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

Chemical control of rust and Cercospora leaf spots of peanuts in Honduras and Nicaragua. P. A. ARNESON (Div. Trop. Res., Tela Railroad Co., La Lima, Honduras). Peanut rust (*Puccinia arachidis*) and the *Cercospora* leaf spots (*Cercospora arachidicola* and *C. personata*) were widespread on experimental plantings of peanuts in Honduras and Nicaragua. Under the conditions of high rainfall and high humidity of the "postrera" planting season, these diseases were devastating and difficult to control. Because of the rapid weathering of the fungicide residues, short spray cycles (no more than 7 days between applications) were found necessary for good disease control. Spray formulations were found superior to dust formulations because of the greater tenacity of the fungicide residues. Dithane M-45 (coordination product of zinc and [ethylenebis (dithiocarbamate)] manganese), 2 lb./acre, gave good control of *Cercospora* leaf spots and fair control of rust. Addition of 0.4 lb./acre of nickelous sulfate to Dithane M-45 improved its effectiveness against rust. Benlate [methyl-1-(butylcarbamoyl)-2-benzimidazolecarbamate], 4 oz/acre, was far superior to the other products tested for the control of *Cercospora* leaf spots, but was ineffective against rust. For good simultaneous control of both diseases, a mixture of Benlate and Plantvax shows promise.

Whitefly-transmitted viruses in Puerto Rico. J. BIRD, J. SANCHEZ, & J. H. LOPEZ-ROSA (Agr. Exp. Sta., Univ. P.R., Rio Piedras). Five different rugaceous viruses identified in Puerto Rico cause, respectively, mosaic diseases of *Sida carpinifolia, Rhynchosia minima, Ipomoea quinquefolia, Jacquemontia tamnifolia,* and *Jatropha gossypifolia.* All except the one causing *Jatropha* mosaic are spread by *Bemisia tabaci* race *sidae. Jatropha* mosaic virus is solely transmitted by *B. tabaci* race *jatrophae,* and affects mainly species belonging to the genus *Jatropha.* The *Sida* virus is apparently related to the causal agent of infectious chlorosis of Malvaceae. The *Rhynchosia* virus has particular affinity for legumes, although several species belonging to the Malvaceae and Solanaceae are affected. It causes a severe form of leaf curl, and usually provokes the formation of leaflike and cuplike enations on tobacco. Certain bean varieties develop tumors after being injured. The *Rhynchosia* virus is apparently related to the Brazilian yellow mosaic virus of *Phaseolus longepedunculatus* and to the Indian yellow mosaic virus of *P. lunatus.* The mosaic virus of *I. quinquefolia* primarily affects Convolvulaceous species, but also causes a moderately severe form of leaf curl on tobacco, although it fails to incite formation of enations. The yellow mosaic virus of *J. tamnifolia* (another Convolvulaceous weed) also affects *J. pentantha. Spermacoce tenuior,* a rubiaceous weed, is susceptible to the yellow mosaic virus of *Jacquemontia.*

Chemical and biological activity of Difolatan 4-Flow with and without Nu-Film 17. C. H. BLAZQUEZ (South Fla. Field Lab., Immokalee). The chemical and biological activities of Difolatan 4-Flow [*cis-N*-(1,1,2,2-tetrachloroethyl) thio-4-cyclohexene-1,2-dicarboximide] were studied during the fall of 1968 in a split-plot experiment with and without Nu-Film 17 to determine the correlation of biological and chemical activities, as well as to establish decay curves with and without Nu-Film 17. The addition of Nu-Film 17 to both rates (1.25 and 2.50 pt) of Difolatan 4-Flow increased the initial amt of residue, extended the days of residue retention by leaves, significantly increased the per cent disease control of gray leaf spot (*Stemphylium solani*), leaf mold (*Cladosporium fulvum*), and late blight (*Phytophthora infestans*), and significantly increased the yield of sprayed tomato plots when compared with the check.

Effect of Nu-Film 17 on adherance of Dithane M-45 to tomato and cucumber leaves. C. H. BLAZQUEZ (South Fla. Field Lab., Immokalee). The effect of Nu-Film 17 (terpene trimer) on the adherence of Dithane M-45 80 W (coordination product of zinc and [ethylenebis (dithiocarbamate)] manganese) to cucumber and tomato leaves was studied in split-plot experiments during the fall of 1967 and 1968. Two rates of Dithane M-45 (½ and 1½ lb./100 gal of water) were applied on a weekly schedule with and without Nu-Film 17. The addition of Nu-Film 17 to both rates of Dithane M-45 significantly increased yield and per cent disease control of gray leaf spot (*Stemphylium solani*) on tomato, and also significantly increased yield and per cent disease control of target spot (*Corynespora cassiicola*) on cucumbers.

Wilt of chickpeas or garbanzo beans (Cicer arietinum) incited by Fusarium oxysporum. E. ECHANDI (N. C. State Univ., Raleigh). Wilt has been recognized as the most serious disease of chickpeas in Peru. Symptoms consist of wilting and yellowing of the foliage and necrosis of the roots. Isolations from over 250 wilted plants invariably yielded *Fusarium oxysporum. F. lateritium* was not isolated from wilted plants in Peru. Chickpeas inoculated with monoconidial isolates of *F. oxysporum* developed symptoms similar to those observed in the field, and the pathogen was easily reisolated from inoculated plants. Susceptibility of plants was increased by wounding the roots. Thirty-day-old chickpea plants were more susceptible to wilt than 10- to 20-day-old plants. Greenhouse studies substantiate the fact that wilt is more severe in light sandy soils than on heavy clay soils. Chickpea varieties Espanol and Gigante were more resistant to wilt than the widely used local variety Criollo.

Alternaria pathogenic on blooms of roses, chrysanthemums, and King asters. A. W. ENGELHARD (Gulf Coast Experiment Sta., IFAS, Univ. Fla., Bradenton). *Alternaria* sp. was isolated from small, 1-3 mm in length, reddish-brown lesions on the petals of a spider type bloom of a chrysanthemum seedling, and also from decaying King aster blooms. The two isolates were designated *Alternaria* sp. 1964 and *Alternaria* sp. 1652A, respectively. Both isolates incited severe petal necrosis on King aster blooms and on Tropicana and Red American Beauty rose buds. *Alternaria* sp. 1964 caused small, 1- to 3-mm reddish-brown lesions on the petals when Yellow Knight chrysanthemum blooms were inoculated. Similar lesions developed on the petals of Southern Comfort chrysanthemum blooms when *Alternaria* sp. 1652A was used for inoculum. Both fungi infected King aster blooms at 18, 23, 29, and 35 C (95 F), but not at 9 or 12 C (52 F). Maximum disease development occurred at 23 C. With *Alternaria* sp. 1964, infection occurred on King aster blooms when the period between inoculation and incubation in an environment favorable for disease development was as long as 40 hr. *Alternaria* sp. was isolated from inoculated blooms of roses, chrysanthemums, and King asters. Naturally occurring symptoms similar to those produced experimentally were observed in field grown roses, chrysanthemums, and King asters.

Supplemental effects from the use of certain fungicides on citrus trees. F. E. FISHER (Univ. Fla., Citrus Exp. Sta., Lake Alfred). Valencia orange trees were sprayed at petal fall, in April, with zineb [ethylenebis (dithiocarbamate) zinc] 1½ lb., ferbam [ferric dimethyldithiocarbamate] 1½ lb, and basic copper (0.75 lb metallic cu)/100 gal of water. Samples taken in June showed that trees sprayed with zineb or ferbam had larger fruits, and the fruits were darker in color and weighed more than those from trees sprayed with copper. Fruits from zineb- or ferbam-treated trees were also more symmetrically formed and had significantly fewer chimaeralike abnormalities than those treated with copper.

Hosts of Septoria sp. isolated from potato in Peru. A. T. JIMENEZ & E. R. FRENCH (Estacion Exp. Agr. y Univ. Agraria, La Molina, Peru). The fungus *Septoria* sp. has been isolated from leaves and stems of potato (*Solanum tuberosum* subsp. *andigena*) in the Peruvian Andes, where it causes symptoms like those recently described in Vene-

zuela. Better lineal growth occurs in agar media with potato-dextrose, potato leaf extract-dextrose, and V-8 juice, than in Czapek's medium. Sporulation occurred only on V-8 and cornmeal, and only in light. Solanaceous plants were inoculated in a moist chamber with spore suspensions of the fungus and transferred after 48 hr to the greenhouse. Bonny Best tomato, Black Beauty eggplant, *Datura metel, Nicotiana rustica,* and seven potato varieties were susceptible. *Datura stramonium* and *Physalis peruviana* were resistant. Some of these plants have been reported hosts of *Septoria lycopersici,* which morphologically resembles this *Septoria* from potato. An isolate of *S. lycopersici* from North America produced similar symptoms on tomato and eggplant, but only resulted in a hypersensitive reaction on potato. These results suggest that both *Septoria* are of the same species but of different *forma specialis* or races.

Control of black pod disease of cocoa in Trinidad. E. M. JONES (Min. Agr., Central Exp. Sta., Trinidad, W. I.). Black pod disease of cocoa caused by the fungus *Phytophthora palmivora* is the most serious field disease of cocoa in Trinidad and Tobago. In field trials conducted in Trinidad in three different locations with an average annual rainfall of 100 inches, it was shown that 3 weekly sprays with Kocide 101 (cupric hydroxide 86%) at the rate of 2 lb./25 gal of water/acre reduced losses (diseased pods) from black pod disease to 15% in the sprayed plots as compared to 37% losses in the unsprayed (control) plots. The results also showed that there was an average increase of 82% in the number of good (healthy) pods reaped, and an average increase of 73% in pounds of wet cocoa beans obtained in the sprayed plots as compared to the unsprayed (control) plots.

Effect of Fusarium spp. on germination and stem rot of sugarcane in Puerto Rico. L. J. LIU (Agr. Exp. Sta., Mayaguez, Univ. P. R., Río Piedras.) *Fusarium moniliforme* and *F. roseum* were isolated from the roots of stunted sugarcane plants. Three methods were employed to inoculate sugarcane plants with these fungi: seedpiece-dipping, substrate inoculation, and stem-puncture. The results indicate that *F. moniliforme* reduced germination of variety P.O.J.2878 as much as 40% when both the seedpiece-dipping and substrate inoculation methods were used. Inoculations with *F. roseum* had practically no effect on germination. Sugarcane varieties P.O.J.2878, P.R.1117, P.R.980, P.R.1059, P.R.1085, and N:co.310 were susceptible to *F. moniliforme* when inoculated by the stem-puncture method.

Pathogenicity of Fusarium moniliforme and F. roseum and their interaction with Trichodorus christiei on sugarcane in Puerto Rico. L. J. LIU & A. AYALA (Agr. Exp. Sta., Mayaguez, Univ. P. R., Rio Piedras). A study was made to determine whether there is a positive interaction between *F. moniliforme, F. roseum,* and *T. christiei* on top and root growth of sugarcane plants. Varieties P.R.980, P.R.1059, P.R.1085, P.R.1117, and P.O.J.2878 were separately inoculated with *F. moniliforme* and *F. roseum,* and a second set of sugarcane plants was inoculated with both fungi and the nematode *T. christiei.* Seedpiece germination was greatly reduced in all varieties when inoculated with *F. moniliforme* individually and in combination with *T. christiei.* Height of stems, number of tillers, as well as fresh and dry wt of both the top and the root were greatly reduced in the variety P.O.J.2878, but not in the others. *F. roseum* alone and in combination with *T. christiei* had no effect on germination and top growth. There was some evidence of a positive interaction between *F. moniliforme* and the nematode on root growth, but not on top growth.

Response of banana varieties to black leaf streak disease (Mycosphaerella fijiensis). D. S. MEREDITH & J. S. LAWRENCE (Univ. Hawaii, Honolulu). The response of 39 banana varieties to infection by *Mycosphaerella fijiensis* was studied in an experimental plot in Hawaii. The major commercial varieties (Cavendish and Gros Michel) were highly susceptible. The tetraploid I.C. 2 was slightly less susceptible, but nevertheless was severely affected. Certain cooking bananas, i.e., Saba, were partially resistant. As susceptibility increased, the interval between infection and first symptom expression decreased and the number of functional leaves present at harvest decreased. Several cultivars resistant to Sigatoka caused by *M. musicola* were moderately to highly susceptible to *M. fijiensis.* It seems likely that breeding for resistance against *M. fijiensis* will prove more difficult than against *M. musicola.*

False broomrape, a destructive tobacco disease in Nicaragua. C. R. MILLER & G. B. LUCAS (Univ. Fla., Gainesville, N. C. State Univ., Raleigh). Although false broomrape, a disease of unknown cause, has been reported on tobacco for at least 40 years, the first indication of its economic importance occurred when a severe outbreak on tobacco developed in the Jalapa Valley of Nicaragua during the 1968-1969 growing season. In some fields of burley and shade-grown cigar-wrapper types, yield and quality were decreased 25%. Symptoms appeared as masses of white, succulent, irregular outgrowths on roots that varied in shape and size (up to 12 × 15 cm). Nearly all roots were affected in many plants. Occasionally, leaflike structures developed from the hypertrophied root tissue that emerged from the soil and developed chlorophyll. There was less damage where tobacco was planted early in the season in cool damp soil than when tobacco was planted later in warmer, dryer soil. Disease incidence has not yet been correlated with irrigation, fertilization, nematodes, fumigation, or other pesticide usage.

Helminthosporium rostratum in Puerto Rico. J. A. B. NOLLA (Univ. P. R., Mayaguez). *Helminthosporium rostratum* was first isolated in 1964 along with other *Helminthosporia* on sugarcane and Merker grass from Mayaguez, and later from six other distant localities. The symptoms produced on inoculated cane plants are small, eye-shaped lesions with reddish centers and yellow-halos (typical of eye-spot) and linear brown or black stripes (typical of brown-stripe), except on variety M28, on which irregular black necrotic areas are produced. The most resistant sugarcane cultivars appear to be Rayada P.R. 980 and B4362, and the most susceptible are B4145, B34-104, B37-161, and P.R. 1013. Conidia of the fungus possess a protuberating hilum, rostrate elongated apical end, and dark colored, thick, or accentuated end septa. They are larger (23.8-231 × 10.2-20.4 μ) than those from Florida (109-188 × 7-14.8 μ) and longer but narrower than the type (32-184 × 14-22 μ) on *Eragrostis major.*

Pratylenchus spp. as citrus pathogens. J. H. O'BANNON & A. T. TOMERLIN (ARS, USDA, Orlando, Fla.). Population studies in the greenhouse showed *Citrus limon* to be highly susceptible to *Pratylenchus coffeae* and moderately susceptible to *P. brachyurus.* Measurements taken 11 months after inoculation of 6-month-old citrus seedlings with 25 individuals of each species showed a 22% reduction in shoot growth and a 5% reduction in stem diam of seedlings infected with *P. coffeae.* Seedlings infected with *P. brachyurus* showed no growth reduction when compared to the controls. Populations of *P. coffeae* increased to 8,500/g of root, while *P. brachyurus* increased to only 15/g of root. Variations in field symptoms and numbers of *P. brachyurus* extracted from roots indicated the presence of biotypes. Citrus seedlings were each separately inoculated with 50 *P. brachyurus* of each of six isolates, and one *P. coffeae* isolate. Roots processed 7 months after inoculation showed no recovery of three isolates of *P. brachyurus,* and an average of 5, 138, and 1,000 nematodes/replicate for the other isolates from Indiantown, Tilden, and Lake Placid. There was an average of 7,401 of *P. coffeae* recovered. The Lake Placid isolate of *P. brachyurus* and *P. coffeae* caused a significant reduction in linear growth of seedlings when compared to control seedlings.

Interaction of cultivars, nematodes, and fumigants on development of Verticillium wilt on tomato. A. J. OVERMAN, J. P. JONES, & C. M. GERALDSON (Gulf Coast Exp. Sta., IFAS, Bradenton, Fla.). A split-plot design involving eight tomato cultivars and two fumigants with an untreated control was repeated on five planting dates from August to February in a field naturally infested with *Verticillium albo-atrum* and three species of phytoparasitic nematodes. Preplant soil treatment with ethylene dibromide (1,2-dibromoethane) or Vorlex (20% methyl isothiocyanate + 80% chlorinated hydrocarbon mixture) applied at the rate of 6 and 35 gal/acre, respectively, reduced the incidence of wilt in the susceptible cultivars (Floradel, Walter, 393-6-4, and 1150-4-2-3) from 9 to 15 weeks. An average of 98% control of *Tylenchorhynchus capitatus* was maintained for 3 months with ethylene dibromide and 96% with Vorlex. Yield of fruit was increased equally by the fumigants in the wilt-resistant Tropic and VFN 6428 as well as the wilt-susceptible cultivars. Resistance of VFN 6428 to *Meloidogyne incognita acrita* held throughout the five plantings.

Systemic fungicide interval for control of sugarbeet Cercospora leaf spot. A. O. PAULUS, F. SHIBUYA, J. NELSON, & O. A. HARVEY (Univ. Calif., Riverside). Sprinkler irrigation in the interior valleys of California enhances defoliation from *Cercospora* leaf spot of sugarbeets. Susceptible cultivar H-5 was planted during the summer of 1969 and sprinkle-irrigated 3 times weekly. Plots were inoculated with a suspension of *Cercospora* spores several times during the course of the experiment. Fungicidal sprays were applied every 18 days. Severe disease developed in the check. Methyl-1-(butylcarbamoyl)-2-benzimidazolecarbamate (Benlate) was significantly better than all other chemicals tested. Fall trials consisted of fungicidal sprays applied on an 11- or 22-day schedule. Medium inoculum pressure was present in the check, and Benlate applied every 22 days was significantly better than all other fungicides. Next in effectiveness on the 22 day schedule was 2-(4′-thiazolyl) benzimidazole (TBZ); tetrachloroisophthalonitrile (Daconil 2787); *cis-N*-(1,1,2,2-tetrachloroethyl) thio-4-cyclohexene-1,2-dicarboximide (Difolatan), and triphenyl tin hydroxide (Duter). On the 11-day schedule, copper hydroxide (Kocide 101), TBZ, Daconil 2787, Duter, and Difolatan were significantly better than all other materials.

Dry frond disease (Tala seca) of African oil palm in Bahia, Brazil. H. PEIXOTO-SANTOS & B. H. WAITE (IPEAL/IRI, Cruz das Almas, Bahia). A condition consisting of yellowing and drying of leaf pinnae, initially in one side of the frond, in 3- to 4-year-old oil palms, and less frequently in older plants, occasionally occurs during the rainy season following exceptionally dry periods or low temp. Frond bases exhibit deep brown lesions near the point of attachment with a lighter-colored stripe extending along the center or side of the rachis. The pinnae dry and break away as the lesion progresses. Often one side of the frond may be completely green, while on the other all pinnae are killed. Symptoms are absent in the internal tissue of the palm trunks and the roots. All palm varieties appear to be equally susceptible. Seven genera of fungi were isolated from rachis lesions and inoculated into 1-year-old nursery plants and 3-year-old field palms. No symptoms developed after 6 months. Usually plants recover during favorable growing periods. The disease is considered to be physiological in origin and due to a response to unfavorable soil moisture conditions and/or low air temp. Dry frond is not a threat to the oil palm industry in Bahia.

Infection of banana leaves with fruit spot organism, Pyricularia grisea. R. A. RODRIGUEZ (Kennecott Copper Corp., S.P.D., Houston, Texas). *Pyricularia grisea,* causal agent of the pitting disease of bananas, produces numerous dark, sunken spots on the fruit, unfavorably affecting its market appearance. The disease also develops during transit and storage. Transition leaves and bracts associated with the inflorescence are also infected, and the lesions produced are suggested to serve as the source of primary inoculum for the young fruit. No reports are available of the disease occurring on functional leaves or other parts of the banana plants. Typical lesions of the disease have now been found on laminae of weak leaves, water suckers, sheath-stalks, petioles, and, in some cases, at the periphery of old sigatoka-infected tissue in banana plantations of Guapiles, Costa Rica. Large necrotic areas resulted on leaves of Giant Cavendish plants from wound-mycelium inoculations after 6 days, and typical lesions fully developed on spore-inoculated leaves after 15 days. The fungus was also recovered by the standard methods of isolation. The role of *Pyricularia grisea* on banana leaves as a source of inoculum for fruit infections, under the conditions of the Guapiles area, is suggested.

Preliminary studies on the interaction of Pratylenchus brachyurus and Pythium graminicola on sugarcane. J. ROMAN & H. KOIKE (Agr. Exp. Sta., Univ. P.R., Mayaguez, ARS, USDA, Gurabo, P.R.). Sugarcane in Puerto Rico is frequently found associated with infections of the lesion nematode, *Pratylenchus brachyurus,* and/or with the root rot fungus, *Pythium graminicola.* To investigate the possible interaction between these organisms, greenhouse experiments were conducted. Dry-wt data from canes inoculated with the fungus 2 weeks after inoculation with the nematode indicated that there is no synergism between the fungus and the nematode. The fungus when inoculated alone, and in combination with the nematode, is capable of reducing significantly top and root growth. No significant differences were found between the above two treatments nor between the treatments in which the nematodes were inoculated alone and the control. Although these results indicate a negative interaction between *Pratylenchus brachyurus* and *Pythium graminicola,* the possibility that under various other conditions their combined pathologic potential may be far greater than the sum of their individual effects cannot be overlooked.

Induction of the perfect stage of Mycena citricolor by other fungi. J. A. SALAS (Univ. Calif., Berkeley). The perfect stage of *Mycena citricolor* was induced by five clones of *Penicillium,* two of *Alternaria,* and two of *Cladosporium* when grown in coculture in petri plates on certain media. These inducers were selected from 75 fungi which were tested against *M. citricolor.* One of the *Penicillium* clones was far superior to the other tested fungi in its ability to induce basidiocarps. When this clone was tested against 60 isolates of *M. citricolor* from Costa Rica, five from Guatemala, and one from Mexico, most of which did not produce the perfect stage alone, basidiocarps were readily induced in all of them. When the best *Penicillium* inducer was grown on potato-dextrose broth, the sterile supernatant induced *M. citricolor* to produce the sexual stage. This suggests that some substance(s) is produced by the *Penicillium* that induces *M. citricolor* to produce the perfect stage.

Preliminary characterization of a Penicillium metabolite which induces the perfect stage of Mycena citricolor. J. A. SALAS & C. L. ATKIN (Univ. Calif., Berkeley). A factor which induces the perfect stage of *M. citricolor* was present in the supernatant of floating cultures of a *Penicillium* grown in potato-dextrose broth (PDB). The activity was max after 1 week's growth under laboratory conditions (23 ± 2 C), with assays obtained by placing 5 ml of sterile *Penicillium* supernatant on the uncolonized part of an 8- to 10-day-old potato-dextrose agar or YpSs (Difco) plate of *M. citricolor.* The factor was dialyzable, stable to autoclaving, fairly stable to alkaline hydrolysis, but destroyed by acid hydrolysis. Gel filtration experiments indicated a mol wt in the range of 100 to 300. In electrophoresis, ion-exchange, and solvent-extraction experiments the factor behaved as a weak acid. Further chemical characterization is in progress. Neither common amino acids, organic acids, vitamins, etc., cyclic-3′, 5′-AMP, zearalenone, stigmasterol,

ergosterol, cholesterol, sistosterol-Beta, dihydrocholesterol, nor testosterone induced the formation of *Mycena citricolor* perfect stage.

Lethal yellowing disease of coconut palms in the Dominican Republic. E. SCHIEBER & E. HICHEZ FRIAS (Min. Agr., Guatemala, Sec. Estado de Agr., Dominican Republic). The disease of coconut palm (*Cocus nucifera* L.) known as lethal yellowing was found for the first time in the Dominican Republic. The disease is present in the Province of Puerto Plata and Dajabon in the Atlantic coast and bordering Haiti. Symptoms are similar to those described by Carter in Jamaica and Martinez in Florida, USA. The disease is of importance, since it spreads rapidly killing coconut palms within 6 to 7 months. Eradication of affected trees was started early in 1969 after the disease was found. Testing of resistant material such as Malayan Dwarf under Dominican conditions has been suggested, as well as the survey and studies of the disease in the Department Du Nord in Haiti bordering the Dominican Republic.

Coffee berry necrosis in Guatemala and Costa Rica. E. SCHIEBER, G. A. ZENTMYER, D. J. MITCHELL, & J. ROHEIM (Min. Agr., Guatemala, Univ. Calif., Riverside). A disease of coffee berries, similar in appearance to the coffee berry disease in East Africa, has increased in severity in Guatemala in recent years, and also occurs in Costa Rica. In Guatemala it was first observed in 1963 by Echandi and Schieber. Spots appear as the berries begin to mature, and may affect 40 or 50% of the berries, resulting in a significant crop loss and reduction in quality. The disease is most severe in mountain-grown coffee and plantations with sparse shade. The principal fungi isolated from diseased berries are *Cercospora* sp., *Colletotrichum* sp., *Fusarium* sp., and *Pestalotia* sp. Preliminary pathogenicity tests indicate that *Cercospora* sp. and *Colletotrichum* sp. isolated from the lesions are pathogenic to coffee berries, but the precise disease syndrome has not yet been reproduced in the laboratory and greenhouse. Spray trials are under way in Guatemala, using Difolatan [*N*-(1,1,2,2-tetrachloroethylsulfenyl)-*cis*-△-4-cyclohexene-1,2-dicarboximide] and copper sprays.

Ethylene production in banana plants infected with Mycosphaerella musicola and its possible role in premature ripening of the fruit. R. H. STOVER (United Fruit Co., La Lima, Honduras). Fruit from banana plants infected by *Mycosphaerella musicola* ripened prematurely under simulated transit conditions of 58 F for 13 days. As little as 6% of the total leaf area per plant affected by *M. musicola* increased premature ripening, provided spotting occurred on younger leaves. Such levels of spotting do not affect yield or time from flowering to harvest. Young lesions produced large quantities of ethylene, but this is released at, or near, the site of production and does not, therefore, trigger fruit ripening. *Mycosphaerella musicola* in agar cultures did not produce ethylene. Green fruit from spotted plants, which subsequently ripened prematurely, did not have a base rate of ethylene production in excess of normal fruit of the same age. The preclimacteric rise in ethylene production that preceded ripening was related to age of fruit at harvest and to leaf spot. The rise occurred sooner in fruit from spotted plants of the same age as fruit from nonspotted plants. Fruit from spotted plants behaved similarly to fruit that was physiologically 1-2 weeks older than control fruit of equal age. Something other than ethylene is produced in diseased banana leaves that causes an increase in the physiological age of the fruit.

Populations of Rotylenchulus reniformis and yields of cotton following soil fumigation in Texas. W. H. THAMES, C. M. HEALD, & J. AMADOR (Texas A&M Univ., College Sta., USDA, ARS, CPRB, Weslaco). Counts of *Rotylenchulus reniformis* per 100 g of soil extracted by centrifuge and Baermann techniques were made approximately 1, 3, 4, and 5 months after planting cotton in a 1968 soil fumigation trial in the Lower Rio Grande Valley. Mean numbers recovered for the periods were 160, 894, 2,407, and 2,674 using the Baermann, and 32, 480, 665, and 871 with the centrifuge technique. Significant negative correlations between yields and counts occurred only for the 3-month sampling. Differences in counts due to treatment were significant at 1 and 4, but not at 3 and 5 months. Yields of cotton were not significant. Near the same site in 1969, soil fumigants were applied in adjacent trials to compare control of *R. reniformis* in cotton following cotton and in cotton following sorghum. Pretreatment counts were 10 times greater after cotton (100/100 g of soil compared to 9 following sorghum). Nematodes were extracted by the Baermann technique 1.3, 2.5, 3.9, and 5.1 months after treatment. Differences in counts due to soil fumigant applications were significant for the first three samplings in cotton after cotton, but only for 1.3- and 3.9-month samples where cotton followed sorghum. Untreated plots reached peak populations at 2.5 months then declined. Treated plots peaked at 5.1 months. Yields of cotton were significantly increased with dichloropropene-type fumigants in both trials.

Relationships among clones of Calonectria (Fusarium) rigidiuscula isolated from gall diseases of Theobroma cacao. D. L. THOMAS & W. C. SNYDER. (Univ. Calif., Berkeley). *Calonectria (Fusarium) rigidiuscula* isolated from *Theobroma cacao* in the Caribbean, Central America, South America, and Africa consisted of numerous homothallic and heterothallic clones. On the basis of pathogenicity tests for green point gall, heterothallic cultures were classified as either green point gall inducers or noninducers. Heterothallic noninducing cultures were isolated from flowery galls and other flower cushion disorders as consistently as heterothallic green point-inducing cultures were isolated from green point galls. Unlike homothallic populations of *C. rigidiuscula*, which showed relatively little variation, heterothallic populations showed marked variation. Heterothallic green point-inducing cultures were morphologically indistinguishable from heterothallic noninducing cultures, and both groups were readily interfertile.

A Phytophthora fruit rot of breadfruit. E. E. TRUJILLO (Trust Territory Pacific Islands, Ponape, E. Caroline Is.). The causal agent of a serious fruit rot of breadfruit observed in the Truk and Ponape districts of the Trust Territory of the Pacific Islands was isolated and tentatively identified as *Phytophthora palmivora*. Wound and nonwound inoculations were performed in detached rough and smooth skin fruits incubated in a moist chamber at 25 C. These inoculations resulted in invasion and lesion formation. Apparently the pathogen can penetrate rough skin fruit cultivars directly or through wounds, and smooth skin fruit cultivars through wounds only. The first visible symptoms of the disease are water-soaked lesions on the fruit surface appearing 48-78 hr after inoculation. As the lesion enlarges, the center turns light brown in color and sporulating hyphae are produced close to the margin. Sporulation occurs in nature when night temp are 21-23 C and relative humidity is 100. Rapid lesion enlargement occurs in the daytime at temp of 27-29 C. This periodicity in growth shows in the lesions of diseased fruit as concentric bands of different shades of green-brown color. Rotted fruit mummifies on the tree.

Some aspects of Diplodia canker formation on cacao. H. J. VALE-HUERTA & R. AYCOCK (Univ. del Zulia, Maracaibo, Venezuela, N. C. State Univ., Raleigh). Pathogenicity of isolates of *Diplodia theobromae*, the cause of canker disease of cacao, and *D. natalensis* was established by inoculating them into 8-month-old cacao plants. No differences were observed between reisolates and original isolates. Isolates showed no consistent differences in size, shape, and arrangement of pycnidia. Differences in shape of pycnidia observed within isolates probably resulted from rigidity exerted by host tissue against the pycnidial walls. Green-

house tests showed that heat injury was very effective in predisposing young cacao plants to infection. Damage by heat to the bark-cambium and cortex permits rapid development of the fungus, which then attacks the healthy tissue encircling the tree and causing death of the upper parts of the plant. Penetration of the fungus between adjacent cells of the bark appears to be mechanical, and occurs approximately 8 days after inoculation. Pycnidia are formed 12 days after inoculation. Further development occurs inter- and intracellularly without disrupting the normal shape of cells. Penetration of adjacent cells occurs by constriction of the hyphae. There was no evidence of secretion of substances that caused enlargement or dissolution of host cell walls.

Cover crops and temperature as factors affecting lettuce seedling injury caused by Pythium. A. G. WATSON (Univ. Calif., Berkeley). Incorporation of barley, rye, or broccoli cover crops into field soils consistently increased the population density of *Pythium ultimum* as measured by Stanghellini's plate-drop method. *Pythium* population remained higher in the amended soils for 2 to 3 months. Initially, the increased population resulted in an increased inoculum potential as measured by seed colonization or lettuce seedling root injury. Later the *Pythium* inoculum potential in amended soil fell below that found in unamended soil, even though the *Pythium* population remained higher in the amended soil. The *Pythium*-lettuce interaction was extremely temp-sensitive. As soil temp at the planting depth increased from 65 F to 80 F, the degree of *Pythium* injury increased. An understanding of the role of cover crops as substrates for ecological successions of soil microorganisms and the attendant initial increase and subsequent decrease in *Pythium* inoculum potentials may be useful in developing a cultural control to reduce *Pythium* damage to seedlings.

Distribution of mating types of Phytophthora palmivora. G. A. ZENTMYER & D. J. MITCHELL (Univ. Calif., Riverside). The distribution of mating types of *Phytophthora palmivora,* geographically and by hosts, was studied, using our collection of 125 isolates. Isolates were paired on clear V-8 juice agar and incubated in darkness for 10 days at 22-25 C. Both A^1 and A^2 mating types were found on cacao (*Theobroma cacao*), rubber (*Hevea* spp.), black pepper (*Piper nigrum*), papaya (*Carica papaya*), and orchid. In our studies the common mating type on cacao was the A^2, and on rubber, the A^1. A coconut isolate from Ceylon was homothallic. Both mating types occur on cacao in Brazil, Mexico, and Nigeria, and on rubber in Ceylon and Malaya. Both mating types, irrespective of host, were found in Brazil, Ceylon, Costa Rica, Malaya, Mexico, and Nigeria. On cacao, the A^1 type occurs in Brazil, Guatemala, Jamaica, Mexico, and Nigeria; the A^2 type in Brazil, Ceylon, Colombia, Costa Rica, Dominican Republic, Fiji, Ghana, Honduras, Ivory Coast, Malaya, Mexico, New Guinea, Nicaragua, Nigeria, and Truk. On rubber, the A^1 type was found in Brazil, Ceylon, Costa Rica, and Malaya; the A^2 type in Ceylon and Malaya. The A^1 type corresponds to the earlier designation of the "rubber" group of *P. palmivora* isolates; the A^2 to the "cacao" group. The possibility for the development of new strains of the fungus is obviously increased in areas with both types.

A mosaic disease of dasheen caused by a filamentous virus. F. W. ZETTLER, M. J. FOXE, & R. D. HARTMAN (Univ. Fla., Gainesville). Locally grown plants of dasheen, *Colocasia esculenta,* were infected with a virus not previously described for this species. Leaves of infected plants exhibited an indistinct mosaic with little or no leaf distortion. Only seedlings of the single aroid species tested, *Philodendron selloum,* exhibited symptoms when mechanically inoculated with juice from infected dasheen leaves; cowpea, pumpkin, *Datura stramonium,* and varieties of tobacco, pepper, and corn were not visibly infected. Filamentous virus particles were found in negatively stained leaf extracts from infected dasheen. Of 178 particles measured, 91% were between 700 and 800 mμ in length. Typical of other known filamentous viruses of this length, this virus was also found to be (i) aphid transmitted in a stylet-borne manner; and (ii) associated with cylindrical cytoplasmic inclusions. Aphid transmission was effected to *P. selloum* seedlings by individuals of *Aphis craccivora* allowed single 30- to 90-sec acquisition probes on infected dasheen leaves. Cylindrical inclusions and their striated substructure were discerned in ammonium molybdate stained extracts of infected dasheen leaf tissue. Inclusions also were seen in ultrathin sections of infected tissue. The virus is tentatively designated dasheen mosaic virus.

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