ABSTRACTS OF PAPERS

Presented at Meetings of the American Phytopathological Society

The enzyme-linked immunosorbent assay (ELISA) technique was evaluated for its ability to distinguish various strains of Tobacco Mosaic Virus. The standard sandwich test using TMV-UL IgG demonstrated positive responses to various strains of TMV including strain 5 strains isolated from orchid. The various strains differed in the extent of the dilution to which they would yield a positive visual reaction. In a reciprocal test using a TMV-orchid strain IgG the reaction was positive only with the homologous virus. The indirect test using TMV-orchid strain IgG yielded a positive visual reaction for all the TMV-orchid Strains assayed and with TMV-UL.

ENZYME-_LINKED IMMUNOSORBENT ASSAY (ELISA) AS A RAPID METHOD FOR SCREENING FOR THE PRESENCE OF CYMBIDIUM MOSAIC VIRUS & ODONTOGLOSSEUM KING SPOT VIRUS. Arthur V. Allison, Edward B. Adams, & Lane Steinagel. Del Oro High School, 3301 Taylor Rd., Loomis CA 95650

Serospecific electron microscopy (SEM), enzyme-linked immunosorbent assays (ELISA), negatively stained leaf dip preparations for the electron microscope (EM) were compared for sensitivity in detecting both Cymbidium Mosaic Virus (Cymbidium MV) and Odontoglossum King Spot Virus (OKSV) in serial dilutions of purified virus. Cymbidium MV could be detected at 10 fold greater dilutions by both SEM & ELISA than by EM. OKSV could be detected at the same dilution by all 3 methods. It is concluded that the ELISA technique is at least as sensitive and in some cases more so than either SSEM or EM dips. Plant material screened by EM dips was tested using ELISA; both tests yielded identical results.

FACTORS INFLUENCING SUSCEPTIBILITY OF LEMONS TO GEOTRICHUM CANDIDUM. A.A.H. Baudoin and J.N. Enzler. Department of Plant Pathology, University of California, Riverside, CA 92521

Injection of 5 ml spore suspension of G. candidum, 2.5 mm deep into the peel of lemon fruits, produced either a rapidly advancing soft rot or an arrested, dry lesion. Infections that did not develop into active lesions within 5-6 days at 25 C rarely did so thereafter. Differences in expansion rate of the soft rots were small. Susceptibility was expressed as the percentage of active lesions 5 days after inoculation or the inoculum concentration producing 50% active lesions (ED50). Susceptibility differences between the lemon cultivars Lisbon and Eureka were minor. Susceptibility increased with color change from light-green to yellow and with duration of storage. Treatment with ethylene accelerated this increase. Water uptake or water loss (2-102, changing the peel water potential by 0.6-3.0 bars), respectively, reduced or increased the ED50 by a factor of 3-30. Lemons picked at 8 a.m. or after rainfall were more susceptible than those picked at 2 p.m. or during a dry period.

DISEASE ASSESSMENT MODELS. W. J. Bloomberg, Canadian Forestry Service, Pacific Forest Research Centre, 506 West Burnside Road Victoria, British Columbia, V8Z 1M8, Canada

Three approaches to crop disease assessment by disease progress curves, regression analysis, and disease simulation are compared with respect to disease prediction, epidemiological analysis, and disease management. Examples of crop disease simulation models are examined for their relevance to these aspects of crop loss. Decision aids for disease simulation models are suggested with special reference to relevant host crop biology, incorporation of disease management options, and usefulness to practitioners.

THE ROLE OF VIRULENCE OF PHOMA LINGAM STRAINS IN CABBAGE BLACKLEG EPIDEMIOLOGY. J. M. Donovan, P. L. Gabrielson, Western Washington Research & Extension Center, Puyallup, WA 98371; P. H. Williams, and P. A. Delwiche, Dept. of Plant Pathology, Univ. of Washington, Madison, WI 53706

Seedling response to wound inoculation and pigment production in vitro were used to differentiate two strains of P. lingam. Isolates of each strain were tested for virulence in seed bed and transplant experiments in Wisconsin. The strain which caused expanding tissue collapse in the seedling test, and did not produce pigment, spread from inoculated to noninoculated plants in seed beds and damaged transplanted cabbage crops grown to maturity. The strain which caused only tissue darkening and limited tissue collapse in the seedling test and produced pigment did not spread significantly in the seed bed and caused only superficial lesions on transplanted cabbage grown to maturity. The latter strain is most commonly isolated in the Pacific Northwest and is probably insignificant in cabbage blackleg epidemics. Others have suggested a similar conclusion based only on greenhouse studies.

INTEGRATED CONTROL OF FUSARIUM ROOT ROT AND SCLEROTINIA WILT IN BEANS. D. W. Burke and D. E. Miller, USDA SEAAR, IAREC, Prosser, WA 99350.

Fusarium root rot (F. solani f. sp. phaseoli) in bean (Phaseolus vulgaris) is counteracted by frequent irrigations. Contrarily, this practice favors Sclerotinia wilt (S. sclerotiorum). In 1979 P. aphanidermatum-resistant beans and seedbed chiseling to reduce soil compaction were used to promote rooting and reduce irrigation requirements. In the experiment plots were sprinkler irrigated at 12 or 16 4-day intervals. For total replacement, Sclerotinia wilt was severe. In P. aphanidermatum-resistant beans, down to 1/3 replacement of Et gave optimal yields, with negligible Sclerotinia. In another experiment 16 bean selections were compared when sprinkler-irrigated at 16 vs. 8-day intervals. Five days but not 10-day intervals favored Sclerotinia wilt. In both P. aphanidermatum-infested and noninfested fields, P. aphanidermatum-resistant beans in chiseled plots produced near optimum yields with either 5 or 10 days between irrigations.

SUPPRESSION OF MELOIDOGYNE INCognita WITH DIFFERENT LEVELS OF MACROPTILUS FYRIFERA (KELP) IN SAND AND SOIL. Lynn Carte and Edward K. Mercure, Department of Biology, California State Polytechnic University, Pomona, CA 91768.

Foliar sprays and soil amendments of dried, powdered kelp were tested on 3-week old Tropic VP tomatoes in the greenhouse. Three thousand second stage M. incognita larvae were pipetted to each of ten pots per treatment in sterile sand or soil. After six weeks, the equivalent of 250 pounds per acre kelp in soil but not sand, 500 pounds per acre kelp in sand but not soil, and 0.3% but not 1% kelp significantly (5%, 0.1% levels) reduced root galla per plant. Top weight reduction was noted on barcoded infested plants with 3-day pretreatments of 1% kelp or 500 pounds per acre kelp in sand. In sand, 500 pounds per acre kelp applied both with and before nematodes showed 93% and 97% reductions in larval extracted per gall, and significant increases in root branching compared to the nematode control. The radish cotyledon bioassay showed cytokinin activity in the treated kelp dosages. Hormones, chelators, and phenolic compounds in kelp may be important in the above results.

A COMPARISON OF THREE ELISA TECHNIQUES FOR SENSITIVITY IN DETECTING VIRUS ANTIGEN. Wesley M. Chee, & Arthur Allison; Del Oro High School, 3301 Taylor Rd., Loomis CA 95650

Three variations of enzyme-linked immunosorbent assay (ELISA) technique, direct, indirect, and sandwich, were compared for
sensitivity in detecting virus. Purified virus preparations and infected tissue of two viruses in the Potexvirus group, Cymbidium Mosaic virus and Clover Yellow Mosaic virus, and Odontoglossum King Spot Virus of the Tobamovirus group were utilized. All three methods were equally sensitive in their ability to detect virus antigen.

PRODUCTION OF INDOLACETIC ACID IN Pseudomonas savastanoi is a PLASMID CODED FUNCTION. Luca Cantal and Teoue Kongue, Dept. of Plant Path., Univ. of California, Davis, CA 95616.

Pseudomonas savastanoi, a pathogen of olive and oleander, induces gain of function by producing indolelactic acid (IAA). Production of this secondary metabolite in the bacterium is achieved through an enzymatic pathway involving tryptophan synthase converting tryptophan into IAA via indoleacetaldehyde. Tryptophan monoxygenase, the first enzyme of the pathway, also detoxifies the inhibitory analogue 5-methyl-tryptophan. Thus, growth in the presence of 5-methyl-tryptophan is lethal for this strain and IAA is synergistic with auxins for this enzyme activity and production of IAA. Efficient curing of IAA production was obtained by acridine orange treatment followed by subculturing in King’s B broth. Cured IAA strains lacked a 34kD molecular weight plasmid, which was always present in IAA+ cells. Further, IAA isolates also lost indoleacetaldehyde dehydrogenase, the enzyme converting indoleacetaldehyde into IAA. Transformation of IAA+ strains with the IAA plasmid was detected by co-transformation of BH 101, a small B factor. Transformed cells regained the capacity of producing IAA.


Biological control of crown gall by A. radiobacter B84 is correlated with the production of agrocin 84. However, agrocin 84 has never been isolated from infected plants. This led to the determination that agrocin 84 is the sole mechanism of control of a mutant strain of B84 which was developed by potyviro Curing the 30 megadalton bacteriophage and increased virulence, and competitiveness of the wild-type B84 completely prevented galling, but the agrocin mutant allowed 100% infection. However, when the B84 mutant was specifically inoculated with crown gall bacteria, the agrocin was reduced to 35%. In addition, infection by agrocin-resistant A. tumefaciens B6 was reduced to 40-50% when either B84 or the B84 mutant was inoculated to the wound site 24 hr before B6. The data suggest that a physical blockage of infection sites is also involved in biological control by B84.

FEASIBILITY OF USING MEAN ORCHARD TEMPERATURE FOR TIMING PEAR FIRE BLIGHT SPRAY IN WASHINGTON. Ronald P. Cowsay, Washington State University Tree Fruit Research Center, Wapato, WA 99350.

Orchard temperature, relative humidity and incidence of fire blight have been monitored in various Washington pear orchards since 1972. Epiphytic populations of Erwinia amylovora in pear blossoms and on leaf blades have been monitored since 1973. Even in the presence of low numbers of Erwinia amylovora, fire blight was not detected when temperature were below 15°C. Blossom infection was rare during periods when the bacterium had not been detected by monitoring, and disease频率 frequently failed to develop even when Erwinia was detected. The occurrence of high epiphytic populations and/or disease was not necessarily related to rainfall or high humidity, but was more closely related to temperature in excess of 15°C. During the normal pear blossom season these temperatures are seldom achieved and most infection occurs on secondary blossoms. A position effect has been noted with more infections occurring in the top third of the trees than in the bottom third.


The interaction of 3 isolates of Staphylococcus bayrousce differing in virulence and 3 clones of alfalfa differing in resistance to Staphylococcus leafspot was evaluated in greenhouse. Pathogenic host responses of alfalfa isolates did not affect conidial germination or germ tube growth. For all host-pathogen combinations, growth of the fungus was restricted to the site of penetration throughout symptom development. The virulence isolates produced conidial clones which were infective to susceptible virulent isolates, and more frequently affected cells further than 0.1 mm from the hypha. This distance corresponded to the minimal lesion radius subsequently measured on a susceptible clone. Host resistance was manifested as faint chlorotic spots, whereas necrotic lesions formed on the susceptible clones. The minimum and average lesion areas produced by all isolates were the same, independent of the number of lesions which were produced. Therefore, pathogen virulence and host resistance in this disease appear to be distinct phenomena.

PARTIAL PURIFICATION OF FUNGICIDE SUBSTANCES FROM TOMATO PLANTS INOCULATED WITH FUSARIAL OXYSPORUM C. ap. LYCOSEQUIC. SI. Danko and M.E. Corden, Dep. Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331.

Substances toxic to Fusarium were extracted with acetone from the xylem of wilt resistant tomato plants (cv. Jeferson) inoculated with race 1 of the pathogen. The amount of fungitoxic material in the extracts was determined by several factors including water availability. Bioassayed extracts were most fungitoxic at pH 4.5, but ineffective at pH 6.0 and above. Highly fungitoxic substances in the extract were soluble in water, acetone, and ethyl acetate; other slightly fungitoxic materials were soluble in acetone but not water. Thin layer chromatography on silica gel resolved four fungitoxic compounds. Two large peaks and four smaller peaks of fungitoxic were resolved by chromatography on Sephadex L100-20. Preliminary tests indicated that these fungitoxins are polyphenolic and may contribute to disease resistance.


Sideres treatments of either aldicarb or phenamiphos at time of planting (3.4 kg/ha a.i.) significantly reduced Verticillium wilt severity (Verticillium dahliae Kleb. a-d). The treatment of aldicarb inadvertently increased root rot of Verticillium dahliae and increased root rot of Fusarium solani. When aldicarb was reevaluated in the same field at 2 application rates (3.4 and 6.7 kg a.i./ha), aldicarb was shown to reduce populations of Pratylenchus and Helicotylenchus spp by 66 to 70% of differences between control and treatment means. Populations of nematodes are reduced with a fall in soil temperature, and may reduce both Verticillum wilt and degree of colonization in potato stem tissue by V. dahliae (P=0.01). Nematode interactions with V. dahliae are implicated.

CUCUMBER MOSAIC VIRUS ISOLATES SEEDBORNE IN PHASEOLUS BEANS: RELATIONSHIPS, CURRENT SIGNIFICANCE. Robert F. Davis and K. O. Hampton. USDA SEA-AR. Dep. of Botany and Plant Pathology, Oregon State University, Corvallis 97331

Three isolates of cucumber mosaic virus (CMV) from New York, Spain, and France, respectively since 1974 to be seedborne in beans (Phaseolus vulgaris), were compared. The isolate from France has been independently determined to be a member of the CMV-2 serotype of the DTL of Deverge and Cardin. The New York and Spanish isolates were antigenically indistinguishable from the French isolate by gel double-diffusion serology and presumably belong to the DTL serotype as well. Isolates differed only slightly in virulence on selected hosts. Plants of strategic bean breeding materials in Idaho, Washington, and Oregon were assayed for such CMV isolates on CMV-sensitive hosts and by ELISA. Plant Introduction Phaseolus accessions from selected geographic origins were also tested for seedborne CMV. No CMV was detected in these materials, indicating that this pathotype has not yet become established in the North American and in selected accessions of Phaseolus germplasm.

AN AHPID TRANSMITTED VIRUS OF CARDAMOM IN GUATEMALA. J. E. Dinkelman, Department of Biological Sciences, California State Polytechnic University, Pomona, CA 91768.

Although cardamom, Elettaria cardamomum Maton (Zingiberaceae), has been grown commercially in Guatemala since the 1920s, Cardamom Mosaic has only recently become a major problem. Foliar symptoms include mild chlorosis with green and yellow mottling. New shoots are frequently bleached and stunt growth, and yield. Yellow flowers and green blotching. Flower spikes may show this blighting. The virus is seed, soil or mechanically transmitted and it was not transmitted by Cucurbit sp., several species of nematodes, or green peach aphid, Myzus persicae. It
was transmitted by banana aphid, Pentalonia nigronervosa and Toxoptera sp. Aphids are nonspecific vectors transmitting after a 1- to 1½-hour acquisition, and becoming noninfectious after 1 hour of feeding on healthy plants; symptoms appear in 40-45 days. Natural infection may reach 83% within 6 months of planting in a new field. Nurseries and new fields can be kept clean by sanitation practices, shading, roguing and aphid control.

DYNAMICS OF DRYLAND BEAN ROOT GROWTH IN RELATION TO FUSARIUM ROOT ROT. Paul Dryden and N. K. Van Alfen, Dept. of Biology, UMC 45, Utah State University, Logan, UT 84322

Root length, soil inoculum levels, and soil water contents were measured at 15 cm depth intervals (up to 105 cm) and at three monthly intervals during the 1979 growing season. Root growth occurred throughout the season at all depths, but was greatest in the 15-30 cm depth interval. Fusarium inoculum levels corresponded to areas of high root densities. Fusarium solani inoculum levels correlated positively to root densities. Although lesions were not easily distinguished on feeder roots, isolations of the pathogen from them showed a high frequency of recovery (average of 0.85 colonies/cm root) and a high positive correlation with inoculum density in the soil. These findings, coupled with other observations, indicate that the impact of the causal agent on the feeder roots must be considered in measuring disease severity or in developing control measures.

BEET WESTERN YELLOW VIRUS ISOLATED FROM POTATOES WITH THE LEAF ROLL SYNDROME. James E. Duffus, USDA SEA-AR, U. S. Agricultural Research Station, Salinas, CA 93915.

Beet western yellow virus (BWV) has been isolated from potato stocks with typical potato leaf roll (PLR) symptoms. Isolates of BWV differing in host reaction and serological characteristics have been found in individual potato plants indicating a complex etiology for the PLR syndrome. In addition to potato, and other solanaceous hosts, one isolate has been transmitted to and recovered from species in the Boraginaceae, Chenopodiaceae, Compositae, Cruciferae, Leguminosae, Malvaceae and the Portulacaceae. The BWV in these species is referred to as potato-like virus and virus free potato cultivars, indicating that these isolates might easily be confused with "typical" PLR. Preliminary serological data indicate several serotypes of BWV in potato that differ from each other from BWV in serological reactions from PLR in serological reactions. This evidence suggests that serological testing for PLRV occurrence would probably give misleading information. The broad host range of these BWV isolates raises questions about the re-infection of virus free potato stocks and the origins of PLRV.

THE DISCOVERY AND CHARACTERIZATION OF A POTATO YELLOW DWARF VIRUS ISOLATE OCCURRING NATURALLY IN CALIFORNIA. B. W. Falk and L. G. Weathers, Department of Plant Pathology, University of California, Riverside, CA 92521

A severe disease of perlwinkle (Vinca rosea) was observed at various locations in California. External symptoms consisted of a yellow mosaied followed by a general yellowing and dwarfing. Electron microscopic studies of infected plants revealed virus-like particles in the leaf tissue. The virus was mechanically transmitted by rubbing Nicotiana tabacum, N. rustica, N. clevelandii and N. clevelandii X N. glutinosa. In agar diffusion tests this virus reacted with antisera to the SDV isolate of potato yellow dwarf virus (PYDV) (kindly provided by Dr. R. J. De Leon, USDA) isolated between California PDD and SDV when sonicated virions or soluble antigens from virus infected tissues were reacted with antisera to either isolate in agar diffusion plates, suggesting a difference in the two isolates. Polysacrylamide gel electrophoresis of virion proteins showed no detectable differences between California PDD and SDV.

ULTRASTRUCTURAL AND METABOLIC ACTIVITY ASSOCIATED WITH INHIBITION OF SCEROTIAL FORMATION BY PHENYLTHIOUREA IN SCEROTINIA SCEROTIORUM AND SCEROTIORUM ROFSII. John K. Fellman, Duane LeTourneau and David L. Stiera. Dept. of Bacteriology and Biochemistry, University of Idaho, Moscow, ID 83843

In synthetic liquid culture, 1.9 mM PTU (1-phenyl-2-thiourea) inhibited sclerotial formation in S. scerotiorum and S. rofoii while permitting continued mycelial growth. Ultrastructural studies on both organisms grown in the presence of the inhibitor indicate that an alteration of membrane systems is a primary effect. Mitochondria, ribosomes, ER, and the biopolymer vesicular structures. Compared to controls, micrographs of PTU-treated S. scerotiorum hyphae showed increased cyto-

plasmic disorganization manifested by the accumulation of lipid material. Metabolic studies conducted with labeled substrates in the presence and absence of PTU revealed that structural change in the presence and absence of PTU reinforced the ultrastructural data. Increased oxygen consumption was observed in PTU-treated S. scerotiorum. Conductivity measurements showed little change in membrane permeability upon PTU treatment of either organism.

CROP LOSSES IN SUGARBEETS DUE TO LATE SEASON OUTBREAKS OF POWDERY MILDEW IN WYOMING. John A. Fernandez, Division of Plant Science, University of Wyoming, Laramie, WY 82071

The effect of 1 triadimefon and 3 sulfur treatments regimes on sugarbeet powdery mildew was studied in a commercial sugarbeet field near Torrington, Wyoming, in 1979. Powdery mildew developed in mid-August and disease severity remained at moderate levels (+70%) with little foliar disease was observed following August controls until harvest (early October). Although some chemical applications substantially reduced disease severity, none significantly increased yields over non-treated controls. The economic desirability of late season control of sugarbeet powdery mildew is discussed.

SEASONAL ACQUISITION OF X-DISEASE AGENT (CHERRY BUCKSKIN) FROM CHERRY BY THE LEAFHOPPER VECTOR, COLLADONUS MONTANUS. Karen Konot and A. H. Purcell, Depts. of Plant Pathology and Entomology, University of California, Berkeley, CA 94720.

Seasonal variation in leafhopper acquisition of the X-disease agent from infected cherry was assessed by subsequent leafhopper transmission to cerry in 1978. Groups of 600 non-infective Colladonus montanus were given 1 wk acquisition access feeding on X-infected 'Bing' cherry (Hazzard rootstock) in a commercial orchard near Stockton, CA. Transmission rates were 17, 20, 4, 4, 6, 8, 19, 3, 0, 0%, April 20, when beginning and terminating in September. The shortest median latent period occurred following acquisition feeding in August, reflecting a possible increase in titer in the diseased cherry trees during this period. Two-thousand non-infective C. montanus were given 1-wk acquisition access feeding periods on four protected peach trees. No transmission occurred. These results suggest previous field observations that peach does not serve as a major source for further spread of X-disease, whereas cherry may provide inoculum for field spread.

THE INFLUENCE OF NH4Cl WITH KCL ON ANTIGENICITY BETWEEN FLUORESCENT PSYDNOINODAS (FP) & GANASHROMYCTES CRAMATIS VAR. TRITICI (GCT) ON THE WHEAT BULLSEYEPLANE. M. Jackson, Dept. of Bot. & Phy. Path., Oregon State Univ., Corvallis, OR 97331.

Chloride fertilizers have been implicated in suppression of take-all of wheat, incited by GCT. In a growth chamber study, NH4Cl+KCl (2.3+12 g/115mm pot, resp.) was banded in the seed zone of infested soil (fertilized infested, FI soil), maintained at near field capacity. Controls were unfertilized infested (UF) and unfertilized (UF) soil. Wheat was planted at 0, 2, 6 wk after initial soil treatment. Root rot + rhizoplane FP population were estimated 5 wk after planting. Root rot was less in FI soil than in UF soil and decreased in both UF and FI soil as the number of FP isolated. The greatest number of FP was from roots grown in the FI soil at the 4th wk of planting. FP colonies were tested for in vitro antagonism of GCT. Antagonism was greatest in those isolates from roots grown in FI soil, as estimated by zones of GCT inhibition. Greater populations of FP with enhanced antagonism may be involved in NH4Cl+KCl suppression of take-all root rot.


Hymenomyctes often decay most of the sapwood of fire or insect-killed Douglas-fir trees before timber salvage can be completed. Accelerated decay associated with bark beetle gallery has been attributed to vectoring or provision of infection courts by the beetles. Hymenomyctes isolates were obtained on several infected logs from Harvard, Pennsylvania, in July of 1977. Douglas-fir beetles (DFA), Dendroctonus pseudotsugae, Eighty adult DBF reared from Douglas-Fir Bolts without exposure to the airfares (pre-flight) yielded no Hymenomyctes. In contrast, 178 of 222 DBF collected in flight yielded Hymenomyctes: Fomitopsis pinicola was isolated from 169, Cryptopus volvatus from five, and other species from 31. Only 6 of 122
post-flight adults removed from egg-galleries yielded these fungi. Airborne basidiospores appeared during the beetle flight may be significant in accelerating sapwood decay.


Definitive identification of Tillietia contortus teliospores is of critical importance in assessing bunt contamination in grain exported to The People's Republic of China. Identification is of particular significance in that the teliospore morphology of this species is quite similar to other species and those of T. caries. Characterization of T. contortus and T. caries teliospores were quantified to determine the best criteria for species separation. In general, teliospores of T. contortus were larger and exhibited greater variability in T. contortus than in T. caries. These differences are observed in normal distribution curves based on single criteria which indicated a classification error of 2.7% to 7%. Discriminant analyses using several criteria provided better species separation than any single criterion. Several linear models were derived that reduced the probability of misclassification to about 10%

COMMON ROOT ROT OF BARLEY IN UTAH. Rastri Dev Kidamba and N. K. Van Alfen, Department of Biology, UMC 45, Utah State University, Logan, UT 84322.

Surveys of barley fields in Utah indicate root rot caused by Helminthosporium sativum is a serious problem. A time course study of disease initiation, development and progress was made throughout the growing season to determine the period between 25-30 days after planting and reached maximum levels at ca. 60 days. Soil inoculum levels were determined by the flotation viability method and the pathogen was found to be present universally although variable in population levels. Disease index readings were taken on 20 different varieties (8 commercial and 12 breeding) at 6 locations. Yield loss determinations were made on the basis of dry weight of kernels. Significant reductions in dry weight of kernels (mean gm/kg) were found to be correlated with disease index. The effects of Baymex, Dyrene, Topsisin N, CGA 64251 on control of the disease were examined.

LETTUCE BIG VEIN DEFIES RDMIL®. Demetrios G. Kontaxis and D. S. Teakle, Univ. of California, Coop. Ext., 960 East St., Pittsburg, CA 94565, and Univ. of Queensland, Australia, resp.

RDMIL® 56, N-(2-Dimethylphenyl)-N-(Methoxylacetil)-alanine methyl ester, (0.98 kg/ha) was spread on 15 m-long lettuce beds and inoculated 2 cm into the soil before the first irrigation, in Imperial Valley, California during Oct. 1978. The treatments were randomized and replicated six times in 14 fields. All plots were sprinkler or furrow-irrigated and received commercial cultural practices. An average of 44 percent of the plant population in both treated and non-treated plots developed big vein symptoms. The chemical was not phytotoxic. Zoospores of Olpidium brassicae, the vector of big vein disease, in 0.05% glycerine solution were mixed with RDMIL® 56 to 25 ppm (w/v) a.i. and a pot of Monterey lettuce seedlings was drenched with the suspension. Another similar pot was drenched with the zoospore suspension only and served as control. Big vein symptoms appeared in both treated and non-treated pots. Olpidium zoospores remained mobile in a 25 ppm a.i. RDMIL® solution for at least 20 min at 20°C temperature.

GROWTH RESPONSES OF CORN AND APPLE TO VESTIGIAL-ABRUSCULAR MYCORRHIZAS, PHOSPHORUS AND ASBECIN. W. J. Larson, R. C. Covey, and B. L. Koch. Tree Fruit Research Center, 1100 N. Western Ave., Wenatchee, WA 98801.

Inoculation with Glomus mosseae alone or in combination with G. microcarpus increased growth of corn and apple in soil with a high phosphorus capacity, but mycorrhizal inoculation with G. mosseae alone had no effect on growth. Corn inoculated with mosseae alone or in combination with G. microcarpus had growth comparable to that of uninoculated or microcarpus-inoculated plants that were given 100 ppm additional phosphorus. Additional phosphorus. Addition of As decreased corn growth regardless of inoculation treatment, but growth decreases were smaller for mosseae and combination-inoculated plants. Addition of up to 400 ppm As to this soil had no effect on apple growth regardless of inoculation treatment. In a second experiment using this soil, growth response by uninoculated apple occurred only after addition of 600 ppm P.

DETECTION OF ILAR VIRUSES (SUBGROUP B) USING THE ELISA METHOD. J. L. McConran and H. R. Cameron. Oregon State University, Corvallis, Oregon, 97331.

Fifteen strains of subgroup B ILAR viruses were tested by the enzyme-linked immunosorbent assay (ELISA) against eight subgroup B antisera. The sera used were (1) Rose Mosaic, Apple Mosaic, and Hop A, (2) Almond Calico, Cherry Cytoplasm, and Plum Line Pattern, and Prunus Necrotic Ringspot, and (3) Prune Dwarf. Although other workers have observed weak development of ELISA reactions and no positive combinations produced negative ELISA results. Homologous combinations produced positive ELISA results at plant sap dilution as high as 1:1000 - 1:2000. All 15 strains could be detected in a single assay by combinations of the most sensitive antisera from each of the three groups. The ability to detect these ILAR strains by ELISA declined as plant tissues matured in late summer, causing some "false negative" results (failure to detect infected trees).

PERSEPTION OF THE TOXIC EFFECTS OF SMOKE. J. D. Mihaili and J. R. Parmeter Jr., Dept. of Plant Pathology, University of California, Berkeley, CA 94720.

Persistence of the toxic effects of cereal straw smoke on germination of bean rust (Uromyces appendiculatus) was investigated. A suspension of spores was sprayed on glass microscope slides which had been exposed to 0-10 minutes of smoke 0-8 days prior to the test. Germination of spores was inhibited for at least 8 days. Persistence of the protective effects of smoke against infection by bean rust and snapdragon rust (Puccinia antirrhini) was investigated during an 8 day period after exposure of plants to smoke. Suspensions of bean rust or snapdragon rust spores were sprayed on bean or snapdragon plants exposed to 0 or 5 minutes of smoke respectively. Compared with unsprayed controls, infection was significantly reduced for 4-8 days after exposure to smoke. At lower fuel loads (250/5 mg, 500/5 mg.) and shorter exposures protective effects lasted only 4 days, while at higher fuel loads protective effects often last 8 days.

RELATIONSHIP OF VARIABLE INFECTION TYPE TO SLOW LEAF RUSTING. R. C. Miller and R. F. Line. Washington State University, Pullman, WA 99164.

Sixty-two winter wheat cultivars, which appeared susceptible but had moderate to low percentages of leaf rust (caused by Puccinia recondita) in field plots for five years, were compared with five very susceptible cultivars in the greenhouse. Seedlings, 14 days after inoculation with inoculum of leaf rust spores. Infection types based on size of pustules and lesions were determined on the first seedling leaf 12, 14, and 16 days after inoculation and on later leaves after the pustules had developed to maximum size. Pustules on two leaves were less than 0.5 mm long, indicating a high degree of hypersensitive resistance. A range in size of pustules and lesions occurred on 47 cultivars at one or more growth stages, but was most evident on the flag leaves. Large pustules developed on the remaining 13 cultivars. Of the 47 cultivars with a range in infection types, 37 had a common ancestor, Gros Bleu (PI 340700). This suggests that these cultivars may also have a common mechanism of resistance.


We have found that a fluorescent pigment, produced by fluorescent pseudomonads, inhibits the growth of many patho- genic fungi by chelating iron from the media. The sensitive fungi include Clonostachys rosea, Chlorella punctata, Chlorella vulgaris, Cladosporium cladosporioides, and Phaeosphaeria nodorum. A direct correlation was established between the concentration of the partially purified pigment in the media and the level of inhibition. We are currently attempting to establish whether or not the pigment is produced, under certain conditions in the rhizosphere, in sufficient quantities to interfere with the growth and development of soil-borne pathogens. So far as we know this is the first report of the antifungal activity of the fluorescent pigment.
EFFECT OF APPLE CULTIVAR ON VENTURIARIA INARQUALIS ASCOSPORE EMISSION, AND EFFICIENCY OF AUTUMN AERIAL REEDING PERITHELIAL INOCULUM IN CALIFORNIA. W. J. Muller and L. C. Hendricks (University of California, Davis, CA 95616).

Six apple cultivars growing in the interior region of California were compared for spring ascospore productivity from infected leaves following an unexpected epidemic in 1978 when most cultivars became heavily infected. Three previous studies of the ascospore emission period in this region. There were distinct differences between cultivars in spring ascospore productivity; the period of emission only lasted 4–5 wk and was virtually complete by any cultivars reached full bloom. In late October, heavily infected trees were hand-sprayed with either 5% or 6% urea plus zinc sulfate. An equal number of diseased leaves were then collected from each treated tree, dried, weighed, and germinated in wet paper. The same leaves were retrieved again 5 mo later, weighed, then tested for ascospore emission. Leaf weight was not significantly different between treatments, however, the urea plus zinc spray reduced ascospore productivity by approximately 70%.

NONINFECTIOUS HAIRY ROOT OF APPLE SEEDLINGS. W. W. Moore and M.A. Atchle, Department of Bot. and Plant Path., Oregon St. Univ., Corvallis, OR 97331; 2015 S. 1st St., Yakima, WA 98903.

Apple seedlings produced in central Washington often have prolific root bushing development similar to published reports of plants with hairy root disease (Agrobacterium rhizogenes). Such seedlings are culled and destroyed. Although Agrobacterium were isolated readily from the roots of these seedlings from 1975–78, none of the bacterial strains (over 600) were pathogenic in repeated inoculations of tomato seedlings and carrot slices. In contrast, A. rhizogenes A4 caused prolific root development on carrot slices, but not on tomato plants. Because host specificity might explain the failure to infect tomato tissues, 157 selected strains were each inoculated to wounded apple and sugar beet (a reported host for A. rhizogenes) seedlings. After 4 months, none of the apple or sugar beet seedlings had hairy root symptoms. Except the apple seedlings inoculated with A. rhizogenes 15834, we conclude that the root proliferation on apple seedlings in Washington corresponds to Siegler’s description of “noninfectious hairy root” (Am. Nurseryman LXXI:7).

EFFECT OF CROWN GALL ON BOYSENBERRY PRODUCTION. L.W. Moore and L.W. Martin, Dept. of Bot. and Plant Path., OSU, Corvallis, OR 97331; N. Willamette Exp. Sta., Rt. 2, Aurora, OR 97002.

The effect of crown gall on vigor and yield of boysenberries was tested in Western Oregon from 1974–79. Rooted cuttings from virus-free plants were divided randomly into three groups. Plants were either wounded and inoculated with Agrobacterium tumefaciens (Group A) or uninoculated (Group B), or inoculated with the nonpathogenic Agrobacterium (Group C) which then planted in a Latin Square design. Mean number of fruiting canes per plant in 1976 and 1978 was: 8, 11 and 11, respectively, and 25, 58, and 59, respectively. Mean yield in tons/acre for Group A was 31.1, Group B was 30.5, and Group C was 27.7, respectively, and 2.6, 4.9, and 1.6, respectively. The plants were dug and examined for galls in 1979. Plants from Group C were the most vigorous and least infected (15%). Thirty-three percent of the plants from Group B were galled and dead, whereas 91% of the plants from Group A were galled and 45% dead. These data show that crown gall can limit boysenberry production and that treatment with N86 was beneficial.

SOME ANATOMICAL CHARACTERISTICS OF VIVRAT CUTLUS ASSOCIATED WITH RESISTANCE TO PSEUDOCYCGESPORERLA HEMIPHORISIMODES. T.D. Murray and G.W. Brushi, Department of Plant Pathology, Washington State University, Pullman, Washington 99164.

Disease indices were determined for 10 winter wheats with varying degrees of resistance to P. hexadripodid, the causal agent of strawbreaker footroot. Samples for atomic study were collected prior to boot stage, at the watey-rice stage, and at full maturity. Anatomical characteristics of the lowest elongated internodes were measured for the above three stages, and between hypertidal width and number of hydropetal cell layers, versus disease indices were significant (r=0.88 and r=0.87, respectively). Correlations between epidermal cell wall thickness and disease indices were not significant (r=0.47 and r=0.19, respectively). Maximum anatomical development was completed before the watey-rice stage. Cuppelle-Desper and VPM-1, the most resistant wheats, developed wider hydropetal layers (111.4 μm and 111.1 μm, respectively), and thicker, more heavily lignified cell walls. Sprains, the most susceptible wheat, had the thinnest hydropetals (74.2 μm).

AN ENZYME-LINKED IMMUNOSORBENT ASSAY (ELISA) FOR DETECTION OF PIERCE’S DISEASE BACTERIA IN PLANT TISSUES. N. F. & D. Bocampoli (U. Nacional de Cordoba, Argentina), A. G. Goosen, T. E. B. Raju & G. Nyland (Univ. of Calif., Davis, CA 95616).

Pierce’s disease bacteria (PDB) were harvested from pure cultures by centrifugation, and washed several times with phosphate buffered saline (PBS). Antisera were prepared against these, having a reciprocal titer of 10:96. The immuno-globulins of the antiserum were purified, conjugated, and used in ELISA for detecting bacteria in host plant tissues. The ELISA was used to detect PDB in 1 ml of PBS. Petioles, leaf veins, or shoots (1.0-2.5 g) from healthy and affected grape, almond, and woody host plants were ground with extraction buffer (EB). The homogenates were filtered through cheesecloth and centrifuged at 25,000 g for 15 min. The pellets were resuspended in EB, sonicated, and used as antigens in ELISA tests. ELISA readily detected the bacterium in homogenates from plants that were infected but tests were negative with healthy plants.

AN EPIDEMIC OF PEACH YELLOW LEAF ROLL (PYLR) EPIDEMIC OF UNPRECEDENTED INTENSITY WAS PRESENT IN YUBA, SUTTER, AND BUTTE COUNTIES. G. Nyland, B. C. Raju, Dept. of Plant Pathology, Univ. of Calif., Davis, CA 95616; and A. H. Purcell, Dept. of Entomological Sciences, Univ. of Calif., Berkeley, CA 94720.

A peach yellow leaf roll (PYLR) epidemic of unprecedented intensity was present in Yuba, Sutter, and Butte counties in 1978. A sharp increase in the number of infected peach trees was apparent in 1978. All commercial cling peach orchards in the "Peach Bowl" area centered around Marysville and Yuba City, CA were examined. In 1979 by the California Cling Peach Advisory Board. No cultivar resistance to PYLR was evident. Trees in orchards less than 4 years old did not have PYLR symptoms, nor did comparable age replants even in orchards where spread was invasive (>10%). Over 33,000 trees were diagnosed as having PYLR. With rare exceptions, all heavily infected orchards were near commercial pear orchards. Gradins of disease spread suggest considerable primary spread of PYLR from pear orchards.

MAIZE DWARF MOSAIC VIRUS IN HAWAII. Jori J. Oku and Mamoru Ishii, Department of Plant Pathology, Univ. of Hawaii, Honolulu, Hawaii 96822.

A virus disease of maize was epidemic on Molokai, Hawaii, early 1980. Although infection was near 100% in all fields examined, aphids vectoring the disease were not present. Plants infected ranged in development from the 5–6 leaf stage to milk stage. In older plants a mild mosaic with some stunting are generally seen. Mosaic and stunting were more severe on younger plants. Late stage death was frequent. Sap of infected plants was expressed in 0.05 M pH 7.2 borate buffer and tested serologically with antisera of Maize Dwarf Mosaic Virus (MDMV) strains A and B. After 18 to 24 hours incubation at 25°C, 177 maize plants strongly reacted with MDMV-B antisera. No reaction occurred with MDMV-A antisera. Millet and sorghum exhibiting mosaic symptoms also only reacted with MDMV-B antisera. Electron microscope examination of leaf disk preparations of infected maize showed flexible rods of 750 nm.

COMBINATION, SINGLE, AND ALTERNATE APPLICATIONS OF FUMIGIDES FOR CONTROL OF SEPTORIA APICOLA ON CELERY. A. O. Paulaus, H. Otto, and J. Nelson, Plant Pathology Department, University of California, Riverside, CA 92522.

Septoria leafspot of celery (Septoria apicola) seriously afflicts celery in California during heavy rainwell seasons. Results of three joint trials at Coachella Valley City 64250; benzyl & either chlorothalonil or maneb. Son of alternate sprays of benzyl-chlorothalonil-benzyl provided excellent control of Septoria leafspot. Chlorothalonil or maneb alone gave intermediate control. Combination treatment of chlorothalonil and maneb gave excellent control. Poor control was obtained with copper salts of fatty and rosin acids (Citriop) or dichlor (Quintar 50) fungicide applications.

TRANSMISSION BY INJECTED LEAFHOPPERS OF SPIROPLASMA ISOLATED FROM PLANTS ATTACKED BY ASHY YELLOW. A. H. Purcell, B. C. Raju, and G. Nyland, Department of Entomological Sciences, University of California, Berkeley 94720 and Department of Plant Pathology, University of California, Davis 95616.
Spiroplasma isolated from surface-sterilized Plantago major and aster plants infected with greenhouse-maintained strains of aster yellows (AY) were subcultured 3 to 5 times in liquid media, pelleted, resuspended in 10% sucrose (10^-7 dilution of original inoculum), and injected into Macrophilus fascifrons. Three isolates were transmitted to pest plants, causing typical AY symptoms; 36 isolates were not transmitted; 9 isolates, including 3 from AY-infective M. fascifrons, produced syndromes that were atypical of aster yellow. All such "mild" strains had no fluid body of Spiroplasma and were readily passed from such plants but less frequently from plants with typical AY symptoms. Noninfective M. fascifrons transmitted typical strains but not atypical strains by feeding acquisition.

Transmission by Injected Leafhoppers of Spiroplasma Isolated from Plants with X-Disease. A. H. Purcell, B. C. Raja and G. Nyland. Department of Entomological Sciences, University of Calif., Berkeley 94720, and Department of Plant Pathology, University of Calif., Davis 95616.

Spiroplasmas originally isolated from celery and peach with the peach yellow leaf roll strain of X-disease (XD), were injected with microneedles into Colladosus montanus leafhoppers. Three isolates that had been subcultured, 3 to 5 times before injection (representing greater than 10^3 dilution of original inoculum), produced typical XD symptoms in leafhoppers in 4 to 5 weeks after exposure to injected leafhoppers. Two isolates were also transmitted by injected Scaphytopius nitidus leafhoppers and produced atypical symptoms of XD after a 6 to 10 week incubation period. Serologically indistinguishable Spiroplasmas were isolated from experimentally-infected plants. Plants with "mild" (atypical) strains were not killed by XD. "Typical" strains killed plants in 8 to 12 weeks. Twenty-four spiroplasma isolates were not transmitted.

Serological Relationships of Rickettsia-like Bacteria in Diseased Plants. B. C. Raja, G. Nyland and A. C. Coven (SEA/AR, & Univ. Calif., Davis, CA 95616); S. F. Nome, (UNIV. NACIONAL DE CORDOBA, ARGENTINA); J. W. Wells & D. J. Weaver (SEA/AR, Byron, CA 91308), & R. F. Lee (UNIV. FLORIDA, Lake Alfred, FL 33850).

Pierce's disease bacteria (PDB) were cultured in vitro from grapes from California, Florida, Texas, Costa Rica, and Mexico, and from almond and alfalfa from California. Antiserum against 7 representative isolates from grape, almond and alfalfa were produced in rabbits. An antiserum against phony peach (PP) was obtained from J. F. French. Agglutination, ring precipitation, ELISA, and agar double-diffusion tests were used to compare serological relationships of the PDB with morphologically similar, naturally-occurring bacteria associated PDB, plum leaf scald (PLS), and wild tree decline of citrus (WTD), using bacteria from root extracts as antigens. The serologically the PDB and the rickettsialike bacteria (RLB) associated with PP, PLS, and WTD are closely related. Antiserum used in these tests were specific only for xylem-limited RLB.


A deficiency of phosphorus, potassium, magnesium, copper, iron, manganese, and zinc in wheat plants growing in silica-sand, and with all other nutrients at pH 8, increased incidence and severity of take-all caused by Gaeumannomyces graminis. Lowering the amount of nitrogen to 1/2 that of 1/2 had no significant effect on take-all. Doubling (2%) the amount of any one nutrient, or of nitrogen as nitrate, and with all other nutrients at pH 8, resulted in less take-all. Calcium and sulfur, at either 1/2 or 2%, had no affect on take-all. Nutrients that reduced take-all also promoted root development on the wheat. In conclusion, decreased take-all as foliar applications, confirming that the effect was through plant nutrition. Take-all was reduced in one field trial by zinc or copper, and in another by zinc or copper + phosphorus; in the latter trial, disease control was significant at 2 to 4 weeks at 2 levels of nitrogen.

Increased Take-all with Limiting Results from Increased pH and/or pH from Increased Calcium or Magnesium. E. M. Reis, R. J. Cook, and B. L. McNeal. USDA, SEA, AR, 367 Johnson Hall, Washington State University, Pullman, WA 99164.

Wheat plants were grown with inoculum of Gaeumannomyces graminis var. tritici in silica sand at five pH values (4.5, 5.5, 6.5, 7.5, and 8.5) in all combinations with three levels of calcium (2000, 4000, and 6000 ppm) or magnesium (48, 96, and 144 ppm) by modifying standard Hoagland's solution to study, respectively, the effects of calcium and magnesium on disease severity. Take-all increased with increasing pH but not with increasing calcium. Increasing pH in combination with magnesium did not increase take-all as much as with calcium, probably because of magnesium's control of calcium uptake. Plant uptake of copper, iron, manganese, and zinc, and also the rate of new root formation, were significantly less at pH 7.5 and 8.5 compared with lower pH values. Apparently, the increased deficiency of certain micro-nutrients in the host, thereby favoring take-all. The pH range most favorable to new root formation by the host was 5.5 to 6.5, whereas greatest disease severity was at pH 7.5.

Predicting Crop Loss from Disease Severity. Mary Ann Salit, Department of Plant Pathology, Univ. of Calif., Davis, CA 95616.

Models for relating crop losses to disease severity have had moderate success in predicting losses in grain and potatoes. These models have been of three main types: single point, multipoint, and integrated disease progress. The former two have considerate relationships which relate crop loss to one or more measurements of disease severity. The latter is a multipoint model based on the assumption that the amount of loss is proportional to the amount and duration of disease as described by the area under the disease progress curve. Progress in this area has been limited because of the tedious nature of the disease progress data required to formulate such models. Built into each of the currently used disease loss models in the assumption that a given level of disease produces or is correlated with a certain level of yield loss. Many recent yield models may invalidate this assumption. Consequently these models are of limited predictive ability. Realistic models which reflect the mechanisms of yield loss are needed.

A New Race of Fusarium oxysporum F. sp. APII in California. R. W. Schneider and J. L. Norelli, Dept. of Plant Pathology, University of California, Berkeley, California 94720.

This study determined that a new race of the pathogen is responsible for a recurrence of Fusarium yellows of celery in California. Isolates were obtained from France, where susceptible cultivars predominate, from the American Type Culture Collection (ATCC), which were collected before the recent development of Fusarium yellows, and from several diseased and healthy celery plants in California. The cultivars Golden Detroit and Fordhook, susceptible and resistant, respectively, to fusarium yellows in a test conducted in 1933, and Tall Utah-57-20 were used as differential hosts. Golden Detroit was highly resistant to all isolates. Fordhook was the most susceptible to one of two ATCC isolates, highly susceptible to three French isolates, and moderately resistant to recent California isolates. Tall Utah-57-20 was highly resistant to the ATCC and Fordhook isolates but highly susceptible to most recent California isolates. Thus, race 1 attacks Golden Detroit and Fordhook but not Tall Utah-57-20, while the new race 2 attacks all three varieties.

Identification of Barley yellow dwarf virus strains present in Eastern Washington. L. J. Seybert and S. D. Wyatt, Department of Plant Pathology, Washington State University, Pullman, WA 99164.

Aphids were collected from wheat, barley, oats and volunteer grasses in Eastern Washington in 1977 and 1978. Of the 1977 collection, 425 were Aulacorthum oplites, and of the 1978 collections, 542 were Alulacorthum. Rhopalosiphum maidis, Macrosiphum avenae and Schizaphis graminum were tested for their ability to vector barley yellow dwarf virus (BYDV). Serial transmission tests were used to distinguish between isolates that could be transmitted by Aulacorthum and Macrosiphum avenae and Schizaphis graminum, respectively. Transmission patterns suggest that vector-specific strains of BYDV were not present in 1977 and 1978. Serial transmission tests and a vector efficiency study indicate that the species can be ranked in descending order of efficiency as follows: R. maidis, S. graminum, M. avenae, and M. maidis.

Eighty Monilinia laxa isolates were obtained from almond, apricot, peach and pruned apple trees. Isolates from California and Texas were used in all experiments. Some of the isolates that have been tested by artificial inoculation and field tests were found to be resistant to carboxin. Carboxin-resistant isolates were found to be resistant to benomyl and triforine. The studies described here were designed to determine the effectiveness of carboxin and triforine on experimental fungi. The results indicate that carboxin and triforine are effective against Monilinia laxa in the field.

In 1968, the Phebblem experimental station in Phebblem, Arizona, began to investigate the symptoms of cork bark (CB) and stem pitting (SP) diseases. The eighteen plants of each rootstock were individually examined in February 1969, using a rating system on a scale of 0 to 10. The symptoms were classified as SP symptoms. The results of these examinations indicated that the CB symptoms were found in one to three canes, 10 SP symptoms on the trunk base and on the arms or CB symptoms on 4 or more canes. In 1969, the experiment was repeated with similar results.

The use of carboxin and triforine in the field trials from 1970 to 1980 showed that these fungicides were effective in controlling Monilinia laxa. The results of these trials indicated that carboxin and triforine are effective against Monilinia laxa in the field.

The need for disease and crop loss information is of increasing importance in the field. The Pennsylvania State University, University Park 16802, is conducting research on the effects of Monilinia laxa on almond, apricot, peach and pruned apple trees. The research is designed to determine the effectiveness of carboxin and triforine on experimental fungi. The results indicate that carboxin and triforine are effective against Monilinia laxa in the field.

Agrocin resistance readily develops in virulent agrobacterium tumefaciens. Without visible or p.ti. plasmid, S. Roule & C. I. Rado, Univ. of California, Davis, CA 95616.

Exposure of agrocin to p.ti. results in the development of resistance to this antibiotic. The development of resistance is associated with the presence of a Plasmid which codes for resistance to the antibiotic. This plasmid, known as the Plasmid Resistance Gene (PrG), is located on a circular DNA molecule and is transferred from one bacterial cell to another by conjugation. The PrG codes for an enzyme that inactivates the antibiotic, thereby allowing the bacteria to grow in its presence.

The presence of the PrG in the bacterial cells is responsible for the development of resistance to agrocin. The PrG is a readthrough type of plasmid and is not usually found in bacteria that do not grow in the presence of the antibiotic. The PrG is not a part of the bacterial chromosome and it is not inherited by the offspring of the bacteria. The PrG is, however, transmitted from one generation to the next by conjugation.

Oxalic acid is produced by Sclerotium cepivorum during the infection of onions. R. E. Stone & V. N. Armentrout, California State Polytechnic University, Pomona, CA 91768.

Sclerotium cepivorum Berk. produces oxalic acid in culture and in infected onion tissue. Oxalic acid was precipitated from culture filtrates and extracellular fluids with calcium chloride—sodium acetate buffer at pH 4.5. Precipitate, when brought to oxalic acid by paper chromatography. Quantification was by titration with KMnO4. The fungus grown on medium composed of glucose, sucrose and calcium chloride—sodium acetate buffer at pH 4.5. Oxalic acid was precipitated from culture filtrates and extracellular fluids with calcium chloride—sodium acetate buffer at pH 4.5. Precipitate, when brought to oxalic acid by paper chromatography. Quantification was by titration with KMnO4.

SELECTIVE SUPPRESSION OF VERTICILLIUM DIAELAE STRAINS IN CLAY-

AMOND CAMPBORA BY STEM INJECTIONS WITH 2-(2-DIETHOXY ETHYL)

-BENZIMIDAZOLE CARBAMATE (DBEC) AND OXYCARBON. W. B. Thomas, Jr. and Gerald F. Malcolm, P.O. Box 745, Lafayette, CA 94549.

Field trials between 1973 and 1980 showed that the efficiency of DBEC and Oxycarbom in suppressing Verticillium dahliae in Camellia sinensis with 2-(2-diethoxyethyl)-benzimidazole carbamate (DBEC) and oxycarbom applied as stem injections was significantly higher than the previous treatments. The results of these trials indicated that DBEC and Oxycarbom are effective in suppressing Verticillium dahliae in Camellia sinensis.

ROLE OF BACTERIA IN CROWN ROT OF ALFALFA IN UTAH. V. A. Turner and N.K. Van Alfen, Dept. of Biology, UMC 45, Utah State Univ., Logan, UT 84322.

Fusarium spp. have been shown to be weak pathogens causing a slow decay of alfalfa crowns. However, large numbers of white gram negative bacteria and fluorescent pseudomonads can be isolated from rotten crowns. Isolates of white bacteria from Utah alfalfa and similar isolates obtained from Montana State Univ. (shown to be pathogenic in sainfoin) were inoculated into 2 month old 'Dupuui' alfalfa crowns in the greenhouse. Plants were harvested 6 weeks later, split open, and disease development was assessed. The results indicated that there was no significant difference between the control and the treated plants.

U.V.-INDUCED LOW VIRULENT, WHITE COLONIES FROM ENDOTHIA PARASITICA: THEIR RELATIONSHIP WITH TRANSMISSIBLE HYPORULINANCE. W.K. Van Alfen, J. G. Gillies, J.R. Simmons, and J.T. Bowman, Dept. of Biology, UMC 45, Utah State University, Logan, UT 84322.

European type hyporuline colonies of Endothia parasitica are whitish and sporelurite poorly. Such cultures are either low in virulence or avirulent. Colonies of this description can be obtained in high numbers when transmissible hyporuline isolates are irradiated with U.V. light. It has been established that such colonies may be the result of induction of the hyporuline factor which has otherwise been latent within the fungal cell. Results to date suggest that these U.V.-induced, hyporuline colonies, do not contain the transmissible hyporuline factor since transmission of the white colony type is not detectable using auxotrophic mutants. Also, these U.V.-induced colonies contain no ds RNA. Transmissible hyporuline colonies have always been found to contain ds RNA.

ICE NUCLEATION BY PSEUDOMONAS SYRINGAE ASSOCIATED WITH CANKER PRODUCTION IN PEACH. D. J. Weaver, USDA, SEA/AR, Kearneysville, WV 25430; and C. F. Gonzales and H. English, Department of Plant Pathology, University of California, Davis 95616.

Five isolates of Pseudomonas syringae varying in syringomycin (SR) production and ice nucleation (IN) capability were compared
for their effect after inoculation into actively growing peach seedlings, dormant trees grown in 20-cm pots, and excised twigs from dormant field-grown trees. Dormant trees and twigs were kept at 15°C for 10 days after inoculation; some were then frozen at -10°C for 24 hr. Seedlings were maintained on a greenhouse bench at 23-25°C. Typical light tan bark cankers were induced on active and dormant tissue by isolate B3A from peach and isolate B15a from almond; both were positive for SR production and IN. Isolate B15-, a SR-negative strain of B15+, was positive for IN and induced typical cankers in dormant twigs but had no effect on actively growing seedlings. Typical cankers were not induced by isolate HS 191 (SR-positive) from millet and its cured (SR-negative) form Ao 111; both were negative for IN. Results suggest that IN by isolates of P. syringae may play an important role in the bacterial canker disease of peach.


Crop yield is an expression of the collective impact of numerous production variables. It may be possible, therefore, to evaluate crop performance in a systems context. In 1979, a project was initiated to identify a number of factors that affected pea yield in the Palouse region of Washington State. In 1980, 100 pea fields were sampled, and a subset of 24 variables was identified that explained 82% of the variability in seed yields. Estimates of each variable's relative impact on yield were used to develop a model of the overall yield variation. The model included 24 variables at varying levels of significance, with the most important being field size, soil type, and crop rotation.

LOCALIZATION OF PATHOGENS CAUSING APRICOT JACKET ROT. C. E. Yarwood, Dept. of Plant Pathology, University of California, Berkeley, California 94720.

Apricot jacket rot or green rot in California is caused primarily by Sclerotinia sclerotiorum and/or Botrytis cinerea in seasons of much rainfall during the March bloom. On apricot B. cinerea causes a darker rot than S. sclerotiorum. Surveys for these organisms as well as for Monilinia fructicola and M. laxa from 1964 to 1980, were conducted by collecting healthy-appearing as well as diseased blossoms, and incubating them in petri dish moist chambers. Of 1856 blossoms collected in coastal areas (Berkeley, Oakland, Alvarado, Alviso, Stinson Beach, etc.) the numbers with B. cinerea, Monilinia, and S. sclerotiorum were 972, 117, and 25, respectively. Of 5600 blossoms from interior areas (Hollister, Brentwood, Livermore, Patterson, Manteca, etc.) the corresponding numbers were 2188, 352, and 1252. The important finding of the abundance of these fungi on healthy blossoms and in disease-free seasons, and the greater proportion (22% vs. 1.3%) of S. sclerotiorum in the interior areas than in the coastal areas.

THE OCCURRENCE OF THIELAVIOPSIS BASICOLA. C. E. Yarwood, Dept. of Plant Pathology, Univ. of California, Berkeley, CA. 94720

T. basicola (syn. Chalara elegans) is of current interest as a root pathogen, as a cause of plant failure, as a stimulant of plant growth, as a carrier of virus, and as a host of ameba. When field soil was applied to carrot root slices which were then inoculated dry in petri dishes, T. basicola was usually the only fungus which developed. This "dry" method is fast and almost free of contamination. T. basicola also developed on cut surfaces of lemon, apple and pear fruits, sweet potato roots, Irish potato tubers, and celery petioles. It was abundant in the apparent absence of disease in many cultivated and a few virgin areas, but most collections were free of the fungus. Of some 506 genera of higher plants from which the soil was assayed, 139 were positive in at least one test. Genera with which the fungus was most frequently or most heavily associated in nature or in cultivation were: Betula, Daucus, Geranium, Humulus, Hypochoeris, Malva, Phaseolus, Prunus, and Rhus. The fungus was abundant in California, Arizona, British Columbia, Alberta, England, and Moscow, Russia.