Abstracts of the 1970 Annual Meeting of the Southern Division of The American Phytopathological Society

Bougainvillea blight caused by Phytophthora parasitica. S. A. ALFIERI, JR. (Fla. Dep. Agr., Gainesville). A foliar blight of *Bougainvillea* was first observed in 1968 in Fort Myers, Fla. The lesions occur as small, dark-green, irregular, hydrotic spots, usually starting at the tips and margins of the younger leaves. Under favorable conditions for disease development infection is rapid, and as the lesions enlarge the entire leaf becomes necrotic. Such leaves become limp, blackened, and curled. Floral bracts are extremely susceptible. Symptoms are manifest by the appearance of tan lesions of collapsed tissue having a reticulate appearance. The fungus often invades the petiole and stems. Older, mature leaves have never been found infected and appear to be immune. Of the four *Bougainvillea* cultivars tested for resistance, Sanderiana (purple) was found to be highly resistant, After Glow moderately resistant, and Barbara Karst and Gold highly susceptible. Preliminary results obtained toward disease control indicated that of the three fungicides tested, Daconil 2787 was most effective, captan moderately effective, and basic copper sulfate (53% metallic) least effective.

A new disease of Mahonia bealei in Florida. S. A. ALFIERI, JR., C. P. SEYMOUR, & E. K. SOBERS (Fla. Dep. Agr., Gainesville, Univ. Ga., Coastal Plain Sta., Tifton). A species of *Cylindrocladium* causing spotting and marginal necrosis of leaves of *Mahonia bealei* was discovered at Monticello, Fla., in May 1969. Individual lesions first appear along the leaf margin as irregular, light-brown spots surrounded by a diffuse chlorotic area. As the lesions enlarge, they coalesce to produce a generalized marginal necrosis followed by complete necrosis of the leaf. Although the fungus resembles *C. scoparium* superficially, it is considered to be different and is easily distinguished from this species. Its ellipsoid-to-oval vesicles are significantly smaller, 9.5-20.4 × 6.8-8.8 μ (avg 15.8 × 7.6 μ), as compared with 19.0-37.7 × 8.3-14.5 μ (avg 29.6 × 11.9 μ) for *C. scoparium*; and its conidia are 47.6-76.2 × 4.1-5.4 μ (avg 62.7 × 4.6 μ), as compared with 34-57.1 × 3.5-4.8 μ (avg 43.6 × 4.4 μ). The average conidium size of the new *Cylindrocladium* (62.7 μ) exceeds the upper extreme of *C. scoparium* (57.1 μ), and the lower extreme (47.6 μ) is larger than the average conidium size (43.6 μ) of *C. scoparium*. Differences in the shape of phialides and amount of conidiophore branching are also apparent. Pathogenicity to leaves of *M. bealei* and to *Rhododendron indicum* 'Pride of Dorking' has been established.

Histological studies on the mode of penetration of boll rotting organisms into developing cotton bolls. L. F. BAEHR & J. A. PINCKARD (La. State Univ., Baton Rouge). Boll tissues involved in dehiscence of *Gossypium hirsutum* 'Stoneville 7A' and 'DPL 16' were studied to determine their role in boll rot. Microtome sections were made along the suture lengths of field-grown bolls aged 5-50 days from anthesis. Sutural anatomy was described, and progress of dehiscence followed for each boll age. Sutural splitting proceeded centrifugally with age of bolls. Exocarps of bolls approximately 45 days of age were completely separated, exposing the locules. Paradermal sections of apparently healthy field boll surfaces aged 5-55 days were also made to investigate entry of boll-rotting organisms. Sections revealed fungal spores and/or mycelia randomly covering the surface of the bolls after the 10th day. As the age of the boll increased to the 20th-25th day, a marked change in the stomata was noted. The guard cells seemed to become nonfunctional or senescent, remained open, and the stomata were penetrated by various fungal mycelia. Those tentatively identified to genus included species of *Alternaria, Fusarium, Curvularia, Verticillium, Aureobasidium,* and *Diplodia.* The external boll sutures and the bractioles which surround them have been found to be a source of abundant inoculum available for entry of the opened guard cells and partially dehisced sutures.

Effects of drying, storage gases, and temperature on development of mycoflora and aflatoxins in stored high-moisture peanuts. G. L. BARNES, G. L. NELSON, & H. B. MANBECK (Okla. State Univ., Stillwater). Molds develop on high-moisture peanuts when improperly dried or held in bulk. Storage of pods in N_2 or CO_2 to prevent mold growth and aflatoxin production was tested. Nondried and partially dried pods were inoculated with *Aspergillus flaxus* conidia and stored in chambers held at 3 and 24 C. Air, N_2 and CO_2 were metered through replicated chambers. Spaced samples were assayed for quality, moisture, mycoflora, and aflatoxins. All air-treated pods at 24 C soon became covered with species of *Fusarium, Rhizopus,* and *Mucor,* but the moldy, partially dried pods soon became overgrown with *A. flavus.* Mold development was greatly delayed by cold or N_2. CO_2 prevented mold development for over 2 weeks at 24 C while those held 36 days at 3 C in CO_2 had their original mold-free appearance and a near-normal odor. Moldy pods had a fermentation odor. High concentrations of aflatoxins occurred in air-stored pods at 24 C. Concentrations increased with time. Higher concentrations occurred in nondried pods than in partially-dried pods. CO_2 and N_2 treatments produced aflatoxin-free kernels. Mold fungi were isolated from all pod samples regardless of treatment. CO_2 and N_2 were fungistatic.

Effects of time of inoculation with maize dwarf mosaic virus strain A on the agronomic characteristics of grain sorghum hybrids. R. D. BATTE, R. W. TOLER, & A. J. BOCKHOLT (Texas A&M Univ., College Station). The study was conducted to determine the effect of the time of inoculation with maize dwarf mosaic virus on some agronomic characteristics of a tolerant and a susceptible grain sorghum hybrid. A completely randomized block design with three replications was utilized. Mass inoculation of the plants was accomplished through use of the artist's airbrush procedure. The virus was found to cause reduction in yield, delay in maturity, stunting, and lowering of test wt of both hybrids. Additional effects on the susceptible hybrid included a reduction in head size, threshing per cent, and the number of heads produced. Per cent protein of the susceptible hybrid was increased. There was no effect of the virus on the seed size, wt of 1,000 seed, or sp gr of either hybrid. The magnitude of the effects of the virus was dependent upon the particular hybrid and the time of inoculation. As expected, the tolerant hybrid was affected to a lesser degree than the susceptible hybrid. In general, the earlier in the growth cycle of the plant that infection occurred, the greater was the effect of the virus. For most characters, MDMV had little or no effect when inoculation was made after 40 to 47 days of growth.

Cotton varieties which resist and escape multiple diseases. L. S. BIRD (Texas A&M Univ., College Station). It has been determined that resistance and escape from five major cotton diseases (seedling disease, bacterial blight, *Fusarium* wilt, *Verticillium* wilt and *Phymatotrichum* root rot) are interrelated and have genes in common. This led to the hypothesis that multiple disease-resistant cottons may be developed with relative ease. This report gives performance of strains developed under this hypothesis. Some success came from selecting in initial populations with limited genetic variability. Selections from the fourth cycle of hybridization were the first to strongly support the hypothesis. The selections prevented or significantly reduced economic loss from five major diseases. They performed as well or better than cultivars where no known diseases were present. Strains which resist and escape known pathogens would perhaps resist unknown ones, and would be expected to perform more consistently across locations and years. Performance of selections suggest this is the case. The results suggest that simultaneous selections for high-yielding ability and desirable fiber and seed also occurred. This reverses the classical

difficulties of combining disease resistance with favorable production and product quality. Although favorable levels of resistance and production have been recovered in strains, potential levels of all traits have not been reached. Initial performance of selections from newer hybrid populations suggest that additional improvements have been made.

Status of genetically improving varieties of cotton for resistance to bacterial blight. L. S. BIRD, M. A. F. TAYEL, & W. E. BATSON (Texas A&M Univ., College Station). Cotton cultivars from programs where breeding for blight resistance is absent, those from programs planned for a slow introgression of genes into susceptible cultivars, and advanced strains from the Texas program where major emphasis is on resistance were compared in field plantings. The plantings were inoculated with *Xanthomonas malvacearum* races 1, 2, 7, and 14. Leaf lesions were graded from 1 (no infection) to 10 (full susceptibility). All plants of cultivars from programs where breeding for resistance is absent were susceptible. Cultivars from programs with resistance breeding have plants with varying degrees of resistance and higher average levels of resistance. No cultivar was uniformly resistant; thus, they may have losses from the disease and contribute to selection of new races of the pathogen. In many of the Texas advanced strains, all plants were immune and provided control of bacterial blight with preclusion of selecting new races of *X. malvacearum*. The strains were equal or superior in production to many commercial cultivars in the absence of blight. Thus, a breeding program with emphasis on resistance has been more efficient and effective in cotton improvement in comparison with programs planned for a slow introgression of genes into varieties.

Quantitative and qualitative effects of maize dwarf mosaic virus infection on two grasses. J. V. CANERDAY & R. T. GUDAUSKAS (Auburn Univ., Auburn, Ala.). Effect of maize dwarf mosaic virus (MDMV) infection on yield, protein content, and digestibility of Johnson grass, *Sorghum halepense,* and a sorghum-sudangrass hybrid, *S. vulgare* × *S. sudanense* 'Funks 77F', was investigated. Plants were grown in plastic pots in the greenhouse and mechanically inoculated in the seedling stage with sap from MDMV-infected corn plants; controls were inoculated with healthy sap. At intervals after inoculation, cuttings of the grasses were made for determining dry matter yield, protein content by the semimicrokjeldahl method, and digestibility by the small-sample in vivo digestion procedure. MDMV did not significantly affect yield of Johnson grass at either of two cuttings; however, slight (1-2%) increases in digestibility and protein content of infected grass as compared to healthy were found at first and second cuttings, respectively. Yield of MDMV-infected sorghum-sudangrass was unaffected at the first cutting, but reduced by 40 and 12% at the second and third cuttings. No significant effect of MDMV on protein content or digestibility of the grass was detected at any cutting.

Effect of planting date, soil moisture, and soil temperature on incidence of cotton seedling blight pathogens. A. Y. CHAMBERS, L. F. JOHNSON, & J. W. MEASELLS (Tenn. Agr. Exp. Sta., Jackson & Knoxville, and ESSA Weather Bureau, Jackson). Cotton was planted at intervals during April and May of 1963-68. Soil temp and moisture content were recorded for 30 days after each planting. Fungal isolations were made from necrotic hypocotyl segments. *Pythium* spp. were more prevalent on seedlings killed before emergence from soil; *Rhizoctonia solani* was isolated more frequently from emerged seedlings. *Pythium* was isolated more frequently from cotton planted during April; *R. solani* was more prevalent on cotton planted during May. Isolation frequency of *Pythium* was correlated negatively with soil temp and positively with soil moisture content. At mean min soil temp of 13.3 C or lower, 16-25 days after planting, most diseased seedlings were attacked by *Pythium*. Progressively fewer seedlings were attacked by *Pythium* as temp became higher. Cotton was rarely injured by *Pythium* when mean min temperature was 19.5 C or higher. Seedlings were attacked equally well by *R. solani* through a range of mean min temperatures of 13.8 C to 23 C, but rarely isolated when temp were lower than 13.8 C. Soil moisture content was related positively to killing of germinated but nonemerged seedlings by *Pythium* but not by *R. solani. Pythium* was isolated eight times more frequently than was *R. solani* from such seedlings in wet soil.

Autumn introduction and winter survival of poplar rust on the Texas coastal plain. A. CHITZANIDIS & E. P. VAN ARSDEL (Texas A&M Univ., College Station). The life cycle of poplar rust (all collections were *Melampsora medusae*— = *M. albertensis*) has been worked out for the Gulf coastal plain in Texas. Although telia on fallen dead leaves released sporidia in the spring, this stage is locally functionless without alternate hosts. The fungus can occasionally overwinter as uredia on green leaves in sheltered places. In the late spring, however, the disease was slowed, then ceased. The last uredia in 1969 with few viable spores were observed in June. Very few urediospores germinated at 30 and none at 35 C. They were killed after 3 hr at 35 C. Therefore, high temp prevents the spread of the disease during summer. Newly formed uredia were observed near College Station on 26 September in a cool forest opening in a cool valley. On 2 October, there was a widespread infection of poplar. Hundreds of pustules occurred on each leaf in favorable microclimates on the first wave of infection, indicating the presence of a great amount of inoculum in the air. During 1969, the first uredia appeared 11 August at Urbana, Illinois, 8-12 September at Broken Bow, Oklahoma, and 26 September at College Station. This reintroduction from the north as the weather cools seems to occur annually.

Chemical control of bacterial canker of tomato with ristocetin and vancomycin. W. F. CONGLETON & D. HUISINGH (N. C. State Univ., Raleigh). Of 48 compounds screened for their effectiveness against *Corynebacterium michiganense* in vitro and subsequently in vivo using a root-soak application and foliar inoculation to detect translocated compounds, 13 proved effective. Manapal tomato plants treated by soaking the roots 14 hr in ristocetin at 10^2 or vancomycin at 10^3 μg/ml prior to stem inoculation developed no bacterial canker symptoms in a greenhouse test within 24 days. Plants similarly treated and planted into infested soil had 60-70% fewer diseased plants 75 days after transplanting than untreated plants. Plants treated as above with 10^2 μg/ml vancomycin, planted in infested soil and sprayed three times at 5-day intervals with 10^2 μg/ml vancomycin, had 45% fewer diseased plants 75 days after transplanting than unsprayed or untreated plants. These same compounds and treatments substantially reduced the incidence and severity of bacterial canker in the field in stem-inoculated plants observed for 62 days after inoculation. Foliar sprays alone proved to be ineffective. Two definite advantages of these two antibiotics are that (i) they are translocated; and (ii) they are not absorbed from the human gastro-intestinal tract.

Microorganisms isolated from boles of healthy longleaf pines. R. C. DE GROOT & D. L. LOTT (Southern Forest Exp. Sta., USDA, Forest Service, Gulfport, Miss.). During midsummer 1969, one 6-foot section from the trunk of each of five longleaf pine trees was longitudinally bisected. Isolations were attempted from the median face of one-half of each bolt at points adjacent to the cambium, at 1-inch intervals across the sapwood, in the middle of the heartwood, near the pith, and within the pith. This cross-sectional series of isolations was performed with each of seven media at both ends of the bolt and at approximately 6-inch intervals along its length. Fifty-one of 1,925 attempted isolations were positive. Bacteria tentatively identified as *Bacillus subtilis* and *B. pumilis* were the predominant organisms isolated from sapwood. Four other species of bacteria were occasionally isolated from the sapwood, as were *Paecillomyces*

warottii and *Streptomyces* and *Geotrichum* spp. Nothing was isolated from either the heartwood or the pith.

A virus-induced RNA polymerase in cell-free extracts of TMV-infected tobacco leaves. K. S. DERRICK & R. S. HALLWELL (Texas A&M Univ., College Station). A particulate fraction which sediments at 12,000 *g* from a cell-free extract of TMV-infected tobacco leaves has been shown to contain an actinomycin D-independent RNA polymerase. The polymerase was made soluble by treating the fraction with Triton X-100 and mercaptoethanol. This ability to synthesize RNA in the presence of actinomycin D was observed in cell fractions 72, 96, and 120 hr following inoculation with TMV, and was not observed in similar fractions from healthy tissue. RNA synthesis was indicated by the incorporation of tritium labeled UTP into acid-insoluble material in the presence of ATP, GTP, and CTP. The incorporation of labeled UTP did not occur in the absence of the three unlabeled ribonucleoside triphosphates.

Effect of temperature on composition of Pythium irregulare and Pythium vexans. W. M. DOWLER & H. F. CANTRELL (ARS, USDA, Clemson University, Clemson, S.C.). *Pythium irregulare* and *P. vexans* were grown in liquid shake culture in a glucose-rich medium at 22, 27, and 32 C. Although *P. irregulare* grew twice as rapidly as *P. vexans,* the following observations apply in general to both fungi. Free sugar content of the mycelia decreased significantly as temp increased, while protein content increased with temp. Significant trends were not observed with lipid and alcohol-insoluble carbohydrate content of mycelia. Either lipid or alcohol-insoluble carbohydrate increased as temp was raised, accompanying the decrease in sugar content. This suggests a balancing effect of these reserve substances in these fungi. Apparently there was an increased conversion of carbohydrate to protein as incubation temp rose. This hypothesis is supported by the observed changes in composition which suggest utilization of carbohydrate reserves for protein synthesis. There is a marked influence of temp on fungal metabolism and composition.

The influence of crop rotations, crop sequences within rotations, and fallowing on black shank of flue-cured tobacco. P. D. DUKES (Univ. Ga., Coastal Plain Exp. Sta., Tifton). Field plots uniformly infested with *Phytophthora parasitica* var. *nicotianae,* the causal agent of black shank of tobacco, were established for long-range studies to determine the influence of cropping and cultural systems on the incidence and severity of this disease. Disease incidence (DI) for continuous tobacco, with and without a winter cover crop, was high for 4 years of this study, resulting in no yield of tobacco. Clean fallow or marigolds-weeds for 3 successive years reduced the DI to 2% or less. A number of crops when grown for 3 years were effective in reducing the DI to less than 15% when tobacco was again planted in these plots; and good yields of tobacco were evident for most treatments. The crops in order of the lowest DI (% disease) were rye-weeds (3), peanuts (7), bahia grass (9), cotton (9), and soybeans (14). Three years of weeds resulted in a high DI (26%); however, corn resulted in 49% DI, which was the highest of all treatments. Sequences of crops that included corn just prior to tobacco generally resulted in an increase in black shank over those without corn. Thus, a number of crop and cultural treatments, e.g., peanuts, clean fallow, rye-weeds, and bahia grass, are much more effective than others in reducing black shank. Although some of the treatments resulted in economic control of the disease, none eradicated the pathogen from the soil.

Field and greenhouse evaluations of nematicides for soybean cyst nematode control. J. M. EPPS (USDA, Univ. Tenn., Jackson). Systemic and contact nematicides reduced the number of soybean cyst nematodes, *Heterodera glycines,* when applied to infested soil in greenhouse tests. Some treatments resulted in increased top wt and a decrease in white female development on the roots. In field tests, application at time of planting resulted in an increase in the vigor of the plants when compared to nontreated plots. Some treatments were slightly phytotoxic to the young plants, and some reduction in stand was noted. There was a significant increase in yield in some cases, but in no case did a treatment significantly increase the yield over that of the resistant Pickett or Dyer cultivars that were not treated. These limited tests indicate that some of the new systemic and contact nematicides may have a place in the control of nematodes in the low per acre income crops.

Physiologic race identification in Sphacelotheca reiliana. R. A. FREDERIKSEN & L. K. EDMUNDS (Texas A&M Univ., College Station, ARS, USDA, Manhattan, Kan.). Natural populations of most plant parasites are composed of numerous physiologic forms. Widespread use of common sources of resistance reportedly has provided a suitable background for intense selection pressure for more virulent physiologic forms of various pathogens. During the past 2 years a new race of *Sphacelotheca reiliana* has developed that attacks a large percentage of the popular formerly smut-resistant sorghum hybrids. We currently recognize three races of *S. reiliana* on three differential hosts: SA7078, universally susceptible; SA281, susceptible to race 2 but resistant to races 1 and 3; Tx414, resistant to races 1 and 2, susceptible to race 3. Race 1 is common to most sorghum-growing areas; race 2 occurs on the West Coast; race 3 differs from race 1 only on the basis of its ability to attack Tx09 (Combine White Feterita) and other sorghum lines possessing the same smut-conditioning gene derived from Tx09. Many breeding lines of sorghum are resistant to both race 1 and race 3.

A new species of Cylindrocladium on Ilex. D. L. Gill & E. K. SOBERS (ARS, USDA, Univ. Ga., Coastal Plain Exp. Sta., Tifton). A new species of *Cylindrocladium* associated with severe defoliation and leaf spotting of *Ilex cornuta* 'Burfordi' and 'Rotunda', *I. crenata* 'Helleri', *I. opaca* 'Savannah', and *I. vomitoria* 'Nana' has been observed in southwest Georgia for the past 3 years. The disease is characterized by the appearance of small chlorotic spots that become purplish black as they enlarge. Mature lesions are circular, frequently zonate, 10-15 mm in diam, with gray to tan centers and wide purplish black margins. The fungus fruits abundantly on leaf lesions, but growth on most culture media is slow and scant. Pathogenicity of the fungus to leaves of *I. cornuta* 'Rotunda', *I. crenata* 'Helleri', *I. vomitoria* 'Nana', and *Rhododendron obtusum* 'Hinodigiri' and 'Coral Bell' has been established. The most significant morphological feature of this fungus is the avesiculate stipe, although on occasion a slight clavate swelling may be observed at the apex. Conidia are one-septate and 51-78 × 3.5-4.7 μ. The name *Cylindrocladium avesiculatum* will be proposed for this pathogen.

Characterization of glycogen from Phymatotrichum omnivorum. M. GUNASEKARAN & S. D. LYDA (Texas A&M Univ., College Station). Glycogen was extracted from mature sclerotia of *Phymatotrichum omnivorum* grown in sterile soil culture. Sclerotia were extracted with 30% trichloroacetic acid (TCA), and glycogen was precipitated in 95% ethanol. The glycogen was purified by resuspension in TCA and reprecipitation with ethanol 10 times for characterization by physical, chemical, and enzymatic methods. Physical properties of Phymatotrichum glycogen were similar to glycogen from rabbit liver and shell-fish when compared by optical rotation, optical rotatory dispersion, and infrared absorption. Ultraviolet absorption spectra of iodine complexes were also similar. The infrared spectrum of glycogen has an absorption peak at a wavenumber of 830 cm^{-1}, which confirms the α-D-glucopyranose units. Two peaks at 930 and 760 cm^{-1} confirm the (1-4) linkage of glucose units. Electron micrographs (× 20,000) revealed that *Phymatotrichum* glycogen consists of aggregates of small spheres. The average chain length of *Phymatotrichum* glycogen was 13 glucose units as determined by sodium periodate oxidation and alpha amylase action.

Influence of certain environmental factors on the utilization of glycogen by Phymatotrichum omnivorum. M. GUNASEKARAN & S. D. LYDA (Texas A&M Univ., College Station). The interactions of temp, CO_2, pH, and mineral concentrations upon the growth of *Phymatotrichum omnivorum* were studied in liquid and agar media. Growth was measured at seven temp ranging from 10 to 35 C, and 7 pH units ranging from 3 to 8 in citrate-phosphate buffer. A synthetic medium composed of the following in g/liter distilled water: NH_4NO_3 (1.18), KCl (0.15), K_2HPO_4 (1.55), KH_2PO_4 (1.50), $MgSO_4 \cdot 7HOH$ (0.75), $CaCO_3$ (1.5); trace elements (Fe^{+3}, Cu^{+2}, Mn^{+2}, Mo^{+5}, and Zn^{+2} at 2.5 ppm); and glycogen (0.5, 1.0, 2.0, and 4.0%) was used in the studies. Mineral constituents were also compared at 0.5, 1.0, and 2.0 times the above strength. When glycogen served as the carbon source, the optimum temp for growth of the fungus was 28 C and the optimum pH was 5. More growth was found at 28-35 C, but initial growth rate was higher at 15-20 C on agar medium. Less glycogen was utilized in high-CO_2 environments (5 and 50%) than in low-CO_2 environments (0.03 and 0.5%). There was less growth in the 0.5 and 2 $\times$ levels of minerals regardless of glycogen concentration in the medium. There was a direct correlation between growth and glycogen concentrations, with most growth being produced in the medium containing 4% glycogen.

An additional gene for resistance to the soybean cyst nematode, Heterodera glycines. E. E. HARTWIG & J. M. EPPS (ARS, USDA, Stoneville, Miss., Jackson, Tenn.). The soybean cultivar Peking has been used as the source of resistance to the soybean cyst nematode in developing the cultivars Pickett, Dyer, and Scott. Resistance to Peking is conditioned by three independent recessive genes rhg_1, rhg_2, and rhg_3 and a dominant gene Rhg_4 which is closely linked with the *Ii* locus. The *Ii* locus controls seed coat color. A strain of the cyst nematode found in Virginia reproduces on Peking, but P.I. 90763 gives complete resistance. Genetic studies show that P.I. 90763 carries an additional recessive gene for resistance.

Reaction of sorghum to injection of juice from sorghum infected with Sclerospora sorghi. R. B. JAVIA & D. C. BAIN (Miss. State Univ., State College). Apical meristematic areas of stalks of 1- to 2-month-old healthy sorghum plants were hypodermically injected with juice extracted from similar areas of sorghum systemically infected with *Sclerospora sorghi.* Controls injected with juice from healthy plants remained normal. In 3 to 5 days, reactions to juice from mildewed plants became visible only in leaves which showed injury from needle penetration. Area of reaction, between injury and leaf base, was 1-3 inches long and often involved width of leaf. Symptoms varied from pale chlorotic mottling to chlorotic streaks that were sometimes interrupted. Increase in size of reaction areas did not occur. In several tests, 50-85% of the plants reacted as described. No fungus structures were observed in these areas. One or more tillers from affected plants showed stunting, occasional mosaic patterns, or chlorotic streaking. Healthy plants injected with juice from diseased tillers also reacted in the manner indicated above. Differences in varietal reactions were obvious. We believe that an entity of virulent nature, other than a fungus or bacterium, was transmitted from diseased plants to healthy ones.

The mode of Sclerospora sorghi conidial infection of Sorghum vulgare leaves. B. L. JONES (Texas A&M Univ., Agr. Res. Ext. Center, Weslaco). Seedling leaves of *Sorghum vulgare* 'Pioneer 846' and 'DeKalb C48A' became infected with *Sclerospora sorghi* after overnight exposure to conidia in the field and the greenhouse. Conidia that were formed during the night were dispersed, had germinated, and had penetrated leaves by 8 AM. Germ tubes grew randomly over the surface of leaves until stomata were encountered or until the energy for growth was exhausted. When a stoma was reached, an appressorium developed over the stomatal opening. Penetration was first apparent as a small vesicle extending through the stomatal opening. This vesicle enlarged, ultimately forming a larger spherical vesicle within the substomatal cavity. The vesicle then gave rise to one or more hyphae. Hyphae with haustoria were observed extending intercellularly from substomatal vesicles at 9 AM. This indicates that with this pathogen conidial formation, dispersal, germination, penetration, and infection of the host occur in a relatively short period of time.

Enzymatic activity of Phytophthora cinnamomi in sterilized soil. W. D. KELLEY & R. RODRIGUEZ-KABANA (Auburn Univ., Auburn, Ala.). *Phytophthora cinnamomi* was cultured in autoclaved sandy-loam field soil (SLFS) for 12 days and in clay loam forest soil (CLFS) for 20 days. The soils were supplemented with nutrient solution, and enzymatic activity in the air-dried soil was measured at 2-day intervals. Maximal activity of β-glucosidase (arbutin substrate) and amylase (soluble starch substrate) occurred at assay pH values of 4.0-4.5. Activity of phosphatase (Na_2 phenylphosphate substrate) and esterase (phenyl acetate substrate) was maximal at pH 4.0-5.5 and 4.0-6.5, respectively. When tested individually, activity of each enzyme was linearly related to the amount of colonized soil used or to the amount of mycelial matter added to autoclaved soil. Enzymatic activity was higher in CLFS than in SLFS. Activity of each enzyme in both soils increased with time after inoculation, and reached maximal values on the 12th day. In the CLFS experiment, all enzyme activity decreased or leveled off after reaching maximal values. Maximal activity coincided with depletion of glucose from the soils. Soil pH decreased with time after inoculation with corresponding increases in titratable acidity.

Observations of Polyporus hispidus in East Texas. J. F. KILLEBREW & E. P. VAN ARSDEL (Texas A&M Univ., College Station). Canker decay of red oaks (*Quercus* spp.) by *Polyporus hispidus* is probably the most important hardwood disease in East Texas. Volume loss in water oak (*Q. nigra*) stands is high, and reduces the status of an otherwise excellent timber species. On 28 1/10-acre plots, 44% of the trees 3 to 6 inches in diam at breast height (dbh) had cankers or some symptoms of disease; 13% of the trees larger than 6 inches were infected. The presence of *P. hispidus* was determined by symptoms, frequently confirmed by wood chip isolation on 2% malt agar, and by comparison with Forest Disease Laboratory isolates. The buff color was similar, and a strong dark reaction on malt extract-5% gallic acid medium provided additional confirmation. The incidence of *P. hispidus* decay was higher on trees less than 6 dbh than expected from decay literature. Incubation on 2% malt agar from 5-35 C showed increasing growth rates to 35 C. Observations of fungal fruiting in nature during 1969 showed increasing frequencies of sporophore production through November. *Polyporus hispidus* frequently attacks young trees, grows at higher temp, and fruits later than reports indicate.

Barley leaf stripe control by Vitavax. G. KINGSLAND (Clemson Univ., Clemson, S. C.). The systemic fungicide Vitavax (Uniroyal trade name for 2,3-dihydro-5-carboxanilido-6-methyl-1,4-oxathiin) has been reported to be selective for control of Basidiomycetes. Additional research indicates that Vitavax is also effective for the control of barley leaf stripe caused by *Helminthosporium gramineum.* In recent experiments, Colonial 2 barley had 54 diseased culms per 10 ft of row in the untreated control. Plants from seeds slurry-treated with 2 and 4 oz of Vitavax/100 lb of seed had two and three diseased culms, respectively. Plants from seed dry-treated with 2 and 4 oz of Vitavax/100 lb of seed had six and two diseased culms, respectively. Rogers barley had 134 diseased culms/10 ft of row in untreated controls. Plants from seed slurry-treated with 2 and 4 oz of Vitavax/100 lb of seed had 10 and six diseased culms, respectively. In the case of severe infection, as with Rogers

barley, significant differences in yield were recorded between treatments (56 and 55 bu/acre from the 2- and 4-oz treatment rates, respectively) and controls (36 bu/acre).

An interferometric analysis of the effects of fungal parasitism on epidermal nuclei of Arisaema dracontium. F. B. KULFINSKI, R. A. KATSANOS, & A. J. PAPPELIS (Southern Ill. Univ., Edwardsville, Rutgers University, Newark, N.J., Southern Ill. Univ., Carbondale). Epidermal tissue was removed from green and yellow areas of leaves of *Arisaema dracontium* naturally infected with *Uromyces ari-triphilli* and the size (area), dry matter per unit area, and total dry mass of nuclei were determined (quantitative interference microscopy of living cells, photography, image projection, and planimetry) during a 2-week period in early June when leaves were fully expanded. Nuclei in epidermal cells of yellow regions were smaller in area than those in green regions (6.4 and 7.8×10^{-7} cm^2 compared to 9.0 and 9.0×10^{-7} cm^2 in early and late samples, respectively). Nuclei in yellow regions were equal to or greater in dry matter than nuclei in epidermal cells in green regions of the leaf (14.0 and 10.2×10^{-5} g/cm^2 compared to 9.4 and 10.2×10^{-5} g/cm^2 in early to late samples, respectively). Nuclei in yellow regions had greater dry mass in early samples and less in late samples than nuclei in green regions (9.0 and 7.9×10^{-11} g in yellow regions compared to 8.5 and 9.2×10^{-11} g in green regions in early and late samples, respectively).

Size of epidermal nuclei of onion bulb scales in response to neckrot fungi. F. B. KULFINSKI & A. J. PAPPELIS (Southern Ill. Univ., Edwardsville, Carbondale). Nuclear sizes (area determined by using interference microscopy, photography, image projection, and planimetry) in inner epidermal cells of white onion bulbs were compared with those in bulbs with neckrot. Nuclei in 10 equal longisections (living cells), numbered 1 at the base and 10 at the apex, were measured in noninfected bulbs and used for comparison with nuclei in locations 1, 6, 7, 8, 9, and 10 of infected bulbs. In healthy bulbs, the mean nuclear area increased from 3.4×10^{-6} cm^2 in the base to a maximum of 9.1 in location 4, decreased to 8.7 in location 6 and to 3.6 in location 10. Nuclear sizes in infected and adjacent locations containing no mycelium were less than those of controls. The mean size in infected location 10 was 81% of controls, and in adjacent location 9, 97%. When 10 and 9 were infected, nuclei in 9 were 51% of controls while those in adjacent location 8 were 71%. When 10 through 7 were infected, nuclei in 7 were 47% of controls while those in adjacent location 6 were 64%. When location 10 was infected, nuclei in 6 were 111% and those in 1, 106% of controls, respectively. Apparently, these pathogens secrete substances that destroy nuclei in close proximity to the mycelium, cause adjacent nuclei to decrease in size, and stimulate more distant nuclei to increase in size.

A virus isolate from Desmodium related to bean pod mottle virus. F. N. LEE & H. J. WALTERS (Univ. Ark., Fayetteville). A sap-transmissible virus was isolated from *Desmodium paniculatum* showing mosaic symptoms and growing near the Arkansas River in the vicinity of Van Buren, Ark. Host range of the Desmodium virus differs from that of bean pod mottle virus (BPMV). It produces systemic infection in soybean and Jack bean; local infection in Black Valentine, Pencil Pod Wax, Cherokee Wax, Dwarf Horticultural, and French Horticultural beans; no infection occurred in Monarch cowpea and Sutter Pink bean. All of these hosts are systemically infected by BPMV. The virus was infective after 10 min at 60 C, but not at 70 C. Infection occurred at a dilution of 10^{-3} but not 10^{-4}. In gel-diffusion tests, the Desmodium virus reacted with antisera to BPMV, cowpea mosaic virus, and squash mosaic virus, and formed a spur within 24 hr with each of these viruses.

Chlorophyll content and chlorophyllase activity in hoja blanca-infected rice plants. N. D. LONG & L. L. BLACK (La. State Univ., Baton Rouge). Rice plants, cultivar Nato, were caged individually at the beginning of the third leaf stage with one male transmitter of the planthopper *Sogatodes oryzicola* for 2 days. Chlorotic spots appeared on the third leaf of rice plants 6 days after infection. The leaves emerging after transmission became basally or completely chlorotic. Chlorophyll content and chlorophyllase activity were measured on the completely chlorotic part of the fourth and fifth leaves. Chlorophyll content of infected leaves, measured spectrophotometrically, was reduced 70% below the level found in leaves from healthy plants. Chlorophyllase was precipitated with cold 80% acetone, collected on filter paper, and added as a dry powder to a chlorophyll extract in 50% acetone. Chlorophyllase activity was measured spectrophotometrically by the amount of chlorophyllide formed after 5-hr incubation. Chlorophyllase activity in infected leaves increased by more than 10-fold over that in leaves from healthy plants. A simultaneous reduction of chlorophyll content and increased chlorophyllase activity occurred in leaves of rice plants affected by the hoja blanca disease.

Influence of plant age and temperature on root rot of cotton caused by Pythium irregulare. S. M. MCCARTER & R. W. RONCADORI (Univ. Ga., Athens). Carolina Queen cotton seeded in clay pots filled with sterile soil or *Pythium irregulare*-infested soil was placed in a greenhouse maintained at temp of 27 C or above. At 10, 20, and 30 days after seeding, 10 plants from each soil treatment were placed in growth chambers at constant temperatures of 18 and 26 C. Data on shoot height, root wt, and disease severity were taken 3 weeks after the 30-day group was placed in the chambers. At 26 C, damage to cotton usually was not significant regardless of plant age when placed at that temp. Damage was restricted to isolated lesions on the lateral root system. Plants subjected to 18 C were 69, 85, and 88% as tall as controls; root wts were 24, 42, and 64% that of controls for the 10, 20, and 30-day treatments, respectively. At the lower temp, root damage consisted of extensive decay of the primary and lateral root systems. Rot severity was inversely related to age of plants when placed at low temperature. These results indicate that well-established cotton plants may be damaged by *P. irregulare,* and show the importance of suboptimum temp for plant growth in disease development.

Inoculation studies with Fusicladium effusum. K. E. MCNEILL & C. H. GRAVES, JR. (Miss. State Univ., State College). Inoculation studies were initiated in an effort to effect a screening program for comparing the response of pecan varieties to different isolates of *Fusicladium effusum.* Stuart and Success cultivars were employed to determine (i) if excised nuts could be used in controlled screening tests; (ii) the age of green nuts most suitable for such tests; and (iii) the incubation temp most favorable for infection. Nuts were collected at weekly intervals, beginning approximately 6 weeks after the pollination period. They were briefly dipped in ethanol, rinsed in sterile distilled water, then placed on wire racks in moist chambers with the basal portion of the nuts immersed in 2% glucose. The nuts were inoculated by placing on the blossom end small pieces of previously sterilized absorbent cotton that had been dipped in mycelial suspensions. Excellent infection was consistently obtained in some of the treatments. Excised nuts showed great promise for such screening tests. The most suitable age was approximately 8 weeks following pollination, and the most favorable incubation temperature was 21 C.

A comparison of type bean pod mottle virus with a closely related strain from Arkansas. B. J. MOORE & H. A. SCOTT (Univ. Ark., Fayetteville). An isolate of bean pod mottle virus, designated J-10, collected from soybean did not differ in host range from type bean pod mottle virus (T-BPMV), but differed in symptomatology in certain hosts. Black Valentine bean and Hill soybean infected with J-10 showed more severe leaf distortion and more pronounced stunting, and *Chenopodium quinoa* developed chlorotic ring-

spots on inoculated leaves followed by systemic invasion, whereas T-BPMV remained localized in the inoculated leaves. Gel diffusion tests with T-BPMV and J-10 and T-BPMV antiserum resulted in spur formation indicating a serological difference. Purified J-10 preparations contained two immunoelectrophoretic components and three centrifugal components (top, middle, and bottom) which migrated at the same rates as those of T-BPMV. Middle and bottom components from T-BPMV and J-10 were separated by density-gradient centrifugation and inoculated on Pinto bean either singly or as mixtures. Heterologous mixtures of middle and bottom components resulted in several-fold increases of infectivity, and were equal in infectivity to homologous mixtures. Eight of 28 and eight of 24 bean leaf beetles, *Ceratoma trifurcata,* transmitted J-10 and T-BPMV, respectively, during individual 24-hr test feeds on healthy Lee soybean following 24-hr acquisition feeds on infected soybean.

Aphid-transmissible material produced by Sclerospora sorghi in corn and sorghum plants. N. Z. NAQVI & M. C. FUTRELL (Miss. State Univ., ARS, USDA, State College). Under controlled temp (21.1 C day and 7 C night) the fungal body of *Sclerospora sorghi* gradually disappeared in infected corn and sorghum plants. Leaves of corn and sorghum infected with *S. sorghi,* but free of organized fungus mycelium, were fixed in Randolph-Navashin's Chromosome-specific fixative. A number of variously sized and shaped bodies reacted with nuclear stains. Aphids (*Rhopalosiphum maidis* and *Schizaphis graminium*) were fed on these plants and then transferred to healthy plants. The nuclearlike bodies developed in the recipient plants before symptoms appeared. Mosaiclike leaf symptoms developed on healthy plants 1 week after aphid feeding.

Bimonthly changes in fungi associated with apparently healthy and root rot-diseased strawberry roots. S. NEMEC (USDA, ARS, Southern Ill. Univ., Carbondale). Main roots of root rot-diseased Surecrop and Cyclone strawberry plants were plated at bimonthly intervals for fungi on potato-dextrose agar containing rose bengal and streptomycin. From October through February, less than 7% of the isolates from apparently healthy runner plant root tips of each cultivar were *Pythium* spp. From root sections 5-6 cm from the root tip, less than 3% of the isolates were *Pythium* spp. *Pythium* isolates increased to 57% from lesions of Surecrop in December, and to 15.3% from lesions of Cyclone in April. *Pythium* spp. were not isolated from the stele of diseased Surecrop mother plants, and only once from Cyclone steles. *Rhizoctonia* was recovered only in October from Surecrop root tips, but constituted 20% of the isolates from Cyclone root tips in April. *Rhizoctonia* comprised less than 1.3% of the fungi isolated from apparently healthy sections 5-6 cm from Surecrop root tips in October and February, but amounted to 11.3% in Cyclone in April. *Fusarium* and *Rhizoctonia* occurred most frequently in lesions from June through October, and recovery of *Rhizoctonia* increased to 43.3% from Cyclone lesions in August. In June, *Rhizoctonia* reached peaks of 20 and 17.3% from Surecrop and Cyclone steles, respectively. Isolation trends of other genera were determined.

Effect of the herbicide EPTC on growth and enzymatic activity of Sclerotium rolfsii and Trichoderma viride. J. L. PEEPLES & E. A. CURL (Auburn Univ., Auburn, Ala.). Response of *Sclerotium rolfsii* and *Trichoderma viride* to treatments with EPTC (ethyl *N,N*-dipropylthiolcarbamate) was determined in modified Czapek's nutrient solution or sterilized sandy loam soil. Herbicide concentrations were 1, 2.5, 5, 10, and 40 μg/ml of solution or μg/g of oven-dry soil. In liquid culture, mycelial dry wt of *S. rolfsii* increased in herbicide treatments of 1-10 μg/ml and decreased with 40 μg/ml, as compared with the herbicide-free control. These effects were accompanied by a similar change in economic coefficients relating either glucose or nitrate-nitrogen consumed to mycelium produced. *Trichoderma viride* was not significantly affected at any concentration of the herbicide. In soil, growth response was measured by enzyme activity. Saccharase activity in soil with *S. rolfsii* increased with all herbicide concentrations (1-40 μg/g); highest activity occurred at 40 μg/g. This was also reflected in utilization of glucose and nitrate-nitrogen. *T. viride* showed no detectable saccharase activity at any herbicide concentration or in the control.

Aflatoxin levels in fresh-dug peanuts. R. E. PETTIT, R. A. TABER, & H. W. SCHROEDER (Texas A & M Univ., College Station, Texas). Peanuts were harvested from dryland and irrigated plots in North and South Texas during the years 1967 through 1969. Replicate 50-g samples were hand-shelled immediately after digging, and placed in acetone. These were then assayed for aflatoxin. Accumulation levels were found to be influenced by the extent to which drying occurred while the kernels were in the soil, and by the maturity levels of the individual kernels. Aflatoxin levels in dryland-harvested peanuts ranged from 0 to 34,000 parts/billion (ppb), with 27 out of 102 treatment samples containing more than 5 ppb. In contrast, irrigated-grown peanuts contained a maximum of 50-ppb aflatoxin, with 9 out of 102 treatment samples containing quantities greater than 5 ppb. Moisture levels in the fresh-dug dryland peanuts ranged from 24 to 31% in comparison to a range of 37 to 48% for the fresh-dug irrigated peanuts. Extent of *Aspergillus flavus* infestation was also higher in the fresh-dug dryland grown peanuts. The per cent of those surface-sterilized kernels examined from the dryland plots containing *A. flavus* ranged from 18 to 100%. In comparison, infestation in peanuts harvested from the irrigated plots ranged from 0 to 18%.

Brown stem rot of soybeans in Georgia. D. V. PHILLIPS (Univ. Ga., Ga. Exp. Sta., Experiment). Soybean (*Glycine max*) cultivars Lee, Bragg, Hampton, and Coker 102 growing in replicated microplots were inoculated with four isolates of *Cephalosporium gregatum* by the basal stem puncture method. Brown stem-rot symptoms developed in 97% of the inoculated plants and in 3% of the controls. There were no significant differences among cultivars or isolates in the percentage of plants with brown stem rot symptoms; however, there were differences among isolates in the extent of symptom development. Two isolates caused extensive internal browning (83 and 84% of the stem length), while two caused limited internal browning (14 and 15% of the stem length) in all four varieties. During mid-October 1969, plants from 73 fields in 25 counties were examined for brown stem-rot symptoms. Internal browning was found in plants from 86% of the fields sampled, and *C. gregatum* was isolated from 40% of the samples with internal browning. *Cephalosporium gregatum* was isolated from plants in all major soybean production areas of the state. Since *C. gregatum* appears widespread and brown stem rot developed extensively in these studies, the disease should be considered a potential threat to soybean production in Georgia and the southeast.

Effect of aphid saliva and extracts of aphid-infested leaves on the infectivity of tobacco mosaic virus and some stylet-borne viruses. T. P. PIRONE (Univ. Ky., Lexington). Because tobacco mosaic virus (TMV) is inhibited by extracts of leaves infested with aphids and by solutions which contain aphid saliva, some investigators have suggested that aphid saliva is responsible for the inability of aphids to transmit TMV. If this conclusion is valid, such preparations should not be expected to inhibit aphid-transmitted viruses. Crude extracts of mustard (*Brassica perviridis*) leaves which had been heavily infested with *Myzus persicae* were tested for their ability to inhibit the infectivity of TMV and the stylet-borne cucumber mosaic (CMV), tobacco etch (TEV), turnip mosaic, and alfalfa mosaic viruses. Aphid saliva, obtained by feeding *M. persicae* on 2% sucrose solutions, was tested with purified TMV, CMV, and TEV. Infectivity tests made by mechanical inoculation of half-leaves of

Chenopodium amaranticolor showed that the stylet-borne viruses were inhibited by infested leaf extracts as rapidly as and to a greater extent than TMV. Inhibition of TMV by saliva occurred in some tests, but it was no greater than that of CMV and TEV. Although the results with TMV confirm previous reports of inhibition by such preparations, the fact that stylet-borne viruses are also inhibited does not support the hypothesis that differences in aphid transmission are due to differential effects of saliva.

Identity of iron sulfides on rice roots. G. PITTS, A. I. ALLAM, & J. P. HOLLIS (La. State Univ., Baton Rouge). Toxic soluble sulfides produced in flooded rice soils are largely detoxified by reaction with ferrous iron to form black, insoluble material on root and soil surfaces. This material has been reported widely in the literature as ferrous sulfide (FeS). Eh-pH stability diagrams constructed from thermodynamic data indicate, however, that FeS cannot occur abundantly under rice field conditions, and that the principal insoluble sulfides formed in rice fields are FeS_2 and Fe_2S_3. Compounds produced experimentally under controlled Eh-pH conditions in aqueous solutions containing 100 ppm each of Fe and H_2S included iron sulfides and hydroxides. These compounds were isolated, dried under vacuum, and their identification attempted by visual inspection, mp, differential thermal analysis, temp gravimetric analysis, and visual and IR spectrophotometry. Data from these analyses verified the theoretical stability diagrams except for the apparent presence of Fe_2S_3 in part of the Eh-pH region ascribed to $Fe_3(OH)_8$. Fe_2S_3 could not be predicted accurately, due to absence of thermodynamic data and pure samples.

Effect of glucose on growth response of Sclerotium rolfsii in atrazine-treated soil culture. G. PITTS, E. A. CURL, & R. RODRIGUEZ-KABANA (Auburn Univ., Auburn, Ala.). Year-to-year fluctuations of experimental results from manipulated ecosystems, including chemical crop response and pesticide trials, are commonly attributed to factors influencing chemical effectiveness or pest populations. However, a background factor effect (BFE) exerted directly by the environment on response capacity of the biotic factor may be a more important cause of fluctuating results. A precise BFE on the growth response of *Sclerotium rolfsii* was demonstrated in soil supplemented with atrazine (2-chloro-4-ethylamino-6-isopropylamino-*S*-triazine) and glucose. The soil was sterilized, inoculated with a standardized suspension of mycelial fragments, and treated with herbicide at 2, 5, 10, and 20 μg/g soil and with glucose at 1.2 and 6.0 mg C/g soil. Analyses were made at intervals up to 20 days for nutrient removal, acid production, and enzyme accumulation. Fungal growth was slow in atrazine-free soil low in glucose, and herbicide effects were slight. In high-glucose atrazine-free soil, however, growth was rapid, and atrazine inhibited fungal responses up to 12 days. The effect of atrazine on growth of *S. rolfsii* was radically altered by the BFE of glucose.

Population dynamics of Ditylenchus dipsaci on Phlox subulata given foliar applications of 0,0-Diethyl O-p(methylsulfinyl) phosphorothioate. H. E. REED & C. J. SOUTHARDS (Univ. Tenn., Knoxville). A study was made to determine the effects of Dasanit on the population dynamics of *Ditylenchus dipsaci* in plots of *Phlox subulata*. Two foliar applications of this nematicide were made at rates of 1, 2, and 4 lb. active ingredient/acre on 18 June and 2 August 1968. Increased rates of Dasanit resulted in lower soil and foliage populations of *D. dipsaci* in April and May of 1969, and a reduction in the soil population of plots given the 2- and 4-lb. rates from May to November 1969. The number of *D. dipsaci* found in soil given the 1-lb. treatment was greater than that found in the untreated plot from May to November. Blossom counts in plots treated with the 2- and 4-lb. rates were 10 times greater than that of the untreated plot taken at the height of the blooming period on 9 April. Populations of *D. dipsaci* migrated from the soil to the foliage in early April, and foliage populations remained high through May. During June and July, migration of *D. dipsaci* was mostly from the foliage back to the soil, and few numbers of *D. dipsaci* were found in the foliage from August to November.

Polarographic determination of catalase activity in natural and fungal colonized soils. R. RODRIGUEZ-KABANA & B. TRUELOVE (Auburn Univ., Auburn, Ala.). Catalase activity of natural soils and soils colonized by *Sclerotium rolfsii* (SR), *Fusarium oxysporum* f. *vasinfectum* (FV), and *Rhizoctonia solani* (RS) was measured polarographically with an oxygen electrode. With 0.02% H_2O_2, a linear relationship between activity and amount of soil was found in each case. The order of activity in soil was SR>RS>FV. For maximal catalase activity, SR soil required buffering but activity in RS and FV soil was unaffected by buffering. With fixed soil quantity, FV showed linearity over the range 0-0.02%, and RS over the range 0-0.08% H_2O_2. Compared with the $KMnO_4$ titrimetric method, the polarographic technique was faster (2.5 min/determination), approximated more closely the condition for first order kinetics, and was more sensitive with a lower coefficient of variation. Catalase activity measured polarographicallv in SR colonized soil showed the lag, log, and stationary phases of growth; this cannot be shown titrimetrically because oxalic acid produced by SR interferes with the $KMnO_4$ assay. The polarographic method can be used with small amounts of soil (1-200 mg), and may be suitable for rhizosphere studies.

Transmission of serological strains of tobacco ringspot virus by Xiphinema americanum. M. C. RUSH (N. C. State Univ., Raleigh). Four serologically distinct strains of tobacco ringspot virus (NC-38, NC-39, NC-72, and NC-87) isolated in North Carolina from naturally infected tobacco, a serologically distinct strain isolated in the Rio Grande Valley of Texas from watermelon, and the Eucharis mottle strain from Peru were tested for their transmissibility by a N.C. population of *Xiphinema americanum* Cobb. Tests were conducted using mass-screened and hand-picked nematodes. The North American strains were transmitted from cucumber to cucumber in all tests, whereas the Eucharis mottle strain was not transmitted. Lack of transmission of the strain from South America was interpreted as evidence for specific or differential transmission of strains of the virus by its nematode vector.

Periodic production of ochratoxin A by an isolate of Aspergillus ochraceus. A. F. SCHINDLER & D. B. HARDY (Food and Drug Admin., Washington, D.C.). In an initial experiment, when spores of *Aspergillus ochraceus,* isolate M298, were inoculated onto fresh potato-dextrose agar medium and grown at 27 C, there appeared to be a periodicity of ochratoxin A production. To test this periodicity, 300-ml Erlenmeyer flasks containing 50 ml of fresh potato-dextrose agar were inoculated with spores and incubated at 27 C. Amounts of ochratoxin A/flask were determined by thin-layer chromatography after $CHCl_3$ extraction. Three replicate flasks were harvested each day, beginning on the 7th day and ending on the 28th day after inoculation. Ochratoxin A was present in the flasks of the 7th and 8th days, the 12th thru the 15th day, the 22nd and 23rd days, and the 26th day. Amounts of ochratoxin A recovered ranged from 0.83 to 8.3 μg/flask. On all other days, no ochratoxin A was detected. In all instances, all 3 replicate flasks on a given day were either all positive or all negative for ochratoxin A.

Some properties of Desmodium yellow mottle virus. H. A. SCOTT & B. J. MOORE (Univ. Ark., Fayetteville). Desmodium yellow mottle virus (DYMV) was purified from Great Northern bean 10-14 days after inoculation by extraction with 0.2 M NaH_2PO_4 (2 ml/g tissue), adjustment to pH 5.0, and alternate high- and low-speed centrifuga-

tions. Virus yields ranged from 10-20 mg/100 g tissue. Virus preparations contained two centrifugal components with sedimentation coefficients of 57 and 114. Top and bottom components separated by density-gradient centrifugation exhibited spectra typical of protein and nucleoprotein, respectively. Reciprocal gel diffusion tests with antiserum for each virus showed DYMV and turnip yellow mosaic virus (TYMV) to be serologically related but not identical. Both viruses migrated as single immunoelectrophoretic components, but DYMV moved more rapidly toward the anode than TYMV. Nucleic acid was readily extracted from DYMV with phenol-sodium dodecyl sulfate, and was about 30% as infective as virus. A broad-leafed *Desmodium* sp. served as the local lesion assay host. Local lesions appeared 3-4 days after inoculation.

Reactions of certain trichloromethyl sulfenyl fungicides with low molecular weight thiols. M. R. SIEGEL (Univ. Ky., Lexington). When S^{35} labeled and unlabeled captan, folpet, or reduced glutathione (GSH) were reacted in vitro with low molecular-wt thiols, the primary reaction product formed was oxidized glutathione (GSSG). Approximately 10-15% of the S^{35} label, however, was in new, unidentified products. When folpet was reacted with cells of *Saccharomyces pastorianus* labeled with S^{35} Na_2SO_4, the primarily soluble thiol GSH decreased with increasing concentrations of the fungicide. In contrast to the in vitro reaction, no GSSG could be recovered from folpet-treated cells. Instead, a series of new unknown derivatives were formed. Some of these products were also formed when S^{35} folpet was reacted with unlabeled yeast cells. Fungicidal effects were only noted when a large portion of the total GSH present in the cell was destroyed. The disappearance of GSSG and the inability of treated cells to resynthesize the reduced thiol could be responsible in part for the toxicity of these fungicides.

Identification of plant viral nucleic acids utilizing selected area electron diffraction. J. W. SIMMONS, JR., & R. S. HALLIWELL (Tex. A&M Univ., College Station). A technique has been developed in this laboratory, using selected area electron diffraction, which enables the discrimination of viral nucleic acids as well as single- and double-stranded nucleic acid configurations. Discrimination is based upon differences in the interplanar spacings of the nucleic acid molecule. A comparison of several nucleic acids and synthetic polynucleotides indicates that some spacings will be shared by two or more different molecules. There are, however, interplanar spacings for each specimen which differ from those of other nucleic acid sources and appear to be characteristic of a given nucleic acid or polynucleotide. This technique could permit comparison of plant viral nucleic acids as well as nucleic acids in intact plant viruses. Intact viruses could be studied without having to chemically remove the protein coat in order to obtain the nucleic acid in pure form, although some of the nucleic acid's reflections will be obscured in this case.

Suppression of peanut leafspot epidemics with Benlate foliar sprays and soil drenches. D. H. SMITH & F. L. CROSBY (Univ. Ga., Ga. Exp. Sta., Experiment, U.S. Weather Bur. AAM, ESSA, Experiment). Argentine peanuts (*Arachis hypogaea*) were treated with foliar sprays of Benlate [methyl-1 (butylcarbamoyl)-2-benzimidazolecarbamate]. The dosage was 3 oz/acre (active ingredient) in 10 gal H_2O. Three schedules were evaluated: weekly (W), biweekly (BW), and meteorological (M-time of application determined by temp and RH data). On 28 August, 5 days prior to harvest, the infection percentages (infected + defoliated leaflets/total no. of leaflets) for W, BW, and M were 15.6, 27.3, and 31.4, respectively. Each schedule resulted in a significantly greater yield than the control, but yield differences among schedules were nonsignificant. In a test with Starr peanuts, a Benlate M schedule (8 applications) and a Benlate extended meteorological schedule (EM-4 applications) were compared. Although the percentage infection was significantly less on the M schedule, yield differences between the M and EM schedules were nonsignificant. In greenhouse tests, Benlate soil drenches (25, 50, and 100 mg/50 ml H_2O/4-inch pot) prevented or significantly decreased infection of Argentine plants by *Cercospora arachidicola*. Application of a single drench (50 mg/50 ml H_2O/4 inch pot) at 0, 6, 24, 48, or 72 hr after inoculation prevented infection by *C. arachidicola*.

Ultrastructure of MDMV-infected grain sorghum varieties susceptible and tolerant to MDMV infection. J. P. SNOW & R. W. TOLER (Texas A&M Univ., College Station). Electron-microscope studies of susceptible (T × 412, B378) and tolerant (T × 414) grain sorghum infected with MDMV-A revealed the presence of "pinwheels" and "bundle-type" inclusions in cells of leaf tissue. These structures were found exclusively in the cytoplasm. A few virus rods were occasionally found scattered among the virus inclusions. Neither inclusions nor rods were observed in sections of control tissue. Comparison of the number of cells containing inclusions showed that approximately one of 10 B378 and T × 412 cells contained pinwheels and bundles; approximately one of 50 T × 414 cells contained these virus structures. Approximately five times as many cells of susceptible varieties contained virus inclusions as did cells of the tolerant variety. Comparison of number of pinwheel inclusions in inclusion-containing cells revealed that B378 cells contained up to thirty pinwheel inclusions; T × 414 cells contained up to fifteen pinwheel-type inclusions. The presence of virus structures was the only observed difference between cells of infected and control tissues. In general, cells of the disease-susceptible hybrids contained more virus inclusions than did those of tolerant varieties.

Epidemiology of spinach white rust in South Texas. C. E. THOMAS (ARS, USDA, Weslaco, Tex.). White rust (*Albugo occidentalis*) of spinach (*Spinacia oleracea*) is the foremost disease problem on this South Texas crop during the September to March growing season. The disease does not appear until night temp fall below 8 C. Initial infection is found on lower leaves in direct contact with or close to the soil surface. Oospores that formed on previous spinach crops are considered as the primary inoculum, as no known alternate host for the pathogen has been found in South Texas. Continuous cropping has led to the deposit of large numbers of oospores in commercial fields. There are no reports of the successful germination of these oospores, however. Also, as noted by other workers, mornings of heavy dew or fog followed by sunny afternoons favor the rapid secondary spread of the pathogen by means of airborne sporangia. It has not been reported, however, that the development of lesions is stopped by several nights of successive frosts, which also apparently kill the sporangia. The disease then recycles with the initiation of infection by the still apparently viable oospores. In years of mild winters, when frosts are rare, the spread of the disease is not abated and damage to the crop is extremely severe. No known spinach variety is immune to or possesses a requisite level of resistance to this disease.

An improved method for determining structural details of the cuticles of plant parasitic nematodes. D. R. TURNER & R. A. CHAPMAN (Univ. Ky., Lexington). Observation of cuticular structure of many plant parasitic nematodes was greatly enhanced in specimens cleared in chloral hydrate (1 kg in 125 ml H_2O). Internal structures of living or fixed specimens immersed in chloral hydrate for several sec to a few min were partially to completely destroyed. Degree of clearing and time required to obtain it varied with species and desired result. Specimens were mounted in chloral hydrate for examination within 30 min or transferred to lactophenol for more permanent mounts. Specimens in lactophenol show no apparent deterioration after 5 months. Fine details of annulation, alae, openings through cuticle, and structures with cuticular linings such as the lumen of the oesophagus and the excretory duct were clearly visible. This method

supplements conventional methods of identification. Because of some distortion and lack of internal structures, chloral hydrate-treated specimens are not suitable for identification by themselves. Species of *Tylenchida* are much better suited to this method than are species of *Dorylaimida*.

The remote sensing of oak-decline symptoms. E. P. VAN ARSDEL & D. L. BUSH (Texas A&M Univ., College Station). The differentiation of oak decline into its components (e.g. *Cephalosporium* wilt, soil fill, excavation injury, herbicide injury, and fertilizer burn) by symptoms is aided by using matched color and infrared Ektachrome photographs. *Cephalosporium* wilt is the dangerous infectious disease of the complex. Morphologically identical *Cephalosporium* spp. have been isolated from live oak, post oak, Texas red oak, elm, willow, and persimmon. It is common in post oak and nearly universal in persimmon near Bryan. All isolates grew at 10 C to over 35 C (optimum 30 C). These temp are higher than those shown for elms in the North. Dothiorella stages have been found on Texas red oak and elm, and have been produced in cultures of *Cephalosporium* from post oak. Elm, live oak, and post oak have been cross inoculated with various *Cephalosporium* isolates, and the fungus was reisolated from each inoculated tree. Elm has shown wilt symptoms 2 months after inoculations with *Cephalosporium* from live oak. Periodic photographic comparisons from air and ground are being made between trees cross inoculated with all *Cephalosporium* isolates and mechanically wilted (girdled, undercut, etc.) trees. After 2 months, most undercut trees show wilt symptoms, but inoculated and girdled trees did not. *Cephalosporium* seems to be a relatively highly evolved parasite that kills its host slowly.

Bacterial leaf stripe of Strelitzia reginae. C. WEHLBURG (Fla. State Dep. Agr., Div. Plant Ind., Gainesville). Young plants of *Strelitzia reginae* (Bird-of-Paradise Flower) often display dark-brown to black stripes on the leaves between the lateral veins. Sometimes several stripes next to each other produce broad, dark bands of affected leaf tissue. Young leaves that become infected before they expand often develop an abnormal shape with frayed and crinkled margin. Heavily infected leaves become necrotic, and this may cause the loss of a large percentage of seedling plants. A white bacterium was consistently isolated from diseased leaf tissue, and proved to be pathogenic when wound-inoculated into the youngest leaves of *Strelitzia*. The pathogen is a *Pseudomonas* but no specific name has been assigned. It is motile by one polar flagellum. Acid is produced from galactose, and arabinose, but not from dextrose, levulose, lactose, sucrose, maltose, mannose, raffinose, and mannitol. Gelatin and a solidified polypectate medium are not liquefied. Starch is not hydrolyzed. No fluorescin is produced. Nitrate is reduced; corn seed oil is metabolized, and hydrogen sulfide is produced in tryptone broth.

Physiological effects of victorin on bean plants. H. WHEELER (Univ. Ky., Lexington). In previous work, bean plants (*Phaseolus vulgaris* 'Pinto') which had taken up through cut stems solutions containing 10 units of victorin/ml for 16 hr were rendered highly resistant to tobacco and alfalfa mosaic viruses. With young plants (first trifoliate leaf still furled), victorin treatments that induced virus resistance reduced transpiration and loss of electrolytes from leaves shaken in distilled water. Initiation of adventitious roots was also delayed 2-3 days on stems of treated plants. With older plants (first trifoliate fully expanded), primary leaves of victorin-treated plants became yellow and senescent 3-5 days before similar changes occurred in controls. These effects on plants resistant to victorin indicate that this pathotoxin may provide a tool for the study of a variety of physiological processes in plants.

The 1970 Annual Meeting of the Southern Division of The American Phytopathological Society was held 2-4 February in Memphis, Tennessee.