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CORRELATION OF FREQUENCY OF AVID TRANSMITTED INFECTION WITH FREQUENCY OF MECHANICALLY TRANSMITTED INFECTION AND SYMPTOM TYPE IN SORGHUM. J. D. Alexander and R. M. Toler, Department of Plant Pathology and Microbiology, Texas A&M University, College Station 77843

Forty-seven sorghum accessions were planted in 6-m rows in a field trial. Half of each row was mechanically inoculated with maize dwarf mosaic virus strain A (MDMV-A) when the plants reached the 3-leaf stage. The second half of each row was left for natural inoculation via aphids. After five weeks, disease incidence and severity were recorded within each treatment and accession. Regression analyses were run comparing levels of infection by natural inoculation with levels of infection due to mechanical inoculation and with symptom type within the same accession. With the exception of the accessions with genes for "field resistance", there was a significant correlation (P<0.05) between aphid transmitted infection levels and mechanically transmitted infection levels. In addition, the accessions with moderate to severe mosaic symptoms tended to be more easily infected through aphid transmission than those with mild mosaic symptoms or those with necrotic symptoms.

ROOT ROT OF CAMELLIA SASANQUA AND C. OLEIFERA CAUSED BY CYLINDROCLADIUM SP. L. W. Baxter, Jr., A. M. Sprott, S. B. Segars, and S. G. Fagan, Department of Plant Pathology and Physiology, Clemson University, Clemson, SC 29634-0377.

Camellia sasanqua and C. oleifera plants are used as grafting stock for C. japonica because they are resistant to root rot caused by Phytophthora cinnamomum. During the past 2 summers many newly transplanted rooted cuttings of sasanqua & oleifera died 1 to 2 months after transplanting. Isolations from roots and stems of 50 diseased plants yielded a Cylindrocladium sp. Inoculations confirmed this fungus as the cause. Wound inoculations on 3-yr-old plants were successful as were inoculations on detached, nonwounded, healthy leaves. The fungus is suppressed completely in culture by benomyl at 10 μg/ml but is not killed. Fungal transplants left for 2 wk on carrot juice agar (CJA) amended with benomyl (1200 μg/ml) grew when placed on CJA. Captan, triadimefon, PCNB, glycophene, etridiazol, and clozolin which also have good activity against S. minor. Resistance was detected on field-grown c. oleifera with 40 μg/ml but is of iprodione, a concentration lethal to sensitive isolates of T. indica teliospores were present above a burning plume. At least 50% of the teliospores were viable. These results suggest the possibility for spread of the pathogen over long distances by air currents.

PHENOL-OXIDIZING ISOZYME EXPRESSION IN WATERMELON INDUCED BY DIFFERENT RACES OF FUSARIUM OYSXSPORUM F.SP. NIVEUM. C.L. Bills and R. D. Martyn, Department of Plant Pathology and Microbiology, Texas A&M University, College Station, 77843.

Watermelons were protected from a virulent race of Fusarium oxysporum f.sp. niveum when previously inoculated (induced) with an avirulent race. Horizontal IEF-PAGE was used to examine differences in three phenol-oxidizing enzymes (peroxidase (PER), polyphenol-oxidase (PPO), and shikimate dehydrogenase (SDH)) in compatible, noncompatible, and induced-resistant reactions. Isozyme patterns differed with the tissue examined (root, stem, leaves). The PER loci apparently recognized the avirulent race 12 hr after induction but did not recognize the virulent one. PPO loci responded similarly to both the virulent and avirulent races. Additional PPO isozymes were expressed in the induced treatments 24 hr after challenge with the virulent race but not in the compatible treatments. SDH isozyme patterns were similar at each time in the compatible, noncompatible, and induced-resistant reactions.

POSSIBLE DISSEMINATION OF TELIOSPORES OF TILLETTIA INDICA BY THE PRACTICE OF BURNING WHEAT STUBBLE. M. R. Rondo, USDA-ARS, Frederick, MD 21701; J. N. Presscott, CIMMYT, Mexico 06600, D.F. Mexico; T. T. Matsumoto, CSFA, Sacramento, CA 95814; and G. L. Peterson, USDA-ARS, Frederick, MD 21701.

Tilletia indica, causal agent of Karnal bunt of wheat, has been found in the Yaqui and Mayo Valleys, major wheat growing areas of Mexico. In the state of Sonora, Mexico, wheat stubble is burned in the field following harvest to determine if T. indica teliospores were present above a burning field, a Cesna 210 airplane was flown through a smoke plume at 300, 1500, and 3000 m elevations. Dustbust 70 vacuum cleaner bags were placed over the air intake filters of the samples collected at each elevation. At 300 m, an average of 4.5 teliospores were trapped per min of flight, whereas at 1500 and 3000 m elevations, 3.3 and 0.5 teliospores were trapped per min, respectively. At least 50% of the teliospores were viable. These results suggest the possibility for spread of the pathogen over long distances by air currents.

IN VITRO DICARBOXIMIDE RESISTANCE IN SCLEROTINIA MINOR FROM PEANUT. T. B. Brennanman, Plant Pathology Dept., Univ. of GA, Coastal Plain Station, Tifton, GA 31973, P. M. Phipps and R. J. Stipes, Plant Pathology Dept., VPI & SU, Blacksburg, VA 24061.

One isolate of Sclerotinia minor with in vivo resistance to dicarboximide fungicides was recovered from a field microplot of peanut infected 2 years earlier with a fungicide-sensitive strain. Six total applications of iprodione (2 μg/ml), and verified on fungicide-treated excised peanut stems. Stem colonization by the resistant isolate (R-2iv) was unaffected by 40 μg/ml of iprodione, a concentration lethal to sensitive isolates as well as those with previously induced in vitro resistance. R-2iv was highly resistant to dicloran and vinclozolin which also have good activity against S. minor. Although in vitro dicarboximide resistance occurs readily in S. minor, this is the first report of field resistance.

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SPATIAL PATTERN OF MACROPOMINA PHASEOLINA IN TEN FIELDS IN NORTH CAROLINA. C. Lee Campbell, Department of Plant Pathology, North Carolina State University, Raleigh 27695.

Propagules of Macropomina phaseolina are usually aggregated in field soils. To quantify propagule aggregation and to ascertain whether soil texture influences spatial pattern of M. phaseolina, a total of 10 fields were studied. In each field one core sample (2.5X10-12 cm) was removed from each of 150 1X1X1 cm contiguous quadrats and a 10 g subsample of soil was assayed for M. phaseolina. Mean inoculum density (ID) ranged from 3.3-7.8 X 10-17 to 1.1 X 10-17 propagules per 10 g soil in Edgecombe and Wayne County Fields, respectively. Values of Morisita's index (I) were between 3.3 and 0.5 indicating to moderate aggregation of propagules. Soil surface texture, determined for ten 15-quadrat blocks in each field, was generally silt loam, loamy sand, or sand. Mean ID of the 15-quadrat blocks of M. phaseolina was not generally correlated significantly with percentage sand, silt, or clay. Thus other factors must account for propagule aggregation of M. phaseolina within the fields examined.

Protomyces gravis as a potential mycoherbicide of giant ragweed, Ambrosia trifida. R. D. Cartwright and G. E. Templeton, Department of Plant Pathology, University of

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An indigenous fungal pathogen, *Protomyces gravidus*, is being considered for biological control of giant ragweed. It causes large stem galls permeated with mycelium and resting spores. Pure cultures were isolated by germination of overwintered resting spores. On solid media or in liquid culture, it grew as a yeast at constant temperature between 12-28C, optimum at 20C. Seedlings were killed by washed cells (1x10^7) of *P. gravidus* in the greenhouse. Maximum infection occurred after inoculation at 20C and 48 hrs 100% RH. Stem and leaf galls were produced 2-4 weeks after inoculation. Dispersed ascospores were produced in large quantities in 4-13 days after inoculation. Leaves of treated plants showed systemic infections. Diseased trees were mechanically inoculated with *P. gravidus* at the 2-year period and monitored. Disease severity was assessed by measuring the length of infected area and the number of infected leaves, percentage of infected shoots, and percentage of infected plants. Disease severity was significantly lower (P=0.01) in treated trees compared to untreated controls. Burning of the galls was significantly reduced disease (P=0.05) compared to soil incorporation of residue and controls.

Effect of fertilizer level and cultivar on susceptibility of Calathea to *Bipolaris setariae*. A. R. Chase, University of Florida, IFAS, Agricultural Research and Education Center, Apopka, FL, 32703.

*Calathea* species and cultivars were grown for 2 mo in a steam treated potting medium top-dressed with Osmocote 19:6:12 at one of the following rates: 5, 10, 15, and 20 g/15-cm pot. The recommended rate is approximately 4 g/15-cm every 3 mo. Plants were then inoculated with a conidial suspension (1x10^8 conidia/ml) of *B. setariae* and placed in plastic bags for 15 days. Plants were then misted intermittent misting (5 sec/30 min, 12 hr/day) starting 24 hr after inoculation and contining until test completion. Rate of fertilizer affected plant quality, number of leaves, height, and leachable salts but did not affect susceptibility to *B. setariae*. Calathea 'Silver Portrait' and 'Vandenheckei' were most susceptible with *C. insignis* also susceptible. *Calathea* makoyana was moderately resistant and *C. louiseae* and *C. roseo-picta* were highly resistant.

Effect of fertilizer rate on susceptibility of *Ficus lyrata* to *Pseudomonas cichorii*. A. R. Chase, University of Florida, IFAS, Agricultural Research and Education Center, Apopka, FL, 32703.

The effect of fertilizer rate on severity of *Pseudomonas* leaf spot of *Ficus lyrata* was tested using a strain of *P. cichorii* isolated from that plant. Plants were grown in a Canadian peat and pine bark mix (50-50) top-dressed with various rates of Osmocote 19:6:12 for 2 mo prior to inoculation. The rates were 1, 2, 4, 7, 14, and 16 g/15-cm pot; 4 g/12.5-cm pot is the recommended rate. Plants were misted (5 sec/30 min, 12 hr/day) starting 24 hr prior to inoculation and continuing until test completion. plants were sprayed with a bacterial suspension (1x10^8 cfu/ml) of *B. setariae* and placed in plastic bags for 3 days. Plants were then misted intermittent misting (5 sec/30 min, 12 hr/day) starting 24 hr prior to inoculation and continuing until test completion. Plants were then inoculated with a conidial suspension (1x10^8 conidia/ml) of *B. setariae* and placed in plastic bags for 3 days. Plants were then misted intermittent misting (5 sec/30 min, 12 hr/day) starting 24 hr prior to inoculation and continuing until test completion. Rate of fertilizer affected plant quality, number of leaves, height, and leachable salts but did not affect susceptibility to *B. setariae*. Calathea 'Silver Portrait' and 'Vandenheckei' were most susceptible with *C. insignis* also susceptible. *Calathea* makoyana was moderately resistant and *C. louiseae* and *C. roseo-picta* were highly resistant.


Resistance of 468141 and PI 468142, A. helodes (PI 468144), *Pseudomonas* sp. (PI 468345 and PI 468169), and of the Rhizomatosae section (PI 468174, PI 468363, and PI 468366), were evaluated for resistance to peanut stripe virus (PStV). These entries and susceptible cultivar *C. quinoa* were mechanically inoculated with PI 468169. Three to 4 weeks after inoculation, leaves from each entry were tested for PStV infection. Infection was determined by symptomatology, local-lesion assay on *Chenopodium amaranthicolor*, enzyme-linked immunosorbant assay, and electron microscopy. All entries except for PI 468169 and the susceptible cultivar Argentina were negative for virus infection. To our knowledge, this is the first report of resistance to PStV in *Arachis*.

FORMATION OF HYBRID CITRUS RINGSPOT VIRUS ISOLATES BY COMPONENT MIXING. J. V. da Graca and R. F. Lee, University of Florida, CREC, Lake Alfred, 33850.

The top and bottom components of two isolates of citrus ringspot virus (CRSV), one causing bark lesions (6B1), the other not (4E), were separated by sucrose density gradient centrifugation. The top component of each was mixed with the bottom component of the other and inoculated onto *Chenopodium quinoa*, a local lesion host which reacts differently to the two hybrid isolates, and then back to citrus to determine if either restored infection to citrus or whether either component could 3' to 4 weeks after inoculation, leaves from each entry were tested for PStV infection. Infection was determined by symptomatology, local-lesion assay on *Chenopodium amaranthicolor*, enzyme-linked immunosorbant assay, and electron microscopy. All entries except for PI 468169 and the susceptible cultivar Argentina were negative for virus infection. To our knowledge, this is the first report of resistance to PStV in *Arachis*.

RESISTANCE TO PEANUT STRIPE VIRUS IN ARACHIS GERM PLASM. J. N. Culver, J. L. Sherwood, and R. A. Melouk, Department of Plant Pathology, Oklahoma State University and USDA-ARS, Stillwater, OK 74078-0285.

Control of *Cercospora asparagi* on asparagus was compared by burning or soil incorporation of fern residue, and a fungicide. Ferns were mowed (March) and left as residue on surface of 16 blocks of asparagus. Residue was rototilled into soil in 4 blocks. Fungicide blocks provided good seedling stand in April. Sprays were allowed to grow after harvest to produce ferns. Chlorothalonil (1.75 kg (a.i.)/ha) was applied to ferns of 4 blocks on 9, 24 July and 12 August. Untreated blocks were evaluated weekly (July-October). Area under disease progress curve values were significantly less (P=0.01) on ferns in fungicide protected blocks compared to other treatments. Burning the residue was significantly reduced disease (P=0.05) compared to soil incorporation of residue and controls.


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and one culture each of *Macillus subtilis* and *R. pumilus* were compared using tube cell polyacrylamide gel electrophoresis. One DNA fluorogram scan was made on the supernatant cultures and the remainder were ultrasonically disrupted and centrifuged at 45,000 g for 30 min. The supernatant was used as the soluble protein fraction. Although the four cultures differed in quantity and quality of their protein, protein banding at Rf values of 0.05, 0.21, and 0.65 was common for all isolates. These bands may be involved in antibiotic of *R. tritici*; further investigations are required.

**COMMON GENE PRODUCTS AMONG PSEUDOMONAS AND ACINETOBACTER ISOLATES**

A **DISPERSE QUALITY OF BACTERIAL COLONIES AS A MEANS TO DIFFERENTIATE XANTHOMONAS CAMPESTRIS** from other **YELLOW-FLORESCENT BACTERIA**. *D. citrulli*, J. T. M. and P. Bertrand. Department of Plant Pathology, Coastal Plain Experiment Station, University of Georgia, Tifton, GA 31993.

Populations of *Xanthomonas campestris* pv. *pruni* (XPR) were monitored on peach leaves by spreading 0.1 ml samples from leaf washings on nutrient agar plates. Colonies were counted after incubation for 48 hr. Identifications were based on the patterns in individual colonies when plates were held 15 cm above a clear light table that contained horizontal black line spaced 3 mm apart. The plate was placed on the translucent surface of a light-box that was subilluminated with two 45.7 cm white fluorescent lamps (20 joules/sec). The clarity of XPR colonies created an undistorted view of distinct straight lines when the template was viewed through the colony. Most other yellow colonies contained various distorted patterns or were opaque. Initial identifications made by using the straight-line template exceeded 98 percent accuracy.


Aclorobacter *tumefaciens* (AT) has not been generally consid-

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Soluble protein fractions from one nonfluorescent and six fluorescent *A. tumefaciens* strains were examined for their ability to suppress the growth of wheat head blight. Ultrasonically disrupted cells were centrifuged at 45,000 g for 30 min. Soluble protein fractions in the supernatant separated on 10% polyacrylamide gel revealed both qualitative and quantitative differences. Proteins banding at Rf values of 0.02, 0.05, 0.07, 0.19, 0.21, 0.45, and 0.57 were common among the eight isolates. The possible involvement of one or more of these proteins in the antagonistic mechanism is being investigated.


Disease symptoms developed 20-25 days after virus inoculation of 'Sudax' (sorghum x sudangrass hybrid) from field infected plants. Symptoms included yellow streaks and bands in half of the leaf, followed by chlorosis, necrosis, and death of the plant. Isometric particles, 22-26 nm in diameter, were observed in embedded tissue of sorghum 'Sudax' and sweet corn 'Silver Queen'. The virus was not transmitted by *Schizaphis graminum* or *Mogoplistus viridis*, and viral particles were not observed in the ovaries or seeds of the parental species. Enzyme-linked immunoassay analysis of field collected samples confirmed the presence of the virus in sorghum and sweet corn. The virus was identified as *Xanthomonas campestris* 97. Three isolates of the virus were obtained from sweet corn, sorghum, and in the commercial jumbo ricedicotyledonous plants were inoculated with the virus. Symptoms appeared only in sweet corn, sorghum, and in the commercial jumbo ricedicotyledonous plants inoculated with the virus. Symptoms included yellow streaks and bands in half of the leaf, seedlings died, and 0.65 was common for all isolates. These isolates caused a significant pathogen on muscadine (Vitis rotundifolia), though AT biovar 3 is common and serious on *V. vinifera* and other *Vitis* plants. A significant incidence of apparent crown gall was found on Georgia 15-5-3 and Georgia 23-45 selections. Similar occurrences have been noted on *Magnolia, Satureja, Carlos,* and other cultivars. Galls were usually located near the soil line and occasionally on aerial portions of plants. When severe, aerial portions died. *Agrobacterium* spp. were isolated from both *V. rotundifolia* and *V. vinifera* galls, and pathogenicity indicated. Extensive sampling of symptomatic muscadine cultivars from several vineyards (where vascular juices were extracted and plated on RS and NKS media) suggested a high percentage of cultivated muscadines infected with *Agrobacterium* spp.


Detached fruit of pepper (cayenne and Yolo Wonder) and tomato (Heinz 1350 and Roma FD01) were inoculated with twenty-two isolates of *Colletotrichum* from pepper and tomato representing *C. acutatum, C. capsici, C. coccodes,* and *C. gloeosporioides*. Fruit were wound inoculated with a spore suspension of 10^6 spores/ml using a hypodermic syringe and held at room temperature. Percent fruit showing lesion development and lesion diameter were recorded after 9 days. Only 43% of *C. gloeosporioides*-inoculated fruit showed lesion development compared to 87%, 74%, and 75%, for *C. acutatum, C. capsici,* and *C. coccodes*, respectively. Average lesion diameter caused by each species was similar (*C. gloeosporioides*, 18.7 mm; *C. acutatum*, 24.6 mm; *C. capsici*, 21 mm; and *C. coccodes*, 21 mm).

**XYLEM-LIMITED BACTERIA CAUSE BLIGHT SYMPTOMS IN CITRUS.** D. L. Hopkins, Agricultural Research and Education Center, IFAS, University of Florida, Leesburg, FL 32749-0388

Xylem-limited, grain-negative bacteria (XLB) isolated from various hosts were used to inoculate seedlings of rough lemon, the citrus rootstock that is most susceptible to blight. After 2 years, stunt and dieback symptoms were observed in seedlings inoculated with XLB isolates from grapefruits, peach, oak, blackberry, and goldenrod. Three isolates of the Pierce's disease of grapevine bacterium and two isolates of an XLB obtained from citrus with blight were used to inoculate rough lemon, rangpur lime, and sweet orange citrus seedlings. One citrus XLB isolate produced stunt and dieback symptoms in all three rootstocks, with more severe symptoms occurring in rootstock. These isolated seedlings also had reduced water conductivity in stem sections and elevated zinc levels in trunk wood and phloem, which are diagnostic tests for blight. Three sweet orange trees on rough lemon rootstock inoculated with XLB also developed symptoms.

**INDUCTION OF SYNCHRONIZED ASEXUAL DEVELOPMENT OF ASPERGILLUS PARASITICUS IN LIQUID CULTURE.** S. T. Kendall and D. M. Wilson, Department of Plant Pathology, University of Georgia, Coastal Plain Experiment Station, Tifton, GA 31933.

A temperature mediated shake culture method was developed which synchronized conidial production in A. parasiticus (NRRL 2999). Cells were grown in a 150 x 24 cm containing five ml of a defined liquid medium (pH 4.5) were prewarmed to 41C and inoculated with a washed conidial suspension (5 x 10^6 conidia/ml). The tubes were incubated for 20 hr at 41C followed by 28 hr at 30C. During the 41C incubation floating conidia swelled two times their original size, germinated, and formed a loose mat. Continued incubation at 30C resulted in synchronized asexual development and by 10 hr at 30C conidiospore was observed. Rapid spore production followed which leveled off after about 20 hr as determined by spore counts. Aflatoxin synthesis occurred in this system at 30C. Addition of beta-tomone to cultures resulted in altered aflatoxin synthesis and atypical conidial development.

**REDUCTION OF LESIONS CAUSED BY RHIZICOCCONIA SP. ON STEM OF JUVENILE SOYBEAN AND BEAN PLANTS WITH A PREEMERGENT SPRAY OF SN 84364 (FLUTONANIL) ON THE SOIL.** T. A. Chukrach and R. E. Cullen. Plant pathology Dept., University of Florida, Gainesville, 32611.

In separate field tests on soybeans and beans, a preemergent, banded...
(25-31m) spray on the soil along the row center with SN 84364 (50WP at 1.12 kg/ha) reduced the number of lesions caused by Rhizoctonia sp. on the leaf by 49 and 60%, respectively. The addition of metalaxyl (5EC at 1.12/ha) to the spray further reduced lesions on soybeans but not on beans. In two additional field tests on soybeans where SN 84364 was tank mixed with metalaxyl, lesions were reduced by 47 and 24% and the metalaxyl by itself reduced lesions by 34% in the former test but not the other. Spray volume was 187 and 74 l/ha for the bean and soybean tests, respectively, but spray pressure was identical (2.1 kg/cm²).

ANALYSIS OF LATE LEAF SPOT (Cercosporidium personatum) DISEASE COMPONENTS TO EXPLAIN THE RATE-REDUCING EFFECTS OF A PROTEKTANT AND A STEROL INHIBITING FUNGICIDE. J. Labrinos, F.W. Nutter, Jr., and S.C. Alderman, Dept. Plant Pathology, University of Georgia, Athens 30602.

Analysis of disease components can be used to explain how fungicides reduce the infection rate (r). To determine the rate of infection, HWG 1608 (sterilinhibitor) and chlorothalonil (protectant) fungicides were applied at different levels of active ingredient (a.i.) to field plots of peanut (Arachis hypogaea 'Florunner'). Sprays were initiated when Cercosporidium personatum reached the 1% level of infection. Although both fungicides reduced 'r' as a.i. was increased, HWG 1608 reduced 'r' to a much greater extent than chlorothalonil. Analysis of disease components showed that reduction in 'r' was largely attributed to fungicidal effects on sporulation and lesion number. The regression coefficient relating a.i. to the log of number of spores produced per lesion was -0.974 for HWG 1608 and -0.611 for chlorothalonil. The level of a.i. did not affect lesion size.

BIOLICAL CONTROL OF RHIZOTONIA SOLANI ON COTTON BY LAETISARIA ARVALIS AND A MYCOPHAGOUS INSECT, PROSISTOMA MINUTA. Robert Lartey, E. A. Curl, and Curt M. Peterson, Dept. of Plant Pathology, and Dept. of Botany and Microbiology, Auburn University, AL 36849.

Biological control of Rhizotonia solani on seedling cotton by a fungal agent, Laetisaria arvalis, and a mycoparasitic microorganism, Prosistoma minuta, was assessed in sterilized and non-sterilized soil infested with Rhizotonia inoculum densities of 0.01 to 0.15 g/kg soil. L. arvalis applied to the seed reduced disease severity more effectively than when applied to soil; in sterile soil this fungus alone caused minor root injury. Collombola at 1000 g/kg soil suppressed disease without causing root injury. The two agents were compatible and, when applied together, the disease control benefit was significantly greater than for either used alone. Seedling emergence and root and shoot dry weights also varied according to the single agent or combination used. Overall, P. minuta was the more effective of the two agents.

EFFECTS OF POWDERY MILDEW, TRIADIMENOL SEED TREATMENTS, AND TRIADIMENOL POLAR SPRAYS ON YIELD OF WINTER WHEAT IN NORTH CAROLINA. S. Leath, USDA-AHS, Department of Plant Pathology, North Carolina State University, Raleigh, NC 27695-7616.

Wheat plots were established in central and eastern North Carolina in the fall of 1985 to determine yield reductions caused by Erysiphe graminis f. sp. tritici. Inoculated plants were treated with triadimenol, seed treatments, or triadimenol polar sprays. Lesions increased to 4-6 cm after 7 days. Differences in disease severity were detected by the enzyme-linked immunosorbent assay (ELISA). Two pairs of recessive genes (sb-1 and sb-2) controlled resistance to SBMV-C movement in MS. Tolerance to SBMV-C in MS was conferred by two recessive genes. One recessive gene pair in MS controlled resistance to infection by SBMV-C. MS and all subsequent generations having MS as a parent were infected by SBMV but were rated as tolerant due to reduced symptom severity. MS contained no resistance or tolerance to CCMV. The disease control benefit was significantly greater than for severity. MW contained no resistance or tolerance to CCMV. The two agents were compatible and, when applied together, the disease control benefit was significantly greater than for either used alone. Seedling emergence and root and shoot dry weights also varied according to the single agent or combination used. Overall, P. minuta was the more effective of the two agents.

INFLUENCE OF CHLOROTHALONIL APPLIED IN IRRIGATION WATER ON YIELD AND FOLIAGE RESIDUE. Robert H. Littrell.

A quadrant in .4 ha center-pivot system was used to establish four-row plots 4.3 x 9.1 m to apply chlorothalonil with (1) conventional ground sprayer, (2) irrigation water (no traffic), and (3) irrigation water (with traffic). Fungicide was applied seven times in 4 mm of water or 96 l of spray per ha using 1.24 kg a.i.
correlations were obtained in the shoot tissue analysis between Pi and nitrogen, potassium, iron and molybdenum in the shoots. These changes in nutrient levels may result in plants having lower levels of stress tolerance to drought and cold weather.

DEFINITION OF PLANT DISEASE GRADIENTS USING A HAND-HELD, MULTISPECTRAL RADIOSENSOR. F. W. Nutter, Jr., Department of Plant Pathology, University of Georgia, Athens 30602.

A multispectral radiometer was used to determine if plant disease gradients could be detected by measuring the amount and variability of sunlight reflected from plant (Arachis hypogaea) canopies. Reflectance measurements (500 to 550 nm wavelength range) and visual assessments of disease severity were taken within and across plant rows at various distances from peanut runner, (Cercosporidium personatum) disease foci. Reflectance measurements and visual assessments were highly correlated for all gradients measured. Reflectance in the 800 nm wavelength band increased and visual disease and yield has not been increasing distance from disease foci. Although disease gradients were detected with either method, the reflectance method provided data twenty times faster. The development of models to describe disease gradients based upon reflectance data, may provide a standardized and objective method to detect and quantify plant disease gradients in other crops.

THE NATURE OF ICE NUCLEATION-ACTIVE BACTERIA ASSOCIATED WITH APPLE AND PEACH TRUNKS IN GEORGIA AND INFLUENCE OF VARIOUS CHEMICALS ON THEIR ICE NUCLEATION ACTIVITY. J. K. Olive and S. M. McCarter, Dept. Plant Pathology, University of Georgia, Athens, GA 30602.

When 286 strains of ice nucleation-active bacteria from 20 apple and 12 peach orchards in Georgia were tested, all produced fluorescent pigments and were negative for oxidase and catalase activity in addition to not resembling Pseudomonas syringae pv. syringae in that they utilized erythritol, DL-lactate, and sucrose but did not cause pitting of polypropylene media or soft rot of potato. Eighty-four percent produced syringomycin. All except one produced a hypersensitive reaction on tobacco. The strains were diverse in pathogenicity and virulence on green tomato fruit, green bean plants and peach seedlings. Streptomycin resistance among strains was correlated with a history of streptomycin use in (2.2) than those inoculated with isolate CF-4 (1.8). No significant effect of cultivars, fungicide rates, or treatment interaction existed.

SCREENING FOR RESISTANCE TO PHYTOPHTHORA BROWN ROT IN CRIMSON CLOVER. B. G. Pratt and W. E. Knight, USDA, ARS, Forage Research Unit, P.O. Box 5367, Mississippi State, MS 39762

Cultivars and inbred lines of crimson clover (Trifolium incarnatum L.) were screened for resistance to root rot caused by a Phytophthora sp. in greenhouse tests for 5 years. Potentially resistant plants from cultivars were selfed, and their progeny were further scored for up to four additional generations. Inbred lines were compared with parental cultivars and with each other on the basis of scores for severity of root disease symptoms and mortality. Five of 18 S lines, and 7 of 18 R lines, manifested significant resistance in a final severe test. Segregation for resistance within S through S generations was suggested by differences in disease scores of related S and R lines. Results suggest that high levels of resistance to Phytophthora root rot may not be present within cultivars of crimson clover. However, moderate levels of resistance can be obtained that enable plants to survive under prolonged conditions favorable for disease.

Greenhouse Evaluation of Fungicides for Control of Strawberry Anthracnose-Crown Rot. Barbara J. Smith, USDA-ARS Small Fruit Research Station Poplarville, MS 39470

Three fungicides were tested on 4 strawberry cultivars for their efficacy in controlling anthracnose-crown rot. The fungicides were applied weekly for 10 weeks at the following rates (g/l water): benomyl, 1.3, 1.3, 2.2, 2.2; captafol, 19.2, 38.4, 76.8; and propiconazole, 0.3, 0.6, 1.2. After 4 fungicide applications, the plants were spray inoculated with a conidial suspension (1.5 X 10^6 conidia/ml) of Colletotrichum fragariae. The mean disease severity rating (DSR) of each fungicide treatment was significantly less than that for untreated controls (2.7). Plants treated with propiconazole had a significantly lower DSR (1.6) than those treated with either captafol (2.2) or benomyl (2.4). Plants inoculated with isolate MS-9 had a significantly higher DSR (2.2) than those inoculated with isolate CF-4 (1.8). No significant effect of cultivars, fungicide rates, or treatment interaction existed.

SEEDLING DISEASES OF VEGETABLES ASSOCIATED WITH CONSERVATION TILLAGE AND FLUID DRILLING. Donald R. Sumner, Suhas K. Gathe, and Shored C. Patak, Coastal Plain Experiment Station, Tifton, GA 31793-0748

Corn, okra, cucumber, cowpea, soybean, and tomato seeds (untreated or pre-germinated) were planted with fluid drilling into no till or disked rye. Fusarium, Sclerotium, and Rhizoctonia were the most common seedling diseases occurring. Pice of the tests included fungicide treatments with benomyl and metalaxyl. The effects of these chemicals on seedling disease were variable and dependent upon the specific disease. Benomyl and metalaxyl significantly reduced the incidence of Sclerotium rolfsii and Rhizoctonia solani. The effects of these chemicals were less consistent against Fusarium. This study suggests that fungicide treatments should be used in conjunction with conservation tillage practices to control seedling diseases.
taken in early spring from dead rootstock killed at various dates the previous year. This indicates that SR can overwinter as mycelium. SR was readily isolated from trees killed late in the growing season while those killed from early-season infections lacked active mycelium.

'TAM RIO GRANDE GOLD-SWEET' - A NEW MULTIPLE VIRUS-RESISTANT, YELLOW WAX PEPPER CULTIVAR. B. Villalon, Texas Agricultural Experiment Station, 2415 East Highway 83, Weslaco, Texas.

The Texas Agricultural Experiment Station at Weslaco has released a new multiple virus-resistant (MVR) pepper cultivar. 'TAM Rio Grande Gold-Sweet' (TRGG) is a MVR, small-yellow wax, nonpungent, pickling-type pepper. This high yielding, conical, diamond-shaped, 'Caloro' type sets early concentrated fruit on a compact plant with thick foliage. 'TRGG' possesses genetic resistance to tobacco etch virus (TEV), potato virus Y (PVY), pepper mottle virus (PMoV) and tobacco mosaic virus (TMV). The sweet, yellow fruit are well-suited for fresh market consumption in salads, or as a processed, pickled, whole product. Extensive performance trials in Texas and other areas indicated 'TRGG' has a wide range of adaptability.


Spore density of Leptosphaerulina briosiana and Pleospora herbarum (Stemphyllum botryosum) was monitored in or above the alfalfa canopy with a Burkard 7-day spore trap and temperature, relative humidity, leaf wetness and rainfall were monitored in the canopy using a datalogger and electronic sensors at one site in 1985. During the seven l-wk periods examined, quantities of L. briosiana ascospores and S. herbarum conidia were positively correlated (P=0.23). When quantity of inoculum obtained for each fungus each week was related to environmental conditions during the previous 7 days, spore density per m$^2$ for both fungi was correlated negatively with mean maximum temperature (P<0.05) and mean rainfall (P<0.12), and positively (P<0.20) with mean leaf wetness duration. These possible associations indicate the potential importance of environmental factors in ambient inoculum density during epidemics of alfalfa leafspot.

YIELD RESPONSE OF ANNUAL CLOVERS TO MELOIDOGYNE INCognita UNDER FIELD CONDITIONS. G. L. Windham and G. A. Pederson, USDA, ARS, Forage Research Unit, P. O. Box 5367, Mississippi State, MS 39762.

The effect of Meloidogyne incognita on 'Bigbee' berseem clover, 'Yuchi' arrowleaf clover, and 'Chief' and 'Tibbee' crimson clovers was determined by comparing yields in infested and noninfested plots. M. incognita was increased in the nematode-infested plots by growing infected 'Floridel' tomato prior to planting the clovers. Uninoculated tomato plants were grown in check plots. The mean initial nematode populations at planting for Bigbee, Yuchi, Chief, and Tibbee were 1227, 940, 1188, and 832, respectively. Tibbee was unaffected by M. incognita.