



## REVIEW ARTICLE

### DIVERSITY OF NEMATODES IN NORTH EAST INDIA

Debanand Das, \*Rimi Deuri and Prabhat Das

Department of Nematology, Assam Agricultural University, Jorhat – 785 013 (Assam)

#### ARTICLE INFO

##### Article History:

Received 22<sup>nd</sup> October, 2015  
Received in revised form  
15<sup>th</sup> November, 2015  
Accepted 28<sup>th</sup> December, 2015  
Published online 31<sup>st</sup> January, 2016

#### ABSTRACT

North-east India that comprises of seven states of India is a unique geographical location. It is located in between 27°57'N and 28°23'N latitudes and 89°46'E and 98°25'E longitudes. Most of the states are situated in the Himalayan range. This zone is endowed with diversity of natural flora and fauna. A large number of plant parasitic secernentean as well as adenophorean nematodes have been reported from this zone from around the root zones different plants. This review makes an effort to compile the all possible information on the report of nematodes by nematologist of this zone upto 2013.

#### Key words:

Diversity, Nematodes, North east India,  
Secernentea, Adenophorea.

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**Citation:** Debanand Das, Rimi Deuri and Prabhat Das, 2016. "Diversity of nematodes in north east India", *International Journal of Current Research*, 8, (01), 25023-25027.

## INTRODUCTION

Biodiversity is the variability among the living organisms from all the sources, including terrestrial, marine and other aquatic ecosystem and ecological complexes in which they are the part and this includes diversity within the species, between species and of the ecosystem. Biodiversity is often used as a measurement of the health of biological systems: the health of ecosystem. A healthy ecosystem carries greater variability and variety of plant and animal life. World conservation monitoring centre (1992) estimates that the worlds biodiversity ranges from 10 and 13 million species, of which around 1.72 million species (0.42 million species of plants and 1.3 million species of animals) are scientifically named. North East India, which includes seven states of India, is located between 27°57'N and 28°23'N latitudes and 89°46'E and 98°25'E longitudes. The area covers an area of 255 thousand sq km. The climate is sub-tropical to tropical, the annual rainfall varies from a minimum of 731.8 cm and maximum of 1086.9 cm. Soil type of this region varies from alluvium to red loam and lateritic acid. Endowed with great variations in climate, soil and other ecosystem; North East India have an abundant flora and fauna.

\*Corresponding author: Rimi Deuri,

Department of Nematology, Assam Agricultural University, Jorhat – 785 013 (Assam).

Assam, situated between 28°18'N and 24°N latitude and 89°46'E and 97°4'E longitudes, is considered as one of the richest bio-diversity zones of the world. With the "Tropical Monsoon Rainforest Climate", which is characterized by moderate temperature (summer temperature a maximum of 35-38°C and winter temperature a minimum of 6-8°C), heavy rainfall (average annual rainfall =2818mm) and high humidity (above 80% during summer), the state consists of tropical rainforests, deciduous forests, riverine grasslands, bamboo orchards and numerous wetland ecosystems. Endowed with the vast variations in the vegetation and climatic condition, Assam as well north eastern India is rich repository of nematodes. A number of plant parasitic, free living and predatory nematodes were reported from Assam and adjoining states. The year 1949 is considered as milestone in the history of Nematology in Assam as well as in the North East India, as the first report of plant parasitic nematode associated with tea plantation appeared in the Annual report of Tocklai Experimental Station, Jorhat. Das (1958) reported the occurrence of *Meloidogyne hapla*, *M. incognita* and *Pratylenchus* sp. and their infestation of tea seedlings. Jairajpuri (1964a, 1964b, 1964 c) described *Basirotyleptus basiri* sp. n., *Axonchium nitidum* sp. n. *Dorylaimellus curvatus* sp. n., *Proleptonchus teres* sp. n. and along with *Tyleptus striatus*, *Nygellus clavatus* and *Belondira ortha* from tea and sugarcane fields of Jorhat district of Assam. Chona et al. (1965) for the first time recorded the presence of

*Tylenchulus semipenetrans* in citrus crops in Assam, which was one of the factors of citrus slow decline. Basu (1967) and Banerjee (1967) recorded seven genera viz., *Haplolaimus*, *Rotylenchus*, *Helicotylenchus*, *Tylenchorhynchus*, *Tylenchus*, *Paratylenchus* and *Aphelenchoides* from the soil collected around the rhizosphere of tea plants and from tea nurseries at Jorhat. Some of the important species like *Scutellonema brachyurum*, *Pratylenchus brachyurus*, *Paratylenchus curvitalus*, *Aphelenchoides composticola*, *Tylenchus agricola*, *Meloidodera floridensis*, *Tylenchorhynchus mashoodi*, *Hoplolaimus Columbus*, *Xiphinema insigni* and *Aphelenchus agricola* associated with tea crops were reported from Tocklai Experimental Station, Jorhat (Anon., 1968). Jairajpuri (1969) reported three mononchids viz. *Mylonchulus nodicaudatus*, *Iotonchus trichurus* and *I. nonohystera*, and subsequently in 1970 two more species viz. *M. contractus* and *M. mulveyi* from rice and tea rhizosphere of Assam. Mathur and Prasad (1972) reported the occurrence of *Hirschmanniella oryzae* in rice fields of Assam. Roy (1972) reported the infestation of root-knot nematode, *Meloidogyne incognita* on different vegetable crops in Assam. Roy (1973) recorded *M. graminicola* in several rice varieties from Assam. In 1977, he recorded the presence of rice stem nematode, *Ditylenchus angustus* in a number of rice varieties at Jorhat. Phukan and Sanwal (1979a) described three new species, *Paratylenchus pseuduncinatus* from soil around the rhizosphere of tea crop, *P. neolepidus* from pomegranate and *Gracilacus raskii* from the soil around roots of bamboo from Jorhat. In the same year they (1979b) described one more new species, *Coloosia parapaxi* from soil around the rhizosphere of mango at Jorhat. Two new criconematids viz., *Hemicriconemoides neobrachyurus* sp. n. and *Hemicaloosia luci* sp. n. were described by Dhanachand and Jairajpuri (1979). Phukan and Sanwal (1980a) recorded the occurrence of *Hoplolaimus indicus*, *Scutellonema unum*, *Hemicriconemoides cocophilus* and *Hemicriconemoides mangiferae*. Phukan and Sanwal (1980b, 1980c) described four new species, *Aglencus muktii* from soil around roots of peach; *Aglencus assamensis* from soil around roots of French beans; *Macroposthonia onostris* from soil around the roots of brinjal and *Macroposthonia medani* from soil around roots of citrus. They also reported the occurrence of *Cephalenchus leptus* from soil around roots of citrus from Jorhat. Dhanachand and Jairajpuri (1980a, 1980b) reported the genus *Imphalenchus*, along with *I. indicus* and *Cephalenchus lobus* from Manipur. Phukan and Sanwal (1981a, 1981b) described new species of *Helicotylenchus magnicephalus*, *H. paracrenacauda* *Hadronchus karangensis* and *H. diphuensis* from Assam. In 1982, they described *Siddiqia indicus* from the soil collected from the sugarcane rhizosphere of Tezpur, Assam. A new species of *Phallaxonchium parvulum* from Manipur was described by Dhanachand et al. (1982).

Two new species of *Hemicriconemoides* viz., *H. aberrans* from soil around roots of arecanut from Karanga, Jorhat and *Hemicriconemoides conicaudatus* from soil around roots of peach from Nowgaon were reported by Phukan and Sarmah (1983). Rahman (1983) recorded *Tylenchus ritai* from soil around roots of rose from Bomdila, Arunachal Pradesh; *Imphalenchus indicus* from chum tree, Rajmai, Assam; *Basiria graminophila* from pear, Shillong; *Scutellonema orientalis* from pine, Jonai; *Criconemella onoensis* from Kadam,

Golaghat; *Aulosphora oostenbrinki* from *Citronella* sp., Rajmai; *Paralongidorus spiralis* and *Xiphinema brevicola* from Arunachal Pradesh; and *Hemicriconemoides mangiferae* from piper beetle from Jorhat. He also reported the occurrence of *Labronema vulvapapillatum*, *L. goodeyi*, *Belondira clavicaudata*, *Proleptonchus shamimi*, *Paralongidorus sali*, *Xiphinema orthotenum*, *X. mammillocaudatum*, *Prionchulus muscorum*, *Clarkus sheri*, *C. papillatus*, *Iotonchus basidontus* and *I. longicaudatus* from Assam and adjoining areas. In the same year, Rahman and Jairajpuri described a new species *Paramylonchulus noreasus* from lemon tree of Assam.

*Trichodorus borai* sp. n. and *T. complexus* sp. n. were described by Rahman et al. (1985) from the soil around the roots of bamboo from North Lakhimpur district, Assam. Rahman et al. (1987a, 1987b, 1987c) reported *Labronema robustum*, *L. glandosum* from Arunachal Pradesh; *Tylenchorhynchus vulvalatum*. Kaushal and Swarup (1988) described a new genus and new species of cyst nematode, *Brevicephalodera bamboosi* from roots of bamboo from Jorhat district of Assam. Presence of *Aphelenchoides besseyi* in rice was recorded from Cachar district of Assam (Anon, 1989). Singh (1989) recorded *Tylenchorhynchus goldeni*, *T. leviterminalis*, *Helicorylenchus astriatus*, *Hoplolaimus seinhorsti*, *H. columbus*, *Scutellonema labiatum*, *Helicotylenchus dihystra*, *H. digonicus*, *H. erythrinae*, *Criconemella onoensis*, *Hemicriconemoides mangiferae*, *Hemicycliophora tarjani*, *Paratylenchus curvitalus* from soil around roots of plantation crops namely tea, coffee, betel vine, black pepper, coconut and arecanut from Jorhat district. Chaudhury and Phukan (1990) recorded *Cephalenchus leptus*, *Helicotylenchus dihystra* and *Tylenchorhynchus paranudus* in banana cultivars of Jorhat district of Assam. Rahman (1990) described two new species *Discocriconemella oryzae* from soil around roots of paddy from Nagapuri, East Garo Hills, Meghalaya and *Hemicriconemoides longistylus* from the tree fern from Bhalukpung. Doley (1990) reported *Cephalenchus leptus*, *Tylenchorhynchus nudus*, *T. leviterminalis*, *Hoplolaimus indicus*, *Helicotylenchus dihystra*, *Scutellonema labiatum*, *Rotylenchus reniformis*, *Meloidogyne incognita*, *Pratylenchus penetrans*, *P. thronei*, *P. coffeae* and *P. zae* from fruit crops namely banana, pineapple and citrus from Jorhat district. Gogoi (1991) studied the rice nematodes of Jorhat district and reported the occurrence of *Tylenchorhynchus annulatus*, *Helicotylenchus dihystra*, *H. crenicauda*, *Hoplolaimus indicus*, *Meloidogyne graminicola*, *Hirschmanniella oryzae*, *Ditylenchus angustus*, *Criconemella onoensis*. Two new species belonging to the order Dorylaimida viz. *Tylencholaimus minutes* n. sp. and *Oriverutus prodelpus* n. sp. were reported by Dhanachand et al. (1992) from Manipur. Das (1993) made a survey in the Assam Agricultural University, Jorhat campus and recorded *Tylenchorhynchus annulatus*, *T. leviterminalis*, *Hoplolaimus indicus*, *H. columbus*, *Helicotylenchus dihystra*, *H. crenicauda*, *Rotylenchulus reniformis*, *Hirschmanniella oryzae*, *Meloidogyne incognita*, *M. graminicola*, *Macroposthonia onoensis*, *M. onostris*, *Aulosphora dahomensis* (first record from India), *Caloosia paxi*, *Paratylenchus curvitalus* and *Aphelenchus avenae*. Rahaman et al. (1994) reported the occurrence of *Malenchus undulates* on tea soils from Kamrup, which is the first report of the species from India. Dhanachand

and Romabati (1994) reported the occurrence of *Discocriconemella serrata*, and *Criconemella macrodolens*, on *Cinnamomum bejolghota* and *Rhus succidanea* from Manipur. Sinha and Rahman (1995) recorded the citrus nematode, *Tylenchulus semipenetrans* from citrus and other Rutaceae. Dhanachand *et al* (1995) reported two new species of *Paramylonchulus* viz., *Paramylonchulus japonicus* and *P. cassicus* from the soil around the Japanese grass and *Cassia fistula* respectively in Manipur, India. They also described *Mononchus truncatus* from Manipur. Mahilal and Dhanachand (1997) reported three new species of *Actus bagrus*, *Cormansus conoidus* and *Cobbonchus impositias* from Manipur.

Singh and Khan (1997) described 5 new species of *Xiphinema* from fruit crop viz., *Xiphinema filicaudatum*, *X. digicaudata*, *X. gracilicaudatus*, *X. arunachalensis* and *X. pruni* from North East India. Mahila and Dhanachand (1997) reported three new species, *Actus bagrus*, *Coermansus conidus* and *Cobbonchus impositias* from Manipur, of which *Actus bagrus* was reported for the first time from India. Dhanachand and Mohilal (1997) recorded *Paraseinura musicolus* and *Tylaphelenchus leichenicola* on sugarcane from Manipur. Mahilal and Dhanachand (1998) described three new criconematids, *Ogma (Ogma) ornama* sp. nov., *Discocriconemella spermata* sp. nov., *Criconemella ovospermata* sp. nov. from Manipur. Singh and Khan (1999) described four new species from North-East India. *Seriespinula truncatus* from soil around roots of peach from Aradura Hill, Kohima, Nagaland, *Crossonema spinosus* from soil around root of pear, Kohima and *Nothocriconema filicaudatum* from apple soil from Gompa, Tawang, Arunachal Pradesh. Dhanachand (1999) recorded 6 known species belong to the genus *Coslenchus*, of these *C. bisexualis* was reported for the first time on medicinal plant from Manipur. Khan (1999) reported the presence of *Radopholus similis* along with *Pratylenchus coffeae*, *Helicotylenchus multicinctus*, *Meloidogyne* sp. and *Hoplolaimus* sp. from banana in Assam and Nagaland of North Eastern States. Highest frequency of occurrence of *R. similis* was reported from Nagaland, while the frequency of *R. similis* in Assam was 16.7 per cent.

Dhanachand (2000) reported the occurrence of Hoplolaimids and few species of *Scutellonema* viz., *Scutellonema aberrans*, *S. communs*, *S. africanum*, *S. clathricaudatum*, *S. truneatum* for the first time from India and *Scutellonema aberrans* and *Scutellonema sheri* on medicinal plants from Manipur. Mohilal and Dhanachand (2000) recorded two new species viz., *Tylencholaimus vanguardus* and *Dorella papila* around the root of *Vanguireas* and *Gravilea* from Manipur. Mohilal *et al.* (2000) recorded two new species *Dorylaimellus himilus* and *Dorylaimellus chakpilus* on *Cynodon dactylon* from Manipur. Das and Das (2001) reported the occurrence of *M. incognita* and *M. javanica* in Tezpur, Assam and Salari, Arunachal Pradesh in vegetables and papaya. Mohilal *et al.* (2004) revealed the occurrence of *Paratylenchus longicaudatus*, *Hemicriconemoides mangiferae* and *H. dipteroctes* sp. nov., in the soil around the roots of banana from Manipur. *P. longicaudatus* the new record from India. Pramodini *et al.* (2006) recorded a new species *Discocriconemella waitha* around the root region of *Citrus lemon* from Manipur, India. A total of ten species, of which four were new to the science of

nematology (*Laimydorus vulvastratus* sp. n., *Laidorylaimus cardiacus* sp. n., *Prodorylaimus bomdillaensis* sp. n., *Prodorylaimus baldus* sp. n., *Ischiodorylaimus paraugandanus*, *Mesodorylasimus chamolieensis*, *Amphidorylaimus flagellicauda*, *Thornemema baldum*, *T. mauritianum* and *Opisthodorylaimus cavalcantii*) were reported by Baniyamuddin and Ahmad in 2006 from the forests of Arunachal Pradesh. Mohilal and Pramodini (2007) recorded two new species *Criconemella koubrua*, *Hemicriconemoides bishnupurus* and one known species *Hemicriconemoides cocophillus* on cultivated and forest plants from Manipur. Baniyamuddin and Ahmad (2007) recorded three new species of dorylaimid nematode, viz., *Aporcelaimellus rotundicaudatus* sp. n., *Oriverutus neopagurus* sp. n., *Labronema enigmatum* sp. n., along with *Mitoaxonchium basalticum* (described for the first time from India), *Labronema nepalense*, *Makatinus heynsi*, *Paraxonchium parvus*, *Aporcelaimellus chauhani*, *Thonus goaensis*, *Labronemella loofi*, *Discolaimus texanus*, *Acephalodorylaimus attenuatus*, *Oriverutus longistylus* and *Oriverutus asaccatus* (first time from Arunachal Pradesh). Devi (2009) recorded twenty one nematode species belongs to 12 genera viz., *Basiria varians*, *B. graminophila*, *Tylenchorhynchus mashhoodi*, *Aphelenchus avenae*, *T. leviterminalis*, *Helicotylenchus dihystra*, *H. exallus*, *H. rotundicauda*, *Cephalenchus lobus*, *H. digonicus*, *Scutellonema brachyurus*, *Psilenchus elegans*, *Pratylenchus thornei*, *B. assarensis*, *Coslenchus bisexualis*, *C. tausifi*, *Criconemella oblongata*, *C. ornata*, *C. serrata*, *Hirshmanella orzyae* and *Meloidogyne incognita* from Manipur. Singh *et al.* (2010) described one new species, *Tylenchorhynchus bambusi* from the rhizosphere of bamboo in Jorhat. A new genus and along with a new species *Rhinodorylaimus kazirangus* was described by Ahmad *et al.* (2010) from Kaziranga National Park of Assam. Victoria *et al.* (2010) described a new species, *Hemicycliophora dhanachandi* sp. n. from rhizosphere of pine, *Pinus roxburghii* from Leimaram, Manipur. Bina and Mohilal (2010) described one new species *Filenchus neolongicaudatus* sp. n. along with *F. brevis* and *F. nakasonoi* from Manipur. *H. dihystra*, *Hoplolaimus indicus*, *Tylenchorhynchus leviterminalis*, *Macroposthonia onoensis*, *Rotylenchulus reniformis*, *M. incognita*, *Scutellonema labiatum*, *Aglenchus muktii*, *X. radicola* and *Hemicriconemoides* were reported from 38 different medicinal and aromatic plants of Jorhat district of Assam (Deori and Das, 2013).

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