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Predatory mite fauna associated with agri-horticultural crops and weeds from the Gangetic Plains of West Begal, India*

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Abstract

A study was conducted in 2008–2009 to explore the predatory mite fauna from different agri-horticultural crops and weeds in the Gangetic plains of West Bengal. A total of 31 species belonging to nine genera, seven families and two orders were identified; they are listed along with their prey, period of occurrence and the plant habitats in which they were recorded. The most frequently collected species were the phytoseiids *Amblyseius largoensis* (Muma) and *Neoseiulus longispinosus* (Evans), the stigmaeids *Agistemus* spp. and the anystid *Walzia indiana* Smith-Meyer & Ueckermann. Given the frequency with which these mites were found, they can be considered potentially useful in suppressing the associated prey mites. The phytoseiids *Paraphytoseius multidentatus* Swirski & Schechter, *Euseius ovalis* (Evans), *Euseius coccineae* (Gupta), *Neoseiulus fallacis* (Garman) and the cheyletid *Cheletogenes ornatus* (Canestrini & Fanzago) were less frequently found and less abundant, implying that their impact on prey population is less important. The remaining species were rare.

Key words: Predatory mites, biological control, India.

Introduction

The use of synthetic chemical pesticides in agri-horticultural crops for pest control is becoming progressively more restricted in the Gangetic Plains of West Bengal, India (Hazra *et al*., 2011). Thus, knowledge about the prevailing predatory mites on these crops and on associated weeds is becoming more important, for the identification of prospective species to be used in biological control programs.

Among predatory mites, the phytoseiids (Acari: Phytoseiidae) are the most important and dominating group on plants. As a consequence, many faunistic studies of these mites have been conducted. More than 190 phytoseiid species have been reported from India (Evans, 1953; Narayanan & Kaur, 1960; Narayanan *et al*., 1960; Narayanan & Ghai, 1964; Rao & Rao, 1964; Ghai & Menon, 1967, 1969; Bhattacharya, 1969; Rao *et al*., 1970; Prasad, 1974; Dhooria, 1982, 1990; Rishi & Rather, 1983; Rather, 1982, 1984, 1985, 1986; Gupta, 1986, 2003; Rishi, 1990; Arbabi & Singh, 1990; Nagaraj, 1991; Sathiamma, 1995; Chatterjee & Gupta, 1996; Chinnaiah & Mohanasundaram, 2001a, b; Priyadarshini, 2003; Matu *et al*., 2007; Gowda, 2009) from over 2,280 species known from all over the globe (Chant & McMurtry, 2007; Mallik *et al*., 2010).

Several other families of plant inhabiting mites are considered potentially important predators. Gupta (2002) reviewed the literature on the taxonomy and bioecology of those mites, discussing their potential as biocontrol agents. They reported the following numbers of species of the most important of those families in India: Anystidae, 6; Ascidae, 9; Bdellidae, 14; Cheyletidae, 15; Cunaxidae, 15; and Stigmaeidae, 25. The objective of the present study was to survey the mites of those families from agri-horticultural crops and weeds in the Gangetic Plains of West Bengal, with a view to identifying the potentially important species.

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Materials and Methods

A rapid survey was conducted in the districts of North and South 24 Parganas, Howrah, Hooghly, Nadia and Murshidabad, between February 2008 and November 2009. The following agri-horticultural crops were examined for the presence of predatory mites: *Amaranthus* spp., banana (*Musa sapientum* L.), beans (*Dolichos* spp.), betelvine (*Piper betle* L.), *Bauhinia* sp., brinjal (*Solanum melongena* L.), chilli (*Capsicum annuum* L.), *Chrysanthemum* spp., *Citrus* spp., coconut (*Cocos nucifera* L.), cowpea (*Vigna unguiculata* Walp.), *Dahlia* spp., *Datura* spp., fig (*Ficus carica* L.), *Gerbera* spp., green gram [*Phaseolus mungo* (L.)], ground nut (*Arachis hypogaea* L.), guava (*Psidium guajava* L.), jute (*Chorchorus* spp.), litchi (*Litchi chinensis* Sonn.), mango (*Mangifera indica* L.), marigold (*Tagetes patula* L.), *Mikania* sp., okra [*Abelmoschus esculentus* (L.) Moench], pointed gourd (*Trichosanthes dioica* Roxb.), pomegranate (*Punica granatum* L.), red gram [*Cajanus cajan* (L.) Millsp.], rice (*Oryza sativa* L.), rose (*Rosa* spp.), sesame (*Sesamum indicum* L.), sugarcane (*Saccharum officinarum* L.) and tea [*Camelia sinensis* (L.) Kuntze]. The following weeds were also examined: *Ageratum conyzoides* L., *Argemone mexicana* L., *Cynodon dactylon* (L.) Pers., *Physalis minima* L. and an undetermined grass species.

In each survey, plants were examined for symptoms of mite attack. The presence of mites was confirmed with a 20x hand lens, and leaves with mites were detached for transport to the laboratory for detailed observations under stereoscopic zoom microscope and to collect the mites for identification. Collected mites were mounted in Hoyer's medium for later identification under a compound microscope.

Results

The species found in this study are shown in Table 1. A total of 31 species of predatory mites, belonging to nine genera, seven families and two orders was found.

TABLE 1. Predatory mites and associated mites and insects collected in West Bengal, India in 2008–2009.

Family	Species	Associated phytophagous mites/insects	Period of collection	Plant habitat[1]	Remarks[2]
		Predatory mite order Mesostigmata			
Ascidae	*Lasioseius* sp.	*Polyphagotarsonemus latus* (Banks), *Steneotarsonemus spinki* Smiley, *Tetranychus urticae* Koch, mealybugs	June to September	Jute, pointed gourd, rice	B
Phytoseiidae	*Amblyseius aerialis* (Muma)	*Brevipalpus phoenicis* (Geijskes)	April to September	Betelvine	C
	Amblyseius channabasavannai Gupta & Daniel	*T. urticae*	August to November	Jute	B
	Amblyseius herbicolus (Chant)	*P. latus, T. urticae*	April to September	Cowpea, mango, pointed gourd	A
	Amblyseius kulini Gupta	*Brevipalpus* sp.	April to June	Betelvine	C
	Amblyseius largoensis (Muma)	*P. latus*	March to October	Banana, Datura, jatropha, jute, pointed gourd	A

Family	Species	Associated phytophagous mites/insects	Period of collection	Plant habitat[1]	Remarks[2]
	Amblyseius neorykei Gupta	*Eriophyes granati* (Canestrini & Massalongo)	May to June	Pomegranate	C
	Amblyseius paraaeri-alis Muma	*Brevipalpus sp., Bemisia tabaci* (Gennadius)	April to June	Betelvine	C
	Amblyseius sp. n. 1	*P. latus*	June to July	Jute	C
	Amblyseius sp. n. 2	*Aceria mangiferae* Sayed	February to March	Mango	C
	Amblyseius sp. n. 3	*P. latus*	August to November	Jatropha	C
	Amblyseius sp. n. 4	*T. urticae*	April to October	Pointed gourd	C
	Euseius coccineae (Gupta)	*P. latus*	April to September	Chilli	C
	Euseius finlandicus (Oudemans)	*Panonychus citri* (McGregor), *T. urticae, P. latus*	April to October	*Bauhinia* sp., cowpea	B
	Euseius meghalayensis (Gupta)	*T. ludeni* Zacher, *T. urticae*	March to May	Cowpea	C
	Euseius ovalis (Evans)	*P. latus, P. citri, T. urticae*	April to October	Chilli, citrus, weed	A
	Neoseiulus fallacis (Garman)	*Oligonychus* sp.	April to May	Grass	A
	Neoseiulus longispinosus (Evans)	*T. urticae*	March to October	Banana, cowpea, jute, okra, pointed gourd, weeds	A
	Paraphytoseius multi-dentatus Swirski & Shechter	*P. latus*	April to September	Jatropha, jute, brinjal	A
	Paraphytoseius sp. n.	*P. latus*	April to June	Jute	C
	Typhlodromips sp. n.	*T. urticae*	April to June	Pointed gourd	C
	Typhlodromips sp. n.	*P. latus*	August to October	Jatropha	C
	Typhlodromips syzygii (Gupta)	*P. latus, T. urticae*	April to October	Chilli, jute, pointed gourd	C
	Phytoseius sp. n.	*Eotetranychus* sp.	April to May	Fig	C
	Amblydromella sp. n. 1	*Oligonychus* sp.	May to October	Grass	C
	Amblydromella sp. n. 2	*P. latus*	May to August	Jatropha	C
		Predatory mite order Prostigmata			
Anystidae	*Walzia indiana* Smith-Meyer & Ueckermann	*Brevipalpus* sp., *P. latus, B. tabaci*	April to October	Betelvine, chilli	A
Bdellidae	*Bdelloides* sp.	*Brevipalpus* sp., *P. latus, B. tabaci*	April to October	Betelvine, mango	B

Family	Species	Associated phytophagous mites/insects	Period of collection	Plant habitat[1]	Remarks[2]
Cheyletidae	*Cheletogenes ornatus* (Canestrini & Fanzago)	*A. mangiferae, P. latus*	April to October	Jatropha, mango	B
Cunaxidae	*Cunaxoides* sp.	*P. latus, T. urticae, B. tabaci*	April to October	*Datura, Mikania* sp., pointed gourd sp.	B
Stigmaeidae	*Agistemus* spp.	*Brevipalpus* sp., *P. latus, T. urticae, P. citri, B. tabaci,* mealybug	April to October	Betelvine, chilli, citrus, green gram, guava, mango, pointed gourd	A

[1] See text for scientific name of plant species; [2] Based on field observations: A—feeding actively; B—feeding occasionally; C—only associated

Discussion

The species most frequently collected in this study were the phytoseiids *Amblyseius largoensis* (Muma) and *Neoseiulus longispinosus* (Evans), the stigmaeids *Agistemus* spp. and the anystid *Walzia indiana* Smith-Meyer & Ueckermann. Field and laboratory observations of the samples collected showed these predators to thrive on the following prey species: *N. longispinosus* fed on *Oligonychus indicus* (Hirst) (Tetranychidae) on rice and banana and *Tetranychus urticae* Koch on pointed gourd; *A. largoensis* fed on *Polyphagotarsonemus latus* (Banks) (Tarsonemidae) on jute and jatropha; *Agistemus* spp. fed on *P. latus*, *Bemisia tabaci* (Genn.) and mealybug on betelvine, chili and *Datura* spp. as well as *Brevipalpus* sp. (Tenuipalpidae) on betel vine, guava and pointed gourd; *W. indiana* fed on *Brevipalpus* sp. and whitefly on betelvine and chilli.

These predators were quite often observed on both cultivated plants and weeds, indicating the possible role of the latter as alternative substrates onto which the predators could be found. Of particular interest was *N. longispinosus*, found quite often on weeds like *P. minima* and grasses in crop fields. Most probably these plants serve as alternative habitats for this promising predator; this is the probable reason for its occurrence in the field throughout the year (our unpublished observation). Also of particular interest was the stigmaeid *Agistemus* spp. They were often found in the field thriving on the broad mite, eggs of *B. tabaci*, mealybugs and scale insects infesting crops like betel vine, chilli, green gram and jute.

A second group of predators, less often encountered than the species mentioned above but also commonly found, consisted of the phytoseiids *Paraphytoseius multidentatus* Swirski & Schechter, *Euseius ovalis* (Evans), *Euseius coccineae* (Gupta), *Neoseiulus fallacis* (Garman) and the cheyletid *Cheletogenes ornatus* (Canestrini & Fanzago). The remaining predators were only found occasionally.

The total number of phytoseiid species so far reported from West Bengal from different plant species is much greater than reported in this study (Moraes *et al*., 2004). At least 54 species not found in this work has been reported from this Indian State. However, three of the phytoseiids reported in this paper had not been reported from West Bengal before, namely *Amblyseius kulini* Gupta, *Amblyseius paraaerialis* Muma and *Euseius meghalayensis* (Gupta). In addition, nine of the species found are new to science.

Given the importance of rice crop to India, also of interest is the association of *Lasioseius* sp. (Ascidae) with *Steneotarsonemus spinki* Smiley (Tarsonemidae), one of the most important pests of this crop in India and elsewhere (see Karmakar & Gupta in this volume). Species of that predaceous ascid mite have been reported by other authors in association with this pest (Gerson *et al*., 2003; Zhang & Fan, 2010).

The present study shows that a rich predatory mite fauna occurs in agri-horticultural crops and weeds in the Gangetic Plains. The potential of some groups of predators found in this study as con-

trol agents has been extensively studied, especially the phytoseiids Gerson *et al*. (2003). Several phytoseiid species have been shown to play significant role as natural enemies of pest mites under natural conditions and when commercially produced for mass released on different crops. The predators found should be conserved so that they can exert natural suppression of pest mite species and some insect pests, minimizing the need for use of chemical pesticides.

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