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ABSTRACTS

RESPONSE OF PLANT-PARASITIC NEMATODES TO SOIL SOLARIZATION, ETHYLENE DIBROMIDE, AND FALLOW
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A field trial to determine the effect of 3 week or 6 week solarization, fumigation with 600 l/ha ethylene dibromide (EDB, 450 g a.i./l), and fallow on the population of plant-parasitic nematodes was done during December 1983 to January 1984. Average daily maximum soil temperatures were 46, 40 and 30 C in solarized plots and 36, 33, and 29 C in fallow plots at 5, 15, and 30 cm depths, respectively. Results from soil samples analyzed following treatment by 6 week solarization showed population reductions of 77 to 95% from initial levels of *Pratylenchus pratensis*, *Rotylenchus incultus*, *Criconebella xenoplax*, *Paratrichodorus lobatus* plus *Nanidorus minor*, but less reduction of *Meloidogyne javanica*. EDB reduced populations of all genera 96 to 100%. 3 week solarization and fallow treatments were less effective. During 6 months following the field trial, populations in EDB plots were generally lower than in other treatment plots, except 6 week solarization resulted in the greatest long-term reduction of *P. pratensis*. Results indicate that 6 week solarization is an effective method of lowering the populations of many plant-parasitic nematode genera, but not as effective as 600 l/ha EDB fumigation.

STUDIES ON THE RELATIONSHIP BETWEEN NEMATODES AND SUGARCANE IN SOUTH AND WEST AFRICA : PLANT CANE
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In West Africa (WA) the loss in yield of the sugarcane plant crop caused by nematodes is due largely to a decrease in the number of stalks while in South Africa (SA), it is due more to a reduction in length of stalks. To explain this difference, studies were made of the growth of sugarcane and associated changes in numbers of plant-parasitic nematodes in nematocidal trials in the two localities. In both trials numerous endoparasites invaded the sett roots during the period when tillering was suppressed in untreated plots but the rate of invasion was much greater in WA. In SA, a marked difference in length of stalks between nematocidal-treated and untreated plots was associated with an increase in the population densities of *Xiphinema*, the dominant ectoparasites. In WA however, where the cane was irrigated, there was only a small difference in length of cane between treated and untreated plots, despite the presence of large numbers of *Meloidogyne* and *Pratylenchus* in the shoot roots. *Helicotylenchus dihystrera* was the dominant ectoparasite in WA. Possible reasons for the differences in the reaction of sugarcane to nematode control in SA and WA are presented.

GEOGRAPHICAL DISTRIBUTION AND ECOLOGY OF VIRUS-VECTOR NEMATODES (TRICHOODORIDAE AND LONGIDORIDAE) IN BELGIUM
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The European Plant Parasitic Nematode Survey (EPPNS), an international research project, deals with the geographical distribution pattern of virus-vector nematodes and the abiotic and biotic factors influencing this distribution pattern. As a part of the EPPNS 2015 soil samples have been taken during the national survey at 908 sites in Belgium from 1977-1982. Ten species belonging to the family Trichodoridae and fifteen species belonging to the family Longidoridae were found; fifteen of these species being reported for the first time. An analysis of the environmental factors that influence their occurrence and abundance shows that each species has its own habitat requirements. Because such information is very valuable for nematode pest management a proposition is made to all nematologists present to start a South African Plant Parasitic Nematode Survey (SAPPNS). Some suggestions for data base management (data acquisition, input, manipulation, computer programs for mapping, data tabulation and analysis) are made.

FRESHWATER NEMATODES: INDICATOR VALUE BASED ON CHEMO-PHYSICAL PARAMETERS
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The effect of pollution on nematode populations was studied during a twelve month period in Skidderspruit, Pretoria. Samples for nematode counts and for the determination of eighteen chemo-physical parameters were taken at monthly intervals from August 1978 to July 1979 in nine different sampling stations. It was found that the general population composition as well as the correlation between the nematode species and certain chemo-physical parameters, such as conductivity, concentration of NH_4 -nitrogen, chloride and soluble reactive phosphate, calcium hardness, organic carbon content and clay content of the substrate gave an indication of the degree of pollution which apparently varied between mesosaprobic and polysaprobic. The degree of saprobicity varied at different sampling stations and at different times of the year. Secernentea was generally limited to polysaprobic, and the Adenophorea to mesosaprobic habitats. Based on the correlations which the dominant species showed with the abovementioned chemo-physical parameters, a saprobicity index was devised whereby the indicator value of each dominant species was determined. This showed *Paratolaimella bernensis*, *Rhabditis (Ce) oxyerca* and *Anchidiplogasteroides stigmatus* to be polysaprobic indicator organisms, while *Tobrilus diversipapillatus*, *Medosorylaimus intermedium*, *Mononchus aquaticus*, *Monhystera somereni*, *M. filiformis* and *Dorylaimus asyphydorus* were indicators of mesosaprobic conditions.

DETERMINING AT WHICH STAGE IN THE DEVELOPMENT OF THE TOBACCO PLANT NEMATODE DAMAGE IS MOST PREVALENT
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The influence of the age of a tobacco plant and the time of inoculation was determined. Tobacco seedlings were inoculated with 8000 per pot as 1, 14, 35, 56 and 77 days after transplanting. The age of the tobacco plant and the time of inoculation are apparently related to the amount of damage done to yield. Infection decreased as the age of the plant increased. The tobacco yield could be increased significantly if *M. javanica* were controlled adequately during the first month of growth.

EVALUATION OF A TECHNIQUE FOR STUDYING EGG HATCHING OF MELOIDOGYNE JAVANICA IN SOIL AT A KNOWN CLAY PERCENTAGE
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The determination of the hatching ability of *M. javanica* eggs by means of the Agar-slide technique (Johnston, 1968) was complicated by the heavier clay soils of the tobacco growing area of Rustenburg. In preliminary experiments it was not possible to retrieve the known number of hatched or unhatched eggs. This illustration shows a simplified technique for studying the hatching of *M. javanica* eggs exposed to soil with different clay percentages. A single egg mass is covered by a known percentage of clay soil in a container. The control is de-ionized water. After a seven day incubation period at 27°C in a growth chamber, the hatched and unhatched eggs are examined microscopically. The percentage eggs and juveniles retrieved when using different average per egg mass is highly significantly better. Data obtained with the glassing technique is probably more accurate and successful for different clay soils than any other technique.

A SURVEY OF ROOT-KNOT NEMATODES (MELOIDOGYNE SPP.) IN SOUTH AFRICA
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A current survey to determine species and biotype distribution of root-knot nematodes is aimed at assisting growers to devise crop rotation systems for control of the nematodes, resistance in crop types and cultivars being species or biotype specific. The information will also be of use to plant breeders for developing resistant or tolerant crop cultivars. To date, only the warmer regions of the Transvaal and Natal have been surveyed. In the 55 populations already examined, *M. incognita* predominates (72% of the samples) followed by *M. javanica* (6%), *M. hapla* (4%), and *M. arenaria* (2%). A number of these populations (22) contained both *M. incognita* and *M. javanica*, and one population both *M. incognita* and *M. hapla*. Biotype determination is under way.

'N VERGELYKENDE ELEKTROMIKROSKOPIESE STUDIE VAN DIE ESOFAGEALE STREK VAN *LONGIDORUS PISI*, *LONGIDOROIDES HOOPERI* EN *PARALONGIDORUS DEBORAE* (NEMATODA: LONGIDORIDAE)

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G.C. Loots en L. Tiedt, Potchefstroomse Universiteit vir CHO, Potchefstroom

Eksemplare van bogenoemde spesies is gemikrotomeer en onder die transmissie-elektromikroskoop bestudeer. Snitte is gemaak deur die cheilostoma, stekel, amfiëde, faringostoma, protraktorspiere odontofoor, anterior esofagus, middel esofagus en basale bulbos. Opvallende verskille tussen die drie spesies is gevind, by veral die amfiëde, die protraktorspiere ten opsigte van rangskikking en aanhegting, die odontofoor ten opsigte van kutikulêre struktuur, faringeale retraktorspiere van die anterior esofagus ten opsigte van getal, rangskikking en aanhegting, asook die kutikulêre plaatjies in die basale bulbos. Hierdie studie word voortgesit op verdere verteenwoordigers van bogenoemde genera, om vas te stel of die waargenome verskille moontlik konstant is by alle spesies binne elke genus, met ander woorde, of dit diagnosties is vir genera, of slegs vir spesies.

THE ASSOCIATION OF *PRATYLENCHUS* SPP. AND ROOT-ROT FUNGI *FUSARIUM MONILIFORME* AND *DRECHSLERA ZEICOLA* ON MAIZE

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The effect of the interaction between lesion nematodes, *Pratylenchus* spp. and root-rot fungi, *Fusarium moniliforme* and *Drechslera zeicola* on maize was studied. Pilot tests for standardizing of potsize, cultivars, inoculation techniques and culture techniques were done. Plants were inoculated including the following six treatments. a. Nematodes alone, b. fungi alone, c. nematodes and fungi, d. nematodes 3 weeks prior to fungi, e. nematodes 3 weeks after fungi and f. untreated control. Results indicated interactions between the nematodes and root-rot fungi. In each case, the combination of *Pratylenchus* spp. and *F. moniliforme* or *D. zeicola*, tended to decrease the top growth and increase the rootrot percentage, more than when *Pratylenchus* spp. or the fungi were used separately. The inoculation of plants with *Pratylenchus* 3 weeks after *F. moniliforme* and *Pratylenchus* + *F. moniliforme* simultaneously, had the highest overall adverse effect on maize. No synergistic effect was found.

VARIABILITY OF TAXONOMIC CHARACTERS IN *MELOIDOGYNE*

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Considerable variation exists in the characters used to separate the four agriculturally important species of *Meloidogyne*. Any population of any of these species contains both typical and atypical specimens. Experience of the extent of variation can be gained by examining many populations from many localities. Correct identification requires the use of all possible characters in as many specimens from a population as can be managed, using relatively stable key characters in combination with less stable, supplementary characters. Males have fewer useful features than females, but variability is less.

POPULATION DYNAMICS OF *XIPHINEMA VANDERLINDEI* ON GRAPEVINE

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The seasonal fluctuations of *Xiphinema vanderlindei* populations were studied in a vineyard growing on sandy soil at Vaalharts. Root growth flushes of the grapevine were determined and soil temperature and moisture levels were recorded. Rainfall and irrigation schedules were noted for the 21 months observation period. Juvenile and adult populations were high during the post-harvest period (March - May, 1983) when the first root flush was observed. Population levels declined during the first winter and were fairly constant during spring and summer when the second root flush occurred. Nematode numbers again increased during March and April 1984. During the second season, however, a peak was observed during July and populations were significantly higher during the second spring and summer although still lower than in autumn. Nematode numbers could not be directly correlated to either soil temperature or root flushes since high and low populations occurred throughout the year. Soil moisture equally did not seem to influence peak or low populations of *X. vanderlindei* under prevailing field conditions.

A PRELIMINARY REPORT ON EXPERIMENTS WITH NEMATOCIDES IN GREEN PEA FIELDS

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During the last decade the cultivation of green peas for the frozen food and canning markets has extended considerably. In many cases, however, the yields did not reach the expected levels. Among different factors which could be responsible for this phenomenon plant-parasitic nematodes were mentioned, but nematocidal treatments of green peas were considered uneconomical. In the Australian wheat production areas this problem was solved by applying reduced amounts of soil fumigants in the planting furrow for the control of *Heterodera avenae*. It was decided to test this method for the control of *Meloidogyne* spp on green peas. During the 1983 and 1984 seasons the application of reduced dosages of nematocides during the planting process was tested in 5 experiments, in which dichloropropene (DCP), ethylene dibromide (EDB), and fenamiphos (Nemacur) at reduced rates (4 to 32%) were included as test compounds. In four experiments the plants were infested with *Meloidogyne* spp and in one experiment with *Pratylenchus penetrans*. In all experiments an improvement in plant growth was observed. In one experiment yield increases of up to 100% were obtained.

POSSIBLE ALTERNATIVE METHODS FOR THE APPLICATION OF SYSTEMIC NEMATOCIDES ON BANANAS

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Two methods were investigated to facilitate the direct introduction of systemic nematocides into banana mats. Two of the advantages of these methods could be a considerable saving of active ingredient per ha treated and a slight or nonsignificant interference with the ecosystem in banana plantings when compared to conventional soil applications. Fenamiphos granules were applied on the cut back pseudostems yielding the previous crop. It was applied once at the rate of 20 g commercial product in August or twice at this rate in August and mid October. Oxmyl was applied undiluted by syringe in the leaf axils of plants at dosage rates of 5 ml (twice) or 10 ml (once) per plant at the same time intervals as fenamiphos. No permanent phytotoxicity was observed with any of these treatments and plants responded well in some instances. Parameters monitored during these trials will be leaf formation, stem diameter, nematode numbers and yield. These trials are to be continued over three seasons.

TESTING THE RESISTANCE OF TOBACCO LINES TO *MELOIDOGYNE JAVANICA* IN THE PRESENCE OF OTHER ROOTKNOT NEMATODE SPECIES

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Using a split root technique, eight week old tobacco seedlings of the susceptible K51E and two *Meloidogyne javanica*-resistant breeding lines were inoculated on one side with eggs of either *M. javanica*, *M. incognita* race 1 or race 3, or left uninoculated. Two weeks after the first inoculation, all plants were inoculated with *M. javanica* eggs, on the second side of the root system. Plants were grown for six weeks and then examined for galling and eggmasses were counted after staining with Phloxine B. Both breeding lines were found to be resistant to the two races of *M. incognita*, as well as to *M. javanica*. Therefore, where *M. incognita* was inoculated on to one side of the root, there was little or no infection and so little possibility of a change in root physiology which would lead to a breakdown of resistance to *M. javanica*. Consequently, resistance to *M. javanica* was maintained in the breeding lines following inoculation with *M. incognita*, while the susceptible K51E became infected by whichever inoculum was used.

AN EVALUATION OF DIFFERENT NEMATOCIDES AS CONTROL MEASURES OF NEMATODES ON MAIZE

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Two trials were carried out in the Highveld Region over two consecutive growing seasons, to evaluate the registered nematocides carbofuran, aminofuracarb, terbufos, carbosulfan and aldicarb as control measures against plant parasitic nematodes, occurring in soils under maize production. Although nematode numbers were on average low in the trial soils, the most abundant nematodes found, were the endoparasitic *Pratylenchus* spp. The ectoparasitic genera *Rotylenchulus*, *Xiphinema* and *Longidorus* also occurred in reasonable numbers. Assessments made in these trials were of nematode numbers, drymass of maize plants, plant populations and yield. Physical analyses of the soils were carried out and rainfall and daily soil temperatures were monitored. Although soil moisture and temperature had some effect on the different nematocides, the results showed no appreciable differences in the effectiveness of the applied nematocides with regard to nematode control. Some nematocides may act as plant growth stimulants or be phytotoxic, thus having either a positive or negative effect on plant drymass. Significant differences in plant populations of different treatments occurred, but it cannot be ascribed to the effect of the treatments only. Overall yields were poor due to the drought. Carbofuran treatments, nevertheless, showed higher yields than the other treatments. Despite pronounced overall nematode control, nematode numbers could not be related to yield loss or gain. Nematocidal treatments therefore proved to be highly uneconomical in these trials.

COMPARATIVE MORPHOLOGY OF THE GONADS OF A NUMBER OF *XIPHINEMA* SPECIES FROM SOUTH AFRICA (NEMATODA: LONGIDORIDAE)
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The morphology of the reproductive system is of great importance in the taxonomy of *Xiphinema*. Freshly dissected gonads of several still undescribed South African species exhibit distinct interspecific as well as intraspecific differences. The most conspicuous differences are seen in the general appearance and size of the gonads and the presence or absence of a pseudo Z-organ and/or spines and crystalline inclusions in the proximal part of the uterus. The results indicate that, in comparison to mounted specimens the median differentiation is more easily seen in fresh material, especially when the gonads are dissected from the body. The presence of a median differentiation in these undescribed species correlates well with an amphimictic mode of reproduction.

PLANTPARASITIC NEMATODES ON MAIZE IN SOUTH AFRICA.
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A brief account of the development of this branch of nematology in the RSA is given. The differences that exist between the problems encountered in the USA and South Africa are discussed with notes on one of the main questions, viz. do the population densities encountered under local conditions merit control, especially chemical control. Other questions elucidated are: which nematode species are responsible for crop loss; at which population levels is damage imminent; do the present sampling techniques give a true indication of the population densities present in the soil or plants. Current trends of research in this field are discussed.

RESULTS OF NEMATICIDE TRIALS ON COTTON IN THE LOSKOP IRRIGATION SCHEME

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Field trials were conducted to determine the effect of nematodes on cotton, to test the effectiveness of various nematicides under local conditions and to evaluate the economic feasibility of their use. Nematicides used included ethylenedibromide, 1,3 dichloropropene, carbofuran, fenamiphos, aldicarb, BAS 263 1, CGA 73102 and HDE 36275. The trial sites were selected to be representative of the various soil types in the area, also taking into consideration the different plant parasitic nematodes present. Nematode counts were done at various intervals. Data collected were green as well as dry plant mass, plant height, boll mass and final yield. Fibre tests were also done. *Meloidogyne* spp. and Trichodoridae were effectively controlled by aldicarb and fenamiphos but in some of the trials the *Pratylenchus* spp. numbers increased. Fungigants used were also effective except against the Trichodoridae, of which the numbers increased. Most of the nematicides had either a positive or negative effect on the physiological development of the cotton seedlings as well as on the final yield.

MEIOFAUNAL NEMATODE RESPONSE TO A HEAVY NATURAL ORGANIC LOAD ON A SOUTH AFRICAN SANDY BEACH

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Nematode community structure has been quantitatively investigated on a low energy sandy beach. The most pronounced feature of the system is a stable reflective beach during storms. Wrack wet mass averages 140kg per metre transect across the 20m wide beach face. Decompositions of this wrack on the beach results in drainage of leachates into the sand. The beach thus has reduced layers at lower tide levels reaching in places to 10cm of the sand surface. Bacterial numbers, interstitial nutrients and wrack input are being monitored seasonally. Groundwater is high in NH₄ and has traces of H₂S indicating reduced conditions. Meiofaunal response to this complex of factors is being monitored simultaneously by quantitative community analysis. Meiofauna numbers range 5-1000 per 100cm³ with highest abundance and biomass at mid to upper levels on the beach. Interstitial nematodes dominate the meiofauna, making up to 85% of total numbers and 60% of biomass. Nematode distribution is mapped in three dimensions and related to dominant environmental gradients. Dominant nematode species have been studied and their impact on the interstitial food chain assessed. Bacterial numbers average 10⁸ per/gram wet sand with maximum numbers in the lower to mid-shore. The relationship between bacterial numbers and nematode feeding types is assessed.

POPULATION STUDIES OF *MELOIDOGYNE* SPP IN YOUNG TOMATO ROOTS
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The populations of root knot nematodes on tomato plants were monitored from transplanting until the beginning of the harvest period. In the first seven days infective juveniles were found. Female juveniles were prevalent from the 11th to the 21st day. Females were first noted on the 21st day, from the 25th to the 35th day they formed the highest proportion of the population. Eggs were first found on the 28th day. Infective juveniles, obviously from the second generation, took up a proportion of 90 to 99% from 42 days after planting onwards. These early populations had a significant effect on the growth of the tomato plants.

THE DISTRIBUTION OF *HELICOTYLENCHUS DIHYSTERA* IN GUAVA PLANTINGS AND PRELIMINARY PATHOGENICITY STUDIES
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Guava plantings in the Transvaal and Cape Province were surveyed to determine species composition and population of stylet-bearing nematodes. The object was to determine the possible role of nematodes in the etiology of guava wilt disease. Earlier studies by CSFHI pathologist, Mr N Grech, revealed that the primary pathogen, *Septofuaidium* sp, is unable to penetrate roots unassisted. The results of the survey indicated that *H. dihystra* was present in all Cape and 97% of Transvaal plantings. Populations varied between 922 and 13000 nematodes/250cm³ soil extracted by sugar-flotation centrifugation. Pathogenicity was evaluated in a glasshouse at 27°C. Six week old guava seedlings of uniform size were inoculated with 12000 nematodes/container. Plants were grown in 2l containers using stem sterilised soil. An equal number of uninoculated plants served as a control. Pathogenicity was evaluated after 4 months by measuring growth (plant height) and leaf size (30 leaves/rep). Growth was reduced by 53% and leaf size by 4% comparing inoculated plants with controls. The widespread distribution of *H. dihystra* in guava plantings, the relatively high population densities and its pathogenicity support the hypothesis of an interaction between *H. dihystra* and *Septofuaidium* sp in the onset or development of guava wilt disease.

THE PLACE OF TEMIK 150G AS A NEMATICIDE IN SOUTHERN AFRICA
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TEMIK 150G is registered for use in South Africa on 9 crops, 8 of which have nematodes listed as a target pest. Yield benefits have to be demonstrable to successfully market TEMIK 150G, benefits that are dependent on interacting factors such as soil type, climate, cultural practices etc. The identification of these factors is a major concern of the development and successful use of TEMIK 150G. On sugarcane, cotton and maize, basic use recommendations are dependent on soil type, whereas on tobacco and potatoes, factors such as time, ease of use, and spectrum of activity are key. Only on bananas where the presence of *Radopholus similis* necessitates the use of a nematicide, and citrus where nematode induced replant problem and small fruit size can be directly correlated to numbers of *Tylenchulus semipenetrans*, can recommendations for TEMIK 150G usage be based solely on nematodes present. Aside from usage rate, pesticide placement is a second key factor in successful TEMIK 150G usage. Placement is largely controlled by the physical, chemical nature of aldicarb and the target pest. In row crops obviously a row placement is required but band width is critical, whereas in perennials the timing and positioning of root-flushes is critical. Thus the identification of complex crop pesticide environmental interactions are fundamentals to successful TEMIK 150G usage, an identification which remains an ongoing programme.

COMPARISONS BETWEEN SOME NEMATICIDES ON COTTON IN ZIMBABWE
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A variety of nematicides, including ethylene dibromide (EDB), aldicarb and carbofuran were tested on commercial cotton crops grown in sandy soils at different sites in Zimbabwe in 1980/81 and 1981/82. Soil samples taken before planting and treatment showed that *Meloidogyne*, *Pratylenchus* and *Scutellonema* spp were the most common nematodes present in these soils. Soil and root samples and root washings done between 8 and 16 weeks after germination indicated that EDB consistently achieved the best initial control of all nematode spp, but re-invasion into the roots sometimes occurred. Aldicarb gave the best control of *Meloidogyne* spp which were the most common parasitic nematodes present, and carbofuran was the most active against the less common *Pratylenchus* spp. Both these treatments had minimal re-invasion into the roots within the first 16 weeks after germination. Chlorpyrifos did not show any activity as a nematicide. These differences between nematicidal activity were reflected in seed-cotton yields, where aldicarb treated plots generally outyielded the others.

THE POSSIBLE USE OF THE ONTOGENY OF THE TAIL IN ESTABLISHING PHYLOGENETIC RELATIONSHIPS WITHIN THE GENUS *XIPHINEMA* (NEMATODA: LONGIDORIDAE)
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The genus *Xiphinema* presently contains about 150 species. Several different groupings have been suggested by various authors, either as informal species groups or as subgenera. These arrangements mostly laid no claim to portray the phylogenetic relationships within the genus, but were intended primarily as an aid in identification. Characters generally taken into account when making these groupings are body posture, body size, length of odontostyle, shape of lip region and tail, position of vulva, morphology of gonads and reduction of anterior sexual branch, presence of Z-organ or pseudo-Z-organ in uterus, and mode of reproduction. In the present study the development of the tail from first stage juvenile to adult has been studied for representative species, either from the literature or from actual specimens in those species where data on juvenile tail shapes were not available in the literature. Several distinct groups could be distinguished as far as ontogeny of the tail is concerned, sometimes leading to similar tail shapes in adult forms. By correlating these with the other characters mentioned it is hoped to recognise natural groups based on the phylogenetic lines of development.

SEASONAL FLUCTUATION IN POPULATIONS OF THE CITRUS NEMATODE
(TYLENCHULUS SEMIPENETRANS) IN THE EASTERN TRANSVAAL
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The seasonal fluctuation in the populations of Tylenchulus semi-
penetrans Cobb was investigated at three different sites in the
Eastern Transvaal. During the period May 1982 to November 1984

it was found that the populations at Hectorspruit attained their
peaks earliest, followed by those in Malelane and Nelspruit, res-
pectively. The highest populations were found to develop during
early autumn, winter, and early spring. Temperature appeared to be
the single factor affecting the time the population attained its
peak. These results indicate that in order to achieve effective
control of the citrus nematode, the geographical position of the
orchard should be taken into account as this has a bearing on the
time of application of a nematicide.