growth in a computer.

PIERCE'S DISEASE RESEARCH - 1978

Alex H. Purcell

Several plant species that are important host plants of the principal vectors of Pierce's disease (PD) were inoculated with suspensions of cultured bacterium isolated from grape. We were able to reisolate the bacterium from blackberry and mugwort (Artemesia) but not from bermuda grass or rye about six weeks after inoculation but not sooner. None of the inoculated plants had disease symptoms. Leafhoppers fed on these plants also acquired and later transmitted the PD bacterium but with very low efficiency. Further tests with these plants will give us some indication of long term survival of the PD bacterium in symptomless hosts.

Microscopy (light and scanning electron microscopes) and isolation of the PD bacterium from various tissues of infective leafhoppers confirm that the bacterium is located in the foregut of transmitting leafhoppers. The bacteria are most commonly found in the entrance to the insects' food pump (cibarium). Apparently plants are inoculated when bacteria are flushed from the foregut during leafhopper feeding.

Dr. M. J. Davis at U.C. Berkeley made serological comparisons of isolates of the PD bacterium from Florida, the Central Valley, Napa and from diseased almond and alfalfa and did not find any differences among isolates. Isolates from all areas were pathogenic to both grape and almond, although some isolates apparently lost pathogenicity in culture. Symptoms of alfalfa infected with the PD bacterium were quite variable. Isolations from alfalfa plants from several Central Valley locations suggest that the response of individual alfalfa plants to infection can vary widely and that many infected plants are symptomless carriers of the PD bacterium.

GRAFT-TRANSMISSIBLE GRAPE DISEASE INVESTIGATIONS

A. C. Goheen

During the past year we continued investigations of the graft-transmissible grape diseases--leafroll, Pierce's disease, fanleaf, corky bark, and assorted minor maladies--but we concentrated mainly on fanleaf and corky bark. We used the methods for culturing the PD bacterium, developed at Berkeley, to show that Pierce's disease occurs in Central America and Mexico. We were able to isolate a toxin from cultures of the bacterium, which produced PD symptoms in the absence of the organism, following injection to healthy plants. Fanleaf is becoming increasingly important because it spread into replanted vineyards from contaminated soils, in spite of treatments of such soils with nematocides. We found that certain grape species, especially Vitis rotundifolia, growing in fanleaf-nematode infested soil at Fresno, did not pick up the virus after more than 10 years exposure. The stem-pitting symptom, observed in grapes, is not caused by tomato ringspot or other NEPO virus infections; but it is a manifestation of the corky bark disease. We are able to index for corky bark in from 6-18 months by grafting to St. George or LN-33 indicator plants. Corky bark is caused by a heat-stable entity that has not been mechanically transmitted. It may be related to the entity that causes leafroll. Candidate virus indexing positive for corky bark invariably index positive for leafroll also, but the reverse is not true. Corky bark spreads mainly by infected scions or rootstocks, and several cultivars in Salinas Valley now show corky bark symptoms. An unknown vector spreads the disease to 100% of vines, including LN-33 indicators, growing in the Aguascalientes region of Mexico, but natural spread has not been demonstrated in California.

Incorporation of disease resistance into scion and rootstock cultivars along with selection of disease-free mother plants appear to be the best way to control the graft-transmissible grape diseases. Our work for the coming season will concentrate on investigations of resistance to PD and fanleaf and on improving heat therapy and indexing procedures, especially for corky bark. We still also study rate of natural spread and look for a possible vector for corky bark in cooperation with plant pathologists in Mexico. We will continue studies of the effect of several diseases on production and quality of grapes.

POWDERY MILDEW STUDIES DURING THE 1978 SEASON

Mary Ann Sall, Beth Teviotdale, Don Luvisi, and Rudy Neja

The 1978 season was a banner year for grape powdery mildew, so the plots received an adequate inoculum level to test the efficacy of the control materials. The percentage of clusters with mildew in the check plots ranged from 66-100%. Probably the warm spring weather helped achieve our "good" mildew levels.

The mildew incidence was rated in most cases when the grapes were around 7° Brix. All clusters on 2-3 vines per experimental unit were examined for infection and placed in the following categories according to the percentage of surface area infected with mildew: 0, <10%, 10-25%, 25-50%, 50-75%, 75-100%. A severity index was computed; it represents the average percent of mildew coverage on the fruit.

The effect of powdery mildew on yield was examined in a field experiment conducted near Lost Hills with the Carignane cultivar. The severity index was highly correlated with yield per vine ($R=-0.78$) and with weight per cluster ($R=-0.79$).

The efficacy of 4 spray formulations of sulfur--Super 6, Micro Sulfur, Wettable Sulfur, and Thiolux--was also examined in the Lost Hills test. The materials were applied 3 times : shoots 15-24", 100% bloom, and 3 weeks later. In general, Super 6 gave the most effective control, but all materials achieved significant control when compared to no treatment.

The experimental chemical RH2161 tested at Lost Hills on Carignane gave control about comparable to the flowable sulfurs. Considerably less material was required to effect control when RH2161 was used. it should be compared to a standard sulfur dust schedule.

Bayleton is another promising experimental material. Two applications gave about comparable level of control as 9 applications of sulfur dust or Cosan in one test on Thompson Seedless at Parlier. The eradicant power of Bayleton was tested in two locations in Monterey County on Cabernet, Sauvignon and Chardonnay and in El Dorado County on Zinfandel. In the Monterey tests, some apparent eradicant effect was demonstrated. Active mildew on Chardonnay before treatment was rated with a severity index of 83.2, after treatment the severity index was as low as 8.1. In the El Dorado tests the eradicant effect was not evident. Single applications of Bayleton gave some measure of control in every case; however, multiple applications to test its eradicant and protectant abilities are needed.

GRAPE BUNCH ROT STUDIES DURING THE 1978 SEASON

Mary Ann Sall, Beth Teviotdale, and Keith Bowers

The 1978 season was a "good" year for bunch rot because of the wet spring which should have assisted the bloom time infections, also the rain in September greatly enhanced the rot levels. The powdery mildew however made evaluation of bunch rot difficult in some areas. The rot in our check plots ranged from 30-90%.

The most effective control for Botrytis bunch rot still appears to be the application of Benlate^(R) at bloom time; a full season treatment with captan was nearly as effective in tests conducted in Caruthers using Chenin blanc and in King City using White Riesling. However, in a test at Parlier using Thompson Seedless, there were no significant differences between the level of severity of bunch rot on Benlate-treated vines and those treated with the unregistered materials or the check plot. No conclusions can be drawn from that test yet. The rain in September increased the late season spread of bunch rot and made the evaluation of the bloom treatments more difficult.

The vines treated with Botran^(R) had consistently fewer rot organisms other than Botrytis cinerea infecting clusters. No other significant trends in the presence of other organisms were noticed.

The application of Botran post-rain on Thompson Seedless did not appear to decrease the spread within clusters or sporulation of the Botrytis.

An experiment comparing trellising and cane trimming conducted in Yountville on Chenin blanc showed that where the two wire trellises were used and canes trimmed midseason significantly less rot developed. Apparently some benefit can be derived from these cultural practices.

EPIDEMIOLOGY AND CONTROL OF EUTYPA DIEBACK

W. J. Moller, A. N. Kasimatis and Curtis Petzoldt

(a) Studies of Pruning Wound Susceptibility and Effect of Fungicide Treatment

Ten-year-old Grenache vines at UC Davis were pruned and inoculated at various intervals in February-March 1977. Treatments were assessed by culturing from inoculation sites during late 1978. Results show that:

1. Pruning wound susceptibility on two-year-old wood of Grenache vines in February is very high if conditions favoring infection (heavy rains) occur during the first week following pruning.
2. Wounds painted immediately with a 2.4% Benlate solution are significantly protected from infection.
3. Pruning wounds made on one-year-old wood are more resistant to infection than comparable wounds made on older wood.
4. Airborne spores of Eutypa can result in "dieback" infection of grapevines (earlier inoculations were made with mycelium).

(b) Spore Trapping

The seasonal pattern of spore frequency is being studied at UC Davis, using a spore trap baited with a surrounding circle of Eutypa spore-bearing wood and located in an artificial environment which simulates a sprinkler-irrigated vineyard. Highest spore numbers occurred in the fall and spring months with major catches in March and April, whenever rain exceeding 0.10" fell. Sprinkler irrigation did result in significant spore discharge.

Monitoring of long distance Eutypa spore dispersal can be accomplished using groups of young, freshly pruned, potted apricot trees as biological traps; spore levels in the Salinas and central valleys were monitored during 1978. Potted trees are maintained at Davis for 6 months following exposure before assessment of results by culturing. These studies have provided preliminary supporting evidence for the hypothesis that the higher rainfall (20" annual) districts in and around the San Francisco Bay area provide most of the Eutypa spores which lead to grapevine infection in the central valley.

(c) Other Fungicide and Crop Loss Studies

Further screening of other potentially effective pruning wound protectant fungicides is in progress.

Grenache vines at Davis, which were artificially inoculated with Eutypa 4 1/2 years ago, are being maintained to determine long term effects of the disease on crop yield. Although symptoms have been evident for 2 years or more, there is not yet a significant yield loss on many infected cordons. It has been repeatedly observed that Eutypa dieback is a disease of older vines, and crop loss studies on artificially-infected vines suggest that the disease has no marked effect on yield of this variety until 5 years or more after initial infection.

Contributors to Abstracts
of
Grape Pest Management Research Progress - 1978

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