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### ABSTRACTS

INTERACTION OF SOIL PH AND MATRIC POTENTIAL ON INCIDENCE AND SEVERITY OF CEPHALOSPORIUM STRIPE IN WINTER WHEAT. J. C. Anderegg and T. D. Murray. Department of Plant Pathology, Washington State University, Pullman, WA 99164-6430.

In greenhouse studies, the incidence and severity of cephalosporium stripe increased from 9% to 37% and 0.2 to 1.3 (scale of 0 to 4), respectively, as soil pH dropped from 7.5 to 4.5. As soil matric potential increased from -1.0 to -0.1 bar, incidence and severity of disease increased from 22% to 33% and 0.7 to 1.2, respectively. An interaction between pH and matric potential occurred with the greatest incidence (43%) and severity (1.71) of disease in the wettest soil at pH 5.5 and least, 6% and 0.1, respectively, in the driest soil at pH 7.5. Cultivars differed in incidence and severity of disease; 'Stephens' exhibited 2.5-3.0 times greater incidence (41.7%) and severity (1.4) compared to 'Daws' and 'Nugaines' which were equal. These data demonstrate the importance of soil pH and moisture on the development of cephalosporium stripe in the absence of root wounds induced by frozen soil.

INTERACTING ROOT PATHOGENS ASSOCIATED WITH BLACK STAIN DISEASE OF *PINUS PONDEROSA* LAWS. C.L. Bertagnole<sup>1</sup>, A.D. Partridge<sup>1</sup>, and D.J. LeTourneau<sup>2</sup> Depts. Forest Resources<sup>1</sup> and Biochemistry and Bacteriology<sup>2</sup>, Univ. of Idaho, Moscow, 83843.

We studied both succession and interaction of root pathogens causing extensive mortality in a 53-yr-old plantation. Primary organisms were *Verticicladiella* sp. A (= *V. wagneri* var. *ponderosae*) (50%) and *Leptographium* sp. B (10%), which occurred together in 35% of stained roots. *Scytalidium* spp. also caused black stain. Common secondary coinhabitants were *Armillaria* sp. and *Poria subacida*. In both naturally- and artificially-inoculated roots, sp. A accumulated in newly-formed tracheids, sp. B invaded axial tracheids and ray parenchyma. Sp. A produced black stain and sp. B caused resinous lesions. Total lesion areas were similar for each species, but sp. B overgrew sp. A in mixed inoculations. Sp. B acidified substrates while sp. A, grown singly, did not alter the initial pH. In liquid shake cultures, sp. B produced hyaline hyphae and a yeast-like phase whereas sp. A had dark brown mycelia and few conidia.

INFLUENCE OF PHYTOPHTHORA ROOT ROT ON STAND LONGEVITY AND YIELD OF ALFALFA CULTIVARS WITH DIFFERENTIAL LEVELS OF RESISTANCE. W. H. Bohl, F. A. Gray, and D. S. Wofford, Plant Science Dept., University of Wyoming, Laramie, WY 82071

The reaction of alfalfa cultivars, varying in resistance to Phytophthora Root Rot (PRR), were tested over 4 years in a field naturally infested with *Phytophthora megasperma* f. sp. *medicaginis*. Cultivars Baker and Vernal, Futura and WL-220, Vancor and WL-312, and Peak and Agate were used for the susceptible (S), low resistance (LR), moderate resistance (MR) and resistant (R) categories, respectively. Total forage yields for each disease category were 30.0 (S), 41.0 (LR), 43.5 (MR), and 46.9 t/ha (R). Initial disease and stand ratings were significantly related to total yield with correlation coefficients of -.51 and .69, respectively. In another experiment, plant mortality was significantly increased in

PRR diseased as compared to healthy plants. Plant losses were observed during the winter months, but not during the growing season.

IMPACT OF THE ROSE BLOOM DISEASE ON GROWTH AND YIELD OF CRANBERRY. P. R. Bristow and G. E. Window, Washington State University, WWREC, Puyallup 98371-4998.

The fungus *Exobasidium oxycocci* causes lateral buds on cranberry uprights to break dormancy and produce abnormal, fleshy, pink-colored branches called "rose blooms". These branches, usually one per infected upright, develop in May and persist through bloom until late June when they shrivel and die. Yield from infected flowering uprights was 36% less than from healthy ones. The loss resulted from a combination of 18% fewer flowers per upright, 18% lower fruit set, and a 7% reduction in berry size. The number of leaves on and the length of new growth of flowering uprights was reduced 22 and 34%, respectively. Growth of non-flowering uprights was reduced 52%. The number of mixed buds set on infected flowering uprights was 27% less than on healthy uprights. The data show that this disease not only reduces yield when rose blooms are present, but also influences next years crop.

OCCURRENCE AND CONTROL OF BENZIMIDAZOLE AND DICARBOXIMIDE RESISTANT *BOTRYTIS* SPP. ON BULB CROPS IN WESTERN WASHINGTON AND OREGON. Gary A Chastagner and Kathy Riley, Washington State University, Puyallup 98371.

In 1986, isolates of *B. elliptica* resistant to benomyl and iprodione were obtained from greenhouse-grown Asiatic lilies where applications of these fungicides failed to control disease development. To determine the prevalence of resistant *Botrytis* spp., samples were collected from field and greenhouse bulb crops in western Washington and the Willamette Valley of Oregon. Forty-three and 87.3% of the *B. elliptica* and 8.3% and 59.3% of the *B. cinerea* isolates obtained from fields and greenhouses, respectively, were resistant to both benomyl and iprodione. Fourteen and 100% of the *B. tulipae* isolates obtained from field and greenhouse tulips, respectively, were resistant to benomyl; none were resistant to iprodione. Applications of anilazine, captafol, chlorothalonil, diniconazole, ferbam, mancozeb, triforine and zineb effectively controlled resistant strains of *B. elliptica* on field-grown lilies.

INHERITANCE OF STRIPE RUST RESISTANCE IN WHEAT CULTIVARS USED TO DIFFERENTIATE RACES OF *PUCCINIA STRIIFORMIS* IN THE UNITED STATES. Xianming Chen, Ronald F. Line, Dept. of Plant Pathol., WA State Univ. and ARS, USDA, Pullman, WA 99164-6430

Inheritance of stripe rust resistance in the 13 U.S. differential cultivars was studied in parental, F1, BC1 and F2 seedlings. The following specific resistance genes were identified: Chinese 166, Yr1, Heines VII, Yr2, and Riebesel 47-51, Yr9, all identical to previous reports; Moro, Lee and Fielder, each with an additional different gene, as well as previously reported Yr10, Yr7 and Yr6, respectively; Druchamp, Yr3a and Yr4b or Yr3b and Yr4a; Stephens, Yr3a and/or Yr4a; Paha, 3 genes including Yr12; Yamhill, Yr2 plus two genes from Alba, its male parent; Lemhi and Tyee, each with one different single gene not previously reported; Produra, two unidentified genes. Yamhill and Heines VII have a common gene with Stephens, probably not Yr2. Both recessive and dominant genes for resistance were identified and various patterns of epistasis were observed.

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POTATO GERMPLASM WITH MULTIPLE RESISTANCE TO MAJOR VIRUSES. D.L. Corsini and J.J. Pavek. USDA/ARS, Univ. of Idaho Res. & Ext. Ctr, Aberdeen, ID 83210.

Potato germplasm (*S. tuberosum* hybrids) with multiple field resistance to major viruses has been identified. Evaluations involved controlled virus transmissions, and use of ELISA to monitor infection. Two clones obtained from seed produced by the Polish Potato Research Institute were shown to remain free of potato viruses S, X, and Y after 5 yr of field testing. Another four clones were shown to remain free of infection by PVX, PVY, and potato leafroll virus (PLRV) after 3 yr of field testing. Of these, one was produced by the Aberdeen breeding program (A78247-17), two by the New York State breeding program (R241-16; R247-1), and one, (PI343201) by the Max Planck Institute. PI343201 has produced adapted progeny with multiple resistance to PVX, PVY, and PLRV. None of the clones evaluated has shown combined field resistance to the common strains of all four major potato viruses.

THE SUPPRESSION OF VERTICILLIUM WILT OF RUSSET BURBANK POTATO: REDUCED *VERTICILLIUM DAHLIAE* IN STEMS AND SOIL WITH OPTIMAL N AND P. J.R. Davis, J.C. Stark, and L.H. Sorensen, University of Idaho Res. & Ext. Center, Aberdeen, ID 83210.

A 3-year field study provided evidence that optimal N and P fertility levels may reduce the incidence of Verticillium wilt in the Russet Burbank potato and suppress the increase of *V. dahliae* populations in soil. During the growing season, the colonization of *V. dahliae* in potato stem tissue was significantly ( $P=0.05$ ) reduced by optimal levels of either N or P. After one season of cropping, the N treatment providing the best fertility level (300 kg N/ha, split-applied) resulted in significantly ( $P=0.01$ ) lower *V. dahliae* cfu in soil than treatments providing less late-season N availability (0 kg N/ha and 300 kg N/ha applied preplant). After two seasons of continuous cropping, high levels (120-240 kg/ha) of P showed lower ( $P=0.01$ ) populations of *V. dahliae* in soil compared to treatment with no added P (6 ppm of residual P in upper 30 cm of soil profile).

EFFECTS OF SOIL FUMIGATION ON POTATO GENOTYPES WITH DIFFERING LEVELS OF RESISTANCE TO VERTICILLIUM WILT. J.R. Davis, S.K. Mohan, and L.H. Sorensen, Univ. of Idaho, Aberdeen, ID 83210.

The effects of soil fumigation (281 L/ha of 74% dichloropropene + 16.5% chloropicrin) on potato genotypes with differing resistance to verticillium wilt were studied. The incidence of wilt and the degree of colonization of potato stems by *Verticillium dahliae* were reduced ( $P < 0.05$ ) with fumigation. The colonization of stem tissue by *V. dahliae* was highly correlated ( $P = < 0.001$ ) with the incidence of wilt. The wilt-susceptible genotypes, Russet Burbank and NDA8694-3, showed yield increases of 17 and 31%, respectively, with fumigation. Although the resistant genotypes, Alpha and A68113-4, showed no evidence of wilt, yields were increased by 16 and 11%, respectively, with fumigation. These results suggest the occurrence of beneficial effects from fumigation that were not related to the reduction of verticillium wilt. Soil assays provided no evidence for the presence of plant-pathogenic nematodes and plant tissue analysis showed no differences in N, P, or K with fumigation.

GERMINATION OF CONIDIA OF *VERTICILLADIELLA WAGENERI* ON ROOT SURFACES. S. Diamandis, L. Epstein, and F.W. Cobb, Jr., Department of Plant Pathology, University of California, Berkeley, CA 94720.

The germination of conidia of the three known variants of *Verticilladiella wagneri* [var. *menziensis* (proposed), *ponderosae*, and *wagneri*], isolated from Douglas-fir, ponderosa pine and pinyon pine, respectively, were studied using epifluorescent, immunofluorescent, and scanning electron microscopy. Conidia of all three variants germinated during the growing season on all three hosts, but only on wounded roots. On both wounded and unwounded roots, 3-8 % of the conidia formed buds. Germination occurred on wounded, succulent, growing root tips to the same extent as on wounded, woody roots. In wounded tissue, more conidia germinated on exposed xylem tracheids than on exposed cortical parenchyma cells. No appressoria were formed within 90 hr.; germings may penetrate indirectly through wounds.

THE RELATIONSHIP BETWEEN EARLYWOOD VESSEL DIAMETER AND DOWNWARD MOVEMENT OF *CERATOCYSTIS ULMI* CONIDIA IN ELMS VARYING IN

RESISTANCE TO DUTCH ELM DISEASE. M. Dietz, USDA-ARS, Cereal Crop Improv. Res. Unit, MSU, Bozeman, MT 59717 and R. Campana, Dept. of Bot. & Pl. Path., UMO, Orono, ME 04469.

Basipetal movement of *Ceratocystis ulmi* conidia was found to be greater in susceptible than in resistant elms (Dietz and Campana 1985, *Phytopath.* 75:624). The relationship between earlywood vessel diameter (EVD) and basipetal movement of *C. ulmi* conidia was evaluated in susceptible (S), intermediate (I) and resistant (R) elm species (*Ulmus americana*; *procera*; *hollandica*; *parvifolia* and *pumila*). Three year old twig samples were cut from 10 trees of each species and sectioned. An image analyzer was used to measure the EVD of vessels located between 2 rays chosen arbitrarily in the last growth ring. EVD's were found to be larger in *americana* (S) and *procera* (I-S) than in *hollandica* (I-R), *parvifolia* (R) and *pumila* (R), suggesting that susceptibility to DED is associated with larger vessels that allow more rapid movement of the pathogen.

CONTROL OF XANTHOMONAS CAMPESTRIS PV. CAMPESTRIS WITH CHLORINE GAS IN NATURALLY INFECTED CRUCIFER SEED LOTS. R. L. Gabrielson, M. L. Derie, and M. Babadoost. Western Washington Research and Extension Center, Puyallup, WA 98371.

Chlorine compounds in various forms have been used to control bacteria in or on seed. A calcium hypochlorite slurry treatment was effective only when seeds were kept in sealed containers following treatment. Chlorine gas was tested as a seed treatment on five crucifer seed lots naturally infected with *Xanthomonas campestris* pv. *campestris*. The pathogen was not detected in any sample exposed to chlorine gas at approximately a 1:1 v/v concentration with air in a sealed desiccator jar for 16 hours at room temperature. The gas treatment was also compared to seven other seed treatments on two infected cauliflower seed lots for control of *X. c.* pv. *campestris*. Chlorine gas controlled the bacterium as well as or better than the other seed treatments, and produced little or no reduction of germination in the seed lots tested.

INFECTION-SPECIFIC dsRNA ASSOCIATED WITH STRAWBERRY CRINKLE VIRUS. R.A. George and R.H. Converse, Dept. of Botany and Plant Pathology, Oregon State University, and USDA-Agricultural Research Service, Corvallis, OR 97331

Strawberry crinkle virus (SCV) isolate C31 from N.W. Frazier, was increased by leaf graft inoculation in *Fragaria vesca semperflorens* cv. Alpine. From four 50-gm frozen infected leaf samples dsRNA was isolated by a modification of the method of Morris and Dodds (*Phytopath.* 69:854) using two passages through CF-11 cellulose columns, DNase and RNase treatment, and 5% polyacrylamide gel electrophoresis (18 hr, 60V, 31mA). The resulting dsRNA bands, stained with ethidium bromide, were compared by planimetry with mycoviral dsRNA standards (Bozarth, *Virology* 80:149) using log transformation and least squares analysis (range of  $r^2=0.987-0.996$ ,  $n=4$ ). Three distinct dsRNA bands occurred in SCV-infected leaves (none in healthy) of  $M_r$  2.1±0.2, 2.3±0.2, and 4.2±0.1 million daltons. To our knowledge, this is the first report of dsRNA associated with this rhabdovirus.

REDUCTION OF UNWANTED B CELL POPULATIONS BY ADSORPTION OR COMPLEMENT-MEDIATED CYTOTOXICITY PRIOR TO ANTI-CAULIFLOWER MOSAIC VIRUS HYBRIDOMA FORMATION. R.A. George, and R.H. Converse, Dept. of Botany and Plant Pathology, and USDA-Agricultural Research Service, Oregon State University, Corvallis, OR 97331.

Standard fusion procedures for developing anti-cauliflower mosaic virus (anti-CaMV) hybridoma clones from mice immunized with CaMV from infected Chinese cabbage leaves resulted in a high percentage of anti-healthy Chinese cabbage (anti-HCC) clones which reduced, by fusion competition and masking, the number of CaMV-positive clones found. Average fusion yield was 12% anti-CaMV and 42% anti-HCC clones. When compared with this standard, complement-mediated cytotoxicity utilizing anti-HCC idotype antibodies or solid-phase immunoadsorption using bound HCC antigen (both employed prior to hybridoma formation) reduced by 66 and 73%, respectively, the unwanted anti-HCC surface immunoglobulin-bearing and immunoglobulin-secreting clones produced. These treatments led respectively to increases of 54 and 73%, compared to the standard method, in the number of desired anti-CaMV clones found during subsequent screening.

PATHOLOGICAL DIFFERENCES OF MELOIDOGYNE HAPLA AND M. CHITWOODII POPULATIONS ON ALFALFA. G. D. Griffin, D. L. Crebs, and M. D. Rumbaugh. USDA-ARS, Forage and Range Research Laboratory. Utah State Univ., Logan, UT 84322-6300.

A study was made to determine the effects of Meloidogyne hapla populations from California, Utah, Washington, and Wyoming on the resistance and susceptibility of Ranger and Nevada Synthetic XX alfalfas. All M. hapla populations significantly ( $P < 0.05$ ) reduced the dry shoot weight of Ranger alfalfa at 15, 20, 25, and 30 C, while the nematode populations differed in their virulence to Nevada Synthetic XX. Greatest nematode reproduction was obtained with the Wyoming and Washington populations on Ranger at 25 C. A greenhouse bench study showed that Nevada Synthetic XX is 100% susceptible to a nematode population from central California, while the percentage of resistance of the alfalfa differed among the other M. hapla populations. A northern California M. chitwoodi population significantly ( $P < 0.05$ ) reduced the dry shoot weight of Ranger and Nevada Synthetic XX alfalfa and reproduced on both cultivars.

**SURVIVAL OF PODOSPHAERA OXYACANTHAE ON SENESCENT CHERRY LEAVES.** G. G. Grove, Washington State University Tree Fruit Research Center, Wenatchee, WA 98801, and R. G. Roberts, USDA-ARS, Tree Fruit Research Laboratory, Wenatchee, WA 98801.

Epidemics of powdery mildew of cherry, (Prunus avium L.), caused by Podosphaera oxycanthae (DC.) de Bary have occurred in Washington in recent years. The pathogen forms globose cleistothecia on infected leaves. On February 7, 1987, senescent cherry leaves (cv. Bing) were collected at random from the floor of an orchard where powdery mildew was prevalent in 1986. Three treatments were applied to potted cherry trees (cv. Bing) by attaching senescent leaves either 1) devoid of mildew signs or 2) with dried mycelium without cleistothecia or 3) with dried mycelium and abundant cleistothecia, to every other internode. Each treatment was applied in a separate, isolated greenhouse room. Circular, chlorotic foliar lesions appeared after 6 wk on trees exposed to cleistothecia. Results indicate overwinter survival of P. oxycanthae as cleistothecia and implicate ascospores as a source of primary inoculum.

**SUCTION TRAPS AND CONCURRENT BIOASSAYS ARE USEFUL IN BYDV MANAGEMENT.** Susan Halbert, Guy Bishop, Richard Johnston, and Larry Sandvol, SW Idaho R/E Center, Parma, ID 83660.

Barley yellow dwarf epidemics recur in S. Idaho contingent upon intensity of vector flights and inoculum pressure. We used suction traps to monitor aphid flights in strategic locations in S. Idaho, and bioassays to measure vector infectivity. Peak flights occurred progressively later in the season at increasing elevations across S. Idaho. Using a threshold of 40 Schizaphis graminum (Rondani)/week/trap, data from trap collections were used to advise growers of safe planting dates for winter wheat. In 3 years of sampling, 6-7% transmission by trap collected fall migrant Rhopalosiphum padi (L.) corresponded with 1-3% transmission by immigrants collected in winter cereal crops. These inoculum levels are apparently insufficient to cause an epidemic given flight intensities observed in the past 3 years.

**FACTORS AFFECTING THE PRODUCTION OF PSEUDOTHECIA OF LEPTOSPHAERIA KORRAE IN VITRO.** William Hammer and Gary Chastagner, Washington State University, Puyallup 98371.

Thirty of 45 Leptosphaeria korrae isolates from Kentucky bluegrass at ten sites in Washington State formed pseudothecia on roots, leaf sheaths and/or seed coats of 'Scaldis' hard fescue seedlings germinated on 2% water agar. Frequency and average number of pseudothecia formed per plate were dependent on the site from which isolates were obtained. Effects of temperature (10, 15, 20, 25 C), light source (dark, cool white, ultraviolet), light intensity (31 to 200  $\mu\text{mol m}^{-2}\text{s}^{-1}$ ) and osmotic potential (-0.6 to -80 bars) on pseudothecia production by selected isolates were studied *in vitro*. Mature pseudothecia were produced at 15, 20, and 25 C; significantly more were formed at 20 C. Pseudothecia were not produced in the dark and no significant difference existed in number of pseudothecia produced under the various light sources and intensities. Pseudothecia were produced only at the highest osmotic potential tested, -0.6 bars.

**BIOLOGICAL CONTROL OF ERGOT AND BLIND SEED DISEASE BY MICROBIAL DECOMPOSITION OF SCLEROTIA STIMULATED BY TREATMENT WITH MONOCARBAMIDE DIHYDROGEN SULFATE.** J.R. Hardison, Dept. Botany and Plant Pathology, Oregon State Univ., Corvallis, OR 97331.

Application of monocarbamide dihydrogen sulfate (N-TAC) at 378 liters concentrate/ha stimulated growth of saprophytic fungi on

sclerotia of Claviceps purpurea (ergot) from Poa pratensis and pseudosclerotia (seed) from Lolium perenne infected with Gloeotinia temulenta (blind seed disease). The resulting decomposition of sclerotia prevented formation of perithecial ascocarps of C. purpurea and apothecia of G. temulenta thereby eliminating ascospore (primary) inoculum of both pathogens. N-TAC is effective by fall application, but immediate contact of the chemical with sclerotia is necessary. Removal of most crop residue before chemical application is essential. Burning straw and stubble in place or straw removal plus flaming are feasible methods for residue removal. Tests are in progress to determine minimum effective dosage, best ratio of chemical components, value of surfactants, and time of application.

**NEMATICIDE TESTS IN THOMPSON SEEDLESS VINEYARDS.** A. R. Harris, Sunraysia Horticultural Research Institute, Trymple, Victoria, 3498, Australia. Present address: Dept. of Plant Pathology, University of California, Davis, CA 95616.

Five nematicides were tested in two established Thompson Seedless vineyards near Mildura, Victoria, Australia over five years. Different formulations, application times and rates were used in four experiments on sands to sandy loams for control of parasitic nematodes and effects on growth and yield of the vines. Only 1,2-dibromo-3-chloropropane (DBCP) consistently reduced soil populations of Meloidogyne javanica (root-knot nematode) and Tylenchulus semipenetrans (citrus nematode), but aldicarb was effective against M. javanica over two years. Fenamiphos reduced numbers of both nematodes in two experiments, but ethoprop did not reduce soil populations of T. semipenetrans. Phytotoxicity symptoms were obvious on oxamyl-treated vines in 1982, and yields and berry acidity were reduced. No non-volatile nematicide increased vine growth or yield, and the fumigant, DBCP, only increased cane growth in vines infested with T. semipenetrans.

**BLUEBERRY RED RINGSPOT VIRUS IS SEROLOGICALLY RELATED TO CAULIFLOWER MOSAIC VIRUS.** R.F. Hepp and R.H. Converse, Fac. Cs. Agropec. y Forestales, Univ. de Concepcion, Chillan, Chile and USDA-Agricultural Research Service, Dept. of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331

A positive serological relationship was established between an isolate of blueberry red ringspot virus (BBRRSV) and the cabbage B strain of cauliflower mosaic virus (CaMV) by enzyme-linked immunosorbent assay (ELISA) and by immunosorbent electron microscopy (ISEM). In reciprocal tests anti-BBRRSV rabbit and mouse immunoglobulins gave positive ELISA absorbance (A405 nm) values with partially purified preparations of both viruses, except when anti CaMV immunoglobulin was used to trap BBRRSV. Homologous and heterologous ISEM decoration was provided by both mouse immunoglobulins for both viruses. These data show that BBRRSV is serologically related to CaMV, the type member of the caulimovirus group.

**TRANSMISSION OF STRAWBERRY MOTTLE VIRUS BETWEEN Chenopodium quinoa AND Fragaria vesca BY APHID AND SAP INOCULATION.** R.F. Hepp and R.H. Converse, Fac. Cs. Agropec. y Forestales, Univ. de Concepcion, Chillan, Chile and USDA-Agricultural Research Service, Dept. of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331.

Strawberry mottle virus (SMV) was reported (N.W. Frazier, Pl. Dis. Repr. 52:64) to be sap- and aphid-transmitted to Chenopodium quinoa (Cq), causing mottling but could not be back-transmitted to Fragaria vesca semperflorans cv Alpine. We repeated Frazier's work but returned SMV from Cq to F. vesca by Chaetosiphon fragaefolii (Cf) aphids in 7% of attempts (2/28 plants). Symptoms in these infected F. vesca plants were like those in the original Alpine source plants. The returned SMV cultures were then transmitted to Alpine and to Cq by Cf, producing typical SMV symptoms in each. Preliminary purification results from SMV-inoculated Cq gave an A256 nm absorbance peak from equilibrium CsCl centrifugation ( $P = 1.35$ ) containing 30 nm viruslike isometric particles that were absent from parallel healthy Cq preparations.

**INFLUENCE OF TEMPERATURE AND PLANT RESIDUES ON PATHOGENICITY OF PYTHIUM SPP. ON WHEAT, BARLEY, PEAS AND LENTILS.** David M. Ingram and R. J. Cook, WSU and USDA-ARS, Pullman, WA 99164.

Pythium ultimum (PU), P. irregulare (PI), P. torulosum (PT), and P. heterothallicum (PH) were compared for pathogenicity using oospores added to steamed Palouse silt loam. At 10-25 C, PU was most pathogenic on wheat, peas, and lentils causing

preemergence seedling blight and stunted seedlings and PI was most pathogenic on barley causing stunted, chlorotic seedlings. At 5 C, PI was most pathogenic on all the crops. PT and PH were weakly pathogenic. Only 9-33% and 13-43% of seedlings emerged, respectively, in soil infested with PU or PI, if the soil was amended with wheat chaff, pea straw or ground oat grains (1% w/w). Leaf lengths of seedlings in residue-amended soil infested with PU and PI averaged 68% and 59%, respectively, of that for seedlings in residue-amended, *Pythium*-free soil. Oatmeal was most stimulatory, followed by pea straw and wheat chaff. Ammonium sulfate did not nullify the stimulatory effect of chaff on the pathogenicity of *Pythium* to wheat.

CONVERSION OF THE ANTIBIOTIC VIRIDIN TO THE PHYTOXIN VIRIDIOL. R. W. Jones and J. G. Hancock, Dept. of Plant Pathology, Univ. of California, Berkeley 94720.

Production of viridin by *Gliocladium virens* occurred during the early log-phase of growth in liquid culture. This was followed by the disappearance of viridin and the appearance of a dihydro-derivative of viridin, identified as viridiol (mw 354).  $C^{14}$  studies indicate that viridiol is derived directly from viridin and that conversion is a cellular process. Reduction of viridin to viridiol occurred on all substrates tested and was dependent only on factors regulating viridin production (nitrogen source and quantity). Conversion of viridin to viridiol was unique to viridin-producing fungi. The spectrum of activity differed between the two compounds. Germination of *Botrytis allii* conidia was prevented by viridin (0.7  $\mu$ g/ml) but was unaffected by viridiol (50  $\mu$ g/ml), however, the phytotoxicity was greater for viridiol than viridin. The implications of this conversion in relation to the use of *G. virens* as a biological control agent will be discussed.

SURVIVAL OF ASCOCHYTA RABIEI IN CHICKPEA DEBRIS. W.J. Kaiser, R.M. Hannan, and A. Trapero-Casas, USDA, ARS, Regional Plant Introduction Station, Washington State Univ., Pullman, WA 99164

Survival of the anamorph of *A. rabiei* and its teleomorph (*Mycosphaerella rabiei*) was studied in field soil, in a weather station shelter (WS) and at 4-6 C and 30%-40% R.H. Naturally infested chickpea pods and stems were placed between two pieces of nylon screen which were incubated on the soil surface or buried 16 cm deep in soil at Pullman, WA. Viability of the pycnidia and pseudothecia was assayed periodically by placing pieces of tissue on acid water agar (AWA) or discharging pseudothecia onto AWA, respectively. Conidia lost viability after 10 wk in stems and 15 wk in pods when buried, but remained viable in pods and stems on the soil surface for 57 and 81 wk, respectively. Conidia were still viable in >90% of the infested debris after 120 wk at 4-6 C and in the WS. Discharge of viable ascospores from pseudothecia ceased after 8 wk when buried 16 cm deep and 27 wk in tissue on the soil surface. Viable ascospores were still being discharged from pseudothecia on stems after 50 wk at 4-6 C and in the WS.

INTERFERENCE BY THE  $Km^r$  GENE ON PLASMID pRK2013 IN SELECTION OF  $Km^r$  TRANSCONJUGANTS IN LOW EFFICIENCY MATINGS WITH *XANTHOMONAS* sp. B122. M.D. KAWALEK, AND N.SCHAAD, DEPT. PSES, U. OF IDAHO, MOSCOW, ID. 83843.

Helper plasmids pRK2073 and pRK2013 were used to mobilize plasmid pMON5003 ( $Km^r, Sm^r, LacY-Z^+$ ) into strain B122 in an attempt to better differentiate it from other strains of *Xanthomonas* in plant tissues. Plasmid pRK2073 mobilized pMON5003 into B122 at a frequency of  $1.6 \times 10^{-7}$  resulting in transconjugants with a  $Km^r, Sm^r, LacY-Z^-$  phenotype, while mobilization by pRK2013 occurred at a frequency of  $4.1 \times 10^{-7}$  producing  $Km^r, Sm^r, LacY-Z^-$  transconjugants. Analyses of plasmid and chromosomal DNA from the transconjugants indicated that the plasmid was transferred by pRK2073, but involved a 11.1Kb deletion which resulted in a  $Lac^-$  phenotype. When pRK2013 was the helper plasmid,  $Km^r$  was conferred only by transposition of the Tn903  $Km^r$  gene present on pRK2013. When using pRK2013 to mobilize  $Km^r$  plasmids, recombinants must be screened to determine if the DNA of interest has been introduced.

PHYTOACTIVE EREMOPHILANES FROM *DRESCHLERA GIGANTEA*. D. Kenfield, F. Sugawara, G. Bunkers, Y. Wu, G. Strobel, Dept. of Pl. Path., MSU, Bozeman, MT 59717 and Y. Fu and J. Clardy, Chem. Dept., Cornell Univ., Ithaca, NY 14853.

*Dreschlera gigantea* is the causative agent of zonate-eyespot disease on numerous grasses. *D. gigantea* produces several

bioactive molecules known as eremophilanes, a chemical class of compounds that are bicyclic sesquiterpenoids having methyl side chains at C<sub>4</sub> and C<sub>5</sub>. We have isolated a number of strictly novel eremophilanes from liquid culture and their structures have been elucidated using conventional spectroscopy and x-ray crystallography analyses. We report the chemical structures and unusual biological activity of these molecules, especially their ability to induce formation of green islands on senescing leaves of monocots, cause root formation in bean hypocotyls and in certain plant tissue cultures and produce localized necrosis in many dicots. These compounds are bioactive in the range of  $10^{-5}$  to  $10^{-6}$ M.

DETECTION OF BEAN COMMON MOSAIC VIRUS (BCMV) IN INDIVIDUAL AND BULKED BEAN SEED SAMPLES. R. E. Klein, S. D. Wyatt, W. J. Kaiser and G. I. Mink. Department of Plant Pathology, Washington State University, Pullman, WA 99164-6430

Techniques to detect seedborne BCMV in individual bean seeds and bulked seed samples were investigated. Preliminary tests using a monoclonal antibody in ELISA and dot immunobinding assay (DIA) indicated ELISA was superior to DIA for detection of BCMV in powdered cotyledons of individual seeds. When ELISA was applied to cotyledon flour from a wide range of bean seed types, a continuous range of absorbance values were observed and individual values clearly indicative of infected seeds were difficult to discern. Subsequent analysis indicated that the probability of a given seed giving rise to an infected plant was directly correlated to its ELISA absorbance intensity. ELISA was then applied to BCMV detection in bulked samples of 6 subsamples of 8 seeds each. The sum of ELISA absorbance values was correlated ( $r=0.91$ ) with BCMV incidence in each seed sample. Application to BCMV testing in a germplasm maintenance program is discussed.

ACCUMULATION OF DEGREE DAYS BY CITRUS SOILS IN WINTER STIMULATES RECOVERY OF SEVERAL TYPES OF PHYTOPHTHORA PARASITICA PROPAGULES. A. Lutz and J. Menge. Dept. of Plant Pathology, University of California, Riverside, CA 92521.

The influence of heat treatments on recovery of *Phytophthora parasitica* propagules was examined in two citrus groves between January and September, 1986. The length of time that soils were exposed to temperatures ranging from 12-32°C was expressed in degree days. The threshold temperature was 12°C, and soils accumulated degree days when exposed to temperatures above 12°C in the laboratory or in the field. Maximum recovery was achieved when winter soils accumulated 100-150 degree days. This occurred in the field during the spring, and coincided with the time when *P. parasitica* populations began to increase. Incubation of summer soils at 32°C for 2-7.5 days increased propagule recovery to a lesser extent. Similar numbers of propagules were recovered from soils exposed to the same number of degree days even when they were subjected to different temperatures. Heat treatment in the laboratory apparently increased the germination of chlamydospores, sporangia and oospores in winter soils.

Effects of Sodium Tetrathiocarbonate (GY-81) on Growth and Sporulation of *Phytophthora citrophthora* and *P. parasitica*. M.E. Matheron and J.C. Matejka. Department of Plant Pathology, University of Arizona, Yuma Mesa Agric. Center, Yuma, AZ 85364.

When diluted in water, sodium tetrathiocarbonate (GY-81) releases carbon disulfide (CS<sub>2</sub>), a known biocide. In vitro tests were initiated to examine the effects of GY-81 on the growth and sporulation of *Phytophthora citrophthora* and *P. parasitica*. No growth occurred when mycelial disks of either pathogen were incubated in 5% V-8 juice containing 1000 ppm CS<sub>2</sub>. Sporangium formation was completely inhibited on citrus leaf disks colonized with *P. citrophthora* or *P. parasitica* and buried in field soil subsequently treated with 64 ppm CS<sub>2</sub>. Zoospores of *P. citrophthora* and *P. parasitica* ceased motility within 6 minutes after being treated with solutions containing 8 and 1 ppm CS<sub>2</sub>, respectively. The results suggest that application of GY-81 as a soil drench could reduce production of secondary inoculum and the rate of dissemination of *P. citrophthora* and *P. parasitica* in soil.

INTERNAL ROOT COLONIZATION AND CHLAMYDOSPORE PRODUCTION BY *THIELAVIOPSIS BASICOLA* IN MATURE PIMA COTTON. P.A. Mauk and R.B. Hine, Dept. Plant Pathology, Univ. Arizona, Tucson 85721.

Pima cotton (*Gossypium barbadense*) was monitored throughout a growing season in a naturally infested field to determine tissue colonization and propagule production by *Thielaviopsis*

*basicola* (=Chalara elegans). Chlamydospores and endoconidia were produced on the exterior of decayed cortical root tissue in all 150 seedlings sampled in April. In August, cortical root tissue of all previously infected plants appeared healthy. However, the fungus was isolated from the internal root tissues from 72 of the 75 plants sampled. At harvest, 53 of the 167 plants sampled had blackened stelar root tissue which contained chlamydospores. Microscopic examination by both bright-field microscopy and SEM indicated that chlamydospores were produced in the pith as well as in the cells of the xylem and the phloem of the root. *L. basicola* was consistently isolated from air dried root tissue containing chlamydospores after 6 months storage at 10 C. Chlamydospores produced in internal root tissue may increase the long term survival of the fungus.

**SURVIVAL OF BOTRYTIS CINEREA IN TWIG CANKERS INITIATED FROM INFECTED MALE INFLORESCENCES OF PISTACHIO.** T. J. Michailides and J. M. Ogawa, Department of Plant Pathology, University of California, Davis, CA 95616.

Twig cankers caused by *Botrytis cinerea* occurred in eleven orchards in male pistachio trees during the wet spring of 1986 in California. These cankers initiated from infected inflorescences, were slightly sunken, dark brown to black in color, and enlarged resulting in shoot girdling and blighting. Both 'Peters' and '02-16' cultivars of male trees were susceptible, however, canker frequency was higher on the '02-16' than on 'Peters'. *B. cinerea* sporulated among the staminate flowers and was recovered from the canker margins throughout the year at a frequency of 12-88%. *Botryosphaeria dothidea* was also isolated from similar cankers consistently after July (up to 42%). Pathogenicity tests demonstrated that both fungi were capable of inciting twig cankers via infected inflorescences. One bloom spray with benomyl (560 g a.i./ha) reduced incidence of *Botrytis* shoot blight by 32-75% compared to unsprayed control.

**PECTIC ENZYME PATTERNS TO IDENTIFY RHIZOCTONIAS INVOLVED IN BARE-PATCH OF CEREALS.** S. M. Neate, A. D. Rovira and R. H. Cruickshank<sup>2</sup>, CSIRO Division of Soils, Adelaide, Australia and <sup>2</sup>University of Tasmania, Hobart, Australia.

*Rhizoctonia solani* AG-8 causes root rot, also known as "bare-patch," in cereals in Australia and the Pacific Northwest, U.S.A. The disease is more severe in crops sown by no-till compared with conventional methods. Pectic enzyme patterns obtained by electrophoresis of culture filtrates on pectin acrylamide gels can be used to distinguish between groups AG-2-1, AG-3, AG-4 and AG-8 of the multinucleate rhizoctonias. The AG-8 group has two subgroups with distinguishable pectic enzyme patterns. This method is faster and less subject to interpretation than anastomosis grouping and could be used as a routine method to identify rhizoctonias associated with bare-patch. This information could assist breeding for resistance and for screening chemicals as potential fungicides.

**COMPARISON BETWEEN TWO SEMISELECTIVE AGAR MEDIA FOR ISOLATING XANTHOMONAS CAMPESTRIS PV. CAROTAE FROM CARROT SEEDS.** OLSEN, J. AND N.W. SCHAAD, UNIV. OF IDAHO, MOSCOW, ID 83843.

Two agar media, MD5 (Plant Disease 69:758-760) and XCS (Phytopathology 74:1142) are available for isolating *X. c. carotae* from carrot seeds. However, no direct comparisons of these media have been made. We report here results of comparing the recovery of 13 strains of *X. c. carotae* and the detection of *X. c. carotae* in six naturally contaminated carrot seed lots. All tests were made in comparison to recoveries (number of cfu/ml) on nutrient agar (NA) or YDC. The recovery of the 13 strains on XCS and MD5 was 95 and 159%, respectively. In contrast, the mean recovery of the pathogen from the six naturally contaminated seed lots was 219% greater on XCS. Seventy-four percent fewer colonies of saprophytic bacteria grew on XCS in comparison to MD5A. The major advantages of XCS over MD5A for isolating *X. c. carotae* from carrot seeds are 1) more rapid growth, 2) larger colonies, 3) fewer saprophytes, and 4) more easily recognizable colonies.

**EFFICACY OF EXPERIMENTAL FUNGICIDE SC-0858 IN CONTROL OF BROWN ROT DISEASES OF STONE FRUITS.** J. M. Osorio, J. M. Ogawa, A. J. Feliciano, and B. T. Manji, Department of Plant Pathology, University of California, Davis, CA 95616.

An experimental fungicide SC-0858 (Stauffer Chemical Company) incorporated in Czapek's medium suppressed mycelial growth

but not spore germination of benomyl-sensitive and -resistant *Monilinia* spp. Sprays (300 µg/ml) at pink bud stage protected anthers and stigmas of Drake almond from *M. laxa* infections when artificial inoculations were made on blossoms opened in the laboratory and afforded effective control of blossom blight in the field under natural disease conditions on Ne Plus Ultra. Preharvest spray treatment of Halloween peach provided 2 wk protection period from *M. fructicola* and suppressed fruit infection even if applied 24 hr after inoculation.

**EDTA TREATMENT INHIBITS BLACK DISCOLORATION ASSOCIATED WITH TRANSIT INJURY OF FRESH PEACHES.** D. J. Phillips, Plant Pathologist, Agricultural Research Service, U.S. Department of Agriculture, Quality Maintenance, Genetics and Transportation Research Unit, Fresno, CA 93727

Black marks on the surface of peaches were associated with rub or abrasion injuries that occurred during the truck transportation of fruit in field bins from orchards to packing sheds. Treatment of the discolored fruit with 0.01 M disodium ethylenediaminetetraacetic acid (EDTA) (pH 3.9) or 0.01 M calcium EDTA (pH 3.5) reduced or eliminated the black color, leaving light brown discolored areas at the injured sites on the fruit surface. Treatment of peach fruit with disodium or calcium EDTA before transit reduced the development of black discoloration less effectively than these treatments applied after transit. EDTA may prevent a chemical that is released by the injury form combining with the anthocyanin pigments in the fruit and, therefore, prevent development of the black discoloration.

**ETIOLOGY OF CANKER AND DIEBACK DISEASES OF SWEET CHERRY IN WASHINGTON STATE.** K. M. Regner, D. A. Johnson and D. C. Gross, Department of Plant Pathology, Washington State University, Pullman, WA 99164-6430

*Cytospora* spp. and wood rotting hymenomycetes were isolated from sweet cherry trees with decline symptoms consisting of dieback, bark cankers and heartwood discoloration. These fungi occurred in the same orchard and sometimes the same tree. *Cytospora* was isolated from 12 of 29 sweet cherry orchards, and one time each from peach and plum orchards, located throughout eastern Washington. Periodic inoculations into 1 and 2-year-old cv. Rainier trees demonstrated that the greatest disease development occurred during the growing season. Two-year-old cv. Rainier trees were generally less susceptible than 1-year-old trees to canker expansion. Hymenomycetes were isolated from mature cherry trees in 6 of 29 orchards, but the sporophore was not usually present. In pathogenicity tests, several hymenomycetes caused heartwood discoloration similar to the characteristic field symptom.

**A POWDER FORMULATION FOR MAXIMIZING SURVIVAL OF PSEUDOMONADS PRIOR TO TREATMENT OF POTATO SEEDPIECES.** D. J. Rhodes and D. C. Gross, Dept. Pl. Path., Wash. State Univ., Pullman, 99164.

Survival of root-colonizing *Pseudomonas* biocontrol agents was poor (10-15% viability) after air-drying in xanthan gum/talc and methylcellulose/talc formulations. In order to enhance viability, a new formulation was developed in which the bacteria were lyophilized. Survival of *P. putida* strain W4P63 approached 100% when the bacteria were suspended in a medium containing 5% m-inositol, 1% sodium glutamate, 0.5% NH<sub>4</sub>Cl and 0.5% sodium ascorbate, followed by addition of 2.5% xanthan gum; the suspension was then freeze-dried and mixed with talc. Populations of pseudomonads in the lyophilized formulation were typically greater than 10<sup>8</sup> cfu/g, exceeding those in xanthan gum/talc by a factor of 10. Enhanced survival was reflected in ten-fold higher populations on seedpieces at planting; rhizosphere populations were 37% to 430% higher three weeks after planting in the greenhouse and 15% to 85% higher after six weeks in the field, depending on the strain.

**GENOTYPIC VARIATION IN SUSCEPTIBILITY OF PISUM SATIVUM TO INFECTION BY AGROBACTERIUM TUMEFACIENS.** Steven L. Robbs,<sup>a</sup> Steven G. Pueppke,<sup>b</sup> and Martha C. Hawes.<sup>a,c</sup> <sup>a</sup>Dept. of Plant Pathology, University of Arizona, Tucson, AZ 85721; <sup>b</sup>Dept. of Plant Pathology, University of Missouri, Columbia; <sup>c</sup>Dept. of Molecular and Cellular Biology, University of Arizona, Tucson.

Ten cultivars of pea (*Pisum sativum*) were tested for their responses to inoculation with *Agrobacterium tumefaciens* strain B6. Three-day-old aseptically germinated seedlings were wounded and immersed for 5 minutes in inoculum (10<sup>8</sup> bacteria

per ml). Two weeks after inoculation, the tumors were excised and weighed. There was a statistically significant reduction in the number of plants infected and in the size of the tumors that developed in two of the ten cultivars tested.

DISSIPATION DYNAMICS OF METHYL BROMIDE IN CALIFORNIA SOILS AS INFLUENCED BY APPLICATION AND EDAPHIC FACTORS. James J. Stapleton and Bert Lear, Department of Plant Pathology, University of California, Davis, CA 95616.

Concentrations of methyl bromide (MB) in the soil atmosphere were monitored by gas chromatography over time and soil depth after commercial application in several California soils. Application variables included dose, injection pattern and depth, and surface sealing method. Edaphic variables included soil type and moisture content. Concentration half-life at soil depths up to 2.74 m occurred within 48 days in each of eight experiments. The time necessary to reach half-life increased directly with soil depth. The effect of soil sealing by polyethylene tarps and mechanical surface compaction on dissipation of MB was minimal. Surface sealing by ca. 5 cm water + polyethylene tarps after MB application at 23 cm depth decreased fumigant dissipation two-fold as compared to the tarps alone. Tarping for 10 days decreased MB dissipation over 3 day tarping only in the upper 30-61 cm soil depth.

GRAMINEOUS HOSTS OF PYRENOPHORA TERES. B. J. Steffenson, M. P. Brown, and R. K. Webster, Department of Plant Pathology, University of California, Davis, CA 95616.

One hundred and seven species representing 16 genera of the Gramineae were tested for their reaction to *Pyrenophora teres*, the causal organism of barley net blotch. In the growth chamber, 35 species were infected by at least one of six California isolates of *P. teres*. Fourteen of the 35 species infected in the growth chamber were also found infected in the field, but most of these grasses had disease severities below one percent. Previously unreported hosts include: *Agropyron ciliare*, *Elymus angustus*, *Hordelymus europaeus*, *Hordeum bogdanii*, *H. violaceum*, *H. roshevitzii*, and *Stipa pulchra*. Based on these tests and the frequency of infection found from survey data, *H. leporinum* is the most significant wild species of epidemiologic importance in California.

EFFECT OF INOCULUM CONCENTRATION, TEMPERATURE AND MOISTURE ON DEVELOPMENT OF ASCOCHYTA BLIGHT OF CHICKPEA. A. Trapero-Casas and W.J. Kaiser, USDA-ARS, Pullman, WA 99164.

The effect of inoculum concentration ( $4 \times 10^4$ ,  $2 \times 10^5$ ,  $10^6$ , and  $10^7$  conidia/mL) on blight development was examined by inoculating four chickpea cvs with four isolates of *Ascochyta rabiei*. With a selected combination of above factors, the effects of temperature (5, 10, 15, 20, 25, 30 and 20-30 C) and wetness duration (0, 3, 6, 12, 24, 48 and 96 hr) were studied. Disease severity (DS) was positively correlated with inoculum concentration, except at higher concentrations, but there was an interaction with cvs. The optimum temperature for infection and disease development was 20 C. At higher or lower temperatures, DS was reduced and latent period was increased; little or no disease occurred at 5 and 30 C, respectively. There was a positive correlation between increase in postinoculation moisture and DS for wetness periods of 12 hr or greater. After shorter wet periods and dry intervals, plants incubated in the greenhouse developed mild symptoms.

A severe outbreak of stem pitting in young trees of sweet cherry. J. K. Uyemoto, C. F. Luhn, and J. A. Griesbach\*,

USDA-ARS, Dept of Plant Pathology and \*Dept of Nematology, University of California, Davis, CA 95616.

In 1986, a 7.3 ha cherry orchard (*Prunus avium* cv. Bing/P. mahaleb) was found to contain young trees (fifth leaf) in various stages of decline (i.e. from a reduction of shoot growth of a single scaffold to tree death). Pits and grooves were found in the woody cylinder of both the scion and rootstock of symptomatic, but not healthy, trees. The orchard contained 48% symptomatic trees and another 15% as replants. Attempts to transmit a virus by expressed sap inoculations of herbaceous hosts or its detection by ELISA (e.g. tomato ringspot virus, TMRSV) failed. Almond and peach trees infected with TMRSV were positive in these tests. Double stranded RNA analysis of diseased cherry leaf tissues were inconclusive. There was no apparent correlation between populations of *Xiphinema americanum* and tree health status. Our results suggest the disease is not *Prunus* stem pitting, but may be sweet cherry stem pitting (JW Hoy, thesis, UCD).

ISOZYME PATTERNS IN ENDOCRONARTIUM HARKNESSII FROM SEVERAL PINE HOSTS AND STANDS IN CALIFORNIA. D. R. Vogler, B. B. Kinloch, F. W. Cobb, Jr., and T. L. Popenuck, University of California, Berkeley, CA 94720.

Spores from single galls of *Endocronartium harknessii* (J. P. Moore) Hiratsuka from native and non-native stands of *Pinus radiata*, *P. muricata*, and *P. coulteri* along 640 km of coastal California were subjected to starch gel electrophoresis to ascertain isozyme banding patterns. Fifteen mg of sieved and air-dried spores of each field isolate were ground in 200  $\mu$ l of 0.1M phosphate buffer (pH 7.5) amended with 2% PVP, 2% PEG, 1% Tween<sup>®</sup> 80, and 0.04% BSA, and the soluble extract separated electrophoretically on four gel-buffer systems (citrate-lithium borate, citrate-sodium borate, citrate, and morpholine citrate). Starch gels were stained for 27 enzymes, of which 19 resolved adequately for interpretation. Regardless of host or stand origin, most fungal enzymes tested were monomorphic.

DOUBLE-STRANDED RNA ISOLATED FROM GRAPEVINE AFFECTED BY GRAPEVINE STEM-PITTING DISEASE. Michael H. Walter and H. Ronald Cameron, Oregon State University, Corvallis, OR 97331.

Dormant cane phloem of grapevines with stem-pitting disease (SP) contains a unique nucleic acid species. The nucleic acid, isolated using cellulose chromatography for dsRNA, is DNase and RNase-resistant and fluoresces green after staining with acridine orange. The dsRNA forms a band at approximately 6 million daltons on 1% agarose gels. Antisera (prepared by Engelbrecht) to grapevine virus "A" does not detect viral antigen in the SP-diseased phloem tissue. The size of the SP-associated dsRNA suggests that it represents the replicative form of a closterovirus, possibly that of grapevine virus "A". The possibility of using dsRNA electrophoretic patterns as a quarantine screening technique is discussed.

Alfalfa Emergence, Nodulation, Plant Density, and Forage Yields as Influenced by Fungicide Seed Treatments. Stanford A. Young and J. Wynn Anderson, Dept. Plant Sci., USU, Logan, UT 84322-4820

Alfalfa seed treatments of Captan, Ridomil, and Thiram (and their combinations) did not significantly ( $p=0.05$ ) affect seedling emergence time or percentage with either raw or inoculated (coated) seed at 4 field locations in Utah in 1983. Due to favorable environment, pathogen pressure at the time of seeding was minimal at all locations. Fungicide treatments reduced nodulation at both locations (1 significantly) where that character was evaluated. Plant density declined as much as 50% from 1983 to 1985, but was not affected by fungicide treatments. Locations with greatest initial stand had the greatest percent decline. Fungicide treatments decreased forage yields when compared to untreated seed at two locations in 1984 and 3 locations (1 significantly) in 1985. The decrease was attributed to reduced nodulation.

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