# RESUMENES DE LA XXXI REUNIÓN ANUAL DE ONTA
# ABSTRACTS OF THE XXXI ANNUAL MEETING OF ONTA
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**NEMATODOS DE LOS ORDENES DORYLAIMIDA Y MONONCHIDA ASOCIADOS A CULTIVOS EN ESPAÑA. S. C. Arcos,[1] D. Jiménez-Guirado[2] y A. Bello,[1] Depto. Agroecología, CCMA, CSIC, Serrano, 115 Apdo 28006 Madrid,[1] y Depto. de Zoología, Facultad de Ciencias, Universidad de Córdoba, San Alberto Magno s/n. Córdoba, España.[2]**—Con el fin de conocer el efecto que producen las prácticas agrícolas sobre las especies más representativas de dorilaímidos y mononchidos en España, se ha revisado la colección de nematodos del Departamento de Agroecología de Ciencias Medioambientales (CSIC), donde están representados la mayoría de los ambientes cultivados españoles. Se estudiaron los dorilaímidos de 6 000 muestras, encontrándose como especies más frecuentes: *Aporcelaimellus obtusicaudatus* (13.5%), *Ecumenicus monohystera* (7.3%), *Discolaimoides filiformis* (3.3%), *Aporcelaimellus amylovorus, Mesodorylaimus litoralis* y *Paravulvus hartingii* (1%). De las muestras estudiadas 257 contenían monónquidos, encontrándose las siguientes especies por orden de mayor frecuencia: *Clarkus papillatus* (36%), *Mylonchulus sigmaturus* (19.4%), *Mylonchulus brachyuris* (7.3%) y *Anatonchus tridentatus* (5.4%). Se observa una menor presencia de especies del orden Mononchida, debido a que estos nematodos se encuentran generalmente asociados con ambientes naturales. Se señala el interés de los nematodos del orden Dorylaimida y Mononchida por ser bioindicadores del grado de alteración a que están sometidos los siguientes agrarios.

**ALTERNATIVES TO METHYL BROMIDE TO CONTROL NEMATODES IN A CUCUMBER-SWISS CHARD ROTATION IN GREENHOUSES. M. Arias, A. López-Pérez, R. Sanz, and M. Escuer, Depto. Agroecología, CCMA. CSIC. Serrano, 115 dpdo. 28006 Madrid, Spain.**—A study was carried out to evaluate alternatives for the use of methyl bromide (MB) in crops in glasshouses in the Madrid Community. The two year study was done in a glasshouse where crop rotation was Swiss chard (autumn-winter)—cucumber (spring- summer). MB had not been applied in more than 20 years, and there was a substantial *Meloidogyne incognita* infestation. The study started after the winter crop; Swiss chard roots were examined at the time of their removal to establish the indices of *M. incognita* infestation and 5 kg $m^{-2}$ of aged cow manure was added and later buried. Twelve plots of 52 $m^2$ were chosen and three replications were established for each of the following alternatives: 60 g $m^2$ of MB, 0.01 L of metam sodium and 5 kg $m^{-2}$ of compost. In the first year, all plots were covered for 20 days with a sheet of polyethylene (220 um thick) after irrigation. In the second year, composted plots were not covered with plastic, but were sealed with a roller after irrigation. Cucumber seedlings cv. Serena were planted following treatment of soil. Degree of infestation and cucumber and Swiss chard production were measured to compare the effectiveness of each treatment. In the early stages of cultivation the differences were minimal, but they increased in the later stages of the crop. Higher infestation indices were found in the northern border of the greenhouse, but the differences among the various plots were not significant. The final yield of both crops was higher in the MB and compost plots and less in the metam sodium and control plots.

**UTILISATION OF *PASTEURIA PENETRANS*, *PARTHENIUM HYSTEROPHORUS* AND *AZADIRACHTA INDICA* FOR CONTROL OF ROOT-KNOT NEMATODES. G. Bala, S. R. Gowen, and H. McConnie-Gibbs, Central Experiment Station, Centeno, Trinidad, W.I., and University of Reading, Earley Gate, Berkshire, United Kingdom.**—The use of root-powder, containing spores of *Pasteuria penetrans*, alone and combined with chopped leaves of *Partheniuim hysterophorus* or *Azadirachta indica* (neem), for control of *Meloidogyne incognita*, was investigated in two successive crops of tomato grown in a sandy clay loam in pots in the greenhouse. A randomized block design with six blocks and eight treatments was used. Treatments were: *P. penetrans* root-powder at 500 mg/kg soil (33 000 spores/g soil); chopped leaves of *P. hysterophorus* at 15 g and 25 g/kg soil used alone and combined with *P. penetrans*; chopped leaves of neem at 25 g/kg soil used alone and combined with *P. penetrans*; and untreated control. At the end of crop cycle two, all treatments resulted in significantly reduced root-galling in-

dices and J2 populations in soil when compared to the untreated control. Generally, greater reductions in root-galling indices and soil populations of J2s were obtained with the combinations of *P. penetrans* and *P. hysterophorus* or neem than with single treatments. Significant increases in yield and growth of plants was obtained with all treatments when compared with the untreated control.

**SCANNING ELECTRON MICROSCOPE OBSERVATIONS ON THE GENERA *TROPHURUS* LOOF, 1956 AND *PARATROPHURUS* ARIAS, 1970 (NEMATODA: TYLENCHIDA: BELONOLAIMIDAE). P. Baujard, Laboratoire de Nématologie, CIRAD/IRD, B.P. 5035, 34032 Montpellier cedex 1, France.**—*Paratrophurus loofi* Arias, 1970 (type species of the genus), *Trophurus imperialis* Loof, 1956 (type species of the genus) and *T. longimarginatus* Roman, 1962 were studied under SEM. These three species exhibited unique features in head shape in the family Telotylenchinae Siddiqi, 1960: head in the shape of a truncated cone and continuous with body contour; labial disc prominent; amphid apertures in post labial position; amphid pouches prominent. The taxonomic position of these genera in the family Belonolaimidae needs a reappraisal.

**INTERACTION BETWEEN *HETERODERA GLYCINES* AND *MELOIDOGYNE JAVANICA* ON BEAN CULTIVARS RESISTANT AND SUSCEPTIBLE TO CYST NEMATODE. W. F. Becker, and S. Ferraz, UFV/DFP, 36571-000,Viçosa-MG, Brasil.**—*Heterodera glycines* and *Meloidogyne javanica* often occur together in bean fields. This study was done to determine the influence of their combined infection on bean cultivars resistant (L-2300) and susceptible (Ouro) to cyst nematode. Plants were inoculated with 2 or $4 \times 10^3$ eggs/plant of each nematode individually, while for the combined infection 1 or $2 \times 10^3$ eggs/plant were used. Weight of pods, shoot and roots, and pod number was determined. In the susceptible cultivars with combined infection, the parameters evaluated did not differ from control; however, in the individual infections with either nematode the values of all the parameters were reduced except for the lower inoculum density of *H. glycines*. In the mixed infection neither number of *H. glycines* females nor number of root galls and juveniles of *M. javanica* were affected. In the resistant cultivar, individual infection by either nematode did not influence any of the evaluated parameters, whereas combined infection either stimulated, reduced or did not affect any of the growth parameters, depending upon the inoculum density and the individual parameter. The number of *H. glycines* females or root galls were not affected by the presence of the other nematode.

**LOCAL RESOURCES AS METHYL BROMIDE ALTERNATIVES IN NEMATODE CONTROL. A. Bello,[1] A. López-Pérez,[1] L. Díaz-Viruliche,[2] L. de León,[3] R. Sanz,[1] and M. Escuer,[1] Depto. Agroecología, CCMA, CSIC. Serrano, 115 dpdo, 28006 Madrid, Spain,[1] Técnico privado, Montevideo, Uruguay,[2] and Universidad Agraria de la Habana, Autopista Nacional y Ctra Tapaste, km 23.5, San José de las Lajas, La Habana, Cuba.[3]**—Methyl bromide (MB) is a soil fumigant listed under the Montreal Protocol in 1992 as an ozone depleting substance, which requires ultimately that its use and production must cease. Availability of substitutes is necessary and will depend on the particular social, economic, geographic and agricultural conditions of different regions and especially of the developing countries. Taking into account these considerations, representative crop management systems based on the use of local resources have been studied in Guatemala, Uruguay and Spain, as representative countries from Central and South America and the Mediterranean region. Cultural practices such as crop rotation and fallow, soil amendments, biofumigation, planting time, water management and flooding, mulching and cover crops, sanitation, resistant varieties, soilless culture and solarization, alone or in combination with chemicals, have been used efficiently as MB alternatives for nematode control in tropical and Mediterranean areas.

**PROBLEMAS NEMATOLÓGICOS DE LOS CULTIVOS DE GUATEMALA Y SU MANEJO AGRONÓMICO. A. Bello,[1] M. Escuer[1] y J. Tello,[2] Depto. Agroecología, CCMA, CSIC, Serrano, 115 Apdo. 28006 Madrid[1] y Depto. Producción Vegetal, Universidad de Almería, Cañada de San Urbano s/n, 04120 Almería, España.[2]**—Se han estudiado muestras de suelo y raíz de melón, tomate, okra, tabaco

y flores en áreas representativas de Guatemala. Se han encontrado 12 especies de *Tylenchida* y *Aphelenchida*, así como nematodos dorilaímidos y rabdídos. Los problemas en orden de importancia se centran en *Rotylenchus reniformis* sobre melón, tomate y okra y *Meloidogyne incognita* sobre okra y tabaco, no habiéndose encontrado nematodos transmisores de virus. Se indica que la presencia de *Pratylenchus penetrans* puede tener interés en tomates, aunque las poblaciones eran muy bajas. Se describen y se dan los resultados de diferentes experiencias de manejo agronómico de los nematodos y su relación con otros patógenos vegetales, que incluyen rotaciones, biofumigación, solarización, variedades resistentes y control químico, especialmente en los cultivos de brocoli, melones, tomate, okra, tabaco y flor cortada.

***HETERORHABDITIS BACTERIOPHORA* POINAR 1975: DESCRIPTION OF TWO NEW ISOLATES FROM CORDOBA, ARGENTINA, AND ANALYSIS OF VARIABILITY. M. A. Bertolotti, and M. M. A. de Doucet, Cátedra de Parasitología—Centro de Zoología Aplicada, U.N.C. CC.122. 5000, Córdoba, Argentina.**—*Heterorhabditis bacteriophora* is a well represented species in Córdoba. At present, 6 populations localized in the central and southern regions of the province are known. Recent soil samplings carried out in Jesús María (30°59'S-64°06'W) and Villa de Pocho (31°29'S-65°17'W), have shown the presence of two new isolates: JMAR and POC, respectively. In this work, these isolates are described, their morphological and morphometric characters are compared with those known for the species, and their variability is analyzed. Insect larvae parasitized by *H. bacteriophora* JMAR and POC show a violet coloration similar to OLI isolate. The morphological characters correspond to those indicated for the species, but the morphometric ones show slight differences which widen the known ranges. The variability was low, intermediate or high, in relation to the character and the stage considered. The intraspecific variability that characterizes *H. bacteriophora* is evident once more. The importance of correctly identifying the new isolates is pointed out. This work was supported by CONICOR, CONICET and SECYT.

**MARKER ASSISTED SELECTION FOR RESISTANCE TO *GLOBODERA ROSTOCHIENSIS* Ro1. B. B. Brodie, and Ngoc Tran, USDA, ARS, and Department of Plant Pathology, Cornell University, Ithaca, NY 14853, U.S.A.**—Molecular techniques such as restriction fragment length polymorphism (RFLP) has provided a powerful tool for constructing genetic maps of plant genomes. Using the RFLP technique, the gene $H_1$ that confers resistance to *Globodera rostochiensis* pathotype Ro1 was mapped to the long arm of chromosome 5 of the potato genome. The localization of this resistance gene led to the development of a molecular marker system to screen for the presence of the $H_1$ gene. The marker TG-689 was used to screen a segregating tetraploid population of potato for resistance to *G. rostochiensis* pathotype Ro1. A cross between a $H_1$ bearing plant (NY103) and a non $H_1$ bearing plant (NDA-2031-2) resulted in 42 potato clones for use in this study. DNA from these 42 clones was extracted and probed with labeled TG-689 for the $H_1$ gene. This test revealed that 36 of the 42 clones were positive for the marker indicating that they possessed the $H_1$ gene for resistance to *G. rostochiensis* Ro1. These data were confirmed in a bioassay test where the clones were subjected to the nematode.

**A FIELD STUDY OF PARASITISM OF BLACKFLIES (DIPTERA: SIMULIIDAE) BY *GASTROMERMIS MASSEI*, DOUCET & CAGNOLO 1997 (NEMATODA: MERMITHIDAE) IN CORDOBA, ARGENTINA. S. R. Cagnolo, and M. M. A. de Doucet. Cátedra de Parasitología, F.C.E.F., and Naturales-Centro de Zoología Aplicada, C. C. 122. 5000 Córdoba, Argentina.**—From 1997 to 1998, Cosquín river (Bialet Massé, Córdoba, Argentina) was periodically sampled for different developmental stages of *Simulium wolffhuegeli* Enderlein. We dissected 202 larvae, 200 pupae and 121 adults. Number of parasites per host was recorded. The following measures were taken: total length and maximum width of nematodes and total length and width of the cephalic capsule in larvae of simuliids. Three categories were considered: small larvae (< 4 mm), moderate (4-6 mm) and large (>6 mm). Thirty-four percent of the larvae were parasitized. The percentage of parasitism per individual larval collection ranged

from 0-100%. Parasitism was present in the three larvae categories. A low frequency of super-parasitism was observed, as well as a positive correlation between the host and parasite sizes ($P < 0.05$). Parasitism was recorded in 7% of the pupae and 3% of the adults. Infection occurred more frequently in small larvae and post-parasitic juveniles, but emergence was recorded more often in large larvae. Parasitism in pupae and adults would have the aim of nematode dispersal.

**FIELD RESPONSE OF EIGHT PLANTAIN CLONES TO PLANT-PARASITIC NEMATODES AND THE CORM-WEEVIL IN PUERTO RICO. J. A. Chavarría-Carvajal, Department of Crop Protection, Puerto Rico Agricultural Experiment Station, University of Puerto Rico, P. O. Box 9030, Mayagüez, Puerto Rico 00681-9030.**—Plant-parasitic nematodes and the corm-weevil (*Cosmopolites sordidus*) are recognized in Puerto Rico and elsewhere as serious constraints to plantain production. Without proper management practices or genetic resistance both pests cause yield reductions under an economical level. A field experiment was carried out to evaluate the response of five horn-type plantains (Common Dwarf, Maricongo, Hartón, Sin Florescencia, and Cuerno Alce) and three french-type plantains (Lacknau 23476, Lacknau 23472, and Super Plantain) to nematodes and the corm-weevil. Plantain clones were established on an acid, infertile Corozal clay (Ultisol), spaced at 2.4 m× 1.8 m. The Common Dwarf, Hartón, and Maricongo, consistently revealed the lower nematode populations at bunch shooting with 0, 0, and 184 nematodes/100 g-root tissue, respectively. The clones Cuerno Alce, Lacknau 23472, and Sin Florescencia, showed the highest nematode levels with 1 104, 1 472, and 2 576 nematodes/100 g-root, respectively. The predominant nematode species recovered from the root tissues were *Radopholus similis, Pratylenchus coffeae, Rotylenchulus reniformis,* and *Helicotylenchus multicintus.* All plantain clones were attacked by the corm-weevil; however, Common Dwarf and Lacknau 23476 were less susceptible showing 4.3 tunnels (7.6% damage) and 4.4 tunnels (6.9% damage), respectively. The clones Sin Florescencia and Cuerno Alce were the most affected by *C. sordidus* showing 21.7 tunnels (40.8% damage) and 22.2 tunnels (37.6% damage), respectively.

**SUPPRESSION OF PLANT-PARASITIC NEMATODES ON PINEAPPLE WITH VELVETBEAN (*MUCUNA DEERINGIANA*). J. A. Chavarría-Carvajal,[1] W. Figueroa,[2] and W. Gandía,[3] Department of Crop Protection,[1] Puerto Rico Agricultural Experiment Station,[2] University of Puerto Rico, P. O. Box 9030, Mayagüez, Puerto Rico 00681-9030, and Puerto Rico Land Authority, Manatí, Puerto Rico.[3]**—Cover crops are effective for improving the use of nutrients by crops, reducing soil erosion, increasing crop yield, and reducing soil populations of plant-parasitic nematodes. A field experiment was carried out to determine the effects of velvetbean (*Mucuna deeringiana*) on *Rotylenchulus reniformis* and *Pratylenchus* spp. during the production of pineapple (*Ananas comosus*). Velvetbean was grown for 3 months and incorporated into soil during pineapple planting. The efficacy of *M. deeringiana* was tested against phenamiphos (Nemacur 3E) and ethoprop (Mocap 10G), applied at doses of 15.5 L/ha and 68 kg/ha, respectively. Also, an untreated control treatment was included. Pre-plant and final nematode populations from soil were determined using the Baermann method. Results showed that velvetbean significantly reduced populations of *R. reniformis* at the end of the experiment, when compared with the control. Also, at this time, no significant differences were found in populations of *R. reniformis,* when velvetbean was compared with phenamiphos or ethoprop. *M. deeringiana* shows promise in suppressing the reniform nematode and may be considered as an alternative to chemical control.

**COMBINATIONS OF ORGANIC AMENDMENTS AND BENZALDEHYDE FOR CONTROL OF PLANT-PARASITIC NEMATODES: EFFECTS ON MICROBIAL ACTIVITY. J. A. Chavarría-Carvajal,[1] R. Rodríguez-Kábana,[2] J. W. Kloepper,[2] and G. Morgan-Jones,[2] Department of Crop Protection, Puerto Rico Agricultural Experiment Station, University of Puerto Rico, P.O. Box 9030, Mayagüez, Puerto Rico 00681-5000,[1] and Department of Plant Pathology, Alabama Agricultural Experiment Station, Auburn University, Auburn, AL 36849-5412, U.S.A.[2]**—A study was conducted to determine the effects of combinations of organic amendments and benzaldehyde on plant-parasitic and non-parasitic nem-

atode populations, and soil microbial activity. Pine bark, velvetbean, and kudzu were applied to soil at rates of 30 g/kg and paper waste at 40 g/kg alone and in combination with benzaldehyde (300µl/kg), for control of plant-parasitic nematodes. Pre-plant and post-harvest soil and soybean root samples were analyzed, and the number of parasitic and non-parasitic nematodes associated with soil and roots were determined. Soil samples were taken at 0, 2, and 10 weeks after treatment to determine populations of bacteria and fungi. Treatment effects on microbial composition of the soybean rhizosphere were also determined by identifying microorganisms. Bacterial strains were identified using fatty acid analysis, and fungal identification was done using standard morphological measurements and appropriate taxonomic keys. Results showed that most amendments alone or in combination with benzaldehyde reduced damage from plant parasitic nematodes. Benzaldehyde applied alone or in combination with the amendments exerted a selective action on the activity and composition of microbial populations in the soybean rhizosphere. In control soils the bacterial flora was predominantly Gram-negative, while in soils amended with velvetbean or kudzu alone or with benzaldehyde, Gram-positive bacteria were dominant. Mycoflora promoted by the different amendments or combinations with benzaldehyde included species of *Aspergillus*, *Myrothecium*, *Penicillium*, and *Trichoderma*.

**ISOLATION AND SELECTION OF THE NEMATODE PARASITIC FUNGUS *VERTICILLIUM CHLAMYDOSPORIUM* FROM PERENNIAL AND HORTICULTURAL CROPS IN ITALY. A. Ciancio, and P. Leonetti, Istituto di Nematologia Agraria Applicata ai Vegetali, Consiglio Nazionale delle Ricerche, 70126 Bari, Italy.**—Perennial and horticultural crops were sampled in Southern Italy to study the occurrence of the nematode egg parasite *Verticillium chlamydosporium* (Hyphomycetes). The fungus was found in more than 50% of the horticultural farms sampled, and was isolated from *Meloigogyne* spp. eggs or nematode infested tomato roots. It appeared widespread in the Mediterranean regions of Italy and was also isolated from soil samples or roots obtained from citrus orchards and vineyards. More than twenty monoconidial isolates were screened *in vitro* for their ability to parasitize eggs of root-knot nematodes in three replicated experiments. After 4-5 days exposure to the fungus on water agar, levels of egg parasitism among isolates were 51.6-94.4%. Parasitism was significantly higher than in controls ($P < 0.001$) and 83% of isolates parasitized more than 70% of the eggs. The production of chlamydospores on corn meal agar (CMA) appeared variable. No production occurred for isolates obtained from citrus soils, whereas $1.7\text{-}16.0 \times 10^4$ chlamydospores were counted per $cm^2$ of CMA for the other isolates. In flasks with a maize-sand medium, production was $5.5\text{-}223.5 \times 10^4$ chlamydospores per g of substrate. On CMA *V. chlamydosporium* showed an optimal growth at 23-26°C and pH 6.0. Data suggest that selecting among local isolates of *V. chlamydosporium* can dramatically increase the biological control efficacy of the fungus in nematode infested fields. Research partially funded by the EU Commission (FAIR5-PL97-3444).

**OBSERVATIONS ON ENDOSPORE GERMINATION OF A *PASTEURIA* ISOLATE PARASITIZING THE PEA CYST NEMATODE, *HETERODERA GOETTINGIANA*. A. Ciancio,[1] M. Cermola,[2] R. Favre,[2] and P. Leonetti,[1] Istituto di Nematologia Agraria Applicata ai Vegetali, Consiglio Nazionale delle Ricerche, 70125 Bari, Italy,[1] and Istituto Internacionale di Genetica e Biofisica, Consiglio Nazionale delle Ricerche, 80125 Napoli, Italy.[2]**—The endospore activation and germination process of a *Pasteuria* isolate parasitizing an Italian population of the pea cyst nematode, *Heterodera goettingiana*, was studied using transmission electron microscopy (TEM). The general ultrastructure of resting endospores of this *Pasteuria* isolate showed similarities with other forms previously described with TEM from the same host. Several endospores were observed at different stages of the activation-germination phase allowing the observation and reconstruction of common phenomena occurring during this process. The activation phase was observed on endospores adhering to the host cuticle. The propagule cytoplasm appeared more electron transparent, and an infection canal developed in correspondence with the basal endospore sectors. In this area, a reduction of the basal wall thickness and the formation of new cellular walls which gave origin to the infection canal were observed. The activated endospores transferred material inside the infection canal and contained electron dense vesiculated organelles measuring 50-

60 nm in diameter. The germinative process was initiated from a primordium of the vegetative thallus having a 50 nm thick cellular wall. At this stage, the core cytoplasm appeared detached from the internal sides of the endospore wall by condensation of the intrasporal material. The external cortical layers of the endospore wall remained electron dense and did not appear altered at this stage. The infection tube developed perpendicularly or laterally to the adhesion plane, and in some cases it penetrated into the cuticle diagonally. In some cases, the germination tube penetrated into the cuticle between adjacent annuli. In correspondence with the germination tube penetration, the cuticle appeared altered and probably enzymatically digested. Research partially funded by MIPA, PF, Orticoltura.

**POPULATION DYNAMICS AND BIOTYPES OF THE CITRUS NEMATODE, *TYLENCHULUS SEMIPENETRANS*, IN VENEZUELA. R. Crozzoli,[1] N. Greco,[2] F. Lamberti,[2] and D. Rivas,[1] Universidad Central de Venezuela, Fac. Agronomía, Apdo. 4579, Maracay, Venezuela,[1] and Istituto di Nematologia Agraria, C.N.R., Bari, Italy.[2]**—Among nematodes affecting citrus in Venezuela, *T. semipenetrans* is the most widespread and damaging. Therefore, two investigations were undertaken to identify its biotypes occurring in the country and to ascertain its population dynamics on different rootstocks and under different irrigation regimes (overhead sprinkling, flooding and rainfall conditions). In the first experiment two month old plants of *Citrus volkameriana, C. reshni, Swingle citrumelo, Troyer citrange,* and *Carrizo citrange,* growing in plastic pots containing 3 000 $cm^3$ of soil, were inoculated with 5 000 eggs and juveniles of *T. semipenetrans.* Nematode population per plant was determined 7 months later. The results showed that the Poncirus biotypes of the nematode is not present in Venezuela. The population dynamics study was conducted for two consecutive years during which the nematode populations in soil and roots were determined monthly. It indicated that under both irrigated and rainfall conditions the largest nematode populations in the roots occurred in February-March, which is a drought period for the country.

**VARIABILIDAD MORFOMÉTRICA Y MORFOLÓGICA EN *BELONOLAIMUS BREVIANULATA* (DOUCET, 1983) FORTUNER & LUC, 1987 (NEMATODA: TYLENCHIDA). M. E. Doucet y S. Filisetti, Laboratorio de Nematología, Centro de Zoología Aplicada, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, C. C. 122 (5000) Córdoba, Argentina.**—El escaso número de ejemplares sobre el cual fue descrita la población tipo, no permitió adquirir en su momento conocimientos suficientes acerca de la variabilidad de los caracteres que definen a la especie. La reciente detección de numerosos especimenes en otra localidad de la provincia de Córdoba, Argentina, posibilitó desarrollar un estudio sobre el particular. Los coeficientes de variación correspondientes a la mayoría de los caracteres morfométricos no superan el valor del 10%, tanto en hembras como en machos. Respecto a los caracteres morfológicos, se obtuvieron nuevos datos acerca de las formas de: región cefálica, porción cónica y cuerpos basales del estilete (en hembras y machos), membranas cuticulares asociadas a la región vulvar y región posterior (en hembras). Los conocimientos actuales muestran que los caracteres que definen a *B. brevianulata* son poco variables.

**NEW DATA ABOUT MALES OF *HETERODERA GLYCINES* ICHINOHE, 1952 (NEMATODA: TYLENCHIDA). M. E. Doucet,[1] P. Lax,[1] and E. Chaves,[2] Laboratorio de Nematología, Centro de Zoología Aplicada, F. C. E. F. y N., Universidad Nacional de Córdoba, C. C. 122 (5000), Córdoba,[1] and INTA, EEA Balcarce, Buenos Aires, Argentina.[2]**—The recent characterization of two populations of *Heterodera glycines* from the province of Córdoba, Argentina, showed the existence of differences in males with respect to other populations already described. For the morphological characters, a clear difference was observed in the cephalic region (rounded *vs* flattened). Among the morphometrical characters, the minimum value corresponding to the body length range was lower than that of known populations. Furthermore, the tail length presented values higher than those already known for the species. As a consequence of these values, there are considerable differences for the ratio c. It is proposed that the populations studied represent morphological and morphometrical variants of the species.

**CONTRIBUTION TO THE KNOWLEDGE OF *PRATYLENCHUS VULNUS* ALLEN & JENSEN, 1951 (NEMATODA: TYLENCHIDA). M. E. Doucet,[1] P. Lax,[1] J. Pinochet,[2] and P. Baujard,[3] Laboratorio de Nematología, Centro de Zoología Aplicada, F. C. E. F. y N., Universidad Nacional de Córdoba, C. C. 122 (5000), Córdoba, Argentina,[1] IRTA, Barcelona, Spain,[2] and CIRAD/ORSTOM, Montpellier, France.[3]**—A study was carried out to evaluate the variability of the morphometrical and morphological characters of *Pratylenchus vulnus* that are considered in the description of all the populations and isolates known for the species. For the morphological characters, new limits of variability were established, the character "shape of the female tail terminus" being the most variable. The CV values of the majority of the morphometrical characters ranged between 1% and 10%. A great number of characters that define the species are associated with some variability. As a result, significant differences can be observed among several populations and isolates. However, it is correct to define the species as well characterized.

**ASOCIACIÓN ENTRE *TARAXACUM* SPP. *Y MELOIDOGYNE HAPLA* EN LA PROVINCIA DE NEUQUEN, ARGENTINA. M. E. Doucet,[1] E. L. de Ponce de León,[2] P. Milanesio,[2] C. Azpilicueta,[3] y E. Maero,[3] Centro de Zoología Aplicada, F. C. E. F. y N., Universidad Nacional de Córdoba, C. C. 122, (5000) Córdoba,[1] Cátedra de Morfología Vegetal, Universidad Nacional de Río Cuarto,[2] y Laboratorio de Servicios Agrarios y Forestales, Neuquén, Argentina.[3]**—El género *Taraxacum* comprende especies de malezas de amplia distribución en la República Argentina. Caracterizadas por una gran capacidad de adaptación a suelos y climas de diversa naturaleza, se diseminan con facilidad y colonizan constantemente nuevas áreas. Estas malezas representan un huésped alternativo para varias especies de nematodos fitoparásitos. En la Provincia de Neuquén se detectó a *M. hapla* parasitando raíces del citado huésped. La presencia del nematodo dentro de la raíz ocasionó la formación de agallas. Internamente se observaron células gigantes ubicadas en el cilindro central que redujeron y desplazaron tejidos vasculares. El nematodo desarrolla en forma completa su ciclo de vida, dando lugar a la producción de una masa de huevos. Se infiere que la asociación hospedante-parásito es estrecha y que el vegetal representa un buen hospedante para *M. hapla.*

**SISTEMA DESTINADO AL MANTENIMIENTO DE PLANTAS PARASITADAS POR NEMATODOS EN CONDICIONES DE LABORATORIO. M. E. Doucet y R. Suarez. Laboratorio de Nematología, Centro de Zoología Aplicada, Facultad de Ciencias Exactas, Físicas y Naturales y Universidad Nacional de Córdoba, C. C. 122 (5000) Córdoba, Argentina.**—El sistema consta de una estructura vertical de 2 070 mm de alto por 1 250 mm de largo y 300 mm de ancho, provista de iluminación propia. Incluye una parrilla para colocar los tubos de PVC que sirven de contenedores para plantas y una bandeja de drenaje con su conexión a un sistema de cañerías para el desagüe. El riego está automatizado para proveer agua en distintos horarios del día según las necesidades de cada planta. El sistema posee una capacidad de 144 tubos de PVC. Se obtuvieron buenos resultados con varias gramíneas, soja, tomate y pimiento, lográndose hasta el momento multiplicar con éxito especies de los géneros *Belonolaimus, Heterodera, Meloidogyne* y *Nacobbus.*

**VIRULENCE AND HOST RANGE OF FOUR ISOLATES OF *HETERORHABDITIS BACTERIOPHORA* POINAR, 1975 FROM THE UPPER VALLEY OF RIO NEGRO AND NEUQUEN, PATAGONIA, ARGENTINA. M. M. A. de Doucet, and A. L. Giayetto, Centro de Zoología Aplicada, U.N.C. CC. 122. 5000, Córdoba, Argentina.**—The aim of this work was to study the host range and virulence of four new isolates of *Heterorhabditis bacteriophora* from northern Patagonia, the most southerly isolates up to the present. The experiments were carried out by exposing different stages of insect and acarii species of agricultural importance (n = 16) to infective juveniles (IJ) of the four isolates. Lethal doses (LD50) were estimated based on the mortality of *Galleria mellonella.* The results show that lepidopterans are the most favorable hosts for all isolates. The response of coleopterans and homopterans was different according to the nematode population. No mortality was observed in aphids, acarii and predators. LD50 values indicate significant differences between the isolate Roca (LD50 = 4± 1) and the others (Neuquén = 7 ± 2, INTA AV = 7 ± 4, and INTA 11-12 = 6 ± 3) ($P \leq 0.05$). This study shows the diversity

of harmful agricultural insects in which these new isolates produce IJ and indicates that their virulence is similar to those observed for other heterorhabditids. These preliminary data permit the continuation of the study of these isolates and their introduction into integrated pest management systems in the upper valley of Río Negro and Neuquén.

**EFFECT OF APPLICATION FREQUENCY ON EFFICACY OF *STEINERNEMA RIOBRAVE* AGAINST THE CITRUS ROOT WEEVIL, *DIAPREPES ABBREVIATUS*. L. Duncan, and C. W. McCoy, University of Florida, Citrus Research and Education Center, 700 Experiment Station Rd., Lake Alfred, FL 33850, U.S.A.**—Adult *Diaprepes abbreviatus* oviposit on leaves of citrus and the larvae fall to the soil where they feed on the root system of the tree for 5 to 8 months. Florida citrus growers use 1 to 2 applications per year of commercially available *Steinernema riobrave* to reduce the number of the soilborne stages of the insect. In a greenhouse study, 5 neonate *D. abbreviatus* larvae were applied each 2 weeks for 6 months to citrus seedlings in pots to simulate natural recruitment of the insect into the soil. Pots not receiving *D. abbreviatus* served as controls. *S. riobrave* were added to pots (20 nematodes/ $cm^2$ surface area) 0, 1, 2, 3, or 6 times during the 6 months. Thirty days after the final nematode application, numbers of weevil larvae were substantially reduced ($P = 0.05$) by all nematode treatments except the single application. Fibrous root weights were directly related to nematode treatment frequency. Compared to plants not infested by *D. abreviatus*, root weight of plants receiving nematodes 6 times were reduced by 30%, and those receiving a single treatment were reduced by 78%.

**DESARROLLO DEL INVENTARIO DE NEMATODOS EN ÁREAS PROTEGIDAS DE COSTA RICA. A. Esquivel, Escuela de Ciencias Agrarias, Universidad Nacional (U.N.A), Instituto Nacional de Biodiversidad (INBio), Costa Rica.**—El Instituto Nacional de Biodiversidad (INBio), cuya misión es promover una mayor conciencia sobre el valor de la riqueza biológica del país, recientemente ha emprendido en forma conjunta con la Escuela de Ciencias Agrarias de la Universidad Nacional (U.N.A), el inventario de nematodos en cinco áreas de conservación de Costa Rica: Arenal, Osa, Tempisque, Amistad Pacífico y Amistad Caribe. El proyecto es financiado por el Gobierno de los Países Bajos y con el apoyo del Sistema Nacional de Áreas de Conservación (SINAC). Para entender el papel de los nematodos (benéficos y dañinos) que ocurren en los ecosistemas, especialmente en aquellos que han sufrido cambios mínimos en su ambiente biótico y físico, se requiere de una sólida base científica que involucra en primera instancia un fuerte conocimiento taxonómico de las especies. Actualmente se han colectado más de 400 muestras en distintos habitats y microhabitats y se ha creado una colección de referencia de más de 2 000 montajes permanentes, y con la ayuda de expertos internacionales hemos ido avanzando en la identificación y descripción de nuevas especies.

**ENZYME PHENOTYPE OF *MELOIDOGYNE* SPP. POPULATIONS. R. M. D. Gomes Carneiro,[1] M. R. A. Almeida,[1] P. Quénhervé,[2] and M. L. Mendes,[3] EMBRAPA/CENARGEN, C.P. 02372, 70849-970 Brasília, DF, Brazil,[1] Centre Orstom, B.P.8006, Fort de France 97259, Martinique,[2] and UEL, Depto de Agronomia, C.P. 6601, 86051-970 Londrina, PR, Brazil.[3]**—Enzyme phenotypes, specifically esterases (EST), malate dehydrogenase (MDH), superoxide dismutase (SOD) and glutamate-oxaloacetate transaminase (GOT) were used to characterize different species of *Meloidogyne*. Esterase activity was polymorphic and was most useful in identification of species. Using this technique it was possible to characterize and identify the four major species: *M. javanica, M. incognita, M. arenaria* and *M. hapla*. Another six less common species, of which only one or a few populations of each were studied, exhibited a variety of esterase phenotypes: *M. cofeicola, M. paranaensis, M. exigua, M. orizae, M. gaminicola* and *M. mayaguensis*. The three enzymes (EST, MDH and SOD) permitted the differentiation of *M. gaminicola* and *M. oryzae*. It was possible to detect atypical (unidentified) species: three from Brazil, one from the USA and another from Chile. The minor bands of esterase profiles provided information to detect intraspecific variability among four populations of *M. incognita* and two populations of *M. exigua*. Profiles of MDH permitted separation of two populations of *M. javanica* from Brazil.

**ESTUDIO DE LA EFICACIA DEL PRODUCTO BIOLÓGICO, NEEM-X (AZADIRACHTINA) COMPARADO CON NEMATICIDAS QUÍMICOS, CONTRA *MELOIDOGYNE INCOGNITA* EN ROSAS. J. Gómez Tovar, Marketing Arm International Inc., Casilla 7559, Guayaquil, Ecuador.**—Desde el 22 de agosto de 1997 hasta el 20 de febrero de 1998, se realizó el ensayo de eficacia nematicida del producto biológico Neem-X (Azadirachtina) comparado con 5 nematicidas químicos y un tratamiento de incorporación de materia orgánica (testigo sin pesticida químico). Plantas de rosa de la var. "Ana" de 2 años de edad y en producción, 10 plantas/parcela y 40 plantas/4 repeticiones, recibieron los siguientes tratamientos: Neem-X (Azadirachtina) 2 y 3 ml; Etoprofos, 10 gr; Oxamil 4 ml; Ebufos, 10 gr; Carbofuran 10 gr y materia orgánica/testigo, 3 kg, todos los tratamientos, dosificados/$m^2$. Se realizaron 3 aplicaciones a intervalos de 3 meses y la población de estados larvales de *M. incognita* se evaluó mensualmente. Las poblaciones de raíces con daño antiguo, no mostraron disminución de población pero en las raíces de "renovación" o raíces nuevas, los productos mostraron eficacia nematicida, aunque no en niveles erradicantes. Entre la acción nematicida de Azadirachtina y los productos químicos, no hubo diferencia estadística.

**RELATIVE TOLERANCE OF ALFALFA TO THE LESION NEMATODE *PRATYLENCHUS PENETRANS*. S. L. Hafez,[1] P. Sundararaj,[1] and D. Miller,[2] Parma Research and Extension Center, 29603 U of I Ln, Parma, Idaho 83660, USA,[1] and Nampa, ID 83653.[2]**—In a greenhouse, 13 alfalfa cultivars were evaluated for their tolerance to lesion nematode *Pratylenchus penetrans* as compared to the susceptible cultivar 'Baker'. Dry and fresh weights of foliage and roots and numbers of nematodes in soil and roots were measured. Significant reduction in nematode densities in soil and root combined with increased fresh root weight and dry foliar weight in the cultivars ZN 9531, ZN 9541, and ZN 9651, indicated maximum tolerance in these cultivars as compared to susceptible cultivar 'Baker'. Though the dry foliar weight is lower in ZN 9540, ZN 9537, ZN 9539, and ZN 9640 than in the susceptible cultivar, nematode numbers in soil and roots were significantly lower. Nematodes in soil and roots were also low in MN GRN14 and MNGRN 4. The remaining four cultivars showed different levels of tolerance.

**HOST RESPONSE OF *DRACAENA* SPECIES TO *ROTYLENCHULUS RENIFORMIS*. R. N. Inserra, N. C. Coile, and S. E. Walker, Florida Department of Agriculture and Consumer Services, P.O. Box 147100, Gainesville, FL 32614-7100, U.S.A.**—The response of *Dracaena cincta, D. concinna, D. deremensis, D. fragrans,* and *D. sanderiana* to a population of *Rotylenchulus reniformis* from southern Florida was studied under greenhouse conditions. *Dracaena* species in pots were exposed to initial population densities (Pi) of 20 *R. reniformis*/$cm^3$ of soil for six months in 1997-1998. Nematode infection and reproduction occurred in all species tested. Final nematode densities in roots ranged from 6 to 96 swollen females and from 18 to 875 eggs/g of fresh roots. In another experiment conducted in 1998-1999, numbers of *R. reniformis* on *D. cincta* 'Tricolor' exposed to Pi of 10 nematodes/$cm^3$ of soil averaged 10 females and 50 eggs/g of fresh roots after three months, and 95 females and 910 eggs/g of fresh roots after 10 months. In both experiments, the number of nematodes on *Dracaena* was smaller than that on cowpea (*Vigna unguiculata*), a nematode susceptible host that was used as a control. Root decay as a consequence of *Fusarium oxysporum* and *F. solani* infections was observed in all the *Dracaena* tested.

**CROP ROTATIONS AND CHEMICAL TREATMENTS FOR MANAGING NEMATODES, DISEASES, AND THRIPS ON PEANUT. A. W. Johnson, and N. A. Minton, USDA, ARS, P. O. Box 748, Tifton, GA 31793, U.S.A.**—The influence of bahiagrass, corn, and cotton in rotation with peanut and chemical treatments with and without aldicarb, or flutolanil, or aldicarb + flutolanil was studied for 3 years. Peanut yields following either 1 or 2 years of bahiagrass, corn, or cotton were higher than those of continuous peanut. Peanut yield means across cropping sequences were highest in the aldicarb + flutolanil-treated plots (5 270 kg/ha), intermediate in aldicarb (4 060 kg/ha) and flutolanil-treated plots (4 590 kg/ha), and lowest in untreated-plots (3 690 kg/ha). The increases in peanut yields obtained in response to cropping sequences and chemical treatments resulted from suppression of *Meloidogyne arenaria*, thrips, *Sclerotium rolfsii*, and *Rhizoctonia solani* population densities. Our data

demonstrate the sustainable benefits and yield increase from using corn, cotton, or bahiagrass in integrated systems with chemical treatments for multiple-pest management in peanut production.

**MOLECULAR, GENETIC, AND BIOLOGICAL CHARACTERIZATION OF CITRUS PARASITISM AND PHYLOGENY IN THE BURROWING NEMATODE. David T. Kaplan, USDA-ARS, Orlando, FL 32803, U.S.A.**—Our research has focused on fifty isolates of *Radopholus* spp. from Africa, Australia, Central America, Cuba, Dominican Republic, Florida, Guadeloupe, Hawaii, Indonesia, and Puerto Rico. We determined that the *Radopholus* genome is highly conserved and all isolates have the same karyotype (n = 5). Citrus-parasitic isolates have only been detected in Florida, but genetic analyses using sequence tag sites and bioassays demonstrated that burrowing nematodes that differ in their ability to parasitize citrus are not reproductively isolated. Results of RAPD analyses, sequence analysis of the rDNA spacer region (ITS1) and the D2/D3 of the 28s rDNA gene indicate that genome variation is very limited. Although burrowing nematodes can reproduce by out-crossing, the high level of genome conservation in conjunction with DAPI-imagery of gametogenesis suggests that hermaphroditism, rather that parthenogenesis, is the primary mode of reproduction. Citrus-parasitic burrowing nematodes appear to be pathotypes derived from *R. similis*.

**RESISTANCE OF SELECTED LEGUME CULTIVARS TO *ROTYLENCHULUS RENIFORMIS*. P. S. King, R. Rodríguez-Kábana, and C. F. Weaver, Department of Plant Pathology, Auburn University, Auburn, AL 36849, U.S.A.**—Twenty-nine legume cultivars (*Trifolium* spp., *Medicago* spp., *Vicia* spp., *Clitoria* spp., *Crotalaria* spp., and *Pisum* spp.) were evaluated for resistance to *Rotylenchulus reniformis* in the greenhouse. Twenty seed of each cultivar were planted in 1-L, 10-cm-diameter cylindrical pots filled with a 50:50 mixture of soil from a soybean field and fine river sand. There were eight replications per cultivar, and pots were arranged in a randomized complete block design. The plants were allowed to grow for eight weeks, after which time soil and root nematode populations were determined. A wide range of resistance to *R. reniformis* was observed among the different lines. Cultivars most resistant to *R. reniformis* (<30 nematodes/100 $cm^3$/soil) were 'Nungarin' subclover, 'Denmark' subterranean clover, tropical alfalfa, 'Sweet White' annual clover, and 'Koala' subclover. Cultivars most susceptible to *R. reniformis* (> 400 nematodes/100 $cm^3$ soil) were 'Dixie' crimson clover, 'Yuchi' arrowleaf clover, 'Americus' vetch, and 'Redland II' clover. Most cultivars showed moderate to low resistance (50-250 nematodes/100$cm^3$ soil) to *R. reniformis*.

**TWO SPECIES OF *XIPHIDORUS* MONTEIRO (NEMATODA: DORYLAIMIDA), NEW RECORDS FOR VENEZUELA. F. Lamberti,[1] R. Crozzoli,[2] S. Molinari,[1] A. Agostinelli,[1] and N. Greco,[1] Istituto di Nematologia Agraria, C.N.R., Bari, Italy,[1] and Universidad Central de Venezuela, Fac. Agronomía, Apdo. 4579, Maracay, Venezuela.[2]**—*Xiphidorus amazonensis* Vesugi, Huang and Cores and *X. minor* Rashid, Coomans and Sharma constitute new records for Venezuela. *X. amazonensis* is reported for the first time after its description from Brazil. It is characterized by body length of about 5 mm, odontostyle length around 97 µm, mid-body vulva, off set lip region and widely conoid tail. *X. minor*, which also occurs in Argentina, Brazil and Uruguay, is characterized by body length of about 2 mm, odontostyle length around 68 µm; slightly anterior vulva, continuous lip region and conoid tail.

**SOLARIZATION DURING AUTUMN FOR SUPPRESSION OF NEMATODES ON LANDSCAPE ORNAMENTALS. R. McSorley, and R. J. McGovern, University of Florida, P.O. Box 110620, Gainesville, FL 32611, and GCREC, Bradenton, FL 34203, U.S.A.**—Efficacy of soil solarization in autumn was evaluated during two seasons in field tests at Bradenton, Florida. Small plots (3m× 3m) were covered with a double layer of clear polyethylene mulch from 26 Aug. to 13 Oct. 1997 and from 10 Sept. to 27 Oct. 1998. Design was a RCB with 5 solarized and 5 nonsolarized plots. Immediately following solarization, a crop of impatiens (*Impatiens wallerana*) was transplanted into all plots. Soil samples collected at the beginning and end of each impatiens crop revealed that *Meloidogyne incognita* and *Dolichodorus heterocephalus* were fewer ($P \leq 0.05$) in solarized plots on all sampling dates. *Criconemella* spp.

were suppressed ($P \leq 0.05$) on 3 of 4 sampling dates. Trends in suppression of other nematodes were similar but sometimes not significant due to their variable occurrence. Results demonstrate the possibility of using double-layer solarization to extend the Florida solarization season into autumn.

**NEMATODE MANAGEMENT IN ORGANIC PRODUCTION. R. McSorley,[1] M. Ozores-Hampton,[2] P. A. Stansly,[2] and J. M. Conner,[2] University of Florida, P.O. Box 110620, Gainesville, FL 32611,[1] and Southwest Florida REC, Immokalee, FL 34142, U.S.A.[2]**—Since organic vegetable producers in the U.S. cannot use synthetic pesticides, they must rely on alternative methods for pest management. In a vegetable production system at Pine Island in SW Florida, summer solarization, compost, summer cover crops, and a resistant cultivar were used to manage *Meloidogyne incognita* (MI) and other plant-parasitic nematodes. At the beginning of autumn crops of tomato and pepper, population levels of MI were lowest following solarization, intermediate following cover crops of browntop millet (*Panicum ramosum*), 'Iron Clay' cowpea (*Vigna unguiculata*), or marigold (*Tagetes minuta*), and greatest following compost alone or a control (summer weeds). Most treatment differences did not persist into a spring vegetable crop. The exception was a treatment with 'Sanibel' tomato, from which no MI were recovered even at the end of the second crop. In this case, the integration of a cowpea cover crop and a resistant cultivar was successful in managing MI and improving tomato yield.

**CONTROL DE *MELOIDOGYNE HAPLA* CON EXTRACTO DE *QUILLAJA SAPONARIA* Mol. EN VIDES DE LA ZONA CENTRAL DE CHILE. J. C. Magunacelaya y R. San Martín, Facultad de Ciencias Agronómicas, Universidad de Chile, Facultad de Ciencias Básicas, Universidad Católica de Valparaíso, Facultad de Ingeniería, Universidad Católica de Chile. Santa Rosa 11315, Santiago, Chile.**—Durante 1 año se evaluó la acción nematicida de dos concentraciones de extracto de *Quillaja saponaria*, de Phenamiphos y de Ethoprophos. El área del ensayo fue un viñedo Chardonnay de 9.7 hectáreas, que se dividió en 9 sectores de acuerdo al sistema de riego por goteo, a través del cual se aplicaron los productos. Se eligieron dos sectores, 2 repeticiones, para cada tratamiento: Phenamiphos, 10 litros por hectárea; ethoprophos, 10 litros por hectárea; extracto de *Q. saponaria*, 15 litros por hectárea; extracto de *Q. saponaria*, 30 litros por hectárea; y testigos. La aplicación se hizo en primavera cuando las raíces de las plantas habían iniciado su crecimiento de temporada. Se trabajó con 12 plantas por sector, doce repeticiones. El extracto de *Q. saponaria* presentó buenas cualidades nematicidas, y no tuvo diferencias estadísticamente significativas con los nematicidas phenamiphos y ethoprophos, en la reducción de las poblaciones de juveniles en el suelo.

**EVALUACIÓN DE EXTRACTOS DE *QUILLAJA SAPONARIA* Mol. COMO AGENTES NEMATICIDAS, EN CONDICIONES DE LABORATORIO. J. C. Magunacelaya y R. San Martín, Facultad de Ciencias Agronómicas, Universidad de Chile, Facultad de Ciencias Básicas, Universidad Católica de Valparaíso, Facultad de Ingeniería, Universidad Católica de Chile, Santa Rosa 11315, Santiago, Chile.**—Se evalúa en condiciones de laboratorio la acción nematicida de tres tipos de extractos provenientes de *Quillaja saponaria*, árbol autóctono de Chile llamado Quillay, característico por contener altas concentraciones de saponinas, especialmente en su corteza. Durante 10 días se midió la mortalidad de *Xiphinema index*, *Meloidogyne hapla*, *Criconemella* spp., *Pratylenchus thornei*, *P. neglectus*, *Pratylenchus* spp., *Helicotylenchus* spp., *Hemicycliophora* spp. y nematodos saprófagos, en soluciones con diferentes concentraciones de extractos de Quillay. Se trabajó con los extractos puros (máxima concentración obtenida en fábrica), 100 000; 10 000; 1 000; 100 y 1 ppm. Los extractos con menor grado de purificación, denominados QL1000 y QL500 muestran una fuerte acción nematicida, a diferencia del extracto ULTRA que tiene mayor grado de pureza de las saponinas, y presenta una menor acción nematicida.

**SURVIVAL OF DEHYDRATION AND INFECTIVITY OF THE DEVELOPMENTAL STAGES OF *NACOBBUS ABERRANS* (THORNE, 1935) THORNE & ALLEN 1944. R. H. Manzanilla-López, and O. A. Pérez-Vera, Instituto de Fitosanidad, Colegio de Postgraduados Montecillos, Km 35.5 Carretera México-**

**Texcoco, C.P. 56230, and Departamento de Parasitología Agrícola, Universidad Autónoma Chapingo, Km 38.5 Carretera México-Texcoco, C.P. 56100.**—*Nacobbus aberrans* is an important limiting factor for growing vegetable crops (especially tomato) in some horticultural regions of Mexico. The knowledge of the biology of this species is still incomplete. There is a gap of information about how the nematode survives for long periods without a suitable host, and to improve control strategies it is necessary to know which stages are more capable of surviving adverse conditions. The objective of the present study was to evaluate the survival and infectivity of the juveniles (second, third and fourth stages), males, vermiform females and egg masses subjected to different relative humidities (RH) for variable periods. The experiments were done using a Mexican population of the nematode grown on tomato (*Lycopersicon esculentum* Mill.) cv. Saladette. The second stage juveniles (J2) were obtained from egg masses incubated at 26°C in tap water; the third (J3), fourth (J4) and adult stages were collected from root macerates and mist chamber. The nematodes were dried and placed in microsiracuses to be kept at different relative humidities using water-glycerin mixtures (0, 20, 40, 50, 60, 80, 98.8, 100%) at 20°C for periods ranging from one to 30 days. They were transferred afterwards to containers with deionized water and the number of surviving nematodes was recorded every 24 hours during five days. Ten egg masses were also used to inoculate one month old tomato plants. The infectivity of the specimens was assessed using the dye Oil Red O. Results showed that J2 tolerated dehydration during short periods (up to five days) in a range of 0-98.8% RH, but longer periods reduced their recovery and infectivity. The highest recovery (35%) for this stage occurred at 98.8% of RH. Third and J4 stages tolerated a range of 20-98.8% RH for periods up to three weeks. The highest recovery (20%) for J3 was at 80% RH. The J4 stage had the highest recovery (85%) at 50% RH and was also infective. Vermiform females survived up to five days in a range of 40-98.8% RH and 40% were recovered at 80 and 98.8% RH. Males were the least tolerant of the different RH. Eggs in egg masses remained viable for one week in a range of 98.8-60% RH and the hatched J2 were infective to tomato plants.

**POTENCIAL BIOREPRESOR DE HONGOS DE LA RIZOSFERA DE LA *MUCUNA DEERINGIANA* SOBRE LAS POBLACIONES DE NEMATODOS EN PLÁTANO. C. D. Mojica y R. Vargas-Ayala, Depto. de Protección de Cultivos, Universidad de Puerto Rico, Recinto de Mayagüez, P.O. Box 9030, Mayagüez, P.R. 00681-9030.**—Se evaluó el efecto de mucuna en asocio con plátano sobre la micoflora con potencial de antagonismo sobre nematodos. Los tratamientos evaluados fueron: plátano en asocio con mucuna (PM), mucuna (M), plátano (P) y suelo en barbecho (S). La población de hongos en la rizósfera se determinó a los 14, 60 y 150 días de establecido el experimento (marzo, 1998). En el primer y tercer muestreo se detectaron diferencias significativas en el número de colonias aisladas. P y PM resultaron con las poblaciones más altas, miéntras M y S tuvieron las más bajas. En el tercer muestreo, la micoflora de PM disminuyó en comparación con la de P, que aumentó. Se encontró que la rizomicoflora de PM fue estadísticamente similar a la de M para el tercer muestreo. Esto sugiere que la mucuna en PM afectó, en parte, la rizomicoflora del plátano. Además, se determinó que especies de *Myrothecium* fueron las más frecuentes en PM. Otros géneros que han sido identificados en la rizósfera de M y PM son, *Phialophora* spp., *Acremonium* spp., *Phoma* spp., entre otros. Algunos de estos géneros se han reportado como agentes antagonistas de nematodos. Más del 90% de las especies de *Myrothecium* aisladas en este estudio presentaron actividad quitinolítica. Otros géneros que mostraron actividad quitinolítica fueron *Chaetomium* spp., *Pyrenochaeta* spp., *Paecilomyces* spp., *Verticillium* spp. y *Trichoderma* spp. Esto es indicativo que hongos habitantes de la rizósfera de M y PM podrían estar ejerciendo cierto parasitismo en huevos de nematodos.

**MULTIVARIATE COMPOSITIONAL DATA ANALYSIS METHODS FOR ANALYSIS OF NEMATODE POPULATIONS. E. Barry Moser, Jason P. Bond, and Edward C. McGawley, Louisana State University Agricultural Center, Baton Rouge, LA 70803-5606, U.S.A.**—Greenhouse and field plot experiments were established to investigate effects of phytoparasitic nematode community composition and abundance on sugarcane (*Saccharum officinarum* L.) stubble decline. Populations composed of known mixtures of *Mesocriconema* spp., *Tylenchorhynchus* spp. and *Paratrichodorus* spp. were established in clay pots containing three-week-old sugarcane cuttings. Five sugarcane varieties and 2 levels of ne-

matode inoculum (1×, 4×) were arranged in a randomized complete block design of 6 replications each, and repeated in each of two years. Initial and final nematode community composition measurements were made and later summarized as percentages of each nematode genus. As these percentages sum to 100%, compositional data analysis methods were used in analyses of the nematode community compositions. Multivariate models of log-ratio transformed percentages preserve the sum to 100% constraint on the percentages and their predicted values, and have properties that are generally more consistent with the multivariate normal distribution model. The final nematode compositions were influenced by the initial level of inoculum ($P < 0.0001$), but the compositions appeared not to be related to the final size of the population ($P = 0.1222$). There was significant variation in composition among varieties ($P < 0.0001$). A mixed-effects multivariate model permitting correlated random effects of varieties and errors and the fixed effects of initial inoculum level and initial composition provided a reasonable explanation of the greenhouse community composition data.

**INTERCEPCIÓN DE NEMATODOS EN PRODUCTOS VEGETALES DE IMPORTACIÓN. D. C. Nava, C. Sosa-Moss y M. B. Hernández, Departamento de Fitopatología, Dirección General de Sanidad Vegetal, Guillermo Pérez Valenzuela 127, Coyoacán, México, D.F. 04100.**—El laboratorio de nematodos fitopatógenos "Dr. Carlos Sosa Moss" tiene como objetivos: Detectar nematodos de importancia cuarentenaria en material vegetal de importación y brindar apoyo técnico. Anualmente se procesa un promedio de 500 muestras de material vegetal de importación por diferentes métodos de extracción, tales como Embudo de Baermann, Elutriador de Oostenbrink, Macerado tamizado centrifugado y aparato de Fenwick. Los nematodos fitopatógenos encontrados son observados bajo microscopio compuesto. Para la identificación se toman en cuenta características morfológicas, fisiológicas, ecológicas, etológicas y geográficas, así como consulta de base de datos (FAO, EPPO, CAB), revistas, monografías, descripciones originales y comparación con paratipos presentes en el laboratorio. Entre las intercepciones más sobresalientes se encuentran *Aphelenchoides besseyi* en semilla de pasto, *Ditylenchus dipsaci* en Liatrix y bulbos de lilium, *Paratrichodorus minor* en esquejes de azalea, *Pratylenchus penetrans* en árboles de manzano y *Meloidogyne incognita* en plántulas de poro.

**SCANNING ELECTRON MICROSCOPE OBSERVATIONS OF SPIRAL NEMATODE (*HELICOTYLENCHUS MULTICINCTUS*) INFESTED BANANA ROOTS. D. Orion,[1] Y. Levy,[2] Y. Israeli,[2] and E. Fischer,[3] Dept. of Nematology,[1] Jordan Valley Experimental Station,[2] Zemach, Israel, Scanning Electron Microscopy Laboratory, [3] Agricultural Research Organization, The Volcani Center, Bet-Dagan, Israel.**—Banana (*Musa cavendishi* cv. Ziv) roots infested with the spiral nematode (*Helicotylenchus multicinctus*) were collected from a four-year-old banana plantation in Zemach Experimental Farm. Root segments showing lesions were fixed, dehydrated, sectioned in polyethyleneglycol blocks and processed for observation with a scanning electron microscope. Electron micrographs of root cortical tissue harboring the nematodes are presented. The nematode settled superficially at a depth of 4-6 cells from the epidermis. The nematode advanced in the root cortical parenchyma parallel to the long axis of the root and laid its eggs within the tissue. Histologically, the lesion appears to be a defined group of collapsing parenchymal cells in response to the presence of the nematode. In most cases the spiral nematode was accompanied by hyphae of various fungi.

**EVIDENCE FOR SPREAD BY RENIFORM NEMATODE IN LOUISIANA DURING THE PAST 20 YEARS. C. Overstreet, and E. C. McGawley, LSU Agricultural Center, P.O. Box 25100, Baton Rouge, LA 70894-5100, U.S.A.**—Although there is speculation that the reniform nematode may be spreading into new parishes or areas within Louisiana, there is no evidence to substantiate increased spread by this nematode. All the data from samples processed by the Nematode Advisory Service for the past 20 years are recorded in a database file and were sorted by parish and year. Incidence for the nematode was reported as a cumulative total over time and grouped within year categories (1980-85, 1980-90, 1980-95, and 1980-99) for each parish. Within individual parishes, incidence (0-3074 fields) and per-

centage of samples with reniform nematode (0-78%) varied considerably. A number of parishes showed an increase in the percentage of samples with reniform nematode over time, indicating additional spread by this nematode. Richland and Franklin parish showed the greatest increases by this nematode (3.6% and 2.5% during 1980-85 to 60.3% and 52.7% during 1980-99, respectively). West Carroll, Ouachita, Calwell, and Morehouse parishes followed the same trend with increased frequency of reniform nematode occurring with time in samples coming from these parishes.

**SITUACIÓN DEL NEMATODO AGALLADOR *MELOIDOGYNE INCOGNITA* EN EL CULTIVO DEL GUAYABO (*PSIDIUM GUAJAVA* L.) EN EL ESTADO ZULIA, VENEZUELA. A. M. Casassa Padrón,[1] J. Matheus,[2] R. Crozzoli,[3] V. Bravo,[1] C. González,[1] y M. Marín,[4] Universidad de Zulia, Facultad de Agronomía, Instituto de Investigaciones Agronómicas, Aptdo. 15205, Maracaibo, Venezuela,[1] Centro Frutícola del Zulia-Corpozulia, Municipio Mara, Estado Zulia, Venezuela,[2] Universidad Central de Venezuela, Facultad de Agronomía, Aptdo. 4579, Maracay, Venezuela,[3] Depto. Botánica-Agronomía-LUZ, Aptdo. 15205, Maracaibo, Venezuela.[4]**—El cultivo del guayabo se ha convertido para el estado Zulia en un rubro frutícola de significativa importancia económica, sin embargo en los últimos doce años, el aumento vertiginoso de la superficie cultivada de este frutal, ha traído como consecuencia el incremento de los problemas fitosanitarios, específicamente, la muerte regresiva de árboles de guayabo, causada por nematodos del género *Meloidogyne*, considerándose un factor limitante para el establecimiento y desarrollo del cultivo. El conocimiento exacto del problema permite establecer prioridades en cuanto a la evaluación de opciones de manejo en pro de encontrar medidas de control adecuadas y duraderas. Es por ello que desde 1991 se vienen realizando investigaciones, cumpliéndose los siguientes objetivos: 1. Evaluar nematicidas químicos en el control de *M. incognita*; 2. Identificar las especies y razas de *Meloidogyne* asociados a guayabo; 3. Estudiar las fluctuaciones poblacionales de *M. incognita* en guayabo; 4. Determinar en úmbraculo el límite de tolerancia; 5. Evaluar selecciones y especies de *Psidium* resistentes a *M. incognita*. Los resultados obtenidos en estas primeras etapas, han permitido seleccionar algunos materiales de *Psidium* como posibles portainjertos resistentes, continuando con la evaluación en campo del comportamiento agronómico de estos portainjertos injertados con *P. guajava*.

**EL NEMATODO DE LOS CÍTRICOS (*TYLENCHULUS SEMIPENETRANS* Cobb, 1913) Y SU MANEJO AGRONÓMICO. M. A. Pastrana y A. Bello, Depto. Agroecología, CCMA, CSIC. Serrano, 115 Apdo. 28006 Madrid, España.**—Se lleva a cabo la caracterización ecológica del nematodo de los cítricos, *Tylenchulus semipenetrans* Cobb, 1913, por los problemas de replantación encontrados en el Levante Peninsular, que están asociados a poblaciones elevadas del patógeno, para seleccionar métodos de manejo agronómico. El trabajo es de gran interés ambiental puesto que, para resolver el problema, se viene empleando bromuro de metilo (BM), un fumigante en vías de retirada por destruir el ozono estratosférico. Se revisan las citas de *T. semipenetrans*, encontrándose que está asociado a cítricos, confirmando su presencia en vid en Almería, Cádiz y Murcia, dando una primera cita sobre caqui en Valencia y naranjo en Ibiza y Mallorca, confirmándose en laboratorio que las poblaciones españolas parasitan olivo, siendo erróneas las restantes citas sobre plantas o cultivos no cítricos en España. Se establece que el uso de diferentes patrones favorece la selección de biotipos, limitando la eficacia de los programas de mejora. Se cita por primera vez en España el biotipo "citrus". Se determina que el ciclo de *T. semipenetrans* a 23°C dura entre 8 a 10 semanas, pudiendo existir tres generaciones. Se observan los máximos de juveniles en primavera y otoño, que son los momentos óptimos para la aplicación de las alternativas de control. La dinámica del nematodo está relacionada con la temperatura y humedad, siendo las bajas temperaturas las que pueden influir sobre sus poblaciones, demostrándose el valor de los restos de cosecha en su control y el interés en horticultura de los suelos que han sido cultivados con cítricos. Se presenta como alternativa de control el manejo agronómico del cultivo, basado en la rotación con frutales y hortícolas, el barbecho y las cubiertas vegetales, así como el empleo de la biofumigación complementada con solarización y control químico, no siendo necesario el uso de BM.

**EFFICACY OF ABAMECTIN (Agri-Mek 0.15EC) AGAINST THE ROOT-KNOT NEMATODE (*MELOIDOGYNE INCOGNITA*) ON TOMATO. L. A. Payan, and D. W. Dickson, Novartis Crop Protection, Vero Beach, FL, 32967, and University of Florida, Gainesville, FL 32611, U.S.A.**—A series of studies were conducted to evaluate the efficacy of Abamectin (Agri-Mek 0.15EC) against the root-knot nematode (*Meloidogyne incognita*) on tomato. Under greenhouse conditions, Agri-Mek at rates as low as 0.01 ppm completely prevented nematode penetration of tomato roots. Under field conditions, Agri-Mek applied as a drip treatment reduced nematode galling, increased yields and reduced nematode population densities. Weekly or biweekly applications at rates ranging from 113.5 to 567.5 g a.i./ha were effective.

**REACCIÓN DEL CULTIVAR DE SOJA *ASGROW 5435 RG* A UNA POBLACIÓN DE *HETERODERA GLYCINES* EN UNA LOCALIDAD DE LA PROVINCIA DE CÓRDOBA, ARGENTINA. E. L. de Ponce de León,[1] M. E Doucet,[2] y M. C. Tordable,[1] Cátedra de Morfología Vegetal, Universidad Nacional de Río Cuarto, Ruta 36 Km 601, (5800) Río Cuarto,[1] Centro de Zoología Aplicada, F. C. E. F. y N., Universidad Nacional de Córdoba, Argentina.[2]**—Es conocida la existencia de diferentes reacciones por parte de distintos cultivares a la acción de *H. glycines*. Se evaluó el grado de susceptibilidad del cultivar *ASGROW 5435 RG* a una población del nematodo proveniente de la provincia de Córdoba. El análisis de la histopatología inducida en raíces permitió observar nódulos de *Rhizobium* que no manifestaban infestación así como una elevada cantidad de nematodos (hembras y quistes). Se detectaron síncitos funcionales con relación a hembras con masas de huevos y síncitos no funcionales asociados a quistes. Los funcionales formados por células hipertróficas ocupaban gran parte del cilindro central ocasionando una considerable reducción en la cantidad de tejidos vasculares. Estas observaciones permiten inferir que el cultivar estudiado parece muy susceptible a la población de *H. glycines* considerada.

**NEMATODE POPULATIONS AND ENZYMATIC ACTIVITY IN RHIZOSPHERES OF TROPICAL LEGUMES IN AUBURN, ALABAMA. R. Quiroga-Madrigal,[1] R. Rodríguez- Kábana,[2] D. G. Robertson,[2] C. F. Weaver,[2] and P. S. King,[2] Facultad de Ciencias Agronómicas, Universidad Autónoma de Chiapas, Villaflores, Chiapas, 30470, Mexico[1] and Department of Plant Pathology, Auburn University, Auburn, AL 36849, USA.[2]**—Soil enzymatic activity has been correlated with microbial activity and suppressiveness to soilborne plant pathogens. A microplot study in Auburn, Alabama, conducted in 1998 demonstrated significant differential enzymatic activities between the rhizospheric soils of tropical legumes in the genera *Canavalia, Mucuna, Indigofera, Crotalaria, Glycine,* and *Clitoria* and the rhizospheric soils of cotton and sorghum. Results also showed that the rhizosphere effects of legumes greatly modify both plant pathogenic and free-living nematode populations. These results confirm previous findings indicating that some legumes can be used in crop rotation systems under the subtropical conditions of Alabama, to suppress nematode pests of crops such as sorghum and cotton, and improve soil fertility status.

**RATES AND APPLICATION TIMING OF TELONE II FOR THE MANAGEMENT OF RENIFORM AND ROOT-KNOT NEMATODES ON COTTON. J. R. Rich, and R. A. Kinloch, University of Florida, NFREC, Route 3, Quincy, FL 32351-9500, U.S.A.**—Field trials were conducted at separate sites in Florida, one infested with *Rotylenchulus reniformis* and the other with *Meloidogyne incognita*. Telone II (94% 1,3-D) was applied at rates of 14, 28, and 42 L/ha, all at 69, 37, 12, and 0 days before planting (DBP) Delta Pine 458BR cotton at the reniform nematode site, and at 92, 63, 36, and 2 DBP at the root-knot nematode site. All treatments were replicated six times. At the reniform site, the non-treated checks averaged 353 kg lint/ha while Telone II treatment across rates and timing averaged 450 kg/ha. Postharvest reniform soil densities were not influenced by treatment (3 048 reniform/100 $cm^3$ soil from non-treated and 3 040 in the Telone II treatments). Yields in the non-treated checks at the root-knot site averaged 349 kg/ha whereas those in the Telone II treatments averaged 504 kg/ha. All Telone II treatments significantly reduced post-harvest soil densities of root-knot (12 J2/100 $cm^3$ soil across rates and timing) compared with the non-treated checks (460 J2). Factorial analyses of data from both sites indicated that no rate x application timing treatment could be determined as optimal.

However, these studies indicate that early applications of Telone II are feasible and will allow greater flexibility in application prior to cotton planting.

**ORIGINS OF NEMATODE RESISTANCE IN COTTON. A. F. Robinson, and A. C. Bridges, USDA-ARS, 2765 F&B Rd, College Station, TX 77845, U.S.A.**—The most damaging nematodes of Upland cotton (*Gossypium hirsutum*) are *Meloidogyne incognita* race 3 and *Rotylenchulus reniformis*. Nematode resistance in Upland cotton is limited and origins of nematode resistance are unclear because direct comparisons among resistant genotypes are lacking. We compared reproduction by *M. incognita* and *R. reniformis* on selected genotypes under growth chamber conditions. High levels of resistance in the breeding lines Auburn 623 and Auburn 634 were confirmed to result from combining relatively weak resistance in parents of Auburn 623 (Clevewilt 6 and USDA TX-2516). Resistance to *M. incognita* was not detected in three obsolete cultivars in the background of Clevewilt 6 (Wannamaker Cleveland, Wannamaker Dixie Triumph, and Coker Clevewilt 884); resistance was observed, however, in Coker 100W developed from Clevewilt. Resistance to *M. incognita* was confirmed in Bayou and three breeding lines developed from Bayou (LA RN 4-4, LA RN 910, and LA RN 1032), which also were weakly resistant to *R. reniformis*. *G. longicalyx*, reported immune to *R. reniformis*, was resistant to *M. incognita*.

**COMPORTAMIENTO DE *COFFEA CANEPHORA* CV ROBUSTA EN CONDICIONES DE ALTA INFESTACIÓN DE *MELOIDOGYNE MAYAGUENSIS*. M. G. Rodríguez,[1] L. Sánchez,[1] M. E. Rodríguez,[2] L. Gómez[1] y R. Enrique,[1] Laboratorio de Nematología, Centro Nacional de Sanidad Agropecuaria, Apdo. 10, San José de las Lajas, La Habana, Cuba. E-mail: margara@censa.edu.cu,[1] Agencia Agrícola. Ministerio de Ciencia, Tecnología y Medio Ambiente, Cuba.[2]**—Entre 1989 y 1991 se demolieron plantaciones de cafeto (*Coffea arabica* cv Caturra) en la región oriental de Cuba debido a los daños provocados por poblaciones de nematodos agalleros compuestas por *Meloidogyne incognita*, *M. arenaria* y *M. mayaguensis* siendo esta última especie la predominante. En los mismos campos se sembró *Coffea canephora* cv Robusta con resistencia a algunas especies de nematodos agalleros, sin que se conozca su reacción en condiciones de producción, frente a poblaciones donde prevalece *M. mayaguensis*, aspecto que constituye objetivo del presente trabajo. Se evaluaron 250 plantas de entre 8 y 10 años, establecidas en un suelo Pardo Tropical, a una altitud de 250 msnm, y con alta infestación de nematodos. Se evaluó la cuantía del daño en la base del tronco, presencia de agallamiento en las raíces, y el estado general de la parte aérea. Así mismo se determinó la composición específica de las poblaciones de nematodos agalleros, realizando la identificación a través del estudio de los patrones perineales. Más del 80% de las plantas presentaron agallamiento en las raíces y rajaduras en la zona baja del tronco que llegaron a abarcar hasta la cuarta parte de su perímetro, mientras que no se observaron síntomas indicativos de ataque de nematodos en la copa o área vegetativa, lo que sugiere que *Coffea canephora* cv Robusta también resulta tolerante a *M. mayaguensis*

**NEMATICIDAL ACTIVITIES OF IODINATED METHANE COMPOUNDS. R. Rodríguez-Kábana, Department of Plant Pathology, Auburn University, Auburn, Alabama 36849, U.S.A.**—The effect of progressive iodination of methane on the nematicidal properties of resulting iodo-compounds was studied in a greenhouse experiment with field soil infested with root-knot (*Meloidogyne arenaria*) and soybean cyst (*Heterodera glycines*) nematodes. Methyl iodide, di-iodomethane, tri-iodomethane and tetra-iodomethane were applied to soil at rates of 10, 20, 40, 60, and 80 mg/kg soil. Following treatment, the soil was potted and maintained moist in a greenhouse for 12 days when samples (pre-plant) were taken for nematological analysis and pots were planted with 'Brim' soybean. The plants were allowed to develop for 6 weeks when they were removed from soil to determine the weights of fresh shoots and roots, and root galling by *M. arenaria*. Root and soil samples were incubated to assess nematode populations. Pre-plant samples showed that all compounds reduced numbers of *M. arenaria* juveniles (J2) in soil when applied at > 10 mg/kg soil. This same pattern of nematicidal activities was also observed for *H. glycines* except that the compounds were generally more effective against root-knot nematode. The compounds had no significant effect on shoot weights when applied at rates <40 mg/kg

soil; however, the 60 and 80 mg rates of tri- and tetra-iodomethane reduced shoot weights. Data on number of root galls, root-knot index values and soil and root J2 populations of *M. arenaria* and *H. glycines* at the end of the experiment indicated that the overall order of nematicidal activity among the compounds was: tetra-iodomethane > tri-iodomethane > di-iodomethane > methyl iodide.

**NEMATICIDAL ACTIVITY OF RKT-2—A MIXTURE OF BIOFUMIGANT COMPOUNDS. R. Rodríguez-Kábana, Department of Plant Pathology, Auburn University, Auburn, Alabama 36849, U.S.A.—** The nematicidal efficacy of a proprietary mixture (RKT-2) of botanical biofumigant compounds was studied in greenhouse experiments with soil from a cotton field infested with *Meloidogyne incognita*. RKT-2 was applied at rates of 0.1, 0.2, and 0.4 ml/kg soil and placed in plastic trays (25 × 52 × 6 cm) each containing 6 kg soil. The soil was kept moist (60% field capacity) for 10 days when the trays were planted with 'Rowden' cotton (*Gossypium hirsutum*), lentil (*Lens culinaris*), 'Red Globe' radish (*Raphanus sativus*), 'Young' soybean (*Glycine max*), and grain sorghum (*Sorghum bicolor*). Each tray had all crops planted in parallel rows with one crop species/row. Plants were allowed to grow for six weeks and were then removed from soil to determine weights of fresh roots and shoots, root-knot index, number of root galls generated by *M. incognita*, and to assess degree of root galling (root-knot index) and the general appearance of the roots (root condition index). Roots of sorghum and soybean had no galls but those of cotton, lentil and radish were galled heavily in untreated soil. All rates of RKT-2 eliminated root-galling in cotton and radish. Root-galling in lentil was inverse-exponentially and exponentially related to rate. Weights of fresh shoots and roots of all plants but lentil increased in response to the two lowest RKT-2 doses; the 0.4 ml rate was phytotoxic to all plants. No change in weights of lentil shoots or roots was observed in response to RKT-2 applications at 0.1 and 0.2 ml rates. A marked improvement in the general appearance of root systems was noted in response to RKT-2 applications. The number of weeds in the flats declined sharply in response to RKT-2 doses. Results of this study confirm previous work indicating that mixtures of biofumigants have broadspectrum activities against phytonematodes and other soil-borne pests.

**NEMATICIDAL PROPERTIES OF LOW MOLECULAR WEIGHT IODINATED HYDROCARBONS. R. Rodríguez-Kábana, Department of Plant Pathology, Auburn University, Auburn, Alabama 36849, U.S.A.—**The nematicidal properties of iodinated C1-C3 hydrocarbons were evaluated in greenhouse experiments with field soil infested with root-knot (*Meloidogyne arenaria*) and cyst (*Heterodera glycines*) nematodes. Iodomethane, di-iodomethane, iodoethane, di-iodoethane, and 1-iodopropane were added to soil at rates of 0.1, 0.2 and 0.4 ml/kg soil. The treated soil was kept moist for 10 days when soil samples were taken for nematode analysis and 'Brim' soybean (*Glycine max*) planted. Soybeans were allowed to grow for 8 weeks and then were removed from soil to determine plant growth, root-knot indices and the number of galls generated by *M. arenaria*. All rates of the di-iodo compounds resulted in elimination of *M. arenaria* (J2) juvenile populations in soil 10 days after application of the compounds; *H. glycines* J2 populations were eliminated by all dosages of di-iodomethane but only by the 0.4 ml rate of di-iodoethane. Iodoethane and 1-iodopropane were ineffective for control of *M. arenaria* and *H. glycines*. *M. arenaria* J2 soil populations increased directly in response to rates of iodopropane. Iodomethane eliminated root-knot nematode juveniles and reduced *H. glycines* J2 populations when applied at the 0.4 ml rate but was ineffective at lower rates. Di-iodo compounds were the most effective of all compounds in suppressing root galling by *M. arenaria*. Significant suppression of gall formation was obtained with iodomethane and iodoethane applied at > 0.2 ml/kg soil; 1-iodopropane had no significant effect on root knot. All compounds but 1-iodopropane increased fresh shoot weight when applied at > 0.1 ml/kg soil. Results indicate that the di-iodo hydrocarbons are more effective nematicides than the mono-iodo compounds.

**ON THE NEMATICIDAL PROPERTIES OF END-CARBON DI-IODINATED NORMAL LOW MOLECULAR WEIGHT HYDROCARBONS. R. Rodríguez-Kábana, Department of Plant Pathology, Auburn University, Auburn, Alabama 36849, U.S.A.—**The nematicidal properties of di-iodinated C2-C8 normal hydrocarbons was assessed in a greenhouse experiment with field soil infested with *Meloidogyne*

*arenaria* (*Ma*) and *Heterodera glycines* (*Hg*).1,2-diiodoethane (C2), 1,3-diiodopropane (C3), 1,4-diiodobutane (C4), 1.5-diiodopentane (C5), 1,6-diiodohexane (C6) and 1,8-diiodooctane (C8) were applied to soil at rates of: 2.5, 5.0, 7.5, and 10.0 mg/kg soil. The potted soil was kept moist in a greenhouse for 10 days when samples (pre-plant) were collected for analysis and the pots were planted with 'Brim' soybean (*Glycine max*). After 7 weeks of growth the plants were removed and soil samples (final) taken. Data were collected on weights of fresh roots and shoots, root galling by *Ma*, and numbers of nematodes in soil and roots. All rates of C2 and C8 were ineffective in reducing *Ma* juvenile (J2) populations in the pre-plant samples. This was also true for C2 and J2 populations of *Hg*; however, C8 rates > 5.0 mg suppressed J2 populations of *Hg*. C3,C4, C5 and C6 applied at > 5.0 mg virtually eliminated J2 populations of *Ma* and *Hg* in pre-plant samples. Hg J2 numbers in final soil samples were generally inversely related to rates for C3-C8. This pattern of suppression in J2 numbers was also applicable to *Ma* in the final soil samples but only for C3-C6. C2 applications resulted in either no change in *Hg* J2 numbers or in increased numbers. Final numbers of *Ma* J2's in soil increased directly with C2 dosage but did not change significantly in response to C8 rates. Applications of C3-C6 to soil increased shoot weights in a manner directly related to dosages but non-linear in pattern. C2 and C8 increased shoot weights slightly with the 2.5 mg rate but had no significant effect on the variable at higher rates. Number of galls/g root and root-knot index values declined proportionately to increasing rates of C3-C6 but the opposite was observed for C2 and C8. Results showed that C3-C6 were the most nematicidal among the compounds tested.

**ON THE NEMATOTOXIC PROPERTIES OF ETHYLENE DIIODIDE AND METHYL IODIDE. R. Rodríguez-Kábana, Department of Plant Pathology, Auburn University, Auburn, Alabama 36849, U.S.A.**—The nematicidal efficacies of iodomethane (IM) and ethylene diiodide (EDI) were compared in a greenhouse experiment using field soil infested with *Meloidogyne arenaria, Pratylenchus brachyurus,* and *Paratrichodorus christiei.* Each compound was added to soil at rates of 100, 200, 300 and 400 mg/kg soil. The soil was potted and kept moist for two weeks when it was planted with 'Brim' soybean after taking samples for nematological analyses. After eight weeks of growth the plants were removed from the pots, soil samples taken, and data were collected on weights of fresh roots and shoots, general appearance of roots (root condition index) and root gall formation by *M. arenaria.* All EDI rates eliminated *M. arenaria* juveniles (J2) and populations of the other nematodes in the pre-plant samples; IM reduced J2 numbers by 50-70%, eliminated *P. christiei* with the 400 mg rate but had no effect on *P. brachyurus.* There were no galls in roots of plants from EDI-treated soil but significant numbers in those from soils treated with IM. A general increase in weights of shoots and roots was observed in response to the two lowest rates of the two compounds; however, EDI at 400 mg was phytotoxic. The general appearance of roots was improved by EDI at rates < 300 mg but IM had no effect on the variable. EDI applications resulted in roots and soils with no nematodes. *M. arenaria* J2 populations in roots were reduced by 60-70% by IM treatments, but the compound had no effect on root populations of *P. brachyurus.* IM had no effect on J2 populations in the final soil samples although it suppressed *P. christiei,* by 50-70%. Results indicate that EDI is a better nematicide than IM.

**RESPONSE OF THE NEMATOFAUNA TO APPLICATIONS OF ELEMENTAL IODINE TO SOIL. R. Rodríguez-Kábana, Department of Plant Pathology, Auburn University, Auburn, Alabama 36849, U.S.A.**—The effect of $I_2$ on nematode populations was studied in a greenhouse experiment with a soil from a soybean field infested with root-knot (*Meloidogyne arenaria*) and cyst (*Heterodera glycines*) nematodes. Aqueous iodine solution ($I_2$-KI) was added to soil at dosages of 10, 20, 30, and 40 mg $I_2$ /kg soil. The soil was kept moist for 10 days when samples were taken for nematode analysis and 'Brim' soybean planted. After 7 weeks of growth, the plants were examined and soil and root samples were collected. Numbers of the root-knot nematode juveniles in soil determined 10 days after $I_2$ application increased directly in proportion to the amount of iodine added; this was also true for *H. glycines* juveniles but only for concentrations < 30 mg $I_2$ /kg soil. Populations of microbivorous nematodes increased in response to iodine rates but there was no clear pattern of response to the dosages. The

number of *M. arenaria* juveniles/g root, the number of root galls caused by the nematode as well as the corresponding root-knot index values increased in proportion to $I_2$ dosage. *H. glycines* juvenile densities in the roots increased slightly in response to the two highest $I_2$ rates. Iodine was toxic to soybean at rates > 20 mg/kg soil. Results demonstrated that $I_2$ has no nematicidal properties when applied to soil and that it may stimulate hatching of root-knot and cyst nematode eggs.

**DISTRIBUCIÓN DE NEMATODOS ENTOMOPATÓGENOS EN DIFERENTES ZONAS DE ARAGUA, VENEZUELA. L. Carolina Rosales y Z. Suárez H, FONAIAP-Centro Nacional de Investigaciones Agropecuarias (CENIAP), Dpto. de Protección Vegetal, Laboratorio de Nematología, Apdo.4653, Maracay 2101, Aragua, Venezuela. E-mail:carosa@telcel.net.ve.**—El conocimiento que se tiene sobre los nematodos entomopatógenos del país es escaso. Con la finalidad de hacer una prospección para detectar la presencia de los mismos, se realizó un muestreo en diferentes zonas climáticas del Estado Aragua (Venezuela). Se tomaron 63 muestras de suelo provenientes de: sabanas de montaña (4), selvas de galería (5), selva decídua (4), selva nublada de transición (6), espinar (15), cardonal (13) y tierras cultivadas (16). Las muestras se procesaron en el Laboratorio de Nematología del CENIAP, según la metodología de Bedding y Arkhurst (1975). Los nematodos entomopatógenos se recuperaron de seis muestras pertenecientes a las zonas: espinar (3) y selva de galería (3). El pH del suelo estuvo comprendido entre 6.8 y 7.0. Se determinó que todos los nematodos pertenecían al género *Heterorhabditis*. Se logró identificar dos de las poblaciones como *H. indicus* provenientes de Cuyagua (selva de galería) y Bahía de Cata (espinar), especie señalada por primera vez en el país.

**SISTEMAS DE CULTIVO PLÁTANO-MUCUNA Y SU INFLUENCIA SOBRE LA DINÁMICA POBLACIONAL DE NEMATODOS FITOPARASÍTICOS. J. A. Rubiano-Rodríguez y R. Vargas-Ayala, Departamento de Protección de Cultivos, Universidad de Puerto Rico, Recinto de Mayagüez, P. O. Box 9030, Mayagüez P. R. 00681-9030.**—Con el fin de evaluar el efecto de *Mucuna deeringiana* (M) sobre la dinámica poblacional de nematodos fitoparasíticos y el rendimiento del plátano (P), se realizaron dos experimentos, asociación plátano-mucuna (P/M) y rotación mucuna-plátano (M-P), en la Sub-estación Experimental Agrícola de Corozal. En ambos sistemas, la mucuna se cortó a los cuatro meses de sembrada, dejándose sobre el suelo como cobertura orgánica. Los experimentos se arreglaron en bloques completos al azar con cuatro tratamientos (M, M + nematicida, plátano solo (P) y nematicida) y cinco repeticiones cada uno. Se tomaron muestras de suelo durante los primeros 3 meses y luego de raíces cada 3 meses. Las muestras de suelo y raíces se procesaron de acuerdo al método de tamices de Cobb y embudo de Baermann. La dinámica poblacional de los nematodos fitoparasíticos en las parcelas con M en asocio (P/M) fue estadísticamente menor a los 14 meses con respecto a las parcelas con P, pero no así con los demás tratamientos. Durante los primeros ocho meses la población se mantuvo baja en todos los tratamientos. Según los resultados mucuna en rotación mantiene poblaciones más bajas de *Pratylenchus* spp., *Radopholus* spp. y *Meloidogyne* spp. que el tratamiento P. La mucuna en asocio resultó más efectiva que en rotación. Probablemente, esto se deba a que el efecto de mucuna tiene una duración aproximada de ocho meses luego de sembrada. No hubo diferencia significativa entre los tratamientos en peso de racimo y número de frutos en la producción de la planta madre. Este efecto pudiera ser más notable en las plantillas subsiguientes. La mucuna en asocio se podría usar como práctica cultural para manejar la población de nematodos fitoparasíticos en plátano.

**PRÁCTICAS DE MANEJO SUSTENTABLES SOBRE NEMATODOS DEL PLATANERO EN PUERTO RICO. E. D. Saavedra y R. Vargas-Ayala, Instituto Nicaraguense de Tecnología Agropecuaria, Managua, Nicaragua y Universidad de Puerto Rico, Depto. de Protección de Cultivos, Mayagüez, PR.**—En Puerto Rico, el uso de nematicidas y el mondar la semilla son métodos de control para nematodos en plátano (*Musa acuminata* × *Musa balbisiana*). Sin embargo, el uso de agroquímicos es motivo de controversias por los efectos adversos a la salud y al medio ambiente. Se realizaron dos ensayos, microparcelas y campo, para determinar el efecto del asocio y los rastrojos de 4 leguminosas de cober-

tura sobre nematodos del plátano; *Radopholus similis, Meloidogyne incognita* y *Rotylenchulus reniformis.* Las leguminosas evaluadas incluyeron *Mucuna deeringiana, Canavalia ensiformis, Dolichos lablab* y *Crotalaria juncea.* El uso de leguminosas asociadas al plátano redujo la población de *M. incognita* en el suelo, mientras que la población de *R. similis* incrementó. Sin embargo, en ambos experimentos se observó un efecto similar entre canavalia, mucuna y la aplicación de nematicida. El asocio de plátano con mucuna superó significativamente ($P < 0.05$) al resto de los tratamientos en el porcentaje de raíces funcionales del plátano. Ninguno de los nematodos invadió las raíces de mucuna, por el contrario, se observó parasitismo por *M. incognita* y *R. similis* en dolichos, crotalaria y canavalia. Los restos de mucuna, canavalia y dolichos redujeron las poblaciones de *R. similis* en raíces de plátano en el campo. Nuestros resultados muestran que las leguminosas de cobertura en asocio con plátano pudieran reducir el daño por nematodos sin incurrir en el uso excesivo de plaguicidas.

**DESARROLLO E INTRODUCCIÓN DE *HETERORHABDITIS BACTERIOPHORA* CEPA HC1 COMO AGENTE BIOREGULADOR DE PLAGAS INSECTILES. Lourdes Sánchez, Mayra G. Rodríguez, B. Martínez, María A. Martínez, y R. Enrique, Centro Nacional de Sanidad Agropecuaria, Apdo. 10, San José de las Lajas, La Habana, Cuba. E-mail: margara@censa.edu.cu.**—La selección de aislamientos promisorios de nematodos entomopatógenos, y una adecuada infraestructura para la reproducción masiva son elementos imprescindibles para su introducción en sistemas de manejo integrado de plagas. Como resultado de un pesquisaje en diferentes regiones agrícolas de Cuba, se obtuvieron 3 aislamientos de *Heterorhabditis bacteriophora,* que fueron caracterizados morfológica, fisiológica y patogénicamente, utilizándose como insecto modelo larvas de *Galleria mellonella.* La cepa HC1, procedente de cítricos, posee mayor potencial reproductivo, capacidad de búsqueda, patogenicidad y rango hospedante que los restantes aislamientos. Para determinar sus potencialidades como agente de control biológico, se evaluó su efecto sobre el complejo de chinches harinosas (Pseudoccocidae) del cafeto en experimentos "in vitro" y en macetas, comprobándose que en ambos casos la mortalidad del insecto fue del 100%. En condiciones de campo, una aplicación del biopreparado en la base del tallo de plantas de cafeto, disminuyó las poblaciones de chinches harinosas de grado 3 a 1. Ensayos realizados con otras plagas, entre ellas *Atta insularis, Cosmopolitus sordidus, Hypotenemus hampei, Phyllophaga* sp.y *Agrotis* sp., han demostrado que este aislado es altamente efectivo en condiciones de campo. Se ha introducido su cría masiva sobre *G. mellonella* en Centros de Reproducción de Entomófagos y Entomopatógenos (CREE), comercializándose el biopreparado líquido directamente a los productores, lo que ha facilitado su introducción en los MIP.

**RELACIÓN ENTRE EL CONTENIDO DE HUMEDAD DEL SUELO, LA POBLACIÓN DEL NEMATODO AGALLADOR CAUSANDO DECAIMIENTO Y EL DECAIMIENTO DEL CAFETO EN HAWAII. M. Serracin y D. P. Schmitt, Department of Plant Pathology, University of Hawaii, 3190 Maile Way Honolulu, Hawaii 96822 USA.**—El grado de decaimiento del cafeto causado por el nematodo agallador *Meloidogyne konaensis* parece estar relacionado a otros factores. En cafetales donde el riego es usado para complementar las escasas y/o erráticas lluvias los síntomas del daño causado por el nematodo son más obvios. En este trabajo se reporta el efecto del riego sobre la dinámica poblacional de este nematodo. En el mismo, y a objeto de observar el comportamiento de diferentes cultivares y prácticas de manejo se utilizaron plantas de 8 meses de edad de los cultivares Catuai y Tipica, y de 14 meses del cultivar Tipica a pie franco e injertadas sobre *C. dewevri* Lebrun. Los cafetos fueron plantados en parcelas infestadas con el nematodo y sometidos a dos regimenes de humedad de suelo. El primero consistió de suelos cuya humedad provenía de las lluvias, mientras que en el segundo se usó riego complementario. Las poblaciones de nematodos en el suelo fueron seguidas durante 18 meses con muestreos trimestrales. Para todos los cultivares, la densidad poblacional fue mayor al aumentar el contenido de humedad ($p < 0.001$). Sin embargo, analizando las raíces se observó que el número de huevos y juveniles fue más alto en el tratamiento de baja humedad ($p < 0.001$). En el material injertado y en 'Catuai' a pie franco, la densidad poblacional fue significativamente más baja que en el 'Tipica'. El riego tiene un efecto transitorio en el decaimiento del cafeto y sus beneficios, en presencia de altas poblaciones de nematodos, requiere de más estudio. Otro factor de im-

portancia a considerar es el uso de cultivares menos suceptibles y los injertos. Además, estos resultados enfatizan la necesidad de revisar los procedimientos al estudiar la interacción nematodo-suelo-cafeto.

**REPRODUCTIVE POTENTIAL OF *MELOIDOGYNE KONAENSIS* ON COFFEE ROOTSOCKS IN HAWAII. M. Serracin, D. P. Schmitt, and B. S. Sipes, Department of Plant Pathology, University of Hawaii, 3190 Maile Way, Honolulu, Hawaii 96822.**—Two coffee rootstocks were evaluated for their reaction to *Meloidogyne konaensis* (Mk) in the greenhouse. Sections of *Coffea arabica* cv. 'Guatemala' were grafted onto rootstocks of *C. arabica*, 'Guatemala', and *C. dewevri* using the cleft method. Grafted seedlings with 3 pairs of leaves (ca. 6 months old) were transplanted into 24.5-cm-diam. pots containing autoclaved volcanic-ash field soil. Plants were inoculated with 2 500 MK second-stage juveniles. Galling index, reproductive factors, root and soil final populations, as well as plant fresh shoot and root weight, were determined 4 months later at harvest. *C. dewevri* was a poor host of *M. konaensis* (RF = 0.25). Highest number of nematode eggs per gram of dry root weight were recovered from *C. arabica* rootstock. Development rate of nematodes and number of males were different between rootstocks. *C. dewevri* is considered resistant, and therefore could be used in the management of *M. konaensis*.

**NEMATODOS FITOPARASÍTICOS EN EL COMPLEJO DE ENFERMEDADES DE ALGUNOS FRUTALES EN VENEZUELA. Z. Suárez-H., L. Carolina Rosales, A. Rondón y M. Suleima González, FONAIAP-Centro Nacional de Investigaciones Agropecuarias (CENIAP), Dpto. Protección Vegetal, Apdo. 4653, Maracay 2101, Aragua, Venezuela. E-mail: zsuarez@telcel.net.ve.**—En Venezuela, en plantaciones de aguacatero, guayabo, maracuyá, piña y duraznero, se ha observado con frecuencia la presencia de nematodos fitoparasíticos asociados con hongos fitopatógenos, causando pérdidas de un gran número de plantas como consecuencia del complejo de enfermedades. En aguacatero, la presencia simultánea de *Phytophthora cinnamomi* con *Rotylenchulus reniformis* y *Helicotylenchus* spp. en guayabo, la asociación entre *Macrophomina phaseolina*, *Fusarium oxysporum* y las especies *Meloidogyne arenaria* y *M. incognita*. En maracuyá, la relación entre *Phytophthora nicotianae* y *R. reniformis*. En duraznero, la presencia de *M. incognita* con *Phytophthora* y/o *Fusarium*. En piña, se ha observado la relación de hongos que causan deterioro radical y las especies *Pratylenchus brachyurus* y *M. incognita*. En todos los casos señalados, los problemas de enfermedades micóticas eran más severos cuando estaban presentes los nematodos. En condiciones controladas, ya se ha confirmado la asociación en aguacatero y guayabo, por lo que los problemas fitosanitarios de estos frutales en Venezuela no deben ser estudiados aisladamente, buscando un solo organismo causal, sino que deben profundizarse los estudios de asociaciones de organismos patógénos en los complejos de enfermedades, para poder dar respuestas apropiadas a los problemas fitosanitarios. Se adelantan estudios en piña, duraznero y maracuyá.

**THE ROLE OF QUARANTINE OF PLANT PARASITIC NEMATODES IN IMPORTED GERMPLASM AND EMBRAPA'S ACTIVITIES IN BRAZIL. R. C. V. Tenente, V. Gonzaga, M. Prates, and R. C. Razuck, EMBRAPA, C.P, Brazil.**—Plant introduction has been one of the most effective actions for agricultural development in the tropics. Coffee and soybean in Brazil, banana in South and Central America, sugarcane in South America and the Caribbean, and pasture grasses in Latin America, are good examples of successful introductions. But the movement of germplasm involves the risks of introduction of pests, pathogens and weeds that are sometimes carried by plant materials. The Brazilian Government took legislative steps as far back as 1934 to prevent the introduction of exotic pests and diseases and to limit their spread throughout the country. Since then, special regulations have been promulgated according to international requirements. Modifications in the legislation have been introduced as the conditions changed and as new facts became available, either by inclusion of restrictions or by suppressing requirements found to be unnecessary. The plant post-entry quarantine for plant germplasm was evaluated for pests including nematodes. The techniques used for plant parasitic nematodes were Baermann funnel, tray technique, sieving and blending and cyst detection by Fenwick. In general, more than one nematode extraction method is used for germplasm analysis. In 1998, 1013

accessions from several countries were found to be infested by nematodes. Therefore, the risks of nematode introduction and spread within Brazil is evident, and precautions to minimize these risks must be taken, such as eradication techniques to control seed-borne nematodes. *Aphelenchoides besseyi* was associated with rice seeds from Philippines and these were treated by a dry heat method. *Ditylenchus* sp. (juvenile stage) and *D. dipsaci* were found in maize seeds from Mexico and from Chile and were treated with hot water methods. Both thermal treatments eradicated the nematodes from rice and maize germplasm, reducing risks of introducing new nematode species or races in Brazil. It was also observed that these treatments did not reduce the germination, vigor or root size of treated plant germplasm.

**RESISTANT CLONES OF BANANA TO THE NEMATODE *RADOPHOLUS SIMILIS*. R. C. V. Tenente,[1] V. Gonzaga,[1] H. Sales,[1] L. Boas,[1] H. Rocha,[2] S. Silva Neto,[2] and M. Prates,[1] EMBRAPA, Recursos Genéticos e Biotecnologia, CP 2372(70849-970) Brasília, DF, Brazil,[1] and CAMPO, Rodovia LMG 658 Km 55 CEP 38600-000 Paracatu, MG, Brasil.[2]**—Presently, 146 different nematode species belonging to 43 genera, have been found in banana crops. *Radopholus similis* is the most important because it damages primary roots and the plant support system, reducing water and nutrients. Therefore, it is necessary to achieve rigorous control of this nematode using healthy seedlings, biological control and genetic resistance, the latter being the most efficient, practical and economic. Fourteen banana clones were tested for resistance to *R. similis*. The greatest numbers of nematodes were found in the Pacovan variety, which served as standard for the resistance evaluation of the other clones. Some clones showed moderate resistance to *R. similis*, or tolerance to this parasite, under greenhouse conditions.

**EVALUATION OF TACTICS AGAINST ROOT-KNOT NEMATODES ASSOCIATED WITH WATERMELON IN A MARGINAL GROWING AREA OF MEXICO. A. Venegas-B, and N. Marban-Mendoza, Depto. de Parasitología Agrícola, Universidad Autónoma Chapingo, Chapingo, C.P. 56230, Mexico.**—The Mixteca region of Puebla, Mexico, is one of the poorest areas (800 $k^2$) in this central state of Mexico. Within this dry semitropical habitat there are patches of irrigated (wells) land (1200 ha) where close to 800 families have been cultivating corn (rainy season) and watermelons (dry season) for the last 20 years. However, during the last 6-8 years about 40% of the watermelon area has been reduced. This investigation supports the idea that root-knot nematodes (*Meloidogyne incognita* and *M. arenaria*) are among the major pests responsible for these losses. In addition, field trials with local farmers have shown that plastic mulches combined with soil amendment (goat manure) and/or ethoprop gel 68 (500 g/ha) increased yield (47 ton/ha average) compared to that obtained using normal grower practices (8 ton/ha). Nematode population was negatively correlated ($P = 0.05$, Tukey) with watermelon yield. Cost-benefit ratio also was very favorable (5:1) for the best treatments compared with that of the local growers. A state foundation is supporting a program to transfer this new approach for growing watermelons in the area where root-knot nematodes are major pests.

**THE EFFICACY OF VELVETBEAN AND COTTON AS ROTATION CROPS FOR THE MANAGEMENT OF *MELOIDOGYNE ARENARIA* AND *SCLEROTIUM ROLFSII* IN PEANUT. C. F. Weaver, R. Rodríguez-Kábana, D. G. Robertson, and C. R. Taylor. Department of Plant Pathology, Auburn University, Auburn, AL 36849, U.S.A.**—A 6-year (1993-1998) field study rotating 'Florunner' peanut (*Arachis hypogaea*) with 'Alabama' velvetbean (*Mucuna deeringiana*) and 'Deltapine 90' cotton (*Gossypium hirsutum*) was initiated to evaluate the effects on *Meloidogyne arenaria* and *Sclerotium rolfsii* in peanut. Second-stage juveniles (J2) of *M. arenaria* in soil were not detected in velvetbean or cotton plots in any year of the study, whereas peanut monoculture supported high levels (>300 J2/100 $cm^3$ soil) of the nematode. Nematode populations and the incidence of southern blight caused by *S. rolfsii* were lower in peanut following velvetbean or cotton compared to peanut monoculture through the first 4 years of the study, but little reduction was noted in the final 2 years. When peanut was preceded by 1 year of velvetbean or cotton, yields increased 35 and 47%, respectively, over untreated peanut monoculture. Peanut preceded by 2 years of velvetbean or cotton performed equally well but not better than peanut preceded by 1 year of velvetbean or cotton.