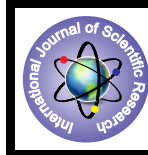


A Report on Mites (Acari) Occurring in Rice Agroecosystem in South Bengal



Science

KEYWORDS : Paddy, mite, South Bengal, phytophagous, predatory, fungivorous.

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ABSTRACT

The present paper provided a list of phytophagous and predatory mites occurring in rice ecosystem in South Bengal. This includes mites not only on paddy leaves but also those which could be collected in stored paddy, paddy husk, weeds and in accumulated water in the paddy field. A total of 44 species of mites have been documented under 19 families, 34 genera and 4 orders including 15 species under 8 genera and 4 families belonging to phytophagous group, 17 species under 14 genera and 8 families under predatory group and 11 species under as many genera as fungal feeders. Habitatwise distribution was 25 species from paddy leaves, 9 species from stored paddy, 8 species from paddy husk, 25 species from associated weeds and one from accumulated water in paddy field. Among these, *Oligonychus oryzae*, *Steneotarsonemus spinki* on paddy leaves, *Acarus* sp. on paddy husk, *Acarus* sp. and *Cheyletus eruditus* on stored paddy and *Acarus* sp., *Fuscurospoda* sp. and *Acarophenax tribolii* on associated weeds were found dominant.

Introduction :- Rice is an important food crop of entire South-East India, South America and in many other parts of the world. Unfortunately, the crop is attacked by hundreds of pests like insects, mites, nematodes, etc. of which mites, in now a days, are increasingly becoming important in pest scenario. Due to their small size, many a times they are overlooked and thus escaped the notice. They make their presence felt only when pest outbreak occurs seriously. Among the mites which occur on rice crops, some are phytophagous, doing various types of damages like chlorosis of leaves, browning, wilting, motling, chaffy grains, etc. The families which are involved doing these type of damages are Tetranychidae, Tarsonemidae, Eriophyidae, etc. Some Tarsonemids are known to cause sterility of the panicle or simply empty head sterility reducing the yield to the extent of 40% (Wei & Chow, 1980). Needless to mention, all these damages inflict severe economic loss to the growers. The rice crop after harvesting is stacked in storage and that is attacked by a number of mites belonging to the families Acaridae, Glycyphagidae, Pyroglyphidae, etc. which feed on the endosperm making those hollow, crumpled and ultimately making those unsuitable for human and animal consumption as well as for seed purpose. There is one species of mite, *Schelorbates zealandicus* which causes brown streaks on leaves and tears parallel to veins giving the plants a pale torn appearance (Venugopal Rao *et al.*, 1982). Even some mites are there (Fam. Arrenuridae) which occurs in rice agroecosystem in accumulated water in rice field and are useful as biological control agent by feeding on mosquito larvae. It may be mentioned that rice field is a good breeding place for mosquito. In addition, a large number of weeds also occur in rice field which harbor different groups of mites and act as alternative hosts of many rice infesting mites especially when the rice crop is not available in field. Hence, these mites have also an important role to play in rice agroecosystem. Although some stray works have already been done in India reporting mites on rice crop which have been reviewed by Prasad (1974), Gupta (1985, 1991, 2012), Srinivasa *et al.* (2004) and Joshi *et al.* (2012), etc. but so far no holistic approach has ever been made from West Bengal to explore the mites in rice agroecosystem.

Material and Methods :-

For collection of mites, two districts of South Bengal were selected, viz. Hooghly, including Rice Research Centre, Govt. of West Bengal, Chinsurah and Narendrapur Agricultural Centre, South 24 Parganas. Regular samples were collected during 2014 – 2015 from these places as well as from other adjoining rice fields and mites were isolated by directly examining the leaves in the field itself under a 20X pocket lens. Mites were picked up with a fine

brush moistened with alcohol. The same methodology was followed for collection of mites from weeds present in the rice ecosystem. Many a times, the leaves of both, paddy and weeds were brought to laboratory in polythene bags after tightly closing the mouth with a rubber band and leaves were examined under stereobinocular microscope for collection of mites. Regarding mites from stored paddy and husk, the samples of those, mostly from Chinsurah Rice Research Station were collected in polythene bags and were subjected to heat desiccation treatment in a Tullgren funnel apparatus. The collected mites found in the receiver containing alcohol were isolated under stereobinocular microscope. For mounting, Hoyer's medium was used and the mounted slides were gently warmed on a hot plate for clearance of body parts and stretching of appendages. Finally, the mites were identified under stereoresearch microscope.

Results and Discussion :- The mite species collected from rice agroecosystem were listed in Table – 1.

Table – 1 : List of mite species collected from different habitats in rice agroecosystem along with period of occurrence

Order – I	Period of occurrence	Paddy husk	Stored paddy	Paddy leaf	Associated weeds	Accumulated water
Prostigmata						
Phytophagous Group						
Tetranychidae						
<i>Oligonychus oryzae</i> (Hirst)	1, 9, 13	-	-	+	+	-
<i>O. manishi</i> Gupta	4, 10, 15	-	-	+	-	-
<i>O. pratensis</i> (Banks)	4, 11, 15	-	-	+	+	-
<i>Tetranychus urticae</i> Koch	1, 12, 13	-	-	-	+	-
<i>T. neocaledonicus</i> Andre	1, 2, 11, 13, 14	-	-	-	+	-
<i>T. lombardini</i> (Baker & Pritchard)	1, 2, 10, 13, 14	-	-	-	+	-
<i>T. hypogaeae</i> Gupta	1, 2, 9, 13, 14	-	-	-	+	-
<i>T. macfarlanei</i> Baker & Pritchard	5, 6, 10, 16, 17	-	-	-	+	-
<i>Schizotetranychus andropogoni</i> Hirst	5, 6, 11, 16, 17	-	-	+	-	-
Eriophyidae						
<i>Chiracus sulcatus</i> Keifer	1, 12, 13	-	-	+	-	-
<i>Abacarus oryzae</i> Keifer	1, 11, 13	-	-	+	-	-
Tarsonemidae						
<i>Tarsonemus</i> sp.	4, 5, 6, 10, 15, 16, 17	-	-	+	-	-
<i>T. cuttacki</i> Iswari	1, 2, 9, 13, 14	-	-	+	-	-
<i>Steneotarsonemus spinki</i> Smiley	3, 4, 10, 15, 16	-	-	+	-	-
Tenuipalpidae						

<i>Brevipalpus californicus</i> Banks	1, 4, 5, 6, 11, 13, 16, 17, 18	-	-	-	+	-
Predatory Group						
Tydeidae						
<i>Pronematus</i> sp.	1, 2, 5, 6, 12, 13, 14, 17, 18	-	+	+	+	-
<i>Parapronematus</i> sp.	2, 5, 6, 11, 14, 17, 18	-	-	+	+	-
Arrenuridae						
<i>Arrenurus</i> sp.	4, 5, 10, 16, 17	-	-	-	-	+
Cheyletidae						
<i>Cheyletus eruditus</i> (Schrank)	1, 2, 9, 13, 14	+	+	+	+	-
<i>Acarophenax tribolii</i> * Newstead & Duvall	1, 2, 10, 13, 14	-	+	-	-	-
Cunaxidae						
<i>Cunaxa</i> sp.	3, 11, 15	-	+	+	+	-
Anystidae						
<i>Walzia indiana</i> Smith – Meyer & Ueckermann	4, 12, 16	-	-	-	+	-
Stigmaeidae						
<i>Agistemus</i> sp.	5, 6, 11, 17, 18	-	-	+	+	-
Order - II Mesostigmata						
Predatory Group						
Phytoseiidae						
<i>Neoseiulus imbricatus</i> Corpuz – Ramos & Rimando	2, 3, 10, 14, 15	-	-	+	-	-
<i>N. baraki</i> (Athias – Henriot)	2, 3, 9, 14, 15	-	-	+	-	-
<i>N. longispinosus</i> (Evans)	3, 4, 5, 10, 14, 15, 16	-	-	+	+	-
<i>N. fallacis</i> (Garman)	2, 3, 11, 14, 15	-	-	+	-	-
<i>Euseius ovalis</i> (Evans)	5, 6, 12, 15, 16	-	-	+	+	-
<i>Paraphytoseius bhadraliensis</i> (Gupta)	5, 6, 11, 15, 16	-	-	+	+	-
<i>Paraphytoseius orientalis</i> (Narayan & Ghai)	5, 6, 10, 15, 16	-	-	+	+	-
<i>Amblyceius largoensis</i> (Muma)	5, 6, 9, 15, 16	-	-	-	+	-
Ascidae						
<i>Blattisocius tarsalis</i> (Berlese)	1, 10, 13	-	-	+	-	-
<i>Lasioseius mcgregori</i> Chant	2, 3, 11, 14, 15	-	-	+	-	-
Fungal feeder						
Uropodidae						
<i>Fuscuropoda</i> sp.	2, 3, 12, 14, 15	+	+	-	-	-
Order - III Cryptostigmata						
Opipiidae						
<i>Oppia</i> sp.	3, 11, 15	-	-	-	+	-
Oribatellidae						
<i>Lamellobates</i> sp. *	3, 10, 15	-	-	-	+	-
Oribatulidae						
<i>Oribatula</i> sp.	1, 5, 9, 13, 17	-	-	+	+	-
<i>Schelorbates</i> sp.	1, 5, 10, 13, 17	-	-	+	+	-
Order - IV Astigmata						
Acaridae						
<i>Acarus</i> sp.	1, 2, 5, 6, 11, 13, 14, 17, 18	+	+	-	-	-
<i>Caloglyphus berlesei</i> Oudemans	4, 16	+	+	-	-	-
<i>Rhizoglyphus robini</i> * Claparede	3, 4, 12, 15, 16	+	+	-	-	-
<i>Tyrophagus putrescentiae</i> Schrank	3, 4, 11, 15, 16	+	+	+	-	-

Glycyphagidae						
<i>Glycyphagus domesticus</i> (De Geer)	3, 10, 15	+	-	-	-	-
Pyroglyphidae						
<i>Euroglyphus maynei</i> * Cooreman	1, 9, 13	+	-	-	-	-

[* Not earlier reported in association with paddy in India,

Explanation of notations (numerical figures indicate the period of occurrence):-

1 – Jan, 2014; 2 – Feb, 2014; 3 – Mar, 2014; 4 – Apr, 2014; 5 – May, 2014; 6 – June, 2014; 7 – July, 2014; 8 – Aug, 2014; 9 – Sep, 2014; 10 – Oct, 2014; 11 – Nov, 2014; 12 – Dec, 2014; 13 – Jan, 2015; 14 – Feb, 2015; 15 – Mar, 2015; 16 – Apr, 2015; 17 – May, 2015; 18 – June, 2015;]

All the mite species collected from four habitats of rice agroecosystem, viz. paddy leaf, stored paddy, paddy husk and associated weeds and accumulated water in paddy field have been identified and listed in Table – 1 along with their period of occurrence. A perusal to Table – 1 indicated the occurrence of a total of 44 species, belonging to 34 genera and 19 families under 4 orders which included 15 phytophagous species, 17 predatory species and 11 fungal feeders. The phytophagous mites were exclusively on paddy leaves and weeds whereas the predatory mites were available in all the four habitats but the maximum was on paddy leaves (14 species) closely followed by associated weeds (12 species) while paddy husk and stored paddy represented 1 and 4 species, respectively.

Among the total number of species, the maximum occurrence was on paddy leaves where 26 species could be collected which represented 9, 14 and 3 species, respectively of phytophagous, predatory and fungal feeding mites. The corresponding figures for associated weeds were 8, 12 and 4 species, respectively. The maximum number of fungal feeding mite was seen in paddy husk (7 species) followed by stored paddy (5 species) and the paddy leaf and associated weeds represented 3 and 4 species, respectively.

Among the phytophagous species, which were frequently encountered on paddy leaves were *Oligonychus oryzae*, *Steneotarsonemus spinki* and *Tarsonemus* sp. and among predatory mites *Pronematus* sp. was most dominant and could be collected throughout the study period. Among the other predatory mites in paddy leaves, the species next in dominance were – *Neoseiulus imbricatus*, *N. fallacis* and *Blattisocius tarsalis*. The occurrence of the others were casual.

Among the mites associated with weeds, the most dominating species were *Acarophenax tribolii*, *Fuscuropoda* sp. and *Paraphytoseius* sp. among predatory mites and *Tetranychus urticae* and *T. macfarlanei* among phytophagous mites. Among 4 fungal feeding mites, collected from associated weeds, none was found to be regularly occurring.

So far as stored paddy was concerned, out of 4 predatory mites, *Cheyletus eruditus* was of regular occurrence. This is a good predatory mite feeding upon Acarid mites (*Acarus* sp. and *Tyrophagus* sp.). Among the 5 fungal feeding mites which could be collected from stored paddy, *Acarus* sp. and *Tyrophagus putrescentiae* were of regular occurrence.

Among the paddy husk mites, *Acarus* sp. was the most dominant, followed by *Tyrophagus putrescentiae* while the others could be collected only occasionally.

So far as paddy leaf mites were concerned, *Oligonychus oryzae* infestation on paddy leaf caused chlorosis and white patches wherever feeding was done. According to Rao and Prakash

(1995), this mite was causing serious problems in Karnataka, Andhra Pradesh, TamilNadu and West Bengal. Nagarjan (1957) reported this mite causing 25% damage. *Schizotetranychus andropogoni* which could be collected only once in paddy field in Hooghly produced white stipplings in longitudinal rows on either side of midrib. Gupta (1985) discussed nature of damage and bioecology of this mite infesting paddy. However, its population was not much. In case of *Steneotarsonemus spinki* which is recently becoming notorious pest in almost all paddy growing areas of the world, (Navia *et al.*, 2005, Karmakar, 2008, Gupta, 2012), could be encountered in the present study only occasionally and its population was low and hence caused no damage symptoms like sterility and chaffy grains. The crop damage due to infestation of this mite was reported to be 30% - 90% (Xu *et al.*, 2001). It may be mentioned that this mite appeared in severe form earlier in the same field wherein the present study was conducted but during the present survey such infestation was never noticed.

Among the predatory mites, *Neoseiulus imbricatus* and *N. fallacis* were quite common and may be of some importance as biocontrol agents against paddy leaf mite. But this needs to be confirmed through future study. Gupta (2012) also reported *N. fallacies*, *N. imbricatus* and *Euseius ovalis* occurring in paddy leaves. Likewise, Cheyletid mites which could be collected from paddy husk and stored paddy was found to be good predator of Acarid mites when the infested samples were examined under stereobinocular microscope.

Finally, it may also be mentioned here that the collection reported in this paper also included two species, one each under *Agistemus* and *Cunaxa* which are likely to be new to science but their descriptions etc. have not been included here pending further study for confirmation of novelty. The present study also listed 4 mite species, the occurrence of which on paddy ecosystem was hitherto unknown. Since, this is a preliminary study aiming at mostly inventorizing mites, not much light could be thrown on the nature of association with different habitats or their economic importance. The study which is ongoing is expected to reveal many more interesting associations and their relative economic importance.

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