

# **ABSTRACTS OF PAPERS**

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### ABSTRACTS

NITIDULIDS AS POSSIBLE VECTORS OF *CERATOCYSTIS FAGACEARUM* IN TEXAS. D. N. Appel, K. Andersen, C. F. Drees, Department of Plant Pathology and Microbiology, Texas A&M University, College Station, TX 77843, and R. L. Lewis, USDA Forest Service, Hardwood Insect and Disease Research Laboratory, Stoneville, MS 38776.

Free-flying sap beetles (Coleoptera: Nitidulidae) were collected at three oak wilt centers in central Texas. The centers were located at Burnet, Austin, and Kerrville, TX. Beetles were trapped on a weekly basis from March (Burnet) or April (Austin and Kerrville) and extending through September, 1984. They were then assayed for contamination with *Ceratocystis fagacearum*. Population peaks of nitidulids at Burnet, TX, were observed from mid-March to early May. Nitidulids then stabilized at low levels through the summer months. Similar trends were found at the other two sites. Fungal mats, the only known inoculum source, reached maximum development at Burnet on diseased Spanish oaks in March. Of 853 beetles assayed, 17 were contaminated with *C. fagacearum*.

TEXAS GULF COAST RICE SHEATH BLIGHT SURVEY. S. B. Belmar, R. K. Jones, and J. L. Starr, Texas A&M Univ., Department of Plant Pathology and Microbiology, College Station, TX 77843

Rice sheath blight, caused by *Rhizoctonia solani* (AG-1), is an important disease in Texas. A survey of 19 rice fields was completed in 1984 to quantify sclerotia populations. Sclerotia were extracted from soil samples by elutriation and collected on 600- $\mu$ m pore size sieves. Sclerotia were identified under magnification based on size, shape, texture, and color. Recovery of sclerotia from artificially infested samples of a sandy loam soil was greater than 90%. The highest mean population for any field was 11.3 (sclerotia/kg air dried soil). Each field also was sampled for incidence of sheath blight at the panicle initiation stage of rice development. A highly significant ( $P < .01$ ) linear correlation ( $r = 0.97$ ) was observed between sclerotia populations and disease incidence. Such information will be useful in developing a hazard index for disease management of sheath blight.

PEPPER VIRUSES IN NORTHEAST GEORGIA. C. P. Benner, C. W. Kuhn, J. W. Demski, J. W. Dobson, and P. Colditz. Dept. of Plant Pathology, Univ. of Georgia, Athens 30602 and Georgia Mountain Station, Blairsville, GA 30512.

Virus diseases are a major constraint to pepper production in northeast Georgia. Disease incidence was near 100% in both 1983 and 1984. Virus identification was determined by collecting leaf samples from nine fields and conducting serological (enzyme-linked immunosorbent assays and immunodiffusion) and infectivity tests. Tobacco etch virus (TEV) was the predominant virus in each field (over 96% of the plants). Cucumber mosaic virus was detected in eight fields, three of which had 20-50% infection. Potato virus Y occurred in 8 of 914 samples. All samples were negative for pepper mottle, tobacco mosaic, and tomato mosaic viruses. TEV was isolated from perennial *Solanum* and *Physalis* species near pepper fields, which may be a primary source of inoculum. Field resistance to TEV was found in a few pepper lines. Neither oil spray nor fertilization strategies altered disease incidence or severity.

\* = Presentation of Soybean Stem Canker Symposium

+ = Student Paper Competition

SOYBEAN CULTIVAR REACTIONS TO STEM CANCER IN LOUISIANA - A TWO YEAR SUMMARY. G. T. Berggren, J. P. Snow, Dept. Plant Path. and Crop Physiol., B. G. Harville, Agronomy Dept., La. Ag. Exp. Stat. and H. K. Whitam, La. Coop. Ext. Serv., La. State Univ. Agric. Ctr., Baton Rouge, La 70803.\*

In 1983, 49 cultivars were evaluated at Baton Rouge, Louisiana for resistance to stem canker. Rating scale was 0 to 9 with 0 indicating no symptoms and 9 indicating all plants in a plot were dead. In 1984, 69 cultivars were rated at Baton Rouge and Crowley, Louisiana using the same scale as 1983. Cultivars evaluated were in maturity groups V, VI, VII and VIII. Cultivars rated as most resistant for both years were Yield King 563, TerraVig 606, Braxton, and Coker 368 (in maturity groups V, VI, VII and VIII, respectively). Those rated most susceptible were Yield King 593, Ring Around 604, TerraVig 708, and Ring Around 801 (in maturity groups V, VI, VII and VIII). High stem canker ratings were usually correlated with low yields.

VIRUS-HOST INTERACTIONS IN COWPEA CHLOROTIC MOTTLE VIRUS INFECTED SOYBEAN LINES. M. Bijaisoradat and C. W. Kuhn, Dept. of Plant Pathology, Univ. of Georgia, Athens, GA 30602.

Virus-host interactions in soybeans infected with cowpea chlorotic mottle virus were classified into six categories based on virus accumulation and symptomatology. Lines which reacted with local chlorosis and systemic mosaic were defined into three categories: susceptible, moderately resistant, and resistant. They differed in level of virus accumulation in inoculated and uninoculated leaves, symptom severity, and length of symptom incubation period. Lines which reacted with local necrotic lesions were defined into two resistant categories, based on the lesion size; furthermore, small quantities of virus were detected in uninoculated symptomless leaves. The sixth category was comprised of lines which reacted locally with both chlorosis and necrosis. Symptoms on uninoculated leaves of lines in this category were variable, ranging from mild to severe mosaic and with veinal necrosis and were not related to virus accumulation.

TRANSMISSION, DETECTION, AND OCCURRENCE OF TOBACCO RINGSPOT VIRUS IN JAPANESE HOLLY. J. H. Blake and J. M. McGuire. Dept. of Plant Pathology, Univ. of Arkansas, Fayetteville 72701.+

Transmission of tobacco ringspot virus (TRSV) to *Ilex crenata* 'Compacta' and *I. crenata* 'Convexa' by *Xiphinema americanum* and mechanical inoculations was attempted. Some control plants of 'Convexa' were infected, but 'Compacta' controls remained uninfected. Both nematode and mechanical transmission of TRSV to 'Compacta' occurred. Detection of infected plants by ELISA and mechanical inoculation bioassay were compared. Chi-square tests indicated a higher probability of detection of TRSV-infected Japanese holly plants by ELISA than by bioassay. Symptoms attributable to TRSV were not observed in infected plants in this greenhouse study. In a survey of landscape plants, 7 of 8 sites contained TRSV-infected Japanese holly as determined by ELISA. Some infected plants were unthrifty, but it is unknown if the virus was involved. *Viruliferous X. americanum* were recovered from 3 of 8 landscape locations. TRSV was detected in Japanese holly plants from 5 of 10 garden centers surveyed.

GREENHOUSE INFECTION OF *XANTHIUM STRUMARIUM* AND *HELIANTHUS ANNUUS* WITH *PUCCINIA CANALICULATA*, A POTENTIAL BIOCONTROL FOR YELLOW NUTSEDGE. M. B. Calloway, S. C. Phatak, Department of Horticulture, and H. D. Wells, USDA, ARS, University of Georgia Coastal Plain Experiment Station, Tifton, GA 31793.

*Puccinia canaliculata* has shown promise as a biological control

of yellow nutsedge. *Xanthium* spp. and *Helianthus annuus* have been reported as alternate hosts for *P. canaliculata* but a persistent search for four years failed to reveal natural occurrence of the disease on these genera in the Tifton area. Therefore, to determine if local ecotypes or varieties of these plants were susceptible, *X. strumarium* and *H. annuus* were grown and inoculated in the greenhouse with *P. canaliculata* teliospores from three local collections and one collection from Fayetteville, AK. Teliospores from one local source and from Arkansas resulted in infection and development of both pycniospores and aeciospores on both *X. strumarium* and *H. annuus*. This demonstrates that factors other than lack of susceptibility are responsible for the absence of the disease occurring on the alternate host at Tifton, GA.

GERMINATION OF SPORES OF LEPTOSPHAERULINA BRIOSIANA AND PHYTOPHTHORA INFESTANS IN SIMULATED ACID RAIN SOLUTIONS. C. Lee Campbell, S. P. Martin, Jr., J. P. Sinn and R. I. Bruck. Dept. of Plant Pathology, North Carolina State University, Raleigh, 27695.

Acidity level in ambient rainfall may influence specific components of disease development. During spore germination, fungal pathogens may be exposed directly to acidic, ambient rain. To elucidate possible effects of acid rain on spore germination, culturally produced spores of *L. briosiana* (Lb) and sporangia of *P. infestans* (Pi) were placed in simulated acid rain solutions at pH 2.4, 3.0, 3.6, 4.2, and 5.6. Percent germination and number of germ tubes/spore decreased significantly with increasing acidity for six isolates of Lb after incubation at 20° C for 4 hr. Direct and indirect germination for two isolates of Pi decreased with increasing acidity after 24 hr incubation at 20° or 8° C, respectively. The relationships between all modes of germination for Lb and Pi and solution pH exhibited quadratic responses.

Control of Rhizoctonia root-rot of beans with avirulent Rhizoctonia-like fungi. José E. Cardoso and Eddie Echanti. Dept. of Plant Pathology, N. C. State University, Raleigh, NC 27695-7616.

Avirulent, *Rhizoctonia*-like binucleated fungi (BN) were grown on sterilized oat kernels for 10 da and mixed with soil at the rate of 3 g of kernels per l of steamed soil. This mixture was placed in flats (35 x 25 x 7 cm) and seeded with dry beans (cv. Topcrop) spaced 2.5 cm apart. Oat kernel inoculum (7.5 g) of a virulent isolate of *Rhizoctonia solani* (RS) was placed in a 2 cm-wide hole made in the soil in the middle of each flat. After 2 wk, two of the BN isolates gave 31 and 65% control of root rot (RS-inoculated control showed 77% disease). The two BN isolates were later incorporated in the furrow (45 g inoculated oat kernels/m of row) with bean seed planted in a RS-naturally infested field. Twenty five and 52% of the bean plants were significantly protected from root rot (untreated control showed 81% disease).

PURIFICATION AND PARTIAL CHARACTERIZATION OF NUCLEAR INCLUSIONS INDUCED BY A PEA MOSAIC ISOLATE OF BEAN YELLOW MOSAIC VIRUS. C. A. Chang, D. E. Purcifull, and E. Hiebert, Department of Plant Pathology, University of Florida, Gainesville, FL 32611.

Nuclear inclusions induced by a pea mosaic isolate (PV-2) of bean yellow mosaic virus (Schroeder and Provvidenti, 1966. Plant Dis. Repr. 50:337-340) were purified from infected pea tissue. The protein monomers of the inclusions were revealed and further purified by sodium dodecyl sulfate (SDS) polyacrylamide gel electrophoresis. The inclusions contain equimolar amounts of protein subunits with molecular weights of 49k and 54k, respectively. In addition, a minor 98k protein was consistently associated with the inclusion preparations. Antisera against 54k and 49k protein subunits were produced. The results of reciprocal SDS-immunodiffusion tests showed that both protein subunits were serologically distinct from each other and also from cytoplasmic cylindrical inclusion and capsid proteins induced by PV-2. Immunofluorescence tests showed that antisera to 49k and 54k proteins both reacted with PV-2 induced nuclear inclusions *in situ*.

EFFECTS OF PLANT GROWTH REGULATORS ON PERIWINKLE INFECTED WITH ASTER YELLOWS MYCOPLASMA-LIKE ORGANISM. C. J. Chang and R. C. Donaldson, Department of Plant Pathology, University of Georgia, Georgia Station, Experiment, GA 30212.

Periwinkle plants infected with the aster yellows mycoplasma-like organism (AYMLO) were obtained by graft transmission. After transmission, plants were grouped according to size and sprayed with gibberellic acid (GA), indole-3-acetic acid (IAA), or kinetin at 200, 200, and 1000 ppm, respectively, on a weekly or biweekly basis for 6 to 8 weeks. Internodes were randomly selected and measured to evaluate the effect of each of the three growth regulators on the plants. Internodes were

elongated two to four times their original length with GA, whereas kinetin and IAA showed slight or no effect. AYMLO-infected plants sprayed with kinetin retained their seed production capability. None of the other symptoms of AYMLO infection, e.g. phyllody and yellowing was affected by the growth regulators. It is evident that not only GA but kinetin also influences symptom development by MLO infection.

MORNING GLORIES AS PERENNIAL RESERVOIRS OF SWEET POTATO FEATHERY MOTTLE VIRUS. C. A. Clark, K. S. Derrick, C. Strand, and B. Watson, Dept. Plant Pathol. & Crop Physiol., Louisiana Agric. Exp. Sta., Agricultural Center, Baton Rouge, LA 70803.

Six morning glory species were monitored each spring of 1981-1983 to determine the growth habit and incidence of sweet potato feathery mottle virus (FMV) infection. *Ipomoea trichocarpa* (IT) regrew perennially, whereas *I. hederacea* (IH), *I. wrightii* (IW), *I. hederifolia*, and *I. lacunosa* were annuals. Perennial growth of IT and appearance of seedlings of IT, IH, and IW were first observed each year before sweet potato sprout emergence. FMV symptoms were observed in perennial IT 1-2 wk following resumption of growth, whereas in IH, IW, and IT seedlings, symptoms were first observed 6-8 wk later. The presence of FMV was confirmed by serologically specific electron microscopy. Since IT in Louisiana is: abundant, widely distributed, grows throughout the sweet potato growing season, and a perennial host of FMV, it may be a potentially important source of inoculum for infection of sweet potato by FMV.

DIFFERENTIAL SUSCEPTIBILITY OF FIELD GROWN ROSES TO BLOSSOM BLIGHT CAUSED BY ALTERNARIA ALTERNATA. P. F. Colbaugh, P. L. Phelps and G. N. Taplin, Texas Agricultural Experiment Station, Texas A&M Univ. Research & Extension Center, Dallas, TX 75252.

Blossom blighting caused by *Alternaria alternata* is common on field-grown roses during the summer months in Texas. Laboratory observations of blighted rose blossoms indicated numerous individual conidial infections were required for flower blighting activity. Symptoms of flower blighting are most common following periods of rainfall; however, some rose varieties are damaged more severely than others. Field observations were made during June through August 1981 and 1983 to assess susceptibility of popular varieties of hybrid tea, floribunda and grandiflora roses to *Alternaria* blossom blight. Of 133 varieties observed in the field, 78% were moderately to highly susceptible, while 22% showed only trace levels or no disease symptoms. Flower color was correlated with varietal resistance to blossom blighting activity. Rose varieties with yellow and red flower colors were more resistant to the disease than others observed.

SCLEROTIIUM ROLFSSII, A PROBLEM OF APPLE NURSERY STOCK IN OKLAHOMA. Kenneth E. Conway and Stephen F. Tomasino. Dept. of Plant Pathology, Oklahoma State University, Stillwater, OK 74078.

Southern blight of apple stock, caused by *Sclerotium rolfsii*, has been a problem in nurseries near Tahlequah, OK since 1973. The fungus infects and kills trees up to 3 yr of age. Although no fungicide was labelled for use on apple, growers have used pentachloronitrobenzene (PCNB) at planting (Terraclor 10 G, 8.9 kg a.i./ha). During 1981 one nursery lost 10% of grafted apple stock in one 1.2-ha field to *S. rolfsii*. Total loss in the nursery was estimated at 10,000 trees. In 1982 there was a 50% loss of Floribunda flowering crabapple (on common apple rootstock) planted in the same field and a 5-10% loss of Jonathan apple in adjoining fields. Total loss at the nursery was 21,000 grafted seedlings. An artificially-infested field plot was established at Stillwater, OK, to evaluate chemical and biological controls. Over a 2-year period, *Trichoderma harzianum* was as, or more, effective than PCNB applied either at planting and/or at midseason.

ANTAGONISTIC EFFECTS OF TRICHODERMA HARZIANUM ON MACROPHOMINA PHASEOLINA IN SOYBEAN. Charles Cottingham, Yvonne D. Riley, and Ukeme E. Eyo. Box 1525, South Carolina State College, Orangeburg, South Carolina 29117

Charcoal rot of soybeans (*Glycine max*), caused by *Macrophomina phaseolina*, reduces yields of infected plants. We evaluated the mycoparasitic properties of *Trichoderma harzianum* on *M. phaseolina* by applying *T. harzianum* in a wheat-bran mixture (800,000 conidia/g.) and *M. phaseolina* in an aqueous suspension (650,000 sclerotia/ml.) to seed of Coker 237 soybean at planting. The seed were either treated with Captan (cis-N-[(trichloromethyl)-thio]-4-cyclohexene-1,2-dicarboximide) at 1.6 g/kg of seed or were left untreated. Addition of the antagonist in combination with the pathogen suppressed the pathogen more in plants grown from treated than from untreated seeds. Plants grown from *M. phaseolina*-inoculated seed that were treated with fungicides or left untreated were shorter than plants from seed receiving both fungi or *T. harzianum* alone. Plants from seeds receiving *M. phaseolina* alone or *T. harzianum* alone had lower dry wt than controls regardless of fungicide treatment.

A COMPARISON OF INOCULATION METHODS FOR EVALUATING STRAWBERRY PLANTS FOR RESISTANCE TO PHYTOPHTHORA FRAGARIAE. S. W. George and R. D. Mitholland, Department of Plant Pathology, North Carolina State University, Raleigh 27695-7616.

Roots of the susceptible cv. Tennessee Beauty were inoculated with Races A-2 and A-6 of *P. fragariae* by immersion in a 1) zoospore suspension ( $3 \times 10^4$  spores/ml), 2) mycelial slurry, and by spraying the roots with a suspension of 3) motile and 4) nonmotile zoospores ( $3 \times 10^4$  spores/ml). After incubation in the light at 14 C for 2 wk, five root segments (15 mm long) were removed from each plant and examined for oospores. The average number of oospores produced per root segment for treatments 1-4 were .03, 48, 1.4 and 34, respectively. Oospores were produced in 80% of the root segments inoculated with nonmotile zoospores but in only 64% of those inoculated with the mycelial slurry. It was concluded that spraying strawberry roots with a suspension of nonmotile zoospores is an effective method for inoculating with *P. fragariae*. This technique also makes it possible to more precisely quantify levels of inoculum.

EFFECT OF INTERMITTANT WET PERIODS, EXTENDED WET PERIODS, AND DELAYED WET PERIODS ON INFECTION OF PECAN BY CLADOSPORIUM CARYIGENUM. T. R. Gottwald, USDA/ARS, Southeastern Fruit and Tree Nut Research Laboratory, P. O. Box 87, Byron, GA 31008.

The effect of intermittent wet periods (IWP), extended wet periods (EWP), and delayed wet periods (DWP) on infection of seedling pecan foliage by *Cladosporium caryigenum* was studied under controlled environmental conditions in growth chambers. Initial leaf wetness periods (ILWP) of 2 hr followed by a 12-hr dry period tended to decrease infection whereas ILWP's of 4 or more hr did not decrease infection when compared with a 48-hr ILWP control. Maximum infection occurred with a 12-hr ILWP followed by a 12-hr dry period. Spore survival and viability decreased only slightly over a 14-day period as demonstrated by incidence of infection corresponding to DWP's from 2 to 336 hr. EWP's of 0 to 240 hr demonstrated a gradual increase incidence of infection.

EFFECT OF PLASTIC FILM MULCHES ON THE INCIDENCE OF TOMATO SPOTTED WILT VIRUS. D.R. Greenough & L.L. Black. Dept. Plant Path. & Crop Physiol., La. Agri. Expt. Sta., La. State Univ. Agri. Ctr., Baton Rouge, 70803.

Thrips-borne tomato spotted wilt virus (TSWV) is a serious problem of solanaceous crops in Louisiana. Aluminum-painted plastic film mulch and black plastic film mulch were compared with no mulch for their effectiveness in repelling thrips and reducing TSWV-infection in tomatoes and bell peppers. Thrips were trapped on yellow sticky boards placed 12" above the row surfaces. The seasonal average number of thrips trapped per day in tomato and pepper fields in Pointe Coupee parish was reduced 66% by aluminum mulch and 14% by black mulch when compared with non-mulched plots. At the end of the season, there were 63% fewer TSWV-infected plants on aluminum mulch and 37% fewer on black mulch when compared with the plants in the non-mulched plots. These results show that both black and aluminum-surfaced film mulches can effectively repel thrips and reduce the incidence of TSWV in tomato and pepper crops; the aluminum-surfaced mulch is more effective than the black-surfaced mulch.

SURVEY OF RICE DISEASES IN LOUISIANA. D. E. Groth and C. A. Hollier, Rice Research Station, P.O. Box 1429, Crowley, LA 70527-1429 and La. Coop. Extension Service, Knapp Hall, Louisiana State University, Baton Rouge, LA 70803.

A disease survey was conducted in Louisiana rice-growing parishes in 1984. Random samples were inspected in commercial rice fields and disease severities (0-9 scale) or frequencies were recorded. The most common diseases were water molds (*Pythium* sp. and *Achlya* sp.), sheath blight (*Rhizoctonia solani*), brown spot (*Bipolaris oryzae*), leaf smut (*Entyloma oryzae*), narrow brown spot (*Cercospora oryzae*), stem rot (*Sclerotium oryzae*), and kernel spotting (various fungi). Water molds were very severe in the spring, on water-seeded rice, appearing in 19 and 92% of the 0.09m<sup>2</sup> field areas examined in the northeast and southwest regions, respectively. Sheath blight was the most severe disease (average 2.0) with some fields severely affected (5.8-6.3). Disease pressure was two to three times greater in the southwest than in the northeast rice-growing region.

COLLETOTRICHUM SPP. ASSOCIATED WITH RIPE ROT OF PEPPER. J. H. Hadden, L. L. Black and J. M. Gatti. Dept. Plant Path. & Crop Physiol., La. Agric. Expt. Sta., La. State Univ. Agric. Ctr., Baton Rouge, LA 70803.

Ripe rot of peppers has been observed throughout the major growing regions of Louisiana. Both falcate and cylindrical

spored forms of *Colletotrichum* spp. are commonly associated with the diseased pods. The falcate spored form has been identified as *C. capsici*, but the identity of the cylindrical spored isolates remains in doubt and may represent more than one species. To date, only *C. capsici* has been isolated from seed. Pepper plantings were made consisting of (1) clean seed in a clean field, (2) infected seed in a clean field, and (3) clean seed in an infested field. *C. capsici* lesions developed on pods in all the treatments except the "clean seed in a clean field" suggesting that infected seed and crop debris may serve as sources of inoculum. Plants in all treatments had pods infected with cylindrical spored forms, suggesting that sources other than pepper may serve as reservoirs for these forms.

IDENTIFICATION OF DIAPORTHE AND PHOMOPSIS ISOLATES FROM SOYBEAN. Thomas W. Hobbs and D. V. Phillips, Dept. of Plant Pathology, Georgia Experiment Station, Experiment, GA 30212.\*

*Diaporthe* and *Phomopsis* isolates from soybean can be placed into four recognizable groups based on symptomatology and cultural characteristics. Two groups, *D. phaseolorum* var. *sojae* (Lehman) Wehm. and *Phomopsis* sp. sensu Kmetz et al., are involved in the pod and stem blight/seed decay complex. The other two groups, *D. phaseolorum* var. *caulivora* Athow & Cald. and an undetermined *Diaporthe* sp., both cause diseases which have been called "stem canker." Observations of symptoms on field-grown plants indicate that lesions on southern cultivars are longer and more unilateral than has been observed for the disease on northern cultivars. These observations correlate with differences in cultural characteristics, such as growth rate and colony appearance, noted between the latter two groups. It is suggested that the disease in the South be referred to as "Southern Stem Canker" and isolates of the pathogen as "southern isolates of *Diaporthe phaseolorum* causing stem canker."

A MOSAIC DISEASE OF CENTIPEDEGRASS AND CROWFOOTGRASS. G. E. Holcomb. Dept. of Plant Path. & Crop Physiol., La. Agr. Exp. Sta., Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

A viruslike mosaic was observed on centipedegrass (*Eremochloa ophiuroides*) and the weed-grass crowfootgrass (*Dactyloctenium aegyptium*). The symptoms on both centipedegrass and crowfootgrass occurred in the same lawn and consisted of a chlorotic mosaic of the leaves. Centipedegrass with mosaic symptoms was widely distributed throughout the affected lawn. This disease was found during a routine survey for St. Augustine decline virus in Hammond, LA. Preliminary results with agar diffusion serology indicated that both centipedegrass and crowfootgrass were infected with a *Panicum* mosaic/St. Augustine decline group virus.

WATER STRESS IN GRAPEVINES WITH PIERCE'S DISEASE. D. L. Hopkins, Agricultural Research and Education Center, IFAS, University of Florida, Leesburg, FL 32749-0388.

The visible symptoms of Pierce's disease (PD) suggest a dysfunction of the water conducting system; therefore, the water relations of grapevine with PD was investigated. Leaf water potential was correlated with leaf marginal necrosis (MN) symptoms in both Carignane bunch grape and Carlos muscadine grape. For example, the average water potential of leaves from healthy Carignane was - 5.6 bars and that of leaves with MN was - 19.2 bars. In Carignane, leaf MN appeared on the older leaves first and developed in an acropetal direction. The leaves immediately adjacent to leaves with MN had xylem water potentials that were nearly as negative as those from leaves with MN symptoms. In Carlos, relative water content of leaf tissue as well as percentage of blocked xylem vessels in the petioles also were correlated with leaf MN symptoms. These studies indicate that water stress is a cause of the leaf MN symptoms of PD.

SPATIAL DYNAMICS OF PHYMATOTRICHUM ROOT ROT IN COTTON. M. J. Jeger, C. M. Kenerley, Texas A&M University, College Station, TX 77843, and T. J. Gerik, Blacklands Research Center, Temple, TX 76503.

Epidemics of *Phymatotrichum* root rot in cotton were monitored on a commercial farm in the Blacklands area of central Texas during the summer of 1984. All plants in a plot area of 32 rows (0.9 m spacing) x 80 m length were assessed for incidence of root rot at 7-day intervals from 12 June to 17 August. The number and length of runs (sequence of diseased plants), and the number of plants/run were recorded. In late June there were 476 runs with a mean value of three plants/run. By August the equivalent values were 767 runs and 13 plants/run; frequency distributions were highly skewed, however, with a maximum recorded value of 280 plants/run. Spatial distributions of root rot in cotton indicated a strong influence of row planting on disease dynamics and the possible role of plant-to-plant spread of the pathogen.

\* = Presentation of Soybean Stem Canker Symposium

A BACTERIAL LEAF SPOT OF *HIBISCUS ROSA-SINENSIS* INCITED BY A NEW PATHOVAR OF *PSEUDOMONAS SYRINGAE*. J. B. Jones, IFAS, Univ. of Fla., Gulf Coast Res. & Ed. Center, Bradenton, FL 34203, A. R. Chase, B. C. Raju, and J. W. Miller.

A leaf disease of *Hibiscus rosa-sinensis* was characterized by angular dark-brown to black lesions that were surrounded by chlorotic halos. A bacterium was consistently isolated. It produced a fluorescent pigment on King's medium B and was negative for oxidase reaction and arginine dihydrolase. The bacterium utilized mannitol, sorbitol, erythritol, L(+) tartrate, and sucrose but not B-alanine, D(-) tartrate, DL-lactate, or trehalose. Although the bacterium was biochemically related to *P. syringae* pv. *lachrymans* and *P. syringae* pv. *tabaci*, inoculation of the hibiscus strains onto cucumber and tobacco produced no pathogenic reaction. The hibiscus strains were virulent on *H. rosa-sinensis*. One *P. syringae* pv. *lachrymans* strain produced a weak reaction on *H. rosa-sinensis*. Based on these results, the hibiscus strains should be placed in a new pathovar of *P. syringae*.

OBSERVATIONS ON PATHOTYPES OF DIAPORTE PHASEOLORUM VAR. CAULIVORA. B. L. Keeling, USDA-ARS, Stoneville, MS 38776.\*

The pathogenicity of *Diaporthe phaseolorum* var. *caulivora* isolates recovered from soybean plants symptomatic of stem canker disease was determined using six differentially reacting host cultivars (Kingwa, Tracy-M, Arksoy, Centennial, S-100, and J77-339). Ten pathotypes are indicated by a resistant or susceptible reaction of seedling plants inoculated by the toothpick technique. Differential cultivars susceptible to the pathotypes are as follows: Pathotype 1 (J77-339); Pathotype 2 (Centennial, S-100, J77-339); Pathotype 3 (Arksoy, Centennial, J77-339); Pathotype 4 (all except Kingwa); Pathotype 5 (all except Kingwa and Arksoy); Pathotype 6 (all except S-100); Pathotype 7 (Centennial and J77-339); Pathotype 8 (Centennial and S-100); Pathotype 9 (S-100 and J77-339); and Pathotype 10 (Arksoy).

EFFECT OF WATER MANAGEMENT ON THE EPIDEMIC DEVELOPMENT OF RICE BLAST. Choong-hoe Kim, M. C. Rush and D. R. MacKenzie. Dept. Plant Path. and Crop Physiol., La. Agric. Expt. Sta., La. State Univ. Agric. Ctr., Baton Rouge, LA 70803.

Blast (*Piricularia oryzae* Cav.) development on the rice cultivars Brazos and M-201 was evaluated under water management systems simulating upland and flooded field conditions. Point sources of inoculum were introduced into each plot. Disease progress was monitored at 3-4 day intervals. Significant differences in disease development were observed between upland and flooded plots. Disease in upland plots progressed rapidly during the growing season. Disease progress was greatly retarded in flooded plots. Final disease severity in upland and flooded plots averaged 58% and < 1%, respectively. When upland plots were subsequently flooded after an epidemic was initiated, further development of blast was greatly decreased. No increase in disease was observed in previously flooded plots that were drained. These results demonstrate that flooding is one effective way of controlling rice blast disease.

MORPHOLOGICAL CHARACTERISTICS OF SYNCYTIA IN DIFFERENT COMPATIBLE HOSTS INFECTED BY SOYBEAN CYST NEMATODE. Y. H. Kim, K. S. Kim, and R. D. Riggs. Dept. of Plant Pathology, Univ. of Arkansas, Fayetteville, AR 72701.

Syncytia induced in different compatible hosts (cleome, Kobe lespedeza, and Lee soybean), infected by *Heterodera glycines* (Race 3) were examined to compare their morphological characteristics. The syncytia formed in cleome were confined to the inside of the stele, whereas those in lespedeza occurred in cortical tissue. In soybean, however, the syncytia were formed in both the stele and cortex. The major characteristics of syncytia, such as the cell wall perforations and hypertrophy of syncytium component cells, were similar among the different hosts. However, cell wall ingrowths, another characteristic feature of syncytia, were more prominent in soybean than in lespedeza and were not observed in cleome. Syncytium component cells of cleome and lespedeza were degenerated whereas those of soybean showed no signs of degeneration at 20 days after inoculation.

ERADICATION OF *CRISTULARIELLA MORICOLA* WITH PROPICONAZOLE FROM LESIONS IN PECAN LEAVES. A. J. Latham, Dept. Botany, Plant Pathology and Microbiology, Ala. Agric. Exp. Stn., Auburn University, AL 36849.

Conidia of *Cristulariella moricola* were applied at the rate of 54/ml to leaves of potted Schley pecan trees. Trees were

incubated in dew chambers at 21 C and 100% RH for 48 hr then in a greenhouse for 48 hr. Propiconazole at 270 mg ai/L or benomyl at 599 ml ai/L were sprayed to runoff on the leaves; alternate leaves that were covered with plastic bags when the fungicides were applied served as controls. After four days incubation, fungus lesions on pecan leaves ranged from 1 to 14 mm diameter, avg. 5.7 mm. At 11 days after inoculation, no sporulation by *C. moricola* was evident on leaves treated with propiconazole; sporulation occurred on benomyl-treated leaves, but conidial morphology was altered. Lesions from propiconazole-treated leaves that were plated onto Czapek's plus yeast extract agar did not yield cultures of *C. moricola*, whereas typical cultures developed from benomyl-treated leaves.

EVALUATION OF COPPER FUNGICIDES USED ALONE AND IN VARIOUS SCHEDULES WITH BRAVO ON PEANUT POD YIELDS. Robert H. Littrell, Plant Pathology Dept., Univ. of Ga., Coastal Plain Station, Tifton, Ga. 31793.

Cupric hydroxide (Kocide 606, Super Cue), tribasic copper sulphate (Phelps Dodge), and copper ammonium carbonate (Ag Research) were evaluated at 2 l of formulated products per ha and Bravo 500 at 2.5 l per ha on Florunner peanut. Treatments were initiated 30 days after planting and repeated every 2 wks until two weeks of harvest. Spray regimes used were (1) copper first 4 sprays, and Bravo last 4 sprays; (2) Bravo first 4 sprays and copper last 4 sprays; (3) alternating copper/ Bravo sprays throughout the season; (4) copper, full season; and (5) Bravo, full season. Lowest yields were with full season use of copper fungicides (4,658 kg/ha) and highest with Bravo full season (5,937 kg/ha). Yields increased significantly with each change in schedules from (2), (1), and (3); 1 was better than 2 because late leafspot developed rapidly in late season.

INOCULATION OF SWEET POTATO BY THE JAVA BLACK ROT PATHOGEN, *DIPLODIA GOSSYPINA*. J.-y. Lo and C. A. Clark, Dept. Plant Path. & Crop Physiol., Louisiana Agric. Exp. Sta., Agric. Center, Louisiana State University, Baton Rouge, LA 70803.

*Diplodia gossypina* was recovered 1-2 cm above and 2-4 cm below the point of wound inoculation of sweet potato vines after 55 days in the greenhouse. It was not isolated from the proximal ends of storage roots harvested from field plots in which the vines were artificially inoculated or the soil artificially infested. After 4 mo storage, the roots harvested from the inoculated vines did not differ from the control, but those from the infested soil showed more disease. Freshly-harvested roots inoculated by placing artificially infested soil on cut proximal ends developed higher disease severity after 4 mo storage than uncut roots and roots inoculated with spore suspensions, mycelial plugs, or infected sweet potato tissue on cut ends. *D. gossypina* spores survived in field soil overwinter and for at least 240 days. Thus, the pathogen may survive in soil and infect roots through wounds at harvest.

GROWTH OF THE TALL FESCUE ENDOPHYTE INTO SEEDLINGS AS RELATED TO TEMPERATURE AND SHEATH DIFFERENTIATION. P. C. Lyons and C. W. Bacon, Department of Plant Pathology, University of Georgia, Athens 30602 and USDA, ARS, Athens, GA 30613.\*

Growth of the fungal endophyte (*Sphacelia typhina*) into tall fescue seedlings from infected seed aged 6 mo and older was studied at 15, 22, and 30 C. At all temperatures percent infection increased in seedling populations during a 2- to 3-wk period beginning within 2 wk of planting. Maximum infection and infection rate depended on seedlot, but within seedlots were always lower at 30 C than at 15 or 22 C. The fungus did not grow into the coleoptile or leaf blade, and infection of the seedling did not occur until the sheath of the first leaf was apparent. The endophyte was frequently observed in sheaths less than 1 mm long. Establishment of infection in seedling populations coincided with the period of early development of the first leaf sheaths. Decreased infection rates at 30 C were not related to sheath differentiation since the rate of differentiation was similar at 22 and 30 C. Infection of subsequent leaves also coincided with sheath differentiation.

INFECTIVITY OF *PHYTOPHTHORA INFESTANS* IN SIMULATED ACID RAIN SOLUTIONS. S. R. Martin, Jr., C. Lee Campbell, and R. I. Bruck. Dept. of Plant Pathology, North Carolina State University, Raleigh, 27695.

Acidity of rainfall may influence the infection processes which lead to the establishment of plant disease. In order to examine these potential effects, culturally produced sporangia of *Phytophthora infestans* (Pi) race (1,5) were placed in simulated rain solutions at pH 2.4, 3.0, 3.6, 4.2, and 5.6. Sporangial suspensions ( $5 \times 10^4$ /ml) were placed as hanging drops (20  $\mu$ l) on the abaxial surfaces of leaflets of Kennebec potato plants at 21 C. Inoculated plants were incubated for periods of 0, 4, 8, or 16 hr of ambient (60-70%) RH, and then

\* = Presentation of Soybean Stem Canker Symposium

\* = Student Paper Competition

maintained at 100% RH by using humidifiers containing deionized water. In tests with 0 and 4 hr before misting, pH did not effect infection efficiency; after 8 to 16 hr, infection was not established at pH 2.4 or 3.0 and infection was reduced at higher pH values, compared to the 0 and 4 hr periods. Thus, infection efficiency in this system may be conditioned by acidity of rain and duration of exposure to an acidity level.

**SOLARIZATION FOR THE CONTROL OF FUSARIUM WILT OF WATERMELON.** R. D. Martyn and T. Hartz. Department of Plant Pathology, College Station 77843, and Texas Agricultural Extension Service, Weslaco 75956, Texas A&M University System.

Microplot trials were initiated to determine the effectiveness of soil solarization in controlling Fusarium wilt of watermelon (*Citrullus lanatus*) caused by *F. oxysporum* f. sp. *niveum* (FON). A sand/cornmeal inoculum mix was incorporated into methyl bromide treated soil in 84 cm (ID) concrete microplots. Infested plots were covered with 1.5-mil clear plastic and removed either 30 or 60 days later. Temperature maxima in solarized plots were 59 C, 50 C, 42 C, and 37 C, at 2, 10, 20, and 30 cm, respectively. Soil samples were assayed for FON at depths of 5-10, 15-20 and 30-35 cm. Plots solarized for 30 days showed a dramatic decline of FON throughout the soil profile compared to nonsolarized plots. Further decline in FON was achieved in the top 10 cm after 60 day treatment; however, FON increased in deeper strata. Solarization was effective in delaying the onset of wilt in "Sugarbaby" watermelon as well as reducing disease incidence, although total control was not achieved.

**REACTION OF NINE JERUSALEM ARTICHOKE GENOTYPES TO SELECTED PATHOGENS.** S. M. McCarter and S. J. Kays, Departments of Plant Pathology & Horticulture, University of Georgia, Athens 30602.

Jerusalem artichoke (*Helianthus tuberosus*) has received increased attention in recent years as a potential crop for fructose and fuel alcohol production. Rust (*Puccinia helianthi*), powdery mildew (*Erysiphe cichoracearum*), southern blight (*Sclerotium rolfsii*), and a tuber rot complex (*Fusarium* and *Pseudomonas* spp.) have reduced tuber yields in Georgia. Nine genotypes of *H. tuberosus* were compared for disease susceptibility in field plots near Athens, GA in 1983-84. Comber and one of its progeny had high *Puccinia* rust resistance. However, these selections were highly susceptible to *Coleosporium helianthi*, whereas the others were not. The nine selections varied in susceptibility to powdery mildew. Cultivars with pigmented tubers were less susceptible to the tuber rot complex than those with white tubers. No differences in susceptibility to *S. rolfsii* were noted. These results suggest the possibility of using breeding to improve disease resistance in *H. tuberosus*.

**INHIBITION OF SCLEROTINIA MINOR BY PENICILLIUM CITRINUM.** H. A. Melouk, F. A. Chanakira and K. E. Conway. USDA-ARS, Stillwater, OK, Dept. of Crop Science, Univ. of Zimbabwe, and Plant Pathology Dept., Okla. State Univ., Stillwater, OK 74708

*Penicillium citrinum* Thom was isolated from sclerotia of *Sclerotinia minor* recovered from field soil planted to peanuts. *P. citrinum* inhibited growth of *S. minor* on potato dextrose agar or Czapek-Dox agar (CDA). Growth of *S. minor* was significantly inhibited on CDA amended with 10% (v/v) filtrate from 2- to 3-wk-old cultures of *P. citrinum* grown on Czapek-Dox broth at 25 C. The inhibitor(s) was active against *S. minor* after autoclaving for 20 min at 121 C and 1.06 Kg/cm<sup>2</sup>. Dialysis and ultrafiltration of culture filtrate indicated that the molecular weight of the active compound(s) is  $\leq$  1000. Also, culture filtrate of *P. citrinum* incorporated in CDA at 10% (v/v) significantly inhibited growth of *S. major* and *Sclerotium rolfsii*. Citrinin, a biocide, was tentatively identified in the filtrate of *P. citrinum* as an active component against *S. minor*.

**EFFECT OF BEETLE REGURGITANT ON TRANSMISSION OF PLANT VIRUSES USING THE GROSS WOUNDING TECHNIQUE.** Judit Monis, H. A. Scott, and R. C. Gergerich, University of Arkansas, Fayetteville, AR 72701.

Regurgitant from Mexican bean beetles and bean leaf beetles prevented the transmission of non-beetle-transmissible zucchini yellow mosaic (ZYMV) and tobacco mosaic (TMV) viruses but had little or no effect on beetle-transmissible squash mosaic and cowpea severe mosaic viruses, when mixed with purified virus and inoculated to systemic hosts by the gross wounding technique. Two members of the bromovirus group, both of which are inefficiently transmitted by beetles, behaved very differently: brome mosaic virus was not inhibited by regurgitant, whereas cowpea chlorotic mottle virus (CCMV) acted like a non-beetle-transmissible virus. Infectivity of CCMV, ZYMV, and TMV was regained when the viruses in regurgitant-virus mixtures were re-purified in CsCl density gradients, demonstrating that non-beetle-transmissible viruses and the inefficiently-transmitted CCMV are not inactivated by regurgitant components.

**EVALUATION OF ARTHROBOTRYNS AMEROSPORAS AS A BIOCONTROL AGENT FOR HETERODERA GLYCINES ON SOYBEAN.** T. L. Niblack and R. S. Hussey, Department of Plant Pathology, University of Georgia, Athens, 30602.

A nematode-trapping fungus, *Arthrobotrys amerospora* (AA), in three commercial preparations of *Rhizobium japonicum* inoculum was evaluated for control of *Heterodera glycines* (HG) on soybean (*Glycine max* cv 'Bragg') in the field and greenhouse. In four successive greenhouse studies, soybeans were inoculated at planting with HG eggs (0, 10,000, or 20,000 per 15-cm diam pot) and treated with one of the AA preparations or Temik 15G at recommended rates, or were left untreated. Two field studies of the same nematode-control treatments were conducted in soil naturally infested with HG Race 3. In the greenhouse, only Temik significantly reduced nematode populations compared with the untreated controls, whereas in the field, none of the treatments provided significant nematode control or a yield increase.

**USE OF A LOW-COST, MULTISPECTRAL RADIOMETER TO ESTIMATE YIELD LOSS IN PEANUTS CAUSED BY LATE LEAF SPOT (CERCOSPORIDIUM PERSONATUM).** F. W. Nutter, Jr., R. H. Littrell, and V. D. Pederson, Departments of Plant Pathology, Univ. of Georgia, Athens 30602; Univ. of Georgia, Coastal Plain Station, Tifton 31793; and North Dakota State Univ., Fargo 58105.

Peanut leafspot epidemics of different intensities were generated in peanut (*Arachis hypogaea* 'Florunner') field plots by using fungicides that differed in control efficacy and by altering fungicide schedules. Disease severity was measured 115 days after planting by visual assessment (using standard area diagrams) and by recording the quality of sunlight reflected from peanut canopies in the 500- to 850-nm wavelength range using a hand-held, multispectral radiometer. Reflectance values in the 800-nm range explained 85% of the total variation in visual disease severity and 74% of the total variation in yield compared with the visual method, which explained 65% of the total variation in yield. Yield loss estimates derived from reflectance measurements could be generated in 4 hr, whereas the visual method required a minimum of 80 hr.

**ISOLATION AND CHARACTERIZATION OF ICE NUCLEATION-ACTIVE BACTERIA OCCURRING ON APPLE AND PEACH TREES IN GEORGIA.** J. W. Olive and S. M. McCarter, Department of Plant Pathology, University of Georgia, Athens 30602.

Buds or blossoms collected from two apple and two peach orchards in Georgia from December, 1984 through April, 1985 were assayed for ice nucleation-active (INA) bacteria. INA bacteria were present in all orchards although populations varied among orchards and sampling dates. Of the 40 INA strains selected and characterized, 88% were fluorescent, oxidase and arginine dihydrolase negative, and produced a hypersensitive reaction on tobacco, suggesting that they were pathogenic strains. *Pseudomonas syringae* was the predominant INA bacterium on both peach and apple, and many strains were INA positive at -5 C or higher. INA strains of *Erwinia herbicola* occurred infrequently and were usually INA only lower than -5 C. All INA strains from three of the four orchards were susceptible to streptomycin, but 66% of the strains from an apple orchard where streptomycin had been used routinely for fire blight control were resistant.

**EFFECT OF NEMATOCIDES AND HERBICIDES ALONE AND IN COMBINATION ON HATCHING, PENETRATION, DEVELOPMENT, AND REPRODUCTION OF MELOIDOGYNE INCOGNITA.** L. A. Payan, A. W. Johnson, and R. H. Littrell, Department of Plant Pathology, University of Georgia and USDA, ARS, Coastal Plain Experiment Station, Tifton, GA 31793.

The influence of phenamiphos (P, 6 ppm), carbofuran (C, 6 ppm), trifluralin (T, 0.5 ppm), metribuzin (M, 0.5 ppm), P+T, P+M, C+T, and C+M on hatching, penetration, development, and reproduction of *Meloidogyne incognita* (race 3) was studied under laboratory conditions. Eggmasses were exposed to fresh solutions of pesticides for 16 days and second-stage juveniles (J<sub>2</sub>) were collected every 48 hr. The J<sub>2</sub>'s collected from 6-8 days were used as inoculum in a series of tests to study penetration, development, and reproduction of nematodes on Rutgers tomato 4, 16, and 32 days after inoculation, respectively. The results indicated that P, P+T, and P+M inhibited (P=0.05) hatching, penetration, development of females, and numbers of eggs produced, but C, T, M, C+T, and C+M did not. This method can be used to study other nematode-pesticide combinations.

**SEASONAL SUSCEPTIBILITY AND INFECTION COURTS OF TEXAS LIVE OAKS INOCULATED WITH CERATOCYSTIS FAGACEARUM.** R. N. Peters and D. N. Appel, Department of Plant Pathology and Microbiology, Texas A&M University, College Station, TX 77843.

One hundred and twenty mature, native live oaks were selected for

inoculation with a Texas isolate of *Ceratocystis fagacearum* to study seasonal susceptibility and infection courts. Inoculations were made at four times of the year in 1983 and 1984 via roots, trunks, and lower branches. The success of root inoculations was 100%, 16%, 16%, and 50% in May, September, January, and March, respectively. Trunk inoculations were successful at the rates of 100%, 16%, 16%, and 83% in the same four months. Only one branch inoculation, performed in May 1983, produced oak wilt symptoms. Spread of the fungus was observed from root and trunk inoculations performed in May 1983. In one case, a single root inoculation resulted in infection of 23 trees within six months. Seasonal susceptibility and infection courts have proven to be important factors in successful colonization of Texas live oaks by *C. fagacearum*.

CURRENT STATUS OF SOYBEAN STEM CANKER IN THE SOUTHEASTERN UNITED STATES. R.G. Ploetz and F.M. Shokes, North Florida R.E.C., Route 3, Box 638, Quincy 32351.\*

Soybean stem canker was first identified in Mississippi in 1974 and is now found throughout soybean-growing areas in Alabama and Mississippi, and to a lesser extent in Florida, Georgia, Louisiana, South Carolina, and Tennessee. The disease has been found only twice in Arkansas and has not been reported in North Carolina, although the disease is probably present. Susceptible cultivars still are grown throughout the region, but where great losses have occurred, a high proportion of resistant cultivars now are used; in these areas, a reduction in the importance of the disease is anticipated. Because resistant cultivars are commonly infected, selection pressure for increased virulence should be low. Therefore, it is probable that new biotypes will not develop in response to the adoption of resistant cultivars.

CHARCOAL ROOT AND CROWN ROT OF ALFALFA IN NORTHERN FLORIDA. D. A. Roberts, Department of Plant Pathology, University of Florida, Gainesville, Florida 32611.

Charcoal root and crown rot, caused by *Macrophomina phaseolina* (Tassi) Goid., occurred in 1983 and 1984 at Gainesville, Florida, in experimental plots of alfalfa (*Medicago sativa* L. 'Florida 77'). Leaves on dwarfed shoots became light green or yellow and wilted before they died and turned brown. The fungus caused a dry, brown rot and shredding of stelar tissues of diseased tap roots and crowns; decaying cortical tissues were black. Numerous black pycnidia, approximately 200  $\mu$ m in diameter, contained hyaline, ovate, one-celled conidia (approximately 12 X 24  $\mu$ m). A few black sclerotia were observed. *M. phaseolina*, a known pathogen of alfalfa, is already widespread in the state as a pathogen of such crop plants as corn, soybean, cowpea, and pine. It could become an important stand-depleting agent in alfalfa, which has been recently recommended for commercial production in Florida.

EFFECTS OF TILLAGE AND CROPPING ON SOUTHERN STEM CANKER OF SOYBEANS. C. S. Rothrock, T. W. Hobbs, and D. V. Phillips, Dept. of Plant Pathology, Georgia Experiment Station, Experiment, GA 30212.\*

During the 1983 and 1984 seasons, Hutton soybeans were assessed for southern stem canker in an experiment designed to test the effects of conventional vs. no tillage and monocropping vs. doublecropping (wheat/soybeans). Percentage of diseases plants (dead + cankered) was determined each year. In 1983, disease incidence was low (less than 2% overall) but was significantly higher in no tillage plots. In 1984, total disease incidence was greater than 70%; more disease was present in no tillage plots than in conventional tillage plots (84.8% and 63.6%, resp.). A similar pattern was found for pathogen isolation in 1984. Double-cropped plots had significantly more dead plants both years. These data show that no tillage contributes to increased disease incidence and that stem canker can increase from a barely detectable amount to an epiphytotic level in one year.

RATE REDUCING RESISTANCE TO NARROW BROWN LEAF SPOT IN RICE. D. N. Sah and M. C. Rush, Dept. of Plant Path. and Crop Phys., La. Agric. Expt. Sta., La. State Univ. Agric. Ctr., Baton Rouge, LA 70803.

Twenty-two rice lines with mean disease ratings of 2 to 4, on a 0 to 9 scale, were evaluated for their apparent infection rates and disease severity values during 1983. Terminal severity values ranged from 0.8 to 25.5% and infection rates from 0.05 to 0.20 in resistant and susceptible varieties, respectively. Five lines which exhibited low apparent infection rates in 1983, as well as one line with monogenic resistance and one susceptible check variety, were evaluated in the field during 1984 using isolates of *Cercospora oryzae* Miyake from

Texas, Arkansas, and Louisiana. Four of the five rice lines showed rate reducing (horizontal) resistance to narrow brown leaf spot. These data constitute the first report of a possible source of horizontal resistance to this pathogen.

EPIDEMIOLOGY OF VIRUSES INFECTING CUCURBITA PEPO IN S.C. B. Sammons and O. W. Barnett, Dept. of Plant Pathology & Physiology, Clemson Univ., Clemson, SC 29631.

Selected commercial fields of yellow summer squash (*Cucurbita pepo* 'Dixie hybrid') in Greenville Co. were monitored for watermelon mosaic virus-1, watermelon mosaic virus-2 (WMV-2), tobacco ringspot virus (TRSV), cucumber mosaic virus, and squash mosaic virus. Viruses were identified by ELISA and gel double diffusion serology. WMV-2 and TRSV were the only viruses detected. WMV-2 incidence increased to a maximum of 73% infection in one field whereas TRSV infection was less than 1% in another field. The pattern of plants infected with WMV-2 was random, whereas TRSV spread in a plant-to-plant fashion. The predominant aphid species, as determined by yellow pan traps, in the WMV-2 field were *Macrosiphum euphorbiae*, *Myzus persicae*, *Macrosiphum ambrosiae*, *Aphis rubifolii*, and *A. cornifoliae*, in descending order of frequency. *Xiphinema americanum* was present in the TRSV field, and bait plants in field soil were infected. TRSV in smooth pigweed (*Amaranthus hybridus*) was seed transmitted.

COMPARISON OF AN ENZYME-LINKED IMMUNOSORBENT ASSAY (ELISA) AND A FILTER PAPER DOT-IMMUNOBINDING ASSAY FOR DETECTION OF WHEAT STREAK MOSAIC VIRUS. J. L. Sherwood, Plant Pathology Dept., Oklahoma State University, Stillwater, OK 74078.

Direct sandwich ELISA and a filter paper dot-immunobinding assay were compared for detection of wheat streak mosaic virus (WSMV) in purified or crude sap preparations from wheat. The filter paper dot-immunobinding assay, originally developed for detection of seed proteins (Anal. Biochem. 132:462), has been adapted for detection of plant viruses (Haber, S., Agriculture Canada, Winnipeg, Manitoba). With purified preparations, 2 ng/ml of WSMV were detected by ELISA, and the degree of response was linear for 4 to 256 ng/ml. With dot-immunobinding, 64 ng/ml of WSMV were detected, and the degree of response appeared similarly linear. In crude sap, ELISA was more reliable in discerning differences in virus concentrations at different days after inoculation than the dot-immunobinding assay. The dot-immunobinding assay could readily differentiate virus-infected and uninfected plants and can be completed in less than 2 hr.

RESPONSE OF LEAFSPOT-RESISTANT PEANUT GENOTYPES TO THREE LEVELS OF DISEASE MANAGEMENT. F. M. Shokes, and D. W. Gorbet, North Florida Research and Education Center, Rt. 3, Box 638, Quincy, FL 32351.

Five peanut (*Arachis hypogaea* L.) genotypes were evaluated under three leafspot disease management programs from 1979-83. Three resistant breeding lines (72x93-9-1-b [BL1]), 72x93-10-2-1-b, 72x83B-7-2-1B), a plant introduction (PI 261893), and a susceptible cultivar (Florunner) were used. Control programs were: no fungicide, fungicide (chlorothalonil) applied on a 20-day interval (minimal management), or fungicide applied on a 10-day (1979-80) or a 14-day interval (1981-83). Mean yield loss for 5 yr due to disease ranged from 12.5% for BL1 to 51% for Florunner when no fungicide was applied. The two genotypes sustained losses of 2.1% and 20.8%, respectively, under the minimal program. Examination of disease progress data indicated that the PI had the highest level of resistance of the genotypes tested. Best separation of the genotypes according to resistance was obtained using the areas under the disease progress curves.

SCREENING STRAWBERRY PLANTS FOR RESISTANCE TO COLLETOTRICHUM FRAGARIAE. B. J. Smith and L. L. Black, USDA-ARS, Small Fruit Res. Sta., Poplarville, MS 39470; and Dept. of Plant Path. and Crop Physiol., La. Agric. Expt. Sta., La. State Univ. Agric. Ctr., Baton Rouge, LA 70803, respectively.

*Colletotrichum fragariae* may infect any of the above ground parts of the strawberry plant. The conidial plant spray inoculation method currently used identifies plants with resistance to petiole infection of anthracnose; however, crown rot is the most destructive phase of this disease in the southeastern U. S. Various inoculation methods were evaluated for their utility in an anthracnose resistance screening program. A "crown injection + plant spray" inoculation method with a conidial suspension consistently gave higher disease severity ratings than other inoculation methods tested. More than 50% of the seedlings derived from crosses between some resistant strawberry lines survived following inoculation by this method. These results indicate that some strawberry plants have resistance to the crown rot phase of anthracnose and that they can be identified by a crown injection inoculation.

\* = Presentation of Soybean Stem Canker Symposium

INTERACTIONS BETWEEN MELOIDOGYNE INCOGNITA, FUSARIUM OXYSPORUM F. SP. VASINFECTUM AND THE ENDOMYCORRHIZAL FUNGUS, GLOMUS INTRARADICES ON COTTON. G. S. Smith, R. W. Roncadori, and R. S. Hussey, Department of Plant Pathology, University of Georgia, Athens, GA 30602.<sup>+</sup>

Root-knot susceptible cotton (Stoneville 213) was grown in fumigated soil infested with five conidial inoculum densities of *Fusarium oxysporum* f. sp. *vasinfectum* race 1 (FOV), four inoculum densities of *Meloidogyne incognita* (MI) eggs, and with or without the endomycorrhizal fungus, *Glomus intraradices* (GI), in a greenhouse factorial design. MI X FOV interactions were highly significant for boll weights and GI root colonization. Boll weights were not reduced until initial FOV soil infestation levels were 50 cfu/g soil and MI inoculum levels were 375 eggs/100 cm<sup>2</sup> soil. All two-factor treatment combinations had highly significant effects on MI reproduction (eggs/g root). Nematode reproduction was stimulated by increasing inoculum levels of MI and FOV, whereas GI reduced nematode reproduction by 42% to 86%. Wilt incidence was not affected by GI.

ESTIMATION OF LEAF SPOT SEVERITY ON ALFALFA USING SUBSAMPLING WITHIN STEMS. W.M. Thal and C. Lee Campbell. Department of Plant Pathology, North Carolina State University, Raleigh, 27695.<sup>+</sup>

Pattern of leaf spot severity among leaves within alfalfa stems was investigated to determine appropriate sampling procedures for application of video image analysis in estimating leaf spot severity. Stems were collected from 24 or 28 cvs. in experimental plots at 2 locations in NC during 1983. Relative position and a visual estimate of leaf spot area (%) were recorded for each leaf. Variation in severity due to stems within a plot, upper vs. lower half of plant, nodes within a plant half and leaves within a node was estimated. Leaves within a node accounted for the greatest percentage of total variation, usually > 70%. Difference in severity between lower and upper plant halves was another important source of variation. The results indicate that disease estimation should involve sampling of nodes from upper and lower strata within a stem and high rates of subsampling at sampled nodes.

RESISTANT REACTION OF MUSKMELON LINE MR-1 AGAINST DOWNY MILDEW. Claude E. Thomas, USDA, ARS, U. S. Vegetable Laboratory, Charleston, SC 29407.

Muskmelon (*Cucumis melo* L.) line MR-1 is an inbred derived from P.I. 124111. It has a unique resistant reaction against downy mildew incited by *Pseudoperonospora cubensis* (Berk. & Curt.) Rost. Lesions on leaves of MR-1 are small (1-2 mm), circular, chlorotic, and water-soaked, whereas lesions on leaves of susceptible cultivars are large (10-15 mm), irregular, and yellow. Previously, the recognition of downy mildew resistance in *C. melo* germplasm has been based on the presence of brown rather than yellow lesions. Extremely limited sporulation is present on MR-1 only when environmental conditions are optimal. Sporulation per unit of leaf area on MR-1 is <1% of that on susceptible commercial cultivars. Lesions on MR-1 do not expand and result in leaf collapse as they do on susceptible cultivars. Research supported by BARDC.

REACTIONS OF SUDANGRASS ACCESSIONS TO STRAIN B OF MAIZE DWARF MOSAIC VIRUS. Stephen R. Vann, Robert W. Toler, Dept. of Plant Pathology & Microbiology, and Frederick R. Miller, Dept. of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843

Seventy-three foreign and domestic sudangrass (*Sorghum sudanense* Hitchc.) accessions were screened for resistance to maize dwarf mosaic virus - Strain B. During the winter of 1983, seedlings grown in plastic containers in the greenhouse were inoculated at the 3-5 leaf stage using a DeVilbiss paint spray gun at a pressure of 6.33 kg/cm<sup>2</sup>. Disease symptom severity was rated after three weeks. Symptoms varied from mild to severe mosaic. Of the accessions tested, 50 were susceptible, 13 intermediate, and 10 resistant. Examples of resistant candidates included Tift and Piper; intermediate candidates included DLS-11 and TE-1004; and susceptible candidates included GA 337 and Trudan 6. With the use of known antisera of strain B, double diffusion tests were conducted to confirm infection with the virus.

POLLINATION, A MAJOR FACTOR CONTROLLING THE FLORAL INFECTING SMUT, *TOLYOSPORIUM PENICILLARIAE*, OF PEARL MILLET. Homer D. Wells, Wayne Hanna and Glenn W. Burton, USDA,ARS, Coastal Plain Station, Tifton, GA 31793.

Pearl millet cytoplasmic male sterile line 23 AE (S) and the isogenic restorer line 23 BE (F) were inoculated by spraying heads to run-off in the late boot stage but prior to stigma emergence with a sporidial budding suspension (ca 1 x 10<sup>4</sup>/ml) of *Tolyosporium penicillariae*. Heads were inoculated at ca 4:00 p.m. and immediately covered with pre-wetted 6½ x 25 cm plastic bags. After 16 h the plastic bags were removed and heads covered with glassine bags. After 22 h a portion of F were pollinated (FP) with the remainder depending on self pollination only. Heads were rated for smut development after 21 d. Ratings were as follows: 0 = no smut, 1 = 0-10%, 2 = 10-30%, 3 = 30-70%, 4 = 70-90% and 5 = more than 90% of florets showing smut. The average rating of S, F and FP were 3.0, 2.0 and 1.0, respectively. Percentage of heads with 30% or more of the florets showing smut for the S, F, and FP were 66, 35, and 0.0%, respectively.

VARIATION IN VIRULENCE EXPRESSED BY SINGLE BASIDIOSPORE ISOLATES OF RHIZOCTONIA ZEAE. A. S. Windham and L. T. Lucas, Department of Plant Pathology, North Carolina State University, Raleigh 27695.

Twenty single basidiospore isolates derived from each of three field isolates of *Rhizoctonia zeae* were inoculated on Kentucky 31 tall fescue to evaluate their pathogenicity. Isolates were grown on oat-water medium for 10 days before inoculating 4-wk-old tall fescue. Tall fescue in 10.2-cm clay pots was inoculated with 0.5 g (fresh weight) of inoculum and incubated in a humidity chamber in the greenhouse for 7 days. Disease severity was assessed at 4 and 7 days using the Horsfall-Barratt scale. All 60 of the isolates were pathogenic on tall fescue. Disease severity reactions after 7 days for single basidiospore isolates of RZ 215, RZ 247, and RZ 255 ranged from 12-74%, 9-67%, and 12-88%, respectively. Most of the isolates were less virulent than their respective parents.

RESPONSE OF SOYBEANS TO HETERODERA GLYCINES AND IRRIGATION. L. D. Young and L. G. Heatherly, USDA-ARS, 605 Airways Blvd., Jackson, TN 38301 and P. O. Box 196, Stoneville, MS 38776, respectively.

Essex soybeans were grown in 56-cm diameter microplots under a transparent shelter for 2 yr in a silt loam soil that was either infested with *Heterodera glycines* (Hg) or noninfested (fumigated with methyl bromide). Wet (-0.1 to -0.3 bar) and dry (-0.5 to -0.8 bar) soil water potentials were maintained in the upper 35 cm of soil for each level of nematode infestation. Response of leaf area and shoot weight to treatments was wet>dry and noninfested>infested, with no significant (P=0.05) interaction. Significant interaction between treatments occurred for pod weight; response was wet-noninfested>dry-noninfested=wet-infested=dry-infested. In 1983 significant (P=0.10) interaction occurred for seed yield; response was wet-noninfested>wet-infested=dry-noninfested>dry-infested. Root weights in the 0-15 and 15-30-cm soil zones were equal for all treatments. Significantly more first generation Hg cysts occurred in the wet-infested treatment.

1,3-DICHLOROPROPENE IN BROADCAST VERSUS STRIP TREATMENTS FOR CONTROL OF PEACH TREE SHORT LIFE. E. I. Zehr and J. K. Golden, Dept. of Plant Pathology and Physiology, Clemson University, Clemson, SC 29631.

Broadcast and strip treatments of 1,3-dichloropropene (1,3-D) at 136 L/ha were compared for control of *Criconebella xenoplax* and short life of peach trees in 12-tree plots replicated four times. The strip treatment, 2.4 m wide centered on the tree row, covered 50% of the plot surface area. The 1,3-D was applied ca. 25 cm deep by shanks 25 cm apart 4 mo before Sunhigh peach trees on Lovell rootstock were planted. The 1,3-D treatment controlled *C. xenoplax* for ca. 2 yr after application. Short life occurred in the third year in the control and strip-treated plots but did not appear until the fifth year in broadcast-treated plots. By the sixth year, 21, 60, and 67% of trees in the broadcast, strip, and control treatments, respectively, had died. Broadcast preplant treatments of 1,3-D appear to be more effective than strip treatments for extending tree longevity in short-life sites.

<sup>+</sup> = Student Paper Competition