

ABSTRACTS OF PAPERS

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ABSTRACTS

SPECIFICITY OF ELISA FOR IDENTIFICATION OF *Xanthomonas campestris* pv. *phaseoli*. L. Afanador and J. I. Victoria. Bean Program, CIAT CFNICANA, Cali, Colombia.

Antisera were produced in rabbits against the glycoprotein fraction and whole cells of *Xanthomonas campestris* pv. *phaseoli*, strain xp-5-51 (X.c.pv.ph). Serological relationships were only demonstrated for selected isolates of X. c. pv. ph. but not for other species of *Xanthomonas*, *Pseudomonas*, *Erwinia carotovora*, *Corynebacterium flaccumfasciens* and *Agrobacterium tumefaciens* studied by double-diffusion (Ouchterlony) tests and indirect ELISA. A higher serological specificity was obtained with the indirect ELISA when glycoproteins rather than whole bacterial cells were used as immunogens, or when compared to the Ouchterlony test using both types of antisera. The maximum sensitivity of ELISA, prepared with antibodies to glycoproteins, was 5×10^5 cells/ml of antigen at 10 ug/ml of gamma globulin.

EVALUACION PRELIMINAR DEL IMPACTO ECONOMICO DE LOS COSTOS DE CONTROL DE SIGATOKA NEGRA EN DIFERENTES SISTEMAS DE PRODUCCION DE PLATANO. EL CASO DE MEXICO. Aguirre, Juan Antonio; Koch, Cristián; Dao, Federico; Lemelle, Jean Pierre. Instituto Interamericano de Cooperación para la Agricultura, Apartado 55-2200 Coronado. San José, Costa Rica.

Estudios preliminares relacionados con el impacto económico de los costos de control de Sigatoka Negra en unidades productivas de plátano señalan diferencias sustanciales en función del programa de control utilizado, forma de aplicación y sistema de producción. En el caso de México, el 65% del plátano nacional se produce bajo condiciones de temporal. En la actualidad la Sigatoka Negra eleva los costos de producción en este sector productivo en un 168% lo que significaría ante una eventual crisis la posibilidad de desaparición de gran parte de éste debido al excesivo peso económico. Paralelamente el estudio presenta los márgenes brutos de utilidad para el sistema de producción bajo riego y temporal cuando se emplean diferentes tratamientos alternativos.

ACTIVIDAD PLATANERA Y SIGATOKA NEGRA EN COSTA RICA. UNA EVALUACION ECONOMICA DE LA PROBLEMÁTICA. Aguirre, Juan Antonio Lemelle, Jean Pierre; Koch, Cristián; Dao, Federico. IICA Apartado 55 - 2200 Coronado - San José, Costa Rica.

En la actualidad el cultivo de plátano en Costa Rica representa una actividad de relativa importancia económica al distribuir entre los agentes que participan en ella más de 200 millones de colonos y asegurar entradas netas de divisas al país del orden de los 6-7 millones de dólares por año por concepto de exportación del producto, sin embargo, frente a la sigatoka negra esta actividad corre serios riesgos de desaparecer debido a dificultades estructurales que limitan la organización de una lucha preventiva eficaz, como la desarrollada en el mismo país por las compañías bananeras. El estudio plantea un conjunto de propuestas y medidas para el combate de la enfermedad en los distintos sistemas de producción de plátano, tanto a nivel institucional como de investigación y extensión.

PRELIMINARY FIELD TEST TO EVALUATE 12 CULTIVARS AND HYBRIDS OF TOMATO RESISTANT TO RACES 1,2 OR 3 OF *Fusarium oxysporum* f. sp. *licopersici* (Sacc.) Snyder & Hansen. David Anzola and Gustavo Román. Fundación Servicio para el Agricultor (FUSAGRI).

Cagua, Estado Aragua, Venezuela.

Fusarium wilt is one of the main diseases affecting tomato crops in Venezuela. Little work has been done on this subject. A block design experiment was set up in farmer's field on a soil infected with this pathogen to determine if races 1, 2 or 3 were present and how they would affect the yields of 5 hybrids and 7 resistant varieties. Floradade and Walter varieties which were supplied by Asgrow Seed Co. and released as resistant to races 1 and 2 had the lowest disease incidence (0%) and the highest yield 78.145 and 75.116 Kg/Ha. respectively. GS-13, Tempo, US-638S2-3, US-638S 2-4 and US-629 had a disease incidence between 12 and 39% while GS-27, PAKMOR, VFN-8, Pera Quíbor and David had more than 88% incidence. Since those hybrids or varieties resistant to race 1 and 3 became infected, it is concluded that race 2 was present.

Mean latent period and number of pustules of *Uromyces phaseoli* var. *typica* in some varieties of *Phaseolus vulgaris*. Azevedo, L.A. S., Kuchalappa, A.C.¹ and Vieira, C.² 1, Departamento de Fitopatologia e 2, Departamento de Fitotecnia, Univ.Fed.de Viçosa, Viçosa, MG - Brazil, 36570.

Fifty varieties/breeding lines of *Phaseolus vulgaris* from the germplasm Collections of Univ.Fed.Viçosa and CIAT were inoculated at first-trifoliolate stage with urediniospores of *Uromyces phaseoli* var. *typica* and maintained under green house conditions until pustule development. The number of pustules appeared were counted at two-day intervals, from which, mean latent period and average number of pustules per trifoliolate leaf were determined. The mean latent period varied from 11 to 18 days and the average number of pustules from one to one hundred. The varieties: BAT-55, BAT-75, BAT-67, 'RICOBAIO-1014' and 'Preto Chumbinho 252' had prolonged mean latent periods, whereas, the varieties: 'Agrorrico', 'Serra Negra', 'Turiaba -1', BAT-75 and BAT-67 had minimum number of pustules per trifoliolate leaf.

IN VITRO SPORULATION OF *Cercospora coffeicola* BERK & COOKE. Hilda Lucía Buitrago-Jaramillo and Octavio Fernández-Borrero. Cenicafé, Chinchiná, Colombia.

In the National Center of Coffee Research-CENICAFE work was undertaken to study the influence of different light periods and culture media on sporulation of *C. coffeicola*, which causes coffee iron spot disease. The study was also intended to promote abundant conidia sporulation to be used in nutritional, pathological plant breeding and epidemiological studies, among others. Studies were conducted using brewed coffee leaves in different proportions on agar, as well as coffee extract at different doses on agar. The cultures were inoculated with mycelium and incubated in two phytotrons 70 cm apart from 12 incandescent lamps and 14 fluorescent ones (2.500 foot-candles, approximately, and at 24 °C) for fifteen days. For cultures of brewed coffee leaves on agar, the exposure periods of light were only 3 and 6 hours. Both types of media were also used to carry out trials at room temperature. The results indicate that light is necessary for sporulation of *C. coffeicola*. In the case of brewed coffee leaves on agar the largest mean of conidia was obtained with 9 hours of light and 15 hours of darkness for 400 grams of coffee leaves/litre. In this trial it was possible to get 1.755×10^5 conidia/ml of water. In the case of coffee extract in agar it was possible to get an average 4.598×10^6 conidia/ml of water at room temperature, the highest sporulation in the whole experiment.

REPRODUCTIVE STRUCTURES OF *Corticium salmonicolor* BERK & BR. CAUSAL AGENT OF COFFEE PINK DISEASE. Gabriel Cadena-Gómez.

Cenicafé, Chinchiná, Colombia.

Coffee pink disease is common in Colombian coffee plantations during the productive stage and rainy periods. Research on *Corticium salmonicolor* described the symptoms throughout the disease cycle, however the reproductive structures on coffee have not been described yet. The pink scab fungus stage on coffee branches was studied under the microscope. Structures similar to basidia and basidiospores were measured and photographed. The basidia were simple, clavate with four short sterigmata. Spores were small, globose or ellipsoid with a smooth colorless membrane. The basidiospores germinated in water and formed strong extensive mycelium in less than 24 hours. In one square centimeter of pink scab, it was possible to count about 150000 basidiospores with 90% germination. It is possible that the primary inoculum for new infections come from the detected basidiospores.

USE OF COFFEE PULP IN NURSERIES FOR IRON SPOT DISEASE CONTROL. Gabriel Cadena-Gómez. Cenicafé, Chinchiná, Colombia.

Iron spot disease (*Cercospora coffeicola* Berk & Cook) on coffee seedlings produces defoliation and growth reduction. There is a close relationship between plant nutritional stage and severity of the disease. In a randomized block design, 4 replications, coffee seedlings were grown in mixtures of soil and pulp (0; 1; 2; 3 and 4 parts of pulp) with and without foliar fungicide (captafol) applications every two weeks during six months. Measures per plant were taken on: infection index, defoliation and dry weight. When pulp was used in the mixture, no significant difference was found with and without fungicide. The best treatment was one part of pulp plus three parts of soil. There were highly significant differences between treatments with and without pulp. The beneficial effect of coffee pulp controlling iron spot disease on coffee seedlings was confirmed in the present work.

BIOLOGICAL STUDIES ON *Corticium salmonicolor* BERK & BR. CAUSAL AGENT OF THE COFFEE PINK DISEASE. Carlos Julio Ramírez-Hernández and Gabriel Cadena-Gómez. CENICAFE. Chinchiná, Colombia.

At Cenicafé, under laboratory and field conditions, biological studies were conducted on *Corticium salmonicolor*, the causal agent of coffee pink disease. Fungal growth and structure formation were measured on five culture media under controlled daily light conditions (3, 6 and 9 hours) and 22°C in a chamber Percival PGW-132. The best fungal growth and sclerotia formation was found on malt agar. The number of sclerotia was influenced by 3 hours daily light period. Also a typical zonation rhythm favored by the same light condition was observed. Coffee fruits with symptoms of pink disease were sectioned (Kryomax model 1210) in fine cross sections (20 U). Under the microscope, they showed the sclerotial role in the infection process. Under field conditions, and efficient inoculation method of coffee fruits was developed. This methodology is independent of the external environmental conditions.

INFLUENCIA DE LA ANTRACNOSIS Y DE LA MANCHA POR ASCOCHYTA EN EL RENDIMIENTO DE DOS VARIEDADES DE FRIJOL. H. Carmen, F. Correa y M.A. Pastor-Corrales. Centro Internacional de Agricultura Tropical, Apartado Aéreo 6713, Cali, Colombia.

Se evaluaron las pérdidas en el rendimiento por la Antracnosis y Mancha de Ascochyta. Se usaron los fungicidas Thiabendazol y una mezcla de Mancozeb y Benomyl y los cultivos de frijol ExRico 23 y BAT 332, ambos susceptibles a la Ascochyta y alta y moderadamente susceptibles a la Antracnosis respectivamente. Se observó niveles moderados de Ascochyta. La presión de antracnosis fue muy alta. Los controles sin protección rindieron 707 kg/ha y 8 kg/ha para BAT 332 y ExRico 23 respectivamente. No hubo diferencias significativas en ExRico 23 entre los tratamientos con Thiabendazol y el control, pero si las hubo entre el control y la mayoría de los tratamientos con la mezcla. Con BAT 332 solo se observó diferencias significativas entre el control y los tratamientos con Thiabendazol a los 26,40 y 26,40,54,64 días después de la siembra. Con la mezcla se observó diferencias significativas entre el control y los tratamientos de 54,69; 40,54,69; 26,40,54 y con 26,40,54 y 69 días después de la siembra respectivamente.

'MONROE': A LOCAL LESION *Phaseolus vulgaris* L. ASSAY VARIETY FOR BEAN AND SOYBEAN MOSAIC VIRUSES. M. Castaño, P. J. Tamayo and F. J. Morales. Bean Program, CIAT, Cali, Colombia.

The bean (*Phaseolus vulgaris* L.) variety 'Monroe', recommended as a local lesion assay plant for bean common mosaic virus (BCMV), reacted with the characteristic ring-shaped local lesions to five different strains of BCMV (Type, New York 15, Florida, NL3 and NL4) as early as five days after manual inoculation, when the test plants were maintained within a 19-28°C temperature range. At lower temperatures (16-19°C), the ring-shaped local lesions, however, were also induced in 'Monroe' plants manually inoculated with a local isolate of soybean mosaic virus (SMV) under similar temperature regimes. The local lesions induced by SMV on 'Monroe' were more abundant and defined than those observed for the five BCMV strains tested. Besides local lesions, some SMV isolates induced systemic symptoms in inoculated bean 'Monroe' plants.

BREEDING FOR RESISTANCE TO PAPAYA RINGSPOT VIRUS. Robert A. Conover and Richard E. Litz, University of Florida Agricultural Research & Education Center 18905 SW 280 Street, Homestead, Florida 33031.

Florida's papaya (*Carica papaya* L.) industry for many years has been threatened by the widespread occurrence of papaya ringspot virus (PRV). Tolerance to PRV infection was identified several years ago in a dioecious papaya accession from Colombia. Since then, through controlled pollination and recurrent selection, PRV tolerance has been transferred to papayas that appear to be suitable for South Florida. Tolerance is conferred by a complex of genes. In addition, papaya has been successfully hybridized with the PRV resistant *C. cauliflora* Jacq. by means of tissue culture.

EVALUACION DE CUATRO FUNGICIDAS EN EL RENDIMIENTO DE UNA VARIEDAD DE FRIJOL SUSCEPTIBLE Y OTRA RESISTENTE A LA ROYA EN EL VALLE DEL CAUCA. F. Correa, M.A. Pastor-Corrales y H. Carmen. Centro Internacional de Agricultura Tropical, Apartado Aéreo 6713, Cali, Colombia.

Se comparó para el control de la Roya del frijol los fungicidas. Biloxazol, Top Cop y el producto experimental Duphar PH-50-98 con Oxycarboxin conocido por su buen control de Roya. Se utilizaron ExRico 23 y BAT 308, cultivos susceptibles y resistente respectivamente, diferentes dosis por área y diferentes números de aplicaciones. En el primer semestre en ExRico 23 se obtuvieron aumentos de 74.6% con Oxycarboxin y de 64.8%, 69.4% y de 56.4% con PH 50-98 para dosis de 100,50 y 20 g i.a/ha respectivamente. Con Top Cop el rendimiento disminuyó 23.5%. En el segundo semestre, los mayores aumentos por fungicida con ExRico 23 se obtuvieron con 5 aplicaciones de Oxycarboxin cada 7 días (67.7%), Biloxazol cada 10 días (66.9%) y con PH 50-98 cada 10 días (48.9%). Con Top Cop solo se observó un aumento del 7.4% con aplicaciones cada 14 días y pérdidas con los otros tratamientos. Con BAT 308, solo se observó aumentos con: Baycor cada 10 días (17.3%), Top Cop cada 10 días (10.6%) y con Oxycarboxin cada 14 días (6.8%).

INVENTARIO DE VIRUS QUE ATACAN A AJI Y PIMENTON EN VENEZUELA. E. A. Debrot. CENIAP, Sección Fitopatología. Apartado 4653, Maracay 2101, Venezuela.

En vista de que las virosis constituyen un grave problema en las siembras de ají (*Capsicum annum* y *C. frutescens*) y pimentón (*C. annum*) en Venezuela, se realizó un inventario para averiguar cuáles son los virus que los atacan. Más de 100 muestras de material enfermo colectadas en diversas localidades del país fueron inoculadas mecánicamente a diversas especies de plantas indicadoras para establecer la identidad de los virus presentes. Los virus detectados en pimentón en orden de mayor frecuencia fueron: grabado del tabaco, un potyvirus aparentemente nuevo que denominamos mosaico suave del pimentón, mosaico del pepino y mosaico del tabaco. Los dos primeros parecen ser los más importantes y frecuentemente ocurren juntos en infecciones mixtas. Estos dos fueron los únicos virus detectados en ají.

NON DIFFERENTIAL REACTION OF FOLIAGE AND PODS OF *Phaseolus vulgaris* LINES TO *Xanthomonas campestris* pv. *phaseoli*. H. Fernández and M.A. Pastor-Corrales. Centro Internacional de Agricultura Tropical. Apartado aéreo 6713, Cali, Colombia.

The reaction of leaves and pods of 58 bean lines to the common bacterial blight pathogen was studied under field conditions in Palmira, Colombia. The first trifoliolate leaves of 21 day-old plants were inoculated with the Colombian isolate Xp-123, utilizing the surgical blade procedure. In the evaluation conducted 14 days after inoculation a 1-5 disease severity scale was used. The hypodermic syringe-needle method was uti-

lized to inoculate approximately 14 day-old pods, which were evaluated 40 days after inoculation, and evaluated using two scales; in one, the pod lesion diameter (PLD) was measured and in the other a visual 1-5 severity scale or pod severity index (PSI) was used. The correlation between the foliage disease reaction and the PLD and PSI was of 0.8352 and 0.8043 respectively, suggesting that bean plants selected for foliage resistance to this pathogen are very likely to also have resistant pods.

REACTION OF BEAN PODS OF DIFFERENT AGES TO Xanthomonas campestris pv. phaseoli. H. Fernández and M.A. Pastor-Corrales. Centro Internacional de Agricultura Tropical. Apartado Aéreo 6713, Cali, Colombia.

A study was conducted to determine the reaction in the field and in the greenhouse of pods of different ages of seven common bean cultivars, Phaseolus vulgaris, and one of tepary bean, P. acutifolius to Xanthomonas campestris pv. phaseoli, the common bean bacterial blight pathogen. Pods were inoculated approximately 7, 14 and 21 days after their appearance with the Colombian isolate Xp-123. Inoculum was applied with a hypodermic needle in the sites between the seeds. Disease reaction was determined by measuring the external diameter of the lesion with the aid of stereo microscope equipped with a micrometer. Lesions of 14 day old pods permitted a more accurate discrimination between the cultivars for their known reaction to the common bacterial blight pathogen than 7 or 21 day old pods.

CHEMICAL SEED TREATMENT FOR PARTIAL BUNT OF WHEAT. S. Fuentes, E. Torres, and C. García. - CYMMYT, Apdo. 6-641, México D.F., and CIANO, Apdo. 515, Ciudad Obregón, Sonora, México.

Partial bunt of wheat is caused by the fungus Tilletia indica. The pathogen is soil borne and may be disseminated as teliospores in bunted kernels or on infested seed. Upon germination, each teliospore produces about 100 primary basidiospores. Basidiospores are windborne and infect individual florets of the wheat spike at anthesis. Infections result in partial destruction of the endosperm and its replacement by a black, fetid mass of teliospores. Studies were conducted to identify seed dressings that prevented teliospore germination. Fungicide efficacy was evaluated by teliospore germination *in vitro*. Bunted seed lots were treated with candidate materials at different rates. Teliospores were extracted from bunted kernels and sown on soil extract-agar 48 hr, 1 wk, 1 mo and 2 mo after treatment. Pentachloronitrobenzene 75% (Terrazan) at 1 kg/ton of seed and methylmercury guanidine 2.2% (Panogen 15) at 700 ml/ton completely suppressed teliospore germination.

TOLERANCIA A LA MUSTIA HILACHOSA DEL FRIJOL (PHASEOLUS VULGARIS) Guillermo E. Gálvez, J.J. Galindo y B. Mora. - CIAT, Apartado Aéreo 6713, Cali, Colombia.

Hasta el presente no se ha encontrado inmunidad o resistencia a la Mustia hilachosa causada por Thanatephorus cucumeris, el estado perfecto de Rhizoctonia solani, entre más de 5000 accesiones de Phaseolus vulgaris ensayadas bajo condiciones de alta incidencia en Montería, Colombia y Esparza, Costa Rica. En esta última zona, situada en el trópico bajo, con alta temperatura, alta humedad relativa, y precipitaciones pluviales altas y frecuentes, la incidencia y la diseminación son uniformes lo que permite un tamizado excelente a este patógeno; más aún la presencia de otras enfermedades o plagas es casi nula. En base a varias evaluaciones efectuadas en los pasados 4 años, las accesiones Porrillo 70, Porrillo 1, S 630 B, Turrialba 1, PI 313754 (G02617) y Talamanca han mostrado tolerancia. Líneas hijas de estos padres han resultado también tolerantes como BAT 1230, BAT 1235, A 48, BAT 1061, BAT 1222, DR 5680 y DR 5685 indicando que es posible trasladar esta tolerancia a variedades susceptibles como Calima, o Pompadour.

HYPERSENSITIVE REACTION INDUCED IN TOBACCO LEAVES BY Pseudomonas solanacearum BIOVAR 3. G. A. Granada and L. Sequeira. ICA. Apartado Aéreo 233, Palmira, Colombia, and University of Wisconsin, Dpt. of Plant Pathology, Madison, WI. 53706.

Forty two out of 50 strains of P. solanacearum Biovar 3 collected in Australia (12), Brazil (1), Costa Rica (6), Kenya (5), Philippines (11), People's Republic of China (5), Sri Lanka (7) and Taiwan (2) from different solanaceous crops (tomato, potato, pepper, tobacco, eggplant) and weeds, induced a hypersensitive reaction after infiltration into leaves of the tobacco cultivar Bottom Special. The results indic-

ate that the differentiation of biotype 3 (race 1) of P. solanacearum can be aided by, but cannot be based solely on the leaf infiltration technique (Phytopathology 60: 833). These results corroborates previous work (Phytopathology 65: 731) based only on a few strains of Biovar 3 of the bacterium.

Pseudomonas solanacearum BIOVAR 3 AS INDUCER OF HYPERSENSITIVE REACTION. G.A. Granada and L. Sequeira. ICA, Palmira, Colombia and University of Wisconsin, Dept. of Plant Pathology, Madison, Wisconsin, U. S. A.

Fifty strains of P. solanacearum Biovar 3, collected from different countries including Australia (12), Brasil (1), Costa Rica (6), Kenya (5), Philippines (11), People's Republic of China (5), Sri Lanka (7) and Taiwan (2), and isolated from different solanaceous hosts (tomato, potato, pepper, tobacco, eggplant) and weeds, showed that 42 of them (84%) were inducers of hypersensitive reactions after infiltration on tobacco leaves, cv. Bottom Special. The results indicate that the differentiation of races of P. solanacearum based only in the leaf infiltration technique (Phytopathology 60:833) is no convenient, and corroborates previous work (Phytopathology 65: 731) based only on a few strains of Biovar 3 of the bacterium.

ETIOLOGY OF DIEBACK OF CENTROSEMA SPP. AND THE EFFECT OF THE PATHOGEN ON YIELD AND QUALITY DURING THE PERIOD OF ESTABLISHMENT OF THE LEGUME. Claudia Guevara Gómez, Jillian M. Lenné and Celina Torres G. Tropical Pastures Program, CIAT, A.A. 6713, Cali, Colombia.

Dieback of young parts of plants of promising introductions of the tropical forage legumes Centrosema spp. was observed in various sites in Colombia during 1980 and 1981. A bacterium was consistently isolated from affected plants. By comparative analysis of the characteristics presented by the isolated cultured bacteria with other known genera and species, the organism was classified taxonomically as Pseudomonas fluorescens Biotype II. Dry matter yield during the period of establishment of the legume was seriously affected by the presence of the disease. It was found that P. fluorescens Biotype II reduced dry matter yield of plots by 47.3% with natural inoculum and 38.9% with artificial inoculum in comparison with chemically protected plots. Production of crude protein decreased by approximately 50% in comparison with that obtained from protected plots.

ELECTROPHORETIC DETECTION OF FROG SKIN-INFECTED Manihot esculenta. U. Jayasinghe, A.C. Velasco and J.C. Lozano. Cassava Pathology, CIAT, Cali, Colombia.

Frog Skin (FS), a cassava (Manihot esculenta Crantz) disease of unknown etiology, can cause yield losses of up to 100% in susceptible cultivars. Analyses of partially-purified preparations, obtained from FS-affected 'M Col 33' cassava plants, by polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulfate (SDS-PAGE), revealed a marked increase in the concentration of a normal host protein (MW 54.000 d) in infected tissue, when compared to FS-free controls. This phenomenon has been consistent in SDS-PAGE analyses of leaf and root extracts of FS-affected 'M Col 33', 'Secundina', and 'Quilcace-PR' cassava plants, and of leaf extracts of 30 other different cassava genotypes. The electrophoretic method is suitable for the detection of FS-affected cassava plants grown both under glasshouse and field conditions.

AN EQUATION TO PREDICT COFFEE RUST INFECTION RATE. A.C. Kushalappa, M. Akutsu, S.H. Oseguerra, G.M. Chaves, C.A. Melles, J.M. Miranda, G. Bartolo. DEPT. DE FITOPATOLOGIA, UNIV. FEDERAL DE VIÇOSA, VIÇOSA, MG, 36570, BRAZIL.

In one hectare of Coffea arabica, in each of four locations in the state of Minas Gerais leaves and leaf area rusted, and leaves formed and fallen were determined at fortnightly intervals from Sept. 1978 to Aug. 1980. Based on this data regression equations were developed to predict coffee rust infection rate (P^*) based on proportion of leaves (PLR) and leaf area rusted (PRA) for 28 days after the date of prediction (DP). The independent variables were survival ratio for monocyclic process (SRMP) of Hemileia vastatrix urediniospores, and proportion of leaves (PLAI) or leaf area available for infection (PLAAI) during Z days before DP. A maximum of 70% of the variation was explained by the equation $y = .3471 + 2.12 PRA - .3463 PLAAI$, where, y is infection rate based on PRA and PRA is infective rust area (or SRMP).

COFFEE RUST PREDICTION: INTERNATIONAL PROGRAM. A.C. Kushalappa, and R. Montoya. Dept. de Fitopatología, Universidad Federal de Vicosa, Vicosa, Brasil, and IICA, Lima, Perú.

Eversince coffee rust was reported from Brazil in 1970 it has been spreading further north in the American continent. At the initial outbreak of any disease an epidemiological study is very important to determine timing of fungicidal applications. Based on a two-year study at four locations in Brazil an equation has been developed to predict coffee rust infection rate which could be applied to determine timing of fungicidal applications. If the same method, with some modifications to suit the local cultural patterns, is adopted by researchers of other countries, later, our results could be compared and a more stable prediction program can be established. Cooperation among the scientists as well as government and private financing organization is very important to make this possible. Sponsering by APS-Caribbean Division would help in executing this program on international basis.

ANTHRACNOSE (COLLETOTRICHUM GLOEOSPORIOIDES) OF STYLOSANTHES CAPITATA: IMPLICATIONS FOR FUTURE DISEASE EVALUATION OF INDIGENOUS TROPICAL PASTURE LEGUMES. Jillian M. Lenné, Tropical Pastures Program, CIAT, A.A. 6713, Cali, Colombia.

Anthracoze, caused by *Colletotrichum gloeosporioides*, is the most widespread and damaging disease of *Stylosanthes* species. From 1978 to 1981, field screening of 121 accessions of *Stylosanthes capitata* at two sites in Colombia and at CPAC, Brazil showed that although 90% of accessions were resistant to anthracnose in Colombia, 84.3% were moderately to severely anthracnosed at CPAC, Brazil. This strongly suggests that the specialized pathogenic isolates of *C. gloeosporioides* to *S. capitata* exist in Brazil, within the native habitat of this legume, and not in Colombia where *S. capitata* is an exotic species. Glasshouse studies with isolates of *C. gloeosporioides* from various countries have confirmed this relationship. Results strongly imply the need to screen indigenous tropical pasture legumes for disease resistance in their native habitats in Central and South America.

DISFASFS OF TROPICAL FORAGE PLANTS IN COLOMBIA. J. Lenné, CIAT Tropical Pastures Program, Cali, Colombia.

During four years, tropical forage plants have been intensively evaluated for diseases in different sites in Colombia, especially at the Experimental Station ICA-CIAT, Carimagua, Meta and at the Experimental Station CIAT, Santander de Quilichao, Cauca. More than thirty diseases have been detected in forage legumes and grasses, most of them in legumes. The causal agents were determined from observations of symptoms in the field and afterwards verified in the laboratory. Fungi, bacteria, mycoplasmas, viruses and nematodes were recorded as causal agents of these diseases, most of them being caused by fungi representing all taxonomic groups. The distribution and importance of diseases of promising genera of tropical forage plants is discussed.

PATHOGENIC VARIATION AMONG ISOLATES OF COLLETOTRICHUM GLOEOSPORIOIDES AFFECTING STYLOSANTHES SPP. Jillian M. Lenné, Amparo Vargas de Alvarez and Celina Torres G. Tropical Pastures Program, CIAT, A.A. 6713, Cali, Colombia.

During the past four years, glasshouse studies of pathogenic variation among isolates of *Colletotrichum gloeosporioides*, the causal agent of anthracnose, from *Stylosanthes* species from South America have been carried out. To date, seven groups have been recognized: group 1 on common *Stylosanthes guianensis* group 2 on late-flowering *S. guianensis*; group 3 on both *S. guianensis*; group 4 on *S. capitata* and *S. scabra*; group 5 on *S. capitata* and *S. hamata*; group 6 on late-flowering *S. capitata*; and group 7 on *S. capitata* and common *S. guianensis*. Groups 1, 2, 3 and 6 have been found in Colombia; groups 4, 5 and 7 in Brazil only. Groups 1 and 2 are present in both countries, group 1 also being common in Peru and Venezuela. Classification of the variability within the pathogen is continuing.

FACTORS AFFECTING THE DEVELOPMENT OF THE COMMON CORN SMUT (HUITLACOCHÉ) CAUSED BY *Ustilago maydis* (D.C.) CDA. C.F. López and S. Romero. Dept. Parasitología, Universidad Autónoma de Chapingo, México.

Corn smut is known in all the maize producing zones of the world. It causes losses ranging from 1 to 100%. Therefore it is important to understand factors affecting growth of the fungus. The present work was focused on the study of factors related to the host (genotype and plant age), the fungus (inoculum concentration, pathogenic variation and infection sites) and the environment (relative humidity, precipitation and temperature). The factors

determining disease incidence seem to be genotype and plant age, inoculum source and concentration (with higher spore concentration (with higher spore concentration there are more infection sites and therefore higher numbers of galls). Relative humidity, temperature and fresh wind are important factors because they affect spore germination and dissemination.

EFFECT OF CUTTING QUALITY ON CASSAVA (*Manihot esculenta* Crantz) PERFORMANCE. J.C. Lozano; B. Pineda and U. Jaysinghe. Cassava Pathology, CIAT, Apartado Aéreo 6713, Cali, Colombia.

Cassava is normally propagated by planting 20cm long stem cuttings. The general performance of a native cultivar and a recently selected hybrid was investigated according to planting material source. Results showed that by using cuttings from plants regenerated after meristem culture, the root and starch yield increased by 69.5% and 70.3%, respectively, with regard to traditional planting material. When comparing the native cultivar with the selected hybrid, there were no differences in yield if clean "cuttings" were used. When using traditional planting material for the native cultivar the hybrid produced around 3.2 times more than the native cultivar. All these findings indicate a continuous decrease in the performance of cassava cultivars with time due to the effect of biotic stresses asserted during each growing cycle. These bring out the need for: a) careful evaluation of the genotypes during selection by using planting material of equal qualities; b) use of clean planting material for a high performance.

ASSESSMENT OF THE EFFECT OF SOME CULTURAL PRACTICES ON THE INCIDENCE OF MAIZE RAYADO FINO VIRUS IN CHAPINGO, MEXICO. Gerardo Martínez, José A. Toledo and Moisés Cárdenas-Alonso. Universidad Autónoma Chapingo, Departamento de Parasitología. Chapingo, México. 56230. México.

In two field trials we evaluated the effect of weed control, planting distances and densities and maize-field bean intercropping on the incidence of Maize Rayado Fino Virus (MRFV). A greater incidence was observed in intercropped (20%) compared to maize alone (10%) and in equidistant (33%) as normal planting distance (20%). The incidence of MRFV was highest in the always weed-free check with equidistant distribution (46 and 42% for the low and high density, respectively) and the lowest was observed in the always weedy check with normal planting distance (2 and 3% for the low and high density, respectively).

RESPUESTA DEL FRIJOL CARGAMANTO A DENSIDADES DE SIEMBRA Y CONTROL QUIMICO DE ENFERMEDADES. R. Navarro y O. D. Puerta. Respectivamente, Programa Sanidad Vegetal y Programa Fitopatología. Centro Regional de Investigación "La Selva", apartado aéreo 51764, Medellín, Colombia.

En el control de las enfermedades foliares del frijol cargamanto (*Phaseolus vulgaris* L.) se ha encontrado que los fungicidas Benomil, Clorotalonil y Captafol, en aspersiones quincenales, han dado los mejores resultados para el control de la Antracnosis (*Colletotrichum lindemuthianum*) y la Mancha anillada (*Ascochyta* sp.). Dado que a altas densidades de siembra las enfermedades foliares son limitantes se estudiaron diferentes distancias de siembra, siendo la de 60 x 60 cm con control químico a base de Benomil, aquella en la que se obtuvieron los mas altos rendimientos (4.914 Kg/ha).

MICROSCOPIA DE LUZ Y ELECTRONICA DE INCLUSIONES DEL VIRUS DEL MOSAICO DE LA SOYA EN *Phaseolus vulgaris* L. A.I. Niessen y F. J. Morales. Programa de Frijol, CIAT, Cali, Colombia.

Se confirmó la patogenicidad del Virus del Mosaico de la Soya (SMV) en frijol (*Phaseolus vulgaris* L.) 'Double White' mediante la observación con la ayuda de un microscopio de luz (x 1000) de las inclusiones intracelulares inducidas por el virus en plantas susceptibles. La observación de cortes ultrafinos de tejido de frijol infectado por el SMV, con un microscopio electrónico, demostró la presencia de inclusiones citoplasmáticas radiales (pinwheels) típicas del grupo potyvirus al cual pertenece el SMV. La presencia de agregados laminares que clasifican al SMV dentro de la subdivisión III del grupo potyvirus, fue detectada en cortes ultrafinos de tejidos de soya pero no de frijol obtenidos de plantas infectadas sistémicamente.

PATHOGENICIDAD Y DISTRIBUCION SISTEMICA DE UNA CEPAS NECROTICA DEL VIRUS DEL MOSAICO COMUN EN VARIEDADES HIPERSENSIBLES DE FRIJOL. A. I. Niessen y F. J. Morales. Programa Frijol, CIAT, Cali, Colombia. Una cepa del virus del mosaico común del frijol (BCMV) capaz de inducir necrosis sistémica en plantas de frijol (*Phaseolus vulgaris* L.) que

poseen el gen dominante de hipersensibilidad, fue caracterizado como una variante de la cepa NL3 del BCMV. La variante aislada, designada aquí como NL3-CIAT, difiere de la cepa BCMV-NL3 en su dependencia de la temperatura para inducir necrosis sistémica, especialmente, en la variedad diferencial de frijol 'Jubila'. La NL3-CIAT sólo indujo necrosis sistémica en una (Black Turtle Soup) de las cinco variedades diferenciales hipersensibles a la BCMV-NL3, a una temperatura promedio de 18.2 C. La NL3-CIAT fue aislada de hojas primarias de las variedades 'Black Turtle Soup', 'Widusa' y 'Jubila' inoculadas mecánicamente así como de la primera hoja trifoliada de las variedades 'Black Turtle Soup' y 'Widusa', inoculadas mecánicamente en las hojas primarias, demostrando el movimiento sistémico del virus en plantas que poseen el gen de hipersensibilidad. La abscisión de las hojas primarias mecánicamente inoculadas con la NL3-CIAT, antes del quinto día de la inoculación, previno el desarrollo de la necrosis sistémica en las cinco variedades hipersensibles seleccionadas.

YIELD EVALUATION OF BEAN CULTIVARS WITH SMALL OR LARGE RUST PUSTULE TYPE. M.A. Pastor-Corrales and F. Correa. Centro Internacional de Agricultura Tropical, a.a. 6713, Cali, Colombia.

Phaseolus vulgaris L. cultivars of known reaction to *Uromyces phaseoli* in Palmira, Colombia, were field evaluated under protected, natural and rust inoculated conditions. The cultivars had either large rust pustule type of more than 500µ in diameter and often accompanied by pustules of intermediate size or small pustule type of less than 300µ in diameter. The disease progress was monitored and the predominant pustule types for each cultivar registered. Yield data was obtained. Statistically significant yield differences were observed between the protected and nonprotected plots for the cultivars Pinto 650, ExRico 23, Jamaica, BAT 883, BAT 256 and BAT 153 with large pustule type. No significant yield differences were observed between the nonprotected plots under natural and rust inoculated conditions. No significant yield differences were observed between the protected and nonprotected plots for BAT 41, BAT 93, BAT 308 and EMP 81 with small pustules. In this study, rust pustule type appeared to be more important than rust severity in determining yield differences between protected and nonprotected plots.

PERDIDAS EN RENDIMIENTO CAUSADAS POR LA MANCHA ANGULAR DEL FRIJOL. M.A. Pastor-Corrales, F. Correa y H. Carmen. Centro Internacional de Agricultura Tropical, Apartado Aéreo 6713, Cali, Colombia.

Muy poca información existe sobre las pérdidas en rendimiento que puede causar la mancha angular del frijol. Se utilizó el cultivar susceptible G 2858 y los fungicidas Biloaxol (Baycor) y Top Cop (Sulfato Cuprico Tribásico). Se hicieron siete tratamientos diferentes de aplicaciones con cada uno de los fungicidas a diferentes épocas después de la siembra. En las parcelas de control que no se recibieron fungicidas, el rendimiento fue de 1118 kg/ha. El rendimiento en todas las parcelas tratadas con fungicidas fue superior al del control. Los mayores incrementos en rendimiento con Baycor fueron de 41%, 37% y 33% cuando se hicieron aplicaciones a los 26, 40, 54 y 69; 40, 54 y 69 y a los 26, 40 y 54 días después de la siembra respectivamente. Con Top Cop los mayores incrementos se observaron cuando las aplicaciones se hicieron a los 26, 40 y 54 (33%), 40 y 69 (31%) y a los 40 y 54 (30%) días después de la siembra respectivamente.

FUNGAL DISEASES AND PESTS OF THE PAPPESED *Brassica napus* L. and *B. campestris* L. IN THE HIGH VALLEYS OF MEXICO.- F. Ponce and C. Mendoza. Depto. Parasitología, Universidad Autónoma de Chapingo, México.

The rapessed, a plant with high oil content, has been recently introduced as an oil crop. It is commonly attacked throughout its production cycle by diseases and pests which reduce crop yield. During 1980-81, surveys were carried out collecting samples of insect attacked and diseased plants from several localities in the High Valleys and in observation plots planted at Chapingo, México. From the study we found: a) Fungi: *Rhizoctonia solani* Kuhn; *Albugo candida* (Pers. ex Chev.) Kuntze; *Alternaria brassicae* (Berk) Sacc. *Oidium* sp; *Peronospora parasitica* Pers. ex Fr.; *Sclerotinia sclerotiorum* (Lib.) Dyb; b) Insects: *Brevicoryne brassicae* L.; *Leptophobia aripa* Boisd.; *Macrodactylus mexicanus* Burmeister; flower beetles (Mitidulidae); blossom bug (Miridae) and stalk borer (Curculionidae). We consider *A. brassicae* the pathogen with most incidence. We estimate that *L. aripa* is the most damaging species.

Witches' Broom of *Theobroma cacao* induced by *in vitro* basidiospores of *Crinipellis perniciosa*. L.H. Purdy, Plant Pathology Dept., Univ. of Florida, Gainesville, FL. 32611.

Basidiocarps of *Crinipellis perniciosa* developed on autoclaved and propylene oxide sterilized dry witches' brooms of *Theobroma*

cacao imbedded in water agar. These basidiocarps were characteristic of those produced under natural conditions. The seven basidiocarps developed from mycelial isolates of *C. perniciosa* from Brazil and Ecuador that were paired in each flask that contained sterilized brooms. Basidiospores from these basidiocarps were applied to shoot apices of *T. cacao*. Symptoms were observed after 3 and 6 wk in the two brooms that developed. Mycelium characteristic of *C. perniciosa* was observed in free-hand sections of these brooms. Reisolation yielded mycelial cultures identical to cultures isolated from field produced brooms and to single basidiospore cultures of *C. perniciosa*.

DEVELOPMENT OF BLACK SIGATOKA IN THE ATLANTIC AREA OF COSTA RICA.- Ricardo A. Rodríguez-Research Dpt. ASBANA- San José, Costa Rica.

A scoring method was used which considers unique characteristics black sigatoka. Disease incidence was recorded in several banana farms distributed throughout the Atlantic area of COSTA RICA. Except for the relative severity of leaf spotting, results obtained to June 1982 show similar behavior of the disease in all farms. Disease index was mainly influenced by local climatic conditions, but also, defective crop management practices have been characterized as factors greatly favoring disease development. A better understanding of the problem on the part of the grower should help minimize disease losses.

ESTUDIO DE ALGUNOS ASPECTOS RELACIONADOS CON LA MUERTE REGRESIVA DEL AGUACATE, Amado Rondón G. CENIAP, Aptado 4653, MARACAY VENEZUELA.

Análisis de laboratorio sobre muestras de plantas de aguacate enfermas procedentes de diferentes huertos permiten concluir que "la muerte regresiva de las ramas" esta relacionada principalmente con la presencia en el tejido de las mismas, del hongo *Botryodiplodia theobromae* Pat., el cual se encuentra asociado a *Colletotrichum* sp y *Pestalotia* sp., considerados organismos secundarios. Mediante contajes de plantas afectadas se logró establecer porcentajes de infestación que iban desde 0% en las variedades 'pedro', 'schaff', 'duke' y 'yon' hasta un 80% en la variedad 'prince'. También se determinó que la incidencia de la enfermedad estaba relacionada con lesiones o heridas en las ramas producidas por golpe de sol o por ataque de insectos, con condiciones ambientales favorables al patógeno y con prácticas agronómicas deficientes. Se logró buen control de la enfermedad combinando medidas preventivas y curativas.

A LINEAR MODEL TO PREDICT BEAN RUST INFECTION RATE. D. P. Santos, A.C. Fushalappa, and C. Vieira. Dept. de Fitopatología, Universidad Federal de Vicosa, Vicosa, Brasil.

In 0.3 hectare of *Phaseolus vulgaris* cultivar Rico 23, in Vicosa, Brasil, proportion of leaflets (PLR) and leaflet area rusted, (PRA) and host growth were determined at weekly intervals during four growing seasons from 1979 to 81. A regression model was developed to predict the infection rate (P") based on PLR and PRA, the dependent variable, for 14 days after the date of prediction (DP). The independent variables were inoculum (PLR or PLA), dissemination function, infection function, survival ratio for monocyclic process (SRMP) of *Uromyces phaseoli typica* and proportion of leaflets (PLAI) or leaflet area available for infection (PLAAI) for 14 days before DP. The function for infection was $y = 1.027 + .85T + .142H - .0023T^2 - .0019H^2 - 0.034TH$, where T is temperature in °C and H is hours of free water during penetration period. A maximum of 72% of the variation in infection rate based on PRA was explained by inoculum (PRA) and infection function.

SPRAY APPLICATIONS WITH A VERTICAL BOOM ON COFFEE TREES. César Sierra-Sanz and Diógenes Villalba-Gault. CENICAFE. Chinchiná, Colombia.

Using the methodology of sampling two and four years old commercial coffee trees, 5000 and 6500 plants/ha, were cooper sprayed under two application systems" a knapsack sprayer with a vertical boom (four nozzles) was compared with the conventional knapsack sprayer (one nozzle) in terms of spray coverage, droplet size (vmd), spray distribution and cooper deposit on coffee leaves. A significant statistical difference in the spray coverage (s.c.) between the two application systems was found. However, the s.c. obtained with the vertical boom was above the optimum range (50-70 droplets/cm²). No significant difference was found in droplet size (100-200 microns). The cooper deposit on the coffee leaves was over the optimum level, 60 mg/m² of

leaf area. The major advantage of using the vertical boom over the conventional one is that it increases the application efficiency on a higher number of coffee trees sprayed/day. The results could be very important in reducing cost of control of any pest on coffee.

REACTION OF MACROPTILIUM ATROPURPUREUM ACCESSIONS TO UROMYCES APPENDICULATUS. R. M. Sonoda, University of Florida IFAS Agricultural Research Center, Fort Pierce, FL 33454, USA.

Macroptilium atropurpureum (DC) Urb. accessions collected from southern Mexico were screened against Uromyces appendiculatus Fries collected from rust-infected M. atropurpureum cultivar 'Siratro' in southeast Florida. Three accessions, IRFL 3350, 3356, and 3440 were unaffected by U. appendiculatus. Plants of IRFL 3440 were similar in growth characteristics to Siratro. Plants of IRFL 3350 and 3356 had more narrow leaves and produced much less vegetative growth than did Siratro. All three accessions were highly resistant to rust under field conditions in south Florida. The resistant accessions were collected from scattered locations in southern Mexico.

INFECTION PROCESSES OF PUCCINIA MELANOCEPHALA IN SUGARCANE LEAVES. I. A. Sotomayor, L. H. Purdy, A. T. Trese. Department of Plant Pathology, University of Florida, Gainesville, 32611.

The mechanism of infection of Puccinia melanocephala from germination of urediospores to its establishment within sugarcane leaves was studied. The optimal range for germination of urediospores and formation of appressoria was 15 to 30 C. Scratched cellophane membranes and plastic leaf replicas elicited the sequential differentiation of the germ tube into an appressorium, substomatal vesicle, infection hypha, and haustorial mother cell. This differentiation was a thigmotropic response to either scratches in the cellophane membrane or plastic stomatal impressions. The development of infection structures in the host was studied in whole leaf pieces using fluorescent microscopy and sectioned. The sequence of development was similar to the general pattern of rust fungi with unique features such as substomatal vesicle and haustorial morphology. Fungal growth in nonhosts ceased at infection hyphae (wheat) and haustorial mother cells (oat).

EFFECT OF VARIOUS TREATMENTS ON THE SURVIVAL OF CORYNEBACTERIUM FLACCUMFACIENS IN SEEDS OF ZORNIA SP. CIAT 7847. Celina Torres G. and Jillian M. Lenné, Tropical Pastures Program, CIAT, A.A. 6713, Cali, Colombia.

By the means of various treatments in the laboratory, infection by Corynebacterium flaccumfaciens was reduced in seeds of Zornia sp. CIAT 7847. The control had an infection level of 65.3% and 21.7% germination. Treatment with heat for 10 days and cold for 16 weeks reduced infection to 15.7% and 17.1% respectively and increased germination to 43.6% and 37.8% respectively. In addition, chemical treatments: with carboxin 5,6 dihidro-2-metil-1,4 oxatiine-3-carboxamida + (Triclorometilto)-4-Cyclohexano-1, 2-dicarboximida (Vitavax) had an infection level of 1% and 35% germination and with cooper oxide (Kocide) had an infection level of 6% and 38.3% germination. Treatment with copper oxide and 100% relative humidity had an infection level of 3.1% and 42.2% germination. The last three treatments are recommended to reduce the level of infection of seeds Zornia sp. CIAT 7847 with C. flaccumfaciens.

FOLIAR BLIGHT (RHIZOCTONIA SOLANI) IN CENTROSEMA BRASILIANUM AND PRELIMINARY STUDIES OF THE ANTAGONISTIC ORGANISMS. Amparo Vargas de Alvarez and Jillian M. Lenné, Tropical Pastures Program, CIAT, A.A. 6713, Cali, Colombia.

Foliar blight characterized by cream-colored spots on leaves, necrosis, defoliation and death of plants of Centrosema brasilianum was observed for the first time in the Experimental Station ICA-CIAT, Carimagua in the Eastern Plains of Colombia in 1981. Rhizoctonia solani was determined to be the causal agent. All isolates were pathogenic to 4 week old seedling of C. brasilianum, C. pubescens and C. macrocarpum. During the period of highest precipitation and humidity, favorable conditions for development of the fungus, levels of infection decreased notably. The action of antagonistic organisms was suspected. High populations of Trichoderma spp., other fungi and bacteria were isolated from the soil and from leaves collected from the soil surface. Tests realized in the laboratory confirmed the inhibitory action of Trichoderma spp. to seven isolates of R.

solani. At the same time, of 11 isolates of bacteria, five showed the same antagonism. Further studies are in progress.

ECONOMIC IMPORTANCE OF A VIRUS COMPLEX IN MAIZE TRANSMITTED BY Peregrinus maidis. F. Varón de Agudelo, F. Arboleda, and G. Martínez-López. ICA-Palmira & Apartado Aéreo 85036 Bogotá, Colombia.

Preliminary studies on the economic importance of a virus complex, observed in the Cauca Valley, complex in which there seems to be involved at least four different viruses, all of them transmitted by Peregrinus maidis (Ashm.) (Homoptera, Delphacidae), indicated that plants presenting each one of the three main symptoms associated with the disease complex: "raya gruesa", "hoja blanca" and "raya fina", is associated with yield reductions, that in all the cases was higher than 50%, when their yield was compared with the one from plants apparently free of the disease problems. This reduction in yield was higher than 80%, in plants infected early during the growing season, being very frequent the death of diseased plants. Similar results were observed in the four cultivars studied: ICA-H 211, ICA-H 212, ICA-H 257 and DIACOL-H 253.

MAIZE HOJA BLANCA: A COMPLEX OF VIRUSES TRANSMITTED BY Peregrinus maidis. F. Varón de Agudelo, G. Martínez-López. ICA-Palmira & Apartado Aéreo 85036 Bogotá, Colombia.

Electron microscope studies with maize samples, collected in maize fields in the Cauca Valley, from plants affected by a general chlorosis of the younger leaves, symptom that has been named "hoja blanca", indicated the presence of isometric particles of about 40-45 nm, and/or bundles of very thin, thread-like particles. Transmission experiments oriented to the identification of the vector of the disease complex, indicated that it is transmitted by the maize delphacid Peregrinus maidis (Ashm.) (Homoptera, Delphacidae). The virus complex can be acquired in a feeding acquisition period of 48 to 72 hr. It has an incubation period in the insect vector of 4 to 24 days with an average of 18 days. The incubation period in the plant had a range of 4 to 24 days, with an average of 11 days. Both types of particles observed in this study, had been previously observed in samples with related symptoms, transmitted by P. maidis, in other places in the Americas and in Africa.

MAIZE RAYA GRUESA: A RHABDOVIRUS TRANSMITTED BY Peregrinus maidis. F. Varón de Agudelo, G. Martínez-López. ICA-Palmira & Apartado Aéreo 85036 Bogotá, Colombia.

Electron microscope studies with maize samples, of a disease problem characterized by wide chlorotic stripes, of around 1.0 mm wide, that have received the name of "raya gruesa", indicated that the causal agent is a new rhabdovirus, with morphological and cytopathological properties that indicate that it is different from the maize mosaic rhabdovirus. Preliminary serological studies also support the difference. The virus is transmitted, in a persistent manner by Peregrinus maidis (Ashm.) (Homoptera, Delphacidae). The virus can be acquired by a feeding acquisition period of 48 to 72 hr. It has an incubation period in the insect vector of 4 to 22 days, with an average of 17 days. The incubation period in susceptible young plants had a range of 8 to 21 days, with an average of 12 days.

CONTROL DE MOHO AZUL EN TABACO. J.E. Ventura y R. Cancelado. Du Pont Latin América, Florida, U. S. A.

El moho azul del tabaco Peronospora tabacina Adam, ha producido severas epifitotias en la mayoría de países productores de tabaco. Los métodos convencionales de control han fallado repetidamente cuando la cantidad de inóculo es elevada y las condiciones ambientales son favorables al patógeno. En 6 experimentos de campo con tabacos Habano cultivado a la sombra y a libre exposición y Burley a libre exposición, un nuevo fungicida: 2-ciano-N-(etilamino) carbonil-2-(metoximino) acetamida, cimoxanil (2) combinado con mancozeb dio excelente control. Aplicaciones terrestres cada 5 a 7 días de la mezcla cimoxanil a 160-240ppm con mancozeb 1280-1920ppm dieron controles entre 2.0 y 12.3 calificados según el sistema de Coresta (grado mínimo en la escala 2.0= no enfermedad; grado máximo 25.0). No hubo diferencias significativas entre las distintas dosis de cimoxanil + mancozeb, pero todos los tratamientos con cimoxanil fueron superiores a la mezcla metalaxil (3) + mancozeb o benalaxil (4) + mancozeb aplicado solo. Añen condiciones de ataque severo, se obtuvo con la mezcla cimoxanil + mancozeb hojas para capa de puros con calidad comercial aceptable.

CHEMICAL CONTROL OF SUGARCANE SMUT (*Ustilago scitaminea* SYDOW) BY SEEDCANE TREATMENT. J. I. Victoria, P. Carrillo and C. Cassalet. CENICANA, Cali and ICA-Cúcuta, Colombia.

The system used to evaluate the chemical control (eleven compounds at a concentration level of 500 ppm) consisted in a complete immersion of CP57603 seedcane in hot water (50C for 2h) or cold water (25C for 2h). The best control results were obtained with triadimefon. An inverse relationship was found between dosage and time for immersion in triadimefon. For a lower dose (125 ppm) a longer period of immersion (2h) in hot or cold water was necessary; triadimefon at 125 ppm in hot water gave good control even when the immersion was for only 5 min, not so in cold water where 500 ppm for 5 min of immersion were necessary to give similar control. Triadimefon was not effective in controlling sugarcane smut when applied by foliar spraying, immersing only the seedcane ends in fungicide solution, spraying fungicides on seedcane ends or seedcane on rows; the best control was reached when there was a complete immersion of seedcane pieces.

RESISTANCE TO SUGARCANE SMUT (*Ustilago scitaminea* Sydow). C. Cassalet, J. I. Victoria, P. Carrillo and H. Ranjel. CENICANA, Cali and ICA-Cúcuta, Colombia.

From 1977 to 1980 more than 426 sugarcane varieties were evaluated in Ingenio Sicarare (Codazzi), Agrozulia S.A. and ICA-Cúcuta, as to their resistance to sugarcane smut (*Ustilago scitaminea* Sydow). Evaluation was done by immersing single seedcane buds in 2 g spores/l water plus triton ACT (0.5 ml/l) for 10 min. Periodically the production of the number of whips was determined and used as indication of susceptibility to smut. After several evaluations, 23 varieties were found as resistant to smut; from this group, 11 varieties were selected to have their agroindustrial characteristics checked at different sugar mills in the Cauca Valley (Colombia): (PR 61902, CoX, M336 x PR980, B63, ICA 71-11, ICA 70-36, ICA 70-67, Ragnar, EPC 38122, ICA 69-11 and PR 61632). The four first varieties were found highly susceptible to sugarcane mosaic and the four following varieties had poor agroindustrial characteristics. The last three varieties have been selected to form a basic group to be used in regional trials at 10 different sugarcane mills.

ETIOLOGICAL STUDIES ON THE THREE MORE IMPORTANT DISEASES IN "GUANABANO" *Annona muricata* L. IN THE VALLE DEL CAUCA, COLOMBIA, Rubén Darío Zárate. Facultad Ciencias Agropecuarias. Apartado Aéreo 237. Palmira, Valle, Colombia.

The three diseases are foliar anthracnose *Colletotrichum gloeosporioides* (Penz.) Sacc.; dry rot (initially caused by *C. gloeosporioides* and finally associated with *Fusarium coeruleum* at the end of the infection process; and brown rot caused by *Rhizopus stolonifer* invading wounds or holes made by the seed

and fruit borer *Bephrata maculicollis* C. Both. Incidence was rated at 72%, 42% and 42-72%, respectively. A relationship between brown rot and environmental conditions was determined. Some relationships between cultural practices and the appearance of these diseases were found. Descriptions of symptoms and causal agents were made. Some preliminary measures of management and control are advised.

EVIDENCE FOR PATHOGENIC SPECIALIZATION OF *SPHACELOMA MANIHOTICOLA* ON CASSAVA. R. S. Zeigler, Department of Plant Pathology, Cornell University, Ithaca, New York 14853, USA, E. Alvarez and J. C. Lozano, CIAT AA 6713 Cali, Colombia.

Sixty cassava cultivars of diverse geographic origins were used in a series of controlled inoculations with 30 single-spore isolates of *S. manihotica* of diverse origin. Inoculation was with conidia from 21-28 day-old colonies from PDA at 3×10^6 conidia/ml in 0.1% water agar and surfactant applied by aspiration. Stem cuticle was disrupted with a cotton swab immediately prior to inoculation. Inoculated plants were placed in controlled environment (100% RH for 48 hours, 24-28 C, 12 hr photoperiod at 11,000 lux), and evaluated after 10-12 days. Evaluation was as percent susceptible stem surface involved in lesions and number of internodes diseased. No hypersensitive response was detected. Two-way analysis of variance yielded repeatable significant cultivar x isolate interactions suggestive of pathogenic specialization. Interactions frequently occurred with field resistant cultivars. Factors other than physiological compatibility are probably involved in field resistance.

THE PERFECT STATE OF *SPHACELOMA MANIHOTICOLA*, CAUSAL AGENT OF CASSAVA SUPERELONGATION DISEASE. R. S. Zeigler, Department of Plant Pathology, Cornell University, Ithaca, New York 14853, USA and J. C. Lozano, CIAT, AA 6713 Cali, Colombia.

Leaf, petiole, and stem lesions on cassava infected by *Sphaeceloma manihotica* collected throughout Colombia frequently had scattered or coalescing pulvinate structures with darkly pigmented surfaces. These were found to be ascoma typical of *Elsinoë* species, the only known sexual stage of *Sphaeceloma* spp. Ascoma range from 20-130 μ m in diameter, originate subepidermally, and contain scattered locules. Globose, bitunicate asci (13-22 μ m in diameter) are solitary in the locules. Mature ascospores (11-14 x 3-7 μ m) are hyaline with three transverse septa and often internal longitudinal septa. Germination may be direct or by production of conidia. Single ascospore isolates yielded colonies typical of *S. manihotica* and were pathogenic on cassava, causing typical SED symptoms. Ascoma development coincides with onset of rains and ceases as rains become sporadic. Ascospores are wind dispersed. This is the first *Elsinoë* described on *Manihot* spp.