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ABSTRACTS

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EFFECT OF CHEMICAL PROTECTANTS IN REDUCING THE INCIDENCE OF SCLEROTINIA MINOR IN PEANUT SEED. Carolyn Bowen, H. A. Melouk, and K. E. Jackson. Department of Plant Pathology and USDA-ARS, Oklahoma State Univ., Stillwater, OK 74078-9947.

Chemical protectants, individually or in combination, including captan, dicloran, carboxin, PCNB, dithiocarbamate, and thiophanate-methyl were applied at 113.5 g/45.5 kg of Sclerotinia minor-infected peanut seed. One week after incubation at 22 C, treated seeds were agitated for one min in a 0.2% solution of liquid detergent and rinsed twice in deionized water. Seeds were blotted between cheesecloth, plated onto potato dextrose agar containing 100 ug/ml streptomycin sulfate, and incubated at 25 C in darkness for two weeks. Seed positive for S. minor ranged from 0.0% to 0.56% for treated seeds. Seed positive for talcum treated controls was 3.68%. S. minor was not detected in seed treated with thiophanate-methyl.

ACREMONIUM COENOPHIALUM INFESTATION LEVELS OF TALL FESCUE SEED LOTS AFFECT SEEDLING LOSSES DUE TO RHIZOCTONIA SPP. C.A. Blank, K.D. Gwinn and A.M. Gavin. Univ. Tenn., Knoxville, TN 37901-1071.

Effects of Acremonium coenophialum infestation levels on losses due to Rhizoctonia spp. were investigated in greenhouse experiments. Seed lots with varying infestation levels were planted (10 g/flat) in Promix® or Promix® amended with R. solani or R. zeae; numbers of seedlings/5 cm- diam. core were counted. Seed lots grown in Rhizoctonia-amended Promix® had significantly lower mean number of seedlings/core than corresponding controls. In all experiments, mean number of seedlings/core in Rhizoctonia-amended Promix® was lowest for seed lots with low A. coenophialum infestation levels. Thus, seed lots with high A. coenophialum levels may be desirable for planting in Rhizoctonia-infested soils.

EFFECTS OF THREE DIFFERENT EPIDEMICS OF SOUTHERN STEM ROT ON POD YIELDS OF FLORUNNER AND SOUTHERN RUNNER PEANUT. T. B. Brenneman, Dept. of Plant Pathology, Coastal Plain Experiment Station, University of Georgia, Tifton, GA 31793.

Stem rot susceptible Florunner (FR) and partially resistant Southern Runner (SR) peanut were grown two years in a field with a high population of Sclerotium rolfsii. Nontreated, PCNB (5.6 kg/ha) and flutolanil (2.2 kg/ha) treated plots had a mean disease incidence for both varieties of 35.1, 28.4 and 10.4 percent infected row, respectively, and yields were 3451, 3751 and 4687 kg/ha, respectively. SR had less disease than FR in 1989 but not in 1990. Linear regression demonstrated the relationship between yield (YLD) and disease incidence (DI) for FR to be YLD = 4374 - 38.4(DI) and YLD = 5519 - 53.3(DI) in 1989 and 1990, respectively, and for SR to be YLD = 4950 - 46.2(DI) and YLD = 5481 - 45.3(DI) in 1989 and 1990, respectively. Slope values indicate that similar DI results in similar yield loss for FR and SR.

INFLUENCE OF MICROCLIMATES WITHIN CANOPIES OF CORNUS FLORIDA ON SEVERITY OF DOGWOOD ANTHRACNOSE. Dan O. Chellemi and Kerry O. Britton. USDA Forest Service, Southeastern Forest Experiment Station, Athens, GA 30602.

Incidence and severity of dogwood anthracnose within the interior and exterior canopies of partially exposed dogwood (Cornus florida) trees and canopies of understory trees were recorded over a 53-day period during the summer of 1990. Concurrent measurements of vapor pressure deficit (VPD), temperature, evaporative potential, and photosynthetically active radiation (PAR, 400-700 mm) within the various canopies were also recorded. Disease severity was significantly different in all three canopies with the lowest severity in exterior canopies of partially exposed trees and the greatest in canopies of understory trees. Evaporative potential, quantified through use of atmometers, consistently distinguished the canopy microclimates. Severity of dogwood anthracnose was greater in canopies associated with low levels of evaporative potential and decreased as the corresponding level of evaporative potential increased.

TECHNIQUE FOR INOCULATING TOBACCO WITH PHYTOPHTHORA PARASITICA VAR. NICOTIANAE. A. S. Csinos and J. W. Hendrix, Departments of Plant Pathology, Coastal Plain Experiment Station, Tifton, GA and University of Kentucky, Lexington, KY, respectively.

Although typical infection of tobacco (Nicotiana tabacum L.) by P. parasitica var. nicotianae (Ppn) initiates on the roots and colonizes the lower stem, soil infestation techniques are inconsistent. Inoculation of tobacco stems with Ppn has been effective for both determining fungal pathogenesis and race determination. A technique was developed to quickly and successfully inoculate tobacco seedlings. Round toothpicks were autoclaved in potato dextrose agar (PDA), aseptically placed on petri plates containing V-8 agar and infested with the test isolate. The isolates are allowed to grow over the toothpicks on the plate for 7-10 days. Tobacco seedlings 6-8 wks old, having stem diameters of about 7 mm were inoculated by pushing the Ppn toothpick culture into the lower stem. Non-infested toothpicks pushed into tobacco stems did not cause symptoms that can be confused with tobacco black shank.

ASSOCIATION OF TOMATO SPOTTED WILT VIRUS WITH GENERAL CHLOROSIS AND ROOT NECROSIS IN PEANUT. A. K. Culbreath, A. S. Csinos, T. B. Brenneman, J. W. Demski, and J. W. Todd. Dept. of Plant Pathology and Dept. of Entomology, University of Georgia, Coastal Plain Experiment Station, Tifton, GA 31793

Twenty to 30 peanut (Arachis hypogaea) plants showing general chlorosis of foliage and root necrosis were collected from four locations in 1989 and two locations in 1990. Root and foliar tissue from each plant was assayed for tomato spotted wilt virus

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(TSWV) ("L" strain) by ELISA. Root tissue was plated on PDA for detection of fungal pathogens. Positive tests for TSWV were obtained for 92, 70, 92 and 88 % of the root samples and 0, 0, 32 and 8 % of the foliage samples from the respective locations in 1989. A Fusarium sp. was recovered from 60, 56, 64 and 96 % of the root samples from those respective sites. TSWV was detected in 90 and 75 % of the root samples and 23 and 10 % of foliage samples from the two sites in 1990. Fusarium sp. was isolated from 61 and 75 % of roots of samples from those plants. No other pathogen was consistantly isolated in 1989 or 1990.

EFFECT OF FREE-AIR CARBON DIOXIDE ENRICHMENT ON RHIZOCTONIA SOLANI AND ASSOCIATED MICROBIOTA IN COTTON RHIZOSPHERE. E.A. Curl[1], H.H. Rogers[2], B.E. Helms[1], and S.A. Prior[2], [1]Department of Plant Pathology, and [2]USDA-ARS National Soil Dynamics Laboratory, Auburn University, AL 36849.

Relative Rhizoctonia solani infestation, along with general microflora and fauna populations, were assessed for cotton-rhizosphere soil samples from the 1990 USDA FACE experiment at the Maricopa Agricultural Center in Arizona. Treatments were ambient CO_2 (C=control, 350 ppm) and elevated CO_2 (F=fumigated, 700 ppm) with two subplots wet (W) and dry (D). Whereas plant-growth was enhanced under elevated CO_2, the rhizosphere microbiota generally showed a negative response. Rhizoctonia infestation declined 8.3% in FW plots and by 25% in FD plots. Bacterial populations, including streptomycetes, were reduced 50% in FW and 30% in FD plots. Fungi (cfu/g soil dry wt) declined 50% and 24% in FW and FD treatments, respectively. Populations of microarthropods (Collembola and Acari) were low, but showed a consistent negative response to the elevated CO_2 environment.

ULTRASTRUCTURAL LOCALIZATION OF PHENOLS IN PECAN INFECTED WITH CLADOSPORIUM CARYIGENUM. S. V. Diehl and C. H. Graves, Dept. of Plant Pathology and Weed Science, Mississippi State University, Mississippi State, MS 39762.

Scab-infected and non-infected leaves and nuts from resistant Stuart and susceptible Schley pecan cultivars were compared for ultrastructural localization of phenols. Two glutaraldehyde fixation methods (with and without caffeine) were evaluated for their ability to localize phenols within pecan leaves using transmission electron microscopy. Phenol distribution within vacuoles of pecan leaves varied depending upon the fixation method used. Fixation without caffeine was more reliable for comparing phenolic compounds among different tissues. Greater amounts of phenols were found in infected tissues than in non-infected tissues. Leaves of Stuart pecan contained more phenols than Schley. No difference in phenol content were found in Stuart and Schley nut husks.

COMPARISON OF RHIZOCTONIA ZEAE ISOLATES FROM TURFGRASS IN OHIO AND SOUTHERN FLORIDA. M. L. Elliott, University of Florida, Fort Lauderdale Research & Education Center, 3205 College Ave., Fort Lauderdale, FL 33314

Six Rhizoctonia zeae isolates from southern Florida, five from bermudagrass and one from an unknown turfgrass host, were compared with seven R. zeae isolates from Ohio, one from bentgrass and six from a bluegrass/ryegrass mixture, for in vitro growth response to four different temperatures, 20, 25, 30 and 35 C. Growth of mycelia was measured on PDA with 100 ug/ml streptomycin after three days incubation. The best growth response for all isolates was observed at 30 C with 40 mm radial mycelial growth. The majority of isolates grew slightly slower at 35 C. Growth of all isolates was reduced by 25-50% at 25 C while growth at 20 C was reduced by 75%, as compared to growth at 30 C. In general, all isolates responded similarly to the four temperatures evaluated, despite the differences in their geographic origin and turfgrass host.

EFFECT OF TRIADIMENOL SEED TREATMENT AND TIMING OF TRIADIMEFON SPRAYS ON POWDERY MILDEW, LEAF RUST AND YIELD OF WINTER WHEAT. K. L. Everts and S. Leath, USDA-ARS, Department of Plant Pathology, North Carolina State University, Raleigh 27695-7616.

Powdery mildew (PM) and leaf rust (LR) cause yield losses in wheat in North Carolina, but onset and maximum severity of PM occur earlier in the season than that of LR. The effect of triadimenol seed treatment and timing of triadimefon sprays on severity of PM and LR and yield was examined on three winter wheat cv. Saluda, Coker 983 and Florida 302, at two locations in 1989-90. Where PM was severe, a spray at growth stage 8 (Feekes' scale) increased grain yield (kg/ha) of Saluda and kernel weight (kw) of both Saluda and Coker 983 over unsprayed plots. Where LR was most severe, a spray at growth stage 9 increased kw of Saluda and Florida 302 and yield of Coker 983 over unsprayed plots. Seed treatment delayed the onset of PM, so foliar fungicide applications after growth stage 8 may be more effective in reducing both PM and LR and in increasing yield.

EFFECT OF SURFACTANTS AND WHEAT LEAF LEACHATE ON PRODUCTION, GERMINATION, AND INFECTIVITY OF SEPTORIA TRITICI CONIDIA. A. Farih, F. J. Gough, R. M. Hunger, and J. R. Montana. USDA-ARS, and Department of Plant Pathology, Oklahoma State University, Stillwater, OK 74078-9947.

Tween 20 (polyoxyethylene sorbitan monolaurate), used as a surfactant in spore suspensions, suppressed germination and germ tube growth of Septoria tritici conidia compared with an all-purpose surfactant (Amway Corp., Ida, MI 49201) used with other pathogens (Phytopathology 73:556-558) and a water control. Inocula consisting of S. tritici conidia suspended in water supplemented with leachate from green wheat leaves, with and without Tween 20 or Amway surfactant, elicited more lesions/g of inoculated leaf tissue than similar inocula lacking leachate. Leachate added to sucrose-yeast agar supported conidial production equal to that on commonly used yeast-malt agar. Leachate from resistant and susceptible wheat cultivars did not affect germination of conidia of the S. tritici isolates on water agar.

SPREAD OF PEANUT STRIPE VIRUS (PStV) FROM PEANUT TO SOYBEAN AND YIELD EFFECTS ON SOYBEAN AND LIMA BEAN. A. G. Gillaspie, Jr. and M. S. Hopkins, USDA, ARS, Plant Introduction Station, Griffin, GA 30223.

Spread of PStV from peanut to soybean and yield effects on soybean and lima bean were determined in field tests at Byron, GA. Plants were air-brush inoculated 10 days after planting. Infection was determined by visual symptoms and confirmed by indirect ELISA. Initial spread of PStV was observed 38 and 35 days after inoculation of the peanuts in 1988 and 1989, respectively. After another 26 and 21 days, PStV had spread 24.4 and 16.8 m. PStV infection was highest in the southeastern and southwestern sectors of the fields. Secondary spread in soybean was observed in both years. Infection of six soybean cvs. had significant main effects for seed yield (1988) and plant height (1989) and no significant effect for seed weight in either year. No yield effects were measured in four lima bean cvs. in 1989 (1988 data were unusable). No seed transmission occurred in 2,691 soybean and 2,112 lima bean seeds.

PECTINOLYTIC MICROFLORA ASSOCIATED WITH VIDALIA ONIONS BEFORE AND AFTER CONTROLLED ATMOSPHERIC (CA) STORAGE. R. Gitaitis, R. Baird, D. Sumner, D. Gay, and D. Smittle. University of Georgia, Tifton, GA 31793.

Pseudomonas viridiflava was isolated from 99% of the samples of onion foliage with bacterial blight symptoms in 1990. However, that bacterium was recovered from only 0.3% of bulbs at harvest and from 0% of bulbs after 4-5 months of CA storage (1.1 C; 70-80% relative humidity; and an atmosphere of 3% oxygen, 5% carbon dioxide, and 92% nitrogen). Other pectinolytic bacteria recovered from 2.1, 2.1, 1.8, and 0.9% of bulbs at harvest were other fluorescent Pseudomonas spp., opportunistic xanthomonads, Erwinia chrysanthemi, and unidentified bacteria, respectively. After 4-5 months under CA storage, fluorescent pseudomonads, opportunistic xanthomonads, E. chrysanthemi, and unidentified bacteria were recovered from 0, 3.9, 0, and 8.4% of the bulbs, respectively.

DNA PROBES FOR DETECTION OF MYCOPLASMALIKE ORGANISMS (MLO'S) ASSOCIATED WITH WITCHES'-BROOM DISEASE OF PIGEON PEA (CAJANUS CAJAN) IN FLORIDA. N. A. Harrison, J. H. Tsai, C. M. Bourne and P. A. Richardson, University of Florida, Research and Education Center, 3205 College Ave., Fort Lauderdale, FL 33314.

A Florida isolate of the pigeon pea witches'-broom (PWB) MLO was transmitted using dodder (Cuscuta sp.) from naturally infected pigeon pea to periwinkle (Catharanthus roseus) and induced symptoms typical of a 'yellows' group disease in the

latter host. PWB MLO DNA was separated from periwinkle total DNA extracts by cesium chloride-bizbenzimide buoyant density gradient centrifugation. EcoR I-Hind III restriction fragments of MLO-associated DNA were ligated with pUC19 plasmids and cloned in Escherichia coli DH5-alpha. Cloned fragments of PWB MLO extrachromosomal DNA used as probes hybridized only to DNA extracts from witches'-broom infected periwinkle and pigeon pea plants. Several cloned fragments of PWB MLO chromosomal DNA also hybridized to DNA extracts from plants affected by various other MLO-associated diseases.

AERIAL BLIGHT OF ROSEMARY CAUSED BY RHIZOCTONIA SOLANI AG-1. G. E. Holcomb. Dept. Plant Pathology & Crop Physiology, LA Agr. Exp. Sta., LA State University Agricultural Center, Baton Rouge 70803.

A severe aerial blight was observed on rosemary (Rosmarinus officinalis) in the summer of 1989 in the demonstration herb garden of the Burden Research Plantation. Cultivar Prostratus, a prostrate form of rosemary, was killed whereas the common erect form was damaged but not killed. Isolations to water agar yielded a multinucleate Rhizoctonia sp. which anastomosed with tester group AG-1 of R. solani. Sclerotia produced by the rosemary fungal isolates matched those of AG-1 IB when compared on potato dextrose agar. Pathogenicity tests with the rosemary isolates were positive and R. solani was reisolated from inoculated plants. Significant disease control was obtained with spray applications of Benlate, Dithane M-45 and Chipco 26019 in greenhouse tests.

COLONIZATION OF GRAPEVINE BY VARIOUS STRAINS OF XYLELLA FASTIDIOSA. D. L. Hopkins, Central Florida Research and Education Center, University of Florida, Leesburg, FL 34748.

Petioles and stem internodes of the grape cultivar Carignane were inoculated with strains of Xylella fastidiosa obtained from goldenrod, oak, sycamore, sumac, and grapevine. Three weeks after inoculation, bacterial populations in inoculated petioles were 100 to 1000 fold higher with strains from grapevine than with strains from goldenrod, oak, sumac, and sycamore, Final populations in petioles were 10 to 100 fold higher with grapevine strains. In stem inoculations, only the grapevine strains and one from sycamore migrated from inoculated internodes and colonized plants systemically. Only the grapevine strains produced typical Pierce's disease symptoms in Carignane, but the one from sycamore did occasionally results in slight marginal leaf necrosis. All strains of X. fastidiosa tested were capable of multiplication in grapevine, but systemic colonization was correlated with pathogenicity of the strain of grapevine.

EFFECTS OF TEBUCONAZOLE ON SEED QUALITY AND FUNGAL COLONIZATION ON TWO CULTIVARS OF PEANUTS. J. C. Jacobi and P.A. Backman, Department of Plant Pathology, Auburn University, AL 36849.

Florunner and Southern Runner peanut cultivars were grown under leafspot control programs with and without 2 sprays of tebuconazole (0.25 kg a.i./ha) substituted for chlorothalonil (1.26 kg a.i./ha) in a 7 spray schedule. In each year peanuts were harvested at optimum maturity. In 1989, percent damaged kernels (%DK, primarily fungi) was 6% and 2% for chlorothalonil treatments of Florunner and Southern Runner peanuts, respectively. Also, Florunner treated with tebuconazole had significantly increased extra large kernels (%ELK) and reduced %DK from 6% to 2% as compared to chlorothalonil alone. Sound mature seed were examined for infections by Aspergillus spp. and other fungi, and the latter was significantly lower in Southern Runner, while tebuconazole reduced fungal colonization of seed by Aspergillus spp. in both cultivars. Drought stress during the 1990 growing season apparently reduced the fungicide effect of tebuconazole treatments. However, Southern Runner had significantly greater %ELK and lower %DK than Florunner.

SUPPRESSION OF THIELAVIOPIS BASICOLA WITH HAIRY VETCH AMENDMENTS. S.R. Kendig and C.S. Rothrock. Department of Plant Pathology, University of Arkansas, Fayetteville AR 72701.

In a long-term winter cover crop study, cotton plots annually planted to hairy vetch (Vicia villosa) had lower soil populations of Thielaviopis basicola (= Chalara elegans) than winter fallow plots (34 cfu/g vs 189 cfu/g, respectively). There was also a corresponding reduction in incidence of black root rot of cotton. This study investigated the influence of hairy vetch on soil populations of T. basicola. In controlled environmental studies, incorporation of 0.15% (w/w) hairy vetch into soils from winter fallow plots reduced populations from 556 cfu/g to 325 cfu/g by 21 days and 0.5% (w/w) hairy vetch reduced soil populations from 556 cfu/g to 77 cfu/g by 14 days ($P<0.005$). Reduction of soil populations was observed as early as 7 days after incorporation at both 20 and 25 C. These data suggest that in addition to reducing soil erosion, improving tilth and increasing soil nitrogen levels, a winter cover crop of hairy vetch may be an effective part of an integrated crop management system to control black rot of cotton.

UNUSUAL OCCURRENCE OF LESIONS CAUSED BY DIPLODIA SP. IN UPPER STEMS OF PEANUTS IN FLORIDA. T.A. Kucharek, Plant Pathology Dept., University of Florida, Gainesville, 32611.

Black lesions, greater than 5 cm in length, occurred in upper stems of peanut in two fields with whiteflies near the end of the season in 1989. Diplodia sp. was isolated consistently from the black lesions. In greenhouse tests, 30-day-old peanut plants were inoculated with a culture of Diplodia sp. midway along the main stem or at the soil surface with or without wounding. Black lesions like those found in the fields occurred if the stems had been wounded with a shallow cut and if the wounded plants had been placed within a mist chamber. Diplodia sp. was isolated from margins of induced black lesions. Inoculations of misted, unwounded, terminal vine buds resulted in black lesions in 2/9 attempts. Internal necrosis was significantly greater ($P=0.05$) in upper stems compared to lower stems following wounding. Of 12 fungicides added to APDA at 5 mg/L, only iprodione totally inhibited growth of two isolates of Diplodia sp.

EFFECTS OF SEED AND SOIL FACTORS ON COLONIZATION OF COTTON BY BACILLUS SUBTILIS GB-03. W.F. Mahaffee and P.A. Backman, Auburn University, AL 36849.

Five cotton cultivars and 10 soils were examined for their effects on colonization of cotton by the biocontrol agent Bacillus subtilis strain GB-03. Seed-surface pH ranged from 1.9 to 3.5 due to residual sulfuric acid from the delinting process. Spermosphere and rhizosphere populations of GB-03 on acidic seed were reduced as much as 80% compared to neutralized seed. Correlation, factor, and regression analyses showed that spermosphere colonization was affected by the following soil factors; Ca, CEC, Mn and NO_3 levels, % organic matter, % sand, and % clay. Rhizosphere colonization was predominantly affected by soil pH. However, Ca, CEC, % organic matter, % clay, and water availability were positively correlated, and NH_4 and % sand were negatively correlated to colonization. Soils with high % clay, CEC and fertility appeared to counteract the seed-surface pH effect. Cotton root colonization by GB-03 is affected by the seed and soil environment. This suggests that formulation or mixed inoculants could broaden adaptability of products.

REACTIONS OF JERUSALEM ARTICHOKE GENOTYPES TO CERTAIN FOLIAR PATHOGENS. S. M. McCarter, Department of Plant Pathology, University of Georgia, Athens 30602.

Jerusalem artichoke (*Helianthus tuberosus* L.), a minor food crop for many years, has recently attracted attention as a potential crop for the commercial production of fuel alcohol and inulin. Production of the crop in the southeastern USA is limited by foliar and soilborne pathogens. In 1989 and 1990 28 genotypes of *H. tuberosus* obtained from the North Central Plant Introduction Station at Ames were evaluated for their reaction to *Puccinia helianthi*, *Coleosporium helianthi*, and *Erysiphe cichoracearum* near Athens, GA. The genotypes varied greatly in their reactions to the three pathogens. Genotypes that had high susceptibility to *P. helianthi* often were resistant to *C. helianthi*. The reverse was also true. Some genotypes had little powdery mildew whereas others were heavily diseased. These results indicate that useful levels of resistance to these foliar pathogens exist within available germplasms of *H. tuberosus*.

ENDOPHYTIC BACTERIA FROM FIELD-GROWN CORN AND COTTON. John A. McInroy and Joseph W. Kloepper. Department of Plant Pathology, Auburn University, AL 36849-5409.

Endophytic bacteria were isolated from healthy field-grown corn and cotton roots and stems at emergence, 2, 7, 14, 21 and 28

days after emergence, and then every 2-3 weeks. Surface-sterilized tissue samples were macerated in phosphate buffer, and dilutions were plated on tryptic soy agar, R2A medium (for oligotrophs) and SC medium (for fastidious bacteria). Average population densities for total bacteria in cotton roots ranged from 10^2 to 10^3 initially to 10^8 after 10 weeks. Cotton stem populations were 0 to 10^3 at emergence and up to 10^6 during the season. Populations for corn root ranged from 10^4 to 10^9, and corn stems ranged from 10^3 to 10^4 initially, to 10^{10} after 10 weeks. Population counts varied very little for the three media sources. 822 bacterial isolates were identified by GC-FAME as 33 different genera, with Enterobacteriaceae 27%, Pseudomonadaceae 26%, and Bacillus 11% being the largest groups.

INFECTION OF ECLIPTA ALBA WITH SCLEROTINIA MINOR. H. A. Melouk, J. P. Damicone, and K. E. Jackson. USDA-ARS and Dept. of Plant Pathology, Oklahoma State Univ., Stillwater, OK 74078-9947.

Eclipta alba, a member of the composite family, has become a well established weed in irrigated peanut fields in the Southwest. Sclerotinia minor was isolated from blighted plants of E. alba present in a peanut field at Stillwater, OK with a history of Sclerotinia blight. Viable sclerotia of S. minor were formed on and in the pith cavity of stems of dead E. alba plants. Inoculations of detached shoots with S. minor (Plant Disease 73:68-69,1989) of both peanut cv. Tamnut 74 and E. alba produced characteristic lesions three days after inoculation. Sclerotia formed on infected detached shoots of E. alba and peanut 15 days after inoculation. This is the first report of E. alba as a host of S. minor.

FIELD EVALUATIONS OF APOSPHAERIA AMARANTHI AS A POTENTIAL MYCOHERBICIDE FOR PIGWEED. A. S. Mintz and G. J. Weidemann, Plant Pathology Dept., University of Arkansas.

Field studies were conducted in 1989 and 1990 to determine the potential of Aposphaeria amaranthi as a biocontrol agent for tumble pigweed (Amaranthus albus L.) and redroot pigweed (A. retroflexus L.) Tests were designed to compare the efficacy of two different isolates, and the effects of conidial concentration and application rate on plant mortality. Seedlings at the 2-8 true-leaf stage were spray inoculated with conidial suspensions ranging from 1×10^5 conidia/ml to 6×10^6 conidia/ml with a CO_2 backpack sprayer at either 281 L/ha or 1076 L/ha or with a pump sprayer until run-off (1372 L/ha). Ninety-nine percent of tumble pigweed seedlings and 73% of redroot pigweed seedlings were killed within 3 wk with the most virulent isolate when sprayed until run-off at a conidial concentration of 6×10^6 conidia/ml. These results suggest that A. amaranthi may have potential as a mycoherbicide for pigweed.

IN-FIELD STUDIES WITH FUNGICIDES FOR SHEATH BLIGHT PREVENTION IN RICE. W. F. Moore, MCES, P.O. Box 5446, Miss. State, MS 39762, G. L. Sciumbato, MAFES, P.O. Box 197, Stoneville, MS 38776 and J. P. Damicone, O.S.U., Stillwater, OK 74078.

In-field experimental plots have been established yearly since 1986 to measure potentials for reducing losses from sheath blight incited by Rhizoctonia solani (AG-1A) with propiconazol, benomyl, and iprodione applied at label rates aerially at 93.5 l/ha. Applications were made at early internode elongation and mid-boot. Sheath blight incidence at first application ranged from 20.4 to 80%. Significant suppression of disease movement up plants was obtained in most tests. Significant yield increase was obtained in some tests but not others. However, when costs were considered, economic return was inconsistent. There were no significant differences between treated and untreated rice in pounds per bushel, percent total rice, and percent whole rice.

THEORETICAL UNDERESTIMATION OF DISEASE PROGRESS RATES WITH MAXIMUM DISEASE INTENSITY LESS THAN 100 PERCENT. Deborah Neher and C. Lee Campbell. Dept. of Plant Pathology, North Carolina State University, Raleigh, NC 27695.

Most applications of disease progress models assume maximum levels of disease (K_{max}) equal 100% or 1.0, but this is not always the case. Underestimation of the rate (r) of disease increase was calculated by comparing r with actual K_{max} values (0.25-1.0) to that with an assumed K_{max}=1.0 for 30-day epidemics with a range of initial disease (y_0 = 0.01 to 0.0001) and standardized rates (r_s). With a decrease in actual K_{max}, increasing underestimation of r occurred with the logistic, Gompertz, and monomolecular models, respectively, assuming K_{max}=1.0. Increasing underestimation of r with increased r_s occurred with the monomolecular, logistic and Gompertz models, respectively. When epidemic duration was 45 days, effects of decreased K_{max} and increased r_s increased the underestimation of r, especially for Gompertz and logistic models. The results highlight a potential problem in assuming K_{max}=1.0 when the actual K_{max} is less than 1.0.

EFFECTS OF HOST GROWTH AND DEFOLIATION ON PROGRESS OF LEAF SPOT EPIDEMICS ON WHITE CLOVER. Scot C. Nelson and C. Lee Campbell. Department of Plant Pathology, North Carolina State University, Raleigh 27695-7616.

Twenty leaves on each of 512 clover plants in a white clover/tall fescue pasture were evaluated twice per wk for 6 wk in 1990 to determine total cm^2 leaf area (LA), leaf spot severity (% LA diseased), and total cm^2 diseased area (DA). Five types of interactions between increasing (↑), decreasing (↓), or unchanging (→) LA and DA accounted for observed decreases in leaf spot severity (≥ 2%) between consecutive ratings. Interaction types I (→LA,↓DA), II (↓LA,↓DA) and III (↑LA,↓DA) were characterized by a decrease in DA (defoliation); types III, IV (↑LA,→DA) and V (↑LA,↑DA) by an increase in LA (leaf addition and expansion). Analysis of the 512 disease progress curves revealed that 97.2% of 399 total observed decreases in disease severity (≥ 2%) involved a reduction in DA, whereas 29.8% involved an increase in LA. Thus, defoliation (rather than host growth) was the primary determinant of observed decreases in leaf spot severity.

GLOBODERA SOLANACEARUM (OCN) DISEASE LOSSES IN EGGPLANT IN REPLICATED FIELD PLOTS. W. W. OSBORNE, IAI, INC., SOUTH BOSTON, VA 24592

The OCN, Globodera solanacearum, continues to be a severe phytopathogen since its discovery in 1961 (Plant Dis. Reptr. 45: 812-813). The rapid spread of OCN in Virginia and recently in North Carolina threatens economical production of eggplant, tomato, and tobacco. In 1985 the OCN was found associated with eggplant crop failure. (Soc. Nematology Meeting, 1986: p61.) In 1986, replicated plot research was initiated in OCN infested fields to evaluate biological and chemical control of OCN on eggplant. Studies terminated in 1990 show that uncontrolled OCN populations stunt plant growth, delay plant and fruit maturity and cause poor quality "off color" fruit. Yield in cultivars Black Beauty, Dusky, and Millionaire is curtailed by 40 to 50%. Four chemicals were consistant in providing different OCN population levels and fruit yield.

EXSEROHILUM TURCICUM ON SWEET CORN IN FLORIDA. J. K. Pataky. Dept. of Plant Pathology, Univ. of Illinois, Urbana, IL 61801.

Four races of Exserohilum turcicum have been identified in North America: race 0 (Ht1,Ht2,Ht3,HtN/0), race 1 (Ht2,Ht3, HtN/Ht1), race 23 (Ht1,HtN/Ht2,Ht3) and race 23N (Ht1/Ht2,Ht3, HtN). Although many supersweet (sh2) sweet corn hybrids carry the gene Ht1, severe epidemics of northern leaf blight occur in Florida, especially in the Belle Glade area, presumably due to the prevalence of race 1. As a preliminary survey, isolates of E. turcicum were collected in May 1990 from sweet corn breeding nurseries and hybrid trials in four fields near Belle Glade and a field near Zellwood. Seventy-six of 94 isolates assayed in a greenhouse were virulent on B37Ht1 and 'Florida Staysweet' which carries the gene Ht1. Three isolates from fields near Belle Glade caused susceptible reactions on A619Ht2, Oh43Ht2, Pa91Ht2, A619Ht3, Pa91Ht3, and Va26Ht3. Three isolates from those fields caused susceptible reactions on B37HtN and Oh43HtN. Isolates virulent on Ht2, Ht3, and HtN are being assayed again to confirm the presence of race 23 or 23N in Florida.

THE EFFECT OF INOCULATION METHOD ON DISEASE INCIDENCE AND SEVERITY OF THE CORN SMUT CAUSED BY *USTILAGO MAYDIS*. D. D. Pope and S. M. McCarter, Department of Plant Pathology, University of Georgia, Athens, GA 30602

In 1990 field tests four different inoculation methods were compared by treating the corn cultivar Silver Queen with a heterogeneous mixture of four sporidial lines of *Ustilago maydis*. Ears were inoculated after silk protrusion but before silks reached 10 cm in length. The inoculation methods included application of inoculum to the unwounded protruded silks, to the wounded tips of ears from which the silks had been removed, to the exposed cobs of ears from which not more than 2 cm of cob had been cut (perpendicular to the long axis of the ear), and by injecting inoculum directly into the centers of intact ears through a median-line needle wound. No smut was found in control plots. Smut incidence readings were 1.6%, 65.3%, 87.0%, and 88.3% for the unwounded silk, wounded tips, cut cob, and injection methods, respectively. Disease severity was highest when the injection method was used.

EFFECT OF SOLARIZATION AND *GLIOCLADIUM VIRENS* ON *SCLEROTIUM ROLFSII*, SOIL MICROBIOTA AND DISEASE INCIDENCE ON TOMATO. Ristaino, J. B., Perry, K. B., and Lumsden, R. D. Depts. Plant Pathology and Horticulture, respectively, N. C. State University, Raleigh, NC, and USDA-ARS, Beltsville, MD.

Soil solarization and soil amendment with the fungal antagonist *G. virens* were evaluated for 3 years for control of southern blight caused by *S. rolfsii* on tomatoes. Maximum soil temperatures measured at depths of 10 cm were 41 C, and 49 C in 1988 and 1990. *G. virens* reduced numbers of sclerotia by 100%, 96%, and 56% to depths of 30 cm in 3 years, whereas solarization reduced numbers of sclerotia by 64% in 1990. Solarization and *G. virens* reduced southern blight by 49% and 60% in 1988 and 1990, whereas solarization reduced disease by 34% in 1990. *G. virens* and *Trichoderma* spp. did not survive solarization at 10 cm depths. Thermotolerant fungi increased and fluorescent pseudomonads decreased after solarization. Shoot dry weight increased in solarized plots, but yield was not affected by either treatment.

Percent reflectance at 800 nm as a measure of green leaf area of *Arachis hypogaea* L. F. M. Shokes, V. M. Aquino, D. W. Gorbet, and R. D. Berger, North Florida Research and Education Center (NFREC), Quincy, FL, 32351, NFREC, Marianna, FL, 32446, and Department of Plant Pathology, University of Florida, Gainesville, 32611.

Radiometric measurements were compared to healthy green leaf area in two years of tests. Florunner, a peanut cultivar susceptible to late leafspot, caused by *Cercosporidium personatum*, was used in 1988 and 1989. Southern Runner, a cultivar with partial resistance to late leafspot, was included in the 1989 test. Levels of cumulative disease stress were obtained using periodic applications of the fungicide chlorothalonil at four rates. Canopy reflectance at 800 nm, leaf area index (LAI), and disease severity were measured eight times each season. Green leaf area was calculated from LAI and the total disease severity. A linear relationship was obtained between reflectance and green leaf area. Coefficients of correlation were ≥0.86 for these parameters. Results support the hypothesis that the radiometer is measuring green leaf area at the 800 nm wavelength.

SUSCEPTIBILITY OF LEAF AND STEM TISSUES OF FRUIT AND VEGETABLE HOSTS TO COLLETOTRICHUM SPP. B. J. Smith, USDA-ARS, Poplarville MS 39470, and L. L. Black, LA State Univ., Baton Rouge 70803

Many Colletotrichum species cause fruit rots. Thirty-seven Colletotrichum isolates representing 9 species from 11 hosts were used to wound inoculate leaves and stems of strawberry (SB), tomato (TOM), pepper (PEP), blueberry (BB), blackberry (BK) and muscadine grape (MG). All 4 C. fragariae isolates caused lesions to develop (+) on SB, TOM, BB, and BK, and 1 was + on MG. Eight of 11 C. acutatum isolates were + on SB, 2 + on TOM and 1 + on BB. Six of 11 C. gloeosporioides isolates were + on SB, 2 + on TOM, 1 + on BB, 1 + on BK, and 2 + on MG. Two of 3 C. capsici isolates were + on SB, and 1 + on BB. One of 2 C. truncatum isolates was + on SB, and one of 2 C. destructivum isolates was + on TOM and BB. One isolate of C. higginsianum was + on SB. Two C. coccodes isolates and one C. orbiculare isolate were negative on all hosts. All isolates were negative on PEP. Isolates obtained from ripe fruit generally did not cause foliage or stem symptoms on the same host.

INFLUENCE OF PEANUT HOST ON FLUCTUATIONS OF PYTHIUM SPP. POPULATIONS IN SOIL. R. K. Soufi and A. B. Filonow. Department of Plant Pathology, Oklahoma State University, Stillwater, OK 74078-9947

Field plots at Ft. Cobb, OK in 1989 and 1990 were planted with peanut or soybean or fallowed. Weekly populations of Pythium spp. in peanut soil peaked and declined after pegging, and peaks at similar times were not observed in soybean or fallowed soil. During the season, the frequency of Pythium spp. isolated from peanut pods increased. Fluctuations in Pythium spp. populations in peanut soil were not directly correlated to soil temperature or matric potential. Populations of Pythium spp. in seven other fields in Oklahoma planted to peanut in 1990 showed peaks after pegging. In the growth chamber, soils with peanut had higher populations of Pythium spp. than those left fallow. Results indicate that the peanut host is a major factor in driving fluctuations of Pythium spp. in soil.

SEEDLING DISEASES AND NEMATODES ON RAPESEED FOLLOWING PEANUT IN GEORGIA. Donald R. Sumner and Norman A. Minton, Univ. of Georgia and USDA/ARS, Coastal Plain Expt. Sta., Tifton, GA 31793-0748.

Seedling diseases and nematodes caused moderate to severe pre-and post-emergence damping-off and stunting in fall rapeseed following peanut from 1986-1990. The fungi isolated most frequently from diseased seedlings were Rhizoctonia solani AG-4, Pythium irregulare, and Pythium ultimum. In a pathogenicity test in a greenhouse, R. solani AG-4 caused severe and P. ultimum slight seedling disease on cultivars Westar, Cascade, Bridger, and Jupiter. The peanut root-knot nematode, Meloidogyne arenaria, caused slight to moderate injury to roots, and rapeseed growth was improved by soil treatment with fenamiphos (6.72 kg/ha). Metalaxyl (0.28 kg/ha) decreased infection by Pythium spp. and increased plant stand. In field experiments, soil treatment with fenamiphos + metalaxyl + flutolanil increased yield of seed significantly (424 kg/ha) in 1989 but not in 1990.

ALTERATIONS IN TISSUES AND GROWTH REGULATORS IN SOUTHERN YELLOW PINES INFECTED WITH FUSIFORM RUST. C. Walkinshaw and V. Ammon, Pathologists. USDA Forest Service, Resistance Screening Center, Rt. 3, Box 1249A, Asheville, NC 28806, and Mississippi State University.

The reactions of loblolly (Pinus taeda L.), longleaf (P. palustris), and slash (P. elliottii Engelm. var. elliottii) pine stems to invasion by Cronartium quercuum (Berk.) Miyabe ex Shirai f. sp. fusiforme paralleled changes caused by imbalance of growth regulators in other tree species. For pines, families differed significantly in incidence of multiple buds, adventitious shoots, and concentration of growth regulators. Histological observations of numerous rust-infected pine families revealed large variations in degrees of alteration in cellular and tissue morphology. Cambial tissue differed in the number and type of cells produced in susceptible and resistant stem tissues.

INDUCED SYSTEMIC RESISTANCE IN CUCUMBER AGAINST COLLETOTRICHUM LAGENARIUM BY SEED TREATMENT WITH PLANT GROWTH-PROMOTING RHIZOBACTERIA (PGPR). Gang Wei, Joseph W. Kloepper, and Sadik Tuzun, Department of Plant Pathology, Alabama Agricultural Experiment Station, Auburn University, AL 36849-5409.

Ninety-four PGPR strains were screened as seed treatments for the induction of resistance against C. lagenarium on cucumber. The use of a foliar pathogen avoids involvement of competition or antagonism with the PGPR inducers. Plants were challenge-inoculated with C. lagenarium 20 days after planting. Six days later, the number and area of lesions were recorded and compared to nontreated controls and induced resistance (IR) controls (plants without PGPR, induced by inoculating with C. lagenarium 7 days before challenge). Six of the 94 PGPR strains showed evidence of induced resistance with no root necrosis. Although the degree of protection was somewhat less than IR controls, in 3 repeated experiments, these PGPR strains significantly reduced lesion number and/or total necrotic area compared to the non-treated controls. The mechanism is under investigation.

DETECTION OF *CRICONEMELLA XENOPLAX* ON PEACH ROOTSTOCKS FROM COMMERCIAL NURSERIES. S. W. Westcott, III and E. I. Zehr, Department of Plant Pathology and Physiology, 120 Long Hall Clemson University, Clemson, SC 29634-0377.

To evaluate the potential for reintroduction of *Criconemella xenoplax* into fumigated peach orchards by nursery stock, ten trees from each of two cultivar/rootstock combinations were supplied by each of six commercial nurseries that sell peach trees in South Carolina. Plants were grown in sand (steamed twice at 65 C for 30 min) in 3-liter pots in a greenhouse. Care was taken to avoid contamination of experimental materials with *C. xenoplax*. Nemaguard peach seedlings were included as clean controls. After 26 and 52 weeks, 100-cm^3 soil samples were collected and processed by elutriation and then sugar flotation. Nematodes were detected in soil from only one tree provided by one nursery. Populations were 7 and 180 per 100 cm^3 soil, at 26 and 52 weeks, respectively. The probability of successful transfer of *C. xenoplax* to orchard sites on nursery stock does not appear to be high relative to other likely sources of infestation, but this source of nematodes could be important in some situations.

Differentiation of Peronsporales and isolates of *Peronospora tabacina* Adam by direct sequencing. M.D. Wiglesworth, C.L. Schardl, W.C. Nesmith, and M.R. Siegel. Department of Plant Pathology, University of Kentucky, Lexington, Ky. 40546.

The source of epidemics of the tobacco blue mold fungus, *Peronospora tabacina* Adam, in North America remains unknown because traditional techniques for differentiation of isolates have been inadequate. Combining two molecular methods, the amplication of target DNA, via the polymerase chain reaction (PCR) and DNA sequencing, may enable the detection of isolate differences and answer in determining the nature of blue mold epidemics. The purpose of this work was to determine if this technique could distinguish between different genera and species of plant pathogenic Peronosporales (Oomycetes) and differentate *P. tabacina* isolates and populations. In this study, the region of DNA to be sequenced was an internal transcribed spacer (ITS1) of approximately 250 basepairs located between the 18S and 5.8S rRNA genes. PCR amplification and DNA sequencing were completed using standard protocols. Fungal species tested were *Pythium ultimum, Phytothphora parasitica* f.sp. *nicotiana* (race 0 and 1), *Phytophthora infestans, Peronospora trifolium, Peronspora tabacina* (four isolates), *Peronosclerospora sacchari* (two isolates), and *Peronosclerospora maydis*. The ITS1 sequences distinguished genera and species, but not isolates or races. Phylogenic analysis also suggested that the oblighate biotrophs may have arisen for a common ancestor. The more variable rRNA intergenic spacer regions (IGS) are being analyzed to determine whether isolates of *P. tabacina* can be differentiated using this method of DNA sequencing.

DETECTION OF PATHOGENIC RACES OF PUCCINIA SUBSTRIATA VAR. INDICA IN THE UNITED STATES. J. P. Wilson, USDA-ARS Forage and Turf Unit, Coastal Plain Expt. Stn., Tifton, GA 31793.

Both resistant and susceptible reactions have been observed on some pearl millet cultivars when inoculated with bulked urediniospores of Puccinia substriata var. indica collected in Georgia. Single-pustule isolates from some of these plants were increased in isolation and used to inoculate pearl millet seedlings of African, Indian, and domestic origin. Differences in pathogenicity to the cultivars existed for four of the six isolates tested. Similar reactions to the isolates suggest that several millets from Africa, India, and the United States may possess similar genes for rust resistance. This is the first documentation of races of P. s. var. indica in the United States. The presence of races and the apparently limited effectiveness of the resistances will have implications in breeding rust resistant pearl millets.

RAIN DISPERSAL OF COLLECTOTRICHUM GLOEOSPORIOIDES UNDER RICE FIELD CONDITIONS. X.B. Yang and D.O. TeBeest, Dept. of Plant Pathology, Univ. of Arkansas, Fayetteville, AR 72701.

Rain dispersal of Colletotrichum gloeosporioides, a commercial mycoherbicide of northern jointvetch, was studied with different surface treatments in a wind chamber with a rain tower. Understanding the dispersal is important in evaluating the potential for secondary spread of the pathogen under natural conditions. The dispersal curve of lesions per plant for a water surface was much flatter than the curve for a soil surface. Dispersal of the pathogen was significantly reduced when weeds were in a rice canopy. High rice density also significantly reduced the intercept of the dispersal curve. Areas under dispersal curves for low and high rice density were significantly smaller than those for water and soil. Distribution of lesions on stems suggests that height of raindrop rebounding is critical to lesion distribution.

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