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Diversity of some mites occurring on medicinal plants in South Bengal with new records of hosts/habitats along with their economic importance

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ABSTRACT

The present paper reports 49 species of mites occurring on medicinal plants from different districts of South Bengal. This includes 22 species of phytophagous and 27 species of predatory mites. As many as 47 new host/habitat records in respect of 27 species of phytophagous/predatory mites have also been made. In addition, economic importance either as pests or as predators, wherever observed or recorded, has also been indicated in this paper.

KEYWORDS : Medicinal plants, South Bengal, Phytophagous mites, Predatory mites, Diversity

Introduction:

Medicinal plants are gaining increasing importance in India not only because of the fact that they are largely used in Indian Systems of Medicines (ISM) but also because they have various other uses like preparing nutraceuticals and food supplements, herbal cosmetics, toiletries, phytopesticides, phyto-chemicals, coloring and flavoring agents, etc. This has necessitated large scale cultivation of medicinal plants and that, in turn, has invited many pest and disease problems like any other agricultural crops. Among the various pests which attack medicinal plants, mites are one of the important components in pest scenario. Though some publications are available documenting mites occurring on medicinal plants from India as reviewed in Gupta, (2005, 2012) but yet there are many other medicinal plants which need to be explored and mite fauna thereof required to be documented. To fulfil this objective, this study was undertaken mainly concentrating on medicinal plants grown in South Bengal and the results basing on the collection made during September, 2014-August, 2015 are presented in this paper. Along with documentation of the mite species observations were recorded regarding their economic importance, host/habitat records, etc.

Material and Methods:

The collection of mites from medicinal plants was made from different districts of South Bengal, *viz*. Kolkata, South and North 24 Parganas, Hooghly, Nadia, Bardhaman, East and West Medinipur and Murshidabad during September,2014-August 2015. The mites were collected not only directly in the field by examining the leaves under a magnifying lens (20X) but also in many a times the infested leaf samples were brought to the laboratory in a tightly closed polythene bag and were examined under stereo-binocular microscope from where the mites were picked up with a fine brush. The mounting was done in Hoyer's medium and the specimens were examined under research microscope for identification. Wherever required, observations were recorded in the field itself as regards their nature of damage, if any, in case of phytophagous species and predatory behavior in case of predatory species.

Results and Discussion:

The identification of mites collected during the study period revealed the occurrence of 49 species of mites under 4 orders, 23 genera and 11 families. This included 22 species under phytophagous group and 27 species under predatory group (Table-1). Among the phytophagous mites, the species which were found to be most damaging have been indicated in the Table with asterisk (*) along with the medicinal plants on which they were found to do damage. Out of those, *Tetranychus ludeni, T. urticae, T. macfarlanei, Penonychus citri, Petrobia harti, Polyphagotersonemous latus* were most dominating and sometimes caused devastating damage on respective medicinal plants as listed in the Table. The damage in general was chlorosis of leaves which later turned brown, gradually dried up and subsequently defoliated. Needless to mention, this affected the normal physiological activities of the plants and that, in turn, inhibited the plant growth. It is but natural that all these had adverse effects on production of secondary metabolites which are the prime active ingredients used in drug preparation.

Among the predatory mites, those which were most dominating were *Amblyseius largoensis, Euseius alstoniae, E. ovalis, Neoseiulus longispinosus* among Phytoseiidae, *Anystis baccarum* among Anystidae and *Pronematus fleschneri* among Tydeidae. Those were very often encountered on the plants as mentioned against each of the species in the Table. Those were found to feed upon injurious mites and thereby helped in natural control of the mite pests.

Among the mites listed, there were 47 new host/habitat records in respects of 27 phytophagous/predatory species and those have been indicated in the list with double asterisks (**). In addition, this list also included 6 species under Serial No. 17/A, 25/B, 28/B, 30/B, 31/B and 34/B, which appear to be new to science to be described elsewhere later.

The earlier workers (Ghosh & Gupta, 2003 ; Ghosh, 2004; Lahiri *et al*., 2004; Gupta, 2005,2005a; Roy e*t al*., 2006-2010) reported mites from medicinal plants from time to time but many of the mites , as indicated in the list, were hitherto unknown, especially on the hosts/locality on which they were recorded.

Table-I: Diversity of phytophagous and predatory mites of South Bengal with their host/habitat, locality records and economic importance:
Phytophagous:

Serial No.	Species	Host/Habitat	Locality	Remarks
Order I : Prostigmata Family I: Tetranychidae				
1.	***Tetranychus ludeni*** Zacher	*Bixa orellana* L., *Rauvolfia serpentina* Benth ex Kurz, *Datura metel* L., *Piper longum* L., *Piper betle* L, *Rosa* spp.	South 24 Parganas Dist.: Narendrapur Medicinal Plants Garden; Hooghly Dist: Bandel	This mite occurred on undersurface of leaves causing chlorosis, leading to withering of leaves and defoliation.
2.	***Tetranychus macfarlanei**** Baker & Pritchard	*Mentha piperita* L, *Pavonia odorata* Wild.,white sandle wood *Santalum album* L., *Ocimum gratissimum* L.,*Azadirachta indica A. Juss.*	North 24 Parganas Dist: Sodepur; Nadia Dist: Kalyani	This mite infested the listed host causing typical damage symptoms of Tetranychid mites.
3.	***Tetranychus neocaledonicus**** Andre	*Abelmoschus moschatus* Medic,,*Pterocarpus santalinus L.*	Acharya Palli, Narendrapur Medicinal Plants Garden	A very serious infestation was seen on *Abelmoschus moschatus*, not only on leaves but on fruits as well having over 100 mites on each leaf/fruit , all such infested leaves /fruits dried, causing very serious loss.
4.	***Tetranychus urticae**** Koch	*Randia dometorum* Lamk., *Wissadula periplocifolia* (Presl. Ex. Thor), *Cinnamomum camphora (*Nees & Eberm*), Desmodium gangeticum L.*, *Rosa* spp.	North 24 Parganas Dist: Kankinara; Hooghly Dist: Chunchura; Nadia Dist: Bethuadahari	This is a major pest of a number of medicinal plants, damage symptoms included yellowing initially then browning, withering and defoliation.
5.	***Oligonychus indicus*** (Hirst)	*Citrus limon* L.	Narendrapur Medicinal Plants Garden, Hooghly Dist: Srirampur	Occurred on both surfaces of leaves, feeding produced brownish patches. A single leaf might have more than 100 mites , population occurred during December- February
6.	***Oligonychus mangiferus*** (Rahman & Sapra)	*Michelia champaca L.*	Medicinal Plants Garden, Narendrapur, Howrah Dist: Botanical Garden; Nadia Dist: Krishnanagar	Very heavy infestation was observed on these plants specially on the upper surface of the leaf and sometimes on the lower surface as well. The infested leaves had shown brownish spots on the entire leaf lamina which later turned into brownish patches. *Amblyseius herbicolus* and *Cunaxa bambusae* were found associated with this mite colony.
7.	***Oligonychus oryzae*** (Hirst)	*Cymbopogon winterianus Jawitt., Solanum xanthocarpum* Schrad and wendl	North 24 Parganas Dist: Barrackpur , Hooghly Dist: Magra	Serious infestations observed on citronella leaf , single leaves had more than 100 mites, usually occurring during February March, infested leaves started drying.
8.	***Eutetranychus africanas*** (Tucker)	*Michelia champaca L., Ocimum sanctum* L.	Narendrapur Medicinal Plants Garden	Occurred on upper surface of champa leaves, covered with thin webs where dust particles adhered, infested leaves turned brown.
9.	***Eutetranychus orientalis**** (Klein)	*Rauvolfia tetraphylla* L.)	Narendrapur Medicinal Plants Garden	This mite heavily infested leaves of *Rauvolfia tetraphylla* causing browning and drying of leaves.
10.	***Schizotetranychus cajani**** Gupta	*Cajanus cajan* (L.)	Narendrapur Medicinal Plants Garden, Howrah Dist: Uluberia	This small yellowish green mite was seen on undersurface of leaves causing yellowing of leaves.
11.	***Panonychus citri**** (McGregor)	*Carica papaya* L.	Acharya Palli, Narendrapur, Hooghly Dist: Chunchura, West Medinipur Dist: Jhargram	This mite seriously infested both on upper and lower surfaces of leaves mostly concentrating near the petiolar attachments of leaves.
12.	***Petrobia harti**** (Ewing)	*Oxalis corniculata* L.,*Azadirachta indica A. Juss.*	Acharya Palli, Narendrapur Howrah Dist: Shibpur, West Medinipur Dist: Jhargram	Occurred on upper surface of leaves causing chlorosis and later drying of leaves.
Family II: Tenuipalpidae:				
13.	***Brevipalpus californicus**** (Banks)	*Artemisia nilagrica(C.B.* Clarke), *Justicia adhatoda* L., *Pterocarpus santalinus* L.	Narendrapur Medicinal Plants Garden, East Midnapur Dist: Debra; Bardhaman Dist: Bardhaman	Feeding produced brownish patches on leaves
14.	***Brevipalpus deleoni*** Pritchard & Baker	*Michelia champaca L.*	Narendrapur Medicinal Plants Garden, West Medinipur Dist: Bajkul	No noticeable damage
15.	***Brevipalpus essigi*** Baker	*Coffea arabica* L. , *Ocimum sanctum L*)	Narendrapur Medicinal Plants Garden.	Infested lower surface of leaves, feeding produced brownish patches.

16.	***Brevipalpus phoenicis**** (Geijsk.)	*Mentha piperita L.*	North 24 Parganas Dist: Naihati, East Medinipur Dist: Debra	No noticeable damage
17.	***Brevipalpus* spn.****	*Cajanus cajan* (L.), *Lawsonia inermis* L. , *Rauvolfia serpentina* Benth ex Kurz, *Datura metel* L. , *Thespasia lampus* (Cav.), *Ocimum tenuiflorum* L., *Justicia adhatoda* L., *Curculigo orchioides* Gaertn. , *Pentapetes phoenicea* L.	Narendrapur Medicinal Plants Garden,	An undescribed species of *Brevipalpus* was recorded on the listed host, the population of which was not high. This mite inflicted no noticeable damage.
Family III: Eriophyidae:				
18.	***Aceria cajani*** ChannaBasavanna	*Cajanus cajan* (L.)	Narendrapur Medicinal Plants Garden.	This mite occurred on undersurface of leaves as vagrants, is causing no damage.
19.	***Aceria mori*** (Keifer)	*Morus alba* L.	Narendrapur Medicinal Plants Garden, Nadia Dist: Kalyani	This mite was found as vagrants on leaves causing no damage.
20.	***Aceria nerii*** ChannaBasavanna	*Nerium indicum* Mill.	Narendrapur Medicinal Plants Garden, East Medinipur Dist: Bajkul	The mite was found as vagrants causing no damage.
21.	***Aceria* sp.**	*Santalum album* L.	Narendrapur Medicinal Plants Garden	The mite was seen as vagrant on under surface of sandal wood leaves but caused no apparent damage symptoms
Family IV: Tarsonemidae				
22.	***Polyphagotersonemus latus**** (Banks)	*Datura metel* L.), *Mentha piperata* L., *Ocimum gratissimum* L., *Tagetes erecta* L.	Narendrapur Medicinal Plants Garden, Nadia Dist: Kalyani	The mites are very small, fast moving whitish/ yellowish colored, mostly attacked the young apical leaves causing crinkling and crumpling of leaves.

B) Predatory:

Serial No.	Species	Host/Habitat	Lo2cality	Remarks
Family I: Anystidae				
23.	***Anystis baccarum*** (L.)	*Nyctanthes arbor-tristis* L., *Clerodendron inerme* L., *Justicia adhatoda* L.	North 24 Parganas Dist: Barrackpur, Nadia Dist: Ranaghat	This was found in large number on Vasak but less on the other hosts
Family II : Bdellidae				
24.	***Octobdellodes guajavae*** Chatterjee & Gupta	*Cynodon dactylon* L.	Narendrapur Medicinal Plants Garden	occurred occasionally
25.	***Octobdellodes* spn.****	*Michelia champaca* L.	Narendrapur Medicinal Plants Garden	occurred occasionally, comes close to O. *guajavae* but differed in dorsal idiosomal characters.
Family III: Cunaxidae				
26.	***Cunaxa bambusae*** Gupta	*Michelia champaca* L.	Narendrapur Medicinal Plants Garden, Hooghly Dist: Balarambati	Occasionally encountered.
27.	***Cunaxa capreolus*** (Berlese)	*Stevia rebaudiana* Bertz.	Narendrapur Medicinal Plants Garden	Occasionally encountered.
28.	***Cunaxa* spn.****	*Glycosmis pentaphylla* (Retz.)	Narendrapur Medicinal Plants Garden	This is close to *Cunaxa bambusae* Gupta but differed in palp chaetotaxy.
Family IV: Stigmaeidae				
29.	***Agistemus terminalis*** (Quayle)	*Aegle marmelos* (L.)	Narendrapur Medicinal Plants Garden, Nadia Dist: Krishna nagar; Bardhaman Dist: Bardhaman	Occasionally encountered
30.	***Agistemus* spn.****	*Santalum album* L.	Narendrapur Medicinal Plants Garden	Close to *Agistemus fleschneri* but differed in relative lengths and ratios of dorsal idiosomal setae.
Family V : Tydeidae				
31.	***Pronematus* spn.****	Krishna-shariba	Narendrapur	Encountered occasionally, appeared close to *Pronematus sextoni* , but differed in dorsal idiosomal characters.
32.	***Pronematus fleschneri*** Baker	*Michelia champaca* L.	Narendrapur Medicinal Plants Garden, Hooghly Dist: Chunchura	Found on leaves of champa infested with *Oligonychus mangiferus* feeding on eggs.
33.	***Pronematus sextoni*** Baker	*Ocimum gratissimum* L.	North 24 Parganas Dist: Kankinara, Howrah Dist: Shibpur, Nadia Dist: Chakdaha	Only occasionally encountered.
34.	***Tydeus* spn.****	*Ocimum gratissimum* L.	Narendrapur Medicinal Plants Garden, Hooghly Dist: Chunchura, East Medinipur Dist: Tamluk	Close to *Tydeus ornamentalicus* Gupta but differed in setal characters.
Order III : Mesostigmata **Family VI: Phytoseiidae**				

35.	***Amblyseius herbicolus*** (Chant)	*Michelia champaca* L.	Narendrapur Medicinal Plants Garden, Nadia Dist: Kalyani, Bardhaman Dist: Adi Saptagram	It is a commonly occurring predatory mite associated with spider mites.
36.	***Amblyseius largoensis*** (Muma)	*Ocimum gratissimum* L. ,*Abelmoschus moschatus* Medic., Citrus *Citrus limon* L., *Mangifera indica* , *Rauvolfia serpentina* Benth ex Kurz,*Santalum album* L.., *Michelia champaca* L., *Piper nigrum*, *Pterocarpus santalinus* L.	Narendrapur Medicinal Plants Garden	Commonly occurred as predatory mite associated with spider mites. Good predator of spider mites.
37.	***Amblyseius mcmurtryi*** Muma	*Santalum album* L.	Narendrapur Medicinal Plants Garden	Only occasionally encountered.
38.	***Euseius alstoniae*** (Gupta)	*Michelia champaca* L..	Narendrapur Medicinal Plants Garden	Very dominant predatory mite associated with *Oligonychus mangiferus*.
39.	***Euseius coccineae*** (Gupta)	*Ocimum sanctum* L.	Narendrapur Medicinal Plants Garden, Howrah Dist: Uluberia	Occasionally encountered.
40.	***Euseius ovalis*** (Evans)	*Pterocarpus santalinus L.*	Narendrapur Medicinal Plants Garden	Good predator of spider mites being voracious feeder.
41.	***Indoseiulus ricini*** (Ghai & Menon)	*Rosa* spp.	Narendrapur Medicinal Plants Garden, Nadia Dist: Kalyani, East Medinipur Dist: Kharagpur	Rare occurrence, known to be a good predator but such behavior was not observed in the present study.
42.	***Neoseiulus longispinosus*** (Evens)	Michelia champaca L.	North 24 Parganas Dist: Dumdum, Nadia Dist: Ranaghat	Good predator of spider mites being voracious feeder.
43.	***Paraphytoseius multidentatus*** Swirski & Shechter	*Ocimum gratissimum* L., *Ocimum sanctum* L., *Ocimum basilicum* L.	Narendrapur Medicinal Plants Garden, Hooghly Dist: Srirampur	Very dominant predatory mite .
44.	***Phytoseius kapuri*** Gupta	Ficus carica	Nadia Dist: Krishnanagar; East Medinipur Dist: Kharagpur; Hooghly Dist: Bandel	Occasionally found on citrus leaves.
45.	***Scapulaseius polyantheae*** (Gupta)	*Citrus limon* L.	Narendrapur Medicinal Plants Garden	Occasionally found on citrus leaves.
46.	***Scapulaseius suknaensis*** (Gupta)	*Abelmoschus moschatus* Medic.,*Citrus limon* L.	North 24 Parganas Dist: Sandeshkhali; Hooghly Dist: Chunchura; East Medinipur Dist: Debra	Occasionally found on citrus leaves.
47.	***Typhlodromips syzygii*** (Gupta)	*Citrus limon* L.	Narendrapur Medicinal Plants Garden, Hooghly Dist: Chunchura	Occasionally found on citrus leaves.
Order III: Cryptostigmata				
48.	Oribatid Mites (Undetermined species)	*Pavonia odorata* Willd.	Narendrapur Medicinal Plants Garden	Nature of association unknown.
Order IV: Astigmata Family IX: Glycyphagidae				
49.	***Glycyphagus domesticus*** DeGeer	*Solanum xanthocarpum* Schrad and Wendl	Narendrapur Medicinal Plants Garden	Nature of association unknown.

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