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Abstracts

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Alphabetized by first author's last name

CHARACTERIZATION OF THE CAUSAL AGENT OF POSTBLOOM FRUIT DROP OF CITRUS. J.P. Agostini,[1] L.W. Timmer,[1] and D.J. Mitchell,[2] [1]Univ. Florida, Citrus Research and Education Center, Lake Alfred 33850, and [2]Dept. Plant Pathology, Gainesville 32611

Postbloom fruit drop (PFD) of citrus was caused by slow-growing, orange strains of Colletotrichum gloeosporioides (C.g.) but not by fast-growing, gray strains. The colony color and morphology, conidial size and shape, setae production, growth rate, and optimum temperature for growth of the orange and gray strains of C.g. were compared to Gloeosporium limeticola, the cause of anthracnose of Key lime. The orange strain of C.g. and G. limeticola were indistinguishable on the basis of all characters examined, and the gray strain of C.g. was distinct in almost every case. In pathogenicity tests, G. limeticola produced the blossom blight symptoms of PFD similar to those produced by the orange strain of C.g.

FIRST DOCUMENTATION OF WHITEFLY-TRANSMITTED GEMINIVIRUSES CAUSING WIDESPREAD DISEASE IN COTTON, TOBACCO, AND TOMATO IN DOMINICAN REPUBLIC AND TOMATO IN PUERTO RICO. J.K. Brown[1], R. Lastra[2], and J. Bird[3]. [1]Dept. of Plant Pathology, Univ. of AZ, Tucson, AZ 85721, USA; [2]CATIE, Turrialba, Costa Rica, CI; [3]College of Agric. Sci., Mayaguez Campus, Univ. of PR., Rio Piedras, PR 00928.

Symptoms characteristic of whitefly-transmitted geminiviruses were observed for the first time in cotton, tobacco, and tomato in The Dominican Republic (DR), and in tomato in Puerto Rico (PR) during 1990-91. In DR, a bright golden mosaic/leaf distortion in cotton, and a golden mosaic of tobacco were widespread, while in DR and PR yellow leaf curl symptoms were observed in tomato. The presence of WFT geminiviruses in symptomatic leaves was confirmed by DNA-DNA hybridization analysis using individual and/or "cocktail" mixtures of DNA A-components (DNA-1) of several WFT geminiviruses as probes. Uneven ripening of tomato fruit, silverleaf of squash, and reproduction of *Bemisia tabaci* in tomato were also observed during 1990 for the first time in DR and PR. Reason(s) for the unprecedented occurrence of *B. tabaci* and associated viral symptomatologies in monoculture crops are not known. The fact that several growers received tomato seedlings from southeastern US-based nurseries in 1989, suggests the possibility for co-importation of a whitefly population with the potential to reproduce well on tomato (endemic *B. tabaci* do not); this characteristic is not unlike that recently ascribed to *B. tabaci* populations currently under investigation in Arizona, Florida, and Texas.

USE OF DOUBLE ANTIBODY SANDWICH INDIRECT (DAS-I) ELISA WITH COATING ANTIBODIES OF DIFFERENT SPECIFICITIES FOR DETECTION OF CITRUS TRISTEZA VIRUS (CTV). M. Cambra[1], L. Batista[2], M.T. Gorris[1], S.M. Garnsey[3], and E. Carbonell[1]. [1]IVIA, 46113, Moncada, Valencia, Spain; [2]Centro de Sanidad de Citricos y Frutales, Havana, Cuba; and [3]USDA, ARS, 2120 Camden Rd., Orlando, FL 32803.

ELISA-DAS-I assays for CTV with seven coating antibodies of different specificities were compared statistically. Crude extracts and dilutions of purified CTV ranging from 1 μg to 0.001 ng/ml were tested. A mix of CTV specific monoclonals 3DF1 and 3CA5 (Ingenasa) were used at 0.05 μg/ml each as the intermediate antibodies. Immunoglobulins (Ig) from a polyclonal antiserum of low specificity to CTV, prepared to semipurified CTV from infected fruit albedo, worked as well for coating as Ig from more specific polyclonal antisera. As little as 0.1 ng/ml of purified CTV could be detected with an optimized DAS-I procedure. Coating polyclonal antibodies of low specificity have been used for diagnostic studies, for CTV strain differentiation and for detection of CTV in Aphis gossypii fed on plants infected with severe and mild isolates of CTV.

EPIDEMIOLOGY OF BLACK SIGATOKA ON PLANTAINS IN COSTA RICA. I.A. Cervantes,[1] J.J. Galindo [2] and J.V. Escalant[2]. UCR[1] and CATIE[2], Turrialba, Costa Rica.

Effect of rainfall, temperatures and relative humidity on Black Sigatoka (Mycosphaerella fijiensis) development were evaluated on the plantain cv 'False Horn' (AAB), at the Exp. Station "La Lola" (40 masl, 26.5º C, 3670 mm annual rainfall). Disease development time (time elapsed from inoculation on unfolded leaf, stage B, to necrosis) varied from 34 to 46 days; youngest spotted leaf was observed on leaves #4-5; state of evolution (SE) varied from 1318 to 1912; conidiophores were between 14-33/ mm^2 and perithecia between 8-20/mm^2. There were 0-2950/m^3 /wk ascospores and 0-460/m^3 /wk conidia in the air. Higher SE and disease severity correlated with high rainfall and lower values of these parameters correlated with low rainfall and temperature above 31º C. Maximum temperature was highly significant in explaining variation of SE.

INTERACTIONS OF FUNGICIDE-RESISTANT AND FUNGICIDE-SENSITIVE PENICILLIUM IN CITRUS FRUITS. J. W. Eckert, Department of Plant Pathology, University of California, Riverside, CA 92521 and G. J. Torres Leal, Instituto Nacional de Tecnologia, Tucuman, Argentina.

Intensive use of the postharvest fungicides biphenyl, sodium *o*-phenylphenate, thiabendazole, benomyl, *sec*-butylamine, and imazalil to control citrus fruit decay over a period of years has caused a serious problem of resistance in *Penicillium digitatum*. Development of a rational control strategy is dependent upon an understanding of the interactions of the fungicide-resistant (R) and fungicide-sensitive (S) biotypes of the pathogen under fungicide selection pressure (FSP) and in its absence. With FSP, the potential for an increase in frequency of R on diseased citrus fruits depends upon the intensity of FSP, R/S genetic background of the Penicillium population, and the opportunity for synergistic interactions between R and S. Without FSP, changes in the R/S composition of the population are influenced mostly by the relative fitness of R and S.

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EFFICACY OF FOSETYL-AL FOR CONTROL OF PYTHIUM ROOT ROT ON DIANTHUS, PETUNIA, POINSETTIA AND VERBENA. A. W. Engelhard, GCREC, Univ. of Fla., IFAS, 5007 60th St., Bradenton, FL 34203

Drenching the soil with specific fungicides to control Pythium root rot is an accepted method of disease control. Spraying the foliage with fungicides for root rot control has not been as efficacious but fosetyl-Al is now labelled for control of Pythium root rot by foliage spray or drench. Fosetyl-Al applied as a foliage spray or a drench at a range of labelled rates provided poor disease control (P. myriotylum) on Dianthus caryophyllus (a dwarf carnation), Petunia x hybrida, and Verbena x hybrida while a drench of etridiazole 30W provided excellent control and metalaxyl 2E intermediate control. Height growth, top weight, and root ball of poinsettia plants growing in P. myriotylum infested soil and sprayed with Fosetyl-Al 80WP at a range of label rates were significantly less than plants drenched with etridiazole 30W. Impatiens plants growing in P. aphanadermatum infested soil and treated as above were significantly taller when treated with etridiazole 30W than the fosetyl-Al sprayed plants or the inoculated or not-inoculated control plants.

POTENTIAL USE OF RFLP FOR THE CHARACTERIZATION OF COCOA CLONES TOLERANT TO *MONILIOPHTHORA RORERI*. V. Febres, R. Lastra, V. Villalobos, P. Fritz. Programa Mejoramiento Cultivos Tropicales, CATIE, Turrialba, Costa Rica; Cocoa Molecular Biology Lab. Pennsylvania State Univ., University Park, PA 16802.

Moniliophthora roreri is the causal agent of "Monilia pod rot", a fungal disease that causes important losses in cocoa production in Central American countries. The present work utilized restriction fragment length polymorphisms (RFLPs) of DNA of tolerant and susceptible cocoa plants to assess the potential of this methodology for the characterization of tolerant clones. The tolerant clones studied were CC-137, EET-67, EET-75, EET-183 and UF-273. The susceptible ones were POUND-7, CC-132, UF-29, UF-221, CATONGO and UF-613. The use of only one probe (21 KD) in combination with the restriction enzyme Hae III led to the separation of six defined groups between the different cocoa clones used in this study. This result demonstrates the potential of RFLP analysis for the genetic characterization of tolerant clones.

EVALUATION OF THE RESISTANCE OF Musa GERMPLASM TO Mycosphaerella fijiensis. J.J. Galindo,[1] M. González,[1] J.V. Escalant[1] and R. Jaramillo[2]. CATIE[1] and INIBAP,[2] Turrialba, Costa Rica.

Resistance to M. fijiensis of 10 Musa cultivars from the Breeding Programme at CNPMF/EMBRAPA, Brazil was evaluated at the Exp. Station "La Lola" (40 masl, 26.5º C, 3670 mm annual rainfall) under natural inoculation. Spreader rows of susceptible cultivars were previously planted. Evolution time (inoculation on unfolded leave, Stage B, to necrosis) varied between 16-23 days in triploids (AAB) 'EMB-301'/'302'; in the tetraploids (AAAB) 'EMB-401'/'403' between 30-40 days and in the diploids (AA) 'EMB-201'/'205' between 60-90 days. Youngest leaf spotted (YLS) varied between leaves #5-7, 7-9 and 8-11; and functional leaves at shooting (FLS) (less than 5% foliar necrotic area) varied between 4, 8-9 and 10-14 for the three groups, respectively. Susceptible cultivar (AAB, 'False Horn') had ET of 26 days, YLS #5 and 4 FLS.

SUSTANCIAS FOLIARES DE CAFETO ASOCIADAS CON LA RESISTENCIA A ROYA (Hemileia vastatrix Berk & Br.). Elmer Guillermo García, Escuela de Biología. Universidad de Costa Rica. S. J. Costa Rica.

Se estudió la variación en la composición química foliar de plantas de café de los cultivares Catuí Rojo y Catimore, luego de inocularlas con uredósporas de Hemileia vastatrix. Se encontró un éster alifático y un carotenoide que incrementaron la concentración según el tiempo de infección, pero el efecto fue mayor y más rápido en Catimore. Ambas sustancias inhibieron la germinación de las uredósporas del patógeno. También se detectó un carotenoide que desapareció con la inoculación, pero más rápido en Catimore. Estas sustancias pueden tener una importante función en la resistencia mostrada por las plantas de Catimore a la roya.

BACTERIAL INGRESS THROUGH STOMATES OF CITRUS LEAVES AND CULTIVAR SUSCEPTIBILITY TO CITRUS CANKER AND CITRUS BACTERIAL SPOT. J.H. Graham, T.R. Gottwald*, T.D. Riley and D. Achor, Univ. Florida, Citrus Research and Education Center, Lake Alfred 33850, and *USDA-ARS, Orlando, FL 32803

Citrus cultivars, that varied in their susceptibility to citrus bacterial diseases, did not exhibit consistent differences in stomatal morphology, opening size or density of stomates on partially expanded (0.5-0.7) and fully-expanded (1.0) immature leaves. Leaves inoculated with Xanthomonas campestris pv. citri at the most susceptible expansion stage (0.5-0.7) had higher bacterial populations within 72 hr after inoculation than leaves inoculated with X. c. pv. citrumelo. After 7 days, lesion numbers were greater in leaves inoculated at higher spray pressures that yielded full water-soaking (WS) than at lower pressure that gave incipient WS. The tendency for WS of expanding leaves and the number of lesions formed after inoculation with either pathogen did not differ greatly among cultivars. Bacterial ingress depends more on stage of leaf development than on cultivar differences in stomates.

OBSERVATIONS ON LEAF-INHABITING ASCOMYCETES FROM VENEZUELA. Richard T. Hanlin and Omar Tortolero. Department of Plant Pathology, University of Georgia, Athens, GA. 30602 U.S.A., and Posgrado en Fitopatologia, Universidad Centro Occidental 'Lisandro Alvarado', Barquisimeto, Venezuela.

Two foliicolous ascomycetes collected in Venezuela have been identified as *Phyllachora fusicarpa* Seaver and *Apiosphaeria guaranitica* (Speg.) Höhnel. *Phyllachora fusicarpa* causes tar spot on *Duranta repens*, a native shrub used in hedge plantings. Subepidermal spermogonia are formed on the upper surface of the leaf, followed by immersed perithecia with ostioles that open on the lower leaf surface. Both spermogonia and perithecia develop beneath a black clypeus formed by pigmented hyphae that fill the epidermal cells. *Apiosphaeria guaranitica* causes a leaf spot on apamate (*Tabebuia rosea*), a native tree used in street plantings. Pycnidia with filiform conidia form in the lesions, followed by perithecia; both structures are immersed in host tissue beneath a blackened clypeus. The ascospores of *Apiosphaeria* are turbinate, with a septum near the lower end. The upper cell becomes brown with age, with the lower cell remaining hyaline. This study was funded by National Science Foundation Grant INT-8902172 and CONICIT Proyecto S1-2147.

TROPICAL VARIANT OF BIOVAR 2 OF PSEUDOMONAS SOLANACEARUM. Hayward A.C.; Sequeira, L.; French, E.R.; El-Nashaar, H. and U. Nydegger CIP, Apartado 5969, Lima 100 - Perú.

Strains of P. solanacearum from potato in Peru were: 1) from cool highlands, Biovar (Bv) 2/race 3, with little formazan pigment of helical shape; 2) from the Amazon lowlands, Bv 1/race 1, with intense central pigmentation and 3) Amazon Bv 2, faster growing with intense helical pigmentation, not corresponding to a described race. Among 138 potato isolates of Bv 2, 10 of the Peruvian Amazon strain plus 9 similar ones from Brazil, were metabolically more active being more pectolytic in Hildebrand gels, producing acid from ribose and from trehalose, and utilizing L-tryptophane and L (+) tartrate; whereas the remainder were from cool climates (race 3) in 28 countries of the Americas, tropical Africa and Asia, and the Middle East. RFLP analyses confirmed the existence in South America of the two Bv 2 phenotypes and another from South America of Bv 1. The lowland phenotype of Bv 2 is tentatively designated as the Tropical variant or Bv 2-T.

EFFECT OF INOCULUM CONCENTRATION OF *Verticillium dahliae* OR *Fusarium oxysporum* f. sp. *lycopersici* ON DISEASE SEVERITY OF SUSCEPTIBLE TOMATO CULTIVARS. Pedro E. Jorge, Instituto Superior de Agricultura, Santiago, Dominican Republic, William R. Chaney and Ralph J. Green, Jr., Purdue University, W. Lafayette, Indiana 47907.

Roots of Roma F (R) and Bonny Best (BB) tomato seedlings (four leaf stage) were dipped in inoculum suspensions containing $7x10^{1,3,5,or7}$ conidia/ml 0.1% water agar of *V. dahliae* (R, BB) or *F. oxysporum* f. sp. *lycopersici* (BB). Inoculated plants were incubated in a greenhouse for 16 days at a controlled soil temperature of 22 C and ambient air temperature. Disease severity estimates were based on stem fresh weight, symptoms severity index ratings and the frequency of isolation of either pathogen from basal, mid and apical stem sections. As inoculum concentration increased, fresh weights decreased and severity of symptoms increased significantly. Isolation of either pathogen from basal, mid and apical stem sections did not differ significantly among the inoculum concentrations.

RESULTS OF RECENT EXPERIMENTS WITH FERBAM FOR CONTROL OF MANGO ANTHRACNOSE. R. T. McMillan, Jr., J. H. Crane and K. J. Mitchell, University of Florida, IFAS, TREC, Homestead, FL. 33031, J. R. Brooks and Sons, P.O. Drawer 9 Homestead, FL 33090.

The recommended spray program on mango (Mangifera indica L.) for the control of mango anthracnose caused by Colletotrichum gloeosporioides Penz. starting at panicle emergence is weekly

or bi-weekly applications of benomyl at 1.7 kg/hectare followed by monthly applications of copper at 4.5 kg/hectare or benomyl at 1.7 kg/hectare from fruit set to harvest. Ferbam applied at 4.3 kg ai/hectare weekly and bi-weekly had 8.9 and 12.7 percent disease fruit respectively as compared to the recommended program with 17.5 percent and the untreated control with 28.2 percent disease fruit.

NIVELES DE VIRULENCIA EN AISLAMIENTOS DE Phytophthora capsici OBTENIDOS DE CHILE (Capsicum annuum) EN COSTA RICA. J. A. Mercado, E. Bustamante. CATIE. Ap. 7170, Turrialba. Costa Rica.

Se determinó la variabilidad de la virulencia del hongo Phytophthora capsici, causante de la marchitez fungosa del chile. Los resultados indican la presencia de 16 razas provenientes de 5 aislamientos del patógeno. Se observa una amplitud de razas que incluye algunas sin genes que les confieran virulencia en su interacción con las especies diferenciales usadas. Entre las razas fisiológicas también se presentaron diferencias significativas entre los niveles de incidencia, virulencia y producción de zoosporas. La diversidad de razas del hongo P. capsici señala la necesidad de buscar fuentes de resistencia dilatoria que permitan una mayor estabilidad de los cultivares de chile.

EFFECTS OF FUMIGANTS ON GROWTH AND YIELD OF MUSKMELONS IN FIELDS INFESTED WITH MONOSPORASCUS CANNONBALLUS. M. E. Miller, J. M. Amador, R. D. Martyn, and B. D. Bruton. Texas A&M University, Weslaco 78596 and College Station 77843, and USDA, ARS, Lane, OK 74555.

Muskmelon fields naturally infested with Monosporascus cannonballus were treated with Busan 1020, Telone II, Telone C17, Busan 1020-Telone C17 combinations, TERR-O-GAS, and CHLOR-O-PIC. Fifty-five days after planting, vines were significantly longer ($p=0.05$) in fumigated plots, except for those treated with Telone II at 155.6 l/ha and TERR-O-GAS 98 at 192.7 kg/ha. Fruit yields were highest in plots treated with Telone C17 at 93.5 and 187.0 l/ha; however, yields in plots treated with Telone C17 at 46.7 l/ha were not significantly different from the control. Since no assay for quantifying populations of M. cannonballus is currently available, Fusarium spp. were sampled as an indicator species to measure fumigation effects on soil fungal populations. One month after fumigation, CFU's/g soil were significantly lower in all fumigated plots.

EVALUACION DE LA RESISTENCIA DE CULTIVARES DE FRIJOL COMUN A Thanatephorus cucumeris Frank (Donk) B.E. Mora A. Saborío, M. Rojas, G.E. Gálvez. SDIA-MAG. Apdo. 10094. San José, Costa Rica. CIAT.IICA 55-2200

En Esparza, Costa Rica, durante el período 1979 a 1990 se evaluó germoplasma de frijol con el objetivo de buscar material resistente a T. cucumeris. Durante el período 1979-80 se consiguieron dos materiales promisorios del Banco de Germoplasma de CIAT. De 1981.1984 se seleccionaron las variedades centroamericanas Porrillo 1,70 y sintético, Turrialba 1, Talamanca, S 630B, D 145 (Huasteco), Icta Quetzal, Jutiapan y Tamazulapa, además de algunos materiales provenientes del programa de mejoramiento en frijol del CIAT al hongo como Mus 3, 5 y 6; PAI 92, 113 y 114; BAT 76, 789 y 1579. De 1985 al presente se seleccionaron materiales que además de presentar resistencia intermedia al hongo presentan otros caracteres como resistencia a antracnosis y tolerancia a suelos de bajo contenido de fósforo como BAT 76, A 237, Mus 37, 47, 52, 132, 133, 135, 138, 141, 142, 176, 177, 180 y 181. La mayoría de estos materiales presentan padres centroamericanos con alguna resistencia al hongo principalmente del grupo Porrillo y Turrialba.

MOLECULAR CHARACTERIZATION AND DIFFERENTIATION OF POTYVIRUSES INFECTING PASSIONFRUIT (*Passiflora edulis*) IN AUSTRALIA, THE DOMINICAN REPUBLIC AND PUERTO RICO. C.L. Niblett[1], S.S. Pappu[1], K.H. Gough[2], M.J. Frenkel[2], and J. Bird[3]. [1]Plant Pathology Dept., Univ. of Florida, Gainesville, FL 32611, [2]Division of Biomolecular Engineering, CSIRO, Melbourne, Australia and [3]Crop Protection Dept., Univ. of Puerto Rico, Rio Piedras, PR 00928.

The 3′ untranslated region (3′UTR) of potyviruses is a useful molecular probe for identifying and differentiating potyviruses (Frankel et al. J. Gen. Virol. 70:2775-2783). We prepared radiolabeled 3′UTRs of watermelon mosaic virus-2 (WMV-2) and the K strain of passionfruit woodiness virus (PWV-K) from Australia. They were hybridized with nucleic acid extracts from plants infected with potyviurses of passionfruit from Australia, the Dominican Republic (DR) and Puerto Rico (PR). PWV-K hybridized only with samples from Australia. WMV-2 did not hybridize with any samples. The potyviruses from DR and PR did not hybridize with either probe. These viruses are being cloned and further characterized.

Sphaceloma fawcettii JENKINS Y SU INTERACCION CON ACAROS FITOPARASITOS EN CITRICOS (Citrus sp.). R. Ochoa[1], E. Vargas[2], E. Bustamante[1]. 1. Centro Agronómico Tropical de Investigación y Enseñanza. RENARM/MIP. 7170 Turrialba, Costa Rica. 2. Escuela de Fitotecnia, Univ. de Costa Rica, Costa Rica.

El hongo Sphaceloma fawcettii Jenkins (1925), de amplia distribución geográfica, ha sido causante del rechazo y pérdida de frutos de cítricos. La enfermedad es conocida como roña, sarna o verrugosis. Se considera de poca importancia en la actualidad, debido a la eliminación del naranjo agrio como porta injerto y el uso de variedades resistentes. Sin embargo, en Costa Rica se ha observado a S. fawcettii en asocio con ácaros fitoparásitos de las familias Eriophyidae, Tenuipalpidae y Tuckerellidae en diferentes especies y patrones de cítricos. Las lesiones producto de esta interacción son de mayor consideración, con cambios de color y forma en hojas que causan su poco desarrollo, deformación y caída. Las especies de ácaros involucrados son Phyllocoptruta oleivora (Ashmead), Brevipalpus phoenisis (Geijskes) y Tuckerella knorri Baker & Tuttle.

CONTROL OF CARNATION RUST (UROMYCES DIANTHI) WITH SYSTEMIC FUNGICIDES. A. O. Paulus, M. Vilchez and S. D. Van Gundy, Plant Pathology Department, University of California, Riverside, California 92521

Rust of carnation (Dianthus caryophyllus), resulting from infection by Uromyces dianthi, is a common disease in California. In experiments to control rust on carnations in southern California, fungicide sprays were applied at 2-week intervals using a 2-gallon CO_2 Hudson sprayer at 30 psi. Disease severity was rated on a scale of 0 to 10 with 0 = no disease; 10 = severe rust development. In the 1985-86 trial using the fungicides at recommended rates, fusilazole was rated (0.4), bitertanol and myclobutanil (1.4), diniconazole (3) and no treatment (8.7). Repeated sprays of fusilazole and diniconazole reduced plant height 26 and 33%, respectively. In the 1990 trial, recommended rates of fungicides were applied. Disease rating for myclobutanil was (2.9) tebuconazole (3.6), triforine (8.8) and no treatment (9.1).

DIRECT TISSUE BLOT IMMUNOASSAYS FOR DETECTION OF CITRUS TRISTEZA VIRUS (CTV). T. A. Permar, S. M. Garnsey, and C. T. Henderson, U.S. Horticultural Research Laboratory, USDA, ARS, 2120 Camden Rd., Orlando, FL 32803

A tissue blot immunoassay (TBIA) procedure (Phytopathology 80:824-828) was tested for detection of citrus tristeza virus (CTV). Freshly cut healthy and CTV-infected tissue was pressed to nitrocellulose paper, and these blots were assayed directly and indirectly with biotin or alkaline phosphatase-labeled monoclonal or polyclonal antibodies. Tissue blots were read at 10X magnification. Localized areas of the tissue imprints of CTV-infected plants stained intensely. No comparable staining was observed in assays of healthy tissue. Comparison of 800+ healthy and CTV-infected trees by ELISA and by TBIA indicated comparable rates of CTV infection. TBIA is rapid, requires little sample preparation, and tissue blots could be stored 30 days prior to assay. Location of the phloem-limited CTV within host tissues was determined easily without sectioning or other cytological techniques.

EVALUACION DE LA REACCION A Moniliophthora roreri DE CULTIVARES DE CACAO IDENTIFICADOS COMO RESISTENTES. W. Phillips. Ap. 7170 CATIE, TURRIALBA, COSTA RICA.
Se evaluó la reacción a M. roreri de 18 cv de cacao, 15 de ellos señalados como resistentes en otras investigaciones. Se inoculó frutos de 60 días asperjándolos con una suspensión de 100.000 conidios/ml y colocándoles una cámara húmeda por 48 horas. Nueve semanas después se midió la incidencia(I), y con escalas de 1-5 las severidades externa(SE) e interna(SI). La SI varió entre 0,3 y 5; la SE entre 0,2 y 4,1 y la incidencia entre 14 y 100%. Los cv fueron clasificados con base en su SI Unicamente los cv 'UF-273', 'CC-296' conservaron su reacción resistente (SI <1,1). El 'CC-246', 'EET-59' y 'SIAL-407', se comportaron moderadamente resistentes (1,6-2,5). Los cv 'EET-399', 'CC-124' y 'RB-41' presentaron reacción mod. susceptible (3,0-3,4) y el 'EET-48' reacción susceptible (SI=4,2). Se incluyó dos testigos susceptibles: el 'POUND-7' que tuvo la más alta susceptibilidad y el 'CC-18' que fue mod.susceptible. El'UF-676' de reacción desconocida reaccionó mod. resistente. Se confirma la necesidad de reevaluar los cv resistentes con metodologías adecuadas y uniformes, antes de incorporarlos a un programa de mejoramiento genético

THE ETIOLOGY OF DRY ROOT ROT ON Xanthosoma spp. IN PUERTO RICO. J. A. Plaza and P. R. Hepperly. Dept. of Crop Protection, College of Agic. Sci., Univ. P.R. Mayagüez, P.R. 00708.

Experiments were conducted to determine the cause of dry root rot of taniers in Puerto Rico. Tanier root mycoflora was evaluated at Isabela, Corozal, and Fortuna. Rhizoctonia solani was the most frequently isolated fungus closely followed by Fusarium solani. Pathogenicity tests showed R. solani, F. solani, and Colletotrichum dematium each caused distinctive root lesions. Combined infections increased root severity. Tanier root infection sequence was followed and fungal populations were correlated with root rot severity. Significant correlations ($r>0.75$) were found between F. solani and/or F. oxysporum and root rot severity. No other fungi showed significant association with root necrosis.

NECTRIA HAEMATOCOCCA: CAUSE OF A NEW DISEASE OF PASSION-FRUIT VINES IN SOUTH FLORIDA. Randy C. Ploetz and Nabih El-Gholl, University of Florida, 18905 SW 280th St., Homestead 33031, and Division of Plant Industry, P.O. Box 1269, Gainesville 32602.

'Possum Purple' (*Passiflora edulis* f. *edulis* X *P. edulis* f. *flavicarpa*), the primary passionfruit cultivar in South Florida, is affected by a newly recognized sudden wilt syndrome. Vines wilt without conspicuous, prior evidence of reduced vigor, and usually begin dying within a year of planting. Leaves and fruits remain attached to wilted vines which, in turn, are partially or completely girdled with cankers on lower portions of the stem. Cankers occur either at the soil line or are associated with tape vine supports or protective collars on the lower stem. Reddish-brown discoloration of vascular tissue may extend $\geq$40 cm above cankers, and roots may or may not be decayed. Orange to red perithecia of *Nectria haematococca* (anamorph = *Fusarium solani*) are often associated with cankers, and the fungus is easily recovered from affected tissue. During artificial inoculation studies, cankers formed consistently only on wounded vines, suggesting an obligate requirement for wounding; these vines wilted only after the cankers had completely girdled the stem. Since monoconidial isolates formed perithecia on sterile carnation leaf segments and water agar, the pathogen is homothallic.

HOST DIFFERENTIATION OF POTYVIRUSES INFECTING PASSIONFRUIT (Passiflora edulis) IN PUERTO RICO AND AUSTRALIA. R. Provvidenti[1], A.C. Monllor[2], C.L. Niblett[3], J. Bird[2] and K.H. Gough[4]. [1]Plant Pathology Department, Cornell Univ., Geneva, NY 14853, [2]Crop Protection Dept., Univ. of Puerto Rico, Rio Piedras, PR 00928, [3]Plant Pathology Dept., Univ. of Florida, Gainesville, FL 32611 and [4]Division of Biomolecular Engineering, CSIRO, Melbourne, Australia.

Previously we reported a potyvirus affecting passionfruit in Puerto Rico (PRPV), which shared some biological properties with watermelon mosaic virus 2 (WMV-2) (Phytopathology 31, in press). We have now extended this comparison to the K strain of passionfruit woodiness virus (PWV-K) from Australia. PWV-K and WMV-2 infected certain cultivars of Cucurbita pepo and Pisum sativum, but PRPV did not. Pea lines resistant to PWV-K also were resistant to WMV-2, and five other potyviruses. PWV-K infected a number of bean (Phaseolus vulgaris) cultivars, which are resistant to PRPV and WMV-2, including Great Northern 1140 (GN-1140). Conversely, the bean line Black Turtle 1 (BT-1) was resistant to these three viruses. In BT-1 as well as in GN-114 resistance to these viruses was monogenic dominant. WMV-2 is not seed transmitted in beans, and PRPV was not present in 157 plants which had derived from seed of PRPV-infected plants. Thus in some biological properties, WMV-2 seems to assume a position intermediate between PWV-K and PRPV.

A SEMIQUANTITATIVE SEEDLING SCREEN FOR RUST RESISTANCE IN SUGARCANE. L.H. Purdy, E.R. Dickstein, Univ. of Florida, Gainesville, 32611-0513; J.D. Miller, and J.C. Comstock, USDA/ARS, Canal Point, FL 33438.

Applications of inocula with known numbers of viable urediniospores of Puccinia melanocephala to seedlings (from fuzz) of sugarcane by using a semiquantitative automated system resulted in seedling responses to rust that ranged from susceptible to resistant. Inoculated seedlings were incubated at 23-25C and 100% RH for 24 hr, and responses after 10-14 days were classified as follows: (0) no symptoms; (1) chlorotic flecks only; (2) chlorotic flecks with red or brown centers, a few small pustules, some sporulation; (3) chlorotic flecks with red or brown centers, distinct small pustules with sporulation; (4) chlorotic flecks with red or brown centers, sporulating pustules, coalesced lesions; and (5) sporulating pustules, no chlorosis. Responses of 4879 seedlings from eight families inoculated with 50,000 viable urediniospores/ml in three experiments were: 3839 (78.7%) susceptible (classes 4 & 5); 1034 (21.2%) resistant (classes 2 & 3); and 6 (0.1%) without symptoms (class 0). All seedlings were planted in the field at Canal Point, seedling responses generally were indicative of the field responses to rust.

EVALUACION DE FUNGICIDAS A BASE DE ESTAÑO PARA EL CONTROL DE Thanatephorus cucumeris EN FRIJOL COMUN. A.S. Quesada, B.E.Mora, G. E. Gálvez, M. R. Rojas. MAG 10094 San José, Costa Rica. CIAT. 55 IICA

Se evaluaron 5 fungicidas a base de estaño para el control del hongo; 1) Trifeniltin hidróxido 47.5% PM (Duter 2.0 g/l). 2) Trifeniltin hidróxido 60% (Supertin 1.0 ml/l). 3) Maneb + Trifeniltin acetato (Trimastan 2.5 g/l). 4) Maneb + Trifeniltin acetato (Fungol 3.0 g/l) y 5) Trifeniltin acetato 60 PM (Brestan 0.6 g/l). Los testigos fueron Benomyl 50% PM (Benlate 1,2 g/l) y un tratamiento sin fungicida. Las variedades que se usaron fueron Talamanca y Brunca. La aplicación se realizó a los 20, 34 y 48 días de la siembra. Los fungicidas con alta concentración de estaño en su formulación superaron en un 70% los rendimientos (1145 Kg/ha) en comparación con el testigo sin protección (333 Kg/ha), aunque con algún efecto tóxico leve sobre el cultivo pero sin ninguna implicación sobre el rendimiento. Los fungicidas de baja concentración de estaño tuvieron un comportamiento intermedio con respecto al testigo sin protección. El Benomyl como testigo mostró un comportamiento intermedio debido a que se subdosificó en un 20%.

COMPARISON OF ENZYME-LINKED IMMUNOSORBENT AND IMMUNOBINDING ASSAYS FOR DETECTION OF CITRUS TRISTEZA VIRUS. M.A. Rocha-Peña[1], R.F. Lee[2] and C.L. Niblett[3]. [1]INIFAP. Apdo. Postal 3, Gral. Terán, N.L. MEXICO and University of Florida, [2]Lake Alfred, FL 33850 and [3]Gainesville, FL 32611.

A dot-immunobinding assay (DIBA) was adapted for detection of citrus tristeza virus (CTV) and compared with DAS-ELISA and DAS-indirect ELISA. DIBA was easy to perform and as sensitive as either ELISA procedures for CTV diagnosis. The entire test could be performed in 2-3 hr using polyclonal antibodies, and with minimal laboratory equipment. Three different polyclonal antibodies gave a strong positive reaction with 12 selected CTV isolates; however, each serum had to be cross-absorbed with sap from healthy plants before use. The broad spectrum 3DF1 monoclonal antibody reacted with most of the CTV isolates. The MCA-13 monoclonal antibody was specific for most severe CTV isolates. The dilution end points (DEP) of extracts from CTV-infected samples were 1/320 for DIBA and DAS-ELISA when tested against polyclonal antibodies. DAS-indirect ELISA gave a DEP of 1/320 and 1/640 when tested with MCA-13 and 3DF1 as secondary antibodies, respectively.

EVALUATION OF MILD ISOLATES OF CITRUS TRISTEZA VIRUS (CTV) TO PROTECT AGAINST THE CTV-INDUCED DECLINE SYNDROME ON PLANTS ON SOUR ORANGE. M.A. Rocha-Peña[1], R.F. Lee[2] and C.L. Niblett[3]. [1]INIFAP. Apdo. Postal 3. Gral. Terán, N.L. MEXICO and University of Florida, [2]Lake Alfred, FL 33850, and [3]Gainesville, FL 32611.

Valencia sweet orange plants budded on sour orange rootstock were graft-inoculated by leaf pieces using any of four different mild citrus tristeza virus (CTV) isolates and subsequently graft-challenged with a severe CTV isolate. Treatments were evaluated at temperature regimens of 21-38°C and 21-33°C. Plants pre-inoculated with mild isolates when challenged with the severe isolate gave relatively lower ELISA values as compared to the unprotected, challenged control plants. The strain specific MCA-13 monoclonal antibody provided a rapid method to detect the severe isolate in mixed infections. The CTV-induced decline syndrome occurred irregularly within the first 10 months after challenge inoculation at both temperature regimens. The preliminary evaluation of the cross-protecting ability of mild isolates can be accomplished under greenhouse conditions in a relatively short period of 18-24 months.

INHIBITORY EFFECT OF RHIZOBACTERIA ON SOIL-BORNE PATHOGENS IN BEAN (Phaseolus vulgaris L.). Alfonsina Sánchez, R. Echávez-Badel, E.C. Schröder and P.R. Hepperly. Department of Crop Protection, University of Puerto Rico, Mayaguez, Puerto Rico 00709-5000.

One Pseudomonas cepacia strain (PRPc), which is compatible with Rhizobium phaseoli strain (CIAT 632) and efficient bean root colonizer, inhibited in vitro growth of several plant pathogenic soil-borne fungi, causing bean wilts, root-rots, basal stem, rots and damping-off. In the streak plate method on tryptone-yeast agar, the bacterium strongly restricted mycelial growth of Macrophomina phaseolina, Rhizoctonia solani, Sclerotium rolfsii, and was less inhibitory to Phythium sp. and Fusarium solani. A bacterial suspension incorporated into the first 3 cm of soil after inoculation of bean seeds with microesclerotia of M. phaseolina significantly reduced the ashy stem blight disease as compared with nontreated soil-inoculated controls. This research was supported by the Grant No. DPE-1159-G-S-8012-00 from the AID/PSTC, Washington, D.C.

EFECTO DE BINUCLEADOS SEMEJANTES A RHIZOCTONIA EN LA SEVERIDAD DE LA ENFERMEDAD CAUSADA POR *Rhizoctonia solani* Kuhn. V. Sánchez. MAG Apdo. 10094-1000, San José, Costa Rica, E. Bustamante, Apdo. 7170, CATIE, Turrialba. Costa Rica.

Se realizaron aislamientos de raíces sanas de donde se obtuvo 51 binucleados semejantes a Rhizoctonia, de los cuales 10 se seleccionaron para probar su eficiencia en la protección de plántulas de tomate, chile y café contra la infección de *R. solani*. Se sembraron tres ensayos en invernadero, la severidad se evaluó de acuerdo a una escala de 0 a 3; y se calculó un índice de daño que incluyó la incidencia y la severidad. La mayoría de los

aislamientos se comportaron como buenos competidores, entre ellos los aislamientos 1 y 10 tomados respectivamente de *Eleusine indica* y *Capsicum annum*, ofrecieron los índices más bajos de daño en tomate y chile en presencia de *R. solani*. El aislamiento 10 en el ensayo con café mostró comportamiento como patógeno en ausencia de *R. solani* con un índice de daño de 15, el más alto de los tres ensayos. El binucleado 4, proveniente de *Lycopersicum* sp., permitió a *R. solani* el índice de daño más alto. En plántulas de de café ninguno de los materiales probados alcanzó un nivel aceptable de competencia con el patógeno.

GENERAL AND SPECIFIC RESISTANCE TO RUST IN COMMON BEAN. I.R. Steadman, M.T. Mmbaga, J.R. Stavely, J.S. Beaver and D.P. Coyne, University of Nebraska, Lincoln, NE 68583-0722 USA.

Rust (Uromyces appendiculatus) on common bean (Phaseolus vulgaris) is one of the most variable plant pathogens for virulence. In studies on rust cultures from Africa and the Americas, the existence of 250 races would be a conservative estimate. The primary control strategy that does not involve fungicides is disease resistance. Recently race-nonspecific (general) resistance has been associated with abaxial straight leaf hairs, and all the genotypes that express this general resistance are of Andean origin. Some genotypes of this phenotype also have race-specific resistance which may be different from that found in the Meso-american beans. The transfer of this resistance to Meso-american origin bean classes which already have different levels of specific resistance, will result in a combination of diverse specific and general resistance. This should result in stable rust resistance for tropical and temperate bean growers.

GREENHOUSE EVALUATION OF THE RESISTANCE TO Mycosphaerella fijiensis OF Musa VITROPLANTS. A.C. Tapia , J.V. Escalant and J.J. Galindo. CATIE, Turrialba, Costa Rica.

Six-week-old vitroplants from 10 Musa cultivars of the Breeding Programme at CNPMF/EMBRAPA, Brazil were inoculated with a suspension of mycelium and conidia of M. fijiensis using a De Vilbiss atomizer. Vitroplants were obtained from in vitro shoot tip culture. Inoculated vitroplants were kept at 100% relative humidity during 72 hr and under high humidity until appearance of first symptoms. Incubation time varied from 15 days in the cv 'EMB-201', 'EMB-301' and susceptible check (cv 'Grande Naine') to 20 days in the cv 'EMB-204' and 'EMB-402'. Evolution time (from inoculation to necrosis) varied from 15 days in cv 'EMB-302' and the check, to 20 days in cv 'EMB-201' and 'EMB-205', and to 25 days in cv .'EMB-402'. A clear distinction between susceptible and resistant cultivars was attained by using this method, and results were similar to those obtained with natural inoculation.

EVALUATION OF FUNGICIDES AND APPLICATION FREQUENCY FOR CONTROL OF POSTBLOOM FRUIT DROP OF CITRUS CAUSED BY COLLETOTRICHUM GLOEOSPORIOIDES. L.W. Timmer and S.E. Zitko. Univ. Florida, Citrus Research and Education Center, Lake Alfred 33850

Benomyl and captafol were applied to Navel and Valencia orange trees on spray schedules varying from a single peak bloom spray to weekly applications during bloom. The percentage of blighted blossoms was evaluated weekly and persistent calices were counted two months postbloom. Both fungicides reduced the area under the disease progress curve (AUDPC) for blossom blight and the number of persistent calices. The AUDPC and the number of persistent calices decreased with increasing application frequency of fungicides. In another test, aerial application was as effective as ground application of benomyl for disease control.

SUPPRESSION OF SCLEROTIUM ROLFSII WITH BANANA BUNCH RACHIS JUICE. J.A.Toribio, INRA, Centre Antilles-Guyane, Station de Pathologie Végétale, 97170 Petit-Bourg, Guadeloupe (French West Indies).

An oxisol amended with ground dried banana bunch rachis suppressed disease caused by S.rolfsii and also sclerotia of this fungus. Soil watered to field capacity with the juice obtained after pressing of crushed rachis macerated for 1 to 4 days at ambient temperature (22-25°),was also suppressive. In juice-treated autoclaved soil, germination of sclerotia was poorly hyphal (in comparison with eruptive germination of sclerotia in water-treated soil); after 8 days, aseptic sclerotia were totally viable (100% germination on water agar), whereas only 41% of non-aseptic sclerotia germinated. No viable sclerotia could be observed in natural soil treated with the juice after 48 hours. The juice acted as a toxic residue that rendered sclerotia susceptible to rapid microbial degradation. Evidence was obtained that Aspergillus sp., Neurospora sp. and Trichoderma spp. were among the opportunist damaging microorganisms.Suppressiveness of the juice was not affected by boiling or autoclaving. Studies are in progress to characterize the suppressive compounds for S. rolfsii and, eventually, other soilborne fungi.

C. H. Umaña and C. Chinchilla. Corky Base Rot (CBR) of Oil Palm (*Elaeis guineensis*, Jacq.) Caused by *Ustulina deusta* (Hoffm. ex Fr.) in Central America. Programa de Investigación en Palma Aceitera, Apartado 30-1000, San José, COSTA RICA.

CORKY BASE ROT (CBR) of OIL PALM (*Elaeis guineensis*, Jacq.) CAUSED by *Ustulina deusta* (Hoffm. ex Fr.) in CENTRAL AMERICA. Umaña, C.H. and Chinchilla, C. Programa de Investigación en Palma Aceitera, Apartado 30-1000, San José, COSTA RICA.

This disease is considered of minor importance in South East Asia. However, it has caused the death of hundreds of plants in Central America. This report describes some aspects of the disease in Honduras and Costa Rica.

A diseased plant may not show clear symptoms of an infection, that may be quite extended in the basal portion of the stem. Occasionally, lower leaves show some yellowing and bending at the petiole region. Earliest detection yet, relies on spotting the fruiting bodies on the stem base. These are resupinate sporocarps, initially white and round that develop concentric gray bands as conidia develops. When old, the sporocarps are amorphous and perithecia develops in the stroma (5 mm thick). Internally, the affected tissue in the stem has a corky consistence and is a of light brown color. Black stripes are clearly visible in older portions of the lesion.

Inoculation tests, burying chunks of infected stem among physically damaged roots of adult plants (20 yr. old), or placing them at the bottom of nursery bags at transplanting time have not produced infection after 18 months. Neither infection was achieved in 20 yr. old plants, by placing innocula (infected tissue and PDA cultured fungus) directly within the stem.

The disease progress curve is of a monocyclic type (QR= $3.67x10^{-4}$ to $1.45x10^{-3}$ per year). Up to 2.5% incidence have been recorded on 13yr. old plants. Data indicate that 9-11 yr. old plants may be more susceptible. The disease has not been observed in plants younger than 6 yr.

IMPROVEMENT OF LARGE WHITE SEEDED DRY BEAN CULTIVARS FOR RESISTANCE TO NEMATODES IN THE PERUVIAN COAST. A. Valladolid and G. E. Gálvez. E.E.A. Chincha, Apdo. 115, Chincha, Perú and CIAT, Apdo. 14-0185, Lima 14, Perú, respectively.

The Root-Knot nematodes are broadly distributed in the Coast of Perú causing economical losses in beans (Phaseolus vulgaris). Meloidogyne incognita is the main species; less important M. javanica. In 1985, a breeding program began to incorporate nematode resistance into large seeded dry beans (45 g/100 seeds). Three sources of resistance were used: NemaSnap, PI 313789 and Manoa Wonder. None of these sources were compatible in crosses with local varieties. The plants died in F1; in contrast, they combined easily with improved lines. The populations were planted in naturally infested fields with 45 to 92 larvas/100 cc soil replicated twice. The number of root-knot galls were used for selection and evaluation using 1-5 scale. In F5, F6 and F7, individual selections were made based on yield and number of root/knot galls. The best combinations were obtained between NemaSnap and the improved lines CIFEM 690 and CIFEM 691 ("Blanco Larán"). Yield trials of these lines in soils highly infested in several localities indicated that the NEMA: 89004, 89014, 89022, 89061, and 89069 were 233% superior in yield to Blanco Larán, which suffered a 73% yield reduction. In nematode-free fields these lines yield as much as Blanco Larán (about 2500 Kg/ha).

DEVELOPMENT OF MULTIPLE VIRUS AND INSECT RESISTANT CAPSICUMS FOR THE TROPICS. Benigno Villalon, Texas Agricultural Experiment Station, 2415 East Highway 83, Weslaco, Texas, 78596.

The increasing popularity of peppers has created an unprecedented demand for their production in the tropical and temperate regions. For years peppers have been threatened by a complex of viral diseases and their arthropod vectors. A breeding program was initiated in 1970 to develop multiple virus and insect resistant cultivars. Several genotypes possessing heritable resistance to isolates of tobacco etch virus, pepper mottle virus, cucumber mosaic virus, potato virus Y, tobacco mosaic virus and tobacco ringspot virus were identified. These stocks were hybridized with the best commercial cultivars of bells, long green/red chile, jalapeno, serrano, ancho, pimiento, cayenne, cherry and yellow wax pickling types. Approximately 1000 pepper breeding lines are evaluated per year for resistance to diseases, leafminer, pepper weevil, and whiteflies and tropical environmental stresses. The backcross method with screening at every generation has yielded eight new cultivars.

APHID TRANSMISSIBILITY OF DECLINE-INDUCING ISOLATES OF CITRUS TRISTEZA VIRUS. **R. K. Yokomi, S. M. Garnsey, USDA, ARS, 2120 Camden Road, Orlando, FL 32803; and C. O. Youtsey, FDACS, DPI, Winter Haven, FL 33881**

Increased incidence of decline due to citrus tristeza virus (CTV) in Florida citrus plantings indicates extensive natural spread by aphid vectors. Transmissibility by Aphis gossypii of severe CTV isolates was confirmed experimentally from 11 decline-inducing field sources. Transmission efficiencies ranged from 8-70% per isolate with an overall average of 31% using 10 aphids/receptor plant. Aphid-transmitted isolates were propagated in a Navel on sour orange rootstock field plot and evaluated for 3 yrs. Isolates from severe CTV sources induced moderate to severe stunting; whereas mild CTV isolates were symptomless. These results confirm the role of aphids in field spread of decline-inducing CTV isolates in existing groves.

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