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ABSTRACTS

RELATIONSHIP BETWEEN TILLER MATURITY AND REACTION OF WHEAT TO WSBMV. C. R. Armitage, R. M. Hunger, and J. L. Sherwood, Dept. of Plant Path., Okla. St. Univ., Stillwater, OK 74078.

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 Ht_2 and Ht_3 RESISTANCE GENES IN CORN (Zea mays L.) S. M. Bissonnette, T. R. Philips, and W. L. Pedersen. Dept. of Pl. Pathology, University of Illinois, Champaign-Urbana 61801.

Corn inbreds with the Ht_2 or Ht_3 genes are resistant to races 1 and 2 of Exserohilum turcicum. Field trials of parental inbreds (A632, A619Ht_2 or A619Ht_3), F_1 hybrids (A632 X A619Ht_2, and A632 X A619Ht_3) including reciprocal crosses, and the F_2 generations, were inoculated with E. turcicum race 2. Parental inbreds, A619Ht_2 and A619Ht_3, had resistant type lesions while A632 had susceptible type lesions. The F_1 hybrids were all susceptible. The F_2 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 Ht_2 or Ht_3 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 F_1 generation prior to backcrossing to the recurrent parent.

USE OF A HAGBORG DEVICE TO INOCULATE WHEAT WITH SEPTORIA TRITICI. Bockus, W. W., R. C. Stover, and R. C. Summervill. Dept. of Plant Pathology, Kansas State Univ., Manhattan, KS 66506.

A Hagborg device (Can. J. Bot. 48:1135), for infiltration of solutions into thin leaves, was used to inoculate winter wheat with spores of Septoria tritici. The fungus was grown in one-fourth-strength potato dextrose broth for 7-14 days at 15 C. Suspensions (ca. 2 x 10^6 spores/ml) were infiltrated into leaves of 5-11 cultivars differing in susceptibility to speckled leaf blotch. Plants grown in pots in the greenhouse were inoculated at the four-leaf or heading stage. Twenty to 40 sites on each cultivar were infiltrated and marked with a felt-tipped marker. About 21 days after inoculation, reactions were scored by rating chlorosis and necrosis on a 0-3 scale. Correlations between ratings obtained in the greenhouse and known reaction in the field were significant and ranged from r = 0.73-0.97, depending upon the experiment. This procedure may be useful to screen for resistance as well as synchronizing inoculations of S. tritici.

A NUCLEAR GENE CONTROLLING PERITHECIAL PIGMENTATION IN GIBBERELLA FUJIKUROID (FUSARIUM MONILIFORME). **CHULEE CHAISRISOOK AND JOHN F. LESLIE, DEPARTMENT OF PLANT PATHOLOGY, KANSAS STATE UNIVERSITY, MANHATTAN, KANSAS 66506.**

Three field-collected isolates of Gibberella fujikuroid (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 pal1. 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 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.

COMPARISON OF BARLEY YELLOW DWARF VIRUS (BYDV-RPV-IL) TITER IN OATS GROWN IN SOIL AND AEROPONIC CULTURE. H.M. FOULY, R.E. WAGNER AND CLEORA J. D'ARCY. DEPT. PLANT PATHOLOGY, UNIVERSITY OF ILLINOIS. URBANA, IL. 61801

Virus titers of "Coast Black" oats infected with barley yellow dwarf virus (BYDV-RPV-IL) grown in soil or aeroponic culture were compared. Roots and shoots were harvested from plants 16 days after inoculation with viruliferous Rhopalosiphum padi and virus titers were measured by enzyme-linked immunosorbent assay (ELISA). Mean ELISA values for roots from aeroponically grown plants were higher than those from soil-grown plants. No significant differences were detected in virus titers in shoots. Mean lengths and weights of aeroponically grown plants were greater than those of soil-grown plants.

EFFECT OF POLYPEPTIDES ON THE SENSITIVITY OF NORMAL (N) AND TEXAS MALE-STERILE CYTOPLASM (T) MAIZE TO TOXIN FROM BIPOLARIS MAYDIS RACE T (BMT). M. O. Garraway and R. C. Evans. Dept. of Plant Pathology, The Ohio State University, OARDC, Columbus, OH 43210 and Biology Dept., Rutgers University, Camden, NJ 08102.

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-maize to toxin. α-lactalbumin, as a represent-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. ORYZAE IN MIXED RACE INOCULATIONS OF RICE. A. Guo and J. E. Leach, Dept. Plant Pathol., Kansas State Univ., Manhattan, KS 66506.

Bacterial multiplication was monitored in leaves of rice inoculated with mixtures of X. c. pv. oryzae isolates I2 (race 2, incompatible) and C6 (race 6, compatible). When leaves were inoculated with 1:1 (I2 : C6) mixtures, the growth of C6 was similar to that observed when C6 was inoculated alone (final population, 10^{12}-10^{13} cfu/leaf). The growth rate of I2 was reduced and final populations were lower (10^5 cfu/leaf) when compared to inoculations with I2 alone (10^7-10^8 cfu/leaf). Populations of I2 in 1:1 mixtures never reached the level of bacteria needed for expression of resistance (10^7-10^8 cfu/leaf). If ratios of 10:1 or 100:1 (I2 to C6) were used, or if leaves were first inoculated with I2 and then challenged after 4 days with C6, the initial growth rates of both isolates were similar. When populations of I2 reached 10^7-10^8 cfu/leaf, growth rates of I2 and C6 slowed and final populations of both isolates did not exceed 10^8 cfu/leaf. Thus, once induced, resistance is phenotypically dominant over susceptibility.

HOST RANGE OF BINUCLEATE RHIZOCTONIA SPP. AND LAETISARIA 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 Laetisaria arvalis were ascertained by seedling and older (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 L. arvalis isolates tested were non-pathogenic on soybean and sugarbeet. The maximum longevity determined for BN, L. arvalis and R. solani isolates on dried, colonized barley grain, stored at room temperature in paper sacks (plating assays, any growth) ranged from 389 to 1307 d for BN; 826 to 850 d for L. arvalis; 549 and 828 d for R. solani AG-2,T2 and AG-4, respectively. However, longevity was mostly lower (e.g., BN=112 to 389 d; R. solani=373 d), when based on growth of isolates from all (100%) of grains plated.

EFFECT OF PLANTING DATE AND DATE OF INOCULATION ON WHEAT STREAK MOSAIC. R. M. 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 plots 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 in 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 'Rall' 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-O. S. 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 O to determine serological relatedness. CAP-as to KS-1 reacted strongly with O but only very weakly to A or B. CI-as reacted strongly with O but not at all with A or B. KS-1 appears to be closely related serologically to MDMV-O 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. Virology (1987) 96:59-74).

TRANSFORMATION OF HYBRID POPULUS WITH THE PROTEINASE INHIBITOR II GENE. N. B. Klopfenstein, S. A. Heuchelin, H. S. McNabb, Jr., R. W. Thornburg, R. B. Hall, and E. R. Hart, Depts. of Plant Pathology, Forestry, Biochemistry and Biophysics, and Entomology, 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 Ogy were obtained using an Agrobacterium binary vector system containing a disarmed pTiBo542 helper plasmid and the binary vector pRT102 or pRT104 with pin-2. Linked to pin-2 is a selectable marker gene encoding neomycin phosphotransferase II (NPT II). Putative transformed shoots from co-cultured leaves were selected on kanamycin medium. To date, tree leaf extract assays indicate 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. C. R. Krause, B. R. Roberts, J. M. Ichida and V. M. Schnipke, Nursery Crops Research Laboratory, USDA-ARS, 359 Main Rd., Delaware, Ohio 43015

Seedlings of A. platanoides, 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 (SO_2) at 2.5 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. platanoides and A. saccharinum showed intermediate sensitivity while A. saccharum seemed unaffected. SEM examination of abaxial A. negundo leaf surfaces exposed to SO_2 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. platanoides, A. rubrum 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.M. Marshall, J.J. Ooka, and W.L. Pedersen, Department of Plant Pathology, University of Illinois, Champaign-Urbana, IL 61801.

Ten isolates of Exserohilum turcicum (Pass.) Leonard & Suggs collected from Hawaii in 1988 were tested in the greenhouse on seedlings of a series of near-isogenic inbred lines of maize (B37, B37Ht_1, B37Ht_2, B37Ht_3, and B37HtN). Nine of the ten isolates caused reactions similar to previously identified races, but isolate 24930-4 caused a susceptible reaction on B37, B37Ht_2, and B37HtN. Additional tests of the isolate on inbreds Oh45HtN and HyHtN also caused in 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 HtN but a resistant reaction on B37Ht_3.

ASPERGILLUS FLAVUS AND AFLATOXIN IN NORTH DAKOTA CORN, 1988. M. P. McMullen and H. H. Casper. Dept. of Plant Pathology and Dept. of Veterinary Science, North Dakota State University, Fargo, ND 58105.

Twenty-five fields of standing grain corn across three counties of North Dakota were surveyed in early October, 1988 for the presence of Aspergillus flavus. Twenty ears were examined at five locations per field. A few ears in three fields in one county in southeast North Dakota were confirmed to be infected with A. flavus. This fungus was not observed in the other 22 fields surveyed. Composite samples of kernels from ears of each symptomatic field plus composite samples of ears from 12 nonsymptomatic fields were analyzed for aflatoxin by thin layer chromatography. One symptomatic field tested positive for total aflatoxin, at a level of 50-100 ppb. Another 26 shelled North Dakota corn samples, independently submitted by growers and elevators from September through November, 1988, were analyzed for aflatoxin; only one contained aflatoxin, at a level of 20-50 ppb. A. flavus and aflatoxin were uncommon in North Dakota corn in 1988.

A STANDARDIZED RATING SCALE FOR MELAMPSORA LEAF RUST ON POPLAR. B. D. Moltzan and R. W. Stack, Dept. of Plant Pathology, North Dakota State Univ., Fargo, ND 58105.

Melampsora leaf rust is an important disease affecting Populus species and hybrids used for forestry and shelterbelt plantings. Resistance to leaf rust has been identified, but different disease rating systems have been used by various researchers. The rating of infection type should be standardized to ensure uniformity and comparability in future investigations. The system of rating infection types (IT), developed for cereal rusts, has become a standard and has been successfully adopted for use with other crops. Leaves of Populus infected with Melampsora, collected from the central and western U.S. and Canada, were rated for IT using the cereal rust system. A range of IT was observed for each of three Melampsora species. These results indicate that the cereal rust IT scale can be used for rating poplar leaf rust. Further experimentation using controlled inoculations will also be evaluated for the establishment of this scale.

INFLUENCE OF TILLAGE AND CROP ROTATION ON SOIL POPULATIONS OF Cochliobolus sativus. B. Salas and R. W. Stack. Dept. of Plant Pathology, North Dakota State Univ., Fargo 58105.

Soil populations of Cochliobolus sativus were studied in a 1988 field experiment including two tillage systems, two fertility levels and five crop rotations. Soil samples were sifted onto Dodman & Reinke's selective medium for quantitive enumeration. Populations of C. sativus were greater under conventional tillage than under reduced tillage. The level of C. sativus did not vary with depth under conventional tillage but declined sharply with increasing depth under reduced tillage. In the 0-5 cm zone, populations of C. sativus were greater under reduced tillage than under conventional tillage while in the 10-15 cm zone C. sativus levels were less in reduced tillage than in conventional tillage. Plots with previous rotations of soybean had highest populations of C. sativus while those with prior rotations of flax had the lowest. Fertility did not affect total C. sativus population.

REDUCTION IN FUNGICIDE APPLICATIONS TO APPLE TREES. W.H. Shaffer, M.M. Hulse, and H. Wu. Dept. of Plant Pathology and the Electronic Instrument Lab, Univ. of Missouri, Columbia, 65211.

A 50% reduction in fungicide applications to 'Jonathon', 'Red Delicious', and 'Golden Delicious' apple trees was realized during 1988 by use of environmental monitoring, disease forecasting, and a full season eradicative/protective spray schedule. An Automatic Reporting Agricultural Weather System Remote Meterological Station (RMS) was used to monitor environmental parameters including air temperature, leaf wetness, and relative humidity and reported, via radio telemetry, to a multi-tasking/multi-user base computer. Programs have been written for this computer which use the weather information from the RMS to forecast the occurrence of infection periods for primary and secondary apple scab. Trees were sprayed with a combination of Nova (eradicative) and Dithane M-45 (protectant) fungicides within 72 h after the start of the predicted infection period and were not sprayed again until 72 h following the initiation of the next infection period after the standard spray timing interval had occurred. Seven predictive sprays were applied during the season, while trees sprayed by the standard schedule received 14 fungicide applications. Control was equal in both treatments and significantly ($P = 0.05$) different from the unsprayed check.

ROL GENES OF AGROBACTERIUM RHIZOGENES DIRECT ROOT GROWTH AND DEVELOPMENTAL ABNORMALITIES IN TRANSGENIC PLANTS. Farida Shaheen and Frank F. White, Department of Plant Pathology, Kansas State University, Manhattan, KS 66506.

Three genes of the Ri plasmid TL-DNA were tested individually and in combination for their ability to direct root initiation and growth on Kalanchoe diagremontiana and Nicotiana tabacum. RolB alone directed root initiation, whereas rolA and rolC were ineffective. However, rolC in combination with rolB provided better rooting response. In in vitro tobacco root cultures, growth patterns of transgenic roots were compared. Among single genes, roots containing rolC showed characteristics of Ri transformed roots. In transgenic plants, rolA controls severe leaf wrinkling and plant stunting, whereas rolC causes moderate leaf wrinkling, reduced plant height, small flowers with hyperstyly, and reduced fertility. Plants containing rolB appear normal.

EXTRACELLULAR PROTEINASES OF SEPTORIA MUSIVA. J. M. Sillick, H. S. McNabb, Jr., and R. W. Thornburg, Depts. of Plant Pathology, Forestry, and Biophysics and Biochemistry, Iowa State University, Ames, Iowa 50011.

The Proteinase Inhibitor II (P.I. II) gene (pin-2) from potato, whose product is specific for trypsin and chymotrypsin, is being introduced into hybrid Populus to test its ability to confer pest resistance. The potential of this gene to confer resistance to fungal pathogens is unknown. This study was undertaken to determine (1) whether a fungal poplar pathogen produces proteinase(s), and (2) whether the proteinase(s) are inhibited by purified P.I. II. Two isolates of Septoria musiva Peck. were tested. Five replicate cultures were harvested after 2, 3, and 4 weeks, and three trials were conducted for each isolate. Proteinase(s) were found to be produced by both isolates. Highly purified P.I. II was able to inhibit completely proteinase activity of S. musiva under the assay conditions. Studies with transgenic poplar to determine the effect of the pin-2 gene on fungal development are underway.

OCCURRENCE OF DISPERSED REPEATED DNA SEGMENTS IN MAGNAPORTHE GRISEA. D. Z. Skinner and S. A. Leong. Dept. of Plant Pathology and USDA-ARS, University of Wisconsin, Madison. 53706.

Magnaporthe grisea is the teleomorph of the fungus responsible for rice blast and a similar disease of several other grasses. We have identified six distinct classes of repeated DNA segments in this fungus. Cross-hybridizations revealed the six classes shared little or no sequence similarity. Four of the six elements occurred many times in the genomes of rice-infecting isolates, but infrequently in the genomes of isolates from other grasses. The remaining two classes occurred frequently in the genomes of rice isolates and nonrice isolates. Highly repeated elements specific to nonrice isolates have not been observed. One element, when hybridized to EcoRI-cut and size-fractionated DNA of all eight spores of an ascus, revealed a 4:2:2 segregation in one size fraction, where one class of sister spores was different from both parents. This may have resulted from transposition, suggesting at least some of the repeated elements may be transposons. Genetic mapping of polymorphic occurrences of some of these elements indicated dispersion throughout the genome.

EFFECT OF CYST-COLONIZING FUNGI ON REPRODUCTION OF HETERODERA GLYCINES. C.M. Stiles, D.A. Glawe, G.R. Noel, and J.K. Pataky. Dept. of Plant Pathology, Univ. of Illinois, Urbana, IL 61801.

Fungi previously isolated from cysts of Heterodera glycines were tested for the ability to decrease reproduction of the nematode and to colonize cysts and soybean roots. Mycelial suspensions of Diheterospora chlamydosporia, Fusarium oxysporum, Fusarium solani, Paraphoma radicina, Pyrenochaeta terrestris, and Stagonospora heteroderae were used to inoculate roots of greenhouse-grown soybean seedlings (cv. Williams 82). Second-stage juveniles of H. glycines were added to the pots three days after fungal inoculation. After one generation, cysts were extracted from soil and counted. Cysts were observed for signs of fungal colonization and fungi were isolated from cysts and roots. Fungal treatments did not reduce nematode reproduction below the level of the sterile water control. Test fungi were not recovered from yellow females, but were recovered from cream- to brown-colored cysts. Test fungi also were recovered from roots.

DEVELOPMENT OF CERCOSPORA ZEAE-MAYDIS AT VARIOUS RELATIVE HUMIDITIES. P. R. Thorson and C. A. Martinson, Dept. of Plant Pathology, Iowa State University, Ames, IA 50011-1020.

Gray leaf spot of maize caused by C. zeae-maydis has been associated with morning fogs, extended dew periods, and high RH. Because the disease has been observed throughout Iowa where

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 in RH regimes controlled 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 elongation was greatest and appressoria were formed in 48-72 hr at continuous 95 or 100% RH. After 96 hr in 95% RH, 2-5 appressoria formed per spore. Some germ tubes and conidial 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.

PURIFICATION OF A CULTIVAR-SPECIFIC TOXIN FROM PYRENOPHORA TRITICI-REPENTIS, THE CAUSAL AGENT OF TAN SPOT OF WHEAT. A. Tomas*, G. H. Feng**, G. R. Reeck**, W. W. Bockus*, and J. E. Leach*, Depts. of Plant Pathology* and Biochemistry**, Kansas State University, Manhattan, KS 66506.

Pyrenophora tritici-repentis, 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. Ptr toxin is a small protein of MW 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, Ptr toxin caused symptoms on susceptible wheat at concentrations as low as 1.5 µg/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 55108, USA, and Tel Aviv University, Tel Aviv, Israel.**

Thirty seven H. spontaneum accessions collected in Israel were evaluated for resistance to P. hordei in 1984 and 1985 at Rosemount, 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 a mixture of endemic races and isolates produced on Ornithogalum sp. Most accessions in each location were resistant as indicated by small uredinia with chlorosis, necrotic flecks, or a mixture of both. Five accessions were susceptible to the races at each location. Slow rusting was indicated by area under disease progress curves (AUDPC) for three of the susceptible accessions, at Rosemount and at Bet Dagan. Their AUDPC was similar to the slow rusting H. vulgare check cultivars Vada, MN 9062 or Minerva.

DETECTION OF FUSARIUM OXYSPORUM IN SYMPTOMATIC SOYBEAN SEEDS. Rama 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 Fusarium oxysporum Schlech. ex. Fr., cause of pre- and postemergence damping-off and root rot of soybeans, externally appeared as shrunken, slightly 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 hilar 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 OF RADISH IN THE PRESENCE OF ORGANIC AMENDMENTS. R. P. Voland 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 relative to a urea control. At 20 and 30 CFU/g, disease responded similarly to manure, compost, and the control. Inoculum did not decline over time. Disease levels after reinfestation did not vary among amendments. We conclude that, at low inoculum levels, manure is more effective than compost in suppressing disease. This difference in effectiveness dissipates with time, and neither amendment is effective at high inoculum levels.

EVALUATION AND ANALYSIS OF RATE-REDUCING RESISTANCE OF SOYBEANS TO PHYTOPHTHORA MEGASPERMA F. SP. GLYCINEA. R. E. Wagner, S. G. Carmer and H. T. Wilkinson. Depts. of Plant Pathology and Agronomy, University of Illinois. Urbana, Illinois. 61801.

Lesion length and rate of lesion expansion on taproots of aeroponically-grown soybeans infected with P. megasperma f. sp. glycinea (Pmg) provided an accurate assessment of rate-reducing resistance. Four days after inoculation with race 3 of Pmg, lesion lengths of cultivars Corsoy, Sloan, Cumberland, Williams, Asgrow 3127, Agripro 26 and Asgrow 2575 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. R^2 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. E. Jackson, and P. W. Pratt. 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 (Feekes scale 9) was compared with 2 sprays of triadimefon + mancozeb (Feekes scale 9 & 10.5), both at labeled rates. Natural infections resulted in considerable variation between years in disease prevalence and severity; however, significant reductions ($P \leq 0.05$) 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 ($P \leq 0.05$) for Septoria glume blotch in 1985. Significant yield increases ($P \leq 0.05$) were obtained 3 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.

INFECTION DIFFERENCES OF BIPOLARIS AND FUSARIUM IN SUBCROWN INTERNODES OF BARLEY AND WHEAT GROWN IN NO-TILL AND MOLDBOARD PLOW SYSTEMS. **Carol E. Windels and John V. Wiersma, 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 plots. 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 (73%); F. graminearum + F. culmorum + F. avenaceum (G+C+A) were more common in no-till (16%) than in moldboard plow plots (5%). B. sorokiniana also was isolated from SCI of wheat less often in no-till (46%) than in moldboard plow plots (65%); G+C+A 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+C+A 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. Steinegger, 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 fan and rot of the root cortex. The role of Pseudomonas gladioli pv. gladioli as the putative cause of scorch was re-examined 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 over a two year period. P. gladioli was not identified among any of these isolates. Moreover, inoculation of iris with two known strains of P. gladioli pv. gladioli produced water-soaked leaf lesions that averaged from 2.0-6.0 cm in length under conditions of high humidity but did not cause scorch symptoms. Thus, P. gladioli pv. gladioli is not likely the causal agent of scorch of rhizomatous iris.

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