

CONTENTS

Field corn response to granular pesticides : Residues in grains and soils and nematode biological interactions— <i>T. Badra and S.O. Adesiyon</i> ..	1
Effect of temperature and moisture on population fluctuation of nematodes in an apple orchard— <i>M.L. Khan and G.C. Sharma</i> ..	10
Integrated management of root-knot nematode (<i>Meloidogyne javanica</i>) infecting tomato and okra— <i>R.K. Jain and D.C. Gupta</i> ..	14
Seasonal population fluctuation behaviour of <i>Helicotylenchus dihystra</i> , <i>Pratylenchus zae</i> and <i>Tylenchorhynchus vulgaris</i> in buffle grass pasture— <i>Mujib, I. Azmi</i> ..	19
Effect of sebuphos on invasion of <i>Meloidogyne incognita</i> in brinjal— <i>H.C. Meher</i> ..	25
Efficacy of an antihelminthic antibiotic (KT-199) on <i>Meloidogyne incognita</i> affecting winged bean as compared to phenamiphos— <i>Umarao, K. Krishnappa and K.G.H. Setty</i> ..	29
Effect of some biotic and abiotic factors on the stability of esterase of <i>Meloidogyne incognita</i> and <i>Meloidogyne javanica</i> — <i>S.P. Rajasekhar, A.K. Ganguly and D.R. Dasgupta</i> ..	37
Plant parasitic nematodes associated with groundnut in Andhra Pradesh— <i>A. Mani and G. Ratna Kumar</i> ..	44
Root-knot nematode infestation and nodulation as influenced by VA Mycorrhizal association in cowpea— <i>P. Sivaprasad, Arthur Jacob and Babu George</i> ..	49
Efficacy of certain chemicals as seed treatment against <i>Meloidogyne incognita</i> on lentil— <i>B.B. Gogoi and P.N. Phukan</i> ..	53
Effect of temperature on attachment of <i>Pasteuria penetrans</i> spores to the second-stage juveniles of <i>Meloidogyne incognita</i> — <i>N. Soma Sekhar and J.S. Gill</i> ..	57
On the emergence of <i>Aphelenchoides besseyi</i> from infected rice seeds— <i>Nandini Gokte and V.K. Mathur</i> ..	60
Effect of initial inoculum levels of <i>Meloidogyne incognita</i> on bittergourd and round melon— <i>Pankaj and Siyanand</i> ..	64
Infestation, distribution pattern and identity of root-knot nematodes associated with vegetable crops in the districts of Meerut division in Uttar Pradesh, India— <i>Abrar Ahmad Khan and M. Wajid Khan</i> ..	67
Onion varietal response to three species of <i>Meloidogyne</i> — <i>Rajeswari Sundarababu and Sivagami Vadivelu</i> ..	76
Chemical control of <i>Meloidogyne incognita</i> on pea— <i>B. Bhagawati and P.N. Phukan</i> ..	79
Effect of rate of drying of soil on the survival, infectivity and development of the root-knot nematode, <i>Meloidogyne incognita</i> — <i>H.S. Gaur and M. Sehgal</i> ..	84
Correlation between some edaphic factors and <i>Meloidogyne incognita</i> infestation of mulberry in Malda, West Bengal— <i>B.K. Das, J. Sarkar, N.K. Das, Indrajit Ray and S.K. Sen</i> ..	91

(Continued on inner cover)

(Continued from back cover)

Chemical control of <i>Meloidogyne javanica</i> infecting groundnut—A. Ishwara Bhat and K. Krishnappa ..	95
Pathogenetic and histopathological changes in wheat inoculated with two populations of <i>Heterodera avenae</i> —K.K. Kaushal and Khazan Singh ..	101
SHORT COMMUNICATIONS	
Preliminary observations on the population fluctuations of some plant parasitic, predatory and freeliving nematodes in cultivated soils and grassland—T.K. Das and M.C. Mukhopadhyaya ..	108
<i>Panicum miliaceum</i> —A new host record for <i>Aphelenchoides besseyi</i> —Nandini Gokte, V.K. Mathur, Rajan and Arjun Lal ..	111
b-Esterase variation in three common species of <i>Heterodera</i> —A.K. Ganguly, D.R. Dasgupta and S.P. Rajasekhar ..	113
Association of <i>Aphelenchoides</i> sp. with <i>Botryodiplodia theobromae</i> on date palm—A new record—R.K. Kaul and R. Raj Bhansali ..	115
An association of <i>Pratylenchus brachyurus</i> with <i>Pogostemone cablin</i> —Rashid M. Khan and P. Paryatha Reddy ..	116
Effect of nitrogen levels and basmati cultivars on population build-up of <i>Hirschmanniella oryzae</i> —Inderjit Singh, P.K. Sakhuja, S.S. Malhi and Narpinderjeet Randhawa ..	119
Occurrence of sorghum cyst nematode, <i>Heterodera sorghi</i> in Maharashtra State—K.S. Darekar, S.S. Shelke and N.L. Mhase ..	121
Studies on host range of <i>Xiphinema basiri</i> —Rajeswari Sundarababu and T.S. Muthukrishnan ..	122

FIELD CORN RESPONSE TO GRANULAR PESTICIDES : RESIDUES IN GRAINS AND SOILS AND NEMATODE BIOLOGICAL INTERACTIONS

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Abstract : A single side dressing application of aldicarb, carbofuran, miral or oxamyl at 2(I) or 4(II) kg a.i./ha in early season resulted in significant yield increases of corn. Cob yields increased by 24, 27, 28 and 31 % in respect of miral II, carbofuran I, aldicarb I and miral I; and in grain yields by 43, 50, 65 and 84 % in order of oxamyl II, aldicarb I, miral II and miral I. Aldicarb and miral residues in treated grains were <0.01 and <0.02 ppm, respectively, at either rates. Aldicarb degraded rapidly in experimental loam sand from 0.02-1.00 ppm during the early four weeks following treatment to <0.01 ppm by the eighth week and till harvest in the wet season.

Treatment suppressed soil populations of *Helicotylenchus dihystera*, *Hoplolaimus galeatus*, *Meloidogyne incognita*, *Criconemoides* sp. and *Pratylenchus sefaensis* considerably. Miral and aldicarb were the most effective treatments against present nematode species. Response of the individual nematode species to rainfall and interactions with coinhabiting biomass were greatly diversified from untreated in the nematicides' plots. Greater significant negative correlations were found between number or weight of cobs and numbers of *H. galeatus* than those with other contemporary species. This is the first report on residues of aldicarb and miral in corn grains and soils.

Keywords : corn, granular pesticides, yield, residues in grains and soils, nematode community, nematode biological interactions

EFFECT OF TEMPERATURE AND MOISTURE ON POPULATION FLUCTUATION OF NEMATODES IN AN APPLE ORCHARD

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Abstract : The seasonal variations in population densities of the plant parasitic nematodes, *Tylenchorhynchus mashhoodi*, *Helicotylenchus dihystera*, *Meloidogyne incognita* and *Pratylenchus pratensis* in the rhizosphere of apple trees at Solan, has been studied over one year period. The fluctuation in the population densities of *H. dihystera* and *M. incognita* was correlated more with the temperature than with soil moisture. The variation in the population densities of *T. mashhoodi* and *P. pratensis* could not be explained by the variation in temperature and moisture.

Key words : Population, temperature, moisture, apple, *Tylenchorhynchus mashhoodi*, *Meloidogyne incognita*, *Helicotylenchus dihystera*, *Pratylenchus pratensis*.

**INTEGRATED MANAGEMENT OF ROOT-KNOT NEMATODE
(*MELOIDOGYNE JAVANICA*) INFECTING TOMATO AND OKRA**

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Abstract : Studies were conducted on integrated control of *M. javanica* under field conditions in tomato and okra. Two methods of ploughing *i.e.* normal (10 cm² deep) and deep ploughing (20 cm) during the month of June (atmospheric temp. ranging between 42-47°C) were integrated with other effective practices such as nursery bed treatment with aldicarb (tomato)/seed treatment with carbosulfone (okra) and aldicarb application @ 1 kg. a.i./ha in the main field at transplanting/sowing or no aldicarb treatment were evaluated. In tomato, reduction in root-knot nematode population ranged between 78.2 to 92.3 owing to different methods of ploughing. Treatment combination of deep ploughing+aldicarb treated nursery+aldicarb application @ 1 kg. a.i./ha at transplanting of tomato gave maximum yield (7.8 kg/plot) with minimum root-knot index (1.3) and final soil population (175 J₂/250 g soil) in comparison to 3.8 kg fruit yield per plot in check (normal ploughing+untreated seedlings+no aldicarb application). In okra, normal and deep ploughing led to 79.2 to 76.3 per cent reduction in *M. javanica* population, respectively. Further, aldicarb @ 1 kg. a.i./ha applied in plots irrespective of type of ploughing yielded significantly higher than untreated plots. Treated seeds had lower root-knot index in comparison to untreated seeds.

Key words : Summer ploughing, aldicarb, nursery treatment, seed treatment, carbosulfone. *M. incognita*, okra, tomato.

SEASONAL POPULATION FLUCTUATION BEHAVIOUR OF
HELICOTYLENCHUS DIHYSTERA, *PRATYLENCHUS ZEA* AND
TYLENCHORHYNCHUS VULGARIS IN BUFFLE GRASS PASTURE

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Abstract : Seasonal population fluctuation behaviour of the three plant-parasitic nematodes, *Helicotylenchus dihyстера*, *Pratylenchus zea* and *Tylenchorhynchus vulgaris* was studied in Jhansi, India. Approximate average population density peaks of these nematodes during April (Spring) and September (early winter) were 2.4, 2.2, 2.9 and 3.2, 3.6, 4.0; during January (mid-winter) and May (Dry-summer) falls were 1.2, 0.8, 1.6 and 1, 0.8, 1.6 nematodes per ml soil respectively. Nematode population fluctuations were affected by mean temperature, mean relative humidity, rainfall and plant growth. *H. dihyстера* was least affected by environmental stress. *T. vulgaris* was inversely affected by high moisture which caused population decline, whereas *P. zea* multiplied better in high moist conditions.

Key words : Buffle grass, *Helicotylenchus dihyстера*, *Pratylenchus zea*, *Tylenchorhynchus vulgaris*, seasonal fluctuation behaviour.

**EFFECT OF SEBUPHOS ON INVASION OF *MELOIDOGYNE INCOGNITA*
IN BRINJAL**

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Abstract : Invasion of *Meloidogyne incognita* into roots of brinjal, *Solanum melongena* was significantly reduced ($p < 0.05$) when J2 were exposed to sublethal concentrations of 0.0005 to 0.0500 $\mu\text{g/ml}$ sebuphos for 24 to 48 h. The reduction in invasion was found to be dependent upon concentration—time product and remained effective up to 15 days.

Key words : Sebuphos, invasion, *M. incognita*, *Solanum melongena*.

EFFICACY OF AN ANTIHELMINTHIC ANTIBIOTIC (KT-199) ON
MELOIDOGYNE INCOGNITA AFFECTING WINGED BEAN
AS COMPARED TO PHENAMIPHOS

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Abstract : The efficacy of an antihelminthic antibiotic (KT-199), a semi-synthetic peptide from *streptomyces* spp. and the commonly used non-fumigant nematicide, phenamiphos in the control of *Meloidogyne incognita* affecting winged bean was evaluated and compared. As soil drench the antibiotic was equally effective to that of nematicide while as foliar spray it was more effective than phenamiphos in reducing number of galls per plant, as well as multiplication of parasite in the host indicating downward systemic movement of antibiotic comparable to phenamiphos. Under *in vitro* tests the antibiotic was more effective in inhibiting egg-hatching than larval survival.

Key words : Antibiotic, KT-199, phenamiphos, control, *Meloidogyne incognita*, winged bean.

EFFECT OF SOME BIOTIC AND ABIOTIC FACTORS ON THE STABILITY
OF ESTERASE OF *MELOIDOGYNE INCOGNITA* AND *MELOIDOGYNE*
JAVANICA

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Abstract : The stability of isozymes of b-esterase from single female of *Meloidogyne incognita* and *Meloidogyne javanica* under different environmental conditions were studied. Polyacrylamide gel electrophoresis analysis reveal that the isozyme pattern of these two root-knot nematode species remain constant irrespective of host nutrition, age of female, seasonal temperature, though there were some variations in the appearance of minor bands. The isozyme pattern of b-esterase found to be one in the case of *M. incognita* and three for *M. javanica*.

Key words : *Meloidogyne incognita*, *M. javanica*, electrophoresis, b-esterase isozymes.

PLANT PARASITIC NEMATODES ASSOCIATED WITH GROUNDNUT IN ANDHRA PRADESH

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Abstract : Twenty-eight genera of nematodes were recorded from the rhizosphere of groundnut in Chittoor and Nellore districts of Andhra Pradesh during kharif and rabi 1987-88. In general, the occurrence and density of various nematode genera were higher in rabi than in kharif season. *Bitylenchus brevilineatus*, *Pratylenchus* spp., *Basirolaimus* spp. and *Tylenchorhynchus* spp. were the most predominant nematodes with high frequency, density as well as prominence values in both the seasons. *Basiria* spp., *Ecphyadophora* spp., *Nothotylenchus* spp., *Sakia* spp. and *Tenunemellus* sp. were new records of association with groundnut. *Heterodera* sp. *Meloidogyne* sp. and *Rotylenchulus reniformis* were considered to be economically important.

Key words : Survey, groundnut, plant parasitic nematodes.

ROOT-KNOT NEMATODE INFESTATION AND NODULATION AS INFLUENCED BY VA MYCORRHIZAL ASSOCIATION IN COWPEA

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Abstract : Influence of VA mycorrhizal association on nodulation and *Meloidogyne incognita* infestation in cowpea was studied. Dual inoculation with *Rhizobium* and VA mycorrhiza significantly improved the plant growth and nodulation. *M. incognita* drastically reduced the plant growth. The galling, root-knot index and nematode population were very high. Wherever mycorrhiza and *M. incognita* occurred together, the deleterious effect of *M. incognita* was insignificant. Further, the galling, root-knot index and nematode population were reduced to a great extent by VAM association.

Key words : *Meloidogyne incognita*, VA mycorrhiza, cowpea.

**EFFICACY OF CERTAIN CHEMICALS AS SEED TREATMENT
AGAINST *MELOIDOGYNE INCOGNITA* ON LENTIL**

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Abstract : Carbofuran, phorate, diazinon, and ekalux @ 1.0 and 2.0% w/w were tested against *M. incognita* on lentil under both pot and field conditions. All the chemicals at 2% were effective in reducing number of galls and eggmasses and increasing yield. The best results were obtained with diazinon and ekalux at 2% each in the pot and field experiments respectively.

Key words : Carbofuran, phorate, diazinon, ekalux, *Meloidogyne incognita*, control, lentil

EFFECT OF TEMPERATURE ON ATTACHMENT OF *PASTEURIA*
PENETRANS SPORES TO THE SECOND-STAGE JUVENILES OF
MELOIDOGYNE INCOGNITA

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Abstract : Spores of *Pasteuria penetrans* attached more readily to the root-knot nematode, *Meloidogyne incognita* at 25° and 30°C than at 15°, 20° and 35°C as revealed by *in vitro* studies. There was a positive correlation between number of spores attached per juvenile and the period of exposure of nematodes to the bacterial spores.

Key words : *Pasteuria penetrans*, *Meloidogyne incognita*, spore attachment, temperature.

ON THE EMERGENCE OF *APHELENCHOIDES BESSEYI* FROM INFECTED RICE SEEDS

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Abstract : Influence of temperature, moisture, hydrogen peroxide and rice root exudates on emergence of *Aphelenchoides besseyi* from infected rice seeds was investigated. Maximum emergence was recorded at 30°C. Alternate wetting and drying gave slightly higher emergence of nematodes. Hydrogen peroxide at all concentrations stimulated emergence while root exudates of only four days old seedlings influenced rate of emergence of nematodes.

Key words : *Aphelenchoides besseyi*, emergence, rice seeds.

EFFECT OF INITIAL INOCULUM LEVELS OF *MELOIDOGYNE INCOGNITA* ON BITTERGOURD AND ROUND MELON

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Abstract : Pathogenecity of *Meloidogyne incognita* on bittergourd and round melon was tested by inoculating different levels of second-stage juvenile (J2) of the *Meloidogyne incognita*. Significant reduction in the plant growth characters were observed but the final nematode population increased with increase in the inoculum levels. The damaging threshold in bittergourd was found to be one J2/g of soil as against 10 J2/g in round melon.

Key words : *Meloidogyne incognita*, bittergourd, round melon, inoculum levels.

INFESTATION, DISTRIBUTION PATTERN AND IDENTITY OF ROOT-KNOT NEMATODES ASSOCIATED WITH VEGETABLE CROPS IN THE DISTRICTS OF MEERUT DIVISION IN UTTAR PRADESH, INDIA

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Abstract : A case study undertaken to determine the infestation, and the distribution pattern and identity of root-knot nematodes associated with vegetable crops in the districts of Meerut division in Uttar Pradesh (India) showed that root-knot disease incidence in the area was fairly high. In all the five districts about 50% fields were infested and above 36% root-samples of vegetables from the districts were infected with root-knot nematodes. Intensity of the disease in different localities of the districts and on different vegetables showed wide variations. Root-gall index/egg mass index ranged from 2.5/0.5. Cucumber and eggplant were most affected crops followed by okra, tomato and pepper. Cauliflower and cabbage were less affected. *M. incognita*, *M. javanica* and *M. arenaria* were identified to be present in the area associated with the vegetables. The species were found either singly or in mixed populations. *M. incognita* showed highest frequency (75.6%) and was dominant species in the area. *M. javanica* (33.1%) was second most frequent species followed by *M. arenaria* (25.7%).

Key words : *Meloidogyne incognita*, *M. javanica*, *M. arenaria*, incidence, intensity, distribution.

ONION VARIETAL RESPONSE TO THREE SPECIES OF *MELOIDOGYNE*

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Abstract : Three varieties of Bellary onion viz. Arka Kalyan, Arka Niketan and Arka Pragatti were tested against three species of root knot nematodes viz. *M. incognita*, *M. javanica* and *M. arenaria*. Among the 3 varieties tested, Arka kalyan proved to be the most susceptible variety to the three nematode species and *M. arenaria* was more pathogenic comparatively to other root-knot nematode species.

Key words : *Meloidogyne* species, Bellary onion, varietal response.

CHEMICAL CONTROL OF *MELOIDOGYNE INCOGNITA* ON PEA

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Abstract : Four chemicals viz., carbofuran, diazinon, ekalux and phorate each @ 1, 2 and 3 per cent (a.i. w/w) were tested as seed treatment for the control of *Meloidogyne incognita* infecting pea under both laboratory and field conditions. All the chemicals were effective even at low rate of application in reducing galls and egg masses in roots of pea and increased yield. The best result was found with carbofuran at 3 per cent.

Key words : *Meloidogyne incognita*, seed treatment, carbofuran, diazinon, ekalux, phorate, *Pisum sativum*.

EFFECT OF RATE OF DRYING OF SOIL ON THE SURVIVAL,
INFECTIVITY AND DEVELOPMENT OF THE ROOT-KNOT
NEMATODE, *MELOIDOGYNE INCOGNITA*

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Abstract: The mortality, loss of infectivity and slowing of development of the root-knot nematode, *Meloidogyne incognita*, were positively correlated to the rate of moisture loss from soil. The rate of drying was regulated by two techniques viz., air-drying of soil layers of 3-9 cm thickness in shade at room temperature; or by keeping the soil at relative humidity varying from 60 to 100 per cent in the surrounding air, both for a period up to 45 days. With increase in moisture tension to 25.5—51.5 bars in 9-3 cm thick layers there was 62-85 per cent mortality of *M. incognita* (J-2) during 45 days as against only 54 per cent mortality in sealed soil with 2.94 bars suction. In the soil stored at 100—60 per cent RH the juvenile mortality during 45 days increased from 75 to 92 per cent with the moisture tension increasing from 0.01 to 17.6 bars. The infectivity of surviving *M. incognita* J-2 on green gram, *Vigna radiata* cv. Pusa-105 root decreased from 48 per cent of fresh population to 38, 35, 36 and 33 per cent in sealed, 9, 6 and 3 cm thick soil layers, respectively. There was a delay of 2-4 days in the onset of oviposition in case of population surviving in 3 cm soil layers after 45 days. These findings reveal that inducing faster drying of field soil may help in significantly reducing the population densities of nematodes and the damage to the subsequently grown crop.

Key words : Moisture stress; survival, *Meloidogyne incognita*.

**CORRELATION BETWEEN SOME EDAPHIC FACTORS AND *MELOIDOGYNE*
INCOGNITA INFESTATION OF MULBERRY IN MALDA,
WEST BENGAL**

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Abstract : Though the root-knot nematode disease is ubiquitous in West Bengal, the disease seems to turn up more often in the mulberry fields of Malda than in other places. This localised population pattern of nematodes favours existence of a close tie between some edaphic factors favourable for growth of nematodes, with it. The present paper establishes the conspicuous correlation between some edaphic factors and their role in nematode infestation.

Key words : Mulberry, soil—plant interaction; edaphic factors, *Meloidogyne incognita*.

CHEMICAL CONTROL OF *MELOIDOGYNE JAVANICA* INFECTING GROUNDNUT

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Abstract : Evaluation of five pesticides (carbofuran, sebuphos, prophos, carbosulfan and phorate) applied at sowing, at inoculation and 14 days after inoculation in controlling *Meloidogyne javanica* infecting groundnut under pot conditions revealed that the chemicals differed in their effect on plant growth as well as on the nematicidal efficacy. Most of them were effective in reducing nematode population and improving plant growth characters compared to inoculated control. Sebuphos followed by carbofuran applied at 4 kg a.i./ha, at the time of inoculation was found to be the most effective in controlling the nematode besides increasing host growth. Prophos applied at 2 kg a.i./ha 14 days after inoculation was found to be the least effective in controlling the nematode.

Key words : *Meloidogyne javanica*, groundnut, concentration, time of application, pesticide.

PATHOGENETIC AND HISTOPATHOLOGICAL CHANGES IN WHEAT INOCULATED WITH TWO POPULATIONS OF *HETERODERA AVENAE*

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Abstract : Comparative studies were made with two conspecific populations of *Heterodera avenae* (Delhi and Una (H.P.) populations) on pathological alterations in wheat cultivar HD 2329. Observations were also made on reproduction of both the populations as influenced by the host. The damage threshold, under experimental conditions, was determined to be 5 juveniles (J_2)/g and 10 (J_2)/g of soil for Delhi and Una populations, respectively. Judged on the basis of plant growth parameters, Delhi population appeared to be comparatively more pathogenic than Una population. Although no remarkable differences in histopathological alterations were observed with regard to the both populations, a larger syncytium was invariably associated with feeding site of Delhi population.

Key words : Threshold level, histopathogenesis, *Heterodera avenae*, syncytium.