RESUMENES DE LA XXIII REUNION ANUAL DE ONTA, 21-26 JULIO 1991
ABSTRACTS OF THE XXIII ANNUAL MEETING OF ONTA, 21-26 JULY 1991
SAN ANTONIO, TEXAS, U.S.A.

A RAPID AND RELIABLE TECHNIQUE FOR DETECTION OF RESISTANCE TO *PRATYLENCHUS PENETRANS* IN POTATO [UNA TECNICA RAPIDA Y VIABLE PARA LA DETECCION DE RESISTENCIA A *PRATYLENCHUS PENETRANS* EN PAPA]. **M. A. Arévalo-Guerra and B. B. Brodie, Department of Plant Pathology, and USDA ARS, Cornell University, Ithaca, NY 14853, U.S.A.**—Two related potato clones with different reactions to *Pratylenchus penetrans*, L118-2 (resistant) and NY 85 (susceptible), were used in these experiments. 'Saia' oat and 'Wando' pea were used as resistant and susceptible controls, respectively. Ten-day-old seedlings growing in clay pots filled with autoclaved soil, were inoculated with 3 000 *P. penetrans* adults extracted from alfalfa callus cultures. Plants were arranged in a completely randomized design in a growth chamber at 24 C with a 15-hr light period. Numbers of vermiforms and eggs of *P. penetrans* per root system were determined at 5 and 30 days after inoculation, by staining whole root systems in acid fuchsin-lactoglycerol solution and by extracting nematodes via maceration and sieving. At 5 days, *P. penetrans* egg numbers per root system were 23 in Saia oats, 63 in L118-2, 247 in NY85, and 620 in pea. At 30 days, the number of vermiforms and eggs was significantly greater in pea and NY85 than in Saia oats and L118-2. There was a strong correlation (r^2 = 0.98) between egg production at day 5 and total *P. penetrans* population at day 30. These data suggest that egg production 5 days after nematode inoculation is a good indicator of resistance to *P. penetrans* in potato.

LABORATORY AND FIELD EVALUATION OF THE SPATIAL DISTRIBUTION OF *STEINERNEMA* SP. IN MATURE CORN PLOTS IN THE LOWER RIO GRANDE VALLEY OF TEXAS [EVALUACION DE LABORATORIO Y CAMPO DE LA DISTRIBUCION ESPACIAL DE *STEINERNEMA* SP. EN PARCELAS DE MAIZ MADURO EN LA PARTE BAJA DEL VALLE DEL RIO GRANDE DE TEXAS]. **E. Cabanillas and J. R. Raulston. USDA ARS, Subtropical Cotton Insects Research Unit, 2413 East Highway 83, Weslaco, TX 78596, U.S.A.**—*Steinernema* sp. has been observed parasitizing the prepupae and pupae of *Helicoverpa zea* and fall army worm *Spodoptera frugiperda* excavated from corn fields in the Lower Rio Grande Valley of northeastern Tamaulipas, Mexico, and south Texas during the surveys of 1986-1990. The study reported here was undertaken to determine the vertical and horizontal distribution of this local endemic nematode in the soil under corn plots in the Lower Rio Grande Valley of Texas using both laboratory and field bioassays. *Helicoverpa zea* were used as bait to detect the presence of steinernematids in the soil. Bioassays showed that *Steinernema* sp. occurred at all six depths tested. The occurrence of *Steinernema* sp. was significantly higher in the upper 20 cm of soil. In the top 20 cm of soil field and laboratory bioassays indicated that about 49% and 34%, respectively, of the *H. zea* population was *Steinernema*-infected, while at 25-30 cm soil depths, field and laboratory bioassays indicated that 11% and 4.5%, respectively, of the *H. zea* were infected. The distribution of *Steinernema* sp. within the corn plots was spotty, i.e. contagious.

ANTAGONISTIC EFFECT OF THREE SPECIES OF *CAPSICUM* ON THE EMERGENCE, MORTALITY, AND INFECTIVITY OF *GLOBODERA PALLIDA* RACE P4A [EFECTOS ANTAGONICOS DE TRES ESPECIES DE *CAPISICUM* SOBRE LA EMERGENCIA, MORTALIDAD E INFECTIVIDAD DE *GLOBODERA PALLIDA* RAZA P4A]. **M. Canto-Sáenz and A. González. Nematology and Entomology Department, International Potato Center, P.O. Box 5969, Lima, Perú.**—Seeds, foliage and seed plus foliage of three *Capsicum* spp. were blended in 100 ml of distilled water for 5 min and filtered. Cysts of *Globodera pallida* were exposed to the filtrates for 24 hours prior to their transfer to potato root diffusate for a hatching test. In a different test the second-stage juveniles (J2) were exposed to the filtrates. In each of these experiments an infectivity test was conducted in petri dishes to determine J2 penetration into roots of potato cv. Desiree and the percentage of female formation. The filtrates had a nemastatic effect on emergence of juveniles for up to 7 days after the exposure of the cysts to potato root exudate. After 7 days, there were no differences in emergence of J2 as compared to control. The J2 exposed to the *Capsicum* filtrates significantly lost their motility rate as compared to controls. However, they recovered after transfer to water. The recovered J2 also had the capacity to penetrate and develop to females, confirming the nemastatic effect of the filtrates.

GASOLINE, AN ALTERNATIVE MEDIUM TO SEPARATE ORGANIC MATTER FROM CYSTS OF *GLOBODERA PALLIDA* EXTRACTED FROM SOIL [GASOLINA, UN MEDIO ALTERNATIVO PARA SEPARAR MATERIA ORGANICA DE QUISTES DE *GLOBODERA PALLIDA* EXTRAIDOS DEL

SUELO]. **M. Canto-Sáenz and A. González. Nematology and Entomology Department, International Potato Center, P.O. Box 5969, Lima, Perú.**—Acetone is normally used for separating the organic matter from the cyst samples extracted from soil. However, it is difficult to obtain this product in some Andean countries. Therefore, as an alternative to acetone, the efficiency of gasoline of 84 and 95 octane in separating organic matter from cyst samples extracted from soil was compared with that of acetone. Gasolines of both 84 and 95 octane were effective in separating the organic matter from the samples and there were no significant differences in the number of cysts extracted with acetone or gasoline. These solvents did not have any effect on the viability of juveniles. Gasoline is recommended as an alternative medium for use in separating organic matter from cysts extracted from soil.

EFECTO DE *MELOIDOGYNE INCOGNITA* EN EL INCREMENTO DE ALGUNAS ENFERMEDADES DE TUBERCULO DE PAPA EN ALMACENES RUSTICOS [EFFECTS OF *MELOIDOGYNE INCOGNITA* IN THE INCREASE OF SOME DISEASES IN RUSTIC STORED POTATO TUBERS]. **R. Delgado de la Flor y P. Jatala. Centro Internacional de la Papa, Apartado 5969, Lima, Perú.**—Tubérculos del cv. Desireé infectados y no infectados por *Meloidogyne incognita* fueron colocados en almacenes rústicos de luz difusa en la localidad de San Ramón, Perú. La temperatura fue de 19-32 C. Cada 30 días durante 4 meses, los tubérculos fueron examinados para evaluar pudriciones causadas por hongos y bacterias, daño de la polilla de la papa (*Phtorimaea operculella*) y el desarrollo de brotes y peso de los tubérculos. El 58% del total de los tubérculos infectados por *M. incognita* mostraron pudriciones comparados con 16% de pudrición de tubérculos no infestados por el nematodo. *Erwinia* spp., *Pseudomonas solanacearum* y *Fusarium* spp. fueron principalmente aislados de los tubérculos con pudriciones. No se observaron diferencias significativas en el desarrollo de brotes y el daño causado por *P. operculella* en los tubérculos infectados y no infectados por el nematodo. Sin embargo, el peso de tubérculos infectados con *M. incognita* fue significativamente reducido a los 4 meses de almacenamiento. Esta reducción se debió a pudriciones causados por hongos y bacterias. Es importante determinar la naturaleza de las asociaciones de *M. incognita* con *Fusarium* spp., *Erwinia* spp. y *Pseudomonas solanacearum* en almacén. Se sugiere que el nematodo provee puntos de entrada para hongos y bacterias en el campo pero los síntomas se manifiestan 30 días después de almacenamiento de los tubérculos.

A NOVEL NEMATICIDE OF MICROBIAL ORIGIN [UN NEMATICIDA NOVEDOSO DE ORIGEN MICROBIANO]. **P. Devidas, L. Rehberger, and R. Rodríguez-Kábana. Abbott Laboratories Agricultural Research Center, 6131 RFD, Long Grove, IL 60047, and Department of Plant Pathology, Auburn University, Auburn, AL 36849, U.S.A.**—During the last several years attempts to develop a nonchemical means to control plant parasitic nematodes resulted in the isolation of several microorganisms with potentially high levels of bioactivity. This selection was based on critical bioassays in the laboratory and greenhouse. A composition prepared from one of these isolates (designated AARC #0255) gave high levels of control of root-knot nematode populations. This report details our evaluation in the laboratory, greenhouse, and microplot. The commercial potential of such a preparation is also discussed.

NEMATODOS ASOCIADOS CON RAICES DEL CITRICO EN EL VALLE DE YEGUARE, HONDURAS [NEMATODES ASSOCIATED WITH CITRUS ROOTS IN THE YEGUARE VALLEY IN HONDURAS]. **H. Domínguez y L. E. Powers. Departmento de Protección Vegetal, Escuela Agrícola Panamericana, Apartado Postal 93, Tegucigalpa, Honduras.**—Con en fin de proveer información a los productores de cítricos en Honduras, fue llevado a cabo un estudio para determinar la susceptibilidad a nematodos fitoparásitos de algunas variedades accesibles a los productores hondureños. La investigación se llevó a cabo en el valle de Yeguare en Honduras desde septiembre de 1990 hasta marzo de 1991. Las variedades incluyeron Hamlin, Valencia, Jaffa, Pineapple, Tangelo, Parson Brown, McCarty, China, y Dancy. Para extraer los nematodos se utilizó el método de embudo Baermann y centrifugación con azúcar posteriormente, fueron identificados hasta nivel de género. Los géneros de nematodos más frecuentemente encontrados en el suelo fueron: *Criconemoides, Helicotylenchus, Meloidogyne, Pratylenchus, Trichodorus, Tylenchus* y *Xiphinema.* Los nematodos extraídos de muchos sistemas radiculares pertenicían a los siguientes géneros: *Meloidogyne, Pratylenchus* y *Tylenchulus.*

HOST STATUS OF NINE ORNAMENTAL PLANTS AND ONE CYCAD TO RENIFORM NEMATODE [CAPACIDAD HOSPEDADORA DE NUEVE PALMAS ORNAMENTALES Y UNA CYCADA AL NEMATODO RENIFORME]. **R. A. Dunn, R. N. Inserra, and N. Vovlas. Department of Entomology &**

Nematology, University of Florida, and FDACS, DPI, Gainesville, FL 32611-0740, U.S.A., and Instituto Nematologia Agraria, CNR, Bari, Italy.—The host status of *Arecastrum romanzoffianum, Bismarkia nobilis, Chamaerops humilis, Coccothrinax* sp., *Neodypsis decaryi, Phoenix roebellenii, Ptychosperma elegans, Ravenea rivularis, Washingtonia robusta,* and *Cycas revoluta* to *Rotylenchulus reniformis* was investigated in the greenhouse in pots containing soil with initial densities of 4 *R. reniformis*/cm^3 soil for 13 months. Nematode infection and reproduction was detected only on *W. robusta. Rotylenchulus reniformis* densities on *W. robusta* were 0, 5, and 20 females and 0, 77, and 309 eggs/g fresh roots, 4, 9, and 13 months after planting, compared to 13, 110, and 153 females and 192, 948, and 1196 eggs/g fresh roots on *Phaseolus vulgaris*, a host of *R. reniformis*. At the end of the experiment soil nematode densities increased 2.2- and 7.5-fold in *W. robusta* and *P. vulgaris* pots, respectively. Residual nematode densities in soil persisted at detectable levels in all pots with plants determined to be non hosts to *R. reniformis*. Syncytia extending from the endodermis into the pericycle and vascular parenchyma were observed in nematode-infected *W. robusta* roots.

SOMATOTHIGMOTAXIS [SOMATOTIGMOTAXIS]. **R. P. Esser. Bureau of Nematology, Division of Plant Industry, P.O. Box 1269, Gainesville, FL 32602, U.S.A.**—Somatothigmotaxis, aggregation, and migration as a unified concept is attributed for the first time to populations of the plant parasitic nematodes *Dolichodorus heterocephalus, Heliocotylenchus dihystera, Meloidogyne* sp., and *Tylenchulus semipenetrans*. Tests comparing third stage juveniles of entomogenous nematodes *Steinernema feltiae* and *S. scapterisci* maintained on water agar discs revealed striking differences in migration and aggregation behavior. *S. feltiae* produced scattered colonies, variable in size and shape, while *S. scapterisci* produced synchronized migrating columns. Both species were able to migrate and sustain themselves for over 50 days on a dry glass surface.

MANAGEMENT OF ARTHROPOD PESTS OF COTTON IN TEXAS [MANEJO DE PLAGAS ARTROPODAS EN ALGODON EN TEXAS]. **R. E. Frisbie. Department of Entomology, Texas A & M University, College Station, TX 77843, U.S.A.**—Key arthropod pests in Texas cotton include the boll weevil (*Anthonomus grandis*), the cotton fleahopper (*Pseudatomoscelis seriatus*), bollworm (*Helicoverpa zea*), and tobacco budworm (*Heliothis virescens*). Other key pests for certain regions in Texas include thrips, (*Thrips* spp.), cotton aphid (*Aphis gossypii*) and the pink bollworm (*Pectinophora gossypiella*). Emphasis will be placed on pesticide use reductions through integrated pest management (IPM) programs. The boll weevil and cotton fleahopper are primary early season pests. Regional boll weevil management strategies emphasizing planting dates, short season cultivars, fall control of diapausing adults, and phytosanitation is reviewed. Sampling and thresholds for all pests is discussed. The success of insecticide resistance management of the tobacco budworm in Texas is reviewed.

THE EFFECT OF VARIOUS ALDICARB AND 1,3-DICHLOROPROPENE RATES ON RENIFORM NEMATODE IN COTTON [EFECTO DE DIFERENTES DOSIS DE ALDICARB Y 1,3-DICHOROPROPENO SOBRE EL NEMATODO RENIFORME EN ALGODON]. **W. Gazaway and R. Rodríguez-Kábana. Department of Plant Pathology, Auburn University, Auburn, AL 36849, U.S.A.**—A 2-year cotton nematicide study in southern Alabama revealed that higher rates of aldicarb and 1,3-dichloropropene successfully controlled reniform nematodes (*Rotylenchulus reniformis*) in cotton. The granular formulation of aldicarb at 1.7 kg a.i./ha, incorporated on a 15-cm band over the center of the seed bed at planting, returned a profit of $164.32/ha. Fumigant (1,3-dichloropropene) injected at 47 L/ha prior to planting produced a profit of $221.90/ha. The study also revealed that reniform nematode populations were evenly distributed throughout test plots, indicating that reniform nematode damage is likely to be evenly distributed in larger cotton fields.

PRESENT AND FUTURE PROSPECTS FOR ENTOMOPATHOGENIC NEMATODE PRODUCTS [PERSPECTIVAS PRESENTES Y FUTURAS PARA LA OBTENCION DE PRODUCTOS ENTOMOPATOGENOS A PARTIR DE NEMATODOS]. **R. Georgis. 1057 E. Meadow Circle, Palo Alto, CA 94303, U.S.A.**—Steinernematid and heterorhabditid nematode-based products are commercially available for insect control. Recent developments in mass rearing through liquid fermentation have enabled the nematodes to become economically competitive with chemical insecticides in certain market segments. Substantial improvement in formulation stability and shelf life has been developed by immobilizing or partially desiccating large numbers of nematodes on specific carriers such as clay, polyacrylamide and alginate gels.

Large-scale application of nematodes is now feasible due to the ease of mixing and applying these formulations. Standardized protocols and multiple tests are needed to understand the impact of abiotic factors on insect-nematode interactions, thus optimizing nematode efficacy.

EFFECT OF ORGANIC AMENDMENTS IN THE CONTROL OF *GLOBODERA PALLIDA* [EFECTOS DE ENMIENDAS ORGANICAS EN EL CONTROL DE *GLOBODERA PALLIDA*]. **A. González and M. Canto-Sáenz. Nematology and Entomology Department, International Potato Center, P.O. Box 5969, Lima, Perú.**—The effect of five manures on reproduction of *Globodera pallida* race P5A and yield of potato cv. Revolución (*Solanum tuberosum* ssp. *andigena*) was studied in microplots. Tubers were planted in washed and sterilized sand amended with cow, horse, sheep, chicken, and guinea pig manures with a total of 4% organic matter content. None of the manures caused phytotoxicity and all increased values of most of the yield parameters. Chicken manure increased tuber yield significantly as compared to the control. Chicken and horse manures significantly decreased the multiplication rate (Pf/Pi) of *Globodera pallida* and the number of cysts per 100 cm^3 soil. Chicken manure was the best control alternative since it increased the yield significantly and decreased nematode reproduction.

DESARROLLO POSTEMBRIONARIO DE *MELOIDODERA MEXICANA* CID DEL PRADO, 1991 [POSTEMBRIONIC DEVELOPMENT OF *MELOIDODERA MEXICANA*, CID DEL PRADO, 1991]. **F. González Ulibarri y I. Cid del Prado Vera. Centro de Fitopatología, Colegio de Postgraduados, 56230, Montecillo, México.**—Ambos sexos sufren metamórfosis; los cambios se inician con el aumento en grosor del J2. El macho J3 se diferencia de la hembra por el desarrollo elongado del primordio genital, mientras que el de las hembras es oval con 12 a 15 células; estos estadíos se detectaron a los 16 a 24 días en cámara bioclimática e invernadero, respectivamente. El J4 macho se encuentra envuelto por la cutícula J3, presenta forma vermiforme, con la región labial, espícula y gubernaculum ya diferenciados a los 28 y 36 días. La hembra J4 es más obesa, con estilete flexible; metacorpus voluminoso y ovarios bien diferenciados se registraron a los 32 y 40 días. Los machos adultos se detectaron a los 28 y 36 días en cámara bioclimática e invernadero, respectivamente, dentro de la cutícula de los previos estadíos; se encuentran doblados y con la región anterior orientada hacia la parte posterior del cuerpo. Las hembras adultas se detectaron a los 36 días, sobresaliendo sus cuerpos de la raíz, y son del color blanco. A los 42 días en cámara bioclimática, y a los 60 días bajo condiciones de invernadero se detectaron los J2 dentro del cuerpo de las hembras.

THE EFFECT OF GREEN MANURE, RAPESEED MEAL, AND CHITIN FROM SHELLFISH ON COLUMBIA ROOT-KNOT NEMATODE [EFECTO DE LA INCORPORACION DE MATERIA VERDE EN EL SUELO, ORUJO DE COLZA Y QUITINA CRUSTACEOS SOBRE EL NEMATODO AGALLADOR, *MELOIDOGYNE CHITWOODI*]. **Saad Hafez. SW Idaho R & E Center, Parma, ID 83660. U.S.A.**—Green tissues and seed meal of rapeseed (*Brassica napus*) contain high concentrations of glucosinolate. It is known that isothiocyanates are produced from the degradation of glucosinolate in soil. Isothiocyanates are known to be active as biocidal agents. Chitin amendments are known to control nematodes. The addition of chitin to nematode-infested soil will stimulate a specialized microflora capable of producing chitinase, which breaks down the chitin in the shellfish and the nematode egg shell. In this study rapeseed and wheat were used as a green manure crop in a field infested with Columbia root-knot nematode (*Meloidogyne chitwoodi*). Also, in a greenhouse study rapeseed meal (at 2 229 and 4 458 kg/ha) and chitinous material 'Clandosan' at 1 114.5 and 2 229 kg/ha) were tested for the control of Columbia root-knot nematode using tomato plants as indicator hosts. The results of these experiments indicated that rapeseed as a greenmanure significantly reduces the root-knot nematode soil population by 82%. The high rates of rapeseed meal and Clandosan also reduced the root-gall index markedly in comparison with untreated controls. Root gall indices for rapeseed meal, Clandosan, and control treatments were 0.1, 0.3, and 5.0, respectively.

PLANT-PARASITIC NEMATODES AND ASSOCIATED SOIL TYPES FROM COTTON GROWING ALONG THE BRAZOS RIVER IN TEXAS [NEMATODOS FITOPARASITOS Y TIPOS DE SUELOS ASOCIADOS DE ALGODON CULTIVADO A LO LARGO DEL RIO BRAZOS EN TEXAS]. **C. M. Heald, A. F. Robinson, and J. L. Starr. USDA ARS, Cotton Pathology Research Unit, College Station, TX 77845, and Department of Plant Pathology and Microbiology, Texas A & M University, College Station, TX 77843, U.S.A.**—Soil and root samples were collected from cotton fields in a systematic survey of several counties along the Brazos River in Texas. The root-knot nematode (*Meloidogyne incognita*) was found in 44%,

the lance nematode (*Hoplolaimus galaetus*) in 29%, and the reniform nematode (*Rotylenchulus reniformis*) in 14% of the fields. Highest incidence of root-knot and lance species occurred in silt loam soils, whereas the highest incidence of reniform nematode was in silty clay soils. All three species are known to cause economic injury to cotton in other regions; however, the impact of these species has not been evaluated in this area of the Brazos River.

NEMATODES FROM TROPICAL ISLANDS IN THE INDIAN OCEAN [NEMATODOS DE LAS ISLAS TROPICALES DEL OCEANO INDIO]. **J. Heyns and E. Heyns. Department of Zoology, Rand Afrikaans University, P.O. Box 524, Johannesburg, 2000, South Africa.**—There are several island groups in the western Indian Ocean, situated towards the north and northwest of Madagascar. Information on the indigenous nematode fauna of these islands may be of interest to zoogeographers. During December 1990 random samples were taken on several islands in the Comoro and Seychelles groups, as well as on Nosi Komba, an offshore island near the northern tip of Madagascar. As far as possible, samples were taken from what appeared to be virgin areas, so as to avoid recently introduced species. Only preliminary identifications, mostly to genus level, have thus far been made. These will be shown on a poster.

OBSERVATIONS ON THE GENUS *HALIPLECTUS* COBB, [OBSERVACIONES DEL GENERO *HALIPLECTUS* COBB, 1913]. **J. Heyns and A. Swart. Department of Zoology, Rand Afrikaans University, P.O. Box 524, Johannesburg, 2000, South Africa.**—The genus *Haliplectus* presently contains about 18 nominal species, some of which are not very well known. Several species of this genus were recently collected from coastal dune sands in a number of localities along the Atlantic and Indian Ocean seaboards of southern Africa, as well as from the Seychelles Islands in the Indian Ocean. This presented the opportunity to do a more detailed study of the morphology of this group, using both light and scanning electron microscopy. The results will be shown on a poster.

POSSIBLE IMPLICATION OF *MELOIDOGYNE INCOGNITA* IN THE DISSEMINATION OF POTATO SPINDLE TUBER VIROID [POSIBLE IMPLICACION DE *MELOIDOGYNE INCOGNITA* EN LA DISEMINACION DE VIROIDE SPINDLE TUBER DE LA PAPA]. **P. Jatala, R. Delgado de la Flor, Maddalena Querci, L. Salazar, and V. Lazarte. The International Potato Center, Apartado 5969, Lima Perú.**—Potato spindle tuber viroid (PSTVd)-infected tomato plants were inoculated with *Meloidogyne incognita* eggs. Twenty-five and 45 days later females and egg masses were carefully extracted from roots and macerated in a Formaldehyde/10xSSC extracting solution at pH 7.5. Supernatants were tested for PSTVd by the nucleic acid spot hybridization test (NASH) using a radioactive RNA probe. Extracts of nematode females 25 days after inoculation contained the viroid while egg masses were free of viroid. Both extracts of females and egg masses 45 days after inoculation contained significant amounts of PSTVd. When females and egg masses were treated with 10% calcium hypochlorite for 3-4 min prior to maceration, PSTVd was not detected in the extracts. These results suggest that PSTVd can be carried on the surface of the female cuticle, inside the egg mass, and on the surface of eggs extracted from PSTVd-infected plants. This is of particular interest when the egg masses are left in soil from one season to the next. They can become a focal source of PSTV infection for the next crop. This is the first report of possible involvement of a tylenchoid nematode in the transmission of a viroid.

ELECTROPHORETIC STUDIES OF PROTEIN PATTERNS OF THE *GLOBODERA PALLIDA* AND *G. ROSTOCHIENSIS* EGGS [ESTUDIOS ELECTROPORETICOS DE DISENOS PERINIALES DE HUEVOS DE *GLOBODERA PALLIDA* Y *G. ROSTOCHIENSIS*]. **P. Jatala and Lily Gavilano. The International Potato Center, Apartado 5969, Lima, Perú.**—Protein patterns of 16 populations of *Globodera pallida* and *G. rostochiensis* from England, Bolivia, Panamá, and Perú were compared. Approximately 3 000 eggs of each population extracted from 15 cysts were macerated in a buffer at pH 7.00 and the crude extracts were used in electrophoretic studies. Differences in the protein patterns were observed in most of the populations at an isoelectric point corresponding to a pH gradient of 5.0-5.9. There were differences in protein patterns between the races within each nematode species. A protein band at isoelectric point 5.7 was found in a *G. rostochiensis* population from Bolivia. This is contrary to reports by other investigators who suggested that the absence of such a protein band in *G. rostochiensis* distinguishes it from *G. pallida*. This discrepancy in results is probably due to differences in methodology; previous investigators used cysts instead of eggs. It is suggested that properly cleaned eggs would be more valuable than entire cysts in electrophoretic studies for determination of races and species of the potato cyst nematode.

ROLE OF PLANT GROWTH PROMOTING RHYZOBACTERIA IN THE CONTROL OF *MELOIDOGYNE INCOGNITA* ON POTATOES AND TOMATOES [EL PAPEL DE LAS RIZOBACTERIAS PROMOTORAS DE CRECIMIENTO VEGETAL EN EL CONTROL DE *MELOIDOGYNE INCOGNITA* EN PAPAS Y TOMATES]. **P. Jatala, E. Guevara, and M. Zegarra. International Potato Center, Apartado 5969, Lima, Perú.**—Fifty isolates of plant growth promoting rhizobacteria (PGPR) were tested for their efficiency in controlling *Meloidogyne incognita* on potato and tomato plants. Tomato and potato plants had a significantly increased root and foliage weight (fresh and dry) if PGPR isolates were added to pots when potato tubers were planted, and when tomato seedlings were transplanted. Although there were variations in plant responses to different PGPR isolates, in all cases the addition of PGPR to the soil resulted in significantly better plant growth than in the controls. The presence of PGPR isolates reduced the root galling index in tomato plants by at least 50% and some isolates reduced the root galling index in potatoes by 10%. In general, the PGPR were more effective in controlling *M. incognita* on tomatoes than on potatoes. The very high susceptibility of the potato cultivar used in this study may be the reason for a higher root galling index on potato than on tomato. The fact that both potato and tomato plants inoculated with *M. incognita* had lower root galling indices when PGPR were added, indicated the utility of these rhizobacteria in areas severely infested with root-knot nematodes.

ADVANCES IN BREEDING AND SCREENING POTATOES FOR RESISTANCE TO *MELOIDOGYNE INCOGNITA* [AVANCES EN LA MEJORA A SELECCION DE PAPAS PARA RESISTENCIA CONTRA *MELOIDOGYNE INCOGNITA*]. **P. Jatala, K. Watanabe, and E. Guevara. International Potato Center, Apartado 5969, Lima, Perú.**—The reactions of 163 diploid potato clones to *Meloidogyne incognita* were evaluated: 116 clones were developed in 1984, 1985, and 1986 by intercrosses made with materials having *Solanum sparsipillum* as their principal contributor of gene(s) for resistance to *M. incognita*; 36 clones were generated from intercrosses between *S. bukasovii, S. gourlayi, S. multidissectum,* and some haploids from North American cultivars, and were selected on the basis of agronomic characters and 2n pollen production; 11 clones originated from 1988 intercrosses of materials from 1984, 1985, 1986 with *S. bukasovii, S. goulayi,* and *S. multidissectum.* As expected, the highest number of resistant clones was obtained in the 1984, 1985, and 1986 groups. This high number of resistant clones is due to the recurrent use of *S. sparsipillum* gene(s) that govern resistance to *M. incognita.* The lowest number of resistant clones was obtained from 1987 HW and 1988 crosses. Although the level of resistance was low in 1987 HW (27 MR clones) and 1988 (4 R and 4 MR) crosses, the important thing is that new sources of resistance were incorporated in these materials to increase the gene base for resistance to *M. incognita.* It is important to note that the 1987 HW cross produced clones with desirable agronomic characters and with 2n pollens. Some clones had combined resistance to *M. incognita* and potato tuber moth *Phthorimaea operculella.* Some clones were also moderately resistant to *P. operculella.*

PAPEL DE *MELOIDOGYNE ARABICIDA* LOPEZ Y SALAZAR Y *FUSARIUM OXYSPORUM* F. SP. *COFFEAE* EN LA CORCHOSIS DEL CAFETO (*COFFEA ARABICA* VAR. *CATURRA*) EN COSTA RICA [ROLE OF *MELOIDOGYNE ARABICIDA* LOPEZ & SALAZAR AND *FUSARIUM OXYSPORUM* F. SP. *COFFEAE* IN THE CORCHOSIS (CORKY DISEASE) OF COFFEE (*COFFEA ARABICA* VAR. *CATURRA*) IN COSTA RICA]. **N. Marbán-Mendoza y L. Flores. CATIE, Turrialba, Costa Rica.**—Se pretendió reproducir síntomas de la enfermedad corchosis del cafeto (CDC), enfermedad mortal originalmente reportada en Costa Rica. Plántulas de cafeto cv. Caturra de cuatro meses de edad fueron inoculadas con: 1) *Meloidogyne arabicida* (800 J2 y huevos); 2) *Fusarium oxysporum* f. sp. *coffeae* 200 000 microconidias); 3) inoculación simultánea de *M. arabicida* y *F. oxysporum* f. sp. *coffeae*; 4) suspensión axenizadora de los nematodos (2% de NaOC1); y 5) controles sin inoculación. Catorce meses después 80% de las plantas inoculadas simultáneamente con *M. arabicida* y *F. oxysporum* mostraron síntomas severos de CDC en la parte aérea (clorosis, caída de hojas, flores y frutas; achaparramiento) y raíz (acorchamiento de agallas y eje central). Ninguna planta de los demás tratamientos mostró síntomas de CDC. Las hojas de plantas con CDC mostraron deficiencias de nitrógeno, fósforo y potasio así como exceso de manganeso. La altura y peso seco de las plantas con CDC fueron sustancialmente menores ($P = 0.05$) comparados con las plantas sin CDC. En las raíces de plantas con CDC además de *M. arabicida* siempre se reaisló a *F. oxysporum* f. sp. *coffeae*; sin embargo en algunas se aislaron los hongos *Rhizoctonia* spp. y *Trichoderma* spp.

REACCION DE CATORCE CULTIVARES DE *PRUNUS* A CUATRO ESPECIES DE *MELOIDOGYNE* Y *PRATYLENCHUS VULNUS* [REACTION OF FOURTEEN *PRUNUS* CULTIVARS TO FOUR

SPECIES OF *MELOIDOGYNE* AND *PRATYLENCHUS VULNUS*]. **J. Marull y J. Pinochet. Departamento de Patología Vegetal, IRTA, Crta. de Cabrils s/n, 08348 Cabrils, Barcelona, España.**—Un total de diez cultivares de almendro y cuatro de híbridos experimentales de melocotonero × almendro fueron evaluados frente a *Meloidogyne incognita, M. javanica, M. arenaria, M. hapla* y *Pratylenchus vulnus*. En un primer ensayo, los cuatro cultivares de almendro probados resultaron susceptibles a *M. incognita, M. arenaria* y *M. hapla*. En un segundo ensayo, los híbridos D-3-5, G × N No 9 y Cachirulo resultaron resistentes a *M. javanica*. La selección D-3-5 (almendro Tuono × hibrido Titán), se comportó como altamente resistente. La selección G × N No 9 (almendro Garfí × melocotonero Nemared) fue resistente, aunque con agallamiento incipiente. El híbrido Cachirulo resultó moderadamente resistente. Todos los cultivares de almendro evaluados en este ensayo fueron susceptibles a *M. javanica*. En un tercer ensayo, todos las materiales resultaron buenos hospedadores de *P. vulnus*. La selección G × N No 1, altamente resistente a varias especies de *Meloidogyne*, presentó el mayor incremento poblacional a *P. vulnus*.

MANAGEMENT OF *MELOIDOGYNE INCOGNITA* IN CROPPING SYSTEMS IN FLORIDA [MANEJO DE *MELOIDOGYNE INCOGNITA* EN SISTEMAS DE CULTIVO EN FLORIDA]. **R. McSorley and R. N. Gallaher. Department of Entomology and Nematology, and Department of Agronomy, 0740-IFAS, University of Florida, Gainesville, FL 32611, U.S.A.**—The multiple cropping systems typical of the southeastern United States and the tropics allow selection of crop sequences which could limit buildup of root-knot nematode (*Meloidogyne incognita*) populations. To determine crops suitable for this purpose, two experiments were conducted in 1990 on sandy soils (> 95% sand) in Florida. Yield of soybean (*Glycine max*) was greater ($P < 0.01$) and populations of *M. incognita* juveniles (J2) were lower ($P < 0.01$) following a winter cover crop of rye (*Secale cereale* cv. Wrens Abruzzi) than following crimson clover (*Trifolium incarnatum* cv. Dixie). In a second experiment, low initial densities (< 5 J2/100 cm^3 soil at planting) were maintained until harvest of two sorghum (*Sorghum bicolor*) cultivars, with final populations of 5 J2/100 cm^3 soil on DeKalb FS25E and 2 J2/100 cm^3 soil on DeKalb BR64. Final population densities on these sorghum cultivars were lower ($P < 0.05$) than those on soybean (69 J2/100 cm^3 soil) or on the tropical corn (*Zea mays*) cultivar Pioneer X304C (114–189 J2/100 cm^3 soil). The cropping systems approach to managing nematodes is promising, particularly if knowledge is available on the reaction of specific nematodes to the candidate crop cultivar, if performance is consistent under variable conditions, if management of only a few nematode species is acceptable, and if only very definite quantitative results are applied.

ESTERASE PHENOTYPES OF *HETERODERA GLYCINES* FROM ASIA AND THE UNITED STATES [FENOTIPOS DE ESTERASAS DE *HETERODERA GLYCINES* DE ASIA Y LOS ESTADOS UNIDOS]. **G. R. Noel and B. A. Stanger. USDA ARS, and Department of Plant Pathology, University of Illinois, Urbana, IL 61801, U.S.A.**—Twenty-three populations of *Heterodera glycines* from The People's Republic of China, Japan, and the United States were maintained on 'Williams 82' soybean in the greenhouse. The race of each population was determined using cv. Lee 68 as the susceptible soybean and 'Pickett 71', 'Peking', 'PI 88788', and 'PI 90763' as the differential lines. Immediately prior to termination of each race test females were selected individually from roots of Lee 68 and crushed on a 2 × 2 mm piece of filter paper. Papers were placed on a 43 × 50 × .35 mm IEF 4-6.5 gels, and proteins were separated electrophoretically. Esterases were resolved using α-naphthyl acetate as the substrate. Race tests identified two populations of race 1 and one population each of race 2 and 3 from China. One population each of race 1, 2, 3, and 5 were identified from Japan. Races 1, 2, 3, 4, 5, and 14 were designated among U.S. populations. Esterase phenotypes were not specific to a particular race, but complex profiles having three and four esterase bands were typical of individual females in the populations from China. Populations from Japan and the U.S. typically had two bands of esterase activity. Results demonstrate that esterase phenotypes can not be used to identify races of *H. glycines* and that esterase phenotypes of populations from China are representative of the ancestral line of the nematode.

***STEINERNEMA SCAPTERISCI*, A BIOLOGICAL CONTROL AGENT OF MOLE CRICKETS** [*STEINERNEMA SCAPTERISCI*, UN AGENTE DE CONTROL BIOLOGICO PARA GRILLOTALPAS]. **K. B. Nguyen and G. C. Smart, Jr., Entomology and Nematology Department, IFAS, University of Florida, Gainesville, FL 32611-0740, U.S.A.**—*Steinernema scapterisci* was collected from Uruguay in 1985 as a potential biocontrol agent of mole crickets in the genus *Scapteriscus*. After conducting laboratory experiments, the nematode was released in 1985 in three 50-m^2 pasture sites in Alachua County, Florida, where it became

established. Mole cricket populations in the release site declined 85% 1 year after application, about 95% after 2 years, and remained at that level until 1990 when experiments were terminated. The nematode has become dispersed throughout Alachua county by infected mole crickets during their flight period. In 1989, the nematode was applied in 1-ha plots in six pastures in six counties and in portions of three fairways on each of six golf courses in Florida. In 1990, the nematode was known to be established in several of the release sites. *Steinernema scapterisci* appears to have great potential as a biological control agent of mole crickets.

SEM OBSERVATIONS ON *PRATYLENCHUS MEDITERRANEUS* COLONIZING *VICIA SATIVA* ROOTS [OBSERVACIONES EN EL MICROSCOPIO ELECTRONICO DE BARRIDO DE RAICES DE *VICIA SATIVA* COLONIZADAS POR *PRATYLENCHUS MEDITERRANEUS*]. **D. Orion and Drorit Lapid. Department of Nematology, Agricultural Research Organization, Bet Dagan, Israel.**—Roots of vetch (*Vicia sativa* cv. Yovel) seedlings grown in *Pratylenchus mediterraneus* infested soil were observed with an SEM 1, 2, and 4 weeks after germination. The nematodes invaded the roots at the root-hairs region forming a clean-drilled hole in the root epidermis and the cortical parenchyma, suggesting an enzymatic lysis activity. The nematodes advanced in the cortical parenchyma destroying the cytoplasm of cells. The surface of the invaded region appeared as a lesion on which no root hairs were observed and the epidermis was densely punctured. At the lesion margin, abnormally long root hairs were observed, suggesting physiological changes within the parasitized root. In longitudinal sections it seemed that the nematodes tend to aggregate in certain unspecified regions possibly due to signals produced by the first nematodes that managed to invade the root. In later stages the nematodes multiplied in the cortical parenchyma practically destroying the bulk of the tissue. The root apex was severely deformed possibly due to an ectoparasitic activity.

INCREASED SPREAD OF *GLOBODERA SOLANACEARUM* (OCN), TAXONOMIC NOMENCLATURE, AND CROP LOSS IN TOMATO, TOBACCO, AND EGGPLANT [AUMENTO EN LA DISEMINACION DE *GLOBODERA SOLANACEARUM*, NOMENCLATURA TAXONOMICA Y PERDIDAS EN TOMATE, TOBACO Y BERENGENA]. **W. Wyatt Osborne, IAI, Inc., South Boston, VA 24592, U.S.A.**—The OCN now occurs in most flue-cured tobacco producing counties in Virginia and has spread into North Carolina. The pathogenic severity of the OCN on tomato, eggplant, and tobacco had not been proven in 1983 when A. R. Stone published "Three Approaches to the Status of a Species Complex, With a Revision of Some Species of Globodera," (in *Concepts in Nematode Systematics*, Academic Press). In a "Taxonomic note" he considered *Globodera solanacearum* (OCN) to be a subspecies of *G. tabacum* (TCN). At that time it was known that the TCN by itself was of little importance in tobacco, tomato, and eggplant. Consequently, the OCN was practically ignored as a plant pathogen. Recent research shows that uncontrolled OCN causes yield losses of 40 to 50% in eggplant, tomato, and tobacco. Recent advances in differential host ranges, crop loss studies, and an illustrated key to species of *Globodera* clearly show the differences between the OCN and TCN species.

EVALUATION OF LEGUMINOUS CROPS TO THREE ROOT-KNOT NEMATODE SPECIES [EVALUACION DE CULTIVOS LEGUMINOSOS A TRES SPECIES DE NEMATODOS AGALLADORES]. **J. Pinochet and R. Rodríguez-Kábana. Departamento de Patología Vegetal, IRTA, Crta. Cabrils s/n, 08348 Cabrils, Barcelona, Spain, and Department of Plant Pathology, Auburn University, Auburn, AL 36849, U.S.A.**—American jointvetch (*Aeschynomene americana*), Castorbean (*Ricinus communis*), velvetbean (*Mucuna deeringianum*) and horsebean (*Canavalia ensiformis*), with potential use in rotations for root-knot nematode management, were evaluated against *Meloidogyne incognita* race 1, *M. arenaria* race 2, and *M. javanica* under greenhouse conditions. 'Davis' soybean (*Glycines max*), 'Florunner' peanut (*Arachis hypogaea*), okra (*Hibiscus esculentus*), squash (*Cucurbita pepo*), and 'Stoneville' cotton (*Gossypium hirsutum*) were also included in the test. Velvetbean, 'Florunner' peanut, and cotton were nematode non-host species. The other plant species showed varying degrees of galling. Horsebean was heavily galled by *M. incognita*.

PATHOGENICITY OF *PRATYLENCHUS VULNUS* ON SEVEN *PRUNUS* AND ONE *PYRUS* ROOTSTOCK IN SPAIN [PATOGENICIDAD DE *PRATYLENCHUS VULNUS* EN SIETE PATRONES DE *PRUNUS* Y UNO DE *PYRUS* EN ESPANA]. **J. Pinochet, S. Verdejo, and J. Marull. Departamento de Patología Vegetal, IRTA, Crta. de Cabrils s/n, 08348 Cabrils, Barcelona, Spain.**—The effects of *Pratylenchus vulnus* on seven commonly used *Prunus* and one *Pyrus* rootstock were evaluated under greenhouse conditions

during a 1-year period. In a first experiment, two almond (Moncayo and Garrigues), one peach (GF-305), and two peach-almond hybrids (GF-677 and Adafuel) inoculated with 2 000 nematodes per plant proved to be good hosts of *P. vulnus*. Significantly higher numbers of nematodes per gram of root were recovered from Adafuel and GF-677. Root weights were higher in all controls in comparison to inoculated plants, whereas top weights of Garrigues, GF-305, and GF-677 differed from those of inoculated treatments. In a second experiment, three plum (Marianna 2624, Mirabolan 605, and San Julian 655), and one pear (OHF) rootstock were also found to be good hosts of *P. vulnus*, although Mirabolan 605 was significantly less parasitized than the three other materials. OHF and San Julian 655 differed in root weights over controls. Only San Julian 655 showed differences in top weights over inoculated treatments.

NEMATODOS ASOCIADOS A LOS CULTIVOS PERENNES EN EL VALLE DE YEGUARE, HONDURAS [NEMATODES ASSOCIATED WITH PERENNIAL CROPS IN THE YEGUARE VALLEY IN HONDURAS]. **L. E. Powers y H. Domínguez. Departamento de Protección Vegetal, Escuela Agrícola Panamericana, Apartado Postal 93, Tegucigalpa, Honduras.**—Con el propósito de conocer los nematodos fitoparásitos en los cultivos perennes existentes en la Escuela Agrícola Panamericana y los de mayor importancia económica en Honduras, se realizó un estudio en el valle de Yeguare desde septiembre de 1990 hasta marzo de 1991. Se muestrearon los cultivos de aguacate, banano, café espárrago, guanábana, mango, mora, pitanga, y papaya. Se recolectaron muestras de suelo y raíces de estos cultivos, y se extrajeron los nematodos utilizando el método de embudo Baermann y centrifugación con azúcar. Los resultados obtenidos demuestran la importancia de implementar un control de nematodos, debido a la reducción en la cosecha a causa del daño que están causando estos. Los géneros de nematodos que se encontraron con mayor frecuencia en los cultivos incluyen: *Aphelenchus, Aphelenchoides, Helicotylenchus, Hemicriconemoides, Meloidogyne, Pratylenchus, Rotylenchulus, Tylenchus* y *Xiphinema.*

INFLUENCIA DE *PRATYLENCHUS PRATENSIS* EN EL DESARROLLO DE LA PUDRICION RADICAL Y DEL TALLO DEL MAIZ, CAUSADA POR *FUSARIUM MONILIFORME* VAR. *SUBGLUTINANS* [INFLUENCE OF *PRATYLENCHUS PENETRANS* IN THE DEVELOPMENT OF ROOT AND STEM ROT OF CORN CAUSED BY *FUSARIUM MONILIFORME* VAR. *SUBGLUTINANS*]. **M. J. Revelo, I. Cid del Prado V., M. E. Zavaleta, B. Renfro, y G. Zarate de Lara. Centro de Fitopatología, Colegio de Postgraduados, 56230 Chapingo, México.**—*Pratylenchus pratensis* ejerció influencia en el desarrollo de la pudrición radical y del tallo del maíz, incrementando en forma sinergética la incidencia del hongo de 12.5% a 52.5% en campo, de 40% a 100% en invernadero y la severidad de 32.0% a 37.5% en campo y de 8.0% a 44.0% en invernadero. Los dos patógenos presentaron interacción antagónica en las variables peso del grano en campo y peso seco del sistema radical en invernadero, siendo el nematodo el principal responsable de significativas reducciones. En relación al peso de grano, *P. pratensis* solo ocasionó una disminución del 28.63% y en combinación con el hongo 20.42%. Bajo condiciones de invernadero *Fusarium moniliforme* var. *subglutinans* fue el que indujo mayores daños y reducciones significativas en altura de planta y pudrición radical, disminuyendo significativamente la población de *P. pratensis.*

COMPARATIVE REPRODUCTION OF THREE *MELOIDOGYNE* SPECIES ON SEEDLINGS OF *PAULOWNIA TOMENTOSA* [REPRODUCCION COMPARATIVA DE TRES ESPECIES DE *MELOIDOGYNE* EN PLANTULAS DE *PAULOWNIA TOMENTOSA*]. **J. R. Rich, C. Hodge, and R. S. Webb. Department of Entomology and Nematology, University of Florida, Rt. 2, Box 2181, Live Oak, FL 32060, and Department of Forestry, University of Florida, 118 Newins-Ziegler Hall, Gainesville, FL 32611, U.S.A.**—Two greenhouse tests were conducted to determine the reproduction of *Meloidogyne arenaria, M. incognita,* and *M. javanica* on *Paulownia tomentosa*. Seedlings were grown in Cone-tainers® (150 cm^3 soil) for 45 days and inoculated with 6 000 eggs and juveniles of the three *Meloidogyne* species. The experimental design was a randomized complete block with ten replications. Four months after inoculation, root and shoot weights, root galling, and number of eggs were determined. Fresh shoot or root weights of *P. tomentosa* were affected little by the three *Meloidogyne* species. Root galling and egg numbers were high in the *M. incognita* treatment and low in the *M. arenaria* and *M. javanica* treatments. These preliminary data indicate that *M. incognita* may be a problem in the production of this tree species in sandy soils of the southeastern U.S.A.

SEASONAL CHANGES IN CONCENTRATION OF NEMATODE ATTRACTANT WITHIN *SOLANUM ELAEAGNIFOLIUM* [CAMBIOS ESTACIONALES EN LA CONCENTRACION DE ATRAYENTES DE

NEMATODOS EN *SOLANUM ELAEAGNIFOLIUM*]. **A. F. Robinson and A. C. Bridges. Southern Crops Research Laboratory, USDA ARS, Rt. 5, Box 805, College Station, TX 77845, U.S.A.**—An unknown compound from *Solanum* plants strongly attracts the foliar nematode, *Ditylenchus phyllobius*. Flowers, berries, meristems, rhizomes, and three size classes each of stems and leaves were collected from three or more *S. elaeagnifolium* plants each month for 6 months, and an in vitro behavioral assay was employed to measure attractant activity in aqueous extract from lyophilized tissue. Throughout the season, greatest activity occurred in the rhizomes, lower stems, and lower leaves. Upper leaves, meristems, and flowers had less than one-third the activity of stems. Ninety percent of the activity within stems occurred in the bark. During the season, activity within stems and leaves increased 3-fold and 10-fold, respectively. Very weak activity within green berries was completely lost during maturation.

SOYBEAN-PEANUT ROTATIONS FOR THE MANAGEMENT OF *MELOIDOGYNE ARENARIA* [ROTACIONES DE SOYA Y MANI PARA EL MANEJO DE *MELOIDOGYNE ARENARIA*]. **R. Rodríguez-Kábana, P. S. King, D. G. Robertson, and L. Wells. Auburn University, Auburn, AL 36849, U.S.A.**—The value of 'Kirby' soybean (*Glycine max*) for the management of *Meloidogyne arenaria* in 'Florunner' peanut (*Arachis hypogaea*) was studied for 6 years. End-of-season juvenile (J2) populations of the nematode were generally low (< 50 J2/100 cm^3 soil) in plots with soybean and high (> 50 J2/100 cm^3 soil) in plots with monoculture peanut (P). In 1990, J2 populations in plots with peanut following 1 (S-P) or 2 years (S-S-P) of soybean were of the same size as those in P plots; however, peanut yields in S-P and S-S-P plots were, respectively, 89% and 83% higher than the yields from P plots. Application of aldicarb to monoculture peanut resulted in an average yield increase of 21% during the 6 years of the study. Use of the nematicide in peanut in the S-P rotation resulted in an average yield increase of 13.8% throughout the study compared to S-P without nematicide. Peanut yields in the S-S-P rotation with aldicarb were higher by 29.5% in 1987 and 26.2% in 1990 than the yields for this rotation without nematicide. Kirby soybean can be used as a rotation crop to increase peanut yields but it has no effect on *M. arenaria* juvenile populations in peanut following soybean.

VELVETBEAN (*MUCUNA DEERINGIANA*) FOR THE MANAGEMENT OF *MELOIDOGYNE* SPP.: HOST RANGE AND CROP ROTATION STUDIES [MUCUNA DEERINGIANA PARA EL MANEJO DE *MELOIDOGYNE* SPP.: RANGO DE HOSPEDADORES Y ESTUDIOS SOBRE ROTACIONES]. **R. Rodríguez-Kábana, J. Pinochet, D. G. Robertson, and L. Wells. Department of Plant Pathology, Auburn University, Auburn, AL 36849, U.S.A., Departamento de Patología Vegetal, IRTA, 08348 Cabrils, Barcelona, Spain, and Wiregrass Substation, Headland, AL 36345, U.S.A.**—Greenhouse experiments at Auburn, Alabama, with soils with natural polyspecific infestations of *Heterodera glycines* (race 14) plus *Meloidogyne incognita* and of *H. glycines* plus *M. arenaria* (race 2) showed that in contrast to 'Davis' soybean (*Glycine max*), a Mexican cultivar and the 'Florida' cultivar of velvetbean (*Mucuna deeringiana*) were not hosts for the nematodes. An experiment with 'Florunner' peanut (*Arachis hypogaea*) and Florida velvetbean in a field infested with *M. arenaria* (race 1), near Headland, Alabama, showed that significant juvenile populations of the nematode at peanut-harvest time were present only in plots with peanut. A microplot rotation experiment demonstrated that 'Black Beauty' eggplant (*Solanum melongena*) following Florida velvetbean had heavier shoots and lower numbers of *M. arenaria* juveniles in the roots and in the soil than eggplant after 'Summer Crookneck' squash (*Cucurbita pepo*) or Davis soybean.

COTTON AS A ROTATION CROP FOR THE MANAGEMENT OF ROOT-KNOT NEMATODE (*MELOIDOGYNE ARENARIA*) IN PEANUT [LA UTILIZACION DEL ALGODON COMO UN CULTIVO ALTERNATIVO PARA ROTACIONES EN EL MANEJO DEL NEMATODO AGALLADOR *MELOIDOGYNE ARENARIA* EN MANI]. **R. Rodríguez-Kábana, D. G. Robertson, L. Wells, C. F. Weaver, and P. S. King. Auburn University, Auburn, AL 36849, U.S.A.**—The value of 'Deltapine 90' cotton (*Gossypium hirsutum*) in rotation with 'Florunner' peanut (*Arachis hypogaea*) for the management of root-knot nematode (*Meloidogyne arenaria*) was studied for 6 years. Peanut yields following either 1 or 2 years of cotton (C-P and C-C-P, respectively) were higher than those of peanut monoculture without nematicide [P(–)]. At-plant applications of nematicide (aldicarb 15G) to contuous peanut [P(+)] averaged 22.1% higher yields than those for P(–) over the 6 years of the study. The use of aldicarb in cotton and peanut in the C-C-P rotations increased yields of both crops over the same rotations without the nematicide. When the nematicide was applied to both crops in the C-P rotation peanut yields were increased in only 2 of the possible 3 years

when peanut was planted. Application of aldicarb to cotton only in the C-P rotation did not improve peanut yields over those obtained with the rotation without the nematicide. Juvenile populations of *M. arenaria* determined at peanut harvest time were lowest in plots with cotton. Plots with C-P or C-C-P had lower populations of the nematode than those with either P(–) or P(+).

AMERICAN JOINTVETCH AND PARTRIDGE PEA FOR THE MANAGEMENT OF *MELOIDOGYNE ARENARIA* IN PEANUT [LA UTILIZACION DE LA ARVEJILLA AMERICANA Y ACACIA PERDIGUERA EN EL MANEJO DE *MELOIDOGYNE ARENARIA* EN MANI]. **R. Rodríguez-Kábana, C. F. Weaver, D. G. Robertson, and L. Wells. Department of Plant Pathology, Auburn University, Auburn, AL 36849, and Wiregrass Substation, Headland, AL 36345, U.S.A.**—The value of rotations of 'Florunner' peanut (*Arachis hypogaea*) with American jointvetch (*Aeschynomene americana*) and partridge pea (*Cassia fasiculata*) for the management of *Meloidogyne arenaria* was studied for 3 years in an experiment in southeastern Alabama. Peanut yields following 1 or 2 years of partridge pea were higher than those of peanut monoculture without nematicide (aldicarb) treatment [P(–)] and were equivalent to the yields obtained with peanut monoculture plus nematicide [P(+)]. Peanut yields following 1 year of jointvetch were not different from those of P(–); however, yields after 2 years of jointvetch were higher than those of P(–). Jointvetch and partridge pea suppressed development of *M. arenaria* but partridge pea was more effective than jointvetch. End-of-season juvenile populations of the nematode in plots with peanut after 2 years of partridge pea were lower than populations in peanut plots following 2 years of jointvetch or those in P(–) plots.

ROTATIONS OF BAHIAGRASS AND CASTORBEAN WITH PEANUT FOR THE MANAGEMENT OF *MELOIDOGYNE ARENARIA* [ROTACIONES DE PASTO BAHIA Y RICINO CON MANI PARA EL MANEJO DE *MELOIDOGYNE ARENARIA*]. **R. Rodríguez-Kábana, R. W. Young, D. G. Robertson, and L. Wells. Department of Plant Pathology, Auburn University, Auburn, AL 36849, and Wiregrass Substation, Headland, AL 36345, U.S.A.**—The relative value of 'Hale' castorbean (*Ricinus communis*) and 'Pensacola' bahiagrass (*Paspalum notatum*) as rotational crops for the management of *Meloidogyne arenaria* and southern blight (*Sclerotium rolfsii*) in 'Florunner' peanut (*Arachis hypogaea*) production was studied for 3 years in a field experiment in southeastern Alabama. Peanut following 2 years of castorbean (C-C-P) yielded 43% higher than monoculture peanut without nematicide [P(–)]. At-plant application of aldicarb (30.5 g a.i./100 m row in 20-cm-wide band) to monoculture peanut [P(+)] resulted in an average 38.9% increase in yield over the 3 years of the experiment. Peanut yield following 2 years of bahiagrass (B-B-P) was 36% higher than P(–). Aldicarb application had no effect on southern blight but both C-C-P and B-B-P rotations reduced the incidence of the disease in peanut. Juvenile populations of *M. arenaria* in soil determined at peanut harvest time were lower in plots with C-C-P than in those with the B-B-P rotation and both rotations resulted in a lower number of juveniles in soil than in P(–).

SUSCEPTIBILITY TO ROOT-KNOT NEMATODES IN COTTON CULTIVARS RESISTANT TO THE FUSARIUM WILT/ROOT-KNOT COMPLEX [SUSCEPTIBILIDAD A NEMATODOS AGALLADORES DE CULTIVARES DE ALGODON RESISTENTES AL COMPLEJO FUSARIOSIS/NEMATODO AGALLADOR]. **J. L. Starr and R. D. Martyn. Department of Plant Pathology and Microbiology, Texas A & M University, College Station, Department of Plant Pathology and Microbiology, Texas A & M University, College Station, TX 77843, U.S.A.**—Twenty-one cotton cultivars, representing a range of responses to the Fusarium wilt/root-knot disease complex, were evaluted for response to *Meloidogyne incognita* race 3. Cotton resistance to the nematodes was based on nematode population densities at crop maturity in field microplots infested with *Fusarium oxysporum* f. sp. *vasinfectum* and root-knot nematodes. Cultivars reported to be resistant to the complex had lower levels of mortality and vascular browning than did cultivars reported to be susceptible. All cultivars, except for Auburn 634, supported at least a 10-fold increase in nematode population density, regardless of resistance to the disease complex. Cultivars resistant to the disease complex may still suffer substantial yield losses due to the effects of nematode parasitism.

COTTON PRODUCTION IN TEXAS—AN OVERVIEW [LA PRODUCCION DE ALGODON EN TEXAS—UNA VISION GENERAL]. **J. R. Supak, Texas Agricultural Extension Service, Rt. 3, Box 213AA, Lubbock, TX 79401, U.S.A.**—Cotton is the major cash crop grown in Texas; its value exceeded 1 billion dollars annually during the 1986-1990 period. The state typically accounts for 25-35% of U.S. production and 4-5% of the world cotton production. During the last decade, cotton plantings in the state ranged

from 4 to 7.5 million acres. Yields are relatively low as compared to other states and ranged from 301-506 lbs/acre (337-567 kg/ha) during the 1981-1990 period. Cotton is grown in eight regions of the state. These extend from the Rio Grande Valley which has a subtropical climate to the semi-arid High Plains region that has a relatively short growing season for cotton. Annually, the Rio Grande Valley crop is the first cotton to be harvested in the U.S. whereas the High Plains crop is the last to be harvested. The unique aspects of cotton culture in each of the eight production regions will be discussed.

ACCION DE DOS NEMATICIDAS EN EL CONTROL DE *XIPHINEMA INDEX* Y EVALUACION DE LA PRODUCTIVIDAD EN VIDES [EFFECT OF TWO NEMATICIDES ON THE CONTROL OF *XIPHINEMA INDEX* AND AN EVALUATION OF GRAPE PRODUCTIVITY]. **A. Valenzuela y E. Aballay. Departmento de Sanidad Vegetal, Facultad de Ciencias Agrarias y Forestales, Universidad de Chile, P.O. Box 1004, Santiago, Chile.**—En la primavera de 1988 se inició un estudio con objeto de evaluar el uso de dos nematicidas no fumigantes en el control de *Xiphinema index* en vid, var. Thompson Seedless, uno de los problemas más ampliamente distribuídos en la zona Norte y Central de Chile. Se evaluó el efecto de Phemamiphos (Nemacur) y Ethoprophos (Mocap) aplicados en distintas épocas y efectuando desde una hasta seis aplicaciones durante 3 años. Anualmente se midió la producción y calidad de las plantas sometidas a tratamiento. No hubo reducción significativa de la población de *X. index* en ninguno de los tratamientos con estas dos nematicidas respecto a sus testigos. La producción de uva tampoco fue favorecida ni en calidad ni cantidad, aún con aplicaciones dos veces al año, en primavera y en otoño.

ESTUDIO POBLACIONAL DE NEMATODOS FITOPARASITOS ASOCIADOS AL KIWI [A STUDY OF POPULATION DYNAMICS OF PLANT PARASITIC NEMATODES ASSOCIATED WITH KIWI]. **A. Valenzuela, E. Aballay y J. C. Magumacelaya. Facultad de Ciencias Agrarias y Forestales, Universidad de Chile y Depto. de Biología, Universidad Católica de Valparaíso, Chile.**—Durante 10 meses se ha seguido la fluctuación de la población de nematodos en la rizosfera de plantas de kiwi de diferentes edades, condiciones de riego, con y sin protección de malla oscura sobre el parrón y en kiwis interplantados en un parrón de vides. Se presentan las curvas de población de los nematodos y consideraciones sobre su variación. Se ha encontraron que *Meloidogyne* spp. predomina sobre otros nematodos fitoparásitos en las plantaciones de kiwi. *Pratylenchus thornei* y *Tylenchorhynchus* sp. se encuentran ocasionalmente pero en poblaciones bajas. En plantaciones jóvenes las fluctuaciónes de *Meloidogyne* spp. en el suelo son notorias. Sin embargo, en kiwi de edad avanzada la población permanece relativamente constante. Plantaciones con sombra protectora (malla de plastico) mantienen la temperatura del suelo 2 a 3 C más baja que en los kiwis sin sombra. Es posible que ésto favorezca el desarrollo de *M. hapla* sobre *M. incognita* en lugares donde hay poblaciones mixtas.

NEMATODE AND DISEASE PROBLEMS ON COTTON IN TEXAS [PROBLEMAS NEMATOLOGICOS Y PATOLOGICOS DEL ALGODON EN TEXAS]. **J. A. Veech and J. L. Starr. USDA ARS, Cotton Pathology Research Unit, Rt. 5, Box 805, and Department of Plant Pathology and Microbiology, Texas A & M University, College Station, TX 77845, U.S.A.**—The major nematode problems in Texas are *Meloidogyne incognita* and *Rotylenchulus reniformis*. Although races 1 and 2 of *M. incognita* do not reproduce aggressively on cotton, they do parasitize roots and affect fiber quality. Generally, root-knot nematodes are best managed by planting tolerant (often referred to as "resistant") cultivars. A mechanism of resistance to the root-knot nematode has been described but not exploited by breeding programs. The most significant diseases on cotton in Texas are Verticillium wilt, root rot, and seedling disease complex. Fusarium wilt is usually a problem only when nematode populations rise above a threshold level. Wherever cool weather prevails during the period when fiber is being produced (most notably on the high plains) Verticillium wilt can be devastating. Root rot occurs most frequently on the heavy blackland soils of central Texas. Seedling diseases are common throughout the state. There is a very active biological control program on cotton in Texas addressing seedling diseases.

ESTUDIOS SOBRE DINAMICA POBLACIONAL DE *PRATYLENCHUS COFFEAE* (ZIMM.) EN CAFE EN LA ZONA SUROCCIDENTAL DE GUATEMALA [STUDIES ON THE POPULATION DYNAMICS OF *PRATYLENCHUS COFFEAE* (ZIMM.) IN COFFEE IN THE SOUTHWEST ZONE OF GUATEMALA]. **L. Villian, IRCC/CIRAD B. P. 5035 Montpellier Cedex 01, France.**—Se estudiaron en relación con las lluvias las fluctuaciones de población de *Pratylenchus coffeae* en cafetal adulto sobre suelos franco arenosos,

a una altura de 450 m.s.n.m. Se realizaron recuentos de los diferentes estados extraídos por medio de la técnica de doble centrifugación, a partir de muestras de raíces recolectadas mensualmente o quincenalmente, cada vez sobre 20 plantas, en un área experimental de 400 plantas. Se pudo observar dos picos de población de *P. coffeae* durante el año, los cuales sobrepasan los 250 nematodos (larvas y adultos) por gramo de raíces. Se pudo observar también que los picos de población de los diferentes estados (huevos, larvas y adultos) coinciden. El primer pico de población ocurre durante la época seca, en enero y febrero, lo que se puede relacionar con un período importante para el crecimiento radícular del cafeto. El segundo pico se presenta durante la primera mitad de la época lluviosa en junio y julio, mientras las poblaciones decrementan para alcanzar los niveles más bajos del año, inferiores a 100 nematodos por gramo de raíces, durante la segunda mitad de la época lluviosa, la cual corresponde al período de mayor pluviosidad.

THE HIGHS AND LOWS OF NEMATODES AS INSECTICIDES [LAS VENTAJAS Y DESVENTAJAS DE LOS NEMATODOS COMO INSECTICIDAS]. **J. M. Webster. Centre for Pest Management, Department of Biological Sciences, Simon Fraser University, Burnaby, Vancouver, B.C., V5A 1S6 Canada.**—The strong focus on environmental and human health is changing agricultural and medical practices, especially those concerned with pest control. The effective, economic control of insect pests of crops, domestic animals, and man is now more difficult than ever because of the buildup of resistance to and the restricted use of chemical pesticides. Entomopathogenic nematodes kill insects or otherwise lessen their population increase. Some of their effects on insects are dramatically devastating, but the exploitation of these effects on selected insect pests in field situations has had mixed success. The reasons for this and for the potential of nematodes as insecticides will be examined.

INFLUENCE OF *INDIGOFERA HIRSUTA* AND *SORGHUM BICOLOR* × *ARUNDINACEUM* VAR. *SUDANENSE* ON NEMATODES, CORKY RINGSPOT DISEASE, AND POTATO YIELDS IN FLORIDA [LA INFLUENCIA DE *INDIGOFERA HIRSUTA* Y *SORGHUM BICOLOR* × *ARUNDINACEUM* VAR. *SUDANENSE* SOBRE NEMATODOS, RINGSPOT CORCHOSO Y EN LOS RENDIMIENTOS DE LA PAPA EN FLORIDA]. **D. P. Weingartner, Jill Meldrum, J. R. Shumaker, and Louis Wallis III. University of Florida, AREC, Hastings, FL 32045, U.S.A.**—A complex potato (*Solanum tuberosum*) pathosystem including *Belonolaimus longicaudatus* (BL), *Meloidogyne incognita* (MI), trichodorids (TR), and corky ringspot disease (CRS) exists in northern Florida. The January-June potato crop is followed by a June-October summer cover crop of *Sorghum bicolor* × *arundinaceum* var. *sudanense* (SS). Nematode population densities are usually high following the cover crop. Influence of SS and *Indigofera hirsuta* (IH) cover crops on populations of BL, MI, TR, and CRS severity, tuber yields, and tuber appearance was studied in potato fields treated or not treated with 1,3-D (56.1 L/ha), aldicarb (3.4 kg a.i./ha), or 1,3-D + aldicarb. Relative to SS, IH resulted in reduced densities of BL, and 7.2% and 15.2% improvements, respectively, in tuber yields and appearance. Populations of MI and TR and severity of CRS were unaffected. Although IH may reduce BL damage in Florida potatoes, difficulty achieving adequate germination and sensitivity to metribuzin place constraints on IH as a cover crop.