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Studies on the pest complex of tomato (*Lycopersicon esculentum* L.) and their natural enemies in western region of Uttar Pradesh, India

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Abstract

The experiment was conducted at Horticulture Research Centre (HRC) of Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh. The studies on the insect pest complex revealed that a total of 8 insect species and 9 natural enemies found associated with tomato crop at different crop growth stages. The presence of aphids, jassids, thrips and grasshoppers were recorded from the vegetative to maturity stage of the crop, while tomato fruit borer, aphid and whitefly are the major pests at vegetative as well as flowering and fruiting stage of the crop. Serpentine leaf miner and leaf eating caterpillar were found to damage the crop moderately. Other minor insect pests of less importance were found without much economic loss. The natural enemies of different insect pests of tomato recorded in the experimental crop were dragonfly, common blue damselfly, ladybird beetle, ichneumon wasp, green lacewing, red ant, mantid and spider.

Keywords: Pest complex, growth stages, damage, economic loss

1. Introduction

Tomato (*Solanum lycopersicum*) is one of the most important vegetable in the world it belonging to family Solanaceae. It is warm season crop, requires warm and cool climate for its successful cultivation. It an edible fruit originating in Central and South America is now a part and parcel of everyone's kitchen. The plant can't hold out high humidity and frost. Light intensity affect pigmentation, fruit colour and fruit set (Singh, 2017) [10]. Temperature below 10 °C and above 30 °C adversely affects plant tissue. The 21-24 °C is the optimum range of temperature for successful cultivation of tomato.

Tomatoes contribute to a healthy and well-balanced diet. It's rich in sugars, essential amino acids, vitamins, minerals and dietary fibers. It contains much of vitamin A, B and C, phosphorus and iron, also contains lycopene an antioxidant that may contribute to protection against heart disease, cancer and many other common health problems. Tomato fruit contains water (93.1%), protein (1.9%), fat (0.3gm), fiber (0.7%), carbohydrates (3.6%), calorie (23), vitamin 'A' (320 I. U.), vitamin 'B1' (0.07 mg.) vitamin 'B2' (0.01 mg.), nicotinic acid (0.4 mg.) vitamin 'C' (31 mg.) calcium (20 mg.) phosphorus (36 mg) and iron (0.8 mg.) (Mandloi, 2013) [7].

India stands 2nd in the production, next to China, contributing nearly 11% to the world tomato production. In India, the total area under tomato cultivation is 7.89 million hectares with an annual production of 19.76 million tons, productivity 25 MT/ha and in Uttar Pradesh the area wise 13th position under cultivation was 0.22 million hectares with an annual production of 0.85 million tons, productivity wise occupied first place 39.62 MT/ha. (Horticultural Statistics at a Glance, 2017) [4] The main tomato producing states in India are Bihar, Karnataka, Uttar Pradesh, Orissa, Andhra Pradesh, Maharashtra, Madhya Pradesh, West Bengal and Chhattisgarh.

The production quality of tomato fruits are considerably affected by array of insect pests infesting at different stages of crop growth. All parts of the plants offer shelter, food and reproduction site for insects. The major insect pests which play most important role in the economic losses of tomato crop are leaf miner, aphid, jassid, whitefly and fruit borer, total of 41 insect species, belonging to 21 families attack on tomato crop (Reddy and Kumar, 2004) [8]. A thorough knowledge of seasonal activity of insect-pest helps in developing efficient pest management strategies in a particular set of agro climatic conditions. Information on the insect

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pest succession and their natural enemies of brinjal crop ecosystem, particularly in this agro-climatic situation in the recent past, is too little. That's why studies were taken up to find out the succession of insect pest on this crop.

2. Materials and Methods

The experiment was conducted at Horticulture Research Centre (HRC) of Sardar Vallabhabhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh. VRT-4 was sown in 100 sq. meter area following the standard package and practices of the crop. Randomly five plants (each plant six leaves two lower, two middle and two upper) from three middle rows in each plot were tagged and an observation of insect pests and natural enemies of tomato was recorded. Data collected in the dawn hours at seven days interval right from starting day (germination) to last day of

crop (harvest). The nature and amount of damage caused by various insect pests was also recorded to judge the economic status of the pests. Wherever necessary the insect pests were collected and reared up to adult stage. Adult insects were preserved and identified.

3. Results and Discussion

The insect pest species associated with tomato crop along with their nature of damage, damaging stage, seasonal incidence, economic status and natural enemies have been studied and shown in table 1 and 2. Eight species of insect pests and nine species of predators during the period of study from 11 November 2018 to 30th April 2019 at various stages of the tomato crop after transplanting at Modipuram, Meerut of Uttar Pradesh.

Table 1: Pest complex on tomato crop at Modipuram, Meerut during Rabi-2018

S. No	Common name	Scientific name	Family and order	Damaging stage	Nature of damage and damage symptom	Period of activity	Economic status
1	Tomato fruit borer	<i>Heliothis armigera</i>	Noctuidae Lepidoptera	Larva	Larva bore circular holes and usually thrust only head inside the fruit. External symptoms appear in the form of bored holes One larva can destroy many fruits.	Starting January to last April	High
2	Leaf caterpillar	<i>Spodoptera litura</i>	Noctuidae Lepidoptera	Larva	Freshly hatched larvae feed gregariously, scraping the leaves from ventral side, later disperse, feeding voraciously at night on the foliage. Larvae may also feed on fruits making holes of irregular shapes	Mid December to last April	Medium
3	Serpentine leaf miner	<i>Liriomyza trifolii</i>	Agromyzidae Diptera	Maggot	Maggot mines into the leaf and feeds on the mesophyll of the leaves making serpentine mines.	Mid October to last April	Medium
4	Grasshopper	<i>Chrotogonus sp</i>	Acrididae Orthoptera	Nymph and Adult	Nymph and adult feed on foliage results leaf margins as irregular cuttings.	Starting October to last April	Low
5	Whitefly	<i>Bemesia tabaci</i>	Aleyrodidae Hemiptera	Nymph and Adult	Nymphs and adults suck the sap on the ventral surface of leaves. The affected leaves wrinkle and curl downwards	Starting January to last April	High
6	Jassid	<i>Amrasca biguttula biguttula</i>	Cicadellidae Hemiptera	Nymph and Adult	Nymph and adults pierce the plant tissues and suck the cell sap noticed curling up along margins, followed by the yellowing of the margins of leaves.	Mid October to last April	Low
7	Aphid	<i>Aphis gossypii</i>	Aphididae Hemiptera	Nymph and Adult	Yellowish to green or black aphids congregate on the under sides of leaves and suck up sap, leaves curl downwards and discolored.	Starting October to last April	High
8	Thrips	<i>Thrips tabaci</i> , <i>F. rankliniella</i>	Thripidae Hemiptera	Nymph and Adult	Nymphs and adults lacerate the leaf tissues and suck the oozing spa sometimes even the buds and flowers are attacked and form a silvery streak on leaf surface.	Starting November to lat April	Low

Table 2: Natural enemies complex on tomato crop at Modipuram, Meerut during Rabi 2018.

S. No	Common name	Scientific name	Family and order	Period of activity
1	Lady bird beetle	<i>Cheliomenes sexmaculata</i>	Coccinellidae Coleoptera	Starting December to last April
2	Red ants	<i>Formica rufa</i>	Formicidae Hymenoptera	Starting October to last April
3	Common blue damselfly	<i>Enallagma cyathigerum</i>	Coenagrionidae Odonata	Mid October to starting April
4	Dragon fly	<i>Crocothemis servilia</i>	Libellulidae Odonata	Starting October to last April
5	Ichneumon wasp	<i>Ophion luteus</i>	Ichneumonidae Hymenoptera	Starting November to starting April
6	Syrphid fly	<i>Ischiodon scutellaris</i>	Syrphidae Diptera	Starting November to last April
7	Green lacewing bug	<i>Chrysoperla carnea</i>	Chrysopidae Neuroptera	Mid October to starting April
8	White banded crab spider	<i>Misumenoids formosipes</i>	Thomisidae Araneae	Starting December to last April
9	Striped lynx spider	<i>Oxyopes salticus</i>	Oxyopidae Araneae	Starting December to last April

3.1 Pest complex on tomato crop at Modipuram, Meerut during rabi-2018

Tomato fruit borer: Major pest of tomato, attacks most of the cultivated crops (polyphagous) and widely distributed throughout the country. The incidence of the pest on crop started from the starting January to last April (Fig 1).

Leaf caterpillar: Wide spread in India. It is also known as the tobacco cutworm, cotton leafworm, tropical armyworm, and cluster caterpillar. It was observed on the crop from mid December to last April (Fig 1).

Grasshopper: Grasshopper feeds on almost all agricultural crops, hide easily on plants due to their green or brownish colour. This pest infestation on the crop started from starting October to last April (Fig 1).

Serpentine leaf miner: The incidence is first noticed at nursery stage itself, polyphagous and very widely distributed throughout India. The incidence of the pest on crop started from mid October to last April (Fig 1).

Aphid: It is a polyphagous species. In India, it is widely distributed. This pest noted on the crop from starting October to last April (Fig 1).

Whitefly: The cotton whitefly is known to feed on 50 different species of plants but it becomes quite a serious pest of bhendi & cotton in certain regions of the country, highly polyphagous. This pest recorded on the crop from starting January to last April (Fig 1).

Insect Pests	October		November		December		January		February		March		April	
	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight
Tomato fruit borer														
Leaf caterpillar														
Grasshopper														
Serpentine leaf miner														
Aphid														
Whitefly														
Thrips														
Jassids														

Fig 1: Pest complex on Tomato crop at Modipuram, Meerut during Rabi-2018

3.2 Natural enemy's complex on tomato crop at Modipuram, Meerut during Rabi-2018.

Lady bird beetle: Ladybird adults are egg-shaped, range in length from about 1 mm to over 10 mm based upon species. Its occurrence was seen from starting December to last April (Fig 2).

Red ants: Red ants construct hideous mounds in yards. It recorded on the crop from starting October to last April (Fig 2).

Common blue damselfly: Damselflies have slender bodies and fly more weakly. Occurrence on the crop was noticed from mid October to starting April (Fig 2).

Dragon fly: Dragonflies are strong-flying insects and heavy-bodied. It recorded on the crop from starting October to last

April (Fig 2).

Ichneumon wasp: Insects in the family Ichneumonidae are commonly called ichneumonids. It noted on the crop from starting November to starting April (Fig 2).

Syrphid fly: Syrphid flies are normal flower visitors to a broad range of wild plants, as well as agricultural crops. It found on the crop from starting November to last April (Fig 2).

Green lacewing bug: Green lacewings are fragile insects are usually bright green to greenish-brown, it recorded on the crop from mid October to starting April (Fig 2).

Spiders: Spiders are one of the most abundant predatory groups in the terrestrial ecosystems. Various species of

spiders namely white banded crab spider and striped lynx spider were seen in the crop from starting December to last April (Fig 2).

The present results are in agreement with (Singh, 2017) ^[10] where he revealed that the natural enemies of different insect pests of tomato found in the experimental crop, were Lady bird beetle (*Coccinella septumpunctata*), Dragonfly (*Orthetrum sabina*), Mantid (*Mantis religiosa*), Red ant (*Oecophylla smaragdina*), Green lacewing (*Chrysoperla zastrowii*), Ichneomone fly (*Phanerotoma sp.*), Stink bug (*Eucanthecona furcellata*) and Spider (*Argiope aurantia*). Among them the *Coccinella spp.* were noticed predated on soft bodied insects i.e. aphid, jassid and white fly etc on 53

days old crop which continued up to last fruiting stage whereas, stink bug found predated on larvae of tomato fruit borer and tobacco caterpillar when the crop was at fruiting stage. The spiders were observed predated on aphids at vegetative stage (72 days old crop). Suresh, (2006) ^[12] also noticed spiders and coccinellids on tomato crop. According to (Bikash, 2013) ^[2] low level of population of lady bird beetle was recorded during 3rd week of September to 3rd week of November, 2nd week of January to last week of February and 4th week of May to last week of May, higher level of population was maintained during 3rd week November to 1st week of January. Similar results were also noticed by Mahla *et al.*, 2017 ^[6]; Sachin, 2012 ^[9].

Natural Enemies	October		November		December		January		February		March		April	
	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight	First fortnight	Second fortnight
Lady bird beetle														
Red ants														
Common blue damselfly														
Dragon fly														
Ichneumon wasp														
Syrphid fly														
Green lacewing bug														
White banded crab spider														
Striped lynx spider														

Fig 2: Natural enemies complex on tomato crop at Modipuram, Meerut during rabi-2018

4. Conclusion

On the basis of present investigation of insect pest complex in tomato crop concluded that a total of eight insect species and nine natural enemies were associated with this crop at different stages. Among the eight insect pests tomato fruit borer (*Helicoverpa armigera* Hubner) and *Aphis gossypii* were the serious pests recorded to infest the tomato along with other insect species viz. leaf caterpillar (*Spodoptera litura*) and leaf minor (*Liriomyza trifoli*) were known to infest pest moderately. Among the natural enemies *Coccinella* was the most predominant species predated the soft bodies insects like jassids, aphids, whitefly (63 days old crop) followed by spiders predated aphids at (70 days old crop).

5. References

- Barfa SK. Studies on seasonal incidence of pest complex and role of micronutrients against major insect pests of tomato (*Lycopersicon esculentum* Mill). M.Sc (Ag) Thesis. Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 2007.
- Bikash S. Studies on the pest complex of tomato (*Lycopersicon esculentum* L.). and their sustainable management. M.Sc (Ag) Thesis. Uttar Banga Krishi Viswavidyalaya, Cooch Behar, West Bengal, 2013.
- Chaudhary N, Deb DC, Senapati SK. Assessment of loss in yield caused by pest complex of tomato under terai region of West Bengal. Research on Crops. 2001; 2(1):71-79.
- Horticultural Statistics at a Glance. Horticulture Statistics Division, Department of Agriculture, Cooperation &

Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India, 2017.

- Jandial VK, Kumar A. Insect pest status of vegetable crops in Western Uttar Pradesh. International Journal of Agricultural Science. 2007; 3(1):148-150.
- Mahla MK, Lekha, Singh V, Swami H, Choudhary RS. Efficacy of different insecticides against pest complex of tomato and effect on their natural enemies. Journal of Entomology and Zoology Studies. 2017; 5(5):229-234.
- Mandloi R. Study on seasonal incidence of insect pest complex of tomato (*Solanum lycopersicum* L.) and their management with phyto extracts. M.Sc(Ag) Thesis. Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 2013.
- Reddy NA and Kumar CTA. Insect pests of tomato, *Lycopersicon esculentum* Mill. In eastern dry zone of Karnataka. Insect Environment. 2004; 10(1):40-42.
- Sachin S. Studies on insect pest complex of tomato (*Lycopersicon esculentum* Mill) and management of fruit borer, *Helicoverpa armigera* (Hubner). M.Sc (Ag) Thesis. Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 2012.
- Singh S. Studies on insect pests of tomato with special reference to seasonal incidence and management of serpentine leaf miner *Liriomyza trifolii* Burgess. M.Sc. (Ag.) Thesis Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh), 2017.
- Solangi BK, Khoso FN, Shafique MA, Ahmed AM, Gilal AA, Talpur MA *et al.* Host plant preference of sucking pest complex to different tomato genotypes. Journal of

Entomology and Zoology Studies. 2017; 5(1):293-297.

12. Suresh Y. Study on the occurrence of pest complex of tomato (*Lycopersicon esculentum* Mill) and their management. M.Sc (Ag.) thesis. Acharya N. G. Ranga Agricultural University, Hyderabad, 2006.