



RESEARCH NOTE

Diversity of insect and acarine fauna associated with marigold in northern and eastern parts of India

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ABSTRACT: Surveys were carried out during the *rabi* seasons of 2016-18 to enlist the insect and mite fauna associated with marigold in the four regions of northern and eastern parts of India *viz.*, Varanasi of Uttar Pradesh; Chiplima of Sambalpur district, Odisha; Balichak of Paschim Medinipur district and Pundibari of Coochbehar district of West Bengal. Insects belonging to ten orders were recorded and they were either phytophagous *viz.*, Lepidoptera, Diptera, Thysanoptera, Hemiptera and Orthoptera or predatory *viz.*, Coleoptera, Neuroptera, Odonata and Dictyoptera or were pollinating the crop *viz.*, Hymenoptera, Lepidoptera and Diptera. Amongst the pests, aphids (*Lipaphis erysimi* Kalt. and *Myzus persicae* (Sulz.)) were observed as major pests as their damage were more than 10 per cent. Other pests like thrips (*Thrips tabaci* Lindeman), gram pod borer (*Helicoverpa armigera* (Hübner)), serpentine leaf miner (*Liriomyza* spp.), mealybug (*Phenacoccus solenopsis* Tinsley), painted bug (*Nezara viridula* (Linnaeus)), cowbug (*Tricentrus bicolor* Distant), *Lygus* bugs, red spider mite (*Tetranychus urticae* Koch) etc. were recorded as minor pests of this economically important ornamental crop. This paper envisages the insects and acarines associated with this crop comprehensively from these regions.

Keywords: Marigold, insect and acarine fauna, northern and eastern parts of India

Marigold (*Tagetes* spp. Linn; Family: Asteraceae) is an important medicinal and ornamental evergreen flowering herb and known for its nematicidal, insecticidal, anti-microbial, cosmetics, allelopathic and medicinal properties. A native of south and central America, in India, marigold is one of the most commonly grown cut flower and extensively used in religious and social occasions in the one or other form (Ganai *et al.*, 2017). This important economic crop is often attacked and/or visited by a large number of insect and acarine fauna throughout its growth period. Various species of insect-pests *viz.* thrips, aphids, leaf hoppers, scale insects, mealy bugs, leaf miners, caterpillars, cut worms and chaffer beetles attack marigold (Anonymous, 2017). They often cause the serious damage resulting reduction in quality and quantity of flowers, curling and bronzing of leaves and even sometime complete drying and wilting of the plants. However, seriousness of these insect pests and acarine are many times region specific. Hence, an attempt was made to identify the major arthropod fauna visiting this economic herb during its main flowering season in three states covering northern and eastern part of the country. This will serve as a checklist of visiting arthropod fauna from the region.

Periodical surveys were conducted in and around the experimental farm of ICAR-Indian Institute of Vegetable Research, Varanasi (82°52' E longitude and 25°12'

N latitude) and its adjoining regions; Uttar Pradesh; Chiplima (83°92' E Longitude and 21°35' N Latitude), 30 km southwest of district Sambalpur, Odisha; Balichak (87°55' E Longitude and 22°37' N Latitude), district Paschim Medinipur, West Bengal; Pundibari (89°23' E Longitude, 26°19' N Latitude), district Coochbehar, West Bengal. To record the identity of insect and mite fauna associated with marigold observations were made during the *rabi* seasons (December to March) of 2016-18 coinciding with its main flowering season. Fields were selected with due consideration to include different varieties of marigold. The fields were inspected for signs of insect and mite infestation and insect/mite found feeding on marigold were collected and brought to the laboratory and preserved for identification. Information was also recorded on the plant parts damaged, amount and nature of damage, identity of the fauna, developmental stage, and date and area of collection. In addition to these, regular roving surveys with sweep nets (once in a week) were also conducted thorough out the growth stage to record the beneficial fauna associated with this crop. Together with the field surveys, information on the pest problem was also collected from farmers growing marigold. Insect specimens were also sent to Insect Identification Service, Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi, India for their taxonomic identification.

Table 1. Check list of insect and acarine fauna associated with marigold

Common name	Scientific name	Family: Order	Varanasi, Uttar Pradesh	Chiplima, Sambalpur, Odisha	Pundibari, Cooch Behar, West Bengal	Balichak, PaschimMedinipur, West Bengal
Plant lice	<i>Lipaphis erysimi</i> (Kaltenbach, 1843)	Aphididae: Hemiptera	Yes	No	Yes	Yes
Thrips	<i>Myzus persicae</i> (Sulzer, 1776) <i>Thrips tabaci</i> Lindeman, 1889	Thripidae: Thysanoptera	Yes	Yes	Yes	No
Red spider mite	<i>Tetranychus urticae</i> Koch, 1836	Tetranychidae: Trombidiformes	No	Yes	No	Yes
Gram pod borer	<i>Helicoverpa armigera</i> (Hübner, [1809])	Noctuidae: Lepidoptera	Yes	No	No	No
Leaf miner	<i>Liriomyza</i> spp.	Agromyzidae: Diptera	Yes	Yes	Yes	Yes
Mealybug	<i>Droschia</i> spp.	Margarodidae: Hemiptera	No	No	No	No
Green stink bug	<i>Phenacoccus solenopsis</i> Tinsley, 1898	Pseudococcidae: Hemiptera	No	No	No	Yes
Lygus bug	<i>Nezara viridula</i> (Linnaeus, 1758)	Pentatomidae: Hemiptera	No	No	Yes	No
Short-horned grass hopper	<i>Lygus</i> spp.	Lygaeidae: Hemiptera	No	Yes	Yes	No
Tree hopper	Unidentified	Acrididae: Orthoptera	Yes	Yes	Yes	Yes
Red cotton bug	<i>Tricentrus bicolor</i> Distant 1908	Membracidae: Hemiptera	No	Yes	No	No
	<i>Dysdercus cingulatus</i> (Fabricius, 1775)	Pyrrhocoridae: Hemiptera	No	No	No	Yes

		Pollinators				
Honey bees	<i>Apis dorsata</i> Fabricius, 1793 <i>A. cerana indica</i> Fabricius, 1798 <i>A. mellifera</i> Linnaeus, 1758	Apidae: Hymenoptera	Yes No No	Yes No No	Yes No No	Yes No No
Carpenter bee	<i>Xylocopa aestuans</i> (Linnaeus, 1758)	Apidae: Hymenoptera	No	No	No	Yes
Stingless bee / Dammer bee	<i>Tetragonula iridipennis</i> Smith, 1854	Apidae: Hymenoptera	No	Yes	Yes	No
Cabbage butterfly	<i>Pieris brassicae</i> (Linnaeus, 1758)	Pieridae: Lepidoptera	No	No	Yes	No
Syrphid fly adult	Unidentified	Syrphidae: Diptera	Yes	Yes	Yes	Yes
House fly	<i>Musca domestica</i> Linnaeus, 1758	Muscidae: Diptera	Yes	No	Yes	No
Blue butterfly adult	<i>Lampides boeticus</i> (Linnaeus, 1767)	Lycaenidae: Lepidoptera	No	No	Yes	Yes
Nine spotted tiger moth	<i>Amata phegea</i> (Linnaeus, 1758)	Erebidae: Lepidoptera	No	No	Yes	No
Ape fly adult	<i>Spalgis epius</i> (Westwood, 1851)	Lycaenidae: Lepidoptera	No	No	Yes	No
		Predators				
Lady bird beetles,	<i>Coccinella septempunctata</i> (Linnaeus, 1758)	Coccinellidae : Coleoptera	Yes	Yes	Yes	No
	<i>Brumoides suturalis</i> (Fabricius, 1789)		Yes	No	No	No
	<i>Micraspis discolor</i> (Fabricius, 1789)		No	No	Yes	No
	<i>Cheilomenes sexmaculata</i> (Fabricius, 1781)		Yes	Yes	No	No
Green lace wing	<i>Chrysoperla zastrowitsilemi</i> (Esben-Petersen)	Chrysopidae: Neuroptera	No	Yes	Yes	No
Rove beetle	<i>Paederus</i> sp.	Staphylinidae: Coleoptera	Yes	Yes	No	No
Preying mantid	Unidentified	Mantidae : Dictyoptera	Yes	No	No	No
Lynx spider	<i>Oxyopes</i> sp.	Oxyopidae : Araneae	Yes	Yes	Yes	Yes
Dragon fly	Unidentified	Odonata	No	No	Yes	No

Herbivorous fauna: Insect and mite fauna recorded on marigold have been depicted in Table 1 along with their taxonomic status. It is also evident that there is a large variation in arthropod diversity in the four regions covering three states *i.e.*, Uttar Pradesh, West Bengal and Odisha. Few species were found to be major pests, while others were of minor pests status. The major pests with 10% \geq damage were the aphids infesting marigold flowers in Varanasi. Two species *viz.*, *Lipaphis erysimi* and *Myzus persicae* were noticed on marigold flowers. Large aphid colonies consisting of both nymphs and adults were noted to feed on the petals of the marigold flowers. Infested flowers often laden with black sooty mould and dried prematurely. *Lipaphis erysimi* was observed as major pest in Balichak, PaschimMedinipur, West Bengal but *Myzus persicae* was present in Chiplima, Odisha and in Pundibari, Coochbehar, West Bengal during the winter seasons whereas it was assumed as a minor pest status in place like in Pundibari, Cooch Behar, West Bengal. *Thrips tabaci*, another sucking pest in marigold, was recorded from all the three surveyed places except Varanasi, Uttar Pradesh. Pre-mature dropping of pale and brown coloured papery leaves were observed indicating the thrips infestation on the leaves. Unlike thrips, incidence of gram pod borer, *Helicoverpa armigera* was only recorded from Varanasi region. Being a polyphagous and polymorphous, *H. armigera* was reported to infest more than 182 species of plants belonging to 47 botanical families including pulses, oilseeds, fruits, vegetables, soybean, cotton and many other agricultural and horticultural crops (Halder *et al.*, 2010, 2012). Moreover, marigold is widely used as a trap crop for *H. armigera* in tomato cultivation (Rai *et al.*, 2014). In the present study, *H. armigera* was recorded only from the Varanasi region where gravid female laid eggs singly on florets, flower buds and on hatching, larvae was found to feed on the flowers. Bhagat, 2017 recorded that among the major insect pest damaging to this crop, *Helicoverpa armigera* (Hubner) causes severe damage to this crop causing yield loss up to 20%. Thontadarya and Jayaramaiah, 1973 reported that, heavy infestation of *H. armigera* (83.6%) was observed with as many as six larvae per head in Karnataka. Another polyphagous pest *viz.*, serpentine leaf miner *Liriomyza* spp. was the only pest recorded to infest marigold leaves in all the four surveyed areas. Interestingly, recently introduced pest solenopsis mealybug, *Phenacoccus solenopsis* was also recorded to feed on the tender twigs of marigold from Balichak area of West Bengal. In another study, Ganai *et al.*, 2017 documented mealy bug *Drosicha* spp. as a serious pest of marigold in many parts of Jammu. However, in our study the only mealy bug species *P. solenopsis* was observed. Other minor pests like Green stink bug, *Lygus* bug, Red cotton bug, Short-horned grass

hopper and Tree hopper were sporadic in distribution and were present one or other surveyed places. The only acarine pest noted during the surveys was red spider mite, *Tetranychus urticae* from Chiplima, Odisha and Balichak, West Bengal. The results are in agreement with that of Anonymous (2017) who reported that marigold is attacked by insect-pests like thrips, aphids and mites.

Pollinators: The bright orange/yellow colored flowers of marigold attracted a large number of pollinators. Different species of honey bees (Apidae: Hymenoptera) *viz.*, *Apis dorsata* Fabricius, *A. cerana indica* Fabricius, *A. mellifera* Linnaeus were observed as visiting arthropod on marigold. Amongst these, wild/rock bee *A. dorsata* was present all the four surveyed places and little bee *i.e.*, *A. florea* Fabricius was not noticed in any places visiting on marigold during the surveyed period. Other pollinators like *Xylocopa aestuans* (Linnaeus) and Stingless / Dammer bee, *Tetragonula iridipennis* Smith (Apidae: Hymenoptera) were recorded. Amongst the dipterans, adult syrphid fly and house fly (*Musca domestica*) were dominant visitors in marigold. Attractive globular yellow/orange coloured flowers of marigold also attract a large number of adult lepidopterans in many places (Ganai *et al.*, 2017). Amongst the adult lepidopterans Cabbage butterfly (*Pieris brassicae*); Ape fly (*Spalgis epius*); Blue butterfly, *Lampides boeticus* and Nine spotted tiger moth, *Amata phegea* were dominant in one or other surveyed areas (Table 1). However, their abundance and visiting period were non-synchronized and varied.

Predatory fauna: Lady bird beetles (Coccinellidae: Coleoptera) were the dominating predatory fauna associated with the marigold. Four lady bird species *viz.*, *Coccinella septempunctata* (Linnaeus), *Brumoides suturalis* (Fabricius), *Micraspis discolor* (Fabricius) and *Cheilomenes sexmaculata* (Fabricius) were recorded during the study feeding on various soft-bodied insects in many parts of northern and eastern parts of India. Another predatory beetle *i.e.*, rove beetle, *Paederus* sp. (Staphylinidae: Coleoptera) was abundant particularly during the January-February months. During the survey a large number of spiders mainly *Lynx* spiders (Oxyopidae: Araneae) were observed in all the four places. A few other polyphagous predators like preying mantids, dragon flies, reduvid bugs were also noticed during the roving survey.

The present study identified different insect and acarine fauna associated with marigold crop. This serves as base information in identifying economically important pests and developing management strategies. In addition, it also helps to take steps for conservation of beneficial fauna especially pollinators and other natural enemies for sustainable marigold production in these regions.

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