

Abstracts of the Twenty-Seventh Annual Meeting of the Potomac Division of The American Phytopathological Society

Nematicidal effect of alpha-tomatine on *Panagrellus redivivus*. E. H. ALLEN & J. FELDMESSER (ARS, USDA, Beltsville, Md.). The nematicidal activity of α -tomatine, a steroid-glycoalkaloid, was tested at 50, 100, and 200 ppm in 0.05 M BB'-dimethylglutaric acid-NaOH buffer at ca. pH 4, 5, 6, 7, and 7.5. *Panagrellus redivivus* was held in vials containing washed quartz sand with α -tomatine in buffer or buffer alone at 21 C for 48 hr. Nematodes were separated from the sand and held at 21 C for 24 hr, and motile and nonmotile adults were counted. The nonmotile counts were progressively larger with increasing pH values at each level of α -tomatine, and this toxicity was not due to the buffer. The median effective doses (ED_{50}) of α -tomatine to the motility of *P. redivivus* were 50, 100, and 200 ppm at pH values 6.8, 5.6, and 4.6, respectively. The data suggest that the free base of α -tomatine has high nematicidal activity. The influence of pH on the nematicidal activity of α -tomatine may be an important phenomenon in assessing the role of alkaloids as disease-resistance factors in plants, and should be considered in tests of potential nematicides, naturally occurring and synthetic.

Induction of sporangia production in *Phytophthora cinnamomi* by sterile salt solutions and by soil bacteria. W. A. AYERS & G. A. ZENTMYER (ARS, USDA, Beltsville, Md., Univ. Calif., Riverside). *Phytophthora cinnamomi* produced low numbers of sporangia when V-8 agar discs from young (1-3 days) colonies were incubated at 25 C for 18-24 hr in a sterile mineral salts solution, or in certain autoclaved soil extracts. Discs from older colonies formed few or no sporangia in sterile solutions, but formed them abundantly in 2-5 days in nonsterile soil extract, or in mixed cultures of two bacterial isolates. Washed mycelial mats from liquid cultures showed a similar effect of age on sporangia production in axenic and nonsterile systems. Aeration enhanced sporangia production, but glucose, glutamic acid, and dilute culture media inhibited sporangia formation in sterilized solutions, and delayed the onset of sporangia production in nonsterile systems. Cell-free extracts of sonically-disrupted cells of sporangia-stimulating bacteria and Millipore filtrates of the bacterial cultures did not stimulate sporangia production. Sporangia were produced in soil extract prepared from autoclaved soil previously inoculated with the bacteria, and on mycelia buried in this soil. Lysis of mycelium was rapid in natural soil and soil extracts, but there was no observable lysis in autoclaved soil inoculated with the bacteria.

Control of snapbean rust with systemic and nonsystemic fungicides. R. E. BALDWIN (Va. Truck Exp. Sta., Painter). One foliar application of Plantvax (2,3-dihydro-5-carboxanilido-6-methyl-1,4-oxathiin-4,4-dioxide) on the rust susceptible variety Bountiful successfully controlled bean rust (*Uromyces phaseoli typica*) for the entire growing season. Plantvax applied at 0.5 lb. or 1 lb. active ingredient/acre at either the two to three true leaf stage or at the first sign of infection gave better control than four applications of 2 lb./acre of the formulated product of Dithane M-45, Daconil, Polyram, or Thynon. All treatments gave significantly better yields than the untreated control. Foliar infection ratings made at the end of the season indicate that plots treated with 0.5 lb./acre of Plantvax had two to three times the amount of leaf infection as compared to those treated with the 1 lb./acre rate. But control was adequate enough to produce yields that were not significantly different from the 1 lb./acre rate.

Greenhouse and field comparisons of tomato early blight resistance. T. H. BARKSDALE (ARS, USDA, Beltsville, Md.). The relative amount of early blight caused by *Alternaria solani* occurring on the leaves of 30 tomato entries of diverse genetic background was similar in greenhouse tests and in a field epidemic. In both tests, the amount of disease was visually estimated as a percentage of leaf tissue diseased. The field epidemic became severe, and apparent infection rates, depending on the variety, ranged from 17 to

43%/day. Correlation coefficients of 0.41 to 0.51 between the greenhouse and field data were significant, although low. A stem-end fruit rot caused by the same fungus was severe on some varieties in the field, but the amount of this fruit rot was not necessarily associated with the amount of early blight on the foliage.

Ultraviolet induction of an antifungal chemical in soybeans. MARGARET BRIDGE & W. L. KLARMAN (Univ. Md., College Park). Detached cotyledons from 7- to 9-day-old Harosoy 63 soybeans were exposed to ultraviolet irradiation ($\lambda = 2536 \text{ \AA}$) at a distance of 4 inches for 20 min. Other cotyledons were inoculated with the soybean pathogen, *Phytophthora megasperma* var. *sojae*, by inserting mycelium in holes punched in the cotyledons. Controls were similar untreated cotyledons. All cotyledons were incubated in closed petri dishes containing 7 ml distilled water for 2 days in darkness under room conditions. Ether extracts from each group of cotyledons were chromatographed with thin-layer chromatography and assayed by spraying the developed TLC plates with spores of *Cladosporium cucumerinum* suspended in a nutrient solution. Extracts of fungal-inoculated and ultraviolet-treated cotyledons produced spots of inhibition at R_F 0.8, but no inhibition resulted from control extracts. Fungal- and ultraviolet-stimulated extracts exhibited absorption spectra maxima at 289 m μ and 294 m μ , and a minimum at 253 m μ . In cotyledons incubated in darkness following ultraviolet exposure, the surface layer of cells developed a bronze color within 2 days. Bronzing of cotyledons and production of inhibitor were reduced when cotyledons were incubated in strong visible light after ultraviolet exposure.

Screening of *Arachis* accessions for resistance to *Puccinia arachidis*. K. R. BROMFIELD & S. J. CEVARIO (Plant Sci. Lab., Fort Detrick, Frederick, Md.). Accessions of *Arachis hypogaea*, *A. glabrata*, *A. monticola*, and several other legumes were tested in the greenhouse for susceptibility to a culture of *Puccinia arachidis* from Puerto Rico and to one from Texas. Accessions PI 314817 and PI 315608 of *A. hypogaea* were physiologically resistant to both rust cultures. One hundred seventy-one accessions tested to both cultures, 68 tested only to the Puerto Rican culture, and 4 tested only to the Texan culture were susceptible. Five accessions of *A. glabrata* were immune, six nonpeanut legume species were immune, and one accession of *A. monticola* produced only small, weakly-sporulating pustules when tested to the Puerto Rican culture. The two cultures could not be differentiated into physiologic races on the basis of reaction type induced on 173 accessions and on the peanut cultivar Tarapoto previously reported resistant to peanut rust.

EL-273, a curative fungicide for the control of *Venturia inaequalis*. I. F. BROWN, JR., H. R. HALL, & J. R. MILLER (Eli Lilly & Co., Greenfield, Ind.). EL-273, a-(2,4-dichlorophenyl)-a-phenyl-5-pyrimidinemethanol, was applied at 10 ppm to greenhouse-grown McIntosh apple seedlings 24 or 1 hr before, or 24, 48, 72, or 96 hr after inoculation with conidia of the apple scab fungus. Disease symptoms were observed macroscopically on untreated foliage after 96 hr. Foliage treated with EL-273 before and up to 72 hr after inoculation was symptomless. Leaves sprayed after 96 hr contained small necrotic lesions. No fungus was observed associated with these lesions until 22 days after inoculation. When 25 ppm of EL-273 was applied 96 hr after inoculation, no fungal growth was observed at any time. A field trial using 10-year-old McIntosh apple trees was conducted in which the application frequency of blossom and early cover sprays was varied. A correlation between scab infection periods and the timing of EL-273 applications was observed. EL-273 at 35 ppm applied at prepink, full bloom, and seven cover sprays provided 98% disease control as compared to 100% control obtained with a schedule of five blossom and seven cover sprays. The prepink and full bloom sprays were made 8-10 days after good scab infec-

tion periods. Data from greenhouse and field trials indicate that EL-273 has curative activity against the apple scab fungus.

Disc electrophoresis of proteins from bean leaves infected with Agrobacterium tumefaciens. C. R. CURTIS (Univ. Md., College Park). Primary leaves of *Phaseolus vulgaris* 'Pinto III' were inoculated with *Agrobacterium tumefaciens* (ATCC 15955). Six to 14 days later, buffered extracts were prepared from healthy and tumorous leaves and examined by acrylamide-gel disc electrophoresis. Proteins were stained with amido-Schwarz, and peroxidases were visualized by incubating the gels 30 min in various H-donors (2×10^2 M), followed by 15 min in 0.3% H_2O_2 . The most reactive H-donors were benzidine, guaiacol, *o*-dianisidine, caffeic acid, 3,4-dihydroxyphenylalanine, 3,4-dihydroxyphenylethylamine, *p*-phenylenediamine, catechin, and chlorogenic acid. Faint or no bands were obtained with *o*-coumaric acid, L-tyrosine, and ascorbic acid. Protein profiles were not greatly different between healthy and tumorous leaves. Several peroxidase bands clearly occurred on gels of extracts from infected leaves. During the 6 to 14 days, band intensity tended to increase with tumor development, whereas the same peroxidase bands were faint or did not appear in gels of extracts from healthy leaves. The number and intensity of peroxidase bands varied with the H-donor used. Thus, tumor development appeared to be accompanied by increased peroxidase activity.

A virus complex isolated from tobacco. V. D. DAMSTEEGT, G. M. MILBRATH, & A. J. WEBBER, JR. (Plant Sci. Lab., Fort Detrick, Frederick, Md.). A virulent virus complex was obtained in the summer of 1966 from a single plant of *Nicotiana tabacum* 'Burley 21' growing in a border row between a tobacco plot inoculated with tobacco mosaic virus (TMV) and one inoculated with potato virus Y (PVY). The symptoms on new growth were distinct puckered green islands against a light-cream background, stunting, and deformation. Results of repeated mechanical inoculations to local lesion and systemic indicator host plants during the past 40 months indicate that at least two distinct viruses are present in a relatively stable relationship. Green peach aphids, *Myzus persicae*, selectively transmitted PVY from tobacco plants infected with the complex to systemic indicator plants. Differential ultracentrifugation followed by rate zonal centrifugation resulted in two separate bands in the sucrose gradients. The partially purified virus preparation reacted strongly against TMV antisera in Ouchterlony agar-gel diffusion tests. Electron micrograms of infected tobacco leaf tissue revealed short, rigid rods in the 300 μ range typical of TMV, and long, flexuous rods in the 720-780 μ range typical of PVY. The complex is composed of TMV and PVY, but their relative concn and strains have not been determined.

Isolation of exonuclease-resistant ribonucleic acid from healthy and potato spindle tuber virus-infected tomato leaves. T. O. DIENER (ARS, USDA, Beltsville, Md.). Phosphate buffer extracts from tissue infected with potato spindle tuber virus (PSTV) contain infectious RNA that sediments with a rate of ca. 10S, as well as smaller amounts of faster sedimenting infectious material. No evidence for the presence of conventional virions could be found. The infectious RNA is located in the nuclei of infected cells. Incubation of mixtures of partially purified PSTV-RNA and TMV-RNA with snake venom or bovine spleen phosphodiesterases (alone or in conjunction with alkaline phosphatase) had little or no effect on the level of infectivity of PSTV-RNA, but completely inactivated TMV-RNA. Exonuclease-resistant RNA could be isolated (by Sephadex gel filtration and hydroxyapatite chromatography) in similar quantities from healthy and PSTV-infected tomato leaves. Exonuclease-resistant RNA from either source sedimented at a rate of ca. 10S, and coincided with the infectious PSTV-RNA with respect to sedimentation properties, nuclease sensitivity, elution from hydroxyapatite, and stabilization by Mg^{++} . These RNA's are either circular or

are "masked" from attack by exonucleases at both the 3' and 5' termini. PSTV-RNA may be an aberrant form of normally occurring exonuclease-resistant RNA.

Effect of sixteen amino acids on the growth of Physalospora obtusa in vitro. CHARLES R. DRAKE (Va. Polytech. Inst., Blacksburg, Va.). The effects of 16 amino acids commonly found in apple on the growth of *Physalospora obtusa* were compared as sources of N in a semisynthetic liquid medium. Concentration of individual amino acids was equivalent to 2 g/liter of asparagine. The carbon content of the individual amino acid was calculated and then an appropriate quantity of sucrose was added to yield a concn of carbon equivalent to 10 g/liter of glucose. All media were initially adjusted to pH 4, the approximate pH value of apple tissue which supports growth of this fungus. Growth was measured from the dry wt of the mycelium. Cultures were harvested at 4-day intervals for 28 days. Maximum growth with the individual N sources varied with time. Although all amino acids supported growth, DL-phenylalanine, L-tryptophan, L-arginine, DL-histidine, L-threonine, L-proline, and L-glutamic acid provided best growth (175-250 mg); DL-valine, DL-serine, DL-aspartic acid, L-leucine, DL-isoleucine, and asparagine provided intermediate growth (116-150 mg); and L-lysine, DL-methionine, and glycine provided the least growth (98-109 mg) at max harvest.

Nucleic acid synthesis at infection sites of soybeans invaded by the soybean cyst nematode. B. Y. ENDO (ARS, USDA, Beltsville, Md.). Synthesis and localization of nucleic acids were observed at the sites of infection in susceptible and resistant soybeans invaded by the soybean cyst nematode, *Heterodera glycines*. Sites of DNA and RNA synthesis were detected with microautoradiographs of tritium-labeled thymidine and uridine which were incorporated in the tissues. Relative amounts of these nucleic acids were also visualized with the Feulgen's and gallocyanine stains. When infective larvae penetrate the cortex and are localized near the vascular tissues, there is an apparent stimulation of the cells near the lip region of the nematode which results in increased nuclear size and DNA synthesis. After syncytial formation, nuclei within syncytia are usually quiescent whereas active DNA synthesis takes place in newly incorporated cells, tissues surrounding syncytia, and in the regions of normal tissue differentiation. RNA synthesis is active and detectable throughout the infection periods.

Association of a root knot with bacterial wilt of potato. J. FELDMESSER & R. W. GOTH (ARS, USDA, Beltsville, Md.). *Pseudomonas solanacearum* and *Meloidogyne incognita* larvae were used alone, or in combination, to infect *Solanum tuberosum* 'Pungo'. These plants were grown in plastic containers in the greenhouse. All plants inoculated with bacteria, either from culture or infected potato tissue, had symptoms characteristic of bacterial wilt; i.e., yellowing of the lower leaves, terminal wilt, vascular browning, and eventually complete stem collapse. Fifteen days after inoculation, the symptoms developed in those plants infected with the nematode-bacteria combination. Within 25 days after inoculation, 60% of these plants were dead. Those plants inoculated with the bacterial culture alone showed symptoms 35 days after inoculation; 20 days later, death occurred. Thus, plants exposed to the *P. solanacearum*-*Meloidogyne* combinations showed symptoms 20 days sooner than those exposed to the bacterium alone. Check plants and plants inoculated only with surface-sterilized nematodes or nonsurface-sterilized nematodes showed no aboveground symptoms throughout the experiment.

Exogenous carbon and nitrogen requirements for chlamydospore germination by Fusarium solani. G. J. GRIFFIN (Va. Polytech. Inst., Blacksburg, Va.). Chlamydospores of *F. solani* were formed on germ tubes of macroconidia following germination at two conidial densities. Low-density (LD) chlamydospores were formed at 3×10^3 conidia/ml

by germination of macroconidia in a phosphate-buffered (pH 5.7) inorganic salts solution (B) containing no exogenous C or N. After 5 to 6 days of incubation, glucose at 1.0 mg/ml supported complete germination of LD chlamydo-spores within 16 hr; NH_4Cl had no effect on germination. Sucrose, maltose, fructose, or galactose, at 1.0 mg/ml, replaced glucose as a source of C. High density (HD) chlamydo-spores were formed by germination of macroconidia at 3×10^5 conidia/ml in B with 0.1 mg glucose plus 0.01 mg NH_4Cl /ml. After 5 to 6 days of incubation, HD chlamydo-spores washed by centrifugation required both exogenous glucose (10 mg/ml) and NH_4Cl (1.0 mg/ml) for complete germination within 16 hr when the chlamydo-spore density was near 3×10^5 /ml. At 3×10^3 chlamydo-spores/ml, washed, HD chlamydo-spores required no exogenous C or N for complete germination. Thus, the exogenous C and N requirements for chlamydo-spore germination were dependent on the conidial density at which chlamydo-spores were formed on germ tubes of macroconidia, and on the chlamydo-spore density at which germination tests were performed.

Reciprocal reconstitution of tobacco mosaic virus and cucumber virus 3. D. F. HAMMOND & M. K. CORBETT (Univ. Md., College Park). The RNA and protein components of tobacco mosaic virus (TMV) and cucumber virus 3 (CV3), prepared by phenol and acetic acid, respectively, were homologously and heterologously reconstituted to form highly infectious virus preparations. Ultraviolet absorption and sedimentation in sucrose density-gradients of the reconstituted viruses were similar, but not identical, to the parent viruses. The morphologies of the reconstituted and parent viruses were identical. Precipitin zones of the reconstituted viruses in Ouchterlony double-gel diffusion were identical to those of the parent that provided the protein. The infectivity of the reconstituted viruses was determined by the RNA. Plants of *Phaseolus vulgaris* 'Pinto' were infected when inoculated with heterologously reconstituted (TMV-RNA:CV3 protein) virus preparations. Likewise, plants of *Cucumis sativus* 'Long Market' were infected by preparations of CV3-RNA reconstituted with TMV protein. Pancreatic ribonuclease reduced the infectivity of the reconstituted and parent virus preparations by about 10%. Preparations of TMV-RNA and CV3-RNA, after incubation with pancreatic ribonuclease, were non-infectious.

Variation in response of potato cultivars to air pollution. H. E. HEGGESTAD (ARS, USDA, Beltsville, Md.). The effects of the air pollution complex, especially photochemical oxidants, on growth and yield of eight potato (*Solanum tuberosum*) cultivars was determined. Plants were grown in a greenhouse section supplied with air filtered through activated carbon to remove oxidants and in an adjacent section with ambient air. During the study April through August, hourly averages of oxidant were above 5 pphm on 69 days, and above 10 pphm on 5 days. Leaf injury attributed to oxidants developed in varying degree on the cultivars in the ambient but not in filtered air. By mid-June, vines of Haig and Norland had severe injury, average index 9.5, with dead plants scoring 10. Slight amounts of a leaf spot with zonate markings and of unknown cause were observed in filtered air, especially on Irish Cobbler and Superior. Tuber yields of Haig, Irish Cobbler, and Norland were about 50% lower in the ambient air. Also, these cultivars were the most sensitive to ozone in controlled fumigations. Yields of Avon, Superior, and Peconic in ambient air were reduced 11, 20, and 24%, respectively. Kennebec and Alamo were judged most tolerant to the air pollution. They produced about the same yield in both environments.

Tumor development in response to wounding Tempo bean. R. K. HOWELL & DIANE F. KREMER (ARS, USDA, Beltsville, Md.). Tumors, morphologically similar to crown-gall tumors, can be induced on stems, petioles, lamina, and

pod of Tempo bean (*Phaseolus vulgaris*). The abnormal growths are initiated by mechanically wounding the tissues. Nonwounded Tempo plants have not been observed to produce tumors during any stage of the life cycle. Similar tumors could be induced on plants from two seed lots. Preliminary attempts to induce tumors with homogenized tumors in tobacco, geranium, Pinto bean, and *Coleus* stems have failed. Also, local lesions on *Nicotiana glutinosa* and Pinto leaves failed to develop from tumor extracts applied to leaves. Physical wounding did not induce galling on Pinto, Topcrop, or Tenderpod bean plants. The evidence suggests that the tumor-inducing substances are endogenous and are unique to the Tempo bean. This biological system could be of value to those interested in tumor-inducing substances or mechanisms of tumor formation.

Sulfa therapy of aster yellows. M. KLEIN & K. MARA-MOROSCH (Boyce Thompson Inst., Yonkers, N.Y.). Certain tetracycline antibiotics are mycoplasmatic in vitro, while sulfa drugs have no effect on mycoplasmas. Tetracycline, but not sulfa, chemotherapy causes the remission of several yellows-type plant diseases. But in our tests, contrary to previous reports, the condition of aster yellows-diseased *Callistephus chinensis* was visibly improved following spraying with three different sulfa compounds, sulfadiazine, sulfisomidine, and sulfisoxazole. New shoots developed on some plants, and the color of all treated leaves changed from the characteristic bright yellow to dark green. The three compounds were also tested in combination with achromycin (tetracycline hydrochloride). Sulfadiazine-achromycin treated plants produced new, vigorous growth 12 days after the first treatment. The same phenomenon was observed in plants treated with sulfisomidine-achromycin after a longer lag period. Sulfisoxazole-achromycin application resulted in occasional improvement. Remission of aster yellows disease was also achieved in plants treated with achromycin alone, but to a lesser degree than in plants treated with a combination of sulfadiazine and achromycin. The results focus attention on the difficulties in correlating antibiotic spectra of pathogens with results of in vivo observations in plants.

Identification of aliphatic and aromatic acids in root and seed exudates of peas, cotton, and barley. M. F. KOVACS, JR. (ARS, USDA, Beltsville, Md.). Root and seed exudates of aseptic cultures of pea, cotton, and barley plants were examined by thin-layer and gas-liquid chromatography for the presence of aromatic and aliphatic acids. Traces of *p*-hydroxybenzoic acid were detected in the root and seed exudates of all three plant species. Acid hydrolysis of exudates from germinating pea and barley seeds yielded *p*-hydroxybenzoic acid as the major aromatic acid constituent. Cotton seed exudates yielded *p*-coumaric acid as the major aromatic acid constituent. Lactic acid was the predominant aliphatic acid detected in pea and barley root exudates, whereas malic acid was predominant in cotton root exudates. Malic acid was the predominant aliphatic acid found in cotton and barley seed exudates, whereas citric acid was predominant in pea seed exudates. The germinating seed was responsible for a large portion of the total aliphatic and aromatic acid exudation of the seedling plant grown aseptically for 14 days.

Further studies of atypical Septoria nodorum. J. M. KRUPINSKY & A. L. SCHAREN (ARS, USDA, Beltsville, Md.). Wheat leaves with mild symptoms were collected from 16 locations in Pennsylvania and New York in 1969. Atypical *Septoria nodorum* was identified from 11 locations, and typical *S. nodorum* from one location. Nine isolates were obtained of the atypical type and one of the typical fungus. These isolates were compared with six isolates from plants with strong disease symptoms, collected in Pennsylvania and Ohio in 1968. Isolates from both years were stable in cultural characteristics, and had a strong tendency toward beaked pycnidia. Attempts to select the more typical nonbeaked types failed. Pycnosporangia of both types were cylindrical and similar in length; however, the

diam of the atypical spores averaged $2\ \mu$ greater than that of the typical spores. Variability in pathogenicity was found when five atypical isolates and one typical isolate were used to inoculate 12 test lines of wheat. Most atypical strains of *S. nodorum* were weaker in pathogenicity than the typical types, and required longer periods of high relative humidity for establishing infections. Higher average temp and fewer extended periods of cloudy, wet weather during the heading of the wheat crop in central Pennsylvania in 1969 probably account for the decreased incidence and severity of disease when compared with the 1968 season.

The association of mycoplasma-like bodies with sweet-potato little-leaf (witches' broom) disease. R. H. LAWSON, R. P. KAHN, SUZANNE HEARON, & F. F. SMITH (ARS, USDA, Beltsville, Glenn Dale, Md.). A plant introduction of *Ipomoea batatas* 'Nukua Lofa' (P.I. 308200) showed proliferation and little-leaf symptoms. An agent that incites these same symptoms in healthy 308200, *I. setosa* and *I. batatas* Clone No. 21, was transmitted from 308200 by grafting but not by aphids (*Myzus persicae*) or mechanically. Electron microscopy showed that mycoplasma-like bodies (MLB) and pinwheel inclusions characteristic of viruses in the potato virus Y group are associated with graft inoculated 308200 and No. 21. The MLB were pleomorphic and varied from about 0.1 to $1.0\ \mu$, and some had well-defined unit membranes. An incitant that causes vein-banding or chlorotic spots or both (resembling symptoms incited by either internal cork or russet crack viruses, or both), but which does not cause proliferation or little-leaf symptoms, was transmitted from 308200 to *I. setosa* and Scarlett O'Hara morning glory by aphids or mechanically. Pinwheel inclusions (but not MLB) were also associated with aphid and mechanical inoculations. There were no inclusions and MLB in healthy plants. These observations support the hypothesis that sweetpotato little-leaf is incited by a mycoplasma-like agent.

Oxalic acid production by Sclerotinia sclerotiorum. D. P. MAXWELL & R. D. LUMSDEN (Univ. Wisc., Madison, ARS, USDA, Beltsville, Md.). Isolate Ss-3 of *Sclerotinia sclerotiorum* accumulated oxalic acid in young cultures grown in liquid salts-yeast extract medium at initial pH 5.8, supplemented with either 110 mM D-glucose, 110 mM D-glucose and 200 mM potassium phosphate, or 73.7 mM D-glucose and 56 mM sodium succinate. Growth was comparable in these media, but oxalic acid accumulation was 0.5, 17.8, and 70.8 mM, respectively. Increased production of oxalic acid in the medium containing added potassium phosphate or sodium succinate was attributed to an increased buffering capacity of the media. Oxalic acid production by Ss-3 was correlated with the rapid growth phase of the fungus. In bean hypocotyls infected with isolate Ss-3, 1.1, 31.4, and 48.3 mg oxalic acid/g dry wt accumulated on 0, 2, and 4 days after inoculation, respectively. The pH values of tissue extracts decreased from 6.1 on day 0 to 4.1 on day 2; and increased to 5.8 by day 6. By day 2 about 4 cm of the bean hypocotyl was colonized, and extensive water-soaking of the tissue was evident. Oxalic acid apparently plays an important role in infection caused by *S. sclerotiorum*.

Effect of dimethyl sulfoxide on production of sclerotia of Sclerotium rolfsii. J. H. MELHUISH, JR., & G. A. BEAN (Univ. Md., College Park). *Sclerotium rolfsii* was grown in petri dishes on synthetic medium to which dimethyl sulfoxide (DMSO) was added after autoclaving; the concn ranged from 0 to 20,000 ppm in increments of 2,000 ppm. With 2,000 ppm DMSO there was a 55% reduction in sclerotia production, and no sclerotia were produced at 20,000 ppm DMSO. Growth of *S. rolfsii* was reduced by all DMSO concn. On media containing between 2,000 and 6,000 ppm DMSO, sclerotia were larger and their average dry wt was 20% higher than of those produced on DMSO-free medium. Weight of sclerotia did not vary on media containing 8,000 to 12,000 ppm DMSO. However, in media with more than 12,000 ppm DMSO, sclerotia wt increased

and they were often misshapen and coalesced. Sclerotia produced on media containing DMSO, when transferred to DMSO-free medium, germinated at the same rate as those from DMSO-free medium. Sulfur-containing chelating compounds, similar to DMSO, did not affect sclerotia production. DMSO could be useful in a study of the metabolic processes that control sclerotia formation in *S. rolfsii*.

Differentiation of eleven isolates as races of the soybean cyst nematode. L. I. MILLER (Va. Polytech. Inst., Blacksburg). Eleven isolates of *Heterodera glycines* (Va.1, Va.2, Va.3, Va.4, N.C.1, Mo.1, Ark.1, Tenn.1, Ill.1, Miss.1, Ky.1) each proved to be a distinct race, differentiated by its ability to develop egg-bearing females on the following cultivars or plant introductions of *Glycine max*: Peking, Pine Dell, P.I.90763, P.I.88788, P.I.87631-1, P.I.79693, P.I.91684, and P.I.84611. The lines P.I.91684 and P.I.79693 were efficient hosts for Va.1, Mo.1, and Ark.1. These isolates were differentiated on P.I.87631-1 and Pine Dell; P.I.87631-1 was an efficient host for Mo.1 and a poor host for Ark.1 and Va.1; Pine Dell was an efficient host for Ark.1 and a poor host for Va.1. Isolates Va.3, Va.4, N.C.1, and Miss.1 formed numerous females on P.I.91684 and few females on P.I.79693, and were differentiated on P.I.87631-1, P.I.88788, and P.I.84611. P.I.87631-1 was an efficient host for N.C.1 and a poor host for Va.3, Va.4, and Miss.1; P.I.88788 was an efficient host only for Va.3; P.I.84611 was an efficient host for Miss.1 but not for Va.4. Isolates Va.2, Tenn.1, Ky.1, and Ill.1 formed few females on P.I.91684, and were differentiated on Peking, P.I.90763, and P.I.79693. On Peking only, Va.2 formed females; P.I.90763 was an efficient host only for Ky.1; Tenn.1 formed numerous females on P.I.79693, and on Ill.1, only a few.

Kwanzan flowering cherry, a new host of peach yellows. SRECKO M. MIRCETICH & L. O. WEAVER (ARS, USDA, Beltsville, Md., Univ. Md., College Park). In 1968, Kwanzan cherry trees with symptoms resembling those of yellows-infected peach trees were observed in Wheaton and Ellicott City, Maryland. Affected trees showed chlorotic, yellow to reddish leaves that roll and droop; early abscission of leaves; and dieback of terminals. Willow shoots with small, narrow upright leaves are produced, usually from the main branches. Affected trees may die within 2 years. Halford peach seedlings, inoculated in the greenhouse with buds from diseased Kwanzan trees, developed typical symptoms of peach yellows within 10 months. In the Wheaton area where the outbreak of the disease occurred, 67 of 308 Kwanzan trees were infected. Occurrence of several infected trees in the row indicated natural spread of the disease. Several peach trees in the same area were found to be infected by peach yellows, and are suspected to be the original source of virus. This is the first report of peach yellows in Kwanzan cherry (*Prunus serrulata*). Occurrence of this disease in Kwanzan cherry in a suburb of Washington, D.C., warrants close surveillance of the famous flowering cherry plantings in Washington, D.C. Extreme care should be exercised when other *Prunus* spp. are planted in the vicinity of flowering cherry plantings.

Pectic enzymes associated with black shank of tobacco. L. D. MOORE (Va. Polytech. Inst., Blacksburg). Stems of *Nicotiana tabacum* 'Virginia Gold', colonized by *Phytophthora parasitica* var. *nicotianae*, were found to contain pectic methylesterase (PME) activity (indicated by increase in -COOH groups), hydrolase (H) activity (indicated by release of reducing groups) and trans-eliminase (TE) activity (indicated by release of reducing groups and increase in absorbance at 230 and 235 m μ). Maximum PME activity occurred at pH 7. The peak in H activity occurred at pH 4 with sodium polypectate substrates, and at pH 5 with pectin N.F. substrates. H activity was doubled in the presence of sodium polypectate. Macerating activity (indicated by loss of coherence of potato tuber discs) was optimum at pH 4-6. Complete loss of coherence occurred after 6-hr incubation. TE activity was higher with sodium polypectate than with pectin, with the peak in activity

occurring at pH 9 with both substrates. Pectic substances in diseased and healthy stem tissue were determined. The quantity of extractable pectic substances in diseased stems was 30 to 50% less than that in healthy tissue. The activity of the H and TE enzymes in conjunction with PME is thought to be responsible for the extensive degradation of the diseased stem tissue.

Preservation of virulence in a leaf-spotting pathogen. J. G. PALMER, P. SEMENIUK, & R. N. STEWART (Forest Dis. Lab., USDA, Laurel, Md., ARS, USDA, Beltsville, Md.). Conidia from axenic cultures of *Marssonina rosae*, when stored 1 year, infected few detached or attached leaves of Rosa MT Red Radiance. Conidia of the same 7 isolates from living rose leaves induced severe infection. Infected leaves were removed 14 to 20 days after inoculation, and conidia were prepared in Seitz-filtered rainwater at a concn of 10^5 /ml. Inoculum was applied to five detached leaflets of each of 20 rose cultivars, and an infection index was determined for each isolate after 14 days. The remaining leaflets were placed in several deflated bags and frozen at -12°C . The virulence of conidial inocula from these leaves was tested annually and was only slightly reduced after 3 years of storage for each of the seven isolates. After 4 years, virulence was markedly reduced for three of these isolates. Equal numbers of leaves with each isolate were removed and stored later in plastic containers with 50 ml, 300 ml, and 3 liters of air at -12°C . Virulence was retained after 1 year, but was noticeably reduced after 2 years in the largest air volume. Only one isolate appeared to decline in virulence when propagated on living leaves.

Effect of soil environmental factors on viability of Thielaviopsis basicola propagules. G. C. PAPAVIDAS & J. A. LEWIS (ARS, USDA, Beltsville, Md.). The effect of soil moisture, temp, and CO_2 on the viability of endoconidia and chlamydo-spores of *T. basicola* was studied with the propagule assay method and the dilution plate method. In natural soils, chlamydo-spore viability was inversely related to the organic-matter content of soils. After 2 months in Lakeland sand (0.6% organic matter [OM]), Codorus loam (1.0% OM), Galetown-Evesboro sandy loam (3.0% OM), and muck soil (42.7% OM), viability was 87, 75, 21, and 19%, respectively. Soil moisture was the most important single factor affecting viability of endoconidia and chlamydo-spores. Chlamydo-spore viability declined rapidly at 45, 60, and 75% of soil moisture-holding capacity (MHC). Decline was intermediate at 30%; and no decline was observed at 15 and 4% MHC. Temperature also affected propagule viability. In air-dry soil, chlamydo-spore viability was 90% at 10 and 18 C after 3 months, 42% at 26 C, and 30% at 34 C. In wet soils, the effect of temp on viability was masked by that of soil moisture. High soil moisture (50% MHC) and high temp (26 and 34 C) were detrimental to endoconidia. Lysis and death of endoconidia were accelerated at temp of 18 C or higher. High levels of CO_2 delayed loss of chlamydo-spore viability at 10 but not at 26 C.

Rusty-brown discoloration of western winter lettuce. F. M. PORTER, M. J. CEPONIS, & J. KAUFMAN (Eastern Market Path. Invest., ARS, USDA, Belle Mead, N.J.). The name "rusty-brown discoloration" is proposed for a previously inadequately described disease of western winter lettuce. The disease appears late in January, reaches a peak in February, and nearly disappears by April. The disease incidence has increased markedly in recent years, with accompanying serious losses to shippers and receivers. Commercially damaged incidence of rusty-brown discoloration averaged 20, 40, 40, and 90% in New York City lettuce arrivals in February of 1966, 1967, 1968, and 1969, respectively. Lettuce with no rusty-brown discoloration at harvest may become severely affected during transit. In laboratory tests with western lettuce, rusty-brown discoloration increased from 1.7% 1 to 2 days after harvest to 29.2% 7 to 10 days later. Disease symptoms begin at the leaf base on the outer head leaf surface as a diffuse,

yellowish to russet-brown discoloration affecting only the epidermal layer. Later the diseased areas enlarge, spreading along the midribs and secondary veins. Although the discoloration may become more intense and extend below the epidermal layer in later stages of the disease, the lesions remain rusty brown. No etiological agent was found.

Damping-off of Virginia pine delayed by inoculation with saprophytic fungi. W. PUFFINBERGER & W. L. KLARMAN (Univ. Md., College Park). Damping-off of 8- to 10-day-old Virginia pine seedlings, caused by *Phytophthora cinnamomi*, *Pythium debaryanum*, or *Rhizoctonia solani*, was delayed 40 to 50 hr by prior inoculation with *Aspergillus niger* or *Penicillium* sp. The hyphae of these saprophytes grew on the root surface and in the outer 2-3 layers of cortical cells, suggesting that the pathogens must compete with the saprophytes for the root substrate. When the saprophytes were killed by surface sterilization of the roots, however, damping-off was similarly delayed. The presence of the saprophyte mycelium apparently provided a physical barrier to rapid colonization by the pathogens. Unidentified antifungal materials were present in healthy pine roots, and the concn of these materials increased after inoculation of the roots with any of the five fungi. Apparently a combination of physical, chemical, and biological factors are involved in the delay in damping-off that results from saprophyte inoculation.

Effect of 2(3)-benzoxazolinone on the metabolism of Neurospora crassa. N. N. RAGSDALE & H. D. SISLER (Univ. Md., College Park). 2(3)-benzoxazolinone (BOA) at a concn of 1,000 ppm completely inhibited germination of conidia of *Neurospora crassa*, whereas 500 and 250 ppm inhibited germination 91% and 10%, respectively. Oxidation of glucose was stimulated by 250, 500, and 1,000 ppm of BOA. Uptake and incorporation of ^{32}P into various phosphorus fractions (trichloroacetic acid-soluble and insoluble phosphorus, inorganic orthophosphorus, and 7-min acid-labile phosphorus) of conidia incubated in a basal medium containing 1×10^{-5} M phosphate and 500 ppm BOA were inhibited 90 to 95%. Colorimetric determination of phosphorus in these fractions of untreated conidia incubated in basal medium containing a N source, but no phosphate showed appreciable depletion of inorganic orthophosphate; there was no change in inorganic orthophosphate in treated conidia. The primary effect of BOA appears to be interference with the initial production of high-energy phosphates.

Cultural and pathogenic variability of Septoria nodorum. A. L. SCHAREN & J. M. KRUPINSKY (ARS, USDA, Beltsville, Md.). Single-spore isolates of *Septoria nodorum*, cause of glume blotch of wheat, *Triticum aestivum*, exhibited variable characters into the ninth cultural generation. Mycelial color, growth habit, formation of pycnidia, and pycnosporous were prominent variable characters. Cultures that produced pycnidia and spores were selected in five cultural generations from mycelial cultures. From cultures that produced pycnidia and spores, selections were made in three cultural generations that produced no spores. Selections were reversed and cultures returned to original types with equal ease. Cultural variants obtained from single-spore isolates were used to inoculate a series of wheat lines to evaluate pathogenic variability. None of the isolates gave identical reactions on the test plants. None of the *Triticum* spp. are known to have specific resistance to field populations of *S. nodorum*. These experiments document the extreme variability in both cultural characters and pathogenicity of *S. nodorum* and point out the hazards of designations of physiological races of this pathogen.

Isolation of tomato and tobacco ringspot viruses from soil around stem-pitted Prunus trees. S. H. SMITH & R. F. STOFFER (Pa. State Univ., Fruit Res. Lab., Arendtsville). Numerous virus isolates were obtained from soil taken from orchards in which the trees showed a high incidence

of stem pitting. Soil samples were collected from around the following trees: peach, *Prunus persica*; nectarine, *P. persica* var. *nectarina*; sour cherry, *P. cerasus*; and sweet cherry, *P. avium*. Samples were taken 4 to 8 inches below the soil surface within the drip line area around apparently healthy trees, diseased trees, or in areas from which diseased trees had been removed. The soil samples were placed in 8-inch pots, seeded with 6 to 15 cucumbers (*Cucumis sativus* 'National Pickling'), and maintained in the greenhouse. In the case of the more severe isolates, symptoms appeared in the cucumber trap plants within 10 to 14 days. Plants that showed no symptoms by the third-leaf stage were subinoculated to young cucumber seedlings. Some of the isolates have been identified as tomato ringspot virus and tobacco ringspot virus. Other isolates are being identified on the basis of host range, physical properties, and serological reactions. Studies are in progress to determine the possible etiological relationship of the various isolates to the *Prunus* stem pitting disorder.

Production of pectin lyase in apple fruit rotted by Penicillium expansum. D. H. SPALDING & A. A. ABDUL-BAKI (ARS, USDA, Beltsville, Md.). Pectin lyase from apple tissue rotted by *Penicillium expansum* was purified 106-fold by precipitation of the crude homogenate with 35-80% saturated $(\text{NH}_4)_2\text{SO}_4$ and passage through a column of Sephadex G-100. Pectin lyase activity, as determined spectrophotometrically by measuring changes in OD at 235 m μ , was max at pH 6.5 with 0.4% citrus pectin as substrate. No activity was detected with polypectate as substrate. Using pectin as substrate at pH 6.5 with Tris [tris(hydroxymethyl) amino methane]-acetate buffer, Ca^{++} , Mg^{++} , or Mn^{++} (2.5×10^{-2} M) each increased the reaction rate 2.5-fold. In citrate buffer, activity was equal to that using Tris-acetate with Mn^{++} . Addition of Mn^{++} to citrate buffer did not increase activity. Pectin lyase was also detected in a malic acid-mineral salts medium in which the fungus was grown.

Changes in ribonucleic acids during uredospore differentiation on membranes. R. C. STAPLES & L. RAMAKRISHNAN (Boyce Thompson Inst., Yonkers, N.Y.). Uredospores of the bean rust fungus (*Uromyces phaseoli*) contain a template RNA having many of the properties of a messenger RNA. The RNA sediments in sucrose gradients in the 4- to 19-S region, stimulates amino acid incorporation into protein in a cell-free assay system prepared from *E. coli*, is rich in AMP, and chromatographs on MAK columns as would be expected. Template activity of the RNA increases during differentiation at the time of formation of the appressorium, then declines. Incorporation of uridine into template RNA occurs only during differentiation, which suggests that formation of the infection structures may depend on synthesis of messenger RNA.

Relation of leaf ontogeny to reaction of Nicotiana tabacum to Alternaria tenuis. J. R. STAVELY & L. J. SLANA. (ARS, USDA, Beltsville, Md.). Pathogenic isolates of *Alternaria tenuis* infect tobacco leaves of any age. With favorable temp and humidity, the fungus grows intercellularly in older leaves that have reached 75% or more of their full size to incite a dead, circular brown spot lesion 3-30 mm in diam. The fungus advances less than 1 mm beyond the edge of the lesion. Cellular arrangement in the area proximal to these lesions is similar to that in uninfected leaf tissue. On younger leaves, fungal invasion is restricted so that lesions usually occur as mere pinpoint depressions in the epidermis, or as 1-mm dead spots. Both types of reaction can occur on intermediate leaves, but the large lesions are restricted to the ontogenetically older leaf tip. High-density infections on young leaves can cause a 50% reduction in the size reached by leaves 14 days after inoculation. Necrotic cells on young leaves are surrounded by a cicatrice of solidly packed cells. Inhibition of leaf expansion adjacent to the lesion seems to be partially responsible for cicatrice development. The increased number of cell layers between the upper and lower epidermis, and

the presence of some mitotic nuclei in developing cicatrices, suggest that prolongation or initiation of cell division may also contribute to cicatrice formation around infections.

Double freeze-etched replicas and electron microscopy of aster yellows-infected cells. R. L. STEERE (ARS, USDA, Beltsville, Md.). Electron microscopy of double freeze-etched replicas of aster yellows-infected plants show three-dimensional aspects of the characteristic pleomorphic particles presumed to be the agent of aster yellows disease. Spherical and oblong particles of different sizes and shapes, not seen in healthy specimens, are distinctly visible in sieve tubes of infected plants. Unusual, nearly spherical inclusion bodies with crenulated membranes, not previously reported, are clearly visible in cells adjacent to the infected sieve tubes.

Soil thin-layer chromatography of fungicides. R. J. STIPES & DONNA R. ODERWALD (Va. Polytech. Inst., Blacksburg). Successful movement of methyl 1-(butylcarbonyl)-2-benzimidazolecarbamate (B), N-(trichloromethylthio)-4-cyclohexene-1,2-dicarboximide (C), and thiabendazole (T) was achieved with the aid of surfactants by soil thin-layer chromatography (STLC). Each fungicide (200 μg) was spotted on a 0.25-mm thick layer of Lodi loam coated on a 21- \times 21-cm glass plate followed by a 2-hr irrigation. Visualization of compounds was achieved directly with ultraviolet light (2537 \AA) and indirectly with bioautography (BA) in which *Penicillium expansum* conidia were oversprayed on the developed chromatogram. BA was a more sensitive assay than ultraviolet light. Nonionic surfactants, especially Tween 80 (polyoxyethylene sorbitan monooleate) at concn of 1 and 10% (w/v), were the most effective in mobilizing B, C, and T. B and C were more mobile than T, although equally good movement of T occurred with 10% Tween 80. Cationic and anionic surfactants, as well as water, were either poor or ineffective in promoting fungicide movement. STLC, therefore, may provide a promising tool in predicting the movement of fungicides in soil. These results also emphasize the potential efficacy of surfactants in the soil mobility of these and other fungitoxicants.

Mechanical transmission of a virus from buds of stem pitted peach trees. R. F. STOFFER, D. M. SOULEN, & S. H. SMITH (Pa. State Univ., Fruit Res. Lab., Arendtsville). Dormant budsticks from peach trees exhibiting the stem-pitting syndrome were forced in the greenhouse. The partially expanded leaves and flower buds were triturated in 0.03 M phosphate buffer, pH 7.1, and rubbed onto a series of Carborundum-dusted herbaceous indicator plants. Necrotic local lesions were produced on cowpea (*Vigna sinensis* 'Black Local') leaves with at least four separate inoculum sources. The virus caused local symptoms in at least eight different legumes. It also infected cotton (*Gossypium hirsutum*), nasturtium (*Trapaolum majus*), and watermelon (*Citrullus vulgaris*). The virus does not appear to invade most hosts systemically, and has not infected any solanaceous plants. The dilution end point, determined on cowpea cotyledons, was between 1:3,160 and 1:10,000; the virus retained infectivity for 48-72 hr at 21 C; and the thermal inactivation point was between 45 and 55 C. Rod-shaped particles were not detected in electron micrographs of leaf-dip preparations or in partially purified preparations. Attempts are being made to identify the virus and to determine whether it is involved in the *Prunus* stem pitting disease.

A mosaic disease of Rhoecol discolor caused by a strain of tobacco mosaic virus. SUSAN M. THOMPSON & M. K. CORBETT (Univ. Md., College Park). Plants of *Rhoecol discolor* exhibiting mosaic symptoms were found to be systemically infected with a rigid rod virus measuring approximately $324 \times 18 \mu$. Young leaves of infected *Rhoecol* plants showed severe mosaic symptoms, whereas older leaves only a faint mosaic or no symptoms. The virus is mechanically transmissible and causes systemically infected

Nicotiana clevelandii and *Torenia journeri*. *N. tabacum* 'Turkish', *N. glutinosa*, *Phaseolus vulgaris* 'Pinto', and *Datura stramonium*, all susceptible to TMV, were not infected locally or systemically when inoculated with the *Rhoeo* isolate. Local lesions without systemic infection were induced in *N. tabacum* 'Kentucky 35', *Chenopodium quinoa*, *C. amaranticolor*, and *Capsicum frutescens* 'Tobasco'. Of these plants, *C. quinoa* is the most reliable local lesion host. Properties of the virus in crude *Rhoeo* sap are: thermal inactivation, 93 C for 10 min; aging in vitro, over 5 months; dilution end point, 10^{-5} . Preparations were purified using activated charcoal and cycles of differential centrifugation. Purified preparations of the *Rhoeo* isolate reacted in gel diffusion tests with antiserum to ATCC No. 2 isolate of TMV.

Technique for rapid inoculation of pear seedlings with *Erwinia amylovora*. T. VAN DER ZWET & C. N. CLAYTON. (ARS, USDA, Beltsville, Md., N.C. State Univ., Raleigh). We developed a technique for rapid inoculation of pear seedlings with *Erwinia amylovora* enabling us to inoculate about 1,000 seedlings with 1.5 liters of inoculum in 2 hr. An inoculator consisting of two aluminum plates ($20 \times 4 \times 2$ -cm), connected near one end by a hinge and separated in the center by a spring, was used. At the open end of each plate is a circular well, one containing a florist pin holder, the other a sponge. The sponge well is connected to a bottle of inoculum by a plastic hose (4 mm internal diam) with a regulating valve. For adequate flow, the bottle is carried above shoulder height on a back pack made of aluminum tubing. An aqueous cell suspension (1×10^8 cells/ml) from 24-hr-old cultures of *E. amylovora* served as inoculum. Tips of succulent terminals of 4-month-old seedlings were squeezed between the pins and the sponge, thus releasing the inoculum onto the injured plant tissue. Inoculated seedlings were then placed in a moist chamber (23 C) for 5 days, and were rated 4 weeks after inoculation for fire blight incidence. In 11 progenies, 91% of the seedlings blighted and blight penetration averaged 15.4 cm. This technique can also be used for inoculation in the field, and may be adapted for use with other crops and bacterial pathogens.

Responses of *Rhizoctonia solani* to phaseollin. H. D. VAN ETTEN & D. F. BATEMAN (Cornell Univ., Ithaca, N.Y.). When *Rhizoctonia solani* was grown in shake culture at 30 C in 25-ml flasks containing 4.0 ml of a defined media which contained 2% glucose, exponential growth started after ca. 18 hr. Cultures in the exponential growth phase (24- to 26-hr-old; dry wt, 6.5 ± 0.6 mg) were used to determine the effect of phaseollin upon growth, respiration, and leakage of metabolites. Crystalline phaseollin (mp 177-178) added to cultures as a water suspension at concn up to 150 ppm of medium did not inhibit growth. It was necessary to solubilize phaseollin in order to demonstrate biological activity. Ethanolic solutions of this compound were added to all subsequent treatments so as to give 0.5% ethanol (v/v) in the culture medium. Phaseollin at a concn of 15 ppm inhibited growth for at least 12 hr. A

7 and 26% loss in dry wt occurred on exposure of cultures to 47 ppm of phaseollin for 1 and 6 hr, respectively. The respective respiratory rates of *R. solani* in the presence of 0, 9, 15, 33, and 47 ppm of phaseollin were 13.0, 10.5, 9.5, 6.5, and 6.2 μ liters O_2 /mg/hr. When phaseollin (47 ppm) was added to mycelium which had been grown on glucose- $U^{14}C$, the amount of radioactivity released in 15 min into the surrounding medium was 10 times greater than that released in the absence of phaseollin.

Effect of *Meloidogyne incognita* on transpiration of tomato. A. J. WEBBER, J. A. FOX, & M. G. HALE (Va. Polytech. Inst., Blacksburg). Transpiration rates of 8-week-old 'Rutgers' tomato plants infected with *Meloidogyne incognita* were compared with noninfected plants by measuring water loss. Ten plants with 8.3 galls/plant and 10 control plants were subjected to different light intensities and wind velocities designed to produce different conditions of tension in the water column of the conductive tissue. Under the stress conditions, transpiration rates from infected plants were 1.92 g/hr and rates from controls were 1.67 g/hr. The root dry wt of infected plants was higher than that of controls, while the shoot dry wt and leaf dry wt were lower. Shoot to root ratios were 3.0:1 for infected plants and 3.4:1 for controls. Leaf to root ratios were 1.9:1 for infected plants and 2.3:1 for controls. Under nonstress conditions, transpiration rates of infected plants were correlated with quantity of leaf tissue. Under stress conditions, transpiration rates of infected plants were disproportionately higher than expected in relation to the quantity of leaf tissue. The higher transpiration rate was correlated with the lower ratio of transpiring plant parts to water absorbing plant parts.

A third race of downy mildew of lima beans. R. E. WESTER (ARS, USDA, Beltsville, Md.). Downy mildew (*Phytophthora phaseoli*) was discovered on pods of Dover bush lima bean cultivar near Elmer, New Jersey, by Vernon Ichisaka of Seabrook Farms Co. in 1969 in close proximity to where the B strain was discovered in 1958. The appearance of this strain is similar to strains A and B. The only method used to separate these three strains is by host reaction. Early Thorogreen, Fordhook 242, all commercial cultivars, and the majority of foreign Plant Introductions are susceptible to strains A, B, and C; Thaxter and Green Fordhook 861 are resistant to strain A which is widely distributed in the Middle Atlantic Coastal area; Dover bush lima bean is resistant to strains A and B but susceptible to strain C. At present, none of the available lima bean strains is resistant to strain C. A search is now underway to locate a source of resistance to this new strain. Since it took approximately 10 years before the B strain became widely distributed, it should be about the same length of time before the C strain becomes widely distributed. Also, since Elmer, New Jersey, is the only location where all three downy mildew strains occur, one could surmise that the downy mildew organism originated in this area and that additional strains are already present or are being developed.

The 1970 Annual Meeting of the Potomac Division of The American Phytopathological Society was held 24-25 March in Beltsville, Maryland.