NEW RESEARCH HORIZONS FOR PLANT PATHOLOGISTS IN BIOMASS PRODUCTION AND CONVERSION TO FUELS. Antonios A. Antonopoulos, Energy and Environmental Systems Division, Argonne National Laboratory, Argonne, IL 60439.

The traditional role of plant pathologists in providing abundant and healthy food for a better life has now extended to matters of fuel production, utilization, and conservation. New phytopathological problems resulting from the development of biofuel farms, the introduction and cultivation of new biofuel plants, and the use of microbes to degrade crop residues and industry wastes and to convert biomass to fuel will be encountered by plant pathologists. This paper discusses the results of three studies, namely: (a) the potential threat of plant pathogens to silvicultural yields of biomass for-fuels; (b) lignin degradation, cellulose saccharification, and monosaccharide fermentation for fuel production; and (c) assessments of potential fuel savings in the application of plant disease control measures. Finally, contributions of plant pathologists to the national program of biomass for-fuels are identified and evaluated.

PATHOGENICITY OF NOTROYDIOPLIOIDIA HYPODERMIA ON AMERICAN ELMS. C. L. Ash and R. W. Stack, North Dakota State Univ, Fargo, ND 58105.

Notryoldiolisia hypdermiae (Sacc.) Pet. causes a twig canker and dieback of American elms. The yellow foliar symptoms superficially resemble those of Dutch elm disease (DED). B. hypdermiae has been isolated from about 20% of the samples sent in for DED diagnosis in North Dakota over a period of several years. B. hypdermiae was isolated from 18% of branches with dieback and yellow foliar symptoms collected from mature city trees. It was not isolated from branches with yellow foliage but no dieback. B. hypdermiae was isolated from 13% of young trees showing dieback symptoms. American elms were wound inoculated with spore suspension from April through September. Most infection occurred during April, May, and June. B. hypdermiae was reisolated from 56% of inoculated branches. Fruiting bodies developed in October on these inoculated branches. Pyecnidia collected in March from naturally infected branches contained abundant spores. Infection was thought to occur through winter injuries in small twigs and branches.

FURTHER CHARACTERIZATION OF PANICUM MOSAIC VIRUS AND ITS SATELLITE VIRUS. F. G. Buzen and C. L. Niblett, Department of Plant Pathology, Kansas State University, Manhattan, KS 66506.*

Panicum mosaic virus (PMV) supports the replication of satellite panicum mosaic virus (SPMV). PMV replicates in the absence of SPMV, whereas SPMV requires PMV for its replication. PMV and SPMV are unrelated serologically and differ in their sedimentation coefficients and the sizes of their virions, RNAs and capsid proteins. At least six serotypes of PMV have been identified. They can be further separated into two groups based on their electrophoretic mobilities. Purified SPMV is activated in the presence of either PMV or Molinia streak virus (from Germany), which shares a distant serological relationship with PMV. Although biologically similar to tobacco necrosis virus and its satellite virus, PMV and SPMV share no serological relationship with either of these viruses.


The effect of nitrogen on Phytophthora root rot of soybeans was studied using field soil naturally infested with Phytophthora megasperma var. sojae (Pms). Soil collected from beneath disease-eased soybean was mixed and packed into 1.9 liter cardboard cartons at a bulk density of 1.25 and soil matrix potential of -0.3 bar. After 1 mo at 5 C, the soil cartons were frozen and stored 1-5 mo at -8 C. Cartons were thawed and warmed over 3 wk to 18-24 C before planting with soybeans (cv. Ansok). Urea and ammonium nitrate solutions were applied 10 days before planting at 4, 16, 40, and 100 ppm N. Soybeans were grown for 1 mo in growth chambers. Cartons were individually weighed and watered to control the average soil matrix potential. Both forms of nitrogen at 40 and 100 ppm significantly increased seedling damping-off and total plant kill due to Pms. Root rot and stunting were significantly increased by as little as 16 ppm N. Earlier application of ammonium nitrate (at the time of carton packing) did not increase disease.

EFFECT OF THREE DESICCANTS ON SOYBEAN STEM COLONIZATION BY PHOMOPSIS SOJAEE AND COLLETOTRICUM DEMATUM VAR. TRINCATA. R. F. Gerkenius and J. B. Sinclair, Dept. of Plant Pathology, Univ. of Illinois, Urbana, IL 61801.*

Bons and Wells soybeans at the R7 stage (50% defoliation) were sprayed with Parquat 20.1L (2.34 L/ha) and Bon soybeans were sprayed with either NaClO3 + Na2O5-H2O (5.4 kg/ha) (50:50) or Roundup (9.35 L/ha). Ten stems from each of 3-5 sampling dates were cut from the midregion of plants either sprayed or non-sprayed and rated (1 to 5) for presence of pycnidia (P) or acervuli (C). Stems with 5% or more coverage of fruiting bodies were significantly (p<0.05) greater on Parquat sprayed than on nonsprayed stems for all sampling dates. No differences occurred in amount of fruiting bodies between stems from the NaClO3 + Na2O5-H2O and Roundup sprayed and nonsprayed plants, except at 19 days after spraying with Roundup. For the three desiccants there was no difference in the rate of the development of fruiting bodies on any cultivar between sprayed and nonsprayed plants.

GOLDEN STAIN OF LODGEPOLE PINE (PINUS CONTORTA DOUGL. EX LODU) HEARTWOOD. Wallace E. Eslyn, Forest Products Laboratory, U.S. Forest Service, P.O. Box 5130, Madison, WI 53705.

Utility poles of lodgepole pine were found to contain a golden orange stain in the vicinity of their heartwood-sapwood boundary. Questions subsequently arose as to the cause of the stain as well as to its possible effect upon wood strength. Sections of discolored wood observed microscopically contained yellowish, oily globules and hyaline, nodose-septate hyphae with well lumina. Confoterasiae, olivacealba (Boord & Galz.) Jöblach--formerly Corticium fuscostratum Butz--was isolated from the stained areas. Subsequent inoculation of lodgepole pine and southern yellow pine heartwood and sapwood with
the isolate resulted in staining of heartwood only in both species. Use of this fungus in differentiating between heartwood and sapwood in Pinus spp. may be indicated. C. alifaciens—album caused only minor weight losses in both pine heartwood and sapwood in standard (ASTM) soil block tests and probably is not capable of physically deteriorating wood in use.


Immunofluorescence microscopy was used to detect Erwinia tracheiphila in culture and in infected feculent sections and macerated tissues. Antiserum to E. tracheiphila was produced in rabbits by weekly intramuscular injections of 1 ml of glutaraldehyde fixed bacterial cells (3.5x10^6 cells/ml) mixed with 1 ml of Freund's incomplete adjuvant. The resultant antiserm reacted with E. tracheiphila to a titre of 1:32,000 in microagglutination tests, but titers failed to exceed 1:64 with 30 other species belonging to the genera Erwinia, Xanthomonas, Pseudomonas, and Agrobacterium. Gamma globulins prepared by ammonium sulfate precipitation were conjugated with fluorescein isothiocyanate (FITC) for direct staining of E. tracheiphila. Unconjugated gamma globulins and FITC conjugated goat anti-rabbit serum were used for indirect staining, a superior method for detecting bright fluorescent masses of bacteria in infected xylem elements. Hence, immunofluorescence appears to be useful for rapid and clinical diagnosis of infected specimens.

IMPROVED PURIFICATION OF WHEAT SOIL-BORNE MOSAIC VIRUS. C. Ferguson, H. and Uyemoto, J.K., Department of Plant Pathology, Kansas State University, Manhattan, Kansas 66506.

Wheat soil-borne mosaic virus (WSBMV) was purified with sodium acetate buffer, pH 5.0, containing 1% sodium metaphosphate (NaPO_4). Frozen infected wheat (Triticum aestivum var. cv. Eagle) was triturated in buffer (1:3, w/v) and filtered through cheesecloth. After differential centrifugation, high-speed pellets were resuspended in 0.05 M sodium borate pH 7.5 and 0.001 M EDTA, layered on a 10 ml pad of 20% sucrose in borate buffer, and repelleted. These pellets were resuspended in borate buffer and further purified by density gradient centrifugation and zone electrophoresis. Sigma sodium acetate increased virus yields 25-fold over that of sodium acetate alone. Grinded increased amounts of plant tissue (50-200 g) resulted in a near linear increase in virus yield; however, the requirement for NaPO_4 was non-linear (15/50 g tissue vs. 2.5/200 g tissue). Antiserum was prepared and tested in enzyme-linked immunosorbent assay (ELISA).

EFFECT OF SOIL FUMIGATION ON SURVIVAL OF MACROPHOMINA PHASEOLLINA IN SOYBEAN STEM RESIDUE. L. E. Gray, USDA, SEA/AR, Department of Plant Pathology, University of Illinois, Urbana, Illinois 61801.

In 1977 the soil fumigant Sodium N-methyl dithiocarbamate (Metam) was applied to a Clene soil loam soil and evaluated for the control of Macrophomina phaseollina in soybean stem residue. The fumigant was applied at the rate of 474 ml in 3.8 liters of water to each 1.8 m x 2.4 m plot and incorporated into the top 15 cm of soil. Total fungal population counts and total population of Macrophiomina on soybean stem residue from fumigated plots were significantly lower than that in stem residue samples from control plots. Percent plant infection and percent root colonization of Ws soybean by Macrophomina was reduced by soil fumigation. Twenty-five percent of the tap roots of Ws soybeans in fumigated plots were infected compared to 97 percent in control plots. Soybean yields were increased 16 percent by fumigation.


Branches of red oak trees 4-8 cm diam were removed at forks in October 1978, leaving 15-20 cm stubs. In December, stubs were removed, placed in plastic bags, and frozen until assayed. Ten disks, 6-8 mm thick, were cut serially from the exposed end of each frozen stub and then drenched and quartered into wedges. Frozen wedges were surface sterilized by boiling for 5 min. Wedges were incubated 40 hr at 24 C in a sterile dish containing water-saturated air and then each surface was printed for 2 min on an oak wood diffusate agar. A plug of a decay fungus (DF) was placed on the agar 2 cm from the edge of the print. After 6 days, bacteria, yeasts, and fungi inhibitory to DF were observed. Some isolates also prevented growth of Polyporus clemens and Stereum frascatum through red oak disks when isolates were applied to surface-sterilized disks 3 days prior to adding DF. Bacteria were present in sapwood and heartwood of all wedges, whereas yeasts and fungi in sapwood but only occasionally in heartwood.

TRANSMISSION OF BARLEY YELLOW DWARF VIRUS (BYDV) FROM TOLERANT TO INTOLERANT SISTERS OAT LINES BY RHOPALOSIPHUM PADI AND MACROSIPHUM AVENAE FAB. IN RELATION TO THE ACQUISITION FEEDING. J. L. Mitchen, USA, AR, Department of Plant Pathology, University of Illinois, Urbana, IL 61801.

In parallel tests no apparent differences in transmissibilities of BYDV by either M. avenae or R. padi to Coast Black oats from three pairs of infected sister oat lines, each tolerant and intolerant to the virus, were observed with acquisition feedings of 12, 24 or 48 hr. R. padi had higher transmission frequencies (90%) than M. avenae (32%). Although transmission frequencies increased with the length of acquisition feeding, particularly for M. avenae, the mean disease incubation period remained 11 days when the virus was transmitted by R. padi, and 16 days when the virus was transmitted by M. avenae, regardless of the oat line used as a source plant or of the length of the acquisition period.

LEAF EXPANSION OF SOYBEANS INFECTED BY PHYTOPHthora MEGASPERMA VAR. SOJAE. D. B. Kiddle, D. B. Peters and L. E. Gray, USDA, SEA/AR Department of Plant Pathology, University of Illinois, Urbana, Illinois 61801.

An inexpensive potentiometric transducer capable of monitoring leaf enlargement of soybean plants was constructed. The tips of leaves were attached to a thread, while the petiole was immobilized at this point. The thread was connected to a 500 ohm 10-turn potentiometer. As the leaf expanded the shaft of the potentiometer rotated, changing its resistance. This unit can detect changes in leaf size as small as 100s. Susceptible Amsoy soybeans were grown in soil infected with various levels of Phytophthora megasperma var. sojae (PM). Leaf expansion was monitored for 2 to 5 days periods. Leaf expansion was limited to periods of darkness. Leaves of PM-infected plants remained 11 days when the virus was transmitted by R. padii, and required more time for expansion to begin after the onset of darkness, compared to healthy plants.

PSEUDOMONAS LACHRYMON: MIGRATION FROM SEED TO ROOTS. Curt Leph. Ohio Agric. Res. and DeVel. Center, and The Ohio State Univ., Wooster 44691.

Cucumber (Cucumis sativus) seeds inoculated with P. lachrymon were anchored with drops of melted 1.5% water agar on 2.4% water agar in petri or larger plates. Plates were sealed and incubated vertically 4-6 days in light. P. lachrymon was found on all parts of the plant, indicating a root system, which was on the agar surface. The bacterium was detected with selective agar M7 (Phytophthora 62:674) by plating the entire root system or root sections. It was also detected by velvct replica prints of roots on agar or of agar after root removal. When seeds were anchored on dialysis film placed on water agar, migration also took place. Removing roots and staining the agar or film surface revealed many bacterial cells. Bacterial cells were in tightly stained material next to roots. Some cells were dividing. Thus, P. lachrymon may be an active member of the cucumber rhizosphere microflora.

RELATIONSHIP BETWEEN BROWN SPOT SEVERITY AND YIELD LOSSES IN SOYBEANS. G. M. Lim, USDA-SEA/AA, Department of Plant Pathology, University of Illinois, Urbana, IL 61801.

The potential effect of Septoria glycines on yield, 300- seed weight of 'Wells' and 'Williams' soybeans, and the relationship between disease severity and yield losses were studied in
1977 and 1978. Yield reductions in 'Wells' which were artificially inoculated at different growth stages ranged from 12.0 to 33.7% while yield reductions ranged from 8.7 to 12.0% in naturally infected 'Wells' when compared to yield from the fungicide-protected plots. Yield reductions in artificially inoculated 'Williams' ranged from 13.1 to 31.7%; while yield reductions in naturally infected 'Williams' were from 8.0 to 13.0%.

S. graminea caused reduction in 300-seed weight from 0 to 19% in 'Wells' and 5.7 to 13.0% in 'Williams'. Best estimates of reduction in yield were found with the linear expression of area-values under brown spot progress curves.

**WHEAT STREAK MOSAIC VIRUS RESISTANCE IN HEXAPLOID WHEAT.** T. Joe Martin, Fort Hays Branch Experiment Station, Hays, Kansas 67601.

Resistance to wheat streak mosaic virus (WSMV) was found in hexaploid wheats. In seedling tests at 22°C, Eagle (CI 15068), PI 225237, PI 194358, and PI 195713 were less receptive to mechanical inoculation and developed systemic symptoms more slowly than Parker, the susceptible check. Infectivity assays of systemically infected plants of the four resistant cultivars showed they contained lower virus concentrations than did Parker. The resistance of Eagle was not detected at 27°C. PI 225237 was less resistant at 27°C than at 22°C. The resistance of PI 194358 did not change at 27°C. Field studies and seedling tests on F1 lines derived from Eagle x PI 194358 and Eagle x PI 195713 indicate the sources of resistance in these lines are additive. These results improve the prospects of developing an effective level of WSMV resistance in hexaploid wheats.

**CONTROL OF ROOT KNOT NEMATODE WITH AN EXPERIMENTAL NEMATICIDE, DS-16811.** Douglas W. Niswanger and Richard K. Lankau, Diamond Shamrock Corp., T. R. Evans Research Center, P.O. Box 348, Painesville, Ohio 44077.

DS-16811 (4-methyl-3-methylcarbamoylomimidetetrahydrothiophoran) was evaluated for root knot nematode control by several application methods. Greenhouse tests indicated that DS-16811 controlled root knot in cucumbers and tomatoes at rates equivalent to 1.1 kg/ha. Effective control was noted with in-furrow application equivalent to 9-18 g a.i. 100m of row applied in a band 5 cm wide. Residual activity of DS-16811 was maintained for 3 weeks after treatment. Field tests were established in galvanized steel cylinders 75 cm in diameter and 90 cm deep. The cylinders were filled with sandy soil and infested with root knot inoculum. Six susceptible tomato plants were planted in each plot. DS-16811 reduced root knot an average of 87% and increased fruit yield by 79%. Alidicarb averaged 92% control of root knot and increased fruit yield 121%.

**SEPTORIA BROWN SPOT OF SOYBEANS: EFFECT OF ROW WIDTH AND TILLAGE PRACTICE ON DISEASE DEVELOPMENT.** M. T. Mmbaga, C. R. Grau and D. C. Army, Dept. of Plant Pathology, Univ. of Wisconsin, Madison, WI 53706.

Brown spot (caused by Septoria glycines Hemm) development in the field was studied during the growing seasons of 1977 and 1978 to test the effect of row width on disease severity and on grain yield. 18, 38, and 76 cm rows were used in 1977 and 38 and 76 cm rows in 1978. The effect of shallow and deep tillage was studied. In 1977 naturally infected plots showed disease indices of 6.1, 5.3, 5.0, and 4.5 for 18, 38, 76 cm row widths, respectively, in early August, but by end of the season readings of 9.8 and 10 were obtained (scale 0-10). Thirteen cm rows produced about 7% more yield than 76 cm rows. In 1976, grain yield was 19% higher in 38 cm rows compared to 76 cm rows in deep plowed plots, while in disked plots 76 cm rows produced 11% more yield. Shallow tillage supported significantly more disease than deep tillage (disease index 2 for row widths deep plowed vs 3 and 4 for 76 and 38 cm row widths disked).

**THE EFFECT OF THE TIMING OF CHLOROTHALONIL APPLICATIONS ON APPPEL FRUIT RUSSETTING**

*Presented in the Graduate Student Award Competition of the North Central Division of The American Phytopathological Society.

Robert Naundorfer, Richard K. Lankau, Diamond Shamrock, T. R. Evans Research Center, Box 348, Painesville, Ohio 44077

Chlorothalonil is an effective fungicide for the control of apple scab but has not been registered for this use, however, since it was found to cause russetting of apple fruit. The present study was conducted to determine which stages of development the apple fruit are most sensitive to injury from chlorothalonil. Single sprays were applied to individual blocks of four different varieties at different times throughout the season. It was found that sprays applied prior to the pink bud stage did not cause fruit russetting. Sprays applied at pink bud onward resulted in severe apple fruit russetting, whereas sprays applied one-half inch from fruit more than three days after full bloom caused no russetting. The diameter did not. Thus, it would appear that carefully timed sprays of chlorothalonil may possibly have use in a multifungicide or SAT spray programs designed to prevent the formation of fungicide resistance to other materials.

**SEEDLING BLIGHT AND STALK ROT OF MAIZE CAUSED BY GIBBERELLA ZEAE.** S. K. Oken and M. L. Warren, Dept. Botany and Plant Pathology, USDA, Purdue University, W. Lafayette, IN 47907.

Gibberella zeae (Schw.) Fisch. causes seedling blight, stalk, and ear rots of dent corn. Studies were conducted to determine a) the resistance of 50 corn inbreds to seedling blight and the role of nitrogen in disease expression; b) the effect of captan-seed treatment on emergence in the field; and c) the resistance of 50 inbreds to stalk and ear rot. The effect of seedling blight, 24 were susceptible, 22 moderately susceptible, and 4 were resistant (187-2, A632, W37A, and W182B). The addition of nitrate or ammonium form of nitrogen caused a 31% increase in disease severity in comparison to a no-nutrient treatment. Of the two nitrogen treatments, the treatment tended to have lower disease severity. Captan-seed treatment resulted in an 8.7% increase in germination, from 67.5% to 76.9%. Fifty-two of the 50 inbreds tested, 27 were resistant, 21 moderately susceptible, and 2 were susceptible to the pathogen. The correlation coefficient value for seedling blight severity to stalk rot severity was 0.0458.

**MONITORING SOYBEANS IN ILLINOIS FOR POLIAR DISEASES.** J. K. Pataky, S. M. Lim, E. G. Jordan and K. L. Warsaw, Dept. of Plant Pathology, Univ. of Illinois, USDA-SEA, and USDA-APHIS, Urbana, IL 61801.

A soybean monitoring program was established in 1977 and 1978 to determine the incidence and durability of foliar diseases in regions of Illinois, to identify disease risk situations, and to detect shifts in pathogen populations. For the 2 years, a total of 17 cultivars from 5 maturity groups were planted at 10 locations in the state every 2 to 3 weeks. In both years, severities of brown spot (Septoria glycines) were high at all locations and downy mildew (Peronospora manshurica) was prevalent in central and southern Illinois. Bacterial blight (Pseudomonas glycines) was intense in northern Illinois in 1977. Late-maturing cultivars were more intensely infected than early-maturing cultivars when conditions were favorable for disease development.

**ESTIMATING APHONYCIES EUTHELUS POPULATION IN SOIL BY A MOST PROBABLE NUMBER TECHNIQUE.** W. F. Pflender and D. J. Hagedorn, Dept. Plant Pathology, Univ. of Wisconsin, Madison, WI 53706.

A procedure based on the "most probable number" technique was developed to estimate the density of infective propagules of Aphonomyces eutelius in soil. Infected field soil is mixed with sand or pasteurized field soil to produce several dilution levels. Each dilution level is divided into aliquots and placed as a 1-cm layer, sandwiched between layers of vermiculite, in compartments of (2x2x6 cm) of a transplant cage. Plants are planted in the compartments. The tray is placed in a pan of water, with the water level 1 cm below the soil layer, at 24°C. At 2-3 weeks after planting, each plant is removed and scored, by symptoms and/or plating, as positive or negative with respect to infection by Aphonomyces. These data can then be analyzed to estimate the number of infective propagules of this pathogen present in a unit volume of the undiluted field soil. Preliminary results indicate that this method may be helpful in understanding the behavior of this fungus in soil.
American isolates of Ceratocystis ulmi were examined for the presence of double-stranded RNA (dsRNA) by electron microscopy on 2 % polyacrylamide gels. dsRNA was detected in 5 of 10 "more aggressive" (MA) isolates and 4 of 5 "less aggressive" (LA) isolates. From MA isolates, electron microscopy revealed 1–2 dsRNA bands with approx. molecular weights (MW) of 1.5 X 10^6 and 1.6 X 10^6 daltons. dsRNA from 3 LA isolates separated into 5–7 bands with MW's ranging from 0.14 to 1.5 X 10^6 daltons. A fourth LA isolate possessed only 2 dsRNAs with MW's of 1.6 X 10^6 and 2.0 X 10^6 daltons. Overall, LA isolates had more dsRNA species than MA isolates. Although the presence of dsRNA may be related to aggressiveness, it is thought that other factors must also be involved. Other characteristics were studied in relation to aggressiveness. The most consistent differential character in culture has been the more rapid growth of LA isolates at the supraoptimal temperature of 33°C.


A total of 28 mononucleoid isolates from different regions (Canada-3; France-4; New Zealand-3; Yugoslavia-1; U.S.A.-17) were compared. Two basic colony types were identified on malt agar (NA): light (5 isolates) and dark (23 isolates) colored. Radial growth rates at 24°C varied from 1.1 to 4.4 mm/day, with the largest growth rates being characteristic of the light-colored isolates. Two isolates showed a distinct gray color and aerial mycelium, and they were found to have lost their sporulating ability in vitro and in vivo. The optimum temperature for radial growth was 24°C for 76.2% of the isolates. Condido An vivo (150 condi measured/isolate) varied from 12-25, 35.0 cm × 2.0-3.0 cm, with 1/b ratios from 7.15-10.04 (x = 8.94). There were significant differences in condi length among the isolates.


The study was carried out by inoculating 6) grasses (37pp) in a greenhouse (GH), growth chamber (GC), and in the field. For GH and GC inoculations, a spore suspension was sprayed on the plants, which were placed in a mist chamber. In the field, grasses were planted alternately with maize line W04A, which was growing with a spore suspension and dusted with infected debris. In GH, Sorghum bicolor (3cv) developed atypical symtoms: punctiform, purplish spots. In GC, Echinochloa crus-pavull var. frumentacea, Setaria viridis, S. bicolor (4cv) and S. sudanense (2cv) showed atypical symptoms as well as larger (±7mm) necrotic spots. In GC, Zea diploperennis, Z. mays spp. luxurians, Z. mays spp. mexicana, and Z. perennis showed typical lesions. In the field, S. viridis and S. bicolor (1cv) showed atypical lesions on senescing tissue. Isolation was possible, and sporulation observed in lesions from GC and field. Symptoms, sporulation in vivo, and reisolaton were the criteria for considering the cv app. as hosts.


Inheritance of resistance to eyspot was studied in four crossing involving two resistant (R) and three susceptible (S) inbred lines, as follows: W04A (S) X Okm3 (R), W09 (S) X Okm3 (R), Odk5 (S) X Okm3 (R), and W06A (S) X W117 (S). The inbred F1's, F2's, and backcrosses of F1's with both inbred parents of each mapping were evaluated by artificial inoculation in the field. The segregation observed suggested that resistance was quantitative in expression, and partially domi-


White, yellow, and red onions were exposed to air and inoculated with Colletotrichum dematiaceum var. circinans (C&C) and Botrytis allii (BA). Wounded and untreated tissue, on the same bulbs, served as controls. Bulbs were incubated in light or dark for up to 7 days. Lesion area, pH of control, lesion, and adjacent tissues were measured. Movement of nuclei, in 2 vertical rows, 20 cells/row, in tissue adjacent to wounds and lesions was recorded. Largest lesions were produced by BA. Dark incubated bulbs had smaller lesions than those incubated in light. The converse was true for C&C. Basal areas of bulbs exhibited smallest lesions. Lesion pH was shifted below that of controls. Nuclei moved to sides of cells toward lesions. Movement was not related to lesion size, lesion pH, pathogen tested, or section of onion inoculated.

PROTECTION AGAINST STRESS PREDISPOSITION TO BOTRYOSPHAERIA CANKER IN CORNUS STOLONIFERA SOIL-INJECTED WITH BENOMYL. R. F. Schoeneveis, State Natural History Survey, Univ. of Ill., Urbana, Ill. 61801.

Containerized plants soil-injected with 36 or 72 g/m2 benomyl in the soil were inoculated and wilted to below 12 bars plant/y. then incubated for 1 week. Benomyl levels in stems, determined by a chloroform extract bioassay, averaged 11.3 to 18.6 μg/g over the 32 day test period. Stems of treated plants and nontreated controls were not colonized compared, colonized compared, colonized compared.

ANTIOXIDANT ACCUMULATION IN STEMS OF CORNUS STOLONIFERA IN RESPONSE TO INFECTION BY BOTRYOSPHAERIA DOHTHEIDEA. Schoeneveis, D. F. and C. Crumwald, State Natural History Survey, Univ. of Ill., Urbana, Ill. 61801.

A pronounced reddening surrounding inoculation sites appeared on young green stems of C. stolonifera following inoculation with B. dotheidea. Spectrophotometric analysis of HCL-methanol stem extracts indicated accumulation of anthocyanins. Subsequent tests revealed that anthocyanin accumulation was a light-mediated response to the presence of the fungus and wound response. In stems of plants predisposed by water stress to attack by B. dotheidea, anthocyanin accumulation was greater and more rapid than in turgid, resistant stems. The pathway of anthocyanin synthesis is similar to that of certain fungal toxic flavonoids and phytoalexins associated with host defense responses to infection.


Colletotrichum graminicola isolates from infected corn, sorghum, and shattercane leaves were tested for host range & pathogenicity. Plants (15 days old) of corn (Mo940, 33-10, & Mo17HR87371), sorghum (P7211 & Br-54) & a field selection of shattercane were inoculated with each isolate (10 μg/ml). Mo940 & Mo17HR87371 were susceptible to the corn isolate and 33-10 was hypersensitive. Corn only showed chlorotic flecks in response to sorghum (SO) & shattercane (SH) isolates; but, senescing leaves of Mo940 & Mo17HR87371 showed lesion develop-
Sorghum downy mildew in Kansas. Thomas Sim IV, Kansas State Board of Agriculture, Topeka 66612 and Vance H. Longhake, Kansas State University Southwest Area Extension Office, Garden City 67846.

Sorghum downy mildew, caused by Scleromycia sorghi, was first reported from Kansas in 1967, and has caused little economic loss. However, in 1978, disease incidence reached significant levels in several localized areas in Kansas. One such area was the north central Kansas, in which approximately 1,150 to 1,200 acres in a 10-mile radius exhibited severe symptoms of the disease. Fields in parts of northeast and east central Kansas were also found to be infected with downy mildew. Both shattercone (Sorghum bicolor) and johnsongrass (Sorghum halapense) were found to be infected. Many of the grain sorghum hybrids planted in Kansas are susceptible to downy mildew. Present research includes testing hybrids for resistance or susceptibility, existence of overwintering asexuals and epidemiology of the disease.

The effect of planting date on rusting character of seven spring wheat cultivars. J. W. Southern and R. D. Wilcoxson, Dept. of Plant Pathology, Univ. of Minnesota, St. Paul 55108.

Spring wheat cultivars previously reported to rust slowly were planted in hills at Rosemount, MN, on May 10, 27, and June 1, 1975, and on April 21, May 21, and June 22, 1976. They were inoculated with Puccinia graminis tritici race TLM, generally at growth stages 5 to 12 (Rome's scale), and rust severity was judged weekly for 4 weeks. Area under the disease progress curve (AUDPC) was used to indicate the slow rusting characteristic of the cultivars. In 1975 the mean AUDPC of cultivars were: Longmont, 1,123; Manitoba, 562; Exchange, 1,347; Thatcher, 388, and Idae 59 of the first planting ranged 537-3; the second planting 967-344; and the third planting 1441-240. In 1976 the mean AUDPC of these cultivars in the first planting ranged from 406-70, the second planting 1589-622, and the third planting 1996-343. Thus, late planting caused an increase in the mean AUDPC of these cultivars, suggesting that their slow rusting character becomes less effective with late planting.

Snow rot of winter wheat in North Dakota. R.W. Stack, V.L. Jones and H.A. Lamey, North Dakota State University, Fargo, ND 58105.

The winter of 1977-78 was unusual in western North Dakota because snow came early and remained until spring. Because of the continual snow cover throughout much of western N.D., there was no ground frost all winter. As snow melted in the spring, winter wheat plants appeared fresh and green, and farmers anticipated an excellent crop. However, during the next several weeks plants gradually withered and died. The aboveground symptom was severe desiccation and this occurred in large spots on some fields. Dying plants had totally decayed roots and crowns and little evidence of new root development. Pythium was isolated from 271 out of 316 plants when crowns and roots were planted on agar incubated at 5°C. From successful isolations, 72% of 252 of the 350 isolates grew on PDA. These Pythium isolates appear similar to the low temperature isolates reported by Lips and Bruehl (Phytopathology 66:1120). Although not previously reported from N.D., statements from farmers and county agents suggests this disease has occurred sporadically for many years, but was called winter damage.

A PREDICTOR FOR MUSKELON DOWNY MILDEW. W.R. Stevenson, G.L. Reed, and J.R. Mitchell. First and third authors, Associate Professor and Research Assistant, Dept. of Botany and Plant Pathology, Purdue Univ., W. Lafayette, IN 47904, respectively; second author, Research Entomologist, Fruit & Vegetable Insect Research Lab, AR, SEA, USDA, Vincennes, IN 47591.

Downy mildew caused by Pseudoperonospora cubensis is a serious problem on muskmelons in Indiana. First appearance of disease was related to the number and duration of periods of relative humidity (RH) > 95% during the 1975-77 growing seasons. Temperature and RH were used to compute severity values in Wallin's late blight forecasting method were adjusted for sporulation and disease progression optima for the downy mildew fungus. During 1978 weather data in 6 fields were recorded continuously from 14 days after planting and disease incidence data were collected weekly in 25 fields. First mildew symptoms appeared in fields with weather stations 7 days after a mean accumulation of 18.2 severity values. Increases in downy mildew incidence were correlated with increases in total severity values.

A METHOD FOR DEPLOYMENT AND MAXIMUM DIVERSIFICATION IN THE USE OF BROWN STEM ROT RESISTANT SOYBEANS. H. Tachibana, USDA, SEA, Dept. of Botany & Plant Pathology, Iowa State University, Ames, Iowa 50011.

A brown stem rot (BSR) resistant soybean cultivar 'BSR 301' will be available for commercial production for the first time in Iowa and in other states participating in the release in 1981. Because BSR 301 is being released specifically for use in fields that had 72% or more BSR diseased plants in any recent year, it is suggested that BSR 301 and similar disease resistant varieties be designated as prescribed resistant varieties (PRV). BSR 301 has yielded 30% more than comparable nongenetic BSR susceptible soybean lines in BSR problem fields under optimum disease conditions in southern Iowa; the yields were a few bushels below but not significantly different than current or future higher yielding cultivars on the average in regional and national test fields where BSR was not a problem. The release and utilization of BSR resistant soybeans by the PRV method will deploy the BSR resistant germplasm of PI 84,946-2 by an additional epidemiologically significant degree of diversity.


Corn lethal necrosis disease (CLN) was epidemiotic in four irrigated districts in northwest and north central Kansas. Many corn fields were severely affected and some were harvested for silage. Symptoms of CLN include bright chlorosis and necrosis of leaves, small deformed ears, and plant death. The disease is caused by a synergistic interaction between maize chlorotic mottle viroid (MCMV) and maize vein-inhibiting virus (MVIV or maize mosaic virus [MMV]) and either maize dwarf mosaic virus (MDMV) or wheat streak mosaic virus (WSMV) (Nihlett and Claffin, Plant Dis. 62:15-19, 1978). Assays of mild mosaic and CLN diseased tissues showed that MCMV (two serotypes), MDMV strains A and B, and WSMV occurred alone or in combination. In several corn fields, a dry-ear condition was found on otherwise healthy plants. Extracts of healthy ear tissues contained both MCMV and MDMV-B, suggesting a causal relationship.

Western gall rust in shelterbelts on the northern plains. J.A. Wells and R.W. Stack, North Dakota State Univ. Fargo, ND 58105.

Western gall rust in shelterbelts on the northern plains.
Spatial distribution of Longidorus breviamulatus, Xiphinema americanum, Hoplolaimus galeatus and Pratylenchus scribneri on 4th-year corn in irrigated Plainfield sand was monitored from May 24 to September 23, 1978. Populations were sampled at monthly intervals between 76-cm rows at depths of 0-15 cm and 16-30 cm at 5, 20, and 36 cm from the base of the plant. Population peaks for each species generally occurred at the same time at all distances. Populations of L. breviamulatus peaked in July. Numbers of X. americanum and P. scribneri in soil reached a maximum in either August or September, depending on distance from the plant. Highest numbers of H. galeatus in soil occurred in September. Densities of P. scribneri and H. galeatus in roots were greatest in August. At the end of the season, L. breviamulatus was concentrated in the 16-30 cm depth, H. galeatus and P. scribneri in soil were most abundant in the 0-15 cm depth, and X. americanum was evenly distributed between the two horizons.

properties of the selective pathotoxin produced by periconia circinata. T. J. Wolpert and L. D. Dunkle. Dept. of Botany and Plant Pathology, Purdue University, W. Lafayette, IN 47907. The selective pathotoxin produced by P. circinata was partially characterized. Criteria of purity included coincidence of toxicity with homogeneous ninhydrin reactivity following two-dimensional thin-layer electrophoresis (TLE) -- chromatography (TLC). The purified product was a low MW (C1800) peptide having a PI of ca. 2.75 and containing asparagine acid, which accounted for 80 to 90% of the weight. Derivatization with dapsyl Cl and analysis by TLC and TIE revealed a single fluorescent compound (dns-toxin). Acid hydrolysis of dns-toxin yielded two unidentified dns-compounds, which reacted with ninhydrin and were assumed to be diaminos. Absence of ca-dns-aspartate in dapsylation analysis and resistance of toxic activity to treatment with proteases suggested that the toxin is cyclic. Incubation at pH 12 at room temp abolished toxic activity and altered chromatographic and electrophoretic characteristics. Purified toxin inhibited root growth of susceptible sorghum genotypes by 50% at 1 to 3 ng/ml.

Conidium ontogeny and morphology of a soybean seed isolate of Cerospora kikuchii. C.-C. Yeh and J. B. Sinclair. Dept. of Plant Pathology, Univ. of Illinois, Urbana, IL 61801. Previous descriptions of Cerospora kikuchii made from infected soybean tissues did not illustrate conidium ontogeny. Conidium development and morphology of an isolate of C. kikuchii (ATCC-36864), recovered from soybean (cv. Amsoy) seeds with symptoms of purple seed stain, cultured on carrot leaf-decay agar (CLDA), and was artificially inoculated onto soybean (cv. Amsoy) leaves, stems and seeds in reported. Holoblastic conidium development was observed from integrated, sympodial conidigenous cells at the apex of conidiophores within 36 hours (optimum 4 to 5 days) on CLDA under 12 hours of artificial light at room temperature (23 to 27C). Five or six conidia may develop sympodially from one conidiophore in 7 days and conidiophores may reach the length of more than 2 mm. The distance between conidial scars varied from 10 to 150 µm. No scars were observed on newly formed conidiophores. The morphological characteristics of the isolate did not vary between the two substrates.


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