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ABSTRACTS

EFFECT OF DIVALENT CATIONS ON GERMINATION OF UREDIOSPORES OF UROMYCES PHASEOLI. C. Jacyn Baker, USDA, Beltsville, MD 20705; Norton Mock, Univ. of Del., Newark 19711; and John Melhuish, Jr., USDA, For. Serv., Berea, KY 40403.

Urediospores of U. phaseoli germinate well in cooled, hot tap water but not in deionized or distilled water. Ion-exchange chromatography and inorganic analysis of this water suggested that divalent cations may be essential for germination. Spores were freed of their self-inhibitor by floating a monolayer of spores on distilled water containing 0.005% Tween 20. The solution beneath the spores was removed after 10 min and replaced by fresh solution four times. The washed spores were then transferred to various test solutions in a microtiter plate and incubated overnight in a dew chamber at 18C. It was found that calcium (3 mM), magnesium (2 mM), or manganese (0.4 mM) when added to distilled water would stimulate germination. The addition of EDTA to the cation solution prevented germination, until an excess of a divalent cation was added.

RESISTANCE TO PHYTOPHTHORA CAPSICI IN PEPPER. T. H. Barksdale and G. C. Papavizas, Vegetable Laboratory and Soilborne Diseases Laboratory, respectively, USDA, Beltsville, MD 20705; and S. A. Johnston, Rutgers Agricultural Research and Development Center, Bridgeton, NJ 08302.

Resistance to foliar blight of pepper (Capsicum annuum) caused by Phytophthora capsici was found in several P.I. lines by using a spore suspension as inoculum in a greenhouse test. Two crown-rot resistant cultivars, Fyuco from Argentina and P51 from France, were crossed with the susceptible California Wonder and with each other. Resistance to foliar blight from both sources was controlled by a single dominant gene with modifiers. F_1 progeny of each cross generally was as resistant as the resistant parents. Lines selected for resistance to foliar blight in the greenhouse were usually resistant to crown rot in the field. There was an indication that prolonged incubation periods or very high inoculum concentrations could overcome resistance and result in symptoms on some resistant plants.

DIFFERENTIAL INFECTION OF FORTY SOYBEAN CULTIVARS AND LINES BY FIVE PEANUT MOTTLE VIRUS STRAINS. D. C. Bays and S. A. Tolin, Dept. of Plant Pathology & Physiology, Virginia Polytechnic Institute & State University, Blacksburg, Virginia 24061.

Twelve peanut mottle virus (PMV) isolates have been placed in 5 strain groups (P1-P5) based on symptom expression in the soybean (Glycine max) cultivars Lee 68, York, and Virginia. The type member from each strain group was inoculated to 40 soybean cvs. and lines to determine the range of response to PMV strains. Five reaction classes resulted. All virus strains infected 26 of the cvs. and lines with differing symptom expression. None of the strains infected cvs. Buffalo, CNS, Davis, Haberlandt, Kwanggyo, Peking, and Ware. All strains with the exception of V74S/10B-1 infected cv. Cumberland. Three strains, V74S/473, V79S/20 and V79S/33, infected cv. Virginia. Only one strain, V74S/10B-1, infected cvs. Arksoy, Dorman, Shore, V75-183, and York. These strains can be used in studies to identify PMV resistance genes in soybean.

IMPORTANCE OF HOST RANGE STUDIES IN TAXONOMY OF PERONOSCLEROSPORA FUNGI. M.R. Bonde, and G.L. Peterson. Plant Disease Research Lab., USDA-ARS, P. O. Box 1209, Frederick, MD 21701.

Morphological studies alone have been of limited value in species differentiation of the Peronosclerospora fungi causing downy mildew of maize and sorghum. Host range studies were conducted on two isolates of P. philippinensis from the Philippines, two of P. sacchari from Taiwan, and one each of P. sorghi from Texas (USA) and Thailand. Systemic infection was the criterion for susceptibility. Maize was highly susceptible to all isolates. P. philippinensis and P. sacchari both infected several species of Andropogon, Bothriochloa, and Schizachyrium, but neither isolate of P. sorghi infected species in these genera. P. philippinensis and P. sacchari infected 13-15 accessions of the genus Sorghum; however, the level of infection was generally low. The Texas isolate of P. sorghi was highly virulent on almost every Sorghum accession whereas the Thailand isolate did not infect this genus. These results indicate the utility and necessity of host range studies to aid in delineating the taxonomy of Peronosclerospora spp.

SENSITIVITY OF SCLEROTINIA MINOR FROM PEANUT TO DICLORAN, IPRODIONE AND VINCLOZOLIN. T. B. Brenneman, P. M. Phipps and R. J. Stipes, Dept. of Plant Path. & Physiol., VPI & SU, Blacksburg, VA 24061.

Five isolates of Sclerotinia minor from different peanut fields in Virginia were tested for sensitivity to dicloran, vinclozolin and iprodione. Linear extension of mycelia was measured on glucose-yeast extract agar amended with the fungicides. Levels of inhibition calculated from dosage-response data were plotted on logarithmic-probability paper and regression equations used to determine ED_{50} values. Although ED_{50} values for isolates were variable, there was a consistent relationship in sensitivity to the three fungicides. The mean ED_{50} values for linear extension inhibition in vitro were 0.07, 0.11, and 0.91 µg/ml for vinclozolin, iprodione and dicloran, respectively. Nine strains of S. minor with tolerance to one or more dicloronitroaniline fungicides were obtained during in vitro tests. Tolerant strains were capable of growth at fungicide concentrations of 100 µg/ml, and were pathogenic to peanut in growth chamber tests.

WATERMELON MOSAIC VIRUS CAUSES A SERIOUS DISEASE OF PUMPKIN IN SOUTHWESTERN VIRGINIA. F. J. Butterfield, S. A. Tolin and R. C. Lambe. Dept. of Plant Pathology & Physiology, Virginia Polytechnic Institute & State University, Blacksburg, VA 24061.

Pumpkin plants (Cucurbita mixta Pang. [C. argyrosperma Hort.] 'Howden') with severely malformed fruits showing tumour-like protrusions were observed in many fields in Carroll County, Virginia in 1982. Leaves on these plants had a mosaic pattern and were blistered and stunted. A virus was mechanically transmitted from Howden to 'Small Sugar' pumpkin on which it was then maintained. The host range includes several cucurbit species and suggests the virus is watermelon mosaic virus (WMV) 1 or WMV 2. Seeds collected from diseased pumpkin fruits were smaller and showed reduced germination; those seedlings which grew showed no symptoms. Electron micrographs of leaf dips and thin sections of leaf tissue gave evidence of potyvirus-like flexuous rods and pinwheel inclusion bodies respectively. In SDS immunodiffusion tests the pumpkin virus reacted with antisera to WMV 2 but not to WMV 1.

CYTOLOGICAL INVESTIGATIONS OF CHLAMYDOSPORES OF TRICHODERMA SPP. S. D. Cohen, J. A. Lewis, G. C. Papavizas and G. A. Bean. USDA, ARS, Beltsville, MD 20705 and Dept. of Botany, Univ. of Maryland, College Park, MD 20742.

Examination of cytological and morphological characteristics of resting spores of Trichoderma suggests a similarity to other fungal chlamydospores. All resting spores of isolates of T. viride, T. harzianum and T. hamatum were 5-10 times larger (6-12 µm) than conidia. Intercalary or terminal development of resting spores on hyphae was observed in solid or liquid media. Resting spores produced thick cell walls (1 µm) in all conditions tested. Large lipid nutrient reserves were observed in chlamydospores and were verified by staining with the lipid dye Sudan Black. Mithramycin, a nuclear dye, stained one nucleus in conidia and two to four nuclei in the resting spores. Features of resting spores of Trichoderma including spore size, thickened cell wall, lipid contents of cytoplasm, multinucleate condition, and process of morphological development, indicate their similarity to other fungal chlamydospores.

COMPARATIVE STUDIES OF TWO VECTOR BIOTYPES AND TWO STRAINS OF SOYBEAN DWARF VIRUS. Vernon D. Damsteegt, Plant Disease Research Laboratory, USDA-ARS, P.O. Box 1209, Frederick, MD 21701.

A California biotype of Acyrthosiphon solani (foxglove aphid) transmitted both the dwarfing and yellowing strains of soybean dwarf virus, currently not known to be present in the U.S. However, in comparative studies the Japanese biotype was a more efficient vector than the California biotype, especially of the yellowing strain. Japanese aphids readily feed and colonize on soybean while the California biotype will colonize soybean but more readily colonizes leaf lettuce and other hosts. Soybeans exhibit a yellow phytotoxic spotting at the feeding site of the Japanese aphid but no spotting occurs at feeding sites of the endemic aphid. The Japanese biotype generally feeds on the upper epicotyl or unifoliolates of soybean seedlings while the California biotype feeds on the base of the epicotyl or the undersurface of the cotyledons. Japanese aphids are more prolific and larger than the endemic biotype. The presence of a vector in the U.S. for soybean dwarf virus increases the potential threat of this pathogen.

NET BLOTCH EPIDEMICS ON WINTER BARLEY IN THE FALL AS INFLUENCED BY PLANTING DATE. L. M. Delserone, J. A. Frank, and H. Cole, Jr., Dept. of Plant Pathology and USDA-ARS, Center for Cereals Research, The Pennsylvania State University, University Park, PA 16802

The winter barley cultivar Pennrad was planted at Rock Springs, PA on 14, 20, and 27 Sept. 1982. The earliest date is the recommended planting date for winter barley in central PA. Plants were removed from the field and evaluated in the laboratory for net blotch severity (James scale) on 18 Oct. 1982. This procedure was repeated on 26 Oct., 7 Nov., and 9 Dec. 1982 in order to evaluate disease progress. There was a strong positive correlation between the disease level on the main plant and the first tiller. There were significant differences in disease severity between planting dates on the main plant and the first tiller, as well as a significant increase in disease severity for each planting date over time. These same trends were not evident on the second and third tillers. In general, disease severity was greatest on the earliest planted plots and the oldest leaves.

INFLUENCE OF KLEBSIELLA OXYTOCA ON DEVELOPMENT OF SYNNEMATA OF CERATOCYSTIS ULMI ON ELM WOOD. M.E. Dietz, and R.J. Campana, Department of Botany and Plant Pathology, University of Maine, Orono, ME 04469.

Antagonism of Ceratocystis ulmi by native elm microflora in vitro stimulated a study to evaluate the influence of a wetwood bacterium, Klebsiella oxytoca, on development of synnemata on elm wood. Seventy sterilized elm discs were dipped in water suspensions of C. ulmi plus K. oxytoca. Spore numbers of C. ulmi (50,000 sp/ml) were held constant but numbers of K. oxytoca cells were varied ($1x10^1$-$1x10^7$/ml). Additional discs were used as controls, 10 exposed only to C. ulmi and 35 only to K. oxytoca. Data were obtained on frequency of synnemata/mm^2 for one week. Numbers of synnemata on the discs exposed to mixed suspensions with highest concentrations of K. oxytoca were significantly lower ($p=.01$) after 24 hours than on those exposed to C. ulmi only, but not after one day. The data suggest that K. oxytoca delays but does not prevent development of C. ulmi in elm.

PRODUCTION AND FORMULATION OF TWO BIOLOGICAL CONTROL AGENTS FROM LIQUID FERMENTATION. M. T. Dunn, Univ. of Maryland, College Park, MD 20742, J. A. Lewis and G. C. Papavizas, USDA, ARS, BARC, Beltsville, MD 20705.

Large batch production of the biocontrol agents Talaromyces flavus and Trichoderma hamatum was performed by liquid fermentation in 20 L vessels. The system simulated industrial conditions by utilizing commercially available ingredients consisting of molasses plus either dried brewers yeast, cottonseed flour, or corn steep liquor. After 5 days of growth in molasses-yeast medium with aeration, T. flavus produced a mass (120 g dry wt/15 L) consisting of hyphae. The air-dried mats were ground and mixed (25% by wt) with the commercially available carrier Pyrax® (pyrophyllite). The formulated product contained 10^4 propagules/g. T. hamatum, grown initially in a 1-L fermentor containing molasses-yeast medium yielded a 7-8 g dry wt mat composed of hyphae and chlamydospores. Mixed with Pyrax® (10% by wt), the formulation contained 10^7 propagules/g. Addition of NaCl or $CaCl_2$ to the various media did not stimulate conidial production. Survival of both organisms in the Pyrax® formulations was monitored over time, with approximately 90% of the propagules remaining viable after one month.

RESISTANCE TO PSEUDOMONAS SYRINGAE PV. GLYCINEA, D. J. Fieldhouse, D. A. Burbage and M. Sasser, Department of Plant Science, University of Delaware, Newark, DE 19711.

Eight isolates of Pseudomonas syringae pv. glycinea, the causal organism of bacterial blight of soybean, were obtained from leaves and seeds of the Delaware-introduced cultivar Ware. These isolates were obtained by means of a technique involving the use of a selective medium, BANQ, devised in Delaware for the identification and quantification of this bacterium. The isolates, similar in host range, do not fit any previously described race designation. The relative pathogenicity of the isolates on 30 selected cultivars clearly shows that a high level of resistance to this possibly new race of Pseudomonas syringae pv. glycinea is present among the standard and experimental cultivars grown in and for this area. A cropping schedule to reduce this soil-borne as well as seed-borne disease might then include selected resistant cultivars in a rotation with or without other agronomic crops along with the use of seed free from this pathogen.

IN VITRO TWIG ASSAY WITH PHYTOPHTHORA SPECIES ON PEACH. Suzanne E. Flores and D. F. Hindal, Dept. of Plant Pathology, West Virginia University, Morgantown, WV 26506.

In a survey to determine whether Phytophthora species were associated with declining peach trees in West Virginia, Phytophthora cactorum and P. cinnamomi were isolated from necrotic root tissue. The pathogenicity of these fungi was tested on peach varieties Redhaven and Glohaven using the excised twig assay. Twig segments were placed vertically into jars with a lima bean extract and Benomyl (20 mg/l) agar medium, on which P. cactorum and P. cinnamomi had grown for 3-5 days. After 7 days of incubation at 25°C, the periderm on the shoots was removed and the length of necrosis determined. Phytophthora cactorum caused longer lesions on Redhaven and Glohaven twigs than P. cinnamomi. This laboratory method may provide a rapid and inexpensive method to test pathogenicity of Phytophthora species on peach varieties.

COMPATABILITY OF THE ANTAGONIST TALAROMYCES FLAVUS WITH POTATO-SEED-PIECE FUNGICIDES. D. R. Fravel*, J. J. Marois#, M. T. Dunn*, and G. C. Papavizas#. *Univ. of Maryland, College Park, MD 20742, and #USDA, ARS, Beltsville, MD 20705.

Ascospores or conidia of a wild-type or a benomyl-resistant isolate of T. flavus, both antagonistic to Verticillium, were suspended in Pyrax® (pyrophyllite). Potato seed pieces were treated with the spore preparations and captan, maneb, mancozeb, polyram, or thiabendazole (TBZ) at recommended rates. Potatoes were planted in the field, recovered after 19, 35, or 54 days, and populations of T. flavus in soil adhering to the seed pieces were determined using a medium selective for T. flavus. For all sampling dates ascospore preparations of both isolates were generally more compatible with all fungicides than the conidial preparations. After 54 days rhizosphere populations in the TBZ + wild type ascospore treatment were not different from those with the wild type ascospore alone. For the benomyl resistant isolate, after 54 days the polyram +

ascospore, TBZ + ascospore, mancozeb + ascospore, and conidia alone treatments had significantly higher rhizosphere populations than the treatment with ascospores alone.

INFECTIVITY OF SYLVAN SPAWN® IN TWO PENNSYLVANIA CONIFER NURSERIES. J. M. Genua, W. Merrill, and L. C. Schisler, 211 Buckhout Laboratory, The Pennsylvania State University, University Park, PA 16802.

Infectivity of Sylvan Spawn® was tested in two conifer nurseries in Pennsylvania. Spawn inocula, of the ectomycorrhizal fungi, Cenococcum graniforme, Hebeloma crustuliniforme, Laccaria laccata, and Pisolithus tinctorius were incorporated at a rate of 100 ml per 0.3 m^2 prior to seeding. After 4 months, Laccaria laccata established mycorrhizal relationships with Douglas-fir, red pine and Scotch pine and Hebeloma crustuliniforme colonized Douglas-fir. Laccaria sp. was isolated from Douglas-fir (30% recovery), red pine (14%), and Scotch pine (5%) seedlings. The percentage of feeder roots colonized varied from 10 to 80% depending on the host-fungus combination. No mycorrhizal feeder roots were observed on inoculated Colorado blue spruce, Norway spruce, Black Hills white spruce, eastern white pine, southwestern white pine or on trees in any of the check plots.

EFFECTS OF ROOT KNOT NEMATODE ON BACTERIAL WILT OF TOMATO. R.W. Goth, Vegetable Laboratory, ARS, USDA, Beltsville, MD 20705; K.V. Peter, Kerala Agricultural University, Vellinakkara, Kerala, India; R.M. Sayre, Nematology Laboratory, ARS, USDA, Beltsville, MD 20705; R.E. Webb, Chief, Vegetable Laboratory, ARS, USDA, Beltsville, MD 20705.

Eight isolates of Pseudomonas solanacearum (race 1) from diverse geographic locations were used to study the bacterial wilt resistance of selected tomato, Lycopersicon esculentum, cultivars, and breeding lines. Line CL-32d-0-1-19GS from AVRDC in Taiwan was resistant to 3 isolates, and the cultivar Venus was resistant to 1 isolate. Bacterial wilt resistance was broken down when root knot nematode, Meloidogyne incognita, larvae were added at a rate of 100 per 10 cm pot at the time of inoculation with the respective bacterial isolates. These results suggest that M. incognita should be considered as a factor in the development of bacterial wilt resistant tomato germplasm.

EVALUATION OF TOMATO LINES FOR RESISTANCE TO PHYTOPHTHORA INFESTANS. R.W. Goth, Vegetable Laboratory, ARS, USDA, Beltsville, MD 20705; K.V. Peter, Kerala Agricultural University, Vellanikkara, Kerala, India; R.E. Webb, Chief, Vegetable Laboratory, ARS, USDA, Beltsville, MD 20705.

Eleven tomato (Lycopersicon esculentum) cultivars and breeding lines were evaluated for reactions to tomato race 0, tomato race 1 and potato race 1234 of Phytophthora infestans. Immune to tomato race 0 were Pusa Ruby, WV 36, WV 63, and WV 700. WV 36, WV 63, WV 106, and WV 700 had multigenic resistance to tomato race 1. Pusa Ruby was the most resistant to race 1. Lines resistant to potato race 1234 were Pusa Ruby, WV 63, WV 106, WV 700. Those tomato entries susceptible to all the P. infestans isolates used were Better Boy VFN, Pik-Red, Rutgers, Success, and CL-32d-0-1-19GS from AVRDC in Taiwan. These results suggest that Pusa Ruby is a source of germplasm for additional resistance to P. infestans tomato race 0 and race 1. Potato race 1234 is similar to tomato race 0 except that it infects WV 36 which is immune to race 0.

EFFECTS OF AIR POLLUTANT AND SOIL MOISTURE STRESS INTERACTIONS ON SOYBEAN YIELDS. H.E. Heggestad, J.H. Bennett, and T.J. Gish, U.S. Dept. of Agriculture, Beltsville, MD 20705.

Effects of ozone (O_3), sulfur dioxide (SO_2) and soil moisture stress on the yields of two soybean (Glycine max) cultivars, 'Williams' and 'Forrest', were studied in open-top field chambers. The plants were exposed to combinations of these stresses on 79 days between July 8 and Oct. 1, 1982. Treatments were: charcoal-filtered (CF) and nonfiltered (NF) air; NF + 0.03, + 0.06, and + 0.09 ppm O_3; and 0.0, 0.03, and 0.10 ppm SO_2 (a 3x5 factorial). Ozone was added 7 hrs/day (0900-1600 EST) and SO_2 added for 4 hrs/day (0900-1300 EST) except on days with rain. Each air pollutant treatment was conducted at two soil moisture potential levels (Ψ= -0.5 and -2.6 bars). A negative linear regression on soybean yields was observed with increasing O_3 concentration for plots with low soil moisture stress, Ψ= -0.5 bars. No yield reduction was noted at the more negative Ψ for plants in CF chambers. In chambers with NF air water stress interacted with ambient O_3 to reduce yields about 30%. SO_2 in combination with O_3 increased yield losses.

DETECTION OF DOUBLE-STRANDED RNA IN AGGRESSIVE AND NON-AGGRESSIVE STRAINS OF CERATOCYSTIS ULMI. J.G. Hoch, R.J. Campana, and S.M. Tavantzis, Department of Botany and Plant Pathology, University of Maine, Orono, ME 04469.

Induced hypovirulence in Endothia parasitica is attributed to presence of dsRNA. Association by others of dsRNA in strains of C. ulmi with low pathogenicity suggested a similar role in reduced virulence, but this has not been confirmed. A study was initiated to elucidate further the role of dsRNA species in aggressive (A) and non-aggressive (NA) isolates of C. ulmi. Thirty isolates were tested for dsRNA using phenol extraction and cellulose CF-11 chromatography. Treatments with DNase and RNase (in 0.3 M NaCl) were followed by polyacrylamide gel electrophoresis. A and NA isolates of C. ulmi contained 1 to 3 dsRNA species per isolate. Molecular weights of individual species varied from 1.4-3.0 x 10^6 daltons. Preliminary results suggest a possible correlation of specific dsRNA segments with non-aggressiveness, but more data are needed for the establishment of a positive relationship.

VERTICICLADIELLA PROCERA ON PINUS SYLVESTRIS CHRISTMAS TREES. W. E. Horner and S. A. Alexander, Dept. of Plant Path. & Physiol., VPI & SU, Blacksburg, VA 24061.

Symptoms and patterns of disease development observed on Pinus sylvestris were found to differ from those associated with P. strobus. Eight trees exhibiting foliar symptoms were compared with eight symptomless trees. Length of shoot elongation was measured and isolations made for Verticicladiella procera. Trees showing foliar symptoms had significantly reduced shoot elongation. V. procera was isolated from all trees including the symptomless trees. Longitudinal sections at groundline, revealed that colonized stems were girdled, apparently by V. procera. Unlike P. strobus where infected trees produce symptoms shortly after infection, P. sylvestris may be infected for months or years before showing any foliar symptoms.

THE INTERACTION OF TWO STRAINS OF BARLEY STRIPE MOSAIC VIRUS IN BARLEY. P. L. Hunst and R. G. Timian. USDA, ARS, Dept. Plant Pathology, North Dakota State Univ., Fargo, ND 58105.

Barley stripe mosaic virus (BSMV) strains CV 52 (ND 18) and CV 42 (ND 159) are closely related serologically and cross-protect in reciprocal tests on barley, but differ in severity of symptoms on barley, ability to infect Chenopodium amaranticolor or Statesville oats, and in electrophoretic RNA profile. Inocula of the two strains were mixed, mechanically inoculated to and passed successively in Black Hulless barley in two separate trials. Infection of oats, a property of CV 42, was not detected after the 4th or the 7th passage. However, in both trials RNA from virus purified at the 6th passage had a profile similar to CV 42 RNA. Lesions on C. amaranticolor, a property of CV 52, were not produced after the 4th passage in one trial but persisted in the other. Severe mosaic symptoms in barley, characteristic of CV 52, persisted through the 6th and 9th passage, respectively. Virus from the mixtures reacted with antisera to both strains. Results suggest that a variant of BSMV arose from one or both of the parental strains.

EFFECT OF POTTING MEDIUM AND PHYTOPHTHORA CONTROL AGENTS ON SURVIVAL OF PHYTOPHTHORA CINNAMOMI AND ROOT ROT DEVELOPMENT IN AZALEAS. S. Kularatne, W. H. Witts and R. C. Lambe, Dept. of Plant Path. & Physiol., VPI & SU, Blacksburg, VA 24061.

Seventy-five rooted cuttings of azalea cv. Hershey Red were planted in: pine bark (PB); PB plus 10% peat (PM); PB, PM and expanded shale (3M); and PB plus topsoil (TS), in 475 cc pots. Fifteen plants in each medium received Truban®, Subdue®, or Aliette®, drenched at recommended rates, or the fungal antagonist Mortierella alpina (MA), drenched as a 25 ml mycelial suspension of 10 day old, V-8 broth culture per pot. Each pot was inoculated with a single Phytophthora cinnamomi (PC)-colonized oat grain 5 cm below the media surface. After four mo, roots were rated for rot and plated for PC. No significant control was obtained with MA, and PC was recovered from all plants treated with MA and from the controls. Subdue and Aliette gave almost

complete control in all media. Control with Truban was comparable to that with Aliette and Subdue in PB and TS, but much less in media containing peat. Reduction in inoculum of PC showed a pattern similar to root rot ratings.

PREDICTING THE COLONIZATION OF HETEROBASIDION ANNOSUM IN LOBLOLLY PINE. T. Kurdyla and S. A. Alexander, Dept. of Plant Path. & Physiol., VPI & SU, Blacksburg, VA 24061.

Models were developed for predicting colonization levels of Heterobasidion annosum in the root systems of Pinus taeda. Above-ground tree measurements and 0.03m^3 soil-root samples (6/plot) were taken from four plots in each of two thinned plantations. Eighty-six plot trees were excavated and root system colonization levels were determined. Using multiple regression analysis, two and three variable models were developed which predicted root system colonization levels. Measurements of stem diameter, radial growth over the last 5 y were used for the two variable model. The 0.03m^3 soil-root sample was included with diameter and radial growth to build the three variable model. Both models were significant at $P \leq 0.001$, with R^2 values of 0.93 and 0.95, respectively.

ERWINIA AMYLOVORA MUTANTS AND TRANSCONJUGANTS RESISTANT TO OXYTETRACYCLINE. G. H. Lacy, N. P. Cannon and V. K. Stromberg, Dept. of Plant Path. & Physiol., VPI & SU, Blacksburg, VA 24061.

Spontaneous mutants of E. amylovora resistant to oxytetracycline (OTC) were selected on media containing 1.6 but not 12.7 µg OTC/ml at frequencies of $< 6 \times 10^{-8}$cfu. Selection from these mutants yielded second-step mutants at 25.4 but not 102 µg OTC/ml at $< 4 \times 10^{-8}$cfu. Erwinia herbicola and Pseudomonas syringae pv. syringae donors (D) of plasmid RP1 (Amp^r, Kan^r, Tet^r) formed transconjugants (T) with E. amylovora in Pyrus communis 'Bartlett' blossoms at 1×10^{-8} to 3×10^{-1} T/D. The T strains were resistant to > 406 µg OTC/ml. During pathogenesis, RP1 was lost from > 99.9% of the bacteria recovered. The possibility that resistance may interfere with OTC chemotherapy of fire blight is considered.

CONTROL OF SNAPBEAN DISEASES CAUSED BY PYTHIUM AND RHIZOCTONIA WITH AN INTEGRATED APPROACH. J. A. Lewis, R. D. Lumsden, G. C. Papavizas, USDA, ARS, Beltsville, MD 20705 and J. G. Kantzes, Univ. of Maryland, College Park, MD 20742.

An integrated control approach incorporating cultural, chemical, and biological components was studied over a 4-yr period to reduce damping-off, blight, and root rot of snapbeans in a Salisbury, MD field. The major control component was cultural and consisted of plowing (20-25 cm) infested soil rather than disking (5-7 cm) before planting. Plowing alone generally increased plant stand and vine weight and increased pod weight 100, 66, 43, and 54% in each of the 4 yr. Chemical seed treatment with metalaxyl also increased plant stand and weight but the magnitude of the increase was not as great as that achieved with plowing. In 3 out of 4 yr, use of plowing in association with seed treatment gave a greater yield than that attained when each component was used individually. Preparations of biocontrol agents (species of Trichoderma, Laetisaria, Farrowia, Fusarium, Talaromyces, Pseudomonas) added in-furrow or to seed did not reduce disease when used individually or in combination with the other methods.

A NEW APPROACH TO INDUCE PROLIFERATION OF INTRODUCED TRICHODERMA SPP. IN SOIL. J. A. Lewis and G. C. Papavizas. USDA, ARS, Beltsville, MD 20705.

The inability to stimulate the production of large numbers of an antagonist in a natural ecosystem is a major factor inhibiting the exploitation of effective Trichoderma spp. for practical control of soilborne plant pathogens. In this study, a sand-bran medium inoculated with a T. viride isolate (T-1-R4) to provide 1×10^4 conidia/g of bran was added to nonsterile field soils after 1, 3, 8, and 16 days of incubation. Amendment with a 3-day old preparation to provide 0.1% bran and 1×10^3 colony-forming units (CFU) resulted in a population of 4×10^7 and 2×10^8 CFU/g of soil after 1 and 3 weeks, respectively (40,000 and 200,000-fold increase). The magnitude of proliferation declined using older preparations of inoculum. Trichoderma populations did not increase with any combination of nutrients, including bran, when nongerminated conidia were used. The results suggest that pregermination of conidia and the physiological age of the inoculum are critical for establishment and proliferation of introduced antagonists in soils.

EFFECT ON RESPIRATION OF ADDITION OF FUNGAL SPORES TO SOIL. J. J. Marois and D. R. Fravel, Soilborne Diseases Laboratory, USDA, ARS, Beltsville, MD 20705 and Dept. of Botany, Univ. of Maryland, College Park, MD 20742.

Spores from isolates of Trichoderma viride, T. harzianum, Fusarium oxysporum, Penicillium funiculosum, Aspergillus ochraceous, Talaromyces flavus, and Verticillium dahliae were suspended in distilled water and added to soil at 10^3 spores/g of soil dry weight. Soil respiration rates were monitored by an alkaline trap after addition of spores to soil. Soils were maintained at 10% moisture. T. flavus was the only species that consistently increased soil respiration in natural soils, from 5-20% depending on the type and condition of the soil. T. flavus was also the only species that increased (from 5 to 10 fold) in population density in natural soils. When soils were air-dried for 2 days and then rewetted to 10% moisture, the T. flavus-infested soils had the highest respiration rates. Most of the species tested increased soil respiration rates and their population densities increased when added to methyl bromide-chloropicrin or steam treated soils.

EFFECT OF DEW TEMPERATURE, DURATION, AND FREQUENCY ON LESION DEVELOPMENT ON 'WAYNE' SOYBEAN INOCULATED WITH PHAKOPSORA PACHYRHIZI, THE CAUSE OF SOYBEAN RUST. J.S. Melching, USDA-ARS, Plant Dis. Res. Lab., P. O. Box 1209, Frederick, MD 21701.

Soybeans ('Wayne') inoculated with uredospores of Phakopsora pachyrhizi Sydow, then immediately provided a single dew period, required a minimum of 6-7 hr of dew at the most favorable temperatures (17-21 C) for subsequent lesion development. Temperatures of 9 and 26 C were the limits beyond which no lesions developed at dew periods up to 16 hr. At these limiting temperatures, disease establishment required 12 hr or more of dew, and the numbers of lesions produced were 0.1% as many as at 17-21 C. Spores on leaves subjected to sub-minimal dew periods at 18-22 C, followed by drying for 1-4 days before a second dew period of 16 hr, produced 20-50% as many lesions as spores given only the 16-hr period. Dry spores on leaves for one week in the greenhouse caused lesions when 12-16 hr of dew were provided, but their infectiousness was only 0.5%, or less, of that of spores provided with dew 1 hr after inoculation.

EFFECT OF INOCULUM DENSITY ON LESION DEVELOPMENT IN 'WAYNE' SOYBEAN INOCULATED WITH PHAKOPSORA PACHYRHIZI, THE CAUSE OF SOYBEAN RUST. J. S. Melching, USDA-ARS, Plant Disease Research Laboratory, P. O. Box 1209, Frederick, MD 21701.

Soybeans ('Wayne') were quantitatively inoculated with airborne uredospores of Phakopsora pachyrhizi, incubated at 20 C for 16 hr in dew chambers, and then held in the greenhouse until lesions developed. Among 12 separate studies, the numbers of spores/cm^2 of leaf tissue required to produce one lesion varied from 11 to 113; the average value was 42. Increasing numbers of spores were required to produce one macroscopic lesion as inoculum density increased from 200 to 2400 spores/cm^2, but a directly proportional relationship was found at densities of 15-200 spores/cm^2. No interaction between spore concentration and germinability was noted on agar or on leaf surfaces over the range 5-2400 spores/cm^2. These studies of uredospore "infection efficiency" and its variation under defined conditions provide quantitative data required for the development of reliable mathematical models of soybean rust epidemics.

OCCURRENCE OF WHITE PINE ROOT DECLINE IN WEST VIRGINIA. G. J. Meyer, Jr., D. F. Hindal, and D. O. Quinn, West Virginia University, Morgantown, WV 26506.

White pine root decline, caused by Verticicladiella procera, was first reported on white pines in West Virginia in 1967. By 1979 it had been reported in 15 widely scattered counties. A statewide survey was conducted in 1980 and 1981 to determine the current distribution of the disease. To facilitate the survey, a slide-cassette, two-projector dissolve program was produced and shown to County Extension Agents, Christmas tree growers, Golf Course Supts., Depts. of Agriculture, Natural Resources and Forestry, etc., to create an awareness of the problem. As a result the disease was positively identified on white pine in seven new counties and from additional sites in six previously infected counties. The disease has now been found in natural sites, Christmas tree plantations, and landscape and soil conservation white pine plantings in 22 counties. It has not been determined whether this disease is an endemic problem for which a greater awareness has developed, or is posing a new threat to white pine in West Virginia.

POLYACRYLAMIDE GEL ELECTROPHORESIS OF SIX MORPHOLOGICAL GROUPS OF ENDOTHIA PARASITICA. J. A. Micales, R. L. Willey, R. J. Stipes, D. F. Hindal and W. L. MacDonald. Dept. Plant Pathology and Physiology, VPI & SU, Blacksburg, VA 24061; Dept. Plant Science, West Virginia University, Morgantown, WV 26506.

Six different colony morphologies of Endothia parasitica were recovered from cankers on American chestnut (Castanea dentata) induced by hypovirulent and virulent strains of the fungus. The soluble mycelial proteins of isolates representing these different morphological groups were compared by polyacrylamide gel electrophoresis (PAGE) in a nondissociating, discontinuous system. Protein patterns varied among the different colony types, but did not exceed intraspecific variation associated with isolates of the common morphology recovered from naturally occurring cankers. PAGE can not be used reliably to distinguish or to identify these different morphological types.

A DIALLEL ANALYSIS OF THE INHERITANCE OF RESISTANCE TO TOMATO ANTHRACNOSE CAUSED BY COLLETOTRICHUM DEMATIUM. Anita N. Miller and Timothy Ng, Department of Horticulture, University of Maryland, College Park, MD 20742, and T. H. Barksdale, Vegetable Laboratory, USDA, Beltsville, MD 20705.

Six parents were used in a half diallel analysis to determine the inheritance of resistance to tomato anthracnose caused by Colletotrichum dematium. There were no significant differences between selected reciprocal crosses. All possible crosses, excluding reciprocals, were planted in 1982 at two locations, Beltsville and Salisbury, MD, in a randomized complete block design. A bulk of 20 fruit per plot was placed in a shaded greenhouse and puncture inoculated with a spore suspension containing about 9.6×10^6 spores/ml. Lesion diameters were measured 6 days later. Combined data over locations indicated significant general and specific combining abilities. Narrow sense heritability was 70%. Variances and covariances plotted by Hayman's graphic analysis indicated incomplete dominance.

CROSS PROTECTION STUDIES WITH TOMATO ASPERMY VIRUS. H. E. Moline and Joseph Kuti, USDA, ARS, HSI, Hort. Crops Quality Lab, Beltsville, MD 20705

Cross protection studies showed that a mild strain of Tomato Aspermy Virus (TAV) has the potential to protect inoculated tomato seedlings against infection by a severe TAV strain. Inoculation of 30 tomato selections with this TAV strain produced only mild symptoms that were masked by the time infected plants began fruiting. Rutgers seedlings inoculated with the mild TAV strain and challenged with the type strain of TAV (ATCC# PV127) at seven days after inoculation, fourteen days after inoculation, and twenty-one days after inoculation exhibited symptoms varying from severe to mild. Complete protection was achieved when twenty-one days had elapsed between the initial inoculation with the mild strain and the challenge inoculation with the severe strain. Yield trials conducted in field plots showed that plants inoculated with the mild TAV strain had total yields comparable to noninoculated plots; however, ripening of inoculated plants appeared to be delayed slightly.

SUPPRESSION OF DAMPING-OFF AND BLIGHT OF SNAPBEAN CAUSED BY SCLEROTIUM ROLFSII USING TRICHODERMA SPP. AND GLIOCLADIUM VIRENS. G. C. Papavizas and J. A. Lewis. USDA, ARS, Beltsville, MD 20705.

Two hundred fifty wild strains of Trichoderma hamatum, T. harzianum, T. viride and Gliocladium virens and 34 mutants of T. harzianum and T. viride were assayed for their ability to suppress damping-off and blight of snapbean caused by Sclerotium rolfsii. Conidia of the antagonists produced on V8-juice agar were added to S. rolfsii-infested soil at 6×10^5 conidia per g of soil without a food base. Seeds of snapbeans (cv. Blue Lake) were planted 1 wk after addition of the antagonists to soil. Plants were evaluated for damping-off and blight 6 wk after planting. Five strains of T. harzianum, two strains of T. hamatum, one strain of G. virens and one mutant of T. hamatum reduced the disease 40 to 90% depending on the strains of the antagonist and pathogen used. The extent of biological control also depended on the inoculum density of the pathogen and antagonists. Chlamydospores and mycelial fragments containing chlamydospores of T. hamatum were as effective in suppressing S. rolfsii as conidial preparations.

INFLUENCE OF ROW SPACING, PLANT POPULATION, AND CULTIVAR ON INCIDENCE OF SCLEROTINIA BLIGHT OF SOYBEAN. P. M. Phipps, Tidewater Res. Ctr., VPI&SU, Suffolk, VA 23437.

Essex and Forrest soybean were grown in plots (1.8 x 10.7 m) with rows spaced 25 and 76 cm apart. Incidence of Sclerotinia blight, caused by Sclerotinia sclerotiorum and S. minor, was determined at harvest. S. sclerotiorum accounted for ca 70 percent of visible infections. Apothecia of only S. sclerotiorum were found in high numbers beneath areas shaded by dense foliage. Stem lesions were frequently up to 20 cm above the soil line indicating infection by ascospores. Essex yielded 2628 and 2191 kg/ha, and Forrest yielded 2830 and 2373 kg/ha in 25 and 76 cm rows, respectively. Infection centers of Sclerotinia blight/plot averaged 2.5 and 1.7 in Essex and 22.1 and 15.9 in Forrest planted to 25 and 76 cm rows, respectively. As planting rates increased from 2 to 6 seed/30 cm in 25 cm rows and from 6 to 12 seed/30 cm in 76 cm rows, disease incidence tended to increase. Results suggest that soybean cultivars with dense foliage (i.e. Forrest) planted in high populations may result in increased incidence of Sclerotinia blight.

GENETICS OF REACTION TO MAIZE DWARF MOSAIC VIRUS STRAIN A IN FOUR RESISTANT CORN INBRED LINES. C. W. Roane, S. A. Tolin and H. S. Aycock, Dept. of Plant Path. & Physiol., and Dept. of Agron., VPI & SU, Blacksburg, VA 24061.

High degrees of resistance to maize dwarf mosaic virus strain A (MDMV-A) occur in corn inbred lines B68, Oh1EP, Oh7B and Va 85. When these inbreds were crossed with the highly susceptible inbred line Va50 and their F_1 and F_2 progenies were inoculated with MDMV-A, all F_1 plants were resistant and F_2 progenies segregated into resistant and susceptible classes consistent with the hypothesis that a single dominant gene conditions resistance in each inbred. When the following crosses were made, no susceptible segregates appeared in the F_2: B68 X Oh7B, Va85 X Oh7B, Va85 X B68, and Oh1EP X B68. We conclude that each of the resistant inbred lines has a single dominant gene conditioning resistance and that the genes are allelic. This greatly facilitates transfer of MDMV-A resistance in breeding programs.

GENETICS OF REACTION OF FIVE SOYBEAN CULTIVARS TO PEANUT MOTTLE VIRUS. C. W. Roane, S. A. Tolin and G. R. Buss, Dept. of Plant Path. & Physiol., & Dept. of Agron., VPI & SU, Blacksburg, VA 24061.

A study was undertaken to clarify the relations among genes for peanut mottle virus (PMV) resistance present in the three closely related soybean [Glycine max (L.) Merr.] cultivars 'Arksoy', 'Dorman' and 'York', and two unrelated cultivars 'CNS' and 'Shore'. Parental and progeny plants at the V2-3 stage were inoculated with the PMV isolate V74S. From the data obtained, it was determined that Arksoy, Dorman, York and Shore have genes at a common locus. Progenies segregated into dihybrid ratios when CNS was crossed with Dorman, Shore or York. Genes in Dorman and 'Peking' have previously been labeled Rpv and rpv_2, respectively. It was, therefore, concluded that Rpv occurs also in Arksoy, Shore, and York and that the gene in CNS is at a third locus.

NEW GRASS HOSTS OF POLYMYXA GRAMINIS IN VIRGINIA. M. K. Roane and C. W. Roane, Dept. of Plant Path. & Physiol., VPI & SU, Blacksburg, VA 24061.

Polymyxa graminis Led., a root parasite of barley (Hordeum vulgare L.), oats (Avena sativa L.), rye (Secale cereallis L.) and wheat (Triticum aestivum L.), has been found in seven Virginia counties on barley, rye, wheat, corn (Zea mays L.), reed fescue (Festuca arundinacea Schreb.) and bermudagrass (Cynodon dactylon (L.) Pers.). The fungus is a vector of wheat spindle streak virus (WSSMV) and wheat soil-borne mosaic virus (WSBMV) and has been found in roots of oats infected with oat soil-borne mosaic virus (OSBMV). The occurrence of P. graminis in Hanover, Richmond and Westmoreland counties is important since wheat with WSMBV had previously been found there. The significance of corn as a host is emphasized by the occurrence of WSBMV on both corn and wheat. This is the first report of P. graminis on corn, bermudagrass and reed fescue.

EVIDENCE FOR INVOLVEMENT OF ACTIVE OXYGEN IN TOBACCO RESISTANCE TO A BACTERIAL PATHOGEN. M. A. Roy and M. Sasser, University of DE, Newark, DE 19711.

Selected enzymes and compounds known to degrade or 'trap'

superoxide, singlet oxygen, triplet oxygen or hydroxyl radicals were used to determine the possible involvement of active oxygen in plant disease resistance. The compounds were added to inocula of Pseudomonas syringae pv. syringae (10^4 cfu/ml final concentration in $CaCO_3$ buffer) immediately prior to injection into the non-host plant Nicotiana tabacum 'MD 201'. Bacterial populations were monitored by reisolation. Superoxide dismutase (dismutes superoxide), β-carotene (singlet trap), sodium ascorbate (antioxidant) and sodium linoleate caused increases in bacterial population levels when compared to the control. Cystamine (free radical trap) did not affect bacterial populations. Results suggest that inhibition of bacterial growth in an incompatible host plant involves some forms of active oxygen.

RESISTANCE TO BROWN ROT (MONILINIA FRUCTICOLA) IN SWEET CHERRY (PRUNUS AVIUM L.). Ralph Scorza and Lenard Gilreath, USDA, Appalachian Fruit Research Station, Kearneysville, WV 25430.

Fruit were collected from 12 cultivars of sweet cherry in an unsprayed orchard. Fruit were exposed to each of 3 treatments: unwashed; washed and inoculated with 10^5 spores/ml of Monilinia fructicola; and washed, wounded and inoculated. Disease severity was rated following 3 days in a moist chamber. Unwounded fruit exhibited a wide range in infection severity varying from 55% of 'Kaiserien Eugenie' fruit uninfected, to 83% of 'Lambert' and 90% of 'Liefeld's Braune' completely rotted. All wounded fruit were severely infected. While resistance to brown rot is larely dependent upon the integrity of the epidermis, variation in infection of unwounded fruits suggests that some property of the epidermis itself may also be responsible for infection severity. Cultures of M. fructicola spores on cherry juice or cherry epidermis agar did not suggest the presence of a water soluble fungal growth inhibitor or promoter in fruit of the cultivars tested. Susceptibility was not associated with brix.

EFFECTS OF SOIL-APPLIED CADMIUM ON NEMATODE POPULATIONS WITHIN AN EXPERIMENTAL ORCHARD. L. J. Slana and R. F. Korcak. USDA, Appalachian Fruit Research Station, Kearneysville, WV 25430, and Fruit Research Laboratory, BARC, Beltsville, MD 20705.

In February 1981, a cadmium chloride solution ($CdCl_2$) was incorporated into the upper 15 cm of a Galestown sandy loam soil at Beltsville, MD, at rates of 0, 5 and 10 ppm. Two months later apple, peach, pear, and plum were planted in this soil using a randomized complete block with 4 replications. In August 1982, 120 soil samples were taken and nematodes extracted, counted and identified. Correlation coefficients indicated Tylenchus and Paratylenchus populations, which were sporadically found throughout the test site, did not correlate with Cd concentrations. More uniformly occurring populations of Aphelenchoides, Dorylaimus and saprophytic spp. correlated with Cd concs.; 5 ppm Cd slightly decreased nematode numbers, while 10 ppm decreased nematode numbers by 23-30%. Results indicated that Aphelenchoides and saprophytic spp. were the most frequently found nematodes within the orchard and nematode populations were decreased by application of inorganic cadmium.

OPTIMIZING INFECTION BY BIPOLARIS SOROKINIANA, DRECHSLERA TERES, RHYNCHOSPORIUM SECALIS, AND SEPTORIA NODORUM. J. R. Tomerlin, USDA, Field Crops Laboratory, PGGI, BARC, Beltsville, MD 20705.

Pathogens causing blotches and blights, such as B. sorokiniana, D. teres, and R. secalis on barley, and S. nodorum on wheat, often exhibit inconsistent disease reactions under different inoculation conditions. A factorial experiment was conducted to determine what effect treatment with a growth regulator (GR), length of time in a moist chamber (MC), application of a light oil to the foliage (O), addition of a surfactant to the inoculum (S), and a drying period after inoculation but before placement in the MC (DP), had on disease development. Reaction was rated on a 0 (immune) to 9 (susceptible) scale. In general, disease ratings were greater on plants left longer in the MC, on plants treated with GR, on plants sprayed with oil before inoculation, on plants using inoculum with S, and on plants not subjected to a DP. However, GR decreased disease ratings with R. secalis. The O by S and MC by S interactions were significant in some experiments. Adjusting inoculation procedures should result in more efficient use of inoculum and more consistent results.

EFFECTS OF METALAXYL ON ULTRASTRUCTURE AND SPORULATION OF PERONOSPORA TABACINA INFECTING TOBACCO. R. N. Trigiano, C. G. Van Dyke and H. W. Spurr, Jr., Department of Plant Pathology and USDA,ARS, North Carolina State University, Raleigh, NC 27650.

Sporulation by P. tabacina measured 48 h after soil drench application of metalaxyl to infected tobacco plants was reduced to 5% of that on untreated plants. Sporangiophore development was incomplete and sporangial morphology was abnormal on treated plants. Ultrastructural changes in the fungus were evident 24 h after treatment. Haustorial mother cells (intercellular hyphae) and haustoria were highly vacuolated or necrotic and nuclei were condensed. In infected, untreated plants 94% of the haustoria were encased by a single layer of amorphous, moderately electron-dense apposition material; 6% were encased in two layers of apposition material. In infected, metalaxyl treated plants 25% of the haustoria were encased in bilayered appositions. The second layer of encasement consisted of host wall-like and membrane-like portions and was separated from the inner amorphous layer by a membrane.

INFECTION AND COLONIZATION OF TOBACCO CALLUS CELLS BY PERONOSPORA TABACINA. R. N. Trigiano, C. G. Van Dyke, H. W. Spurr, Jr. and D. J. Gray. Department of Plant Pathology and ARS,USDA North Carolina State University, Raleigh, NC 27650.

The infection and colonization of susceptible tobacco callus cells inoculated with sporangia of P. tabacina was studied using light, scanning and transmission electron microscopy. Germ tubes usually exceeded 50 μm and often grew in contact with the host cell wall for considerable distances. Prior to host cell penetration, the apex of most germ tubes expanded to form well-defined, bulbous appressorium-like structures. Host cells were invaded by either intracellular hyphae or haustoria. Intracellular hyphae exhibited indeterminate growth and were surrounded by an electron-dense matrix. Haustoria were also surrounded by an electron-dense matrix but, in addition, were encased in callose-like material. Haustoria observed in callus cells were similar in dimensions and morphology to haustoria in intact leaf cells. A scanty mycelium developed on the surface of the callus culture ten days after inoculation, but declined so that after 20 days only a few hyphal cells remained.

EUROPEAN RUST FUNGI PATHOGENIC TO COLLECTIONS OF LEAFY SPURGE FROM THE UNITED STATES. S.K. Turner, W.L. Bruckart, USDA-ARS, Plant Dis. Res. Lab., Frederick, MD 21701 and P.K. Fay, Plant & Soil Sci., Montana State Univ., Bozeman, MT 59717.

Twenty-one isolates of rust fungi (18 Melampsora spp., 3 Uromyces spp.) were collected in 1982 from five species of Euphorbia in Switzerland, Austria, Hungary, and Romania. Four of these isolates of Melampsora have been maintained under greenhouse conditions for several generations. One of these isolates caused infection of E. esula-virgata from Montana, Michigan, Minnesota, New Jersey, and Nevada. Another isolate infected both E. esula-virgata and E. cyparissias from Iowa, Maryland, Montana, and Nevada. Infection of several U.S. collections of leafy spurge by these European pathogens provides a basis for optimism that rust fungi may be used for biocontrol of this noxious weed.

OCCURRENCE OF FIRE BLIGHT IN COMMERCIAL PEAR SEEDLING ROOTSTOCKS FOLLOWING BUDDING WITH SYMPTOMLESS SCIONWOOD. T. van der Zwet, USDA, Appalachian Fruit Research Station, Kearneysville, WV 25430.

Approximately 600 seedlings in a commercial nursery were budded in early August with apparently healthy scionwood collected from 'Starkrimson' trees severely affected with fire blight. Budwood was collected from an apparently healthy tree and at distances of 2.5 - 30.0 cm and 1.0 - 1.8 m away from blighted branches on diseased trees. Following surface sterilization in 1% sodium hypocholorite for 3 min., equal portions of the budwood from each source were either treated by thermotherapy (50° C for 15 min.), the removed bud dipped for 1 min. in 100 ppm streptomcyin, or were left untreated. In early December, three seedlings in the nursery with buds from untreated, symptomless scionwood from blighted trees were found seriously blighted. Though rare, the spread of endophytic E. amylovora from symptomless, surface sterilized branches to commercial rootstock may have serious implications in the fruit tree nursery trade.

EFFECT OF PLANT HEIGHT AND ERWINIA AMYLOVORA INOCULUM CONCENTRATION ON FIRE BLIGHT INFECTION IN PEAR SEEDLINGS.

T. van der Zwet and R. L. Bell, USDA, Appalachian Fruit Research Station, Kearneysville, WV 25430.

Approximately 400 seedlings from 5 controlled crosses were divided into groups of short (mean 32.4 cm) and tall (mean 50.9 cm) plants. One half of each group was artificially inoculated with a suspension of E. amylovora at 10^3 cell/ml and the other half with 10^6 cell/ml. Each plant was injected by hypodermic needle with approximately .005 ml of inoculum. The higher inoculum concentration resulted in almost twice the incidence of blight (71% versus 39% of plants blighted) and a slight but non-significant increase in the absolute length and percent of plant blighted. Absolute length of blighted terminals was not affected by plant height but the same amount of blight (approx. 11 cm) represented significantly more of the smaller plants (34% versus 21%). Absolute length of blighted shoot may be a better measure of plant resistance than percent of plant blighted, at least in pear seedlings more than 25 cm tall.

Errata
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Two abstracts by A. Hagan and P. O. Larsen were inadvertently omitted from the abstracts of papers presented at the 1981 Annual Meeting of The American Phytopathological Society, which were published in the August 1981 issue.

DIURNAL AND SEASONAL PERIODICITY OF AIRBORNE DRECHSLERA POAE CONIDIA OVER KENTUCKY BLUEGRASS. Austin Hagan, Auburn University, AL 36849 and P. O. Larsen, Ohio State University, Columbus, OH 43210

Airborne Drechslera poae conidia were collected over Kentucky bluegrass with a Kramer-Collins intermittant spore trap and a Burkard 7 day continuous spore trap in 1979 and 1980. Relative humidity, rainfall, and leaf wetness were recorded from April to November. Peak concentrations of airborne D. poae were observed in late May and June. Infrequently, moderate releases of conidia were observed in April or early May. Very few conidia were trapped from July to November. The diurnal discharge of D. poae conidia which peaked between 1200 to 1400 hours coincided with abrupt decreases in the moisture levels in the turf microclimate. Few conidia were collected in the late evening or early morning. Negligible releases of conidia were noted during periods of prolonged leaf wetness or high relative humidity.

POPULATIONS OF DRECHSLERA POAE CONIDIA IN KENTUCKY BLUEGRASS THATCH AND LEAF LITTER. Austin Hagan, Auburn University, AL 36849 and P. O. Larsen, Ohio State University, Columbus, OH 43210

Populations of Drechslera poae conidia in the thatch and leaf litter of Kentucky bluegrass turf were monitored in 1979 and 1980 using a modified mineral oil flotation technique. Thatch samples were collected bi-weekly from March 26 to November 21, 1979 and March 17 to July 10, 1980 from a $95m^2$ Kentucky bluegrass plot. Leaf litter samples were collected from the same plot between August 16 to November 21, 1979 and March 15 to July 10, 1980. Results indicate that the leaf litter and not the thatch is the primary source of inoculum. Peak populations of 400 to 700 conidia/g dry weight leaf litter occurred in May and June when the mean thatch temperatures ranged from 9 to 18 C. Conidium populations were not detectable as leaf litter temperatures exceeded 20 C in July and remained so throughout the summer and fall. No more than 35 conidia/g dry weight thatch were detected in 1979 and 1980 in any thatch sample.

Volume 73, Number 4, 1983

On page 580, in the article entitled "Association of *Pseudomonas syringae* pv. *lachrymans* and Other Bacterial Pathogens with Roots" by C. Leben, in the right column footnote b of Table 2 should have read:

[b]"Wet" = <-0.1 bar; "moderately wet" = -0.1 bar. See text.