

# NINTH SYMPOSIUM

## NEMATOLOGICAL SOCIETY OF SOUTHERN AFRICA

25 to 28 April 1989

Golden Gate Highlands National Park  
near Clarens, Orange Free State

Abstracts of papers and posters

### PAPERS

#### INFLUENCE OF GENOTYPE, GROWTH PERIOD AND PLANT AGE OF GROUNDNUT ON INFESTATION WITH DITYLENCHUS DESTRUCTOR.

Selmaré Basson and D. de Waele. Grain  
Crops Research Institute, Private Bag  
X 1251, Potchefstroom 2520

During the first greenhouse experiment, the population development of Ditylenchus destructor in roots, pegs, shells and seeds of five groundnut cultivars (Sellie, Misga, Norden, Harts, Selmani) and one breeding line (PC137) was investigated. Nematode population densities were lowest in the groundnut genotypes with long growth periods. In the second greenhouse experiment, the population development of D. destructor on three groundnut breeding lines representing a short, medium and long growth period was investigated. The influence of the plant's growth period on the nematode population development was determined. In the third greenhouse experiment, groundnuts (Sellie) were inoculated at three week intervals from planting until 18 weeks after planting to determine the influence of plant age on final nematode population densities.

#### PATHOGENICTY OF DITYLENCHUS DESTRUCTOR ON GROUNDNUT.

Cheryl Bolton and D. de Waele. Grain  
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The pathogenicity of Ditylenchus

destructor on the most common groundnut cultivar, Sellie, was investigated in four glasshouse trials. The initial numbers of D. destructor at planting ( $P_i$ ) and the final numbers at harvest ( $P_f$ ) had no effect on the number of mature pods and seeds per plant, nor shell or root mass. There was an increase in  $P_f$  and a decrease in reproduction ( $P_i/P_f$ ), with increasing  $P_i$ . A rating system was developed for pod and seed symptoms. Positive correlations were found between  $P_f$  in the pods and pod ratings ( $r=0,908$ ),  $P_f$  in the seeds and seed ratings ( $r=0,814$ ) and between pod and seed ratings ( $r=0,887$ ). At  $P_i = 2000/\text{pot}$ , up to 25% of the seeds germinated in field and the mass of the harvested seed was decreased by 20-50%. At the lowest pod symptom rating, 15-20% of the seeds germinated inside the harvested pods. Under the present grading system such seeds are classified as unsound. If a consignment contains more than 15% unsound seed it is downgraded from edible seed (R884/ton) to undergrade seed (about R10/ton). Infested seed cannot be exported or planted.

THE SOUTH AFRICAN PLANT-PARASITIC  
NEMATODE SURVEY (SAPPNS). Hercula  
Coetzee, Plant Protection Research  
Institute, Private Bag X 134, Pretoria  
0001

Data from surveys made by the Plant  
Protection Research Institute and  
other research organisations of plant-  
parasitic nematodes on crops and

natural vegetation are being collected and entered into a DBase III database by the Nematology Section of the Research Institute. This database will be used for research purposes and to compile maps indicating the geographical distribution of the most economically important nematode species in South Africa.

POPULATIONS OF MELOIDOGYNE SPP. IN TOMATO ROOTS ORIGINATING FROM LOW, MEDIUM AND HIGH EGG NUMBERS.

K.C. Daiber, Vegetable & Ornamental Plant Research Institute, Private Bag x 293, Pretoria 0001

Eggs of Meloidogyne spp. at 6000, 30 000 and 180 000 per plant site were applied ten days before tomatoes were planted. Females and eggs of the 1st generation were noted in all treatments on Day 21 after planting.

Infective J<sub>2</sub> from the 2nd generation were observed in the roots on Day 35. A 3rd generation developed from Day 70. Juvenile populations of generations 1 and 2 reflected the ratio at which eggs had been applied (1:5:30). Populations increased more than 140 times from generation 1 to generation 2, populations increased less than 10 times from generation 2 to generation 3. Many males were noted in the 2nd and 3rd generations.

OBSERVATIONS ON HETERODRA SCHACHTII, THE BEET CYST NEMATODE.

K.C. Daiber, Vegetable & Ornamental Plant Research Institute, Private Bag X 293, Pretoria 0001

Cysts of Heterodera schachtii were collected from fields at Rondebult where the nematode is a problem in beetroot and cole crops. The average number of eggs and larvae in these cysts was usually less than 50. Fewer than 5% of the cysts contained more than 100 eggs and larvae whereas 41-77% of the cysts were empty. In contrast, the average number of eggs and larvae per cyst obtained from young H. schachtii populations in potted cabbage plants was up to 119. Almost 50% of these cysts contained 100 eggs and larvae or more, whereas 1-7% of cysts were empty. Larvae emerged continuously for many weeks from cysts kept in moist sand. The

rate at which cysts become empty is discussed.

HISTOPATHOLOGY OF DITYLENCHUS DESTRUCTOR ON GROUNDNUT.

D. de Waele and B.L. Jones, Grain Crops Research Institute, Private Bag X 1251, Potchefstroom 2520

The time, mode of entry and development of Ditylenchus destructor in groundnut were studied in the field and in the greenhouse. Few nematodes were present in the cortex of the roots. At about three to four months after planting, D. destructor was observed in the exocarp at the base of the pod near the point of connection with the peg. From this primary infection site, the peg was invaded. The endocarp was penetrated through openings in the mesocarp, made mostly at the base but sometimes at the apex of the pod. Numerous D. destructor were present in the testa including the vascular bundles. Nematodes were found in the embryo but not in the cotyledons. The histopathology of D. destructor most closely resembles that of Aphelenchoides arachidis, the peanut testa nematode.

INFLUENCE OF TEMPERATURE ON THE IN VITRO REPRODUCTION OF DITYLENCHUS DESTRUCTOR.

D. de Waele and R. Wilken, Grain Crops Research Institute, Private Bag X 1251, Potchefstroom 2520

The effect of temperature on egg production, egg hatch and the development from adult to adult of Ditylenchus destructor isolated from groundnut was investigated. Egg production was highest at 28°C. Five to ten times more eggs were produced at 28°C than at 16°C and 1,5 to 2,5 more eggs at 28°C than at 22, 25 or 34°C. Eggs less than 4 h old and incubated in tap water at 16, 22, 25, 28 and 34°C started hatching from 8, 4, 4, 2 and 2 days, respectively. At 16 and 22°C about 75% of the eggs hatched, more than 90% of the eggs hatched at 25, 28 and 34°C. In groundnut callus tissue, the time required for D. destructor to develop from adult to adult was 12 and 8 days at 16 and 24°C, respectively.

CHEMICAL FACTORS OF MAIZE ROOT EXUDATES AND THEIR INFLUENCE ON THE HATCHING OF PRATYLENCHUS ZEA EGGS. Elsie de Waele, G.C. Loots and C.T. Wolmarans, Department of Zoology, Potchefstroom University for CHE, Potchefstroom 2520

Maize seeds were sterilized, germinated on water agar and transferred to sterile tap water so that only the roots were in contact with the water. Water samples were analysed 5, 7, 9 and 11 days after germination for organic acids and amino acids. Nine organic acids and three amino acids were identified in the water samples collected 9 days after germination. Pratylenchus zea eggs were exposed to each of these acids and to an untreated control for 8 days after which the percentage of hatching was determined. Only exposure to the amino acid lysine caused a significantly higher percentage of hatching.

THE EFFECT OF MELOIDOGYNE INCOGNITA ON GROWTH AND SPECTRAL PARAMETERS OF COTTON, TOBACCO AND MAIZE  
Martie S. Greeff<sup>1</sup>, J. Heyns<sup>2</sup> and P.A.J. van Rensburg<sup>3</sup>, <sup>1</sup>Tobacco & Cotton Research Institute, Private Bag X 82072, Rustenburg 0300, <sup>2</sup>Department of Zoology, Rand Afrikaans University, P.O. Box 524, Johannesburg 2000 and <sup>3</sup>Department of Geography, Rand Afrikaans University, P.O. Box 524, Johannesburg 2000

A replicated greenhouse trial was done with cotton, maize and tobacco using three treatments - control (no nematodes), 2000 M. incognita race 4 and 4000 M. incognita per pot. Observations and measurements were done on plant height, internode length, green mass, root mass, nematode numbers in soil and roots, leaf chlorophyll concentration, leaf anatomy and spectral properties such as reflectance, transmittance and absorptance of upper and lower leaf surfaces. The maize cultivar, Pioneer 473, was more susceptible to root-knot nematode attack than cotton, var. Alpha C, but less than tobacco, var. TL 38, according to the selected plant parameters and the number of nematodes supported by the maize roots. Chlorophyll concentrations in the leaves were

reduced in the presence of nematodes, while no consistent response was noted for leaf thickness. Nematode infestations reduced reflectance of both leaf surfaces and increased transmittance, relative to the control.

EFFECT OF NEMATICIDES ON PEACH TREES IN A REPLANT SITUATION H.J. Hugo, Fruit & Fruit Technology Research Institute, Private Bag X 5013, Stellenbosch 7600

The effect of D-D and different treatments of aldicarb and fenamiphos on young peach trees replanted on an old peach orchard site heavily infested with Meloidogyne javanica was studied. The experiment continued for 5 years. The differences in trunk circumference were highly significant ( $P=0,01$ ) each year, ranging from an average of 303 cm per tree for the best treatment (annual application of aldicarb) to 239 cm for the control at the termination of the experiment. This represents an increase of 27% over the control. There were also highly significant differences in the total yield mass each year. Annual treatments of aldicarb and fenamiphos gave the best results with yields of 39 kg and 43 kg per tree for the third crop, compared to the 25 kg for the control. Initially, nematode numbers were suppressed in the treated plots but after two years there were no differences between the nematode numbers in the control and treated plots.

AN EVALUATION OF GROUNDNUT GERmplasm FOR RESISTANCE TO DITYLENCHUS DESTRUCTOR.

Elizabeth M. Jordaan, D. de Waele and P.J.A. van der Merwe, Grain Crops Research Institute, Private Bag X 1251, Potchefstroom 2520

The groundnut germplasm collection of the Grain Crops Research Institute was screened for resistance to Ditylenchus destructor. This collection consists of more than 600 genotypes from 36 countries. The genotypes were first screened in a field naturally infested with D. destructor. In 116 out of 538 genotypes no D. destructor were found in the hulls or seeds at harvest. The percentage of uninfected genotypes was

lowest in the Valencia and Runner types and in the genotypes with a short growth period. Forty of the uninfected genotypes were then further screened in a greenhouse experiment and artificially infected with D. destructor. Of these 40 genotypes none showed complete resistance to D. destructor but five genotypes had very low infections.

#### A PERSPECTIVE OF PLANT NEMATOLOGY IN SOUTH AFRICA

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The results of a questionnaire survey on the status of plant nematology in South Africa is presented. Plant-parasitic nematodes are major crop pests in southern Africa. Local nematologists have contributed to a better understanding of nematode taxonomy, biology and control but a greater public awareness of plant-parasitic nematodes as crop pests, better career opportunities in nematology, increased funding and competent leadership are required if the present nematological problems of the subcontinent are to be resolved satisfactorily.

#### SOUTH AFRICAN ROOT-KNOT NEMATODES.

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One or more of the four common root-knot nematode species Meloidogyne javanica, M. incognita, M. hapla and M. arenaria occurred in 98% of Meloidogyne populations collected country-wide from various hosts. Meloidogyne javanica has the widest distribution followed by M. incognita, M. hapla and M. arenaria. Other species known to occur in South Africa are M. kikuyensis on sugarcane in Natal, M. acronea on sorghum in the Northern Cape, M. chitwoodi on potatoes in Natal and the Eastern Cape, M. graminicola on grass in the Eastern Transvaal and M. vandervegtei on an unidentified woody plant on the Natal south coast. All these species except M. vandervegtei are economically important.

#### SPERM CELL ULTRASTRUCTURE AND SPERMATOGENESIS IN SOME XIPHINEMA SPECIES

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Spermatogenesis has never been studied in Xiphinema and little information is available on the ultrastructure of the sperm cell. Aspects of these were investigated with the TEM, SEM and light microscope in a few South African species of this genus. The amoeboidal gametes vary from oval-shaped to slightly elongate, with some interspecific but little intraspecific variation in shape. The mature sperm cell lacks a typical acrosome and flagellum but numerous invaginations of the plasma membrane (filopodia) are present. All stages of spermatogenesis were observed in the telogonic testes of young mature males. The central nucleus passes through several phases during germ cell maturation and a nuclear membrane is absent in the spermatozoon. Several perinuclear mitochondria and spheroidal membranous vesicles are visible in the spermatid but are usually less conspicuous in the young spermatozoon. Abscission of the residual body (the cytophore) occurs in the developing germ cell which marks the transition from spermatid to early spermatozoon. Preliminary results obtained in this study seem to confirm the potential taxonomic value of the sperm cells of Xiphinema.

#### NEMATODES AS VECTORS OF PLANT VIRUSES

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Eleven Xiphinema, ten Longidorus, one Paralongidorus, nine Paratrichodorus and five Trichodorus species are implicated in the transmission of 18 plant viruses. Thirteen of these are nepoviruses, two are tobnaviruses and three are not classified by virologists in any group of soil-borne viruses. The virus vector relationship is well established for several of these nematode species, however, it must be reconsidered for Xiphinema americanum and X. coxi, the taxonomy of which was recently reviewed. Some viruses were transmitted only

infrequently by nematodes under experimental conditions and some apparent transmissions were considered to be due to contamination. The work carried out by many authors seems to indicate that establishment and reproduction of trichodorids in the soil is affected by physical and chemical factors more than those of longidorids, but the former are generally the more efficient vectors. The relationship virus-vector-host is more apparent among trichodorids than among longidorids.

EFFECT OF THE CONTROL OF TYLENCHULUS SEMIPENETRANS AND PHYTOPHTHORA NICOTIANAE VAR PARASITICA SEPARATELY AND COMBINED ON REPLANT CITUS TREES AT LETABA

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Effective control of the citrus nematode is not always correlated with a response in tree vigour, growth or production. This study, carried out on a replant orchard, was done to establish the effect of combined nematode and Phytophthora control in orchards infested by both these pathogens as compared to the control of only one of the two pathogens. Twenty months after commencement, the results indicated an increase in dry root mass when compared to the controls of 89% in the metalaxyl plus aldicarb soil drench combination, and 149% in the fosetyl-A1 trunk injection combined with aldicarb soil drench as opposed to 57%, 6% and 52% increases in the metalaxyl, fosetyl-A1 and aldicarb single applications, respectively. Two years later, these results were reflected in both the canopy volume, yield and fruit size. The controls gave 43 kg, aldicarb soil application gave 53 kg and aldicarb plus fosetyl-A1 stem injection 128 kg of fruit per tree. The canopies increased over the same period by 25%, 55% and 72% more than the controls in the aldicarb, fosetyl-A1 and aldicarb plus fosetyl-A1 treatments, respectively. The nematode counts at this stage did not differ statistically as a result of eggs hatching after the nematicide had broken down. This trial emphasises that fact that all factors contributing to the citrus

root rot complex must be identified and dealt with.

OCCURRENCE AND PATHOGENICITY OF MELOIDOGYNE SPECIES TO SOUTH AFRICAN VINEYARDS

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Meloidogyne javanica was found to occur in 73,2% of South African vineyards, M. arenaria in 17,0%, M. incognita in 7,1% and M. hapla in 2,7%. Species occurrence in viticultural regions differed with M. javanica comprising 100% of the populations in the Olifants River Region compared to 50% in the Orange and Vaal River Region. Meloidogyne incognita contributed 38% to populations in the latter region. Pathogenicity to grapevine was found to differ between species and none of the species were able to infest rootstock cultivars generally considered resistant to Meloidogyne. Infestation of vineyards increased with increasing temperature and susceptible rootstocks showed significantly higher galling at 33°C than at 23°C. Resistance breakdown was also evident at 33°C, with moderately resistant rootstocks becoming increasingly infested at this temperature. Meloidogyne javanica populations from different viticultural regions did not differ pathogenetically, morphologically or cytogenetically.

KARYOLOGY OF SOME SOUTH AFRICAN SPECIES OF MELOIDOGYNE

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Identification of some populations of Meloidogyne are difficult because of variant forms and the occurrence of two or more species on the same host plant. To assist in the correct identification of root-knot nematodes it is often helpful to supplement conventional taxonomic parameters with additional information on such aspects as cytogenetics. The method of

reproduction and the number and behaviour of root-knot nematode chromosomes during oogenesis is discussed as well as the value of this data in the correct identification of local Meloidogyne species.

#### EFFECT OF INOCULATION METHODS ON PRATYLENCHUS ZEA DENSITIES IN GRAIN SORGHUM AND MAIZE ROOTS

A.H. McDonald and D. de Waele, Grain Crops Research Institute, Private Bag X 1251, Potchefstroom 2520

The effect of two inoculation methods on population densities of Pratylenchus zae, seven weeks after inoculation, in the roots of six grain sorghum genotypes was evaluated in a factorial greenhouse experiment. The population densities of P. zae per root system, plant height and fresh root mass were significantly higher in all the genotypes in the conventional inoculation method (depressions around the root system) than in the "speedling tray" method. The nematode population density of one genotype was significantly influenced by the inoculation method. In another greenhouse experiment, the effect of six inoculation methods on population densities of P. zae in the roots of one maize genotype, six and ten weeks after inoculation, was investigated. Although high numbers of nematodes were recovered from the maize roots relative to the numbers inoculated, a so-called "multiple seedling" method gave the least variable number of nematodes per root system.

#### OBSERVATIONS ON THE LIFE-CYCLE, TOXICITY AND SPREAD OF ANGUINA AGROSTIS IN THE WESTERN CAPE PROVINCE

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The life-cycle of Anguina agrostis, the nematode associated with annual ryegrass toxicity was studied on a pasture used for grazing cattle in the Malmesbury district. Outbreaks of the disease occurred on this field during 1985. The development of the nematode, together with that of the ryegrass (Lolium sp.) and the bacterium (Clavibacter rathayi) was observed by collecting samples at weekly intervals

during 1986 and 1987. Data regarding duration of the different phases and influence of abiotic factors such as temperature and rainfall was collected and compared to similar data from Australia. Differences between toxic and non-toxic years were investigated, especially with regard to weather conditions in mentioned areas.

#### PREPLANT TREATMENT OF RADOPHOLUS SIMILIS IN INFESTED BANANA LAND

Elmarie C. Rabie, Citrus & Subtropical Fruit Research Institute, Private Bag X 11208, Nelspruit 1200

Six treatments were evaluated for the control of Radopholus similis infesting banana soil. Treatments were an eight month fallow period, eight weeks solarisation, cultivation of a resistant crop (Panicum maximum var. trichoglume) for four months, soil fumigation using methyl bromide at 100 g/m<sup>2</sup>, soil fumigation (methyl bromide at 35 g/m<sup>2</sup>) and solarisation for eight weeks, nematicide treatment with ebufos (2 g ai/m<sup>2</sup>) and untreated control plots. Treatments commenced directly after the removal of infested plants. Radopholus similis populations were determined at monthly intervals during treatments and at three monthly intervals following the establishment of new plants. All treatments except the control treatment reduced R. similis populations prior to planting. During the second evaluation, six months following planting, R. similis was present in high numbers in the fallow and solarisation treatments, however, in the P. maximum treatments the nematode populations were very low.

#### POTENTIAL USE OF NEMATODES IN BIOLOGICAL CONTROL OF WEEDS

M.B. Scott, Department of Agronomy, University of Fort Hare, Alice. Ciskei.

The use of biocontrol agents is normally associated with insects and to some extent fungi. There are certain nematode species, however, which show potential for biological control of both insects and weeds. Nematodes have many attributes which make them ideal as biocontrol agents, viz. their host specificity,

anhydrobiotic behaviour, the ability to vector pathogenic microorganisms, host-finding ability and ease of rearing. This paper reviews the use of nematodes as potential biocontrol agents against weeds with special emphasis on current research being conducted at the University of Fort Hare to investigate the potential of Orrina phyllobia, a leaf-galling Anguinidae, for the biocontrol of satansbos (Solanum elaeagnifolium), an introduced perennial weed.

#### INTERACTION BETWEEN NEMATODES AND RATOON SUGARCANE

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Field trial data show that nematodes reduce yield of ratoon cane in South Africa but have little effect in Burkina Faso. This is despite the fact that in both localities nematodes have a marked effect on plant cane. To explain this difference field trials were established in ratoon cane in the two countries; nematode populations and the development of the cane were monitored at intervals. In Burkina Faso, few Meloidogyne and Hoplolaimus were recovered from roots during the entire period of shoot establishment. Numerous Helicotylenchus dihystra were present in the soil but there was no corresponding reduction in number or length of stalks. In South Africa, where both these growth parameters were affected by nematodes, Xiphinema and Paratrichodorus were abundant and were associated with marked symptoms of damage on the roots. Meloidogyne and Pratylenchus species were abundant in the roots except during the early, critical period of shoot establishment. It was tentatively concluded that differences between the two localities were primarily due to the difference in the ectoparasites.

#### ENTOMOGENOUS NEMATODES TO CONTROL THE SUGARCANE STALK BORER, ELDANA SACCHARINA

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Private Bag x 02, Mount Edgecombe 4300

The results of several field tests to assess the performance of a Heterorhabditis species against larvae of Eldana saccharina in sugarcane are described. The effectiveness of the nematodes, applied to the cane in an aqueous spray, increased as their concentration increased and was almost doubled when the suspension was applied at a rate of 200 ml per stalk than at 100 ml per stalk. More Eldana larvae were killed when the nematodes were applied in the late afternoon than when applied at midday. Removing the pendant blades of the leaves from the cane stalks prior to spraying had little effect on the efficacy of the nematodes, but removing both the leaf blades and leaf sheaths reduced their efficacy. The addition of various chemicals to thicken the suspension did not improve the performance of the nematodes.

#### EFFECT OF NEMATODES ON TOBACCO DEVELOPMENT

Elizabeth R. van Biljon and Martie S. Greeff, Tobacco & Cotton Research Institute, Private Bag X 82075, Rustenburg 0300

Trials were conducted over three seasons to evaluate the effect of various chemicals on the nematode species attacking tobacco. The soil types varied from sandy soils (10% clay) to soils with a clay content of 30%. An attempt was made to determine whether there is any correlation between the nematodes present in the soil and roots of the tobacco plant and the development of the plant. Nematode species included Meloidogyne spp., Pratylenchus spp., Criconema spp., Tylenchorhynchus spp. and Hoplolaiminae. Parameters such as plant height, green mass, leaf length, leaf width, bottom, middle and top internode lengths were used to determine to what extent nematodes can stress the growth and development of tobacco plants. The initial infestation was an average of 6 nematodes per 200 ml soil. Nematode damage was responsible for a 12% reduction in plant height, leaf length and middle internode length, a 16,7% reduction in leaf width and a 42,1% reduction in

green mass.

#### LARVAE OF A PARASITIC WASP PREYING ON ANGUINIDAE

Esther van den Berg, Plant Protection Research Institute, Private Bag X 134, Pretoria 0001

Galled leaves and stems of a weed, Arctotheca calendula, found in the veld near Grahamstown contained specimens of Subanguina mobilis as well as immature stages of a parasitic wasp, Tetrastichus sp. From subsequent collections of infested leaves and stems in the western Cape the nematode was found but not the wasp. At this stage the relationship between these two organisms was not known. Late in 1988, galls collected from Knysna again contained S. mobilis but also wasp larvae. Two wasp larvae were found ingesting nematodes indicating that the larvae most probably prey on the nematode. This is the first time such a relationship has been recorded.

#### NEMATOLOGY AT DISNEY WORLD

Karen R. Wendt, Tobacco & Cotton Research Institute, Private Bag X 82075, Rustenburg 0300

The Land Pavilion in Walt Disney World's EPCOT Centre in Florida comprises five greenhouses which showcase world agriculture for thousands of visitors annually. An integrated pest management programme is implemented by a staff of 30 behind-the-scenes scientists including agronomists, agricultural engineers, entomologists, plant pathologists and nematologists. Root-knot nematode (Meloidogyne spp.) is a devastating problem at the Land Pavilion. Researchers there emphasise unconventional nematode management practices such as trap crops, bag culture, greenhouse pasteurization and biological control using a minimum of lethal chemicals. The facilities at the Land Pavilion provide an unique opportunity for futuristic research in nematode and plant disease management.

#### THE INFLUENCE OF SOIL AND PLANT MATERIAL FUMIGATION ON THE PRODUCTION OF QUEEN PINEAPPLES IN ZULULAND

P. Willers<sup>1</sup>, G.J. Petty<sup>1</sup>, G.

Smart<sup>1</sup> and D. Marx<sup>2</sup>, <sup>1</sup>Citrus & Subtropical Fruit Research Institute, Private Bag X 11208, Nelspruit 1200 and <sup>2</sup>Landkem (Pty) Ltd., P.O. Box 52437, Saxonwold 2132

Queen pineapple propagation material fumigated with methyl bromide (40 g/m<sup>3</sup>) performed significantly better than unfumigated plant material on soil fumigated with either methyl bromide or EDB and on unfumigated soil. The advantages of fumigated plant material were reflected in higher yield, fewer small fruit and an increased proportion of marketable fruit. The best results were obtained when fumigated plant material was used on methyl bromide-fumigated soil. A comparison of the methyl bromide plots with EDB fumigated and control plots indicated that nematode damage was responsible for 32,5% yield reduction and an increase in small fruit (450 g) of 49%.

#### POSTERS

##### THE SEM, AN AID TO TAXONOMY

Naomi H. Buckley and Esther van den Berg, Plant Protection Research Institute, Private Bag X 134, Pretoria 0001

The scanning electron microscope (SEM) is a useful tool for the identification of nematode species. Seven species of Hemicycliophora are illustrated in which the SEM was used to complement the original drawings and descriptions. The SEM was mainly used to study the form and arrangement of structures on the lip region that could not be clearly seen under the light microscope. Details of the lateral field were also examined with the electron microscope.

##### ADVANCES IN NEMATODE-RESISTANCE BREEDING OF ORIENTAL TOBACCO

A.P.F. Cornelissen, Tobacco & Cotton Research Institute, Private Bag X 82075, Rustenburg 0300

Crosses between root-knot nematode (Meloidogyne spp.) resistant sources developed by the author and four oriental tobacco varieties/breeding lines have been evaluated for resistance in glasshouse trials and in



natural populations in the Piketberg area. The F1 hybrids between KNST 1, KNST3, KNST 12 and Elsoma, (Elsoma x S 23 c/c) and (Samsun x (Cavalla)) F8 were planted at Piketberg and the seed bulk-harvested. The F2 generation was evaluated for resistance in Uni-Gro trays as well as on the same site as the F1's. The infestation rating of the F1 and F2 populations was midway between that of the parents. The least susceptible plants in the F2 with the best resemblance to oriental tobacco were selected and seed harvested for the F3 trials.

#### PENETRATION OF FIVE NEMATODE SPECIES INTO RHIZOME TISSUE OF THE WILLIAMS BANANA CULTIVAR

Karen de Jager and Elmarie C. Rabie, Citrus & Subtropical Fruit Research Institute, Private Bag X 11208, Nelspruit 1200

The spatial distribution of Radopholus similis, Helicotylenchus spp., Meloidogyne spp., Pratylenchus spp. and a Paratylenchus sp. was studied by dissecting six Williams cv. rhizomes. Epidermal, cortical, medulla and transitional tissues as well as internal root tissue were separated for extraction and counting of nematodes. Most nematodes of all five species were located in the epidermal and outer cortical tissues. However, R. similis, Meloidogyne spp. and the Paratylenchus sp. penetrated via the root tissue to the deeper cortical and medulla tissues. These findings render the paring practice, which aims to produce nematode-free rhizomes, a dubious method.

#### INOCULATION TECHNIQUES FOR PRATYLENCHUS ZEAЕ ON COTTON

Isabella du Plessis and Elizabeth R. van Biljon, Tobacco & Cotton Research Institute, Private Bag X 82075, Rustenberg 0300

Different inoculation techniques for Pratylenchus zeaе were evaluated on cotton. Various inoculation levels were used in conjunction with Terra-sorb or water suspension. Root development was improved with the use of Terra-sorb whilst the larvae and adult Pratylenchus zeaе were negatively influenced by Terra-sorb.

#### DISTRIBUTION OF XIPHINEMA IN SOUTH AFRICA

Mieke Hutsebaut, Department of Zoology, Rand Afrikaans University, P.O. Box 524, Johannesburg 2000

During the past 30 years, many samples collected in South Africa have contained Xiphinema (Nematoda : Longidoridae). These data, accumulated in a more or less haphazard way during surveys and collecting trips, consist of samples from cultivated land as well as from indigenous vegetation in virgin areas. A few intensive surveys on crops in specific areas were also conducted. In southern Africa, 54 of the 177 known species of Xiphinema have been found which strengthens the view of Coomans (1985) that the region may be the place of origin of the Longidoridae.

#### DEVELOPMENT OF MELOIDOGYNE JAVANICA ON GRAPEVINE ROOTSTOCKS CULTURED ON ARTIFICIAL MEDIA

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Grapevine rootstock cultivars were cultured on different media using 10 mm growth tips. Proliferation and rooting were initiated separately by adding different growth hormones to the medium. Root cultures were successfully established on both complex commercially available mediums and a single one developed during the study. Surface sterilised egg-sacs of Meloidogyne javanica were used to inoculate root cultures and the nematode development on different cultivars was determined. Egg hatch and larval attraction to different cultivars at different temperatures were compared. Larvae penetrated and developed on susceptible cultivars only. However, hatching and larval attraction did not differ between resistant and susceptible cultivars.

#### INVOLVEMENT OF ROOT-KNOT NEMATODE IN FALSE PANAMA DISORDER OF BANANAS

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Several stress factors including root-knot nematode are apparently involved in the onset and etiology of the False Panama Disorder of bananas in South Africa. A standard host test for the identification of Meloidogyne species and races was carried out in the glasshouse using populations from the production areas of Levubu, Hazyview and Tzaneen. Meloidogyne incognita races 1 and 2, M. incognita race 1 and M. javanica were identified from Hazyview and Levubu, respectively. Meloidogyne javanica was present in the Tzaneen area. Meloidogyne incognita race 1 has not been recorded in South Africa previously.

SEM STUDY OF THE GENERA SELEBORCA AND ACROBELES (NEMATODA: CEPHALOBIDAE)  
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Andrássy, 1985 proposed the genus Seleborca which is very similar in head structure and other morphological features to the genus Acrobeles von Linstow, 1877. He differentiated Seleborca by the presence of a "double" cuticle and the structure of the cuticle and lateral field. The relationships of both genera are discussed based on a scanning electron microscope study of the diagnostic characters.

THE CONTROL OF TYLENCHULUS SEMIPENETRANS IN CITRUS SUPERPLANT NURSERIES IN THE R.S.A.

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The citrus nematode, Tylenchulus semipenetrans, is a major problem in commercial citrus orchards. One of the sources of infestation is the nursery. During the past few years, citrus nurseries participating in the Citrus Improvement Programme (Superplant-scheme) have achieved great success in maintaining a nematode-free status. Using non-contaminated water, fumigating potting mixes, restricting movement between nursery and commercial orchards and utilizing registered chemicals for

control (aldicarb and fenamiphos) have contributed to this success. Regular sampling for laboratory diagnosis, ensures the continual freedom from nematodes. This presentation provides data highlighting the important aspects employed in nematode control in citrus nurseries.

NOTES ON THE IN VIVO CULTURE AND PATHOGENICITY OF SPECIES OF HETERORHABDITIS AND STEINERNEMA  
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Populations of Heterorhabditis and Steinernema were isolated from soil samples by means of Bedding & Akhurst's method of baiting soil. Larvae of Eldana saccharina were used as the bait and for the subsequent culture of the nematodes. Laboratory tests showed that a) a species of Heterorhabditis was more pathogenic to Eldana larvae than three species of Steinernema, b) Eldana pupae were less susceptible to the Heterorhabditis and a Steinernema than were the larvae, c) the Heterorhabditis was more pathogenic at 24°C than at 18°C, and d) more progeny were recovered from larvae exposed to 25 infective stages Heterorhabditis per larvae than from larvae exposed to 10, 100 or 1000 infectives. Infectives of the Heterorhabditis could be stored for more than 8 months at 10°C. The problems associated with rearing Heterorhabditis on a cannibalistic host were avoided by containing individual Eldana larvae in 10 ml dome-shaped plastic cells, with four cells per 90-mm-diameter petri dish.

PRATYLENCHUS BRACHYURUS IN THE ROOTS OF ZEA MAYS

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Pratylenchus brachyurus within the roots of Zea mays was studied using both light microscopy and TEM. The findings were compared with those available for P. zae in the roots of Z. mays. Pratylenchus brachyurus penetrated the root in the root hair zone but also in other areas such as the extreme apex of the root. There

was some aggregation of nematodes at the penetration sites. Pratylenchus brachyurus differs markedly from P. zae in that after penetration many individuals move parallel to, and just under the epidermis giving rise to spaces between the epidermis and underlying cortical cells. Several nematodes were noted within the stele and even inside the vascular tissue. The light microscope and TEM showed that there were conspicuous differences in the colour and texture of infested root cells and that there was a dissolution of the cytoplasm.

#### NEW RECORD OF THE LITTLE-KNOWN FAMILY TERATOCEPHALIDAE FROM SOUTH AFRICA

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Teratocephalus lirellus Anderson, 1969 and Metateratocephalus crassidens (De Man, 1880) Eroshenko, 1973 are recorded for the first time from South Africa and a new species, T. diversiannulatus, is described from the same locality. The soil samples were taken on the summit of a narrow ravine (altitude 1350 m) in the Hottentots Holland Nature Reserve, Cape Province. This area receives an annual rainfall of about 350 mm and the vegetation consists mainly of Cape Fynbos and mosses. The specimens were studied with the aid of the scanning electron microscope (SEM) and their general morphology as well as a few new features are depicted in photomicrographs. This study also led to an emended diagnosis of Metateratocephalus.

#### COMPARISON OF INOCULATION TECHNIQUES ON TOBACCO

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In this study, various techniques to inoculate tobacco with Meloidogyne incognita race 4 were evaluated. Eggs, larvae and a combination of eggs and larvae were used as an inoculum in Terra-sorb or water. Both root development and the inoculation of M. incognita eggs were improved with Terra-sorb but M. incognita larvae were negatively influenced by the use of Terra-sorb. Using 0,25 g of infested roots as inoculum proved to be the best method of inoculation.

#### CONTROL OF ROOT-KNOT NEMATODE IN GINGER PLANTINGS

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Yield loss in local ginger plantings can exceed 50% in the presence of the root-knot nematodes Meloidogyne javanica and M. incognita. Control of these species can be facilitated by dipping propagation material in a systemic nematicide solution (1000 mg/kg for 60 min) and by a preplant fumigation with EDB (50 ml/m<sup>2</sup>). EDB can be replaced by hotgas methyl bromide (50 g/m<sup>2</sup>) applied under gastight sheets, or dazomet (50g/m<sup>2</sup>). Methyl bromide or dazomet is used when control of Nigrospora leaf spot, nutgrass and nematodes is required. Postplant nematode control is achieved by using fenamiphos granules in the plant furrow at a rate of 10 g/m and a follow-up treatment as a side-dressing at 5 g/m. Supplementary control measures are a 3 yr crop rotation programme and the organic amendment of soil.