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SHORT COMMUNICATIONS

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Case Studies in Cotton and Citrus: Use of Entomopathogenic Nematodes

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ABSTRACT : Based on the case studies examined here and other literature, we can see that most nematode success stories share two basic characteristics: a suitable nematode for the target pest, and favorable crop economics. For example, nematodes associated with control of *Diaprepes abbreviatus* (L.), *Otiorhynchus sulcatus* (L.) and sciarid pests, being highly suited to their hosts, are applied in relatively high value commodities, and face little or no competition from other control measures. In cases where entomopathogenic nematodes have not succeeded, the causes may generally found to be a poor match of nematode and host, or poor economic conditions. For example, *Steinernema riobrave* proved to be highly efficacious toward Pink bollworm, but in cotton, nematodes could not compete on an economic level with other control strategies. Other insects in row crops fall into the same category, e.g., *Helicoverpa zea* and *Diabrotica* spp. in corn. In other instances a suitable match of nematode to target pest could not be found e.g. wireworms (Coleoptera: Elateridae) and imported fire ants, *Solenopsis invicta* Buren, where strategies to employ entomopathogenic nematodes are futile. Therefore, we conclude that the two most important qualities required for entomopathogenic nematodes to be commercially successful are: host suitability (proper match) of nematode to host, and favorable economic conditions.

Key words : Entomopathogenic nematode, cotton, citrus, economics, host susceptibility, Steinernematidae, Heterorhabditidae.

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Molecular Characterization of *Meloidogyne incognita* Races Based on DNA Sequences of Internal Transcriber Spacers of Ribosomal DNA

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ABSTRACT : The four Indian races of *Meloidogyne incognita* were characterized using internal transcriber spacers 1 and 2 of ribosomal DNA (rDNA). rDNA is amplified from the genomic DNA of the four races using polymerase chain reaction, cloned and sequenced. Amplification of rDNA from the four races resulted in about 800 base pair DNA fragment that included both ITS 1 and ITS 2, the 5.8 S rRNA gene and a small portion of the 3' end of the 18S gene and the 5' end of the 28 S gene. Alignment of ITS sequences of the four races indicated that there was variation in the sequence among the four races resulting in different restriction sites which can be used for differentiating the races. Phylogenetic analysis of the rDNA sequence data indicated that race 1 and race 4 were the most closely related forming one cluster to which race 2 was related. Race 3 was forming entirely a separate cluster.

Key words : Molecular characterization, internal transcriber spacer, *Meloidogyne incognita*.

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Induction of Pathogenesis-related Protein by Salicylic Acid and Resistance to Root-knot Nematode in Tomato

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ABSTRACT : Salicylic acid (SA), dissolved at 10 mM in potassium-phosphate buffer (pH 7) and applied as foliar spray on tomato, inoculated with *Meloidogyne incognita,* reduced nematode infestation and promoted plant growth. SA did not kill nematodes in an *in vitro* test. It enhanced synthesis of pathogenesis related – 1 (PR-1) protein as compared to uninoculated untreated and inoculated untreated plants. The presence of Tween – 20 enhanced the effect of salicylic acid on the accumulation of PR-1 protein. SA treatment has led to a significant increase in resistance to root-knot nematodes.

Key words : *Meloidogyne incognita,* pathogenesis-related protein, salicylic acid, systemic acquired resistance, *Lycopersicon esculen*

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Changes of Catalase Activity in Sugarcane Due to Early and Post Infection of *Pratylenchus zeae*

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ABSTRACT : In both roots and leaves of sugarcane clones, response to *Pratylenchus zeae* infection was compared in resistant (Co 7717) and susceptible (CoC 671) clones at 3, 7, 14, 21, 28 and 35 days after infection. In resistant clone, maximum per cent decrease in catalase activity over uninfected was at 21 and 14 days after infection in roots and leaves respectively. In susceptible clone, the maximum per cent increase of catalase activity over uninfected was at 7 days in roots and 35 days in leaves. Among the 8 resistant clones, all clones showed decreased catalase activity over uninfected clones except in two clones (CoT8201 and NCo 310). In susceptible clones, all clones showed an increase over uninfected clones while the remaining two clones (Co 7219 and Co 62175) showed decreased enzyme activity.

Keywords : Catalase, enzyme assay, lesion nematode, resistant, sugarcane.

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Relative Sensitivity of *Meloidogyne incognita* and *Rotylenchulus reniformis* to Salicylic Acid on Okra

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ABSTRACT : Irrespective of the application method, the shoot length of okra significantly increased at 50 and 100 µg/ml and was at par with carbofuran treatment. When salicylic acid (SA) was sprayed at 100 µg/ml the increase was more pronounced compared to control. There was decrease in plant growth with an increase in concentrations of salicylic acid. The egg masse production was reduced significantly with the application of SA and carbofuran. SA is not effective in reducing the *R. reniformis* population. Thus, SA might have induced some resistance in okra against *M. incognita* but ineffective against *R. reniformis*.

Keywords : *Meloidogyne incognita*, okra, *Rotylenchulus reniformis* salicylic acid.

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Effect of Soil Amendment with Green Manures on Population Dynamics of *Helicotylenchus* spp. and *Hoplolaimus* spp.

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ABSTRACT : Five green manures i.e. cowpea (*Vigna unguiculata*), sesbania (*Sesbania aculeata*), mungbean (*Vigna radiata*), sunnhemp (*Crotalaria juncea*) and clusterbean (*Cyamopsis tetragonoloba*) were tested at three doses @ 100, 200 and 300 quintal/ha against two plant parasitic nematodes *Helicotylenchus* spp. and *Hoplolaimus* spp. Except crotalaria, growing of all green manures for 45 days resulted in increase of population of phytonematodes. However, incorporation of green manures in soil resulted in a decrease in the population of plant parasitic nematodes to various extent as compared to control. Crotalaria was found to be the most effective of all green manures tested in reducing the population of *Helicotylenchus* spp. and *Hoplolaimus* spp.

Keywords : *Helicotylenchus, Hoplolaimus,* Cowpea, Sesbania, Mungbean, Sunnhemp, Clusterbean and Green manures

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Effect of *Pasteuria penetrans* on the Life Cycle of Root-knot Nematode, *Meloidogyne incognita* on Tomato Crop

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ABSTRACT : Effect of *Pasteuria penetrans* on the life cycle of *Meloidogyne incognita* on tomato was evaluated and found that bacterial spore encumbered juveniles penetrated the tomato root in less number. The developmental stages were formed in lower number in comparison to healthy juveniles up to 14 days after inoculation. Later, the life cycle of the *M. incognita* was delayed in presence of *P. penetrans* and the number of J_2, J_3, J_4, healthy females, total root population and egg population were also reduced.

Key words : *Pasteuria penetrans, Meloidogyne incognita,* life cycle, tomato.

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Effect of Different Fertilizer Source on *Meloidogyne incognita* Infecting Okra (*Abelmoschus esculentus*)*

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ABSTRACT : A pot experiment was conducted to study the effect of various fertilizer source on *Meloidogyne incognita* in okra under screen house condition. Better plant growth as well as reduced nematode damages was observed when a combination of N, P, K and Zn fertilizers was applied at recommended dose. Individually, muriate of potash and potassium sulphate at higher doses recorded maximum plant growth. Ammonium sulphate and gypsum reduced nematode reproduction significantly as compared to other treatments. All the fertilizers except calcium nitrate, murate of potash and potassium sulphate, showed reduction in nematode damage with a corresponding increase in their dose.

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Keywords : *Meloidogyne incognita,* inorganic fertilizers, okra, *Abelmoschus esculentus.*

Chemotherapeutic Action of Alanine as Soil Drench Against Root-knot Nematode, *Meloidogyne incognita* on *Vigna unguiculata*

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ABSTRACT : Various concentrations of aminoacid alanine as soil drench were found to suppress the reproduction and population build up of *Meloidogyne incognita* on *Vigna unguiculata* and also improved the plant growth. The growth was found to be maximum in infected plants treated with 1000 ppm concentration of amino acid. Infection resulted in sugar depletion and elevated protein, lipid and phenol levels in the host plant. The activities of dehydrogenase enzymes and total endogenous reductases were more in the infected and infected treated plants. The reduced galling coupled with the improved plant growth and the enhanced organic constituents indicated the improved vigour of the host plant under the influence of alanine treatment.

Key words: *Vigna unguiculata, Meloidogyne incognita,* improved vigour, alanine, soil drench

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Effect of Copper Sulphate on Beet-Root, *Beta vulgaris* Infested with *Meloidogyne incognita*

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ABSTRACT: One week old seedlings of beet-root, *Beta vulgaris*, pre-treated with three concentrations of copper sulphate ($CuSO_4$. $5H_2O$) viz.: 2,500; 1,250 and 625 ppm respectively, were inoculated with 100, 1,000 and 10,000 second stage juveniles (J_2) of *Meloidogyne incognita* per plant. Observations made on the plant growth parameters and Mean Gall Index (M.G.I.) after 90 days of sowing revealed that the above treatments effectively reduced the root gall formation and enhanced the plant growth. Higher concentrations with low J_2 inoculation levels were more effective in comparison to lower concentrations and high J_2 inoculation levels.

Key Words: *Meloidogyne incognita*, copper sulphate treatment, beet-root, growth parameters, *Beta vulgaris*.

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Organic Amendments in Management of *Rotylenchulus reniformis* on Cotton*

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ABSTRACT: Application of neem, castor, *mahua,* mustard, *piludi* and *karanj* cakes, farm yard and poultry manures, dry and fresh *Azolla* pressmud and urea significantly increased the plant growth and decreased the host infestation by *Rotylenchulus reniformis* over control. Among them, pressmud followed by fresh *Azolla* and farm yard manure were proved to be the best. Application of *piludi* cake and urea were least effective.

Key words: Organic amendments, cotton, *Rotylenchulus reniformis.*

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Effect of Culture Filtrates of *Gliocladium virens* and *Trichoderma harzianum* on the Penetration of Rice Roots by *Meloidogyne graminicola*

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ABSTRACT : The root dip of rice seedlings in the culture filtrate of *Trichoderma harzianum and Gliocladium virens* for different durations and concentrations had significant effect on penetration ability of *Meloidogyne graminicola*. Increase in culture filtrate concentrations as well as root dip duration revealed enhancement in inhibitory effect on nematode penetration of rice root. Lowest filtrate concentration (10%) had no effect on penetration up to 18 minutes root dip but afterward this concentration was found to be significantly inhibitory to juvenile entry. Culture filtrate of *G. Virens* was found to be more suppressive to nematode penetration in host tissue than that of *T. harzianum*.

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Key words : Penetration, *Meloidogyne graminicola, Gliocladium virens, Trichoderma harzianum,* Rice.

Comparative Pathogenicity of Root-knot Nematode *Meloidogyne incognita* on Different Pulse Crops

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ABSTRACT: An initial inoculum level of 100 juveniles of *Meloidogyne incognita* per plant caused significant reduction in growth characters of pulse crops and proved to be pathogenic. Reduction in growth characters varied from 1.13 to 69.06 per cent at different inoculum levels. Maximum dexrease was in lathyrus while minimum in french bean at 10,000 level. The multiplication rate of nematode was maximum at 10 inoculum level and minimum at the highest level. Gradual reduction in number of bacterial nodules was observed with the increase of inoculum levels in all the test crops maximum was at 10,000 level.

Key words: *Meloidogyne incognita*, Pathogenicity, pulse crops.

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Amino Acid Profile and its Biochemical Path in Phytonematodes of High Altitude Environment

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ABSTRACT: A study was conducted to determine the amino acid profile and its biochemical path in some plant parasitic nematodes viz. *Hoplolaimus indicus*, *Helicotylenchus indicus* and *Tylenchorhynchus brevilineatus* at different altitudes (at 450, 650 and 1900m Above Sea Level) in Garhwal Himalayan soils. A total of 19 amino acids (6-essential; 6-semi-essential and 7-non-essential) were detected from all the studied nematodes. The common amino acids were detected as—alanine, aspartic acid, cysteine, cystine, glutamic acid, glycine, histidine, hydroxyproline, isoleucine, leucine, ornithine, phenyl-alamine, proline, serine, threonine and tyrosine. Isoleucine was detected in *Hoplolaimus indicus* and *Helicotylenchus indicus* at higher altitude (650m and 1900m ASL). Amino butyric acid and 3, 4- dihydroxyphenylalanine were detected in *Helicotylenchus indicus* at the same altitude. Threonine was unusual amino acid detected in *Hoplolaimus indicus* and *T. bravilineatus* only at 450±50m ASL glutamic acid and ornithine were detected only at 1900±100m ASL.

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Key words: Amino acid, Phytonematodes, high altitude.

Three New Species of *Hemicriconemoides* (Nematoda: Tylenchida: Criconematina) Associated with Ornamental Plants in Bareilly District of Uttar Pradesh, India

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ABSTRACT: Three new species of *Hemicriconemoides* were encountered from the rhizosphere of ornamental plants in Bareilly district of Uttar Pradesh, which have been described and illustrated. *H. rosae* sp. n. described from the *Rosa indica* is characterized by having L = 470-510µm; a = 16-17.6; b = 4.9-5.4; V = 92-94.5%; Rv = 6-9; stylet = 50-55µm; and having prominent labial disc, and presence of membranous sheath over the vulva. *H. rotundus* sp. n. described from the rhizosphere of *Hibiscus rosasinensis* is characterized by having L = 410-640µm; a = 15.8-20.0; b = 4.0-5.10; V = 90.5-93.7%; Rv = 8-12; stylet = 62-78µm, two lip annules, rounded spear knobs and absence of vulval sheath. *H. asymmetricus* described from the rhizosphere of *Rosa indica*, is characterized by having L = 590-660µm; a = 19-19.6; b = 4.7-5.5; V = 89.8-90.4%; Rv =13-14; stylet = 77-80µm; asymmetrical spear knobs, the left knob with anteriorly directed margins, while the right one being rounded, and absence of vulval sheath.

Key words: *Hemicriconemoides rosae* sp. n., *H. rotundus* sp. n., *H. asymmetricus* sp. n.; *Rosa indica*, *Hibiscus rosasinensis*, Bareilly district, Uttar Pradesh.

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Reaction of Cotton Varieties against the Reniform Nematode, *Rotylenchulus reniformis**

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ABSTRACT : Reaction of eight cultivars of cotton against the reniform nematode, *Rotylenchulus reniformis* Linford and Oliveira, 1940 was studied. Five varieties viz., Hybrid-6, Hybrid-4, Suvin, Surat Dwarf and H-31-5 as susceptible and three varieties viz., G-cot-10, American Nectoriless and Varalaxmi as resistant in their reactions.

Key words : Screening, *Rotylenchulus reniformis,* cotton.

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