
Germinated seeds of winter wheat cvs. Newton (resistant) and Vona (susceptible) were planted into clay loam soil obtained from a locale with a history of severe wheat soilborne mosaic (WSBM), and maintained in a growth chamber at 15/10 C (11/13 hr photoperiod). Following vernalization at 5 C for 6 wk, seedlings were transplanted into a 1:1:1 (v/v/v) peat-sand-soil mix in glazed 4 L clay pots, 3 plants/pot, 44 pots/cultivar. Temperatures were gradually raised to, and maintained at 20/15 C for the remainder of the experiment. Foliage was sampled for ELISA just prior to vernalization, and 7 additional times following vernalization. Analysis of data by maturity of tillers more clearly demonstrated a rise in ELISA values in cv. Newton than did analysis of data by sampling date. This suggests that the rise in ELISA values observed in cv. Newton may be influenced by changes in host physiology associated with maturation.

SUPPRESSION OF Ht2 and Ht3 RESISTANCE GENES IN CORN (Zea mays L.) S. M. Blissommette, T. R. Philips, and W. L. Federsen, Dept. of Pl. Pathology, University of Illinois, Champaign-Urbana 61801.

Corn inbreds with the Ht2 or Ht3 genes are resistant to races 1 and 2 of Exserohilum turcicum. Field trials of parental inbreds (A619Ht2, A619Ht3, or A619Ht3Ht2), F1 hybrids (A632 X A619Ht2, and A632 X A619Ht3), including reciprocal crosses, and the F2 generations, were inoculated with E. turcicum race 2. Parental inbreds, A619Ht2 and A619Ht3, had resistant type lesions while A632 had susceptible type lesions. The F1 hybrids were all susceptible. The F2 generations from all crosses segregated in a 13:3 ratio of susceptible to resistant plants. This ratio may be attributed to a two-gene model involving the Ht2 or Ht3 gene with a dominant suppressor gene from A632. While the presence of the suppressor gene in A632 makes identification of resistance in a backcross program using A632 difficult, the procedure may be accomplished by selfing the F2 generation prior to backcrossing to the recurrent parent.

A NUCLEAR GENE CONTROLLING PERITHECIAL PIGMENTATION IN Gibberella fujikuroi (Fusarium moniliforme). CHULOK CHAIKSISOOK AND JOHN F. LESLIE, DEPARTMENT OF PLANT PATHOLOGY, KANSAS STATE UNIVERSITY, MANHATTAN, KANSAS 66506.

Three field-collected isolates of Gibberella fujikuroi (Fusarium moniliforme) which produce abnormally pigmentation perithecia when they serve as the female parent were identified during an ecological survey. These strains produced perithecia with pale pigmentation (yellow to brown) instead of the normal blue-black perithecia found in most wild-type strains. The three strains belonged to two different vegetative compatibility groups indicating that the three isolates carrying this mutation were not clones of a single strain, even though all three mutant alleles mapped to a single nuclear locus, termed pall. The pale perithecia trait was expressed only by the female parent, but was inherited in a normal Mendelian manner.

THE ROLE OF HERBICIDES AND SOIL pH IN THE DEVELOPMENT OF SEEDLING BLIGHT OF GRAIN SORGHUM CAUSED BY Fusarium graminearum. M. A. Davis and D. J. Jardine, Department of Plant Pathology, Kansas State University, Manhattan, KS 66506.

Factors affecting seedling blight of grain sorghum have been carefully evaluated. Different herbicides, herbicide antidotes, and soil pH interact with F. graminearum to alter disease severity. In sterile soil, herbicides and herbicide antidotes reduced the growth of sorghum seedlings 20-45% compared to the untreated control. Addition of F. graminearum inoculated oats at planting further reduced growth, but there were no interactive effects between chemical and pathogen. In a second experiment, field soil (pH 5.0) was amended to achieve pH levels of 3.8, 5.0, 6.1, 7.2, and 8.1. After 2 weeks, seedling growth was reduced 10-35% at pHs above and below pH 7.2. When sterile oats, inoculated with F. graminearum, were added at planting, there was an interactive effect with greatest growth reduction occurring at pH 5.0.


A Hagborg device (Can. J. Bot. 48:1135), for infiltration of pH levels of 3.8, 5.0, 6.1, 7.2, and 8.1. After 2 weeks, prior to backcrossing to the recurrent parent. Factors affecting seedling blight of grain sorghum have not been carefully evaluated. Different herbicides, herbicide antidotes, and soil pH interact with F. graminearum to alter disease severity. In sterile soil, herbicides and herbicide antidotes reduced the growth of sorghum seedlings 20-45% compared to the untreated control. Addition of F. graminearum inoculated oats at planting further reduced growth, but there were no interactive effects between chemical and pathogen. In a second experiment, field soil (pH 5.0) was amended to achieve pH levels of 3.8, 5.0, 6.1, 7.2, and 8.1. After 2 weeks, seedling growth was reduced 10-35% at pHs above and below pH 7.2. When sterile oats, inoculated with F. graminearum, were added at planting, there was an interactive effect with greatest growth reduction occurring at pH 5.0.


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COMPARISON OF BARLEY YELLOW Dwarf VIRUS (BYDV-RPV-IL) TITER IN OATS GROWN IN SOIL AND AEROPONIC CULTURE. H. M. FOELY, R. E. WAGNER AND CLEORA J. D'ARCY. DEPT. PLANT PATHOLOGY, UNIVERSITY OF ILLINOIS, URBANA, IL. 61801
Effort of Polypeptides on the Sensitivity of Normal (n) and Texas Male-Sterile Cytoplasms (T) Maize to Toxin From Bipolaris Maydis Race T (BMT). M. G. Garraway and L. G. Evans. Dept. of Plant Pathology, The Ohio State Univer., OARDC, Wooster, OH 44691. To determine whether low molecular weight proteins affected the sensitivity of maize (Zea mays L.) to BMT toxin, detached leaves of n and T isolines of the inbred W64A were infiltrated for 18-24 hr with 3 different polypeptides (200 µg/ml) with and without toxin, then cut into 4 pieces, immersed in distilled water, and the electrolyte leakage measured over a 24-48 hr period. Lysozyme (14.3 kD), β-lactoglobulin (18.4 kD) and α-lactalbumin (14.2 kD) significantly decreased the sensitivity of T but not n isolate proteins, as β-lactoglobulin, as a representative active polypeptide, reduced the sensitivity of T-maize to toxin when added either 24 hr before or concurrently with toxin but was ineffective (and in some cases stimulatory) when added 24 hr after toxin treatment. Thus, variation in the response of T-maize cultivars to BMT-toxin could involve a non-specific interaction with polypeptides.

Multiplication Dynamics of Xanthomonas Campestris pv. Orvyeae in Mixed Race Inoculations of Rice. A. Gue and J. B. Leach, Dept. Plant Pathol., Kansas State Univ., Manhattan, KS 66506. Bacterial multiplication was measured in leaves of rice inoculated with mixtures of X. pv. orvyeae isolates 12 (race 2, incompatible), 10 (race 2, compatible) and 6 (race 6, compatible). Leaves were inoculated with 1:1:1 (race 6: race 2: compatible) mixtures, the growth of isolate 6 was similar to that observed when 6 was inoculated alone (final population, 10^{2}-10^{3} cfu/leaf). The growth rate of 6 was reduced when both 12 and 200 were inoculated with 6 (10^{7}-10^{8} cfu/leaf). If electrolyte leakage measured when compared to 12 alone was 10^{7}-10^{8} cfu/leaf). Populations of 12 in 1:1 mixtures never reached the level of bacteria needed for resistance of rice (10^{10} cfu/leaf). The growth rate of 12 was reduced when both 12 and 6 were inoculated with 10^{7}-10^{8} cfu/leaf). The growth rates of 12 and 6 inoculated with 10^{7}-10^{8} cfu/leaf). Thus, once induced, resistance is phenotypically dominant over susceptibility.

Host Range of Binucleate Rhizoctonia Spp. and Lateisaria Arvalis Biocontrol Agents and Their Longevity Compared With Rhizoctonia Solani. L. J. Herr, Dept. of Plant Pathology, Ohio State Univ., OARDC, Wooster, OH 44691. Host range and inoculum longevity (shelf-life) data are essential for development of candidate biocontrol agents. The host ranges of isolates of binucleate Rhizoctonia spp. (BN) and Lateisaria arvalis were ascertained by seedling and older host. New isolates of 4 week or > plant assays. The BN tested were non-pathogenic on both seedlings and older plants of cabbage, cucumber, corn, soybean, sugarbeet, tobacco, tomato and wheat. The BN arvalis isolates were non-pathogenic on soybean and sugarbeet. The maximum longevity determined for BN, L. arvalis and R. solani on sugarbeet, tomato and wheat, stored at room temperature in paper sacks (plating assays, any growth) ranged from 389 to 1307 d for BN; 826 to 890 d for L. arvalis; 549 and 826 d for R. solani AG-2,72 and AG-4, respectively. However, longevity was mostly lower than the BN isolate 389 to 1307 d for BN; 826 to 890 d for L. arvalis; 549 and 826 d for R. solani AG-2,72 and AG-4, respectively.

Effect of Planting Date and Date of Inoculation on Wheat Streak Mosaic. R. H. Hunger and J. L. Sherwood, Department of Plant Pathology, Oklahoma State University, Stillwater, OK 74078-9947. Mechanical inoculation of 8 hard red winter wheats with wheat streak mosaic virus (WSMV) in replicated field plot years for 2 years indicate that inoculation in the fall results in significant reductions in yield but not thousand kernel weight. Spring inoculation resulted in significant yield reductions from 4 of 6 cultivars in the first year but no symptoms of wheat streak mosaic (WSM) developed on any of 8 cultivars following the spring inoculation in the second year. Plants inoculated in the spring of the second year were nearly 2 weeks more mature at the date of inoculation which may have resulted in reduced infection. The cultivar 'Bail' showed reduced symptoms of disease and a low virus titer (measured by the enzyme-linked immunosorbent assay), and may be a useful parent in a program of breeding for resistance to WSM.

A Kansas Isolate of MDMV (KS-1) Is Serologically Similar to MDMV-0. B. G. Jensen and J. L. Staudinger USDA and the University of Nebraska, Lincoln, NE 68583. Antisera was raised to the capsid protein (Cap-as) and the cytoplasmic inclusion protein (CI-as) of KS-1, an isolate of MDMV which originated in central Kansas. These antisera to two virus induced proteins were cross reacted with the Cap and CI proteins from MDMV strains A, B and 0 to determine serological relatedness. CAP-as to KS-1 reacted strongly with 0 but only very weakly to A or B. CI-as reacted strongly with 0 but not at all with A or B. KS-1 appears to be closely related serologically to MDMV-0 and would therefore be a member of a group of viruses related to Australian johnsongrass mosaic virus, formerly known as sugarcane mosaic virus strain JG (Shukla, et al. Arch. Virol. 1987) 96:59-74.

Transformation of Hybrid Populus with the Proteinase Inhibitor II Gene. N. B. Klopfenstein, S. A. Nechel, H. S. McNabb, Jr., R. W. Thornburg, R. F. Hall, and R. B. Ditt, Depts. of Plant Pathology, Forest, Biochemistry and Biotechnology, Iowa State University, Ames, Iowa 50011. Attempts to increase pest resistance of Populus by transformation with the Proteinase Inhibitor II (P.I. II) gene (pin-2) are in progress. P.I. II is specific for trypsin and chymotrypsin. Putative transformants of clones Hansen, Crandon, and T17777 were obtained using Agro binary vector containing subunit of plant vector system containing a disarmed pTIB642 helper plasmid and the binary vector pRTI02 or pRTI04 with pin-2. Linked to pin-2 is a selectable marker gene encoding neomycin phospho- transferase, and a neomycin phosphotransferase (NPT) gene. Transformed leaves were selected on kanamycin medium. To date, tree leaf extract assay indicates NPT II expression in Hansen (14) and Crandon (1). Assays to test pin-2 integration and expression are in progress. Bioassays for pest resistance will be conducted after verification of pin-2 expression.

Variation in the Sensitivity of Maple Species to Sulfur Dioxide. J. L. Sherwood, Department of Plant Pathology, Oklahoma State University, Stillwater, OK 74078-9947. Seedlings of A. planataanoides, A. negundo, A. saccharinum, A. rubrum and A. saccharum were grown in the greenhouse and were exposed in chambers to charcoal-filtered air or sulfur dioxide (50 ppm) at 5 ppm for 6 hr/day for 6 days. Leaf samples were taken after completion of exposure on the 6th day and prepared for scanning electron microscopic (SEM) examination. Visually A. negundo exhibited severe leaf injury. A. rubrum, A. planataanoides and A. saccharinum showed intermediate sensitivity and A. saccharum exhibited very little injury. A. negundo leaf surfaces exposed to 50 ppm indicated changes in the conformation of epicuticular wax, cytolysis of epidermal cells and lesion formation. Intermediate levels of SO_2 injury were noted when A. planataanoides and A. saccharinum were examined with SEM. A. saccharum exposed to SO_2 exhibited only alterations to epicuticular leaf wax.

An Isolate of Exserohilum Turcicum from Hawaii Virulent on HTN. J. W. Marshall, J. J. Goka, and W. L. Federsen, Department of Plant Pathology, University of Illinois, Champaign-Urbana, IL 61801. Ten isolates of Exserohilum turcicum (Pass.) Leonard & Suggs collected from Hawaii in 1987 were tested in the greenhouse on seedlings of a series of near-isogenic inbred lines of maize (B37, B37H1, B37H2, B37H3, and B37NN). Nineteen of the ten isolates caused reactions similar to previously identified races but isolate 24930 caused a susceptible reaction on B37, B37H1, and B37NN. Additional tests of the isolate on inbreds 04640N and H8220 also caused susceptible reactions. Thakur, et al reported a new race of E. turcicum (race 4).
collected from South Texas. Results from the Hawaii isolate 24930-4 differed from race 4, causing susceptible reactions on several inbreds containing RhtB but a resistant reaction on RhtHL.

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prolonged periods of leaf wetness are uncommon, effects of RH on development of *C. zeae-maydis* were evaluated. Conidia were atomized onto polysulfone membrane discs and germinated for 6 hr at 100% RH; then discs were placed at two regimes cooled with glycerol solutions at 25.0 C. Germlings were stained with acid fuchsin or aniline blue in lactophenol, or nitro blue tetrazolium, a vital stain, and observed microscopically. Germ tube formation was greatest and appressoria were formed in 60-72 hr at continuous 95 or 100% RH. After 96 hr in 95% RH, 2-5 appressoria formed per spore. Some germ tubes and conidal cells were dead after 6 days in 90% RH. After 8 days in 60, 70, 80, or 90% RH, and when transferred to 95% RH, appressoria formed only if discs were previously at 80 or 90% RH.


Prenocilona tritic-repens, the causal agent of tan spot of wheat, produces a toxin in culture which induces necrosis only on susceptible wheat cultivars. The toxic compound, named Ptr toxin, was purified by gel filtration and ion exchange chromatographies. Pptr toxin is a small protein of Mr ca. 14,500. It has a high content of asp/asn, ser, and gly, a low content of his, met, and lys, and no detectable carbohydrate. With the leaf infiltration bioassay used in this study, Pptr toxin caused symptoms on susceptible wheat at concentrations as low as 1.5 ug/ml (102 nm).

**RESISTANCE IN WILD BARLEY, Hordeum spontaneum, TO BARLEY LEAF RUST, Puccinia hordei, IN MINNESOTA AND ISRAEL.** L. M. Treeful, R. D. Wilcoxson, and J. Manisterski. Department of Plant Pathology, University of Minnesota, St. Paul, MN 55110, USA, and Tel Aviv University, Tel Aviv, Israel.

Thirty seven *H. spontaneum* accessions collected in Israel were evaluated for resistance to barley leaf rust. In 1984 and 1985 at Rosemont, Minnesota, and in 1986 at Bet Dagan and En Dor, Israel, field tests in Minnesota were with North American races 8, 13 and 19 applied singly to the accessions. Field tests in Israel were with races 8, 13 and 19 and isolates produced on *Oryza sativa* sp. Most accessions in each location were resistant as indicated by small uredinae with chlorosis, necrotic flecks, or a mixture of both. Five accessions were susceptible to the races applied in each location. Slow rusting was indicated by area under disease progression curves (AUDPC) for three of the susceptible accessions, at Rosemont and at Bet Dagen. Their AUDPC was similar to the slow rusting *H. vulgare* check cultivars Vada, MN 9062 or Minerva.

**DETECTION OF PUSARIUM OXYSPORUM IN SYMPTOMATIC SOYBEAN SEEDS.** Rana K. Velicheti and J. B. Sinclair, Dept of Plant Pathology, University of Illinois at Urbana-Champaign, 1102 S. Goodwin Avenue, Urbana, IL 61801-4709.

Soybean [Glycine max (L.) Merr.] seeds infected with *Pusarium oxysporum* Schlech. ex Fr., cause of pre- and post-emergence damping-off and root rot of soybeans, externally appeared as shrunk, light brown, irregular in shape, often with cracks in the seed coat with light to dark pink discolored areas over most of the infected seed surface. Heavily infected seeds did not germinate. The fungus was recovered from all samples of surface-sterilized seeds exhibiting symptoms. Hyphae were found ecto- and endophytically. Hyphae were found spread over the surface of the seed coat and abundant in the hilum region producing macro- and microconidia. In histopathological studies, the fungus hyphae were observed in all layers of the seed coat of infected seeds but not in the endosperm or cotyledons. Terminal and intercalary chlamydospores of the fungus were formed in hyphae growing on the underside of the seed coats.

**SUPPRESSION OF RHIZOCTONIA DISEASE IN RADISH IN THE PRESENCE OF ORGANIC AMENDMENTS.** R. P. Yoland and A. H. Epstein, Dept. of Plant Pathology, Iowa State University, Ames, IA 50011-1020.

Use of manure and compost as soil amendments has been proposed as a way of reducing farm input costs, waste disposal problems, and groundwater pollution, and at the same time controlling disease. The objective of this research was to compare the ability of manure and compost to suppress *R. solani*. Soil was amended with 1.5% manure or compost (161 ppm nitrogen), and incubated 1 week. Soil was infested with *R. solani* sclerotia, and planted weekly with radish, four times. When infested at 10 CFU/g, disease was suppressed 22% by manure and 13% by compost, respectively. Disease levels after reinfestation with 70, 80, or 90% RH, and when transferred to 95% RH, disease was suppressed 22% by manure and 13% by compost, respectively.


Lesion length and rate of lesion expansion on taproots of aero-ponically-grown soybeans infected with *P. megasperma* f. sp. *glycinea* (Pmg) provided an accurate assessment of rate-reducing resistance. Four dressings per isolation with race 3 of Pmg, lesion lengths of cultivars Corsoy, Sloat, Columbus, Williams, Asgrow 3127, Agripro 26 and Asgrow 2578 were 8.7, 8.6, 7.0, 7.0, 7.7, 5.2, and 4.0 cm, respectively (LSD=0.84). Linear spline models consisting of two intersecting straight lines with slopes b1 and b2 were used to describe lesion expansion over a 14-day period for each cultivar. b2 values ranged from 0.98–0.99. Estimates of b1 were significantly different among isolates of Pmg. Estimates of b2 for cultivars tested were 1.2, 1.1, 0.9, 0.8, 0.6, 0.4 and 0.1 cm/day, respectively (LSD=0.29). Estimates of b2 provided an accurate description of rate-reducing resistance.

**FIVE YEAR EVALUATION OF FOLIAR FUNGICIDES FOR WHEAT DISEASE CONTROL.** E. Williams, Jr. K. D. Jackson, and W. Pratz. Plant Pathology Department, Oklahoma State University, Stillwater, OK 74078-9947.

The effect of foliar fungicide applications on fungal pathogens and wheat grain yields were studied at Stillwater and Haskell, OK, from 1984–1988. Single spray application of propiconazole (Peeke scale 9) was compared with 2 sprays of triadimefon + mancozeb (Peeke scale 9, 10.5), both at labeled rates. Natural infections resulted in considerable variation between years in disease prevalence and severity; however, significant reductions (P<0.05) in disease severity were obtained with both treatments for leaf rust, powdery mildew, Septoria leaf blotch, and tan spot. At Haskell, both treatments provided a significant reduction (P<0.05) for Septoria leaf blotch in 1985. Significant yield increases (P<0.05) were obtained out of 5 years at Stillwater, and 4 out of 5 at Haskell. The 5 year average yield increase was 15% for propiconazole and 19.5% for triadimefon + mancozeb.

**INFESTION DIFFERENCES OF BIPOLARIS AND FUSARIUM IN SUBCROWN INTERMENDBES OF BARLEY AND WHEAT GROWN IN NO-TILL AND MOLDBOARD PLOW SYSTEMS.** Carol E. Windels and John W. Viersma, Plant Pathologist and Agronomist, respectively, Northwest Expt. Station, University of Minnesota, Crookston, 56716.

Barley (Hordeum vulgare) and wheat (Triticum aestivum) were rated for common root rot in the fourth and fifth years of continuous planting in no-till, chisel plow, and moldboard plow systems. In 1986-87 there were no differences in root rot for any tillage system. Isolation of *B. sorokiniana* from subcrown internodes (SCI) of barley was less in no-till (53%) than in moldboard plow plots. *B. sorokiniana* + *Fusarium oxysporum* f. sp. *avenaceum* (G+4CA) were more common in no-till (65%) than in moldboard plow plots (5%). *B. sorokiniana* also was isolated from SCI of wheat less often in no-till (48%) than in moldboard plow plots (82%). G+4CA were more common in no-till (24%) than in moldboard plow plots (12%). Root rot was unaffected by tillage, but infection of SCI by *B. sorokiniana* was less frequent, and infections by G+4CA were more frequent, in barley and wheat grown in no-till than in moldboard plow systems.

**FURTHER INVESTIGATIONS OF PSEUDOMONAS GLADIOLI PV. GLADIOLI AS THE CAUSE OF SCORCH IN RHIZOMATOUS IRIS.** A. L. Wrobel, J. E. Watkins, and D. H. Steinlegger, University of Nebraska, Department of Plant Pathology, Lincoln, NE 68583-0722.

Scorch of rhizomatous iris is characterized by crown dieback progressing outward from the center of the crown and root of the rhizome. The role of *Pseudomonas gladioli* pv. *gladioli* as the putative causal agent of scorch was re-investigated in this study. SDS polyacrylamide gel electrophoresis of total cell polypeptides was used to screen 28 bacteria isolated from 11 scorched iris at 5 locations. Fifteen of the isolates tested were identical to *P. gladioli* 11. One isolate, from 2.0 ft, was not a member of the group but had high humidity but did not cause scorch symptoms. Thus, *P. gladioli* pv. *gladioli* is not likely the causal agent of scorch of rhizomatous iris.
SUSTAINING ASSOCIATES

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AGRI-DIAGNOSTICS ASSOCIATES, Cinnaminson, NJ
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