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ESTERASE AND MALATE DEHYDROGENASE PATTERNS OF RACES OF *HETERODERA CAJANI* AND *H. ZEA*

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Abstract: The isozyme patterns of esterases and malate dehydrogenases of two races of *H. cajani* and three races of *H. zea* were analysed by native polyacrylamide gel-electrophoresis. The reproducible banding patterns of races of both the nematodes differed in number, concentration and relative mobility.

Key words: Electrophoresis, Esterase, *Heterodera cajani*, *Heterodera zea*, Malate dehydrogenase, Phenotypes, Race.

COMPATIBILITY OF *PASTEURIA PENETRANS* WITH CARBOFURAN IN CONTROLLING *HETERODERA CAJANI* ON COWPEA

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Abstract: Compatibility of a new strain of *Pasteuria penetrans* with a nematicide, carbofuran against *Heterodera cajani* on cowpea cv. Pusa Komal was studied taking three doses of carbofuran viz., 26, 39 and 52 mg (equivalent to 1.0, 1.5 and 2.0 kg a. i. /ha, respectively), used singly or in combination with *P. penetrans* at 1.0×10^7 spores per pot containing 400 g mixture of soil and river sand in the ratio of 2:1. A significant increase in plant growth was observed when carbofuran at all the three doses was combined with *P. penetrans* over the corresponding treatments of carbofuran alone. The per cent reduction in cyst production was 97.2, 83.1 and 72.1 in treatments having 52, 39 and 26 mg of carbofuran respectively, together with *P. penetrans* compared to 71.4, 66.4 and 44.9 in treatments having 52, 39 and 26 mg of carbofuran alone. Similar trend was observed in the reduction of juvenile population (J2) in the soil. The study indicated the compatibility of *P. penetrans* with no adverse effect on the growth of bacterium.

Key words: Compatibility, *Pasteuria penetrans*, *Heterodera cajani*, carbofuran, control, cowpea.

EFFECT OF CHOPPED LEAVES AND NAMATICIDES ON THE INTERACTION OF *GLOMUS FASCICULATUM* WITH *MELOIDOGYNE INCOGNITA* ON COWPEA

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Abstract: The experiment on the effect of different chopped leaves and nematicides on the interaction between *Glomus fasciculatum* and *Meloidogyne incognita* was laid out in earthen pots on cowpea in glasshouse. Among the chopped plant leaves, *Prosopis juliflora* gave the highest growth of the plants followed by *Catharanthus roseus*, *Leucaena leucocephala*, *Calotropis procera* and *Azadirachta indica*. The chopped leaves gave better biomass production than the chemical treatment, but the chemical treatment recorded high reduction in the nematode population. Among the nematicides, phorate (10G) was more effective than carbofuran (3G). The chopped leaves increased the VAM spore production and colonization and reduced nematode population.

Key words: *G. fasciculatum*, *M. incognita*, cowpea, interaction.

BIOCONTROL OF NEMATODES ASSOCIATED WITH MANDARIN ORANGE DECLINE BY THE PROMOTION OF PREDATORY NEMATODE *IOTONCHUS TENUICAUDATUS* (KREIS, 1924)

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Abstract: In mandarin orange decline affected homestead orchards, *Tylenchulus semipenetrans* (*Ts.*) and *Helicotylenchus dihystra* (*Hd*) were predated upon by *Iotonchus tenuicaudatus* (*It*) under normal agricultural practices. True predator-prey relation existed between *Ts* and *Hd* with *It*. *Rs* was the most important parasite and *Hd* population was low throughout. Winter mulching was most effective against the parasitic nematodes as confirmed by the most stable and greatest abundance in population of *It*. When forest litter mulch was compared with farmyard manure, NPK, and carbofuran, it was found that carbofuran was most effective in bringing down the population of both parasitic and predator populations. Carbofuran plus FYM plus NPK resulted in best yield in the succeeding year. Forest litter followed by FYM followed by NPK and their combinations could be recommended for orchards with low and moderate populations of *Ts*. Carbofuran plus FYM of forest litter plus NPK was recommended only when *Ts* populations were at their highest, usually once in 5-6 years in unamended soils.

Key words: Mandarin orange, predatory nematode, biocontrol, *Tylenchulus semipenetrans*, *Helicotylenchus dihystra*, *Iotonchus tenuicaudatus*, forest litter, organic amendment, conservation of natural enemies/antagonists.

IDENTITY OF SPECIES/RACES OF ROOT KNOT NEMATODES ASSOCIATED WITH FOOD AND FODDER LEGUMES IN SOME DISTRICTS OF BUNDELKHAND REGION OF INDIA

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Abstract: A survey of nine districts of Bundelkhand region of India to determine the presence of root-knot nematodes associated with major food and fodder crops of the region revealed 36% incidence of the disease. In general, both the disease incidence and intensity was low in fodder crops as compared to food crops of the three species of knot nematode, *Meloidogyne incognita* was most frequent followed by *M. javanica* and *M. arenaria*. Of the four races of *M. incognita* detected in the area, race 1 was most frequent followed by race 2, 4 and 3. No race was identified in *M. arenaria* populations.

Key words: Food and fodder crops, root-knot nematodes, incidence, intensity, species, races.

BIOLOGICAL CONTROL OF *MELOIDOGYNE JAVANICA* IN TOMATO BY *PAECILOMYCES LILACINUS* AND CASTOR

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Abstract: Experiments were done in *Meloidogyne javanica* infested field. Evaluating the effect of castor leaves together with fertilizer and *Paecilomyces lilacinus* alone and in combination against the root-knot nematode, *Meloidogyne javanica* on a tomato crop, it was observed that the castor alone (8kg/plot) with fertilizer resulted in significant reduction in nematode problem and increased shoot weight and yield over the control. Application by the fungus also reduced the gall index and increased the tomato yield. The integration of the two components and the fertilizer dose increased the efficiency of nematode control. The results obtained were comparable with that observed in the carbofuran treatment. The residual effect of the treatments, on the second crop of tomato showed continued efficacy in controlling *M. javanica* by 29.6-56. 8 and 26.4-57. 9 per cent suppression in gall index and second stage juveniles, respectively, over control.

Key words: Biological control, root-knot nematode, *Paecilomyces lilacinus*, castor, tomato.

PLANT PARASITIC NEMATODES ASSOCIATED WITH MAJOR FODDER CROPS IN INDIA

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Abstract: Thirty two genera belonging to 54 species of plant parasitic nematodes were recorded from the roots/rhizosphere of the six fodder crops. *Meloidogyne*, *Pratylenchus*, *Tylenchorhynchus*, *Helicotylenchus*, *Rotylenchulus* and *Hoplolaimus* spp. were the most predominant nematodes with high frequency, density as well as prominence value in both the seasons. Although high population density of cyst nematodes i.e. *Heterodera cajani*, *H. sorghi* and *H. zae* were also observed at some centres, but their distribution was limited.

Key words: Survey, fodder crops, plant parasitic nematodes.

INTERACTION OF VESICULAR-ARBUSCULAR MYCORRHIZAE WITH RENIFORM NEMATODE, *ROTYLENCHULUS RENIFORMIS* ON RAGI

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Abstract: Field trial was conducted in two seasons namely, Adipattam (Jan-Jul) and Purattasipattam (Sep-Oct) to study the interaction of *Glomus fasciculatum* and *Rotylenchulus reniformis* on ragi. It was observed that the yield was highest in VAM inoculated plots and control of nematodes was effective in phorate 10G followed by carbofuran 3G treated plots.

Key words: *Glomus fasciculatum*, *Rotylenchulus reniformis*, phorate, carbofuran, ragi.

CRICONEMATIDS OF KALESAR FORESTS AND MORNI HILLS OF HARYANA, INDIA

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Abstract: Twenty one species of criconematids found associated with natural flora of Kalesar forests and Morni Hills of Haryana, India have been listed. These include *Crossonema centurian* sp. n. : L = 0.525-0.696 mm, V = 93-96, stylet = 96-112 μ m, RV = 2-4, submedian lobes present, body annule 240-270 with finger-like, 2 μ m long scales, juveniles with longitudinal rows of conical bi- or tri-tipped sceles; and *Hemicycliophora ornamenta* sp. n. : L = 1.06-1.38 mm, V = 78-81, stylet = 99-120 μ m, R = 355-390, R V = 82-100, labial annuli 3-4, lateral lines two, lateral fields ornamented, spermatheca without sperm, vulval lips modified, 3 annuli long, post vulval region 4.8-6.0 vulval body widths long, spike shaped. Juveniles of *Mesocriconema magnilobata* (Darker & Khan, 1981) Loof & De Grisse, 1989 are described for the first time.

Key words: *Crossonema centurian* sp. n., forest trees, *Hemicycliophora ornamenta* sp. n., taxonomy.

**EFFECT OF DIFFERENT pH LEVELS ON THE DEVELOPMENT
AND MORPHOMETRICS OF *HETERODEARA ZEA*
ON MAIZE**

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Abstract: The effect of different pH levels on the development and morphometrics of corn cyst nematode, *Heterodera zea* was studied. The results revealed that the plant growth characters were observed maximum at pH 9.0 whereas maximum nematode population was observed at neutral pH level 7.0. The morphometric characters of the nematode were significantly decreased at pH 9.0 and 5.0 as compared to neutral pH 7.0.

Key words: *Heterodeara zea*, maize and pH levels.

RELATIVE EFFICACY OF NEEM PRODUCTS AGAINST ROOT KNOT NEMATODE ON TOMATO

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Abstract: Study on comparative efficacy of four neem products e.g., neem bitter, repelin, welgrow and neem seed kernel extract against *Meloidogyne incognita* infecting tomato cv. Pusa Ruby by seed treatment, bare root dipping of seedlings and foliar spraying proved that all the neem products were effective in reducing the root knot disease incidence and increasing growth of plants. Neem bitter exhibited better performance in all the three methods of treatments.

Key words: Tomato, *Meloidogyne incognita*, neem bitter, repelin, welgrow, neem seed kernel extract.

EFFECT OF GRANULAR NEMATOCIDES ON THE BIOLOGY OF *HETERODERA CAJANI* OF PIGEONPEA

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Abstract: Application of some granular nematicides such as phorate 10G, aldicarb 10G and carbofuran 3G at the rate of 2.5 mg a.i./Kg soil reduced the entry of *H. cajani* in roots of pigeonpea. The development of the nematode was also delayed by all these nematicides. Maximum adverse effect on penetration, reduction in development, eggs/egg-sac of *H. cajani* was produced by aldicarb followed by carbofuran and phorate. All the nematicides decreased the final population of the nematode. The browning of cysts was also delayed by all nematicides.

Key words: Pigeonpea, nematicide, *Heterodera cajani*, cyst.

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**TAXONOMIC STUDIES ON CRICONEMATOIDEA (NEMATODA :
TYLENCHIDA) ASSOCIATED WITH FRUIT CROPS FROM NORTH AND
NORTH-EASTERN REGION OF INDIA. I. DESCRIPTION OF SEVEN
NEW SPECIES.***

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Abstract: Five new species of Criconematidae viz., *Seriespinula truncatum* n.sp.; *Crossonema spinosus* n.sp.; *C. fusiformis* n.sp.; *C. exhumus* n.sp.; *C. splendidus* n.sp. and two new species of Madinematidae viz., *Nothocriconema digitatum* n.sp.; *N. filicaudatum* n.sp.; found around the rhizosphere of fruit crops from north and north-eastern India are described and illustrated. *Seriespinula truncatum* n.sp. is distinctive in having 50-52 body annules, 65-78 μm long spear, 0.364-0.450 mm long body, single trough shaped head annule, an alternate pattern of protuberances bearing 3-4 spines which becomes longer in last 2-3 tail annules. *Crossonema spinosus* n.sp. is distinctive in having 42-46 body annules, 70-80 μm long spear; body length 0.385-0.505 mm, shape of head annule, 70-80 dagger shape, occasionally drumb-bell shape spines appears to be in a membraneous fold and pattern of spines; RV 3-4, long ovary; *C. fusiformis* n.sp. having two head annules; margins of both head annules bear 10-12 tubercles, in the posterior third region of body, spines are discontinuous, each row having 5-7 spines. *C. exhumus* n.sp. having two set off head annules, margin of second annule bears spines, 40-47 body annules, 68-77 μm long spear, the pattern of spines throughout the body remains same. *C. splendidus* n.sp. having 40-46 body annules, body 0.379-0.462 mm long, spear 76-85 μm long, nature and lesser number of spines, head elevated with two annules, *Nothocriconema digitatum* n.sp., is characterized having 53-59 thick body annules with serrated margins in posterior half of body, body 0.406-0.510 mm long; spear 58-70 μm in length, body suddenly narrows down in posterior third of tail into an almost typically jointed shape, giving the tail annules a phanged appearance. *Nothocriconema filicaudatum* n.sp. is less than 0.5 mm in length with 52-62 μm long spear, body annules 57-62. The posterior third of body narrows down into an spike like tail to give a digitate appearance.

Key words: Biodiversity, Nematoda, Criconematoidea, description, new species, *Seriespinula*; *Crossonema*, *Nothocriconema*, fruit crops.

OBSERVATIONS ON HOST RANGE, VERTICAL MOVEMENT AND SOIL pH ON SPORES OF *PASTEURIA PENETRANS* INFECTING *HETERODERA CAJANI*

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Abstract: Sixteen nematode species belonging to 14 different genera of the order Tylenchida, Dorylaimida and Mononchida were tested for encumbrance of *Pasteuria penetrans* spores obtained from *Heterodera cajani* cysts. Spores were found to encumber on the second-stage juveniles and males of *Heterodera avenae*; juveniles, males and females of *Hoplolaimus indicus*; and juveniles and females of *Helicotylenchus delhiensis* in the range of 10-20, 5-10 and 1-5, respectively while the number of spores on *H. cajani* were in the range of 20-45 at 2.8×10^5 spores/g sand, on incubation at 25°C for 48 h. Observations on the vertical movement of spores in different soil types using spore encumbrance as bioassay showed that the spores reached to a depth of 12 cm after a single application of water from the top. Their further movement and distribution in soil increased with greater pore size and decreased with an increase in the silt and clay contents of the soils. Soil pH had a significant effect on spore encumbrance. At a pH of 8.0 and 10.0, the average number of spores encumbered on the second-stage juveniles of *H. cajani* was 36.45 and 26.32 compared to 7.0 and 10.35 at a pH of 4.0 and 6.0, respectively.

Key words: *Pasteuria penetrans*, *Heterodera cajani*, host range, pH, spore encumbrance, vertical movement.

EFFECT OF DIFFERENT ORGANIC AMENDMENTS FOR THE MANAGEMENT OF ROOT-KNOT NEMATODE, *MELOIDOGYNE INCOGNITA* ON CARROT

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Abstract: A field experiment was conducted on carrot var., 'Early Nentes', with four organic amendments in two doses viz., sawdust, neem cake, poultry manure each @ 1.0 and 1.5 ton ha⁻¹ and water hyacinth @ 1.0 and 2.0 ton ha⁻¹. Results revealed that all organic amendments were found to be effective in reducing the galls, final nematode population and forked tap root of carrot and subsequently increased the yield and yield attributing characters of carrot. Further, among all organic amendments, neem cake was found significantly superior at both the doses i.e. 1.0 and 1.5 t ha⁻¹ in reducing the nematode population and increased yield of carrot followed by sawdust, poultry manure and water hyacinth at higher doses.

Key words: *Meloidogyne incognita*, organic amendment, root-knot nematode. tap root, carrot.