

The American Phytopathological Society

SOUTHERN DIVISION

Annual Meeting
February 5-8, 1984

ABSTRACTS

THE EFFECT OF MAIZE DWARF MOSAIC VIRUS STRAIN B ON THE GROWTH AND YIELD OF SUSCEPTIBLE SORGHUM. J.D. Alexander, R.W. Toler, Dept. of Plant Pathology & Microbiology, F.R. Miller, Soil & Crop Sciences Dept., Texas A&M University, College Station, TX 77843

Effects of maize dwarf mosaic virus strain B (MDMV-B) on the growth and yield of susceptible sorghum accessions was tested. The plants were mechanically inoculated at the three-leaf growth stage. Of thirteen accessions susceptible to MDMV-B infection, five developed "redleaf" and necrotic symptoms resulting in up to 75% yield losses. Plants from these accessions were also reduced in height, panicle length and stem diameter. Kernel size and threshing percent, as well as kernel weight and density, were not affected. The remaining eight susceptible accessions developed only mosaic symptoms which resulted in yield losses of 2 to 40%. Yield losses among the 13 susceptible accessions increased with increasing percent infection, which ranged from less than 5% to more than 95%.

INCIDENCE OF PHOMOPSIS SCABRA AND GLOEOSPORIUM PLATANI IN SEVEN-YEAR-OLD SYCAMORE PLANTATIONS IN MISSISSIPPI. Vernon Ammon, Dept. of Plant Pathology and Weed Science, Mississippi State, MS 39762.

Incidence of *Phomopsis scabra* and *Gloeosporium platani* in sycamore plantations in Mississippi (one upland and one delta) has been determined for the past four years. *Phomopsis scabra* was isolated from 80% of the sampled trees at the delta plantation in 1980, 60% in 1981, 69% in 1982 and 75% in 1983. With the exception of 1981, the incidence of *P. scabra* was less at the upland site. The sycamore anthracnose fungus was isolated from 32%, 9%, 14%, and 19% of the trees growing at the delta site in 1980, '81, '82, and '83, respectively. Significantly lower incidence levels of *G. platani* occurred at the upland location. Also noted were significant differences in incidence of *G. platani* between sycamore seed sources.

INOCULUM POTENTIAL OF GLOMUS SPORES INHABITING AMARANTHUS RETROFLEXUS L. SEED IN THE SOIL. E. M. Arvanetes and R. A. Taber, Dept. of Plant Pathology and Microbiology, Texas A&M Univ. College Station, Texas 77843 and G. L. Philley, Texas A&M Univ. Agr. Ext. Center, Overton, Texas 75684.

Glomus spores inhabited approximately 40% of the *Amaranthus retroflexus* L. seed retrieved from fine, sandy-loam soils in Northeast Texas. Viability of these *Glomus* spores was determined in a sudangrass bioassay. Treatments consisted of sudangrass seed grown with and without retrieved *A. retroflexus* seed in an autoclaved fine, sandy-loam soil. Sudangrass roots were assayed for mycorrhizal colonization 90 days after soil infestation. Approximately 20% of the root length of sudangrass plants grown with retrieved *A. retroflexus* seed was colonized with *Glomus* spores, vesicles, and arbuscules. No infestation was observed in sudangrass roots grown in the absence of *A. retroflexus* seed. Preliminary experiments suggest endomycorrhizal fungus-infested seed serve as sources of inoculum in the soil and should be considered in population biology studies.

EFFECT OF SELECTED ISOLATES OF FOUR SPECIES OF FUSARIUM ON STAND ESTABLISHMENT AND EARLY GROWTH OF COTTON. W. E. Batson,

Jr. and Abdolhamid Borazjani, Dept. of Plant Pathology and Weed Science, Mississippi State University, Mississippi State.

The influence of selected isolates of *Fusarium solani*, *F. oxysporum*, *F. equiseti*, and *F. semitectum* on emergence and early development of Stoneville 213 cotton was evaluated at soil temperatures of 16, 20, and 24 C in root-zone chambers. Percent emergence from fumigated soils artificially infested with *F. equiseti*, *F. oxysporum*, or *F. semitectum* was not significantly different from that obtained from noninfested soil. Emergence was significantly reduced by *F. solani* at 16 and 20 C. *F. solani* at all temperatures and *F. equiseti* at 16 and 24 C caused significant discoloration of seedling roots. Seedling height 21 days after seeding did not differ significantly among infested and noninfested soils at 16 and 20 C. Height of plants at 24 C was significantly greater in infested soil.

COTTON BOLL ROT AND SUBSEQUENT SEED INFECTION BY FOUR SPECIES OF FUSARIUM. W. E. Batson, Jr. and Abdolhamid Borazjani, Dept. of Plant Pathology and Weed Science, Mississippi State, University, Mississippi State, MS 39762.

Attached bolls of greenhouse and field grown Stoneville 213 cotton were wound inoculated with toothpick segments containing mycelium of *Fusarium solani*, *F. oxysporum*, *F. equiseti*, or *F. semitectum*. *F. solani* and *F. equiseti* caused significant damage to bolls under greenhouse and field conditions. In the greenhouse, damage to bolls decreased with increased boll age at inoculation. Open cotton from field inoculated bolls was harvested as individual locks and composited into inoculated, adjacent, and opposite locks for each treatment. *F. equiseti* was more aggressive than the other *Fusaria* based on assay of damaged seed from these categories. *F. equiseti* was recovered from 41% of the acid delinted seed from locks opposite the inoculation point. Seed of each category were planted in fumigated soil in the greenhouse. Emergence was lowest for seed from *F. equiseti* inoculated bolls.

ANTAGONISM OF LAETISARIA ARVALIS AND BINUCLEATE RHIZOCTONIA-LIKE CAG-2 AND CAG-4 TO RHIZOCTONIA SOLANI AG-4 AND AG-2 TYPE 2 ON SNAPBEAN AND CORN. D. K. Bell, D. R. Sumner, and B. G. Mullinix, Jr., Plant Pathology Dept. and Computer Center, Coastal Plain Station, Tifton, GA 31793.

Pots of heat treated soil were infested with *Rhizoctonia solani* AG-4 alone or AG-4 + *Laetisaria arvalis* (LA) or binucleate *Rhizoctonia*-like CAG-2; or infested with AG-2 type (T) 2 alone or AG-2 T 2 + LA or CAG-4. Snapbean or corn was planted 2 or 5 weeks later. Soil infested with AG-4 + CAG-2 had a higher ($P=0.01$) percentage of normal bean plants than soil infested only with AG-4. There were no differences in numbers of normal bean plants between AG-4 + LA and AG-4 + CAG-2 and between AG-4 + LA and AG-4 alone. There were higher numbers of normal corn brace and crown roots in soil infested with AG-2 T 2 + CAG-4 than in soil with AG-2 T 2 + LA or AG-2 T 2 alone. There were no differences between AG-2 T 2 + LA and AG-2 T 2 alone, and none between planting bean and corn 2 or 5 weeks after infesting soil. Except for one isolate of LA, all fungi were indigenous to the Georgia Coastal Plain soils.

ROLE OF ICE-NUCLEATING (INA) BACTERIA IN FROST INJURY OF PEACH FLOWERS IN SOUTH CAROLINA. Ellen M. Bentley and E. I. Zehr,

Dept. of Plant Pathology and Physiology, Clemson University, Clemson, SC 29631.*

Potential ice-nucleating activity of epiphytic bacteria in relation to frost injury of peach flowers was investigated in two South Carolina peach orchards. Washings from dormant floral buds, flowers, young fruit and leaves were diluted and plated in triplicate on nutrient agar. Ice-nucleating activity at -5°C was evaluated by the replica plate technique. Representative INA-positive isolates were selected and identified. The bactericides streptomycin (200 ppm) and terramycin (200 ppm) and ice-nucleation inhibitors CuSO_4 (0.024M), CuSO_4 (0.05M) + urea (0.5M) and tartaric acid (30mM) were sprayed on peach trees to reduce frost injury during flowering. Injury was not significantly reduced during two consecutive frost periods of 31°F and 28°F . Infrequency of INA bacteria on or in flowers at the time of frost injury and the failure of chemical sprays to reduce frost injury, suggest that other factors influence frost damage of peach flowers in South Carolina.

MONOCHAMUS TITILATOR ASSOCIATED WITH BURSAPHELENCHUS

XYLOPHILUS IN LOUISIANA. W. Birchfield, USDA, ARS, Dept. of Plant Path. & Crop Physiol. La. Agric. Expt. Sta., La. State Univ. Agric. Ctr., Baton Rouge, LA 70803. The pinewood nematode (PWN), Bursaphelenchus xylophilus is commonly found on dying pine trees of several species in Louisiana. The vector has not been definitely established in this area, although coleoptera, particularly the cerambycidae are known to vector PWN elsewhere. Monochamus titilator, a pinewood Sawyer, was identified closely with PWN on slashpine, Pinus elliotii. Adult Monochamus feeding sites were consistently observed on smaller slashpine branches. Pinewood Sawyer larvae fed on bark and wood of a killed slashpine, bored into the center of the branches and fed in the xylem and pith. The PWN (all stages) occurred in the larval frass under the pine bark, and in the xylem from cambium to the pith. They were found most abundantly in the pith, also the preferred feeding site of the beetle larvae. This constant and abundant association of Monochamus titilator to B. xylophilus makes it a prime vector suspect. M. alternatus and M. carolinensis are proven vectors of PWN in other places.

EFFICIENCY OF TRANSMISSION OF TOMATO RINGSPOT VIRUS BY XIPHINEMA AMERICANUM AND XIPHINEMA RIVESI. C. Bonsi, R. Stouffer and W. Mountain, Dept. of Ag. Sci., Tuskegee Inst., AL 36088, Dept. of Plant Path., Coastal Plain Sta., Tifton, GA 31794 and Pa Dept. of Ag., Harrisburg, PA 17110.

Xiphinema americanum and X. rivesi were extracted after a 4-5 wk acquisition period on Tomato Ringspot Virus (TmRSV)-infected dandelion and 1, 5, 10 or 50 presumed viruliferous nematodes of either species were added to virus-free dandelion growing in autoclaved soil (50 cm^3 pots). Leaves of dandelion were assayed for the TmRSV 3 wks after the introduction of the nematodes and weekly thereafter for 12 wks. TmRSV was detected 1-2 wks earlier in pots with highest nematode population density. The proportion of infected dandelion plants was highest at the highest nematode population density. No significant differences in the efficiency of transmission were measured between the two species. TmRSV was transmitted by a single nematode of either Xiphinema species.

EFFECT OF DIFFERENT INITIAL POPULATION DENSITIES OF XIPHINEMA AMERICANUM AND XIPHINEMA RIVESI ON GROWTH OF APPLE AND PEACH SEEDLINGS. C. Bonsi, R. Stouffer, and R. Shaffer, Dept. of Ag. Sci., Tuskegee Inst., AL 36088; Dept. of Plant Path. Coastal Plain Sta., Tifton, GA 31794; Penn State Univ. Fruit Res. Lab, Biglerville, PA 17307.

In greenhouse studies, 4-wk old seedlings of apples and peaches in pots (600 cm^3 soil) were inoculated with different initial population densities (P_1) of 0, 100 and 200 nematodes/100 cm^3 soil of tomato ringspot virus-free Xiphinema americanum or X. rivesi. The experiments were terminated 16 weeks after inoculation. Both Xiphinema sp. at either 100 or 200 nematodes/100 cm^3 soil significantly reduced ($P = 0.05$) fresh and dry weight of seedlings. Although the final population density was less than the P_1 for both species, more X. rivesi than X. americanum were recovered at the end of the experiment.

NEMATODES ASSOCIATED WITH SORGHUM IN MISSISSIPPI

J. A. Cuarezma-Teran, L. E. Trevathan, and S. C. Bost, Dept. of Plant Pathology and Weed Science, and Mississippi Cooperative Extension Service, Mississippi State, MS 39762.

A survey was conducted in 1982 to determine the incidence and density of nematodes associated with sorghum in Mississippi,

* = Student paper competition.

and to determine the relationship of certain soil properties to these nematode populations. Twelve free-living and nine plant-parasitic species of nematodes were recovered from soil and root samples collected from 27 fields in 16 counties. Plant-parasitic species recovered were, in decreasing order of frequency: Pratylenchus zeae, Quinisulcius acutus, Helicotylenchus dihystrera, Tylenchorhynchus martini, Hoplolaimus galeatus, Meloidogyne incognita, Xiphinema americanum, Criconemella xenoplax, and Rotylenchulus reniformis. There was a negative correlation ($P=0.05$) between soil pH and P. zeae populations. Both phosphorus and potassium levels were positively correlated ($P=0.01$) with Q. acutus populations.

PRECISION OF A QUANTITATIVE ASSAY FOR MACROPHOMINA PHASEOLINA FROM SOIL. C. Lee Campbell and Larry A. Nelson, Dept. of Plant Pathology and Dept. of Statistics, North Carolina State University, Raleigh 27650.

We quantified populations of M. phaseolina using Papavizas and Klag's (Phytopathology 65:182) soil preparation method with a 0.5% NaClO solution and Mihail and Alcorn's (Plant Dis. 66:662) isolate medium. Each assay required 6 min. with a two person team. Passing soil through a 2-mm diam mesh sieve did not ($P=0.05$) affect number of colonies recovered per sample. Five subsamples of each of 28 soil samples were assayed to determine effect of subsample number on variance (s^2_x) of the general mean (\bar{x}). Sample means ranged from 2-64 colonies/10 g dry soil with x as 17.2. The s^2_x was 6.06 with 5 subsamples assayed/sample and by calculation it would be only 7.19 with 1 subsample assayed/sample. Thus, precision would not be sacrificed with reduction in number of subsamples assayed per sample and cost would be minimized.

EFFECT OF REFLECTIVE MULCH AND STYLET OIL ON INCIDENCE OF WATERMELON MOSAIC VIRUS (WMV) AND YIELD OF YELLOW SQUASH. K. E. Conway, J. L. Sherwood, S. F. Tomasino, and J. E. Motes, Departments of Plant Pathology (1-3) and Horticulture and L. A. (4), Oklahoma State University, Stillwater, OK 74078.

In 1981 WMV severely limited late season squash production. Plots were established in 1983 at Stillwater and Bixby, OK to evaluate reflective mulch (RM) and stylet oil (SO) sprays. A severe strain of WMV collected at Bixby in 1981 was used to inoculate seedlings of yellow squash cv. 'Lemon Drop' that were transplanted to field. Plants for other treatments were seeded in hills between rows of infected seedlings. Treatments consisted of 1.2m RM, a 20% SO spray (at Stillwater only), or non-treated control plants. Plants and fruits with and without symptoms were recorded regularly. Virus infection spread from inoculated plants within one month. Use of RM delayed virus spread by 1 wk. RM plants had earlier fruit set and a 2-6X increase in symptomless harvestable fruits compared to controls. Use of SO produced the least number of virus infected fruits, however, symptomless fruits were 50% less than control plants.

HISTOLOGY OF MACROPHOMINA PHASEOLINA IN SOYBEAN. Charles Cottingham and Yvonne D. Riley. Box 1525 State College, Orangeburg, South Carolina 29117

Macrophomina phaseolina, the cause of charcoal rot of soybeans reduces yield of infected plants. We evaluated the histology of the host-parasite interaction by inoculating soybean seeds of cultivar "Bragg" at planting with an aqueous suspension of M. phaseolina. Scanning electron microscopy revealed that M. phaseolina penetrates epidermal cells directly. Hypha grows intercellularly, intracellularly, vertically and laterally throughout the cortical parenchyma and xylem tissues by direct penetration of cell walls or through pits. Small rounded protrusions on hyphae appeared to be terminal and intercalary chlamydospores or microsclerotia produced during reproduction.

ORGANIC MATTER - SCLEROTIUM ROLFSSII ASSOCIATED TOBACCO TRANSPLANT DISEASE. A. S. Csinos and M. G. Stephenson, Department of Plant Pathology and Agronomy, Coastal Plain Station, Tifton, GA 31793.

In 1980 and 1981 Sclerotium rolfsii was isolated from several dying tobacco transplants under conditions normally not associated with southern stem blight. High amounts of organic matter from turned in cover crops was present in the top 0-10 cm of soil in all problem fields. Isolates of S. rolfsii from tobacco and peanut were tested in a greenhouse and found to be pathogenic to both tobacco and peanut. A higher root-stem disease index (DI) occurred when organic amendment (OA), autoclaved rye seed, was incorporated into methyl bromide treated

soil near tobacco stems. Less disease occurred if the OA was not placed near the stems. The DI was generally higher at 30° than at 22°. OA alone was associated with severe root and stem lesions in 2 of 3 tests. The cause of the damage in OA alone treatment is unknown. Toxins from OA or from a common saprophyte using the OA as a food base are possible explanations.

MODIFICATION OF THE RHIZOSPHERE FUNGUS FLORA BY MYCOPHAGOUS INSECTS. E.A. Curl, R.T. Gudauskas, J.D. Harper, and C.M. Peterson. Dept. of Botany, Plant Pathology, and Microbiology, and Dept. of Zoology-Entomology, Auburn University, AL 36849.

A mixture of two Collembola species, *Proisotoma minuta* and *Onychiurus encarpatus*, was introduced at a rate of 500/140 g soil into glass tubes (3 x 20 cm) of a natural sandy loam with cotton seedlings. After 6 days at 27C, soil dilution and plating revealed that the rhizosphere/nonrhizosphere (R/S) ratio of total colony-forming units of fungi per gram was reduced from $R^0/S^0 = 2.40$ to $R^c/S^c = 0.41$ (o = no insects; c = Collembola). The R^0/R^c ratio was 6.94. The insects also altered the R/S values for *Fusarium* spp. and *Trichoderma* spp., reflecting changes from high to low populations in the rhizosphere. Tests with *F. oxysporum* f. sp. *vasinfectum* chlamydsopores, applied to pre-germinated cotton-seed hypocotyls before transplanting to tubes of sterilized soil, showed a significant decrease in the viable spore population of rhizosphere soil 48 hr after the soil was infested with Collembola. Populations of *T. harzianum* conidia in the rhizosphere also were greatly reduced by insect activity.

INCIDENCE OF RATOON STUNTING DISEASE IN LOUISIANA. K. E. Damann, Jr., E. O. Ogunwolu, and T. E. Reagan. Dept. of Plant Path. & Crop Physiol., and Dept. of Entomology, La. Agric. Expt. Sta., La. State Univ. Agric. Ctr., Baton Rouge, LA 70803.

Samples of sugarcane cultivar CP 65-357 from 44 commercial fields were evaluated for the presence of ratoon stunting disease (RSD). Diagnosis was based on microscopic examination of vascular extracts for the RSD bacterium and alkaline induced metaxylem autofluorescence characteristic of diseased stalks. RSD was detected in samples from 23 of the 44 fields surveyed: 11 of 14 fields along Bayou Teche, 9 of 15 along Bayou LaFourche, and 3 of 15 along the Mississippi River. These are probably conservative figures due to the small sample size per field. In this survey RSD was confirmed in over 50% of the fields sampled.

ETIOLOGICAL STUDIES ON GROUNDNUT ROSETTE. J. W. Demski, C. W. Kuhn, S. M. Misari, R. Casper, O. Ansa, and D.V.R. Reddy. University of Georgia, Experiment, GA 30212; Ahmadu Bello University, Nigeria; Institute for Virus Diseases of Plants, West Germany; ICRISAT, India.

The rosette disease of groundnut (peanut) appears to be caused by two etiologic agents. Naturally-infected plants in the field contained virus-like spherical particles, reacted with luteovirus antisera, and their sap was used to mechanically inoculate healthy peanuts. The mechanically infected plants showed typical rosette symptoms within 5 to 10 days, but they did not have recognizable virus particles or react with the luteovirus antisera. Mechanical transmission was facilitated by adding reducing agents, bentonite, and urea to potassium phosphate buffer and inoculating very young, partially etiolated peanut seedlings. Separation of the luteovirus from naturally-infected peanuts was attempted by serial transfer with viruliferous *Aphis craccivora* to healthy plants. Some of these symptomless plants showed positive serological reactions when tested to luteovirus antisera by ELISA.

DETECTION OF PEANUT MOTTLE VIRUS IN PEANUT SEED BY ENZYME-LINKED IMMUNOSORBENT ASSAY. D.V.R. Reddy, N. Bharathan, R. Rajeshwari, and J. W. Demski. ICRISAT, Patancheru 502324, Andhra Pradesh, India; University of Georgia, Experiment, GA 30212, USA.

Extracting seeds in a phosphate-tween-polyvinylpyrrolidone buffer containing 0.2 M mercaptoethanol and 0.3% urea consistently gave virus titres exceeding 1:10,000. Peanut mottle virus (PMV) was detected in the cotyledon, embryo, and seed coat of peanut seed. Virus presence was tested in seed without destroying its ability to germinate by taking a small sample of cotyledon. Perfect correlations resulted between ELISA and growing out tests. Over 12,000 seeds were tested from over 1,000 germplasm lines for seed transmission using a PMV isolate from India. No seed transmission was detected in EC 76446 (292) and NC AC 17133 (RF) genotypes. When these two genotypes were tested for seed transmission against four PMV

isolates occurring in Georgia, PMV-M isolate continued to show no seed transmission. However, the three other isolates were seed transmitted from 1.0 to 3.5%.

PEANUT STRIPE, A NEW VIRUS DISEASE OF PEANUT. J. W. Demski, D.V.R. Reddy, and Grover Sowell, Jr. University of Georgia, Experiment, GA 30212; ICRISAT, India; and USDA Plant Introduction, Experiment, GA.

A virus which produced characteristic striping and mosaic symptoms in peanuts in the U.S. has been found to be associated with germplasm lines imported from Peoples Republic of China. The initial symptom on young expanding peanut leaflets invariably was vein-banding along the lateral veins, thus the virus is named peanut stripe virus (PStV). In greenhouse tests PStV caused 20% yield loss in Florunner and Argentine peanuts. The virus was seed-transmitted to 19.3, 30.1, and 37.6 percent of the plants in three peanut lines. Physical properties were similar to other potyviruses. An antiserum has been produced. PStV is not serologically related to peanut mottle, peanut green mosaic, potato virus Y, bean yellow mosaic, watermelon mosaic-2, and tobacco etch viruses. PStV was serologically related to blackeye cowpea mosaic, clover yellow vein, and soybean mosaic. Twelve commonly grown peanut cultivars and 20 PI's were all susceptible to mechanical inoculation of PStV.

DELAYED MATURITY OF SOYBEANS. K. S. Derrick, L. D. Newsom, R. H. Brlansky, Dept. of Plant Path. & Crop Physiol., La. Agric. Expt. Sta., La. State Univ. Agric. Ctr., Baton Rouge, LA 70803.

Delayed maturity of soybeans (DMS) is characterized by affected plants remaining green at time of harvest. A number of plant viruses have been reported to cause DMS. These viruses usually cause other symptoms in addition to DMS, and they are transmitted by mechanical inoculation. We report observations on two additional agents that cause DMS in Louisiana. A disease that causes excessive bud proliferation and DMS was found to be transmitted by the leafhopper, *Scaphytopius acutus*. Pleomorphic membrane-bound bodies were found in ultra-thin sections of diseased plants, which indicated this disease may be caused by a mycoplasma. A second agent that causes no symptoms other than DMS was shown to be seed transmitted. This agent has not been characterized, but some plants grown from seed of affected plants were found to contain double-strand RNA (ds-RNA) by analysis with serologically specific electron microscopy. The presence of ds-RNA is indicative of a viruslike agent.

COMPETITION AMONG BARK PARASITES ASSOCIATED WITH PEACH TREE SHORT LIFE. Elke Endert-Kirkpatrick and David F. Ritchie, Department of Plant Pathology, North Carolina State University, Raleigh 27650.

Growth of *Cytospora cincta* and *Pseudomonas syringae* pv. *syringae* were monitored in a liquid medium consisting of aq. extracts of peach twigs, yeast extract, and dextrose. Simultaneous incubation of both organisms resulted in a decline in bacterial populations, in some instances to below detection. Mycelial dry weights of *C. cincta* grown with *P. s. pv. syringae* were comparable to controls ($P=0.05$). *C. cincta* reduced pH of the medium to 4.2 and 4.0 when incubated alone and with *P. s. pv. syringae*, respectively. Bacteria alone reduced pH to 4.9. *P. s. pv. syringae* inhibited the growth of *Schizophyllum* sp. and *Calosphaeria pulchella*. Neither *Schizophyllum* sp. nor *C. pulchella* reduced bacterial populations, and both were incapable of reducing pH of the medium below 4.4. No toxins were detected in *C. cincta* in vitro, suggesting that *C. cincta* inhibits *P. s. pv. syringae* by reducing substrate pH.

CONTROL OF SCAB (*Sphaceloma poinsettiae*) WITH FOLIAR FUNGICIDES ON OUTDOOR GROWN POINSETTIA PLANTS IN FLORIDA. Arthur W. Engelhard, AREC-Bradenton, Univ. of Fla., IFAS, 5007-60th St. E., Bradenton, 34203.

Control of scab (*Sphaceloma poinsettiae*) of poinsettia was obtained with tank-mix combinations of Benlate benomyl 50W at 0.25 lb./100 gal plus either Daconil 2787 chlorothalonil 75W, Manzate 200 mancozeb 80W, or Orthocide captan 50W at 0.75 lb/100. Zyan 75W (a mixture of thiophanate methyl and mancozeb), Daconil 2787 75W, Manzate 200 80W and Orthocide 50W at 1.5 lb/100 gal also gave good disease control but these rates usually resulted in a splotchy and unattractive spray residue. The splotchy residue problem was alleviated with the addition of Ortho X-77 Spreader (alkylaryl polyoxyethylene glycols, free fatty acids, isopropanols) at 8 fl. oz/100 gal on the cultivar 'Annette Hegg Dark Red.' Ornalin vinclozolin, Chipco 26019 iprodione, Subdue metalaxyl, and Afugan pyrazophos provided

inadequate disease control. Baycor biteranol and Rubigan fenarimol showed sufficient promise to warrant further study.

BACTERICIDE, APPLICATION TIMING, AND CULTIVAR EFFECT ON BACTERIAL SPECK OF TOMATO. R. D. Gitaitis, W. G. Bonn, and C. A. Jaworski. Dept. of Plant Path., University of Georgia, Tifton, GA 31793, Agric. Canada, Harrow, Ontario NOR 1G0, and USDA, ARS, Tifton, GA 31793.

Streptomycin (100 ug/ml) and cupric hydroxide (2.24 kg/ha) were used for control of bacterial speck on tomato transplants in Georgia. The bactericides were applied alternately until 7 days prior to the first inoculation of field plots with a suspension of *Pseudomonas syringae* pv. *tomato* (PST). Inoculations were made at 6, 4, and 2 days before harvest and shipment of transplants to Canada. A 24 h post inoculation treatment of streptomycin significantly reduced epiphytic populations of PST at harvest and had an inhibitory effect up to 15 days later in Canada. Cupric hydroxide (2.24 kg/ha) and copper ammonium carbonate (17.9 kg/ha) also were evaluated for control of PST on six tomato cultivars. Both chemicals controlled PST ($P=0.05$) except on tomato cv. Campbell 28, which was highly resistant and had low levels of disease in unsprayed plots.

EFFECT OF TEMPERATURE, POST INOCULATION LEAF WETNESS, INOCULUM CONCENTRATION AND LEAF AGE ON INFECTION OF PECAN BY CLADOSPORIUM CARYIGENUM. T. R. Gottwald, USDA, P.O. Box 87, Byron, GA 31008.

The effect of temperature, leaf wetness, inoculum concentration and leaf age on infection of seedling pecan foliage by *Cladosporium caryigenum* in growth chambers was studied under controlled environmental conditions. A minimum of 2 hrs of leaf wetness was required for infection, expressed as lesions/cm² leaf surface area, however, maximum infection was achieved after 36 hrs of continuous wetness. Longer periods of wetness decreased infection. Optimum temperature range was 20 to 30°C, however, considerable infection occurred throughout the 10-35°C range tested. Infection increased as inoculum concentration increased (0 to 2.5 x 10⁶ conidia/ml) demonstrating the absence of inoculum self inhibition. Foliage was most susceptible 7 days after unfolding but decreased in susceptibility to infection as it approached 36 days old. Leaves older than 36 days were impervious to infection.

EFFICACY OF THREE EXPERIMENTAL FUNGICIDES FOR THE CONTROL OF RHIZOCTONIA BROWN PATCH OF ST. AUGUSTINEGRASS. M. P. Grisham Department of Plant Pathology and Microbiology, Texas A&M University, College Station, TX 77843.

The efficacy of three experimental fungicides (pencycuron, furmecycloz, and etaconazole) was tested for the control of *Rhizoctonia* brown patch of *St. Augustinegrass*. The experimental fungicides were also tested for their effect on the vegetative growth of *Rhizoctonia solani* AG2-2, the causal agent of brown patch of *St. Augustinegrass*, in vitro. Seven fungicides registered for brown patch control were included in field tests and five of the seven were included in in vitro studies. Two rates of each experimental formulation and the recommended curative rate of the registered fungicides were applied. PCNB, pencycuron, iprodione, and furmecycloz effectively controlled brown patch; etaconazole was ineffective. Phytotoxic effects were observed among PCNB and furmecycloz treatments. Iprodione, PCNB, and furmecycloz were the most active inhibitors of *R. solani* in vitro.

AN INTERACTION BETWEEN MELOIDOGYNE INCOGNITA AND HOPLOLAIMUS COLUMBUS ON THE SUSCEPTIBLE SOYBEAN 'DAVIS'. Donnell W. Guy, Jr. and S. A. Lewis. Dept. of Plant Pathology and Physiology, Clemson University, Clemson, SC 29631. *

Potential interaction between *M. incognita* (MI) and *H. columbus* (Hc) on soybean was investigated in the greenhouse. One-wk-old Davis seedlings were planted in plastic pots containing 1.5 l steam-sterilized soil. Three levels of Mi and Hc (0, 1500, 6000) were added separately and in all combinations at the time of planting. The soil temperature was kept at 30°C. After 60 days dry shoot weight (DST) declined linearly and dry root weight (DRT) nonlinearly with respect to initial population (Pi) of Mi or Hc, but in combination suppression of DST and DRT by one species was dependent upon the Pi of the concomitant species. The log of the final population of Mi and Hc in the roots declined linearly with increasing Pi of the concomitant species. In soil Hc suppressed Mi nonlinearly but Mi had no effect on Hc.

AN EPIPHYTIC PHYTOPHTHORA ROOT ROT OF PEACH TREES IN MISSISSIPPI. R. A. Haygood, P. O. Box 5426, Mississippi State, MS 39762, C. H. Graves, Drawer PG, Mississippi State, MS 39762 and W. H. Ridings, 118 Long Hall, Clemson, SC 29631

Symptoms of *Phytophthora* root rot of peach trees, which can be caused by several different *Phytophthora* spp., were observed in over 20 orchards in Mississippi in 1982 and 1983. The number of apparently infected trees in orchards varied from one percent to 75 percent. *Phytophthora* spp. isolated from several orchards have been tentatively identified as *P. cinnamomi* and *P. parasitica*. Final identifications are forthcoming. One year old container grown trees were inoculated using a wound-plug technique approximately 8 cm above soil level with two isolates of each species recovered from different orchards. Four months later, average lesion development was 17 cm above and 7 cm below the inoculated wounds and the respective *Phytophthora* spp. were recovered. No *Phytophthora* spp. were isolated from the small necrotic areas around the wounds inoculated with sterile agar.

INFLUENCE OF OVERHEAD IRRIGATION AND ROW WIDTH ON FOLIAR AND STEM DISEASES OF SOYBEAN. M. C. Hirrel, Univ. of Arkansas, Southeast Research and Extension Center, Monticello, AR 71655.

The compatibility of narrow row widths and overhead irrigation was examined in light of potential problems of managing foliar and stem diseases of soybean. Three soybean cultivars, Centennial, Ring Around 604, and Bragg were planted at three row widths, 15 cm, 45 cm, and 90 cm, under a centerpivot irrigation system. Frequent irrigations were applied from a R1-R4 growth stages to evaluate disease development. No differences in brown spot or pod and stem blight severity were detected between row widths, however, anthracnose was more severe under narrow rows while *Cercospora* leaf blight was more severe under wider rows. Anthracnose developed very little in 45 and 90 cm, rows, whereas, *Cercospora* leaf blight reached the same levels of severity under 15 cm, as in the wider rows, but at a slower rate. There appeared to be no interaction between cultivar and row width. Yield was reduced from 15-20% as row widths narrowed for some cultivars. This suggests that anthracnose may be a major factor in limiting soybean yield under these conditions.

PLANT HORMONES AFFECT THE DEVELOPMENT OF PIERCE'S DISEASE SYMPTOMS IN GRAPEVINE. D. L. Hopkins, Agricultural Research Center, University of Florida, Leesburg, FL 32748.

Pierce's disease (PD) bacteria do not multiply in actively growing juvenile grapevine tissue and PD symptoms in many hosts do not develop until either the time of fruit maturation or late fall when plants are senescing; therefore, the effect of plant hormones on the development of PD symptoms was investigated. Foliar application of indoleacetic acid (IAA) at 200 ug/ml concentration prevented PD symptom development in inoculated *Carlos muscadine* grapevines in a 6-month greenhouse test. In two greenhouse tests, kinetin (1000 ug/ml) sprays prevented symptom development in five of six *Carlos* plants. The unsprayed, inoculated *Carlos* plants all developed leaf marginal necrosis symptoms within 2-3 months of inoculation. Symptoms developed more rapidly and were more severe in plants sprayed with ethrel (100 ug/ml) or abscisic acid (100 ug/ml). These studies indicate that hormone balance in the grapevine may play a role in the development of PD.

THE ROLES OF FERTILIZER RATE, LIGHT INTENSITY, AND HUMIDITY AS PRE-INOCULATION FACTORS IN SUSCEPTIBILITY OF CHRYSANTHEMUM MORIFOLIUM TO PSEUDOMONAS CICHORII LEAF SPOT. J. B. Jones, A. R. Chase, B. C. Raju, and B. K. Harbaugh, IFAS, Univ. of Fla., Agri. Res. & Edu. Center, Bradenton, FL 34203

A split plot design experiment was conducted to evaluate the roles of fertilizer rate (0.5, 1, 2, and 4 x recommended rate (10.5 g/6" azalea pot)) and light intensity (2000 and 5000 ft. c.) on susceptibility of 'Iceberg' chrysanthemums to bacterial leaf spot incited by *Pseudomonas cichorii*. There was a significant increase in disease severity, plant height and plant weight as fertilizer rate increased in 2 of 4 tests. In 3 of 4 tests, plants grown at the higher light intensity had significantly more lesions than those grown at the lower light intensity. In a separate study, the effect of pre-inoculation moisture was tested by placing chrysanthemums under continuous mist for 0, 2, 4, 8, 16, or 24 h. There was a linear increase in number of lesions/plant as exposure time increased in 2 tests with chrysanthemum and in one test with *Schefflera arboricola* (a foliage plant).

DETECTION OF PHYTOPATHOGENIC PSEUDOMONADS ON DISEASED TOMATO LEAVES BY DIFFERENTIAL FLUORESCENCE ON A RANGE OF SINGLE CARBON

SOURCES. J. B. Jones, IFAS, Univ. of Fla., Agri. Res. & Edu. Center, Bradenton, FL 34203, R. D. Gitaitis and S. M. McCarter, Univ. of Georgia, Athens, GA 30602.

Pseudomonas viridiflava (PV), *P. syringae* pv. *tomato* (PST), and *P. syringae* pv. *syringae* (PSS) were tested on a minimal medium without iron containing either DL-lactate, D(-)-tartrate, erythritol, or sucrose as the carbon source. All PV strains grew and fluoresced on all media except that containing sucrose, whereas all PSS strains grew and fluoresced on DL-lactate, erythritol and sucrose while growth and fluorescence on D(-)-tartrate was variable. PST grew and fluoresced on sucrose and grew but did not fluoresce on D(-)-tartrate. Greenhouse grown plants were inoculated with an isolate each of PV, PSS and PST. Twenty-five lesions produced by each strain were macerated and streaked on each of the 4 media. Plates were randomly numbered and then rated for fluorescence. Based on the differential fluorescence, all 75 lesions were accurately identified as to causal agent.

EVALUATION OF TOMATO GERMLASM FOR TOLERANCE TO BACTERIAL SPOT. J. W. Scott and J. B. Jones. IFAS, Univ. of Fla., Agri. Res. & Edu. Center, 5007-60th Street East, Bradenton, FL 34203.

In the summer of 1982, over 250 *Lycopersicon* sp. genotypes with reported tolerance or resistance to tomato (*Lycopersicon esculentum* Mill.) bacterial pathogens were field-screened for bacterial spot (*Xanthomonas campestris* pv. *vesicatoria*) tolerance. A randomized design with 2 blocks of 5 plants per plot was used. The best 25 lines were re-screened in the summer of 1983 in a randomized block design with 4 blocks of 5 plants each. Also in 1983, 60 genotypes not previously tested were field-screened in a completely randomized design with 2 blocks of 5 plants per plot. Disease incidence on leaves was rated on the Horsfall-Barrett scale. Most of the lines tested had little or no useful field tolerance. Promising genotypes with the lowest disease ratings were: Hawaii 7998, Ohio 4014-4, Ohio 4013-3, Heinz 1568, Heinz 2990, Heinz 603, C-28, L 556, [(SAD + MH-1) x H 603], PI 379032, PI 433071, PI 127813, and PI 117899. Pedigree relationships and breeding aspects will be discussed.

EFFECTS OF ALUMINUM, LIME, AND PHOSPHATE COMBINATIONS ON FUSARIUM WILT (RACE 3) OF TOMATO. S. S. Woltz and J. P. Jones, IFAS, Univ. of Fla., Agric. Res. & Edu. Center, 5007 - 60th St. East, Bradenton, FL 34203.

Walter tomato was grown in the greenhouse in 5" pots containing virgin Myakka fine sand mixed with standard nutrients, lime, and aluminum. Plants were inoculated by pouring a suspension of *Fusarium oxysporum* f. sp. *lycopersici* race 3 into two trenches in the pot which provided root wounding and contact of propagules with the wounded roots. Two rates each of lime, phosphate, and aluminum were employed. High lime reduced disease, high phosphate increased disease, and aluminum did not affect disease development on an overall basis. Low phosphorus and high aluminum together reduced disease, as did high lime and low phosphate together. High aluminum accentuated the disease-reducing tendency of the high lime treatment.

EPIDEMIOLOGICAL AND MYCOFLORAL RELATIONSHIPS IN SOYBEAN SEEDLING DISEASE. J. F. Killebrew and K. W. Roy, Dept. of Plant Path. and Weed Sci., Miss. State Univ., Miss. State, MS 39762. Soybean seedlings from 18 locations in Mississippi were assayed for incidence of fungi and symptoms on various tissues. Thirty-four fungal taxa were isolated from seedlings. Some of the more frequently isolated fungi, in order of prevalence were: *Alternaria alternata*, *Fusarium oxysporum*, *Diaporthe* spp., *Rhizoctonia solani*, *Macrophomina phaseolina*, *Fusarium solani*, and *Phoma* spp. Some fungi were more frequently associated with certain seedling tissues than others. Incidence of fungi on root and hypocotyl tissues were positively correlated with root disease index and negatively correlated with seedling population. Incidence of *F. solani* on roots and root disease index were positively correlated, and both parameters were negatively correlated with seedling population. Incidence of *R. solani* on hypocotyls was positively correlated with hypocotyl disease index. Incidence of *Diaporthe* spp. on seedlings, in general, was positively correlated with soil pH.

ULTRASTRUCTURAL RESPONSES OF SOYBEAN LEAF CELLS TO INFECTION WITH AN ISOLATE OF SOYBEAN MOSAIC VIRUS FROM THE PEOPLE'S REPUBLIC OF CHINA. Xue Zhan Li, E. M. Martin and K. S. Kim, Institute of Atomic Energy Utilization in Agriculture, Heilongjiang Academy of Agriculture Science, Harbin, China and Dept. of Plant Pathology, University of Arkansas, Fayetteville, AR 72701.

Lee soybean was inoculated with an isolate of soybean mosaic virus (SMV) from Heilong 16 soybean from China. Thin section electron microscopy of leaf tissue revealed the consistent presence of potyvirus-characteristic cylindrical inclusions and flexuous rod-shaped particles. However, some cytopathic effects uncommon to potyviruses, including SMV, were also observed. These were 1) before virus particles appeared, pinwheels and tubes of cylindrical inclusions were in cytoplasmic invaginations into the central vacuole; 2) when virus particles were present they were appressed to the tonoplast or invaginated into the vacuole in long cytoplasmic strands, and inclusions were in the cytoplasm, not in invaginations; 3) membrane aggregates similar to annulate lamellae occurred near the nucleus.

EPIDEMIOLOGY OF POWDERY MILDEW OF WHEAT, CAUSED BY *ERYSPHIE GRAMINIS* F. SP. *TRITICI*, IN SOUTH CAROLINA IN 1983. Graydon C. Kingsland, Dept. of Plant Pathology and Physiology, Clemson University, Clemson, SC 29631

An epidemic of powdery mildew (PM) developed on wheat (*Triticum aestivum*) throughout SC between January and harvest (June). Disease intensity was related to leaf position in the canopy, never exceeding 15% on leaves 5 through 9 as long as these leaves were topmost on the culm but increasing rapidly as new leaves developed acropetally. Intensity increased most during late March on leaves within the canopy and coincided with maximum vegetative growth. Field temperatures of ca. -3 C on 18, 19, 20 April did not decrease numbers of conidia, viability of conidia, or progress of the epidemic. Numbers of air-borne conidia were increased by physical disturbance of leaves with sporulating lesions. Percent germination of conidia from sporulating lesions was significantly higher than conidia from the air taken in an Anderson particle sampler.

GROWTH INHIBITION OF *CLADOSPORIUM CARYIGENUM* BY CONDENSED TANNIN FROM PECAN. D. W. Laird, A. Borazjani, C. H. Graves, and P. Hedin, Dept. of Plant Pathology and Weed Science, Mississippi State University, Miss. State, MS 39762, and Boll Weevil Research Lab., ARS USDA, Mississippi State, MS 39762.*

Growth of *Cladosporium caryigenum*, the pecan scab incitant, was significantly inhibited in aqueous potato dextrose broth by condensed tannin extracted from fresh pecan leaves (*Carya illinoensis* variety Van Deman). Seven fungal isolates were grown on potato dextrose broth (PDB) containing 4000 ppm (0.4%) condensed tannin (approximately that contained in fresh pecan leaves). The isolate that produced the greatest mycelial mass after 14 days incubation was assayed for growth inhibition in media containing 2000, 4000, 6000, 8000, and 12000 ppm condensed tannin. Growth of *C. caryigenum* was significantly inhibited at 4000 and 6000 ppm condensed tannin; however, no increased inhibition occurred at higher tannin concentrations.

CHLOROTHALONIL FOR DISEASE CONTROL IN PECAN ORCHARDS INTERPLANTED WITH PEACH TREES. A. J. Latham, Ala. Agric. Exp. Stn., Auburn University, AL 36849.

Some growers have requested an effective, safe fungicide for control of peach diseases in trees interplanted in young and maturing pecan orchards. Fungicide evaluations conducted in a mono-culture peach orchard showed that chlorothalonil (Bravo 500) at 1.87 g/L was equal to captan for control of scab and brown rot, caused by *Cladosporium carpophilum* and *Monilinia fructicola*, respectively. Also, in a mono-culture pecan orchard, control of pecan scab, caused by *C. caryigenum* with chlorothalonil at 1.87 g/L was equivalent to triphenyltin hydroxide. No phytotoxicity from chlorothalonil has been observed in foliage or fruit of peaches or pecans. Full-season registration of chlorothalonil for use on both peaches and pecans should facilitate grower management of land resources.

CONTROL OF PECAN SCAB AFTER A LEAF-WETNESS INFECTION PERIOD. A. J. Latham, and H. E. Burgess, Ala. Agric. Exp. Stn., Auburn University, AL 36849.

Fungicidal control of pecan scab, caused by *Cladosporium caryigenum*, in relation to duration of leaf-wetness was tested at the Piedmont Substation. Propiconazole at 180 mg a.i./L was applied on 7 April, and subsequently at 21-day intervals plus 48 hr or 96 hr after the start of a 6-hr period of leaf-wetness. Scab severity was rated from 100 green nuts collected from each of 5 randomly selected trees per treatment. The mean number of clean nut-shucks from propiconazole applied 48 or 96 hr after the leaf-wetness infection period was 96.2 and 60.4, respectively, and from unsprayed trees 0. The eradicated activity of propiconazole facilitates disease management and permits a reduction in number of applications during seasons of low rainfall.

ULTRASTRUCTURE OF CONIDIA OF COLLETOTRICHUM GLOEOSPORIODES DURING GERMINATION. A.R. Lax, K.C. Vaughn, and G.E. Templeton USDA Southern Weed Science Lab, Stoneville, MS 38776 and Dept. Plant Pathology, University of Arkansas, Fayetteville, AR 72701.

An ultrastructural study of conidia was undertaken to identify potential sites of action for the germination self-inhibitor, gloeosporone. Quiescent conidia have two electron lucent wall layers separated by an electron dense fibrillar layer. External to the wall is a granular layer which may be mucilage. Cell walls of germinating conidia appear to be mechanically ruptured at the site of germ tube emergence. Cytoplasm of conidia contains large vacuoles with granules, ribosomes, endoplasmic reticulum, mitochondria, and a single nucleus. Lipid bodies are prominent in quiescent conidia, but reduced or absent in germinating ones. Microbodies are found in both spore states; however, their arrangement at the tip of emerging germ tubes suggests a functional glyoxylate cycle during germination. Glyoxylate metabolism may be a site of action of the germination self-inhibitor, gloeosporone.

DEVELOPMENT OF GALLS IN PEARL MILLET KERNEL SMUT. E. S. Luttrell, Department of Plant Pathology, University of Georgia, Athens 30602

Tolyposporium penicillariae causes a local lesion disease of Pennisetum glaucum in which individual ovaries develop into ovoid galls larger than normal grains and bright green rather than white. Galls are recognizable at 5 days after inoculation at style exertion and are mature at 18 days. Mycelium is visible in the ovary wall near the base of the style in 2 days and spreads throughout the ovary wall and ovule. Hyphae are intracellular. They pass from cell to cell without constriction. At 5 days, hyphae gather in the space between ovary wall and ovary and develop into a white cerebriform stroma in which the dark spore balls progressively appear. The aborted ovary usually is reduced to a sliver of tissue embedded in the smut stroma. At gall maturity the ovary wall is a brown sack filled with spore balls which are released through apical fissures. In unpollinated male-sterile millets infected ovaries develop into typical galls, whereas uninfected ovaries abort.

N-ASSIMILATION AND N-METABOLISM IN ENDOPHYTE-INFECTED TALL FESCUE. P. C. Lyons and C. W. Bacon, Department of Plant Pathology, University of Georgia, Athens, GA 30602 and USDA, ARS, Richard B. Russell Agric. Res. Ctr., Athens, GA 30613.

Activities of key enzymes of N-assimilation were determined in KY-31 tall fescue infected with Sphacelia typhina (= Acremonium coenophialum) and in endophyte free plants grown under high and low NO₃ and NH₃ fertilization conditions. NO₃ reductase and glutamine synthetase activities in leaf sheaths and blades were higher in infected plants than in uninfected plants under all N conditions, while glutamate dehydrogenase activities (NADH and NADPH) were low or not detectable in any case. Although total NO₃ did not differ, NH₄⁺ levels were elevated in infected plants and NH₃ evolution in detached infected and uninfected leaves was dependent on exogenous amino acids. Quantitative and qualitative changes in amino acid composition were also observed in infected plants. Increased enzyme activity in leaf blades of infected plants into which fungal hyphae do not penetrate indicated infection increased N-assimilation while changes in NH₄⁺, NH₃ evolution and amino acids indicated altered N-metabolism.

SOURCES OF RESISTANCE TO PEANUT MOTTLE VIRUS IN THE PEANUT GERM-PLASM. H. A. Melouk, M. R. Sanborn, and D. J. Banks. USDA-ARS, Dept. of Plant Pathology, Dept. of Botany and Microbiology, and Dept. of Agronomy, Oklahoma State University, Stillwater, OK 74078.

Five wild rhizomatous peanut entries (PIs 468363, 468366, 468371, 468171, and 468174) and three wild introductions from the Arachis section PIs 468141, and 468142 (both Arachis diogeni Hoehne), and PI 468169 (A. sp.) that had consistently been found free of peanut mottle virus (PMV) when indexed on Phaseolus vulgaris L. 'Topcrop' beans were examined for resistance to PMV. Leaves on plants of these peanut entries and cv. Tamnut 74 were mechanically inoculated with a severe strain of PMV maintained in peanut cv. Tamnut 74 (Plant Disease 67:819-821). Three to four weeks post inoculation leaves from each plant were tested for virus infection. All entries were found to be negative for the virus by symptomology, local-lesion assays on 'Topcrop' beans, serology and electron microscopy. The control Tamnut 74 plants were positive in each case. This is the first report of resistance to PMV in the Arachis section.

EFFECTS OF CHLOROTHALONIL TREATMENTS ON ONION BULB WEIGHTS. M. E. Miller, B. D. Bruton and J. M. Amador, Texas Agricultural

Experiment Station, USDA-ARS and Texas Agricultural Extension Service, Weslaco, Texas 78596.

Chlorothalonil (Bravo 500, 3.51 L/ha) and mancozeb (Manzate 200, 3.36 kg/ha) were applied to New Mexico Yellow Grano onions to determine the effects of chlorothalonil treatments on bulb weights. Treatments, with 10 applications each, consisted of combinations of 0, 2, 4, 6, 8, or 10 consecutive chlorothalonil applications either preceding or following 0, 2, 4, 6, 8, or 10 consecutive mancozeb applications. Bulb weights decreased significantly with increasing numbers of chlorothalonil applications regardless of which material was applied initially. Bulb weights of onions treated with 10 mancozeb applications and untreated controls were not significantly different. No significant differences in bulb weights were observed between treatments with equivalent number of chlorothalonil applications, indicating that the total number of applications and not the timing of applications affects bulb weight.

COMPARISON OF MUTANT AND WILD TYPE ISOLATES OF HANSFORDIA PULVINATA FOR THE BIOCONTROL OF CERCOSPORIDIUM PERSONATUM. James K. Mitchell and Ruth A. Taber, Department of Plant Pathology and Microbiology, Texas A&M University, College Station, TX 77843.*

The mycoparasite Hansfordia pulvinata (Hp) was shown in microplots to be effective in controlling late leafspot in peanuts incited by Cercosporidium personatum (Cp). Lesions caused by Cp were colonized by 2 of 3 Hp isolates tested (wild type and low-relative-humidity mutant) within 4 days of spraying conidial suspensions of the mycoparasite. Environmental parameters during this 4-day period were: 40 hrs of leaf wetness, 60 hrs of 23-28 C (optimal temperatures for growth of the wild-type isolate), and 16.31 cm rainfall. Twelve days after inoculation with Hp, the percent of total Cp lesions colonized by Hp isolates were: wild type =54.5±9.8, low-relative-humidity mutant =86.4±7.08, high-temperature-tolerant mutant =11.0±4.9, and a mixture of all three isolates =87.7±7.6.

COMPARTMENTALIZATION OF BOTRYOSPHERA DOTHIDEA IN INOCULATED YOSHINO CHERRY TREES. Mary E. Montgomery and Larry D. Smith, Graduate Student, Dept. of Biology, and Associate Professor, PSS Dept., Tennessee Tech. University, Cookeville, TN 38505.

Three-year old Yoshino cherry trees were inoculated with B. dothidea by drilling holes through the stems with a 4 mm bit and injecting a mycelial suspension into the holes. Isolations were taken 10 months after inoculation. The wounds had callused over. B. dothidea had colonized xylem tissues present at the time of inoculation, but not subsequently produced tissues. No cankers formed on the trees as a result of inoculation. B. dothidea was isolated in the old wood as far as 16 cm from the inoculation point. Xylem tissues were discolored 2-6 cm from the inoculation point. B. dothidea was consistently isolated beyond the extent of the discolored xylem tissues.

APPLICATION OF COMPUTER CARTOGRAPHY TO ESTIMATE THE IMPACT OF TEMPERATURE TOLERANCE IN PERONOSPORA TABACINA ON TOBACCO PRODUCTION IN THE SOUTHEAST. M.A. Moss and C.E. Main, Dept. of Plant Pathology, North Carolina State University, Raleigh 27650*

Macroscale epidemics of blue mold in 1979-1980 caused major crop losses in the U.S. The disease has occurred each year since 1979, but effective disease management has reduced crop losses. Prior to 1979, maximum daily temperatures (T) were believed to be too high for disease development in the field, yet in 1979 and 1980 active blue mold occurred throughout the growing season. A possible shift in the pathogen population to temperature tolerant biotypes is being investigated. Temperature data from NOAA first order reporting stations throughout the Southeast and 1980 ASCS tobacco production data were used to estimate the geographic boundaries and potential impact of a P. tabacina biotype tolerant to T >30C as compared to the reported common wild type (15-30C). Estimates of crop losses indicate that a temperature tolerant biotype of P. tabacina could have very serious effects on tobacco production and farm income should current management practices prove to be inadequate.

SERODIAGNOSIS OF STREPTOMYCES IPOMOEA - INFECTED SWEET POTATO ROOTS. J. W. Moyer and E. Echandi, Department of Plant Path., North Carolina State University, Raleigh, NC 27650.

A serological assay for diagnosis of Streptomyces ipomoea infected sweet potato roots was developed. Antiserum was produced by weekly intramuscular injections into rabbits using a homogenate of 7 d old cultures of S. ipomoea as the immunogen. The double diffusion test was able to distinguish pure cultures

of pathogenic strains from nonpathogenic *Streptomyces*-like organisms isolated from diseased sweet potato roots. The double-antibody sandwich ELISA protocol was used to detect *S. ipomoea* in lesions on fibrous and fleshy roots because of nonspecific reactions in microprecipitin tests and lack of sensitivity of double diffusion tests. Samples were prepared by grinding 1-4 lesions in 1 ml of conjugate buffer with a tissue grinder, centrifuging 5 min at 1000 g and then assaying 0.2 ml of supernatant. *S. ipomoea* was detected in 107 samples by ELISA and in 109 samples by isolation from 114 samples collected from 10 fields.

THE MEASUREMENT OF SUPPRESSIVE VIRUS RESISTANCE AND ITS INFLUENCE ON NONPERSISTENT VIRUS TRANSMISSION. J. W. Moyer¹, G. G. Kennedy² and L. R. Romanow², Depts. of Plant Path.¹ and Entomology², North Carolina State Univ., Raleigh, NC 27650.

The objective of this study was to measure the temporal patterns of watermelon mosaic virus II multiplication in various *Cucumis melo* genotypes and the effect on transmission and spread by the vector. WMV II multiplication was measured weekly at three leaf positions for eight weeks using ELISA and local lesion assay. Significantly lower levels of WMV II multiplication were detected by both assays in the aphid resistant line 91213 than in other lines; however, the local lesion assay indicated a greater suppression of virus in 91213 than did ELISA. Acquisition by *Aphis gossypii* was significantly lower from 91213 than from aphid or virus susceptible lines. Inoculation by aphid in laboratory tests was not affected by this form of virus resistance but rather by aphid resistance. Virus incidence in the field was lowest in the aphid/virus resistant 91213.

A BLACKKEYE COWPEA MOSAIC VIRUS STRAIN FROM SOUTH CAROLINA. John F. Murphy, O. W. Barnett, Jr. and W. Witcher. Dept. of Plant Pathology & Physiology, Clemson Univ., Clemson, SC 29631.*

A blackeye cowpea mosaic virus-necrotic ringspotting (BICMV-NR) isolate found in cowpea caused symptoms different from other BICMV isolates in South Carolina and BICMV isolates reported from Florida, Georgia, and New York. BICMV-NR caused reddish necrotic ringspots followed by a reddish network of veinal necrosis on inoculated leaves of Knuckle Purple Hull. Systemically infected leaves initially developed vein clearing or a faint mosaic followed by a more severe mosaic becoming completely chlorotic with reddish veinal necrosis. Other reported isolates of BICMV cause chlorotic local lesions followed by vein clearing and mosaic on systemically infected leaves. BICMV-NR had properties similar to those of potyviruses: flexuous rod-shaped particles, 34000d coat protein, and 2.9×10^6 RNA. The symptoms of BICMV-NR closely resemble those given by Anderson in his original description of BICMV.

THE DOWNY MILDEW OF *NICOTIANA REPANDA*, A PATHOGEN OF BURLEY TOBACCO. W. C. Nesmith, Univ. of Kentucky, Lexington, KY 40546 and Roger Jones, Texas A & M Univ., Uvalde, TX 78801

In May 1983 the pathogen causing downy mildew of *Nicotiana repanda*, Willd. was successfully transmitted to cultivated tobacco, *N. tabacum* L. Resulting lesions and asexual fructifications on inoculated plants were indistinguishable from *Peronospora tabacina* Adam, downy mildew common to burley tobacco. 'Kentucky 14' burley tobacco seedlings were inoculated by misting them with a sporangial suspension collected from sporulating lesions of the downy mildew active on *N. repanda* near Uvalde, TX. Following inoculation, the plants were covered with a plastic bag and placed in a 21°C incubator on a 12 hr day-night cycle. After 24 hrs the plastic was removed and the plants watered as needed until lesions developed, about 7 days later. Plants were then misted with distilled water and re-covered to induce sporulation. Sporulating lesions were examined microscopically. Plants misted with distilled water and exposed to the same regime served as the control.

RE-EXAMINATION OF THE DOWNY MILDEW OF *NICOTIANA REPANDA*. W. C. Nesmith, Univ. of Kentucky, Lexington, KY 40546 and T. M. Keeney, Southwest Texas Junior College, Uvalde, TX 78801

Studies were initiated in March 1982 to determine if the downy mildew of *Nicotiana repanda* Willd., endemic to South Texas has remained active since the report by Wolfe (Phytopathology 37: 721) in 1947. Specimens of *N. repanda* collected since 1947, on file at several college herbaria in TX, were examined microscopically. Sporulating lesions were found only on specimens

collected in 8 of the 23 years examined. Lesions resembling those of downy mildew were found on some collections made in other years but no fructifications were found. A field survey conducted in March-May 1982 and 1983 confirmed downy mildew was common on *N. repanda* populations in Uvalde Co., TX, especially along the Frio River. The sporangial stage was indistinguishable from that observed with the downy mildew on cultivated tobacco, *N. tabacum* L. Oospore characteristics were highly variable among lesions that produced oospores but were similar to those of *Peronospora tabacina* Adam (*P. hyoscyami*), the cause of downy mildew in cultivated tobacco.

FUSARIUM MONILIFORME INFECTION OF MAIZE HYBRIDS IN RESPONSE TO NATURAL AND ARTIFICIAL INOCULATION. T. E. Ochor, S. B. King and L. E. Trevathan. Dept. of Plant Pathology and Weed Science and USDA, ARS, Mississippi State, MS 39762.

To more accurately assess the reaction of maize to kernel infection by *Fusarium moniliforme*, nine hybrids were assayed to determine the effect of harvest date on recovery of the organism from naturally infected material. Infection frequency was determined 8, 11, and 14 weeks after mid-silk stage. In a separate treatment, ears were inoculated at 20 days after mid-silk stage using an *F. moniliforme* contaminated pinbar. Inoculated ears were harvested 36 days later, and kernels adjacent to those wound-inoculated were removed and assayed for *F. moniliforme* according to kernel row position. Infection frequencies among the hybrids differed significantly at harvest regardless of whether naturally infected or inoculated artificially. Mean infection levels ranged from 21 to 43% and 24 to 71% for naturally infected and artificially inoculated hybrids, respectively.

EFFICACY OF SELECTED FUNGICIDES, CALCIUM AND NITROGENOUS FERTILIZERS, AND DEEP PLOWING FOR CONTROL OF *SCLEROTIUM ROLF-SII* ON PROCESSING CARROTS. Z. K. Punja and S. F. Jenkins, Dept. of Plant Path., N. C. State Univ., Raleigh, NC 27650. Three fungicides (chlorothalonil, PCNB, TPTH) and eight calcium- or nitrogen-containing compounds (applied at a rate of 115 kg/ha Ca or N) were tested singly or in combination with deep plowing for control of *S. rolfssii* at locations in NC and Georgia. Three applications of each material were made at 3-wk intervals starting on 7 June 1983. Percent of disease (number of plants dead) on 9 August on the control disked plots (DSK) was 27-34; on plots that were deep plowed (DPL), disease was reduced to 16-20%. All treatments applied to DPS plots reduced disease, which was 1-2% for PCNB and NH_4HCO_3 ; 4-5% for chlorothalonil, $\text{Ca}(\text{NO}_3)_2$ and urea; and 10-12% for CaCO_3 , $\text{Ca}(\text{OH})_2$, CaSO_4 , NH_4NH_3 , $(\text{NH}_4)_2\text{SO}_4$, and TPTH. On DSK plots, only chlorothalonil, PCNB, NH_4HCO_3 , $\text{Ca}(\text{NO}_3)_2$ and urea significantly reduced disease. Deep plowing in the fall followed by applications of NH_4HCO_3 and $\text{Ca}(\text{NO}_3)_2$ in the spring may provide economical control of *S. rolfssii* on carrots.

A BIOASSAY FOR THE SENSITIVITY OF *PERONOSPORA TABACINA* TO SYSTEMIC FUNGICIDES. M. Reuveni and M. R. Siegel, Plant Pathology Dept., University of Kentucky, Lexington, KY. 40546.

Tobacco (Ky 14) leaves (13-14 cm²) from plants (3 weeks old) grown in growth chambers for 4-6 days (23C, 12 hr/day, 150-160 $\mu\text{E s}^{-1} \text{m}^{-2}$) were detached and their petioles placed in 10 ml beakers containing 1 $\mu\text{g/ml}$ kinetin and test fungicides. The beakers were placed in clear plastic boxes and after 3 hr in light (100 $\mu\text{E s}^{-1} \text{m}^{-2}$) at 21C each leaf was inoculated with 6 drops (3 μl) of a sporangial suspension (50,000 sporangia/ml). The leaves were incubated for an additional 20 hr in the dark and then placed in petri plates containing filter paper moistened with 1 $\mu\text{g/ml}$ kinetin. Disease incidence was rated 4-7 days after inoculation. Metalaxyl was the most effective fungicide tested. Blue mold was controlled at 66 ng/ml. Leaves took up about 10% ¹⁴C metalaxyl indicating an effective control concentration of 6.6 ng/leaf. This bioassay was also used to test for strains of the pathogen resistant to metalaxyl. Twelve isolates collected in 1982 from metalaxyl treated fields were as sensitive to metalaxyl as was the wild type isolate.

MYCOFLORA OF COTTON LEAVES IN MISSISSIPPI. K. W. Roy, Dept. of Plant Pathology and Weed Science, P. O. Drawer PG, Miss. State Univ., Mississippi State, MS 39762.

Thirty-seven fungal taxa were isolated from surface-sterilized cotton leaves periodically sampled during two growing seasons. Incidence of fungi varied annually, but was not correlated with temperature or rainfall. Some of the more frequently isolated fungi, in order of prevalence, were *Alternaria*

alternata, Diaporthe spp., Verticillium nigrescens, Phoma spp., Cercospora gossypina, and Cladosporium herbarum. Frequency of occurrence of fungi usually increased with leaf age. Curvularia inaequalis, C. lunata var. aeria, Drechslera halodes, Fusicoccum sp., Geniculosporium sp., Leptosphaerulina sp., Nectria ellisii, Nodulisporium spp., Periconia circinata, Pithomyces chartarum, Sordaria fimicola and Sporormiella sp. were previously unrecorded from cotton.

RESISTANCE OF A HARDSEEDED SOYBEAN LINE TO SEED INFECTION BY DIAPORTHE PHASEOLORUM VAR. SOJAE. K. W. Roy and H. Andrews. Dept. of Plant Path. and Weed Sci., and Dept. of Agronomy, Miss. State Univ., Mississippi State, MS 39762.

Incidence of seed infection by Diaporthe phaseolorum var. sojae (DPS) in the cultivars Hill and Forrest and the hard-seeded line D-671-5677-1 (D1) was determined at field maturity and 2 and 4 wk later. D1 had significantly less infection than Hill at each harvest date, and less infection than both cultivars 4 wk after field maturity. Percentage infection at field maturity and 2 and 4 wk later was, respectively as follows: Hill - 30, Forrest - 11, D1 - 0; Hill - 34, Forrest - 12, D1 - 0; and Hill - 40, Forrest - 18, and D1 - 1. At each harvest date, seed viability was significantly higher in D1 than in Hill and Forrest. Percentage DPS infection of permeable and impermeable D1 seeds did not differ, suggesting that seed coat hardness does not confer resistance to DPS.

EPIDEMIOLOGY OF SOYBEAN STEM CANKER IN MISSISSIPPI. K. W. Roy and Kathy McLean, Dept. of Plant Pathology and Weed Science, P. O. Drawer PG, Miss. State Univ., Miss. State, MS 39762.

Disease incidence was determined from a survey of 25 locations. Infected plants occurred in 84% of the fields surveyed. Incidence of symptomatic plants ranged from 0-50% (average 10%). Plants grown under five different tillage systems were evaluated for stem canker severity. Disease severity was significantly greater for no-till soybeans than for the treatments no-till + cultivation, conventional tillage, conventional + fall chisel-plowing, and wheat/soybean double-crop. Stem canker was least severe for the double-crop treatment, in which crop debris was burned prior to the planting of soybeans. Results suggest that the carry-over of soybean debris increased inoculum potential. Diaporthe phaseolorum var. caulivora was isolated from less than 1% of the more than 9,000 seeds of 12 soybean entries evaluated. Data suggest that seeds are a minor source of primary inoculum in the stem canker disease cycle.

EFFECT OF MELOIDOGYNE JAVANICA AND PSEUDOMONAS SOLANACEARUM ALONE AND IN COMBINATION ON BACTERIAL WILT AND YIELD OF TWO POTATO CULTIVARS. E. Ruchijat, R. S. Hussey, and S. M. McCarter. Dept. of Plant Pathology, Univ. of Georgia, Athens, GA 30602.

Pungo and Ontario potato plants were grown in buried 19-L bottomless pots in the field and were either not inoculated or inoculated with M. javanica or P. solanacearum alone at different levels (62, 250, and 1000 eggs/100 cm³ and 10³ and 2.5 X 10⁶ cells/g of soil) and with all possible combinations. With nematodes alone, mortality rates of Pungo plants were 30-90%, and yields were reduced 62-90%. Nematodes caused 20-30% mortality and 67-80% yield reduction on Ontario. Bacteria alone at the low level caused <10% wilt and little yield reduction on the two cultivars whereas at the high level wilt incidence was 20 and 30% and yield reduction was 25 and 17% for Pungo and Ontario, respectively. Synergistic action was most pronounced at low nematode levels as high mortality at the highest levels masked evidence of an interaction. A combination of the lowest level of nematodes and the high level of bacteria increased bacterial wilt to 80%.

THE EFFECT OF MOISTURE ON INFECTION OF SOYBEAN SEEDS BY PHOMOPSIS SP. John C. Rupe and Richard S. Ferriss, Dept. of Plant Pathology, University of Kentucky, Lexington, KY 40546.*

Seed infection by Phomopsis sp., cause of pod and stem blight, increases if wet weather occurs between physiological maturity and harvest. To determine the effect of pod and seed moisture on seed infection, naturally infected pods from three plantings of Williams soybeans were picked at 4 moistures: approximately 55, 45, 30 and 12% moisture. At the time of picking, Phomopsis sp. infection of pods and seeds averaged 94% and 2%, respectively. Pods in each moisture group were divided into replications of 25 pods each, placed in plastic bags, and incubated at 25C. To determine rates of growth from pods into seeds, samples from

each moisture group were removed at various times and the seeds plated on PDA amended with antibiotics and tergitol. Seed infection occurred fastest at 55 and 45%, was significantly slower at 30%, and did not occur at 12%. Growth of Phomopsis sp. on osmotically adjusted media was optimal between -10 and -20 bars and occurred as low as -120 bars.

VIRUSES INFECTING YELLOW SUMMER SQUASH (CUCURBITA PEPO) IN SOUTH CAROLINA. Bernard Sammons and O. W. Barnett. Dept. of Plant Pathology and Physiology, Clemson University, Clemson, SC 29631.

Fields of commercial yellow summer squash (Cucurbita pepo 'Dixie Hybrid') were surveyed over a 2-year period for watermelon mosaic virus-1 (WMV-1), watermelon mosaic virus-2 (WMV-2), cucumber mosaic virus (CMV), squash mosaic virus (SqMV), and tobacco ringspot virus (TRSV). Young leaves from 12 random plants per ha and 5 virus-infected (diseased) plants per field were assayed by enzyme-linked immunosorbent assay (ELISA) and Ouchterlony double gel diffusion. WMV-1, WMV-2, and CMV were commonly detected in both random and diseased samples. TRSV was detected in only one county. SqMV was not detected in this survey even though it was very common in coastal South Carolina in the 1960s. WMV-2 was the most common virus found. CMV was widespread in the coastal region, while WMV-1 was of scattered occurrence.

SOME PROPERTIES OF AN ISOLATE OF SOYBEAN MOSAIC VIRUS FROM CHINA. Ming-hou Zhang and H. A. Scott, Dept. of Agronomy, North-east Agricultural College, Harbin, China and Dept. of Plant Pathology, University of Arkansas, Fayetteville, AR 72701

An isolate of soybean mosaic virus (SMV-H16) obtained from mottled seed of Heilong 16 soybean cultivar from China was characterized and compared with two SMV isolates from Arkansas. All isolates had similar host ranges and there was little difference between isolates in severity of symptoms on soybean and some garden bean cultivars. SMV-H16 was identified as strain G5, whereas the Arkansas isolates were strain G1 using the differential hosts of Cho and Goodman (Phytopathology 69:467-470, 1979). Ultrastructural studies revealed flexuous rods and pinwheel inclusions in host leaf parenchyma cells. In SDS-immunodiffusion tests, H16 reacted with SMV antiserum and the antisera of watermelon mosaic viruses 2 and E, but not with watermelon mosaic virus 1. No spur formation was observed between H16 and Arkansas SMV isolates. H16 was purified by following the procedures of Hunst and Tolin (Phytopathology 72:710-713, 1982).

TESTING RELIABILITY OF A DISEASE ASSESSMENT SYSTEM. F. M. Shokes, D. A. Zahn, and J. M. Rasp, Univ. of Florida, AREC, Rt. 3, Box 638, Quincy, FL 32351, and Dept. of Statistics, Florida State Univ., Tallahassee, FL 32304.

Reliability of a system for assessing leafspot was tested on five peanut genotypes. Disease was assessed by percent necrotic area estimates at three canopy levels and percent defoliation estimates. Total disease severity was computed by $Td\ sev = ((1-d)*na) + d$. Inter-rater reliability was tested by $\rho = \text{true variance/total variance}$ for the plots as rated by three assessors. Development of this equation is discussed. Consistency of individual raters was tested by a test-retest of 30 randomly chosen plots on consecutive days and correlation coefficients were computer for measured parameters. Greater repeatability occurred with necrotic area measurements than with defoliation or Td sev. Assessors improved in reliability with practice.

INOCULUM PRODUCTION AND PATHOGENICITY OF SEPTORIA POLYGONORUM. Larry D. Smith and L. H. Self, Associate Professor and student, respectively, PSS Dept., Tennessee Tech. Univ. Cookeville, TN 38505.

S. polygonorum which causes a leafspot of Pennsylvania smartweed was studied as a possible mycoherbicide. Suitable inoculum was produced in shake cultures of modified V-8 media within 5 days. Pycnidia were produced within 3 days at 21-24 C. Maximum conidia production occurred in 5 days. Conidia were separated from the culture by passage through a 150 mesh standard testing sieve. Conidia germination, 98% occurred on water agar in 24 hrs at 18-30 C. Conidia and mycelial fragments caused leafspots on older, but not younger, leaves. No

stem lesions developed. Wetting periods exceeding 36 hrs were necessary for infection to occur. Field infections and greenhouse infections were established, but local epidemics did not ensue.

A HISTOPATHOLOGICAL AND SEM STUDY OF INFECTION OF HOST TISSUE BY *SCLEROTIUM ROLFSSII*. V. L. Smith, Z. K. Punja, and S. F. Jenkins, Dept. of Plant Pathology, North Carolina State Univ., Raleigh 27650. *

Sugarbeet and bean leaf discs and bean hypocotyls infected by *S. rolfssii* were prepared for light and scanning electron microscopy using standard procedures. Hyphae were observed ramifying over the host surface prior to penetration and frequently coalesced to form aggregates that resembled infection cushions (IC). Crystals of calcium oxalate (CO) were associated with the IC and individual hyphae. Penetration hyphae were produced from the IC. Subsequent subcuticular hyphal growth occurred both inter- and intracellularly. Cells distal to the hyphae often were collapsed and appeared dead; crystals of CO were abundant in these tissues. Secretion of oxalic acid by *S. rolfssii* and the resulting cell death appears to occur in advance of penetration. Infection cushion formation, which has not been previously reported, facilitates penetration into tissue and assimilation of large quantities of oxalic acid and cell wall degrading enzymes resulting in further tissue destruction.

CURRENT STATUS OF SOYBEAN STEM CANCKER IN LOUISIANA. J. P. Snow, G. T. Berggren and B. G. Harville. Dept. Plant Path. & Crop Physiol., La. Agric. Expt. Sta., La. State Univ. Agric. Ctr., Baton Rouge, LA 70803

Soybean (*Glycine max*) stem canker caused by *Diaporthe phaseolorum* var. *caulivora* was very destructive in Louisiana in 1983. The disease was most severe in southern parishes where rainfall was considerably greater during the 1983 growing season. Some fields in south Louisiana were 100% affected and abandoned as a total loss. Soybean cultivars and breeding lines planted at the various research centers in Louisiana were rated for resistance to stem canker. Cultivars which were rated as resistant to moderately resistant included Tracy-M, Davis, Braxton, Coker 156, Terra-Vig 606, Yield King 503 and Centennial. Susceptible cultivars included Terra-Vig 708, Deltapine 105, Bedford, Ring Around 604, Ring Around 800 and Wilstar 790. Although the disease has been in Louisiana for several years, 1983 was the first year the problem was severe enough to cause serious economic losses.

ETHYLENE SENSITIVITY IN PEPPER ASSOCIATED WITH SENSITIVITY TO CHLOROSIS CAUSED BY *XANTHOMONAS CAMPESTRIS* PV. *VESICATORIA*. R. E. Stall and C. B. Hall. Dept. of Plant Pathology and Vegetables Crops, respectively, University of Florida, Gainesville, FL 32611.

Leaves of a selection of *Capsicum annuum* (PI 271322) yellowed rapidly after inoculation with *Xanthomonas campestris* pv. *vesicatoria*. From a cross with a plant of the cultivar, Early Calwonder (ECW) an F₃ line was selected that was uniform for rapid yellowing after inoculation. Bacterial numbers and electrolyte leakage increased in inoculated leaves of the line, designated P-107, at about the same rate as in leaves of ECW. Patterns of ethylene evolution after inoculation were also similar for P-107 and ECW, but leaves of P-107 became chlorotic more rapidly than ECW after exposure to ethylene at 10 nl ml⁻¹, or to ethephon at 240 µg ml⁻¹. The correlation of ethylene sensitivity with sensitivity to yellowing of inoculated leaves is evidence for the involvement of ethylene in the chlorosis symptom associated with the bacterial spot disease of pepper.

CONTROL OF CROWN AND BRACE ROOT ROT OF CORN WITH SOIL FUNGICIDES. D. R. Sumner, J. E. Hook, N. A. Minton, J. L. Crawford, and C. C. Dowler. University of Georgia and USDA, ARS, Coastal Plain Station, Tifton, Georgia 31793.

In greenhouse experiments pencycuron (PC), PCNB + etridiazole (ETMT), chloroneb, metalaxyl, and CGA-64250 were mixed with field soil just before planting corn. Soil populations of *Rhizoctonia solani* anastomosis group (AG) 4 were reduced significantly by PC and PCNB + ETMT, and populations of *Pythium* spp. by metalaxyl. The number of cultures of *R. solani* AG-4 isolated from roots grown in soil treated with PC and PCNB + ETMT was less than from roots grown in nontreated soil. In contrast, more roots grown in soil treated with metalaxyl were infected with *R. solani* AG-4 than in nontreated soil. Chloroneb and CGA-64250 did not reduce *R. solani* AG-4 root rot or

infection. In heat-treated soil infested with *R. solani* AG-2 type 2 rot of crown and brace roots (RCBR) was reduced by PC. In field tests in 1982 and 1983, PC reduced RCBR by 50%, but metalaxyl, CGA-64250, and PCNB + ETMT did not affect RCBR.

SPATIAL PATTERN OF ALFALFA LEAF SPOT DISEASES. Wayne M. Thal and C. Lee Campbell, Dept. of Plant Pathology, North Carolina State University, Raleigh 27650. *

Spatial pattern of alfalfa leaf spots was analyzed utilizing discrete probability distributions, dispersion indices, and a blocked quadrat variance method. A total of 19 samples was collected during spring and summer, 1982 from 5 fields by rating 3 stems/quadrat from grids of 1 x 1 m contiguous quadrats. Distributional techniques did not allow differentiation in pattern among samples. Indices of dispersion generally indicated a regular to random pattern, although moderate clustering was suggested in a few cases. Taylor's *b* was estimated to be 1.7, indicating a moderate degree of aggregation at higher disease densities. The blocked quadrat variance method showed multiple peaks in the graph of mean square vs. block size which may be due to clustering at several scales. The results indicate a range from regularity to moderate clustering of alfalfa leaf spots among the samples.

POWDERY MILDEW ON OKRA CAUSED BY *SPHAEROTHECA FULIGINEA*. Claude E. Thomas and J. E. Wyatt, USDA, ARS, SR, MAA, U. S. Vegetable Laboratory, 2875 Savannah Highway, Charleston, SC 29407.

Powdery mildew on okra (*Abelmoschus esculentus*) has been attributed to *Erysiphe cichoracearum* in the U. S. A. and to both *Leveillula taurica* and *E. cichoracearum* in India. At Charleston, South Carolina, the incitant of powdery mildew on okra in both the field and greenhouse was identified as *Sphaerotheca fuliginea*. Identification was based on the presence of fibrosin bodies in the conidia and the production of forked germ tubes by germinating conidia. *S. fuliginea* from okra was morphologically indistinguishable from cultures on cucurbit hosts. Inoculations from okra to cantaloup (*Cucumis melo*) and squash (*Cucurbita pepo*) demonstrated high virulence, but reciprocal inoculations demonstrated very low virulence. Mature leaves of okra were more susceptible than younger leaves. Maturing pods were also susceptible.

THE INFLUENCE OF CULTIVAR RESISTANCE, INITIAL DISEASE, ENVIRONMENT AND FUNGICIDE CONCENTRATION AND TIMING ON ANTHRACNOSE DEVELOPMENT AND YIELD LOSS ON PICKLING CUCUMBERS. D. C. Thompson and S. F. Jenkins. Dept. of Plant Pathology, North Carolina State University, Raleigh, NC 27650.

Anthracnose severity on pickling cucumbers caused by *Colletotrichum lagenarium* (Pass) Ell. & Halst. was evaluated in 1981, 1982 and 1983. Cultivars Earlipik 14, Calypso and Calico were used due to their different levels of resistance. Chlorothalonil rates of 2.25, 1.12, .56 and .28 kg/ha were utilized. Similar rates of disease development occurred at 2.25 and 1.12 kg/ha for Calypso and Calico, respectively. Initial disease of 0.01 and 0.1% originating centrally or occurring generally did not affect disease development. Weekly chlorothalonil applications initiated at 0, 1, 10 or 20% diseased tissue were evaluated using rates of 2.25, 2.25 and 1.12 kg/ha on Earlipik 14, Calypso and Calico, respectively. Yield loss was observed during the fall crop when frequent rains and temperature less than 32C occurred before harvesting. Delaying fungicide applications until 10 or 20% diseased reduced applications to 0-2 on Calypso and Calico with occasional yield loss at 20% threshold.

AN INERT CARRIER OF *FUSARIUM SOLANI* SPORES: EFFICIENCY AND VIABILITY IN STORAGE. L. E. Trevathan, W. E. Batson, Jr. and Hamid Borazjani. Dept. of Plant Pathology and Weed Science, Mississippi State, MS 39762.

Corn cob grits were tested as a carrier of fungal spores for application in pathology investigations. Commercially available grits, milled to specifications, are inert, absorbent, free-flowing, non-hygroscopic, degradable, and have a pH of 4.9. While being mixed, grits were infested in bulk (150g) with a 50 ml *Fusarium solani* spore suspension containing 0, 5, 10, 50, 100, 150 or 200 x 10³ conidia/ml. Grits were then stored for varying periods or incubated immediately on PDA for 4 days, after which total number of colony forming particles (CFP) was determined. When stored at 4 C, there was only a slight decline in the CFP numbers through 16 wks. Just over 1 spore/cm² of particle area was required to obtain a CFP effi-

ciency $\geq 90\%$. Scanning electron micrographs confirmed that spores were borne in protected areas on grit particles where they would likely be retained. Spores stored over time were similar in appearance to spores freshly harvested.

SELECTED DIAGNOSTIC PROCEDURES USED IN THE NORTH CAROLINA STATE PLANT DISEASE AND INSECT CLINIC. J. C. Trolinger, R. K. Jones, and A. Hisada, Dept. of Plant Pathology, North Carolina State University, Raleigh, 27650.

Plant disease diagnosis is the initial phase of phytopathology. The grower's need for greater efficiency to remain competitive requires more expedient and more accurate plant disease diagnosis. Efficient diagnostic procedures are necessary in the operation of an effective plant disease clinic. Several rather sophisticated and specific laboratory assays have been developed at the North Carolina Plant Disease and Insect Clinic. Procedures useful in the diagnosis of Phytophthora and Pythium root rot, Rhizoctonia root and crown rot, Southern stem rot (*Sclerotium rolfsii*), Verticillium wilt, Cylindrocladium black rot of peanut, and Thielaviopsis black root rot of Japanese holly will be discussed.

EVALUATION OF PRESUMPTIVE RATING SCALES FOR DETERMINATION OF AFLATOXIN CONCENTRATION IN CORN. D. H. Tucker, Jr., S. B. King and L. E. Trevathan. Dept. of Plant Pathology and Weed Science and USDA, ARS, Mississippi State, MS 39762.

Aflatoxin concentration in corn, determined chromatographically, was compared to results of four presumptive rating methods. Total insect damage and visible *Aspergillus flavus* on ears, and frequencies of bright greenish yellow fluorescence (BGYF) and *A. flavus* colonization of shelled kernels were evaluated as predictive techniques for estimating aflatoxin concentration. Frequency of *A. flavus* colonization ($r = .85$) and insect damage ($r = .70$) were more highly correlated with total aflatoxin concentration than BGYF ($r = .39$) or visible *A. flavus* growth ($r = .43$). Aflatoxin was detected in all BGYF-positive samples as well as in some BGYF-negative samples. An insect damage threshold was established above which aflatoxin was consistently present in detectable amounts.

SPRING BEAUTY LATENT VIRUS: A NEW MEMBER OF THE BROMOVIRUS GROUP. R. A. Valverde. Dept. of Plant Pathology, PS-217, Univ. of Arkansas, Fayetteville, AR 72701.

Spring beauty, *Claytonia virginica*, was found to be infected with a latent virus in northwest Arkansas. This virus, designated spring beauty latent virus (SBLV), was similar to the members of the bromovirus group in particle size and shape, sedimentation coefficient, physical properties, molecular weight and number of RNA components. Nevertheless it differed in host range, molecular weight of protein coat and serology. By using Ouchterlony double-diffusion tests, a very distant serological relationship to cowpea chlorotic mottle virus and brome mosaic virus could be demonstrated but no relationship to broad bean mottle virus was evident. Because of its properties SBLV is proposed as a new member of the bromovirus group.

CUCUMBER MOSAIC VIRUS CAUSING FLOWER BREAKING IN WILD VIOLETS. R. A. Valverde. Dept. of Plant Path., PS-217, University of Arkansas, Fayetteville, AR 72701.

Wild violets, *Viola* spp. showing flower breaking symptoms were found in different locations in northwest Arkansas. A virus with some properties similar to cucumber mosaic virus (CMV) was isolated from infected flowers. Particle size and shape, sedimentation coefficient, molecular weight of protein coat and RNA components were similar to those of CMV. The virus, designated CMV-V, differed from the other CMV strains in its relatively narrow host range, high instability and serology. In Ouchterlony double-diffusion tests CMV-V reacted only with its homologous antiserum and not with that of four CMV strains. Five *Viola* species - *V. papilionaceae*, *V. sagittata*, *V.*

sororia, *V. triloba*, and *V. viarum* - were found to be naturally infected with CMV-V.

TOLERANCE OF *SCLEROTIUM ROLFSII* TO PENTACHLORONITROBENZENE. D. F. Wadsworth and H. A. Melouk. Department of Plant Pathology, Oklahoma State University, and USDA-ARS, Stillwater, OK 74078

Isolates of *Sclerotium rolfsii* obtained from peanut fields in Oklahoma and Texas in which pentachloronitrobenzene (PCNB) failed to control southern blight, were tested for pathogenicity on cv. Tannut 74 and for growth response in potato-dextrose agar (PDA) plates amended with a commercial sample of PCNB 75W. All isolates were pathogenic and grew at 100 ppm (highest concentration tested) which is about 3 times the recommended rate. Most isolates produced sclerotia on PCNB concentrations up to 15 ppm and produced more sclerotia at 5 ppm than at 0 ppm. Three wk old sclerotia obtained from PCNB-amended PDA, germinated 100 percent on water-agar containing 100 $\mu\text{g/ml}$ of streptomycin sulfate.

INFLUENCE OF GYPSUM ON AFLATOXIN CONTAMINATION OF PEANUTS. D. M. Wilson, M. E. Walker, A. S. Csinos, and A. C. Mixon, Departments of Plant Pathology and Agronomy, Coastal Plain Station, Tifton, GA 31793.

Three separate field experiments using several commercial peanut cultivars and gypsum levels showed that the calcium in gypsum can be a significant factor in reducing aflatoxin contamination of farmers stock peanuts. There were no differences between cultivars, but in some years peanuts from plots with no applied gypsum had significantly greater aflatoxin contamination than those peanuts treated with 500, 1000 or 1500 lbs/acre of gypsum. Significant differences were seen in 1979, 1981 and 1982 in some tests; in other tests no aflatoxin was detected in any treatment. Gypsum applications can help decrease aflatoxin contamination but other environmental factors apparently can overcome the calcium effects.

FORMATION OF THE PERFECT STATE OF *RHIZOCTONIA ZEA* IN CULTURE. A. S. Windham and L. T. Lucas, Department of Plant Pathology, North Carolina State University, Raleigh 27650.

Basidia were produced by four isolates of *Rhizoctonia zea* grown on potato dextrose agar and malt agar; basidia were not produced on lima bean agar or corn meal agar. Of the four North Carolina isolates, two were from soil, one from a bentgrass leaf, and one from a bermudagrass stolon. Sporulation increased when cultures were incubated under fluorescent lights (cool white, 40 watt). Basidia were produced on cultures in unsealed petri dishes and were not produced by cultures in petri dishes sealed with parafilm. The perfect state of *R. zea* obtained, conforms to the genus description of *Waitea*. This is the first report of the production of the perfect stage for isolates of *R. zea*.

VIRUSES OF BELL PEPPER (*CAPSIUM ANNUUM*), EGGPLANT (*SOLANUM MELONGENA* L.) AND TOMATO (*LYCOPERSICON ESCULENTUM*) FOUND IN SOUTH CAROLINA. Almaz Yilma, W. Witcher, and O. W. Barnett. Dept. of Plant Pathology and Physiology, Clemson University, Clemson, SC 29631

Commercial bell pepper, eggplant, and tomato fields in nine South Carolina counties were surveyed for cucumber mosaic virus (CMV), potato virus Y (PVY), tobacco etch virus (TEV) and tobacco mosaic virus (TMV). The second youngest, expanded leaf from 12-24 randomly selected plants per ha was tested by enzyme-linked immunosorbent assay (ELISA) and Ouchterlony double-diffusion. Plants with virus-like symptoms also were tested. Homologous virus and healthy sap were used as controls. All four viruses were detected in tomato (two counties) and pepper (one county) but only CMV and PVY in eggplant (one county). Highest percentages of infected plants per field were CMV 5 and TMV 25 (tomato); PVY 42 (eggplant); TEV 70 (pepper). Mixed infections were detected in tomato and pepper.