INOCULUM DOSE AND VERTICILLIUM INFECTION PATTERNS IN DIFFERENT WISCONSIN POTATO CROP ENVIRONMENTS. S. E. Adams and D. I. Rouse
Dept. of Plant Pathology, Univ. of Wisconsin, Madison, WI 53706

Field experiments were conducted at Hancock and Rhinelander, WI in 1984 to determine how inoculum densities of Verticillium dahliae affect seasonal infection patterns in Russet Burbank potato crops grown in different environments. Treatments were established by incorporating different amounts of a dried and ground fungal-yeast mixture containing microsclerotia from a virulent isolate into plots at planting. Sample discs from harvested stem segments were incubated on select media to determine the percentage of vascular bundles infected at 10 cm intervals up canopy stems. Both yield losses and areas under average 'whole-stem' infection curves were maximal at 13 or more propagules per gram of assayed soil. At the highest doses, Hancock infection levels rose to 41% 90 days after crop emergence (BAE), and Rhinelander infection levels peaked at 25% 75 DAE. Treatments of 5 pg produced peak infection levels of 30% at Hancock and 10% at Rhinelander but no yield losses.

EVALUATION OF COMPONENTS OF RESISTANCE TO ASCOCHYTA FABAE ON PAPA BEANS (Vicia fabae). F.H. Ali and C.C. Bernier,
Department of Plant Science, University of Manitoba, Winnipeg, Manitoba, Canada, R3T 2N2

Incubation period, mean lesion diameter, lesion number and disease efficiency (sporulating lesions/total lesions) were assessed in the field (on stems and leaves) of four susceptible and susceptible lines and varieties Erfordia (susceptible) and Acknerperle (moderately susceptible). Plants were inoculated 6 weeks after planting with each of the isolates A, B, C, Y and Z of A. fabae. Mean lesion diameter and lesion number on the stems and leaves of some line-isolate combinations were lower in value than those of Erfordia and Acknerperle. In some line-isolate combinations, lesion diameter decreased as lesion number increased. ANOVA showed a significant line by isolate interaction, confirming that a degree of specificity exists between the lines and some isolates. None of the components were effective against all isolates on any one line. Isolates also expressed different degrees of aggressiveness, with A and Z being the most aggressive.

EFFECTS OF Rhizoctonia solani AG-3 AND POTATO SEED SOURCE ON TUBER YIELD. W.A. Anderson and P.J. Zambino.
Department of Plant Pathology, University of Minnesota, St. Paul, MN 55108

Rhizoctonia solani AG-3 was studied in 1981-1984 at the Sand Plains Research Station of central Minnesota. Experiments had a randomized complete block design with split-plot restrictions. Main plots were seed source (disease tested vs. certified seed). Sub plots were paired row of each of three cultivars Kennebec, Norland, and Russet Burbank. One row of each pair was inoculated with three infected corn kernels per seed piece. Disease-tested seed increased yields in the 4 years an average of 18.6%. Inoculation decreased total tuber yield 5.2, 28.5, and 11.4% in 1981, 1982 and 1983, respectively. In 1981, inoculation reduced yields in Norland and Russet Burbank. In 1980, both inoculations reduced yields in all varieties. In 1985, yields were only reduced in disease-tested seed of Russet Burbank. Inoculation did not decrease yields in 1984, but resulted in more tubers with irregular, knobby shapes, or deeply recessed eyes.

OPTIMIZATION OF FACTORS AFFECTING CELLULOSE HYDROLYSIS AND SUGAR FORMATION BY FIEDERATI STRAINS. K. T. Zambino,
Department of Plant Science, University of Manitoba, Winnipeg, Manitoba, Canada, R3T 2N2

Selected Pseudoxanthus strains have the ability to decompose cellulose and ferment both 5- and 6-carbon sugars to ethanol. Among the factors that affect cellulose hydrolysis and ethanol production in liquid cultures are temperature, pH, dissolved oxygen concentration, nutrients, and substrate levels. Attempts were made to optimize these factors for higher rates of cellulose hydrolysis and ethanol production. The optimum combination of factors for cellulose hydrolysis was temperature of 30°C, pH 5.3, a cellulose concentration of 1%, and use of ammonium nitrate as a nitrogen source. Ethanol production was optimized with pH control and a starting pH of 5.5, an aeration rate of 0.05 V/V-min, and use of recycled inoculum.

EPIDEMIOLOGY AND SEED TRANSMISSION OF GOS'S WILT IN CORN. J.A. Biddle, E.J. Brown and D.C. McGeer.
Dept. of Plant Pathology, Seed and Seed Sciences, Iowa State University, Ames, IA 50011

In greenhouse and field experiments, using leaf inoculated corn plants, which became systemically colonized by Corynebacterium michiganense subsp. nebraskense (CMW). It has been possible to generate infected seed. Preliminary data indicate a maximum of 4% seed infection. During winter months of 1983/84 and 1984/85 periodic field sampling of corn leaf debris infected with CMW was carried out. Although populations of the bacterium declined, to 6% of the initial in 1983/84 and 53% of the initial in 1984/85, they were still substantial at planting time in the spring. A mild winter in 1984/85 may account for the difference in survival of CMW between the two seasons. Both infected seed and corn residues may potentially serve as sources of primary inoculum in the spring.

PRESENCE OF L-ASPARAGINE IN CULTURES OF BIPOLARIS MAYDIS RACE T INCUBATED ON L-ASPARAGINE. T. R. Blissner and M. G. Garvey.
Dept. of Plant Path., The Ohio State Univ., Columbus, OH 43210

Bipolaris maydis race T was incubated in a liquid medium containing 2 g/l glucose and either 4 g/l of L-asparagine (L-asn) or L-asparagine (L-asn) for 72 or 96 hrs at 28°C on a reciprocal shaker (100/min). After 72 hrs ammonium (NH₄) levels were 14.34±2.3 with L-asn and 1.94±1.9 mmole/ml with
L-asp. By 96 hrs NH₄⁺ levels were 20.5±5.0 μMoles/ml with L-asn while remaining constant with L-asp. To test the possibility that NH₄⁺ accumulation on L-asn was accomplished by the formation of L-asn, 20 μMoles/ml of L-asn was incubated for 72 and 96 hrs and analyzed them chromatographically. Chromatograms were run in butanol-acetic acid water (6:3:7-10) v/v/v and developed with ninhydrin and hydroxyisouquinoline in methyl cellosolve. Spots were detected coinciding with L-asn in cultures with L-asp and coinciding with L-asn and L-asn in cultures with L-asn. The data indicate that NH₄⁺ accumulation in cultures of E. h. strain T on L-asn is accompanied by the formation of L-asn in the culture filtrate.


Standard enzyme-linked immunosorbent assay (ELISA) assays with biotinylated Aβ and rabbit anti-Aβ immune serum as substrate. Biotinylated ELISA 9.7-ELISA with biotinylated Aβ detected Aβ, Aβ-AP as the enzyme marker, and Aβ-AP as substrate. Enzyme-linked fluorescent assay (ELFA) with Aβ-AP and Aβ-AP immune serum as substrate. Aβ-AP immune serum for IgG, Aβ-AP immune serum for IgG.

RESPONSE OF SUNFLOWERS TO CULTURE FILTRATES FROM PHOMA MACDONALDI. P. Donl, C. Hartman, J. Venette, G. Secor, Dept. of Plant Pathology, North Dakota State University, Fargo, ND 58105.

Phoma macdonaldii is parasitic on sunflowers (Helianthus annuus L.) and can cause premature ripening. Phoma macdonaldii produces a toxic metabolite in culture which may be useful as a proxy for use in identification of resistant germplasm. Sterile filtrates from a North Dakota strain of the fungus grown in potato dextrose broth or Crzapek broth for one month, inhibited the growth of sunflower seedlings. When the filtrates were sterilized and seeded into soil containing plant, the use of a fluorescent substrate and heads as the solid phase can enhance sensitivity for detection of LVM.


Fusarium solani is the number one cause of fungal keratitis (infection of the cornea) in humans in the U.S. We induced the disease in rabbits by inoculating the cornea with conidia of Fusarium solani. Three hours after infection, the corneal epithelium sloughed off and the point of inoculation and leukocytes accumulated on the surface of the exposed collagen stroma. Two days after inoculation, the cornea had become scarred. When the cornea was examined with the microscope, the collagen matrix and corneal basement membrane were intact. In culture, purified hyphae had been attacked by leukocytes and phagocytosis was well under way. Ultimately, the fungus was eliminated, the corneal epithelium regenerated, and there was a partial regeneration of the collagen matrix.

A BOOLEAN ALGEBRAIC APPROACH TO MODELING PARASITE HOST ENVIRONMENT SPECIFICITY. T. M. Shehab Eldin and L. K. S. Lehel, USDA, Washington, District of Columbia, Department of Plant Pathology.

A Boolean algebraic approach to modeling specificity is

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ANTAGONISTIC ACTIVITY OF BACILLUS SUBTILIS AGAINST THREE VASCULAR WILT PATHOGENS. K. Gregory, L.A. Schreiber, R. Roberts and J. Ichida, USDA, 351 Main Road, Delaware, Ohio.

Several isolates of Bacillus subtilis were recovered from American elm (Ulmus americana L.) that showed repression of

INFLUENCE OF TIMING OF DRY PERIODS IN INFECTION OF ONION BY BACTERICIA SQUAMOSA. K.L. Everts and M.L. Lacy, Dept. of Botany and Plant Pathology, Michigan State University, East Lansing, MI 48824.

Onion plants inoculated with dry conidia of Bactericida squamosa in a setting tower were placed in a dew chamber for an initial dew period of 2-12 hr, then given a 2-hr dry period followed by 12-22 hr of additional dew. Plants received 24 hr of dew in a 26 hr period. The only variable was the timing of the dry period. Control plants received 26 hr continuous dew. Continuous germination observed after 6 hr, and lesions formation after 4 hr, and lesion formation after 10 hr of continuous dew. Two hour dry periods after 6 hr of initial dew resulted in the greatest reductions in apopressin and lesion formation. Histological observations of leaf samples revealed that, by 6 hr, most conidia had germinated, many had begun to form appressoria, but none had yet formed lesions. Conidia in developing appressoria were even more vulnerable to drying than nondeveloping conidia or conidia whose germ tubes had penetrated host tissue.

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LEAF TATTERS - A MALADY OF UNKNOWN CAUSE OF OAKS. R.J. Green, Jr., Professor, Department of Botany & Plant Pathology, Purdue University, Lafayette, IN 47907.

In 1983, a previously unreported malady of white oak Quercus alba, was observed in northcentral Indiana. The symptoms included leaf reduction and leaf blight followed by partial or complete leaf necrosis. Second flush leaves are variable in form and reduce in size. Symptoms begin in the lower part of the crown and are progressive in succeeding seasons. In one location, 50% of trees with total crown involvement in 1994 failed to leaf out in 1995. No trees under observation have recovered, to date. Although symptoms occur primarily on white oak, other oak species are also affected. Attempts to associate specific causal agents with the symptom complex through field observations, laboratory isolations, EM micrographs, grafting, and seed transmission have been inconclusive. However, the progressive nature of symptoms on affected trees and within stands suggests an infectious agent of some type.

ANTAGONISTIC ACTIVITY OF BACILLUS SUBTILIS AGAINST THREE VASCULAR WILT PATHOGENS. K. Gregory, L.A. Schreiber, R. Roberts and J. Ichida, USDA, 351 Main Road, Delaware, Ohio.

Several isolates of Bacillus subtilis were recovered from American elm (Ulmus americana L.) that showed repression of
Dutch elm disease symptoms following inoculation with Ceratostomella ulmi. These bacteria inhibited phytochemical of C. fuscata and Verticillium albo-atrum on potato and cherry trees, causing dieback. Exudation of water-soluble, antibiotic-like substances, possibly aloe exudates, was observed from C. fuscata. The cultures of C. fuscata were classified into two major groups based on their antibiotic profiles. The group A cultures, which produced a broad spectrum of antibiotics, included the isolates from Kentucky, Ohio, and Pennsylvania. The group B cultures, which produced a narrower spectrum of antibiotics, included the isolates from other regions.


We used a root cap cell assay to measure sensitivity of wheat cultivars to H. sativum toxin, and compared relative toxin sensitivity with the susceptibility of the plants to Helminthosporium root rot. Cells were washed from root tips in water and adjusted to 1000/1000 ml of Murashige and Skoog salts. Freshly harvested root tips were used for the assay. Washed roots were exposed to toxin for 24 hr and the number of root tips was recorded. The results were compared to a standard assay that used untreated control roots. The results showed that the toxin sensitivity of the plants was inversely correlated with the sensitivity of the root tips to Helminthosporium root rot.


Six sweet corn hybrids differing in general resistance to common rust, caused by Puccinia sorghi Schew, were planted weekly for eight consecutive weeks and inoculated simultaneously. Significant differences in rust severity, measured as percent leaf area infected, were observed for hybrid, growth stage, and the interaction of hybrid by growth stage. The results indicated that the hybrid by growth stage interaction was significant in all cases. The ranking of the hybrids was: Hybrid A > Hybrid B > Hybrid C > Hybrid D > Hybrid E > Hybrid F. The ranking of the hybrids was consistent over the eight growth stages with one exception. Gold Cup was significantly different from the most susceptible hybrid in all cases except for Pielight at the flowering stage. However, as an adult plant, Gold Cup was not significantly different from the most resistant hybrid, Miracole. The ranking of the other five hybrids over all growth stages in order from most susceptible to most resistant was: Florida Staytastic, Styleleaf, Jubilee, Sugar Leaf and Miracole.

USE OF VISUAL ASSESSMENT AND ELISA TO EVALUATE THE REACTION OF WHEAT CULTIVARS TO WHEAT SOILBORNE MOSAIC VIRUS. Robert M. Hunger and J. L. Sherwood, Plant Pathology Department, Oklahoma State University, Stillwater, OK 74079.

Field reactions of 12 winter wheat cv. to WSMV were evaluated visually by ELISA. Ten plots/cv. with 10 plants/plot were assessed 3 times during spring. In 1985, a disease severity index (DSI) was calculated for each cv. DSI is defined as the percentage of plants that are not symptomless. The DSI was compared to the results of ELISA readings taken during each assessment. ELISA readings of cv. North Dakota, Newton and New Hope were compared to other cv. readings taken with near control readings increased with each assessment. ELISA readings of the other cv. increased with the second assessment and decreased with the final assessment and approximated the last readings of North Dakota. DSI indicates that severity of WSMV is reduced while ELISA indicates that the virus concentration in resistant cv. approaches that of susceptible cv. as the season progresses.

GIBBERELLA ZEA (Group I) AND Fusarium SPECIES OCCURRING ON SCABBY WHEAT IN MINNESOTA. T. Kommedahl, A. R. Wilcoxson, E. A. Kamal, University of Minnesota, St. Paul and C. E. Windels, University of Minnesota, Crookston.

From 9340 wheat grains collected from 19 different fields in 12 counties in southern Minnesota and the Red River Valley in 1984, surface disinfect (3% H2O2, 30 sec), and on paper, on commercial grain isolates from the test were grown on commercial potato-dextrose agar (PDA). 10 species of Fusarium were isolated and identified using the manual developed by Nelson, Tousson, and Marasas, 1980. The species and number of isolates from different fields were as follows: F. graminearum, 32; F. sporotrichoides, 12; F. aquosum, 2; F. cerealis, 4; F. culmorum, 4; F. ergotxii, 1; F. gigasporum, 1; F. javanicum, 1; F. nivale, 1; F. oxysporum, 3; F. semitectum, 1; F. subpelliculare, 1; F. triticum, 1; F. triticoviride, 2; F. tritici-repentum, 2; F. tritici, 3; F. tritici-repentum, 1; F. tiglium, 1; F. wollenworganum, 1; F. zeae, 2. In addition, 98% produced perithecia either on PDA or carnation-leaf agar, indicating that the F. graminearum (Gibberella zeae) isolates were predominantly in Group 111 isolates that also cause stink rot of corn.

cDNA CLONING AND PRELIMINARY ANALYSIS OF WHEAT SCABBY WHEAT MOSAIC VIRUS RNA. S. A. Lomel, T. J. Kendal, Department of Plant Pathology, Kansas State University, Manhattan, Kansas 66506.

A 2.1 kb cDNA fragment (pW38) representing a fifth of the HERBICIDE-INDUCED LEAKAGE OF CARBOXYMATERIALS FROM UNGERMINATED FUNGAL PAPILLAE. T. Isakelt and J. L. Lockwood.*

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big bluestem (B. gerardii), sand bluestem (B. hallii), prairie cordgrass ( Spartina pectinata), indiangrass ( Sorghastrum nutans), prairie sandreed ( Calamovilfa longifolia), eastern gamagrass ( Tripsacum dactyloides), and sand lovegrass ( Eragrostis trichodes) were susceptible to both strains of the virus, while reed canary grass ( Bouteloua curtipendula) was susceptible only to strain A. All were more readily infected by strain A than by strain B in greenhouse tests. All gave mosaic symptoms except switchgrass which showed irregular stripes. No correlation was noted between susceptibility to infection and virus titer. A positive relationship existed between virus titer and infectivity of the sap of these grasses. Most of the grasses had less virus than sorghum ( S. bicolor) but sand lovegrass and prairie cordgrass had more. Likely virus reservoirs were identified.

EFFECTS OF DUAL INFECTION WITH MAIZE DWARF MOSAIC VIRUS AND FUCINIA SORGHI ON SWEET CORN. C. J. Fazur, Cleora J. D'Arcy and R. F. Patak, Department of Plant Pathology, University of Illinois, Urbana, IL 61801.

The effect of dual infection with maize dwarf mosaic virus (MDMV) and Fucinicia sorghi on sweet corn was evaluated in 1984 for six cultivars: Florida Staysweet, Gold Ring, Jubilee, Midway, Sugarloaf and Sundance. The experiment was arranged as a split plot with 2 replications of a 6 by 2 factorial with cultivars as main plots and 4 pathogen treatments (monoculture, rust, dual infection and control) as subplots. Twenty plants from each subplot were sampled. MDM did not appear to affect rust severity. In plots with 100% MDM incidence, yields were reduced from 8.5% to 41%. In plots ranging from 11% to 32% rust severity at anthesis, yields were reduced from 0% to 26%. In plots with dual infection, yields were reduced from 13% to 52%. No significant interaction between MDM and rust was exhibited for yield; however, some quality characteristics such as ear height and tip fill showed a detrimental synergistic response to the presence of both pathogens.

EVALUATION OF SEEDLING INFECTION OF BARLEY WITH Uritago nuda after Kavanagh (1961, Phytopathology 51: 175-177) was modified and evaluated further for inoculation techniques for screening for resistance in barley cultivars. Variables tested included inoculum viability, inoculum concentration, seedling coleoptile length, and vacuum pull technique. It was concluded that to achieve infection, freshly prepared inoculum, coleoptiles no longer than 4 mm, and at least one vacuum pull were necessary.

EFFECT OF LATE SEASON MATURATION RATE ON SOYBEAN QUALITY. E. D. Fluker & T. S. Abney, Department of Botany & Plant Pathology, Purdue University, USDA-ARS, W. Lafayette, IN 47907.

Late season maturation rates (days between BT and RG) and fungal infection of pod and seed by the Diplodia/Phomopsis complex and Cercospora kikuchii on sweet corn was assessed for 85 soybean ( Glycine max) germplasm lines in 1984. Nearly equal numbers of entries, ranging in maturity from 95 to 137 days, were tested because of high or low levels of fungal seed infection data were based on natural conditions for Diplodia/Phomopsis and conidial inoculations in R2 for C. kikuchii. Plating of BT and RG) pods and seeds on PDA revealed that there was ample pod inoculum of these fungi for potential seed infection, and confirmed the differences in seed infection observed in previous years. Plant Introductions 417274, 416523, 417203, 417460, 404294, 417046, and 416994 had high levels of resistance. Entries with mid-season quality had 8.8 to 10.7 days between BT and RG whereas entries with poor seed quality had 9.6 to 16.5 days.

VEGETATIVE COMPATIBILITY GROUPS IN CYTOPORA KUNZELI. Tyre Professors, Dept. of Botany and Plant Pathology, Michigan State University, 48824-1312.

Vegetative compatibility groups (vc-groups) in Cytopora kuenzeli can be demonstrated by pairing conditioned isolates on potato dextrose agar and observing the reaction along the line of contact of the expanding colonies. Using this method 443 isolates of C. kuenzeli were examined. The isolates were taken

CONCENTRATION AND INFECTIVITY OF MAIZE DWARF MOSAIC VIRUS IN NATIVE GREAT PLAINS GRASSES. M. K. Palomar and S. G. Jensen, Univ. of Nebraska and USDA-ARS, Lincoln, NE 68583-0722.

The susceptibility of native Great Plains grasses to maize dwarf mosaic virus strains A and B and their relative virus titer were investigated. Little bluestem (Andropogon scoparius)

Wheat streak mosaic virus (WSMV) genome was cloned in Escherichia coli using a modification of the RNase H-DNA polymerase I mediated second strand synthesis of Gubler and Hoffman (Gene [1983] 25:523-526). Centrifugation of phagemid DNA, preparation of primary DNA synthesis from poly A WSMV RNA. Double stranded cDNA was oligo DT-tailed and annealed with 32P-l restricted oligo DT-tailed pBR322. The viral origin of the recombinant plasmid was confirmed by Southern blot hybridization using a randomly primed WSMV CINA probe. The orientation of the clones was determined by partial restriction maps of pMMB-8 and two shorter clones. It was concluded that all clones were derived from the 3' end of the WSMV RNA template. Nick-translated pMMB-8 is being used as a probe in dot blot hybridization assays to screen wheat germplasm material for WSMV resistance.

AN INHIBITION SOLID-PHASE RADIOIMMUNOASSAY COMPARED TO OTHER MEASURES OF ASPERGILLUS REPENS IN STORED CORN. S. L. Martin and J. Tuite, Purdue University, West Lafayette, IN 47907.

Corn kernels at 17% moisture initially free of fungal infection were inoculated with conidia of Aspergillus repens and stored at 26C for 55 days. Fungal development and kernel deterioration were assayed periodically by eight measures: kernel germination, fungal infection, number of fungal propagules, blue eye, visible sporulation, CO2 evolution, ergosterol content, and inhibition solid-phase Radioimmunoassay (ISPIRA). All measures except blue eye were significantly correlated with each other and with storage length. ISPIRA detected five ug of conidia per ml of corn extract with a log-linear response to 1000 ug per ml and preparation was simple and rapid. Because of ISPIRA sensitivitiy and its lack of correlation with non-time-consuming methods it may be a useful research method for determining the growth of a fungal species in corn kernels.

PATHOGENICITY OF DRONE MOSAIC VIRUS (BMV) TO CORN. Aurelio Martos, G.F. Sehgal and L. Darrah. University of Missouri, Columbia, MO 65211. Sporadic incidence of BMV in field corn ( Zea mays L.) has been observed at the Univ. of Missouri Agronomy Research Center at Columbia during the past several years. The virus, when inoculated to corn plants, produced characteristic symptoms of mottle, distorted leaves, and premature flowering. Symptoms were observed on leaves, stems, and tassels. BMV was present in the field after the first observations in 1981, and this material was used in the greenhouse experiments described in this study.

ALTERATIONS IN LEAF PROTEINS ACCOMPANYING SOUTHERN BEAN MOSAIC VIRUS-INDUCED NECROSIS IN PHASEOLUS VULGARIS L cv. 'PINTO'. F. Mohammadi and G.P. Sehgal, University of Missouri, Columbia, MO 65211.* Soluble proteins from healthy and BMV-infected primary 'Pinto' leaves were analyzed with sodium dodecyl sulfate-polyacrylamide gel electrophoresis. The diseased tissue contained two major proteins, MW 17000 and 15500. Two proteins, MW 17000 and 15000, were present in amounts 3 to 5 times greater in the diseased than in the healthy tissue. The MW 21000 and 17000 proteins had been purified to homogeneity. Neither protein interacts with the early stages of BMV infection. Preliminary studies indicate that infection of 'Pinto' leaves with three other plant viruses (producing hypersensitive reaction) cause protein changes similar to those induced by BMV.

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from 127 cankers on 112 trees (primarily Picea spp.) located in Michigan. From that collection, 34 single vc-groups and 8 multi-vc-groups were identified. At least 1 loci appear to control vegetative compatibility in C. kunkelii based on the number of observed vc-groups, providing that there are only 2 alleles at each locus. Examples of isolates within a common vc-group originating from different species of Picea and from distant geographical areas were noted. Additional studies indicate that vc-groups do not segregate during conidio-formation.

A LABORATORY TECHNIQUE TO EVALUATE INFECTION OF GREEN ASH BY GLEOSPORIUM ARIDUM. Scott C. Redlin and Robert W. Stack. Dept. of Plant Pathology, NDU, Fargo, North Dakota 58105.

Anthracnose, caused by Gleosporium aridum (Ell. & Horl.), causes extensive defoliation on green ash (Fraxinus pennsylvanica Marsh.). Casual observations by the authors and others suggest that a fraction of the wild population shows useful resistance. An excised leaf disc technique may be a suitable tool for resistance screening of green ash. Leaf discs (18 mm dia.) were removed from healthy green ash leaves, surface disinfested and placed into wells cut in water agar in petri dishes. Treatment was done to the abaxial (uppermost) surface of leaf disc included unwounded, cut with a scalpel, and burned with a heated metal rod. Inoculum was applied in aqueous suspensions of 625 to 1.2 x 10^6 conidia per leaf disc. After nine days incubation for the least lesion size occurred on discs wounded by burning and inoculated with 1.3 x 10^6 conidia. The rapid screening of large numbers of genotypes for disease resistance may be possible with this technique.


Charcoal rot is a serious problem in Missouri. In developing a predictive model from commercial plantings, data is being collected from six areas in Missouri. Soils were sampled in April and June 1976 and 1977 for in steam microsclerotia (MS) of Microsphora phaseolla per gram soil. Areas were located at sites known to have a history of charcoal rot in the southwestern corner of Missouri. Analysis of the means for northwest, northeast, west central, central, south central, and southeast were significant; April 1976 (19, 27, 26, 21, 51, and 49), June 1976 (12, 48, 50, 22, 83, and 44), and Spring 1980 (8, 49, 49, 20, 66, and 37), respectively. The lowest MS means are in the northern areas and the highest means are in the central area. Temperature by location interaction appears to be a more significant factor in the north than in the south. This research was supported, in part, by a Missouri Soybean Merchandising Council grant.


Forty-two soybean seed isolates of Cercospora kikuchii from 19 States were tested for their ability to cause both foliar blight and purple seed stain of soybeans. Soybeans were inoculated at 25 (full bloom) growth stage with 3.3 x 10^6 conidia/ml R.O. All isolates produced high levels of foliar blight but different levels of seed infection; rates of symptom development varied among isolates. Isolates which caused more rapid blight development also caused higher levels of purple seed stain. Six of the isolates caused 100% seed infection; 17 isolates caused 20-50% infection; and 9 isolates caused >50% infection on 'Amoco 71' seed. Geographic origin of the soybean isolates was not an indicator of virulence. Cercospora isolates from corn and pea produced only low levels of seed infection.


Prunus basseyii is used as a rootstock for dwarving peach trees. However, most strains originated from one selection which was virus infected. Studies were conducted to determine if P. basseyii could be grown using meristem tip cultures to produce virus-free plants. Murnahine and Skoog medium and Anderson medium were compared. Quarter strength Anderson medium supplemented with sucrose (30 g/l), PVP (20 g/l), and benzyl amino purine (2 mg/l) gave optimum growth in shoot tips. The use of filter paper bridges gave superior results for growth of excised buds in the first weeks of growth. After 2 weeks on bridges, the explants were transferred to solid medium for best results. P. basseyii was successfully grown in vitro through stage I. Growth through successive stages is under investigation.

POLYMER FILMS: A NEW APPROACH TO CONTROL OF APPLE SCAB. I. GREENHOUSE STUDIES. N.H. Shaffer and J.A. White. Dept. of Plant Pathology, University of Missouri-Columbia, Columbia, MO 65211.

The feasibility of using antitranspirant polymer films as a replacement for conventional fungicides in the control of apple scab was studied under greenhouse conditions. The compounds tested included Wilt Pro® Vapor Gard®, AKF-B4, and the fungicide, Dithane M-45. These compounds were sprayed on pot-grown 'Red Delicious' apple trees with a hand sprayer. The 2 youngest leaves were then inoculated with conidia of Venturia inaequalis and placed at a mist chamber at 19°C for 18 hr. After 21 days, 91% of the leaves showed symptoms of scab infection, compared with 59% for AKF-B4, 20% for Wilt Pro®, 5% for Vapor Gard®, and 4% for Dithane M-45. All three polymers and Dithane M-45 provided significant (P=0.05) control of apple scab. Field experiments are being conducted to determine if these polymers are equally effective under field conditions.

CORRELATIONS BETWEEN VIRULENCE FREQUENCY OF UROMYCES APPENDICULATUS (DIEHLER) VOG. AND SOYBEAN VAR. APPENDICULATUS AND PUSTULE SIZE OF SHAMPOO. T.J. Mayer-Weik and James R. Steadman. Department of Plant Pathology, University of Nebraska, Lincoln, 68583-0762.

The relationship between virulence and pustule size was analyzed for 21 closely related races of bean leaf blight using the seven Harter 4x, 8x, 2x, M-45, and F-40 isolates and 53 x 731 differential bean cultivars. Frequency of virulent reactions and the number of atypical spots was positively correlated with that of pustule size. For example, races 2, 40, and 731, had similar sizes but were 100% virulent. In contrast, races 650 and 301, which were 65% and 100% virulent, had a higher number of atypical spots. The relationship between virulence and pustule size was observed among U.S. races 36, 37, 51, 58, and 77 recently identified by Staveley (Plant Disease 65:995-99) using the 7 differentials and 12 additional ones. However, U.S. races 1, 30, and 35 did not exhibit this trend. Among these races virulence was not correlated with grade 3 but was positively correlated with grade 4 or 5. When dry bean races were analyzed separately from snap bean races, a positive correlation between virulence and grade 5 was found among the snap bean races.


A major problem in detecting resistance in barley to common root rot, caused by Helminthosporium sativum, has been the need to test adult plants under field conditions. A seedling test which adequately predicts field resistance is very desirable. Barley lines of known and differing field susceptibility known common root rot were planted in H. sativum-infested soil in the greenhouse. After 3 to 4 weeks, stands were counted and plants were lifted and roots washed. Subcrown intermedes were examined and a rating system for the affected roots, given by number of lesions. Three seedling disease components correlated significantly to field disease but none sufficiently to be directly usable. Overall seedling disease severity was best correlated with a disease severity index based on infected plants. Seedling screening by disease measurements, even very precise ones, does not appear to satisfy the predictive needs of a resistance breeding program.

MICROPROPAGATION OF BLACK WALNUT, Juglans nigra L. B.J. Stefan and D.F. Millikan. Department of Plant Pathology, University of Missouri, Columbia, MO 65211.

Factors associated with the establishment of shoot-tip-meristem cultures of black walnut, Juglans nigra L., have been determined. Initial leaf breaking and root elongation were controlled by the addition of an antioxidant (0.01 M Na Dithioldithiocarbamate) prior to dissection, washing the excised tips with sterile distilled water for five hours, and placing the tips on half-strength B5 liquid medium (HorthCoccus 19:56) supplemented with 25 mol/l PVP. Growth and proliferation of established cultures have
been maintained as long as 10 months on solid medium, producing five succeeding subcultures. One-half strength DME medium supplemented with 4.6 mg/l of BAP, 2.0 mg/l of Zia, 1 x 10^{-6} mg/l of Oxy, and 25 coconut milk is superior to other tested media (M. Anderson, woody plant). The addition of casein hydrolysate at 25 mg/l, 50 mg/l, or 100 mg/l produced a short, dense type of growth but increased the number of subcultures obtained per culture at all three concentrations. Factors permitting rooting and acclimatization of shoots obtained in vitro are under current investigation.


F3 seedlings of three barley (Hordeum vulgare) crosses were evaluated for resistance to Pyrenidiota teres, the cause of net blotch. The crosses were Robust X JCM-2, Robust X M 16-100 and M 16-100 X JCM-2. JCM-2 and M 16-100 were the resistant parents. Seedlings at the two leaf stage were inoculated with a single-spore isolate of P. teres collected in Minnesota in 1983. A total of 91-100 families per cross were tested with 20 - 40 plants per family. In each cross F3 families segregated in a 1:2:1 ratio with chi-square values of 0.02, 0.07 and 0.13, respectively, and p values greater than 0.90. The data suggest that resistance to net blotch is controlled by one gene in the resistant cultivars.

ENOZYMATIC DESTAINING OF CALCOFLUOR TREATED LEAF TISSUE YIELDS HIGH CONTRAST FLUORESCENT RESOLUTION OF FUNGAL COLONIZATION. A.T. Treece and D.C. Loschke. Depts. of Plant Pathology, Univ. of Missouri, Columbia, 65211, and Univ. of Florida, Gainesville, 32611.

We developed a staining procedure that produces high contrast resolution of Helminthosporium spp. mycelia in corn leaf tissue. Infected tissue is cleared and stained in 0.1% calcofluor, autoclaved for 8 minutes in 0.5 N KOH, embedded in a thin layer of agar on a glass slide, and then partially digested with cellulase, H. carboxylic, H. avellana, and H. turcicum infection sites in a variety of corn genotypes, including cultivars near isogenic with respect to Ht1 and Ht2, were viewed with an epifluorescence microscope. In each purslane-host combination staining enabled visualization of all mycelia, from the point of penetration to the periphery of the colony. The high contrast enabled us to measure total hyphal length in susceptible versus resistant interactions of corn with H. turcicum. This technique may also be adaptable to other fungus-plant interactions.


Hemicellulosics sugars are a major component of hydrolysates of lignocelluloses. The efficient fermentation of D-xylose, the predominant hexose in inulin and several other high fructose containing plants, is a key factor in the economic feasibility of utilizing lignocellulosic substrates for ethanol production. Fusarium oxysporum efficiently ferment D-xylose, but over 2% D-xylose solution to ethanol under aerobic conditions. However, increased concentrations of D-xylose are not efficiently fermented, and in the latter stages of these fermentations, ethanol concentrations decrease. The addition of D-glucose to greater than 2% D-xylose fermentations enhances ethanol production. The addition of D-glucose to 4.2% D-xylose fermentations increased the ethanol yield from 0.22 g/g xylose to more than 0.32 g/g xylose utilized. The addition of glucose increased the ethanol yield of up to 7% xylose fermentations. Studies continue to elucidate the role of glucose in xylose fermentations by Fusarium strains.

POLYMER FILMS: A NEW APPROACH TO CONTROL OF APPLE SCAB. II. SCANNING ELECTRON MICROSCOPY. J.A. White and W.H. Shaffer. Dept. of Plant Pathology, University of Missouri-Columbia 65211.

In order to study the mechanism by which certain polymer films reduce apple scab infection, we sprayed the leaves of pot grown apple trees with the polymers described in Part I. The youngest leaves were Wescott, as described in Part I. Samples of the inoculated leaves were taken at regular intervals and were processed for scanning electron microscopy. Examination of polymer-coated leaves revealed that the Scab development was reduced in the paint films permanently included the stoma. Conidia germinated freely on polymer-coated leaves and growth of germ tubes was not inhibited. Appressorium produced on coated leaves were similar in shape to those on leaves. After 7 days, sub-cuticular growth of the fungus was evident in the controls, but markedly reduced in the polymer-coated leaves. We postulate that the polymer films provide a physical barrier that prevent the fungus from penetrating the cuticle.

STREAMBREAKER IN KANSAS WHEAT. William G. Willis. Dept. of Plant Pathology, Kansas State University, Manhattan, KS. 66506.

Wheat streambreaker caused by Pseudocercosporella herpotrichoides is a serious disease in the Pacific Northwest but has not been reported previously from the central Great Plains. Traces were found in Lincoln Co. in 1980, Harvey Co. in 1981 and Montgomery Co. in 1983. In 1984 it was widespread and severe with positive identifications from 23 central and eastern counties with the most severely affected area in south central around Witches. Weather records were compared to the "climatic potential" developed by Bruene in Washington (Bruene et al. Washington Exp. Sta. Bull. 694, 1960). Deviations from normal mean daily temperatures and precipitation at the Witchita airport were, Feb. +6.3°F and +38 in., Mar. -3.4°F and +56 in., and Apr. -4.5°F and +41 in. The "climatic potential" calculated by their formula exceeded that in areas in Washington where streambreaker is regularly severe. Apparently Pseudocercosporella survives long periods at low levels in Kansas wheat fields and with favorable weather can reach severe levels.

RESPONSE OF BLUEGRASS CULTIVARS TO NECROTIC RING SPOT. G. L. Worf, J. S. Stewart and R. C. Newman. Departments of Plant Pathology and Horticulture, University of Wisconsin-Madison, WI 53706.

Bluegrass and turf-type perennial ryegrass cultivars were planted in September, 1982, in large replicated blocks on two sod farms to evaluate their "patch disease" susceptibility. Symptoms developed in mid-July at one, late August at the other site and were rated on the basis of 0 (no disease) to 10 (100% diseased). Crown and root isolations yielded Leptosphaeria homor, the incitant of necrotic ring spot. Cultivars with few or no symptoms included Adelphi, Mayhew, Alcan 1, Alcan 2, Merlot, Newport and Rondure. None of four perennial ryegrasses showed symptoms. Examinations for pathogens and host responses will be continued over the next two years.

SMALCOLON VARIATION OCCURRING IN DISEASE RESPONSE OF REGENERATED CELERY PLANTS FROM CELL SUSPENSION AND CALLUS CULTURES. J.C. Wright and M.L. Lacy. Dept. of Botany and Plant Pathology, Michigan State University, East Lansing, MI 48824.

Whole plants of celery cultivars 'Florida 683' and 'Tall Utah 5270 HK' were regenerated from cell suspensions and from callus cultures. Leaves of these somaclones were inoculated with spores of Sclerotinia fructigena and were regrown with a cell suspension of Pseudomonas cichorii. Somaclones were then placed in muck soil containing Fusarium oxysporum f. sp. api. Race 2. Variable disease responses to all pathogens were observed, ranging from high to highly susceptible. Similar range of disease response occurred in plants whether they were regenerated from cell suspensions or from callus tissue. Several somaclones that appeared to be highly resistant to each organ were obtained, primarily from plants regenerated from cell suspension cultures.

POPULATIONS OF MACROPHOMA PHASEOLINA IN COMMERCIAL FIELDS AS AFFECTED BY CROP SEQUENCING. T.O. Wylle and S.M. Rosenbroek. Dept. of Plant Pathology, University of Missouri-Columbia 65211.

It is possible to manage soil populations of Macrophomina phaseolina in experimental rotation plots. Predicting crop rotation effects on the fungus in soil in commercial plantings is more reliable. Six areas in Missouri

* = Student Paper Competition

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totalling 112 commercial fields having soybeans (SB) among their crop-sequence schedules are being sampled. SB, SB double cropped (DC) with wheat, corn, milo, and others are among the crop sequences being studied. The effect of crop sequencing is expressed in the second and third years and is dependent upon field location. In areas where wheat DC with SB is a practice, DC significantly resulted in higher populations of microsclerotia (ms) than all other crop sequences. Significance ranged from 0.08 to 0.003 when comparing 1984 and 1985 spring numbers of ms, respectively, to the 1982 and 1983 crops. Increases in ms observed in soil are likely related to increased survivability of ms in soybean residue protected by wheat. This research was supported, in part, by a Missouri Merchandising Council grant.