

## RESEARCH NOTES

### Record of Natural Enemies of the San Jose scale, *Quadraspidiotus perniciosus* (Comstock) from Himachal Pradesh

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The San Jose scale, *Quadraspidiotus perniciosus* (Comstock) is recognised as a key pest in the major apple growing states of Himachal Pradesh, Jammu and Kashmir and Uttar Pradesh (Pruthi and Rao, 1951; Tuhani *et al.*, 1979). Although, the parasites and predators of *Q. perniciosus* from Himachal Pradesh and Jammu and Kashmir have been reported recently by Rawat *et al.* (1988 a,b) and Thakur *et al.* (1989), due to occurrence of some new biocontrol agents, it has become necessary to take stock of the latest position of natural enemy complex of San Jose scale in Himachal Pradesh. Survey for natural enemies was carried out at Shimla, Solan, Kinnaur and Kullu Districts of Himachal Pradesh from April to November during 1987 to 1989. Natural enemies recorded were identified by the Commonwealth Institute of Entomology, London.

During the survey, it was observed that among the hymenopterans, the primary parasitoids, *Aphytis* sp. *proclia* group (Walker) and *Encarsia perniciosi* (Tower) were the most commonly occurring parasitoids followed by *Teleterbratus perversus* Compere & Zinna. Although, *A. diaspidis* and *E. perniciosi* had earlier been reported to be well established in Himachal Pradesh by Jolly (1962), both these parasitoids were not recovered till 1987. It was only during 1987, the parasitoid *Aphytis* was recovered at Bhunter and Bhutti in Kullu Valley after reintroduction in large number at various places from Jammu and Kashmir state (Rawat *et al.*, 1988 b). Later, Thakur *et al.* (1989) reported four species of parasitoids viz.,

*Aphytis* sp. *proclia* group, *Encarsia perniciosi*, *Azotus perspicuosus* (Girault) and *Teleterbratus perversus* from Jammu & Kashmir but, only *Aphytis* sp. *proclia* was recovered from Himachal Pradesh. In the present study, except *A. perspicuosus*, all others have been recorded from the Himachal Pradesh. *T. perversus* has been reported for the first time from Sarahan, Kotkhai and Kullu valley of the state. Besides these, two hyperparasitoids namely *Marietta carnesi* (Howard) and *Azotus kashmirensis* Narayanan also have been recorded for the first time in Himachal Pradesh. Earlier, these two hyper parasitoids were recorded as primary parasitoids from Jammu and Kashmir by Amin and Trali (1987).

Among the predators, the coccinellid beetles *Chilocorus bijugus* Mulsant are the commonly occurring predators followed by *Pharoscygnus flexibilis* Mulsant, *Coccinella septempunctata* Linn. and *Sticholotis* sp. Similar observations have also been made by Rawat *et al.* (1988 a,b) and Thakur *et al.* (1989) while working under the same agro-climatic conditions of Himachal Pradesh. The presence of *Sticholotis* sp. on *Q. perniciosus* is also a new record from Cheog, Janerghat and Kotkhai of Shimla District and Kullu valley of Himachal Pradesh, while in Jammu & Kashmir, *Sticholotis marginalis* had earlier been recorded by Kapur (1954). Similarly, *Oenopia sauzeti* Mulsant at Cheog (Shimla) and Kullu valley and *Platynaspis saundersi* Crotch at Chail (Solan) and Cheog (Shimla) have been recorded for the first time from the San Jose scale infested plants in the country. These two

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predatory beetles were observed only once in the fields and attempts to multiply them under laboratory conditions on *Q. perniciosus* were not successful.

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**KEY WORDS :** Survey, *Quadraspidotus perniciosus*, parasitoids, predators, new records.

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