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ABSTRACTS

INFLUENCE OF WATER STRESS ON ENDOTHIA GYROSA CANKER DEVELOPMENT IN CONTAINERIZED PIN OAKS. D. N. Appel, R. J. Stipes and S. S. Brown, Dept. Plant Pathol. & Physiol., VPI & SU, Blacksburg, VA 24061

Five- to 7-yr-old pin oaks inoculated with mycelium of Endothia gyrosa were allowed to deplete soil moisture to various levels for 3 mos in the greenhouse. Control trees received water on alternate days. Soil moisture was monitored by thermocouple psychrometry, and a pressure bomb was used to measure plant water status. Callus formation prevented canker development on all control trees. Canker lengths on water-stressed trees ranged from 35-270 mm. Canker extension was most rapid following periods of moisture stress, with maximum rates of 20-25 mm per day. Watering resulted in inhibition of canker elongation. Trees wilted when morning pressure bomb readings on leaves were -40 to -45 bars. Resistance to fungal colonization was lowered when leaf pressure bomb readings fell below -25 bars. Periodic supplemental watering is warranted when pin oaks are located in high risk areas of E. gyrosa infection.

EFFECT OF PH ON BACTERICIDAL EFFICACY OF HYPOCHLORITE FOR PEPPER SEED TREATMENT. R. Averett, D. Fieldhouse. Plant Science Department, University of Delaware, Newark, DE 19711.

Low pH hypochlorite solutions were better seed sterilants than standard formulations. Pepper (Capsicum annuum L.) seeds with natural bacterial infestation, that included many species, were treated in NaOCl solutions adjusted to pH levels of 5.5, 7.5, 9.5, 11.5. Duration of the hypochlorite soak varied from 30 sec to 40 min, and the five concentrations of NaOCl were between .06% and 1.0%. Treated seeds were incubated in nutrient agar. After five days, seeds associated with any bacterial contaminate were considered infested. All concentrations at pH 7.5 reduced contamination faster than at pH 9.5 or 11.5. However, 40 min soaks in .5% and 1% NaOCl at pH 9.5 eliminated all detectable bacteria. None of the treatments reduced total germination.

DETECTION OF FUNGITOXIC ACTIVITY IN POTATO TUBERS FIELD TREATED WITH CGA 48988 - A SYSTEMIC FUNGICIDE. Satish K. Bhatia, R. J. Young and Sandra I. Pencis, West Virginia University, Morgantown, W.V. 26506.

The systemic fungicide CGA 48988 (N-(2,6-Dimethylphenyl)-N-(methoxyacetyl)-alanine methyl ester) applied to soil or foliage, effectively controlled potato late blight. Tubers of potato cultivar Katahdin harvested from treated plants resisted infection when inoculated with a virulent race of Phytophthora infestans, suggesting that an inhibitory factor had been translocated to the tubers. Inhibition was absolute in freshly harvested tubers from some treatments whereas in others it decreased gradually over a prolonged storage. In 3 selected treatments, the fungitoxic effect persisted for up to 120 days in tubers stored at 10 and 20 C. The effect was greater in larger tubers than in smaller ones, and seemed to be uniformly distributed within the tubers. Tissues from the treated tubers showed greater resistance to zoospore inoculation than to mycelial disc inoculation, suggesting that zoospores are more sensitive to the inhibitory factor than the mycelium.

COMMONLY USED HERBICIDES CAUSE INCREASED FUSARIUM OXYSPORUM INFECTION OF ESSEX AND WILLIAMS SOYBEANS. R. B. Carroll and V. Scarpa, University of Delaware, Newark, DE, 19711.

In greenhouse experiments, Essex and Williams soybean seed were grown in soil artificially infested with Fusarium oxysporum and treated with the pre-emergence herbicide combination of alachlor + linuron at label and double label rates. Both treatments resulted in increased root disease on both varieties. The highest disease rating was obtained for Essex at double label rate which resulted in wilt and death of plants within 2 weeks. For all other treatments, no wilting occurred but significant root disease developed. This disease could become an important factor in Delmarva soybean production since these two varieties and herbicide combination are predominant.

AN EVALUATION OF GERANIUM AND AZALEA LEAF TRAPS FOR CYLINDROCLADIUM AND RHIZOCTONIA IN PEACH NURSERY SOILS. A. Davis, K. D. Hickey, and R. F. Stouffer, Department of Plant Pathology, The PA. State University, University Park, PA 16802.

Cylindrocladium floridanum and Rhizoctonia solani are pathogens of peach seedlings. Geranium and azalea leaf traps were evaluated as bioassays of these fungi in nursery soils. The petiole of geranium or the basal half of azalea leaves was inserted into moistened soil in paper cup moist chambers. Greenhouse and nursery soils were amended with dried C. floridanum microsclerotia at rates of 170,85,35, and 20µg/ml of soil. C. floridanum was recovered from all treatments of the greenhouse soil but was seldom recovered from the nursery soil containing native Rhizoctonia spp. C. floridanum and R. solani were frequently trapped from soils fumigated with Terr-o-cide 72-27(72% ethylene dibromide, 27% chloropicrin) at 140 l/ha and Terr-o-cide 30D(70% 1,3-dichloropropene, 1,2-dichloropropane, 30% chloropicrin) at 280 l/ha but were rarely trapped from MC-33(67% methyl bromide, 33% chloropicrin) treatments at 168 and 185 kg/ha. Both fungi were trapped with equal frequency in the fumigated soils. Percentage of recovery was higher with azalea leaves in all tests.

FUSARIUM WILT OF SOYBEAN AND EFFECT OF TILLAGE PRACTICES ON OCCURRENCE OF FUSARIUM SPECIES IN ROOTS AND SOIL. N. P. Ferrant and R. B. Carroll, Univ. of Delaware, Newark, DE, 19711.

In 1976 and 1977, significant disease losses occurred in southern Delaware soybean fields due to an unidentified pathogen. Disease resulted in wilting of plants at different stages of development. Pathogenicity tests have proven the pathogen to be Fusarium oxysporum. Experimental plots were established in a heavily infested field. Periodically, isolations were made from 40 diseased plants and rhizosphere soil. F. oxysporum comprised 84% (3234) of the possible soil-borne pathogens isolated from roots and stems. From soil, Fusarium species comprised 86% (8270). Field plots were established to study the effect on Fusarium population of double cropping soybeans with small grains. A higher number of Fusarium species was isolated from soil in no-till than in conventional till plots, and from soil where barley rather than wheat was the cover crop. Isolations from stems and roots indicated that neither cultivation practice (till versus no-till) nor cover crop (barley versus wheat) had an effect on the percentage of F. oxysporum obtained.

USE OF FUSARIUM INFESTED DESICCATED RYE GRAINS TO EVALUATE WILT AND CROWN ROT REACTIONS OF MATURE ASPARAGUS OFFICINALIS R. W. Goth and S. A. Johnston, USDA, Beltsville Agricultural Research Center, Beltsville, MD 20705 and Dept. of Plant Pathology, Rutgers University, New Brunswick, N.J. 08903

We used desiccated rye grains, infested with Fusarium moniliforme and F. oxysporum f. sp. asparagi to study mature asparagus resistance to Fusarium wilt and root and crown rot diseases. Rye grain was soaked in an equal vol. of water for 16 hrs., 50 ml were apportioned into 250 ml flasks that were plugged and autoclaved twice for 30 min. on successive days. Grain was seeded with respective Fusarium isolate; when growth was visible, flasks were shaken to prevent matting. Within 4-6 weeks Fusarium-infested grains were used immediately as inoculum or stored for future use. To evaluate mature plant resistance, a Fusarium-infested grain was inserted into a stem incision ca 5 cm above soil line. Here the grain served as a continuing inoculum source and caused typical symptoms. We have used this method to reliably evaluate Fusarium wilt and crown rot reactions of asparagus in the greenhouse and field.

PROCEDURES FOR GROWTH AND INOCULATION OF XANTHOMONAS FRAGARIAE, CAUSAL ORGANISM OF ANGULAR LEAF SPOT OF STRAWBERRY. W. J. Hazel, E. L. Civerolo, USDA, SEA, AR, Fruit Laboratory, Beltsville, MD 20705; G. A. Bean, University of Maryland, Botany Department, College Park, MD 20742.

Xanthomonas fragariae causes angular leafspot of strawberry. Procedures for screening strawberry varieties for resistance and for evaluating the pathogenicity of X. fragariae isolates were examined. The best medium contained 0.8% nutrient broth, 0.5% casein hydrolysate, 0.1% yeast extract, 1.0% glucose and minerals. Distilled, demineralized water and saline (0.85% NaCl) were satisfactory inoculum diluents. Midvein injection of inoculum variably caused veinal watersoaking. Wound inoculation resulted in no symptoms. Vacuum infiltration caused typical symptoms but is impractical. The most rapid, sensitive, and reliable method of inoculation was spray infiltration. Five days following spray infiltration with inoculum containing 10^5-10^7 CFU/ml, there were 37-121 lesions per site (0.8 cm^2).

CULTURAL CHARACTERIZATIONS AND PATHOGENICITY OF FIVE ISOLATES OF CERATOCYSTIS ULMI, D. F. Hindal*, West Virginia University, Morgantown, W.V. 26506

Five isolates of Ceratocystis ulmi of unknown pathogenicity were culturally characterized on two agar media to determine if the different combinations of cultural characteristics produced on these media could be used to predict pathogenicity. The cultural characteristics evaluated were radial growth and aerial mycelium production on an Oxoid malt extract agar medium and synnema and mycelial pigment production on a synnema production medium. Two isolates were predicted to be more aggressive and three less aggressive based on the cultural characters. Results of inoculation trials indicate the two isolates predicted to be more aggressive produced more foliar symptoms of Dutch elm disease in Siberian elms two months after inoculation than the three isolates predicted to be less aggressive. American elm did not differentiate the pathogenicity of these isolates as well as Siberian.

THE EFFECT OF XANTHOMONAS TRANSLUCENS AND SEPTORIA NODORUM ON WINTER WHEAT. J. B. Jones and C. W. Roane, Dept. of Plant Pathology, VPI&SU, Blacksburg, VA 24061. Three cvs. of winter wheat were inoculated with: I. Septoria nodorum, 10^6 spores/ml, foliar spray at growth stage 10; II. Xanthomonas translucens, 10^8 cells/ml, crown injection by hypodermic syringe and foliar spray at growth stage 4; III. Septoria and Xanthomonas as in I and II, respectively; IV. water (control). No treatments for 'Coker 747' or 'Blueboy' showed significant differences (s.d.'s) in yield or disease assessment. For 'Arthur' s.d.'s were obtained for disease assessment, 1000-kernel wt., kernels/spike, grain wt./head and % seed infection by Septoria. No s.d.'s were observed in seed germination. Disease assessment values were 12.6, 13.6, 17.7 and 10.5% for I, II, III and IV, respectively; 1000-k wt. was 37.2, 36.9, 35.5 and 36.9 g for treatments in the same order; III was s.d. from I, II and IV for disease assessment and 1000-k wt. Seed infections were 31.8, 22, 31.8 and 10.5% for I, II, III and IV, respectively. I and III were s.d. from IV. The yields in g/head were 1.25, 1.23, 1.25 and 1.06 for I, II, III and IV, respectively.

FUNGAL FLORA ASSOCIATED WITH DISCOLORATION OF STOKE'S ASTER (STOKESIA LAEVIS) SEED IN MARYLAND. R. A. Kilpatrick. USDA, SEA, AR, BARC-West, Beltsville, MD 20705

A brown to black discoloration of apical tips of Stoke's aster seed grown at Beltsville and Glenn Dale, MD was observed at weekly intervals during 1975-77. Seeds from 20 different plant introductions (PI) were collected throughout the growing seasons, examined, screened (1.8 x 6.3 mm) and then weighed. Weight of 500 seeds varied depending on percent of fungus infection, head type (open or closed bract) and PI. Discolored infected seeds were shriveled and weighed less than plump, non-discolored seeds. Seeds were sterilized in $HgCl_2$ (0.1%) 1 min rinsed in sterile distilled water, plated on PDA (8/dish), and then incubated at 24C for 8 days. Alternaria tenuis and Diaporthe sp. comprised 67-98% of the isolates from 4600 seeds plated. Head type, quality, and maturity of seed affected number of fungi isolated from seed.

DISSEMINATION OF SEED-BORNE PSEUDOMONAS TOMATO BY TRANSPLANTS. S. H. Kim, BPI, PA Dept. of Agr., Harrisburg, PA 17120.

Bacterial speck of tomato, not known to occur in PA, was introduced via GA produced transplants in 1978. Attempts to minimize disease introduction by inspection at transplant receiving stations in PA failed. The disease was found in fields planted with symptomless transplants regardless of Kocide presence on the transplants at the time of inspection. Early season fruit-set was more heavily infected than later fruit-set. A range of 26-93% of the fruit with speck retained the speck after mechanical skining for whole-pack canning. Pseudomonas tomato was isolated from both commercial seed lots and freshly harvested seeds from infected fruit. Seeds were placed on King's medium B for 2-4 days at 26 C. Bluish fluorescent pseudomonads showing weak oxidase reaction (N,N-dimethyl-p-phenylenediamine) were selected to isolate the oxidase-negative pseudomonads. The isolates inducing hypersensitivity on tobacco were used for pathogenicity tests on tomato. Seeds carrying P. tomato produced plants with leaf symptoms in one month at 17-26 C in a moist chamber.

CONTROL OF BOXWOOD ROOT ROT WITH SUBDUE. R. C. Lambe, W. H. Wills and L. A. Bower, VPI & SU, Blacksburg, VA 24061 Subdue® (CGA-48988) was effective against root rot of English boxwood (Buxus sempervirens suffruticosa) caused by Phytophthora parasitica. Applied as a drench 5 days before inoculation with the fungus, Subdue® was equally effective in preventing root rot of greenhouse grown boxwood in soil-pine bark 1:1 and Weblite-pine bark 1:1 media at 9.5 ppm a.i. There was less variation within treatment in the Weblite-pine bark than in the soil-bark medium. Plants drenched with 77 ppm a.i. did not show any apparent injury to the tops or roots 86 days after treatment. P. parasitica could not be isolated from any of the treatments but was recovered from 100 percent of the untreated plants growing in Weblite-pine bark and from 50 to 100 percent of the plants in soil-pine bark. In vitro radial growth of the fungus was inhibited at 20 ppm but not at 1 ppm on a corn meal base medium. When the fungus blocks were transferred from the Subdue® treated plates to plain corn meal agar there was no growth except at 1 ppm indicating fungitoxicity at 20 ppm.

HYALOTHYRIDIUM LEAF SPOTS OF MAIZE. Frances M. Latterell and Albert E. Rossi, USDA/SEA Plant Disease Research Laboratory, P.O. Box 1209, Frederick, Maryland 21701.

Three fungal structures are associated with a distinctive "round blotch" of maize leaves in Costa Rica and Colombia: pycnidia (*Hyalothyridium* sp.), spermogonia (*Asteromella* sp.), and pseudothecia (*Leptosphaerulina australis* McAlp.). In smaller tan eyespot lesions we found only *Hyalothyridium* and *Asteromella*. *L. australis* is a synonym of *Pleosphaerulina zeicola*, described by Stout as a leaf pathogen of maize in Illinois (Mycologia 22:284 1930), and later by Saccas in Africa (L'Agr. Trop. 7:38 1952). The type specimen is not available. Cultures of *L. australis* from Costa Rica were only weakly pathogenic, infecting and growing in moribund tissue following several days' exposure in a "dew" chamber. *Hyalothyridium* spores readily infected maize leaves, producing eyespot lesions 48 hr after inoculation. Whether *Leptosphaerulina* plays a role in the enlargement and rounding of the lesions initiated by *Hyalothyridium* is being investigated, as is also the possible relationship of one or both fungi to the *Asteromella* stage.

BIOLOGICAL CONTROL OF PYTHIUM SEED ROT OF PEAS WITH TRICHODERMA CONIDIA. J. C. Locke, G. C. Papavizas, and M. K. Rubel. Soilborne Diseases Laboratory, SEA, USDA, Beltsville, MD 20705.

Conidia of 12 isolates of Trichoderma spp. were grown on various culture media, suspended in a 4% methyl cellulose solution, and applied to pea seeds (Pisum sativum) at concentrations up to 6 x 10^8 conidia/g seed. Trichoderma-treated, nontreated, and thiram-treated seeds were planted in soil collected from a field naturally infested with Pythium ultimum and incubated in the greenhouse at 16±3 C. Plant stand was determined 2 wk after planting. Efficacy of the seed dressing with Trichoderma conidia depended on the isolate and medium used, with V-8 juice and potato dextrose agar generally being better than malt extract, corn meal, and Czapek-Dox agar. Trichoderma conidia age, conc. of conidia applied, temp. of incubation, and the cultivar treated also affected the efficacy of the treatment. A new Trichoderma selective medium was used to demonstrate the establishment of three Trichoderma isolates in the rhizosphere of treated peas grown in the field.

ISOLATION OF PYTHIUM OOSPORES BY SIEVING AND DENSITY-GRADIENT CENTRIFUGATION. R. D. Lumsden, USDA, SEA, Beltsville, MD 20705

Oospores of P. myriotylum (Pm) and P. aphanidermatum (Pa) were isolated from 2-wk-old diseased bean tissue or mycelial mats by blending, passing through a 37-µm sieve and collecting them on a 25-µm sieve. Debris and oospores were centrifuged in a density gradient at 37,500 g for 1 hr. Sucrose density gradient (30-50%) separated oospores from debris but was injurious to oospores. Ficoll® (20-40%) was not injurious, and separated oospores of Pm into three distinct bands with sp. gr. of 1.12, 1.17, 1.22; and Pa into one distinct band of 1.17. Oospores were separated from soil as above. The recovery rate (1.3%), however, was low. Antibinding agents (0.7% NaCl or 0.5% EDTA) or a surfactant (0.5% Triton-X100®) increased the rate of recovery slightly (3.6%). This method is useful for freeing oospores of Pythium spp. from mycelium and for obtaining naturally produced oospores from diseased host tissue. Recovery from soil by this technique has limited usefulness.

Differential Effect of Light and Temperature on Reaction of Snap Bean Cultivars to Peanut Stunt Virus. J. P. Meiners, USDA, SEA, BARC, Beltsville, MD 20705.

Five snap bean cultivars were inoculated with peanut stunt virus (PSV) and compared for symptom development under two light-temperature regimes in growth chambers. One chamber was set at 16 hrs light, 30 C and 8 hrs dark, 23 C (A regime); the other at 10 hrs light, 25 C and 14 hrs dark, 18 C (B regime). Two replications of 3 plants of each cultivar were subjected to each regime, and the test was repeated. After 32 days incubation, symptoms were recorded on a scale of 0 (no symptoms) to 5 (severe leaf distortion and plant stunting). The reaction of susceptible cultivar, BBL 274 (A-4.0, B-4.0), and resistant cultivar, Roma (A-0.5, B-0.5) was not affected by either regime. Reaction of 3 cultivars to PSV was affected by the regimes as follows: Pencil Pod (A-1.5, B-3.5); Early Gallatin (A-1.5, B-3.0); BL GV 109 (A-1.0, B-3.0). Under A regime these cultivars were resistant; under B regime, susceptible. Thus, environmental parameters are important in properly assessing the reaction of bean cultivars to PSV.

EFFECT OF WATER STRESS ON THE DEVELOPMENT OF VERTICILLIUM WILT OF YELLOW-POPLAR. G. L. Melchior and A. L. Morehart, University of Delaware, Newark, DE, 19711.

The progression of Verticillium vascular disease was evaluated in preinoculated, yellow-poplars (Liriodendron tulipifera) grown under favorable, chronically high and low soil moisture levels in greenhouse and field studies. Greenhouse experiments indicated that Verticillium was substantially more aggressive in host trees stressed by periods of low moisture whereas the opposite was true when host plants were subjected to periods of soil saturation. At no time did diseased, flooded trees exhibit typical Verticillium symptoms. Also, reisolation of the pathogen from root tissue was negative in all but one case. In contrast all other diseased trees incurred extensive pathogen colonization. Data from field experiments were similar except that identical periods of chronic soil saturation was lethal to most trees. Anatomical observations revealed the possible role of vessel blockage in petioles by the fungus and also indicated that the probable origin of serious tissue damage caused by acute flooding is centered in the crown region.

FIELD EVALUATION OF PHASEOLUS VULGARIS FOR REISTANCE TO XANTHOMONAS PHASEOLI. Arnold R. Moody and P.S. Benepal. Department of Life Sciences, Virginia State College, Petersburg, VA 23803

Bean germplasm (Plant Introductions and commercial varieties) has been examined for resistance to common blight caused by Xanthomonas phaseoli for 3 years. Natural epidemics became severe during August of each year and plants were rated using the system: 1 = not diseased, 2 = least diseased, 3 = moderately diseased, and 4 = severely diseased. Of over 300 commercial varieties tested, Black turtle, Bountiful, Great Northern, Greencrop, Greensleeves, Kentucky Wonder, King Horticultural, Resistant Cherokee Wax, Slimgreen, and Wren's Egg Speckled Cranberry were least diseased during all 3 years. Of over 5000 Plant Introduction accessions, 27 were least diseased during all 3 years.

OCCURRENCE OF ANTHRACNOSE ON FORMERLY ANTHRACNOSE-RESISTANT 'ARC' ALFALFA. S. A. Ostazeski, J. H. Elgin, Jr., and J. E. McMurtrey III, Field Crops Lab., USDA, Beltsville, MD 20705.

Anthracnose is a serious disease of alfalfa in the humid eastern U.S. The anthracnose-resistant varieties 'Arc', 'Saranac AR', 'Liberty', and others were released by USDA and State experiment stations. A Colletotrichum trifolii-like fungus was isolated from infected stems of an Arc planting on Maryland's Eastern Shore in 1978. The Eastern Shore (ES) isolates appeared very similar to our standard (S) C. trifolii isolates. Inoculation experiments revealed that Arc and Liberty were extremely susceptible to the ES isolates. In contrast, Saranac AR was moderately resistant. All three varieties were resistant to the S isolates. We have yet to determine if the ES isolates represent a new species of Colletotrichum or a new race of C. trifolii.

BIOCHEMICAL IMPLICATION OF LECTINS AS A FACTOR IN AGGLUTINATION OF PSEUDOMONAS PISI IN TOBACCO LEAVES. M. Sasser, University of Delaware, Newark, DE, 19711.

Recent studies using the electron microscope have shown rapid agglutination of avirulent or incompatible strains of bacteria in plants. Lectins have been suggested as the agglutinating factor, possibly by reacting with lectin receptors in the bacterial cell wall. A series of experiments to biochemically test this hypothesis were performed by vacuum infiltrating a suspension containing Pseudomonas pisi and a lectin attachment-modifying compound into tobacco half-leaves. The leaves were

then incubated for 1 hr and bacterial recovery was attempted using low speed centrifugation. Apparent increased agglutination was found when calcium salts or albumin were added, and decreased agglutination was observed when using potassium salts or EDTA. These results support the lectin hypothesis, but attempts at specific monosaccharide reversal of agglutination gave ambiguous results. Chloramphenicol treatment of the bacteria also reduced agglutination, possibly by inhibiting synthesis of cell wall enzymes.

EFFECT OF AGROBACTERIUM RADIOBACTER VAR. RADIOBACTER STRAIN K84 ON GALL DEVELOPMENT BY FOUR STRAINS OF A. RADIOBACTER VAR. TUMEFACIENS IN FUMIGATED AND NON-FUMIGATED SOILS. Janice Scalza, K. D. Hickey, F. L. Lukezic, and R. F. Stouffer, Dept. of Plant Pathology, The PA State Univ., University Park, PA 16802.

Two conc (1or3x10^{8}cells/ml) of two A. r. var. tumeficiens type 2 strains (A2,Gd) were sprayed onto peach seed in open furrows alone, or onto seed sprayed with A. r. var. radiobacter strain K84(3x 10^{8}c/ml). Test plots were fumigated prior to inoculation. One year after sowing, 17,269 seedlings were assessed for galls. Reduced galling was observed where inoculum had been sprayed at the 1:3 ratio of strain A2 to K84. Galling was reduced at the 1:1 ratio, but increased at the 1:3 ratio of strain Gd to K84. Fumigants reduced the incidence of galling from indigenous inoculum and this reduction was greater when combined with K84. In May, 1978 seedlings were dipped to test the effectiveness of conc of K84 against strains A8 and A9 of A.r. var. tumefaciens type 2 in non-fumigated soil. Strain K84 at 1X,2X or 3x10^{8}c/ml reduced galling on plum and cherry except on cherry at the 1:1 ratio, and the 1:2 ratio against A9. Indigenous galling was 0% with K84.

REACTION OF NICOTIANA SPECIES TO MELOIDOGYNE JAVANICA. L. J. Slana and J. R. Stavely, University of Maryland, College Park, Maryland, and Tobacco Laboratory, SEA, USDA, Beltsville, Maryland 20705.

The galling reactions in 61 Nicotiana species were indexed in the greenhouse 6 weeks after inoculation with Meloidogyne javanica at approximately 750 L_2 larvae/plant. Soil temperatures were maintained at 25-28°C. The results suggested three classes of response: (i) High resistance with an occasional gall containing egg-bearing females in N. repanda; (ii) slight resistance with considerable galling and egg-bearing females in N. knightiana, N. longiflora, N. megalosiphon, N. nudicaulis, N. otophora, N. plumbaginifolia, N. tomentosa, N. trigonophylla, and N. velutina; and (iii) no resistance in the remaining 51 species, including N. tabacum cvs. 402 and NC95. N. repanda was significantly more resistant than the other 60 species. N. tomentosa and N. velutina were among 25 previously untested species.

APPLICATION OF PROBIT ANALYSIS TO FOLIAR DISEASE BIOCONTROL. Harvey W. Spurr, Jr., North Carolina State Univ. and USDA, AR, Tobacco Research Lab., Oxford, NC 27565, and C. E. Main, N.C. State University, Raleigh, NC 27650.

Tobacco leaves inoculated with nonpathogenic conidia of *Alternaria alternata* 3 days prior to inoculation with pathogenic *A. alternata* reduced leafspot disease index (DI). Plots of increasing DI values against inoculum dosage, with and without protective conidia, were asymptotic curves. Results were subjected to computer probit analysis (SAS). Dosage data were transformed to $\log_{10}$ and DI's to probits (DI 3 = 50% disease = probit DI 5). Regression lines were positive, did not differ significantly in slope but did differ in position. Thus, changes in inoculum dosage resulted in proportional changes in DI and protective conidia have a quantitative not qualitative effect. Inoculum dosages giving 50% disease (ED50) calculated from linear regressions, differed significantly: 29 untreated vs 95 for protected leaves (conidia/inoculation site). Probit analysis proved valuable for interpreting aspects of foliar disease biocontrol.

TRANSGRESSIVE SEGREGATION FOR BROWN SPOT RESISTANCE IN TOBACCO. J. R. Stavely, Tobacco Laboratory, PGGI, SEA-AR, USDA, Beltsville, Maryland 20705.

Tobacco introductions (TIs) having a high degree of polygenic resistance to brown spot were crossed with moderately susceptible flue-cured tobacco cultivars. Since 1973, each subsequent generation from selfing and backcrossing has been screened for resistance by artificial inoculation with Alternaria alternata conidia in the field or greenhouse. Advanced generations from selfed progeny of crosses of flue-cured cultivar NC95 with each of eight resistant TIs have numerically lower disease indices than the TI parents. Advanced lines with significantly more resistance than their respective TI parent have been obtained from selfing NC95 x TIs 505, 1043, 1467, 1561, 1562, and from backcrossing F_3-F_5 plants of NC95 x TIs 505, 1138, 1467, and 1562 with flue-cured. These resistant breeding lines show considerable progress towards elimination of the undesirable agronomic characteristics of the TI parents.

PURIFICATION AND CHARACTERIZATION OF THE BACILLIFORM VIRUS FROM AGARICUS BISPORUS. Tavantzis, S. M., C. P. Romaine, and S. H. Smith, The Pennsylvania State University, Univ. Park, PA 16802.

The 19 x 50 nm bacilliform virus associated with LaFrance disease of the cultivated mushroom (A. bisporus) has been purified to apparent homogeneity for the first time. The purification procedure consisted of: homogenization of sporophore tissue in 50 mM phosphate buffer pH 6.0, 10%PEG-0.6 M NaCl selective precipitation, differential centrifugation, sucrose density-gradient centrifugation (15-35%w/v, 122,000 g, 5 hr) and centrifugation in a 10-50% (w/w) preformed gradient of Cs_2SO_4 until equilibrium (122,000 g, 18 hr). The purified virus has an A 260/280 ratio of 1.67 and a buoyant density in Cs_2SO_4 of 1.317 g/cm^3. Analysis of the virion-associated proteins by SDS-PAGE resolved a single polypeptide of MW 24,000 d, presumed to be the coat protein. The virus nucleic acid has a MW of ca. 1.4 x 10^{6}d as determined by SDS-PAGE analysis and is ssRNA as judged by its 1) sensitivity to RNase in 2X SSC and to alkali, but not to DNase and 2) kinetics of melting upon thermal denaturation. We report here the most detailed description of the first ssRNA mycovirus.

OCCURRENCE OF A HIGHLY VIRULENT ISOLATE OF COLLETOTRICHUM TRIFOLII ON ALFALFA IN NORTH CAROLINA. R. E. Welty and J. P. Mueller. USDA-SEA-AR, Dept. of Plant Pathology and Crop Science, N. C. State University, Raleigh, N. C. 27650.

In October, 1977, anthracnose (C. trifolii) was severe on resistant alfalfa (Medicago sativa) cultivars in a forage variety trial at the Piedmont Research Station, Salisbury, N.C. Virulence of five isolates from diseased stems was compared to a standard isolate (PA) used for disease screening. Based on survival of 3- to 8-week old seedlings, a highly virulent isolate (NC-4) was found that was capable of overcoming resistance in Arc and Liberty. Conidia from single-spore cultures of isolates NC 4 and PA were compared. Average length x width for isolates NC 4 and PA were 14.1 x 5 and 12.3 x 4.9 µm respectively. Spores from both isolates were within the range proposed by von Arx (Phytopathol. Z. 29:413-468) for C. trifolii. Saranac AR and Vangard were slightly more resistant to NC-4 than Arc, Liberty, and WL 311.

HISTOLOGICAL STUDY OF ILEX CRENATA ROOTS COLONIZED BY THIELAVIOPSIS BASICOLA. Robert L. Wick and Laurence D. Moore. Dept. of Plant Pathol. & Physiol. VPI & SU, Blacksburg, VA 24061.

We undertook a histological study of Ilex crenata roots colonized by Thielaviopsis basicola. Six month-old rooted Ilex plants were inoculated by drenching an endoconidial suspension into the rooting medium. Three days after inoculation, extensive colonization of root surfaces and occasional penetration of epidermal cells were evident. After five days, macroscopic signs of thick walled darkly pigmented hyphae and chlamydospores were visable. Two types of hyphae were recognized: small dia. (1-3 µm), lightly pigmented hyphae and large dia. (3-8 µm), darkly pigmented hyphae. The larger hyphae were densely packed in host cortical cells. These hyphae gave rise to chlamydospores and endoconidiophores. Colonization of host cells was exclusively intracellular. Six weeks after inoculation the root tissue retained its integrity and no evidence of cell wall degradation had occurred due to colonization by the pathogen.

ANTIFUNGAL ACTION OF THE AZASTEROID ANTIBIOTIC 15-AZA-24-METHYLENE-D-HOMOCHOLESTA-8,14-DIEN-3β-OL. C. P. Woloshuk, H. D. Sisler, Dept. of Botany, Univ. of Md., College Park, MD. 20742, and S. R. Dutky, USDA, Beltsville, Maryland 20705.

Ustilago maydis sporidia treated with 0.1 µg/ml azasterol (15-aza-24-methylene-D-homocholesta-8,14-dien-3β-ol) appeared branched and vacuolated after 6 hours of incubation. Sporidial multiplication, dry weight increase, and synthesis of protein, DNA, and RNA were only slightly inhibited during the initial 3 hours of incubation. An increase of free fatty acids was observed in lipid extracts of treated sporidia after incubation for 3 or more hours. Ergosterol synthesis was completely inhibited within 1 hour and there was a gradual decline of ergosterol content during 6 hours which was accompanied by an accumulation of the sterol intermediate ergosta-8,14-dien-3β-ol. The results indicate that toxicity of the azasterol results from specific inhibition of the reduction of the sterol C-14(15) double bond. A triarimol tolerant strain of Cladosporium cucumerinum was tolerant to the azasterol, but an imazalil tolerant strain of Aspergillus nidulans was not.

CONTROL OF POTATO LATE BLIGHT BY THE SYSTEMIC FUNGICIDE N-(2,6-DIMETHYLPHENYL)-N-(METHOXYACETYL)-ALANINE METHYL ESTER, (CGA 48988). R. J. Young, S. K. Bhatia and S. I. Pencis, West Virginia University, Morgantown, W.V. 26506.

In two years of fungicidal evaluation for the control of potato late blight, yields from plants treated with the systemic fungicide, CGA 48988, were equal to or greater than the standard fungicides. There was consistently less tuber rot from plants treated with CGA 48988. A combination of the granular and the EC gave the highest yield of marketable tubers. Tubers harvested from this treatment were found to resist infection when inoculated with a virulent race of Phytophthora infestans. No residual activity was found in tubers harvested from plants treated with lower rates or fewer applications of CGA 48988. Plants treated with a combination of CGA 48988-EC and Dithane-M-45 once every 14 days produced yields and a level of tuber rot comparable to the granular/EC combination but without the residual activity in the tubers. This treatment combined the "foliage maintenance factors" of the carbamate with the tuber protective properties of the systemic.