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Checklist of insect and acarine fauna associated with sponge gourd, *Luffa cylindrica* (L.) in the Indo-Gangetic plains of India

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Abstract

Surveys for the insect and acarine fauna associated with sponge gourd in the Indo-Gangetic Plains of Varanasi, Mirzapur and Deoria districts of Eastern Uttar Pradesh, India were carried out during the *Kharif* seasons of 2013-16. Insects belonging to seven orders were recorded were either phytophagous *viz*., Diptera, Coleoptera, Lepidoptera, Hemiptera and Orthoptera or predatory *viz*., Coleoptera, Hemiptera and Dictyoptera or were pollinating the crop *viz*., Hymenoptera. Amongst the pests, melon weevil (*Acythopeus curvirostris citrulli*), cucurbit fruit fly (*Bactrocera cucurbitae*), Blister beetle (*Mylabris phalerata* and *M. pustulata*) and whitefly (*Bemisia tabaci*) were observed as major pests as their damage were e"10 per cent. Other pests like pumpkin beetles (*Raphidopalpa foveicollis, Aulocophora lewisii*, *Aulacophora intermedia*), leaf miner (*Liriomyza trifolii*), aphid (*Aphis gossypii*), gall fly (*Lasioptera falcate*), cucumber moth (*Diaphania indica*), Red spider mite (*Tetranychus* spp.) etc. were the minor pests of this summer cucurbit. This paper records the insects and acarines associated with this crop for the first time from this region.

Keywords: Sponge gourd, insect and acarine fauna, Indo-Gangetic plains.

Introduction

Luffa, *L. cylindrica* (L.) a member of the cucurbitaceous family, commonly known as sponge gourd or vegetable sponge is grown throughout India but more widely in the Indo-Gangetic plains of Uttar Pradesh, Bihar and Jharkhand (Halder et al. 2016). It is a popular summer season vegetable and consumed as curry, chutney, sambhar or eaten raw like cucumbers. Besides, it has long been used as a medicinal herb to treat asthma, intestinal worms, sinusitis (Chakravarty 1990; Schultes 1990), edema, pharyngitis and rhinitis (Khare 2007). Pharmacologically it is known to be anti-tussive, anti-asthmatic, cardiac stimulant, hepatoprotective, hypolipidemic properties (Partap et al. 2012), analgesic (Velmurugan et al. 2011), anti-inflammatory (Muthumani et al. 2010; Abirami et al. 2011) and antiemetic (Khan et al. 2013).

Insect and mites are major biotic constraints to vegetable production in India. Apart from causing direct damage, many of them also act as vectors for viral diseases. The crop losses to the tune of 30-40 per cent have been reported from vegetable crops (Rai et al. 2014 a,b) . Besides being pests, many insects also serve as beneficial *viz*., pollinators, parasitoids and predators. Since sponge gourd is a cross-pollinated entomophilous crop, but role of the insect as pollinators also cannot be ruled out. Unlike other popular cucurbits *viz*., cucumber, pumpkin, bitter gourd, pointed gourd and bottle gourd, information on association of various insect and acarine pests, their status and beneficial fauna like predators, parasitoids and pollinators on this underutilized cucurbit ismeager. Information on the diversity and economic importance of pests and beneficial fauna is essential for designing sustainable pest management strategies. Thus the present study was carried out with an aim of identifying and cataloguing the diversity of insect and acarine fauna of sponge gourd in the Indo-Gangetic belt of Uttar Pradesh as a first step towards development of an effective integrated pest management strategy for this region.

Materials and Methods

Periodical surveys were conducted in and around the experimental farm of Indian Institute of Vegetable Research, Varanasi (82°52′ E longitude and 25°12′ N latitude)and its adjoining regions; Chunar area of

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Mirzapur district (82°87′ E longitude and 25°10′ N latitude), Krishi Vigyan Kendra, Deoria district (83°47′ E longitude and 26°30′ N latitude), Uttar Pradesh, India to record the identity of insect and mite fauna associated with sponge gourd during the summer and *Kharif* seasons of 2013-16. Fields were selected with due consideration to include different varieties of sponge gourd. The fields were inspected for signs of insect and mite infestation and insect/mite found feeding on sponge gourd 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 sponge gourd. Insect specimens were also sent to Division of Entomology, Indian Agricultural Research Institute, New Delhi, India

Table 1: Check list of insect and acarine fauna associated with sponge gourd

Name	Taxonomic position	Status	Plant part(s) affected	Stage of the crop and period	Nature of damage
Melon weevil, *Acythopeus curvirostris citrulli* (Marshall 1916)	Curculionidae: Coleoptera	Major pest	Fruits and vines	Fruiting stage (August to October)	Grub bore and feed the fruits and adults puncture / damage the fruit bearing vines.
Fruit fly, *Bactrocera cucurbitae* (Coquillett, 1849)	Tephritidae : Diptera	Major pest	Fruits	Fruiting stage (April to October)	Maggots bore and feed the fruit pulp.
Blister beetle, *Mylabris phalerata* Pallas, *M. pustulata* (Thunberg, 1821)	Meloidae: Coleoptera	Major pest	Flowers and flower buds	Flowering stage (April to October)	Adult beetles devoured flowers and flower buds.
Whitefly, *Bemisia tabaci* (Gennadius, 1889)	Aleyrodidae : Hemiptera	Major pest	Leaf	Both vegetative and reproductive stages (March to November)	Both the nymphs and adults suck the plant sap and create black sooty-moulds. Also act as vector of viral diseases.
Pumpkin beetle, *Raphidopalpa foveicollis* (Lucas, 1849)- red in colour *Aulocophora lewisii* Baly, 1886 *Aulacophora intermedia* Jacoby, 1892 - blue in colour	Chrysomelidae : Coleoptera	Minor pest	Tender leaves and flowers	From germination of the crop till maturity (March to November)	The grubs live in the soil and feeding on roots, rootlets while the adults feed the cotyledons, flowers and foliage.
Aphid, *Aphis gossypii* Glover, 1877	Aphididae : Homoptera	Minor pest	Leaves and buds	From germination to till harvesting (March to November)	Both the nymphs and adults suck the plant sap and create black sooty-moulds.
Leaf hopper, *Amrasca biguttula biguttula* (Ishida, 1912)	Jassidae : Hemiptera	Minor pest	Leaf	From germination to till harvesting (March to November)	Damagecaused by both nymphs and adults by sucking the sap from the underside of the leaf. Affected leaves initially turn yellow and become brittle.
Leaf miner, *Liriomyza trifolii* (Burgress, 1880)	Agromyzidae : Diptera	Minor pest	Leaf	Throughout the crop growth period (March to October)	Maggots feed the young leaves by mining in a zigzag fashion.
Gall fly, *Lasioptera falcate* Felt, 1919	Cecidomyiidae: Diptera	Minor pest	Stem (tender vines)	Throughout the crop growth period (March to November)	Gravid female lay eggs on the vines. Long and tubular galls are formed due to which normal growth of the plants is affected.
Tobacco caterpillar, *Spodoptera litura* (Fabricius, 1775)	Noctuidae : Lepidoptera	Minor pest	Flower	Flowering stage (June to September)	Larvae feed mainly on the flower and flower buds.
Gram pod borer, *Helicoverpa armigera* (Hübner, [1809])	Noctuidae : Lepidoptera	Minor pest	Flower	Flowering stage (June to September)	
Cucumber moth, *Diaphania indica* (Saunders, 1851)	Pyralidae : Lepidoptera	Minor pest	Young leaves	Both vegetative and reproductive stages (August to October)	Caterpillars scrap the chlorophyll portion of the leaves by webbing them together.
Short-horned grass hopper, *Aiolopus thalassinus* (Fabricius, 1781)	Acrididae: Orthoptera	Minor pest	Tender leaves	Both vegetative and reproductive stages (March to November)	Both nymphs and adults feed on the tender leaves.
Red spider mite, *Tetranychus* spp.	Tetranychidae : Acarina	Minor pest	Leaf	Almost throughout the growth period (May to June)	Both the nymphs and adults damage the crops by sucking the cell sap. The affected leaves turn yellow, dry up and finally wither away giving an unhealthy appearance.

for their taxonomic identification.

Results and Discussion

Phytophagous insect and acarine pests: Insect and mite fauna recorded on sponge gourd have been listed in Table 1 along with their visible damage symptoms, pest status, taxonomic status etc. Few species were found to be major pests, while others were of minor pest status.The major pests with e"10% damage were the melon weevil, *Acythopeus curvirostris citrulli* (Marshall); fruit fly, *Bactrocera cucurbitae* (Coquillett 1849); Blister beetle, *Mylabris phalerata* Pallas, *M. pustulata* (Thunberg 1821) and whitefly, *Bemisia tabaci* (Gennadius 1889). Other pests were of lesser importance and often showed sporadic distribution. The only acarine pest noted during the survey was red spider mite, *Tetranychus* spp.

Amongst the major pest, melon weevil, a new pest recording from the area, was considered as a most serious as about 70-80 per cent fruits and 30 per cent shoots were damaged by this weevil (Halder et al. 2016). Critical observation revealed that gravid females lay eggs in small batches on the tender fruits just beneath the skin and on hatching grubs start feeding on the soft, tender fruit pulp and continue till pupation. Due to its feeding, the affected fruits rot and there was no seed formation. Pupation occurs inside the fruits. Cocoons were hard blackish in colour made up of fibrous materials of the fruits and larval excreta. Adults emerge from the dry fruits by making small emerging holes. Affected fruits exhibit characteristic brown gummy encrustations on the fruits which significantly reduce its market value. Other major pests *viz*., fruit fly, Blister beetle and whitefly are discussed in table 1.

Predatory fauna: Lady bird beetles (Coccinellidae: Coleoptera) were the dominating predatory fauna associated with the sponge gourd. Four lady bird species *viz*., *Coccinella septempunctata* (Linnaeus 1758), *Brumoides suturalis* (Fabricius), *Micraspis discolor* (Fabricius 1798) and *Cheilomenes sexmaculata* (Fabricius) were recorded during the study feeding on various soft-bodied insects. Another predatory beetle *i.e*., rove beetle, *Paederus* sp. (Staphylinidae: Coleoptera) was abundant particularly during the post-monsoon season. Few polyphagous preying mantids, damsel flies, reduvid bugs were also noticed during the roving survey.

Pollinators: Being a cross pollinated crop, the bright yellow colored flowers of sponge gourd attracted a large number of pollinators. Four species of honey bees (Apidae: Hymenoptera) *viz*., *Apis dorsata* Fabricius, 1793, *A. cerana indica* Fabricius, *A. mellifera* Linnaeus, 1758, *A. florea* Fabricius, 1787 were observed as major pollinators on sponge gourd. However, their abundance and visiting period were non-synchronized and varied. Few Carpenter bee, Xylocopa *aestuans* (Apidae:

Beneficial insects

a. Predator

Name of the insect	Taxonomic position	Beneficial role
Rove beetle, *Paederus* sp.	Staphylinidae : Coleoptera	Predates on soft-bodied insects like jassid, whitefly nymphs and eggs, aphids, lepidopteran eggs etc.
Lady bird beetles, *Coccinella septempunctata* (Linnaeus, 1758) *Brumoides suturalis* (Fabricius, 1789) *Micraspis discolor* (Fabricius, 1789) *Cheilomenes sexmaculata* (Fabricius, 1781)	Coccinellidae : Coleoptera	Predates on soft-bodied insects like aphid, jassid, whitefly nymphs and eggs, mealy bugs, lepidopteran eggs etc.
Preying mantid	Mantidae : Dictyoptera	Polyphagous; feeds on a wide range of insects *viz*., small moths, grasshoppers and other soft-bodied insects.

b. Pollinators

Name of the insect	Taxonomic affiliation	Beneficial role
Honey bee, *Apis dorsata* Fabricius, 1793 *A. cerana indica* Fabricius, 1798 *A. mellifera* Linnaeus, 1758 *A. florea* Fabricius, 1787	Apidae : Hymenoptera	Pollinate the crops and produces honey and related products.
Carpenter bee, *Xylocopa aestuans* (Linnaeus, 1758)	Apidae : Hymenoptera	Pollinator
Stingless bee / Dammer bee, *Tetragonula iridipennis* Smith, 1854	Apidae : Hymenoptera	Pollinator
Leaf cutter bee, *Megachile* sp.	Megachilidae : Hymenoptera	Pollinator but also damages by cutting the leaves of many ornamental plants *viz*., rose, bougainvillea etc. (Halder *et al*., 2014)
Small carpenter bee, *Ceratina smaragdula* (Fabricius, 1787)	Apidae : Hymenoptera	Pollinator
Sweat bee, *Lasioglossum* sp. and *Halictus* sp	Halictidae: Hymenoptera	Pollinator

Hymenoptera), Leaf cutter bee, *Megachile disjuncta* (Megachilidae: Hymenoptera), Stingless bee or Dammer bee, *Tetragonula iridipennis* (Smith) (Apidae: Hymenoptera) were also recorded during the roving survey. Based on the surveys all the insect and acarine fauna are being reported on sponge gourd for the first time from this region.Also the utility of the current checklist increases due to the inclusion of details of stage and plant part infested along with the symptoms of damage.

It also envisages the major pests that need to be tackled during development of bio-intensive ecofriendly pest management modules as well as also steps to be taken for conservation of beneficial fauna especially pollinators and other natural enemies for sustainable sponge gourd production in this region.

सारांश

गंगा के मैदानी क्षेत्रों जैसे वाराणसी, मिर्जापुर और पूर्वी उत्तर प्रदेश के देवरिया जिलों में नेनुआ फसल से जुड़े कीट एवं माईट जीवों का सर्वेक्षण वर्ष 2013–16 के खरीफ सत्र के दौरान किया गया था। जिसमें शाकजीवी सात गणों जैसे– डिप्टेरा, हैमिप्टेरा, लेपिडोप्टेरा, कोलियोप्टेरा एवं परभक्षीः– कोलियोप्टेरा, हैमिप्टेरा और डिप्टेरा तथा कुछ फसल को परागित करने वाले कीट हयमेनेप्टेरा पाये गये। कीटों में, तरबूज का घुन, विविल (*एकथोपेयस कुरीरोस्ट्रस सट्रोलि*), कद्दू वर्गीय फलमक्खी (*बेक्ट्रोसेरा कुकुरविटी*), बिलिस्टर बीटल (*मायलाब्रिस फेलेराटा* एवं *मायलाब्रिस पस्टुलाटा*) और सफेदमक्खी (*बेमिसिया टाबाकी*) इत्यादी को प्रमुख कीटों के रूप में पाया गया। क्योंकि उनकी क्षति 10 प्रतिशत थी। कद्दू बीटल (*रेफिडोपल्पा फेविकोलिस, ओलुकोफोरा लेवेसी, ओलुकोफोरा इंटरमिडिया*) पर्णभृंग (पत्ति माइनर) *लिरिओमेजा ट्राफोली*, माहू (*एफीस गोसिपि*), पत्ति गढ़ मक्खी (*लेसियोप्टेरा फलकेटा*) खीरा कीट (माँथ) (*डायफैनिया इण्डिका*) लाल माईट (*टेट्रानायकस स्पी.*) इत्यादी को मामूली कीट के रूप में पाये गये। इस शोध पत्र में इस क्षेत्र से पहली बार इस फसल से जुड़े कीट और माइटों को दर्ज (रिकार्ड) किया गया।

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