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Report on Two New Members of Family Nothridae (Oribatids), Neonothrus tamilnadensis gen. et sp.nov. & Nothrus rutaceae sp.nov in Tamil Nadu, India

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***Abstract*: Every year large quantum of various litter material is being added to the soil ecosystem and the rate of decomposition depends on the intensity and nature of soil micro-fauna. The oribatids are often mistaken for small beetles under the class Insecta, due to sclerotization belong to subclass Acari in Arthropoda, cosmopolitan group playing a vital role in decomposition of soil wastes. A systematic survey was carried out and soil samples were collected from various parts of Tamil Nadu, India on different eco systems revealed that prospects of soil oribatids plentiful in soil microfauna consisting twenty families of oribatids viz., Nothridae, Camisiidae, Gymnodamaeidae, Plateremaeidae, Nodocepheidae, Damaeolidae, Otocepheidae, Oppiidae, Passalozetidae, Xylobatidae, Protoribatidae, Areozetidae, Haplozetidea, Scheloribatidae, Chaunoproctidae, Ceratozetidae, Oribatellidae, Ceratokalumnidae, Galuminidae and Epactozetidae. Among the different ecosysytems gardenland, forest areas soil samples were were rich with oribatid population and members of the families Galumnidae, Ceratokalumnidae and Scheloribatidae as predominant outnumbering others by generic richness and individuals. The present study resulted in two new records of one new genus cum species *Neonothrus tamilnadensis* gen. et sp.nov. and one new species *Nothrus rutaceae sp.nov* had been reported for the first time in Tamil Nadu with the collection studies belonging to the family Nothridae.**

***Keywords*: agroecosystem, microfauna, Mites, Nothrus, Oribatids.**

1. Introduction

It is a known fact that the arthropod population always occupy an overwhelming proportion in any soil biota outnumbering other creatures. Conservation of the soil micro-fauna for the enrichment of soil fertility through biodegradation and decomposition has been greatly emphasized amidst ever-changing technologies due to variety of soil input applications such as fertilizers and pesticides. Considering soil tilth, the study of beetle mites started eight decades back as evidenced by literature that three species viz., *Megalotocepheus darjeelingensis, M. aokii, M. bengalensis* was the first record in India (Mondal and Kundu, 1990) In South India, Haq (1980) enlightened the abundance of oribatids for Kerala.

Mites of minute, medium or large body size belong to this sub order, Cryptostigmata length vary between 110-300 µm, but majority of species fall into the size of 300-900 µm. These oribatids are found usually in the upper layers of the soil, still observed as deep as 18 inches (Woolley, 1988). Oribatids are abundant in decaying plant materials with sufficient moisture. Soil faunal studies attributed that oribatids constitute a high percentage and are important factors in promoting soil fertility through break down of organic matter by digestion similar to earthworms (Baker and Wharton, 1958).

2. Materials and Methods

An extensive survey was carried out to screen out the richness of oribatids among the soil fauna of various agroecosystems in Tamil Nadu viz., garden land, wet lands, dry lands, forest areas, hill regions, rookeries, sea shores and ayacut area, debris on garbage, industrial wastes and compost manure pits. Soil samples were collected from surface to 15 cm depth. all these places were with-in the altitudes range of 4.6 M to 426 M from East to West and not much variation in South to North (20-39 M).

Samples collected were observed for oribatid mites by Berlese funnel extraction method for 3-12 hours based on sample size. The mites and other organisms moved downwards were collected in alcohol filled containers fixed to the stem of the funnel. Later preserved in 70% alcohol and studied for taxonomic characters with lactophenol for clearing. Then mites were washed with alcohol. The microscopic study was carried out following Half Open slide method (temporary) (Balogh and Mahunka,1983). Using phase contrast microscope specimen were carefully examined for taxonomic points studying dorsum, ventrum, legs, gnathosoma and chaetotaxy.

The following are the abbreviations used to mark the parts.

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Aa, A1-A3	-	area porosae
ag	-	aggenital setae
A	-	anal plate
an	-	anal setae
ch	-	cheliceral setae
D	-	dorsum
dsej	-	dorsosejugal setae
ep1 - ep4	-	epimeres
ex	-	exobothridial setae
G	-	genital plate
g	-	genital seate
in	-	interlamellar setae
la	-	lamellar setae
L I-IV	-	legs
mt	-	Mentotectum
N	-	Notogaster
P	-	prodorsum
pd	-	pedotectum
ptm	-	pteromorpha
ro	-	rostral setae
ss	-	sensillus (pseudostgmatic organ)
ta, te, ti,ms, r_1-r_3, P_1 -P_3, l_1 -l_3	-	sate of notogaster
V	-	Ventrum

3. Results & Discussions

Investigations on the mites collected from samples reveal forty oribatid mites from three major groups consisting twenty families two viz., Nothridae, Camisiidae, belong to the Holonotic macrphyina group, six families viz., Gymnodamaeidae, Plateremaeidae, Nodocepheidae, Damaeolidae, Otocepheidae, Oppiidae belong to the Pycnonotic brachyphylina group, and twelve families viz., Passalozetidae, Xylobatidae, Protoribatidae, Areozetidae, Haplozetidea, Scheloribatidae, Chaunoproctidae, Ceratozetidae, Oribatellidae, Ceratokalumnidae, Galuminidae and Epactozetidae belong to the Poronotic brachypylina group. Among the different ecosystems garden land, forest areas soil samples were rich with oribatid population and members of the families Galumnidae, Ceratokalumnidae and Scheloribatidae as predominant outnumbering others generic richness and individuals.

Anong the collections two new records are accomplished as described in details following oribatids taxonomic keys.

Group - Holonotic Macropylina

Hysterosoma dorsally without small separate sclerites. Legs with five free segments. Body not ptychoid, never compressed laterally. Anogenital region macropyline type (genital and anal plates meet and occupy entire length of anogenital region. Notogaster without transverse sutures.

Family: Nothridae Berlese

Body holoid; proterosoma and hysterosoma immovably fused. In the dorsal region the sejugal articulation is very well developed. Bothridium present. Anogenital region of macropyline type V - shaped; ventral plate not well developed. Aggenital stae absent; with strong epimeral neotrichy: epimeres II with 3-6 pairs of setae.

Genus: *Nothus* C.L. Koch.

Aggenital setae absent. Strong epimeral neottrichy; epimere II with 3-6 pairs of setae. Two pairs of anal and three pairs of adanal setae present. Nine pairs of genital setae. Rostrum with median incision

Type species: *Nothrus palustris* C. L. Koch
Nothrus rutaceae sp.nov.

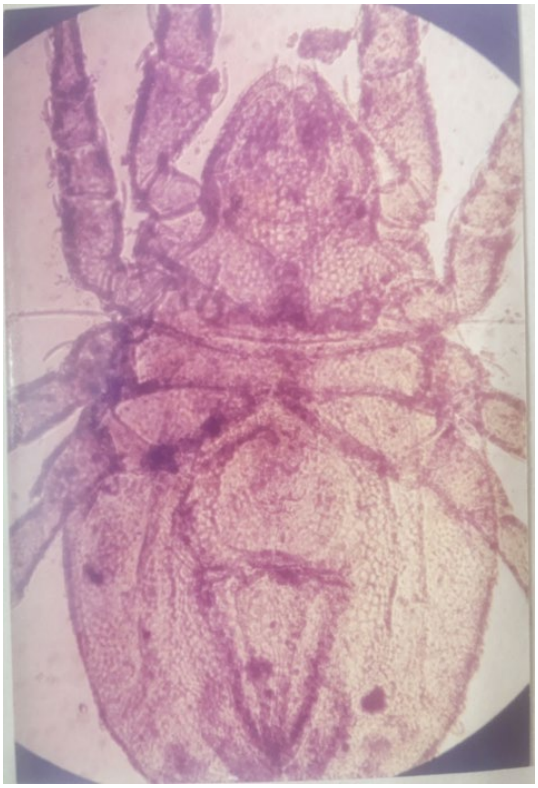

Fig. 1.

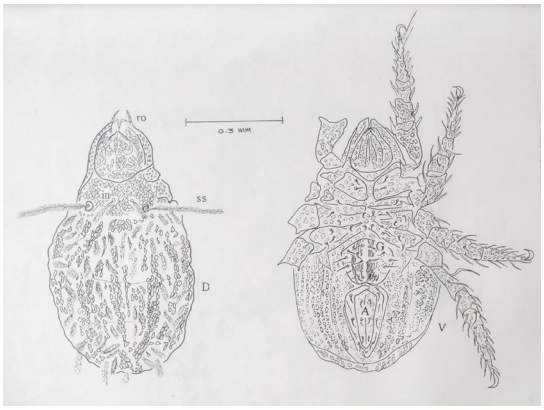

Fig. 2.

Colour: yellow to yellowish brown.

Measurement: Body 865 µm long 488 µm wide

Prodorsum:

Prodorsum triangular. Rostrum with single incision with broad lamellae, blunt lamellar cuspis; lamellar setae develop from lateral side of lamellar cuspis. Prodorsal surface with irregular spots closely packed, almost punctuated reticulation. The interlamellar setae phylliform, club shaped, thicker, longer than other prodorsal setae. Bothridium tubular with spherical, anterior tubercle. Sensillus 221 µm long thin, thread like ciliated throughout. Dorsosejugal suture outlines clearly the prodorsum amidst polygonal macro sculpture.

Notogaster:

The cero tegument with larger, irregular macro sculpture

arranged longitudinal lines. Notogaster with sixteen pairs of lanceolate setae, granulated surface. The lateral margin of notogaster with irregular wavy line and rounded posteriorly

Ventral Region:

Gnathosoam 221 µm long posteroirly converged. Epimeres well developed. Strong epimerel neotrichy observed. Epimere II with 3 pairs of setae and setal formula 1-3-2-2. Anogenital region of macropyline type. Genital and anal plates developed very closely. Genital plate pentagonal, 144 µm long with nine pairs of genital setae without any aggenital stae. Anal plate triangular broader anteriorly tapering posteriorly, 266 µm long with three pairs of anal aaand three pairs of adanal setae arranged in longitudinal line. The genital plate and anal plate contiguous, situated anteriorly at a distance of 188 µm from gnathosoma.

Legs:

Legs monodactylous with thick claws; the segments of the legs also with reticulation of polygonal and angular structures.

Types: Holotype 1 adult marked on slide. India: Tamilnadu: Mettupalayam.

Soil sample collected around Pungam trees with shed leaf litter. One paratype marked on slide; Five in alcohol with smae collection data as that holotype

Diagnosis:

The new species is very similar to Nthrus monticola Hammer (1961) with leg and gnathosomal characters; similarly, Nothrus gracillis Hammer (1961) for specific pattern of prodorsum and notogaseter with rounded to ploygonal structures. However, thenew species differs from compared species bt the size and sensillus structure as well by anal setae. Setae P_1, P_2 are longer than other setae.

Neonothrus gen.nov.

Aggenital setae absent. Strong epimeral neotrichy; epimeres II, with only one pair of setae. Three pairs of anal, three pairsof adanal setae preent. Ninepairs of genital setae. Rostrum with median incision. Lamellar setae hairy, phylliform owing to the super imposed certegumant layer, anteriorly projecting beyind rotsral margin. Interlamellar setae absent. Leg tridactyl.

Type species: *Neonothrus tamilnadensis* sp. nov.

Diagnosis:

The new genus resembles closely with Nothrus C. L. Koch (1836) due to the similar characters such as strong epimeral neotrichy, absence of aggenital setae; nine pirs of genital setae and rostrum with median incision. But it differs by absence of interlamellar setae, cerotegument not arranged in longitudinal pattern and by number of notogastral setae; epimeres II have only one pair setae instead of 3-6 pairs.

Neonothrus tamilnadensis ge. et sp.nov.

Colour: Integument highly sclerotized; colour yellowish brown to dark brown.

Measurement: The body rages from 754-770 µm long and 343 - 490 µm wide.

Prodorsum:

The integument of aspis porose, minutely punctuated densely, along with sclerotization. Naso evident. Rostral border smooth rounded with median incision. Rostral seate (ro) 15 µm long strongly roughened; "ro" located on an elevation. Lamellar setae distinctly, pubescent, clavate gradually increased to rounded terminal) la). 68 µm long. The "la" develops from apophyses situated on a transverse ridge. Interlamellar setae small, 38 µm long acuminate, ciliated distinct from lamellar setae. The bothridium produced into elongated anterior tubercle and closely placed each other. The sensillus (SS) 137 µm long thread like stose, bacilliform with bifurcated terminal. Dorsosejugal line conspicuous.The whole prodorsum sparsely puntate in scattered manner; both " exa, exb" absent

Notogaster:

Almost oval shaped; highly sclerotized and rough. Surface with rounded, spherical as well as polygonal sculpture throughout the notogaster identified as chitinous excerscence in depressions. The ornamentation cold be clearly seen from central to the lateral margin. Thirteen pairs of notogastral setae small in anterior and longer centrally (98-100 µm) and posteriorly (137 µm).

Fig. 3.

All the setae of uniform structure, fusiform (clavate but immediately sudden enlargement) with highly ciliated (pubescent); both the anterior and posterior margin of notogaster rounded; pteromorphae completely absent.

Ventral region:

Gnathosoma - labiogenal articulation diarthric type. Mentum conspicuous, but not p=broad. Genae broad and rutellum also broad, unscelerotized with three to four notches. All infracapitulaum setae smooth and normal; "h" longest "a" long and "m" intermediate. Labial palpi four segmented. Cheilicerae broad, digitus fixus with four and digitus mobilis with three teeth. "cha" long and "chb" short. Epimeral region.

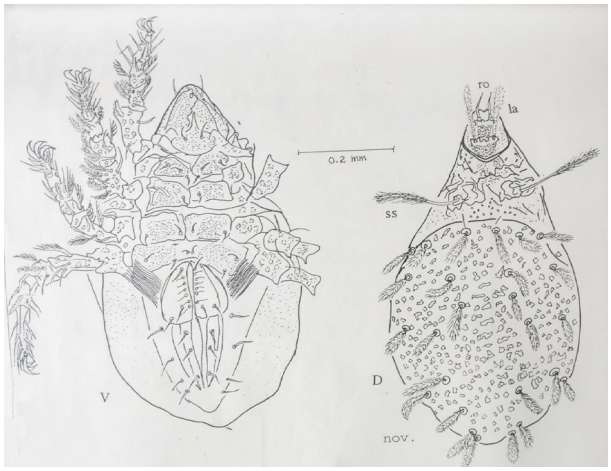

Fig. 4.

Epimeral region:

Epimeres with clear cut apodemes snd I - IV increasing size as the body enlarges towards centre. Epimerel setae formula 3 - 1 - 2 - 3.

Genital and anal region:

Genital anal plate contiguous, the former broader (98 µm) posteriorly and converging anteriorly. Each genital plate carries nine smooth setae arranged in line close to inner margin"g_1" placed close to anterior margin and large; next six setae arranged in line very close to inner margin and "g_8" "g_9" posteriorly distended towards outer margin. Aggenital setae absent. Anal plates narrow each plate carrying three setae represented by ts insertion and with three pairs of adanal setae. Anal plate 147 µm long and 78 µm wide anteriorly.

Legs:

All legs tridactylous measuring I -IV 323, 294, 294 and 392 µm and the femur alone measured 98 µm in all legs.

Types: Holotype 1 adult female India: Tamil Nadu: Erode soil sample collected from coconut rhizosphere along with debris of shed male flowers.

The study indicated that the oribatid populations so far unexplored ae plentiful and the different ecosystems indicated the spatial distribution of the mite population. Similar studies were carried out by McGregor (1965) in citrus trees of Southern California and Hammer (1961) recorded several species at the elevation of 3000-4000 M.

The findings reveal that the richness of microfauna in garden land and forest areas denotes upon the top soil moisture and the temperature as evidently reported by Vannier (1978) that the abundance of the surface oribatids depend on the soil temperature and moisture and did not alter the availability with slight alterations. Similarly, Nef (1971) expressed the prevalence of oribatids movements occurred towards upward desiccation gradient.

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