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SHORT REPORT Open Access

A new host and distribution record for the black coccinellid, *Stethorus aptus* Kapur (Coccinellidae: Coleoptera)

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Abstract

The black Coccinellid species *Stethorus aptus* Kapur was identified as a predator on the European red mite, *Panonychus ulmi* (Koch.) for the first time. The *S. aptus* was also reported for the first time in India. Adults of this coccinellid species were black colored and oval or slightly ovate in shape, and its body covered with numerous white setae. The grubs and adults were found actively feeding on *P. ulmi* in apple and almond orchards in Kashmir region of India.

Keywords: Coccinellidae, Stethorini, Predator, Kashmir, India

The European red mite, *Panonychus ulmi* (Koch.), is a very serious pest of temperate fruit crops throughout the world and inflicts heavy losses. The indiscriminate use of broad spectrum pesticides is the main cause for *Panonychus ulmi* outbreaks by way of development of resistance and suppression of natural enemies (Cross and Berrie 1994). Any long-term commitment to pure chemical approach is unsatisfactory and has necessitated focusing research on other methods, especially biological control (Rather and Bano 2008). The species of the tribe Stethorini Dobzhansky (genera *Stethorus* Weise and *Parastethorus* Pang and Mao) are the specialist mite predators in the family Coccinellidae (Biddinger et al. 2009). Earlier, the genus *Stethorus* and *Parastethorus* were placed under the tribe Scymnini. But now, it belongs to the monogeneric tribe Stethorini. The Stethorini were unique from all other Scymninae due to their convex anterior margin of the prosternum and truncate clypeus near the antennal bases (Gordon 1985). The genus *Stethorus* is distributed throughout the world in many different climates ranging from tropical rainforests to temperate deciduous forests and plains to colder northern regions of Europe, Canada, and Russia (Chazeau 1985; Biddinger et al. 2009).

The adults and larvae of *Stethorus* spp. are specialized predators of spider mites (Tetranychidae) and closely related to false spider mite or flat mites (Tenuipalpididae) (Chazeau 1985). Khajuria (2009) reported that *S. punctum* LeConte was one of the efficient predators associated with phytophagous mites in India. The European red mite, *P. ulmi* was found infesting on apple and almond orchards in Kashmir Valley (32.17–36.55° N, 75.32–75.76 °E, 1700 MASL) of Jammu and Kashmir in India. An extensive survey was conducted during March to November 2011, for the collection of natural enemies of *P. ulmi*, with particular focus on Coccinellids. The collected specimens were sent to the National Bureau of Agriculturally Important Insects, Bangaluru, India, for species identification. After identification, the specimens were deposited in the National Bureau of Agriculturally Important Insects, Bangaluru, India.

Identified species was *S. aptus* Kapur (1948), which was found feeding on *P. ulmi* on apple and almond orchards of Kashmir valley in India (Fig. 1d). This is a new host record for *S. aptus*. This species was reported earlier as a predator on citrus red mite, *P. citri* (McGregor) in China (Li et al. 1990). The earlier records of *Stethorus* predators of *P. ulmi* were *S. bifidus* Kapur, *S. darwini* (Brethes), *S. gilvifrons* (Mulsant), *S. puntillum* Weise, *S. punctum punctum* LeConte, and *S. vagens* (Blackburn) on different host plants (Table 1). Perusal of literature shows that five species of *Stethorus* have been recorded in India (Table 2). Hence, *S. aptus* was reported for the first time from India and therefore, a new addition to *Stethorus* fauna of India was made through this research survey. This species was

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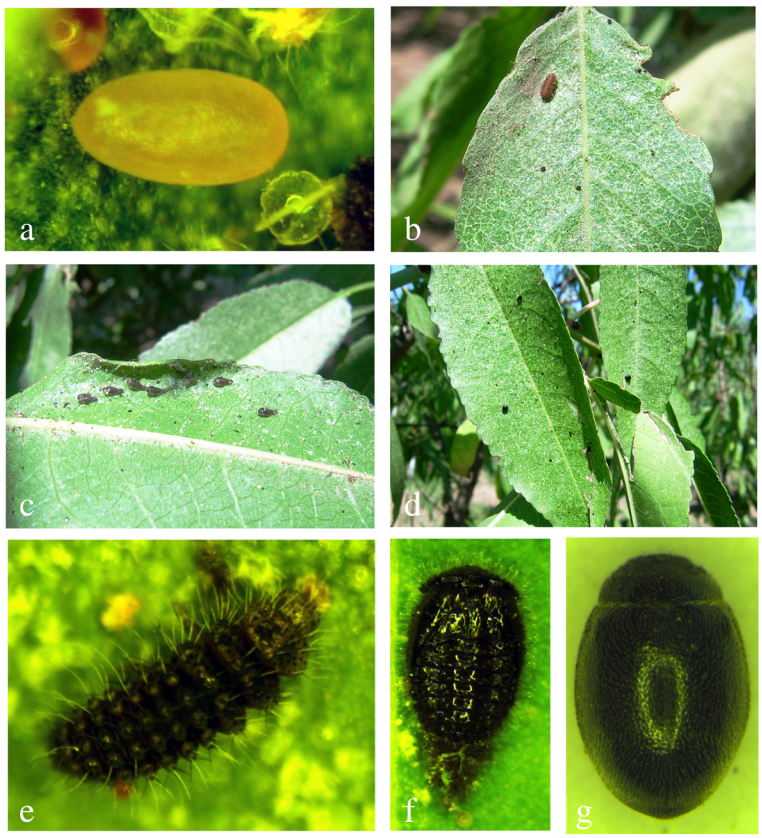

Fig. 1 Life stages of Stethorus aptus feeding on Panonychus ulmi. (**a**) Egg. (**b**) Grub feeding on P. ulmi. (**c**) Pupa on leaf surface. (**d**) Adults feeding on P. ulmi. (**e**-**g**) Magnified picture of grub, pupa and adult beetle

earlier reported in China (Fujian, Guangdong, Guangxi, Hainan, Zhejiang), Japan (Ryukyu), Malaysia, and Taiwan (Yu 1995). The eggs of *S. aptus* were light pinkish in color and elongated oval in shape which was laid singly in longitudinal position (Fig. 1a). The larvae were pinkish or pale orange in color in earlier stage and later turn to brown or black (Fig. 1b, e). The pupae were black, covered with numerous white setae, and attached themselves to the posterior side with the leaf surface (Fig. 1c, f). Adults are black, oval to slightly ovate in shape, covered with numerous white setae, and were active flier (Fig. 1g). Both larvae and adults were found feeding on *P. ulmi* (Fig. 1b, d). The other predatory coccinellid species (or genera) such as *Hippodamia convergens* Guerin-Meneville, *Coleomegilla maculata* De Geer, *Harmonia axyridis* (Pallas), *Olla abdominalis* (Say), *Adalia tetraspilota*, *Coccinella undecimpunctata*, *Halyzia* sp., *Eriopus*, *Scymnus*, and *Psyllobora* were reported feeding on mites (Rather 1989; Biddinger et al. 2009), but these taxa were not considered to be primary predators of mites (McMurtry et al. 1970; Hodek and Honek 1996).

Table 1 *Stethorus* predators of *Panonychus ulmi* of the world

Sample no.	Species	Crop	Region	References
1	*S. bifidus* Kapur	Apple, Plum, Pear	New Zealand	Collyer 1964
2	*S. darwini* (Brethes)	Apple	Brazil	Lorenzato 1987
3	*S. gilvifrons* (Mulsant)	Apple	Iran	Haji-zadeh et al. 1993
4	*S. punctillum* Weise	Fruit trees	Canada	Putman 1955
		Fruit trees	Europe	McMurtry et al. 1970
		Apple	Italy	Pasqualini and Antropoli 1994
5	*S. punctum punctum* (LeConte)	Fruit trees	North America	McMurtry et al. 1970
6	*S. vagens* (Blackburn)	Apple	Australia	Walters 1976

Table 2 Checklist of the genus *Stethorus* from India

Sample no.	Species	Distribution
1	*gilvifrons* (Mulsant) *Scymnus gilvifrons* Mulsant 1850: 995 *Scymnus* (*Stethorus*) *gilvifrons*: Weise 1885: 74 *Stethorus gilvifrons*: Korschefsky 1931: 112	India, Pakistan, Italy, Cyprus
	indira Kapur transferred to *Parastethorus* by Slipinski 2007	
2	*keralicus* Kapur *Stethorus keralicus* Kapur 1961: 35	India
3	*parcepunctatus* Kapur *Stethorus parcepunctatus* Kapur 1948: 312	India
4	*pauperculus* (Weise) *Scymnus pauperculus* Weise 1895: 155 *Stethorus pauperculus* Weise 1900: 440	India, Pakistan, Malaysia and Thailand
5	*rani* Kapur *Stethorus rani* Kapur 1948: 313	India, China, and Thailand

The attractive characteristics of *Stethorus* for mite biological control were their prey consumption, longevity, and high reproductive capacity (Biddinger et al. 2009). Hence, there is an immediate need for further studies on biology and ecology, with special preference on their predatory potential and effects of miticides or pesticides. These studies are necessary in order to promote them as a potential biological control agent on mites. There is a need for better knowledge of their requirements, including utilization of alternative foods, refuges for dormancy and from nonselective pesticides, and host-finding mechanisms as stated by Biddinger et al. (2009). These studies would help in integrating pest management strategies with inclusion of *S. aptus* as one of the biocontrol agent in management of European red mite among temperate fruits crops.

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