Incidence of onion thrips, *Thrips tabaci* (Lindeman) and its management in Punjab

Report

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By

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From: Dr.Ankush Moreshwar Raut Date: **……**

(Assistant Professor)

Certificate

This is to certify the work recorded in this thesis entitled **"Incidence of onion thrips, *Thrips tabaci* (Lindeman) and its management in Punjab."** Submitted by Satinder Pal (Reg. number- 11719019) in partial fulfilment of the requirements for the award of Degree of Master of Science (Agriculture) in Agriculture Entomology of Lovely Professional University, Phagwara, Punjab is the faithful and bonafide research work carried out under my personal supervision and guidance.

(Signature of Students) (Signature of supervisor)

Name: Satinder Pal Dr.Ankush Moreshwar Raut

(Signature of co-advisor) (Signature of HOD)

Mr. Johnson Dr. Adesh Kumar

(Signature of A.O.)

Introduction

Onion (*Allium cepa* L.) belonging to family Liliaceae is one of the most popular bulb vegetables originated from Central Asia (Brewster, 1994). It has special qualities which add taste and flavour to food as well as medicinal value. In India, total onion cultivated area is 1.19 million hectare with the production of 21.4 million tonnes (2017-2018) which is estimated to declined as compare to last year area is 1.30 million hectare with the production of 22.4 million tonnes (2016-2017), (TOI 2018). However our country is second largest producer of onion in world after China.

The onion plant is attacked by several insect pests like thrips, onion fly, cut worms and tobacco caterpillars etc. Among these pests, onion thrips (*Thrips tabaci* Lindeman) considered to be the most important pest of onion. T. *tabaci* L. are cosmopolitan in distribution and polyphagous which attack a wide range of crops mainly cabbage, cotton, carnation, garlic, onion and causes significant yield losses globally (Lewis, 1997; Trdan et al. 2005). Anually yield loss varied from 10-15% due to insect and diseases (Gupta *et al.*, 1994) but directly and indirectly infestation caused 30-50% yield reduction by T. tabaci (Nault and Shelton 2008; Diaz-Montano et al., 2011; Karar et al. 2014).

Onion thrips pass through egg, nymph, and pupal stages of development before reaching adulthood. It have asymmetric mouthparts comprising a single mandibular stylet. The nymph and adults were feeds on leaf tissue by piercing and rasping and causes silvery stippling or blotching on leaves which affect on reduction of chlorophyll and photosynthetic efficiency (Boateng *et al*., 2014). Nymphs cause more damage than adults because population was more and less mobile (Kawai, 1988). It carries plant pathogens and transmit 'Iris Yellow Spot Virus' which is a tospovirus causing adverse effects on bulb and seed yield.

Thrips in onion are difficult to control because of succulent nature of leaves, which prevent spray solution reaching the pests and also due to hiding habit of thrips in central axis near the bulb. Overdose and repetition of same chemical developed resistance in sucking pest. Keeping all the background in forefront an experiment was undertaken in order to find out the fallowing objectives:

1. To study the population dynamics of onion thrips
2. To study the effect of pesticides and planting dates against onion thrips.

Review of Literature

Ibrahim and Adesiyun (2010) studied population dynamics of thrips in different transplanting (from November to March) in onion during 2000-2004 in Nigeria. Resulted that maximum thrips were observed in month of February (176 thrips/plant), March (416 thrips/plant and 608 thrips/plant) and April (86 thrips/plant) where onion seedlings were transplanted in November, December, January and March respectively. The early transplant in November month had peak thrips population at maturity while late transplant had observed peaks in early stage.

Blatt *et al.* (2015) observed that maximum population was monitor by blue trap in August month. Thrip population gradually increased from growing season and decreases at ripen time of crop. Early date of planted had significantly found less incidence of thrips than late date of transplanting of cabbage variety.

Karar *et al.* (2014) stated that thrips is most destructive and important pest and it cause 63% which population of thrips increased rapidly after 8-14 leaf stage and decrease in bulb formation stage of onion. Maximum temperature found significant effect on average population of thrips/plant (0.516) during 2008 and. minimum temperature (0.581) during 2009.

Hossain et al. (2014) studied on different transplanting dates in 15 days interval from November to January month and minimum population were found that early transplanting in November (7.81 thrips/plant) and December (10.76 thrips/plant) months. Highest yield of onion bulb were found in early transplanting in November month as compared to late transplanting (December and January).

Ibrahim and Adesiyun (2009) result obtained that the thrips incidence appeared from January month. The maximum thrips population found in November at 15 week after transplanted, December at 13 WAT, January at 10 WAT, February at 9 WAT, March at 6 WAT and April at 5 WAT. Among the five date of transplanting from December to April, early transplanting had effectively managed thrips with highest bulb yields upto 48 t/ha whereas late transplanting was obtained upto 2 t/ha.

Malik et al (2009) revealed that the nitrogen dose ranged from 50 to 100 kg/ha was observed no effect on abundance of thrips population in Pakistan. Fertilizer dose 200-250 kg/ha was directly proportion to thrips population which increased 74% abundance. Onion bulb yields increased with nitrogen to 200 kg/ha while decrease in yield occurred when 250-300 kg/ha of nitrogen was used.

Patil et al (2009) evaluated new insecticides and plant products for management of onion thrips. The result indicated that application of combination with Deltamethrin 1EC + Trizophos 35 EC @ 0.072% was found significantly control upto 14th days but Spinosad @ and Carbosulfan @ observed significant at par effect with Deltamethrin 1EC + Trizophos 35 EC @ 0.072%.

Reddy and Gowdar (2005) minimum infestation was observed in first and second week transplanted onion seedling. Highest intensity of disease was recorded in June and July transplanted crop while lowest intensity observed in late transplanted crops (August and September).

S.D Patil, et al. (2009) studied the effect of various insecticides on thrips control in onion. The data indicate that the treatment deltamethrin 1 EC + triazophos 35 EC @0.072% proved to be significantly effective against control of thrips, which recorded minimum number of 2.73,1.59 and 2.07 thrips/plant at 4th, 7th, and 14th days after spray.

AmnaSadozai, et al.(2007-2008). An experiment was conducted at Agriculture Research Institute, Tarnab, Peshawar to evaluate the efficacy of different insecticide for the management of onion thrips during 2007-2008. The result was founded that the Thiodan 35% EC@ 800 ml/acre proved best followed by Curacron and Karate.

B.V. Sumalatha, et al.(2016). Field experiment was conducted at Research Farm of Department of Agricultural Entomology, VNMKV, Parbhani, during Kharif 2016, to study bioefficacy of newer insecticides against onion thrips and the result was founded that the Spinosad 45 SC @ 73 g. a.i. ha-1 and fipronil 5 SC @ 50 g. a.i. ha-1 were the most superior and persistent treatments against thrips and also the highest bulb yield was recorded in spinosad 45 SC @ 73 g a.i ha-1 (18.03 t/ha).

Mishra, et al. (june 2014) study the effect of spacing and planting time on growth and yield of onion variety N-53 under major Himalayas at Central Agriculture University, Imphal, Manipur during 2014 and result was founded that closer spacing (10. 10cm) and planting on 25th November was the best for onion production under Manipur condition to get higher productivity up to 358q/ ha.

Material and Method:

The present study entailed "**Incidence of onion thrips, *Thrips tabaci* (Lindeman) and its management in Punjab**" was conduct at Agricultural Research Farm, School of Agriculture, Lovely Professional University, Phagwara , Punjab during 2017-18. The research field is located at 31^0 15' North latitude, 75^0 32' East and at 228 meter above mean sea level.

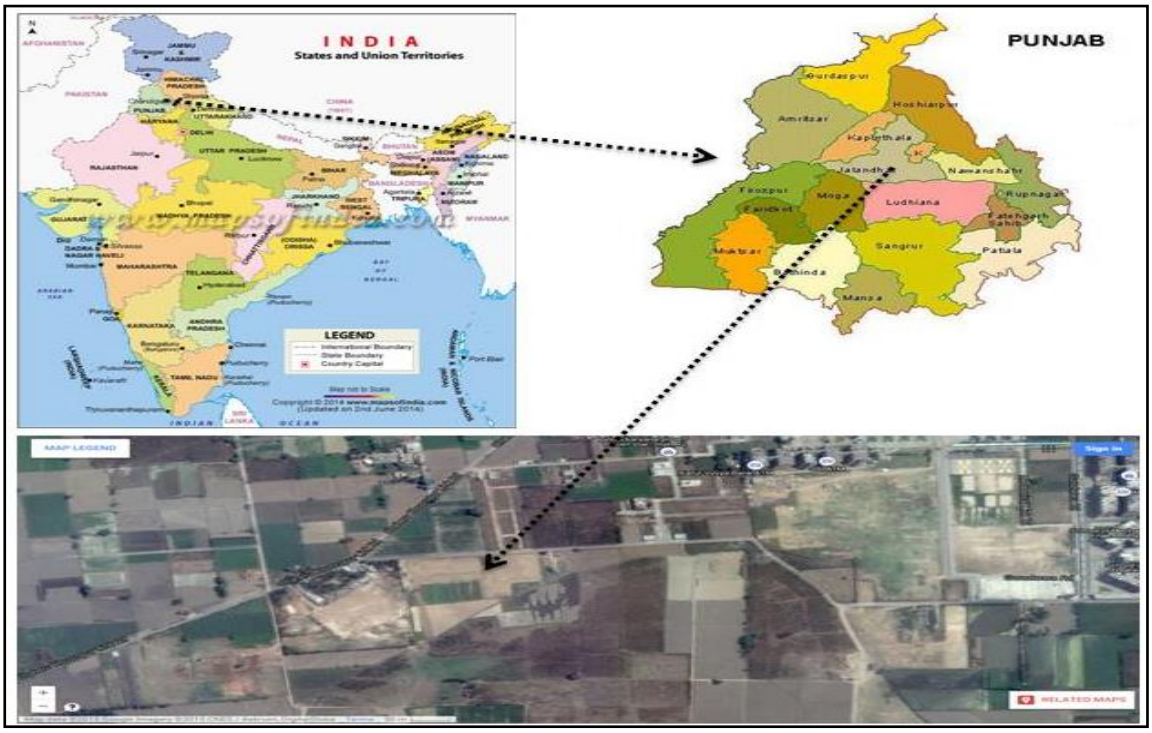

Figure 1- Satellite image of study area (Chaheru, khusropur link road, Lovely Professional University, Jalandhar, Punjab)

Plan of experiments:

Experimental Crop	**:**	Onion (*Allium Cepa)*
Name of variety	**:**	Deep Red
Source of germplasm	**:**	PAU, Ludhiana, Punjab
Test insects	**:**	Onion thrips (*Thrips tabaci)*
Design	**:**	Randomized Block Design (RBD)
Replications	**:**	7
Total area	**:**	130 m^2
Date of Transplanting	**:**	Ist DOT: 12 December-2017 2^{nd} DOT: 22 December-2017 3^{rd} DOT: 12 January-2018

Experimental layout:-

Plot size was kept 2 x 3 m^2 area and spacing was maintained 30 x 30 cm (row to row) and 10 x 10 cm between plant to plant. An onion cultivar Deep Red was transplanted in field condition at three different date of transplanting. The first transplanting is done in 12 December 2017, second transplanting is done in 22 December 2017 and third or final transplanting is done in 12 January.

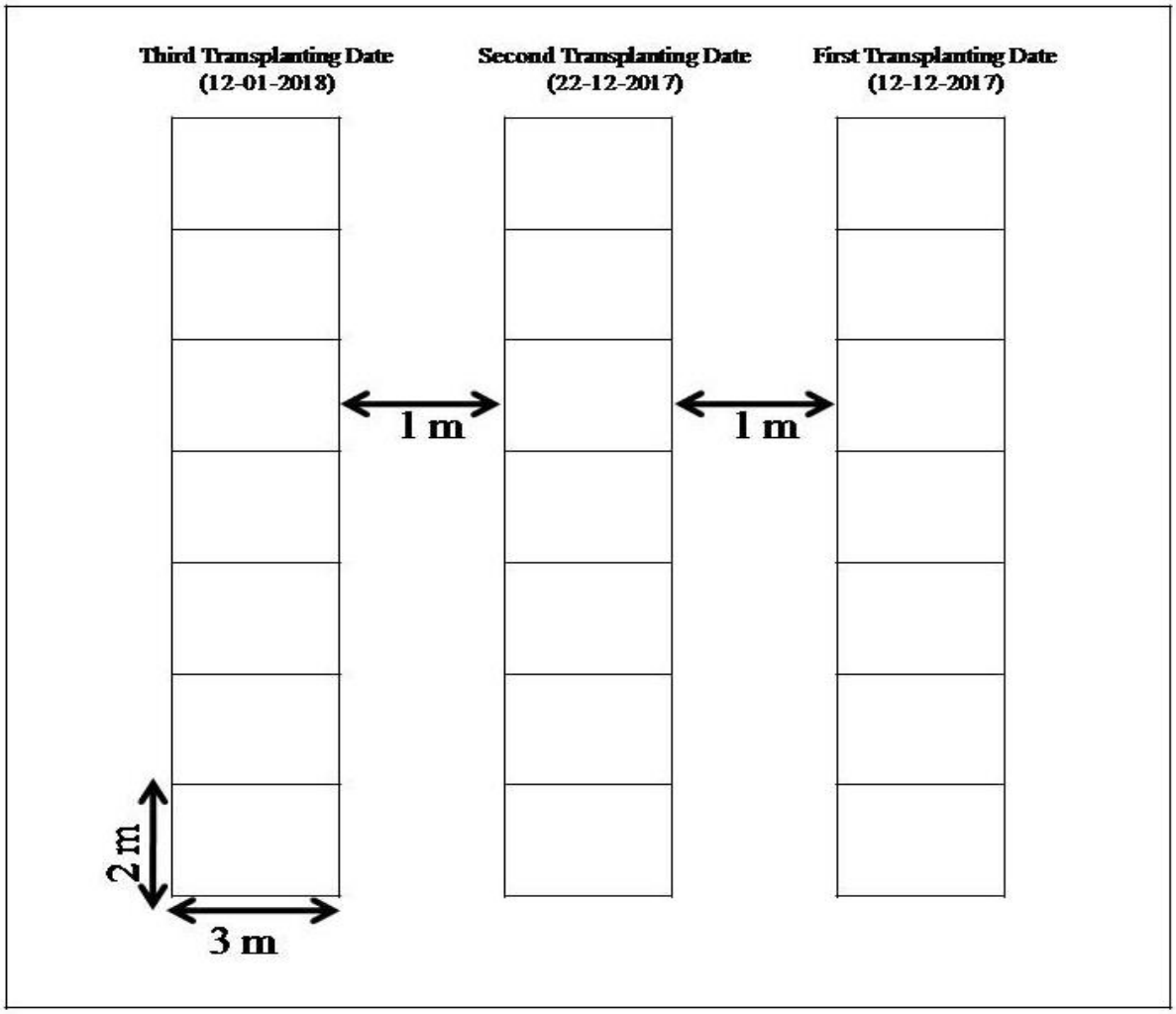

Fig 2: Field layout for population dynamics experiment including seven replication during rabi season.

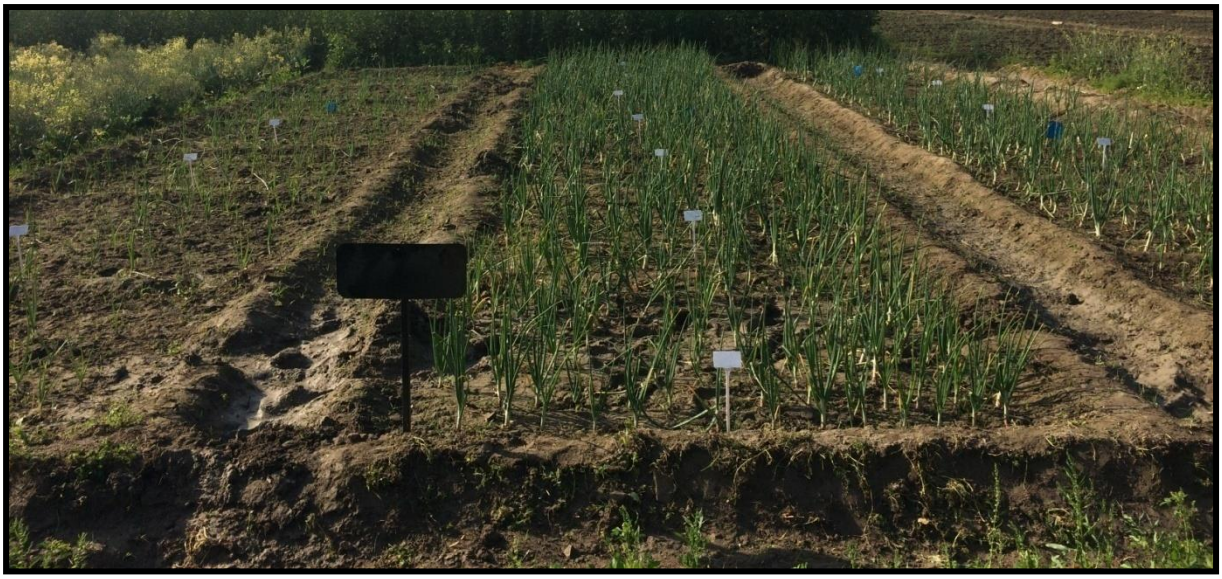

Fig 3- Field layout at three different transplanting dates of onion during rabi season.

Land preparation and transplanting:-

The plot was prepared by using harrow followed by rotavator till the soil became friable to expose the soil for free from weeds, insect pupa and soil born pathogen and makes the soil capable enough to grow the plant easy. The well rotten FYM @15-20t/acre was incorporated during the last ploughing. The field was divided into 21 plots and each plot size maintained 2 x 3 m^2. The Seedling was transplanted with the help of small wooden stick to make the lines.

Fertilizer application, weed management and Irrigation:-

The recommended dose of fertilizer were applied at 20 tonnes of FYM, 90 kg of urea, 125 kg of superphosphate and 35 kg of muriat of potash per acre. Half of nitrogen, full phosphate and potash were applied as basal dose and remaining nitrogen applied after one month after transplanting. Manually first weeding was done at 25 days after transplanting (DAT) while second and third weeding at 40 DAT and 65 DAT respectively. The irrigation was applied time to time as per the crop need.

Data collection

Nymph and adult of thrips incidence were recorded after every three days interval from randomly selected six plants from each transplanted dates. Hand lens was used for counting nymph and adults at different crop satages. The insects were recorded after 45 DAT upto till harvesting. Different natural enemies also observed during crop period.

Statistical Analysis:

The thrips count data at every three days after interval from each transplanted dates were transfer into squar root transformation for normalised the data. Different analysis for experiment like ANOVA, correlation, DMRT will performed in SPSS (22.0 version) statistical software.

Result and Outcomes:

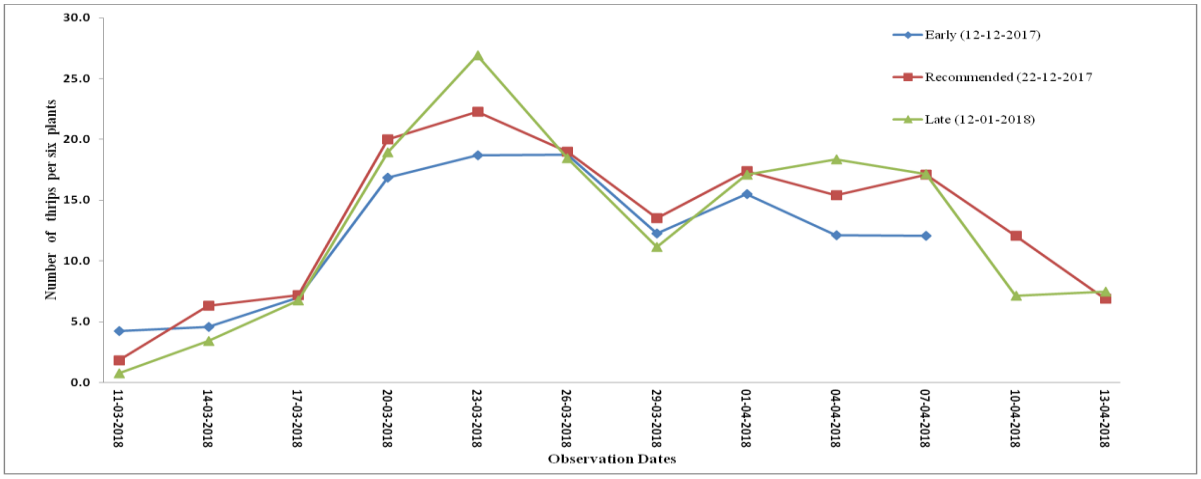

Fig 4: Population dynamics of T. tabaci on different transplanted onion during rabi season in Punjab

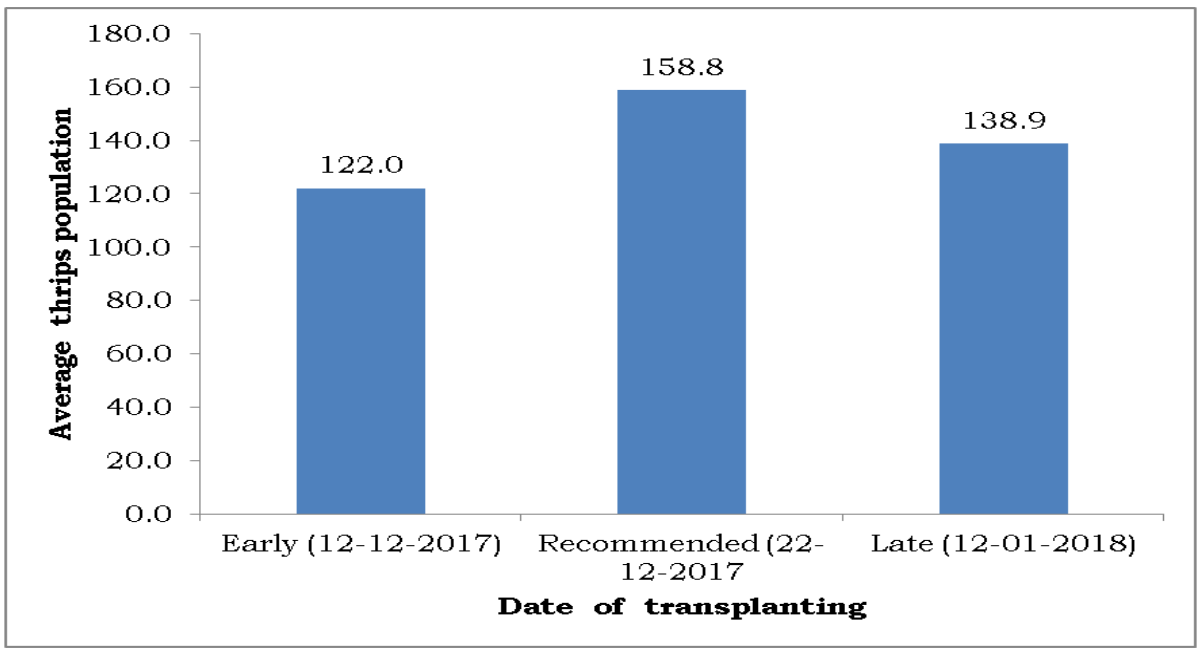

Fig 5: Average population of T. tabaci on different transplanted onion during rabi season in Punjab.

Fig 6: Data recording at different growth stage of onion during rabi season.

Fig 7: Installing blue sticky trap against onion thrips to check the incidence during crop period.

Thrips Morphology:

- The body size of thrips is about 1.5mm (0.06 inch).
- Thrips have piercing – sucking type of mouthparts.
- Antennae are short and having 7 – segmented.
- Eyes are dark brown – blackish colour.

- 1st and 2nd instar larvae are pale yellow in colour and having elongated body size (0.5 – 0.8 mm).
- 3rd and 4th instar larvae are dark yellow in colour and approximately body size (1.0 – 1.2 mm) are inactive and non - feeding stage.
- Adults are dark brownish in colour.
- Adults are immediately active and moved when disturbed.

Fig 8: Nymph and adult stage of onion thrips during rabi season.

Feeding Habit:

Thrips are present in the middle leaves of onion plant. They are feed in gregariously. They will move upward to the tip. Larvae and adult both are feed the sap. Thrips first pierced the plant leave and then suck the sap due to its asymmetrical mouth part.

Fig 9: Abundance of thrips present at middle of three leafs of onion.

Symptoms:

Due to thrips attack after sucking the sap from the leaves the chlorophyll content is reduce and it causes the white to silver colour patches appear on the leaves. Dark green colour minute liquid spot are also visible on the leaves that is known as excreta of thrips.

Fig 10: Scratching the cell sap by *T. tabaci* during crop period.

Diseases Transmitted:

Thrips are generally vector of many diseases like Iris yellow spot, Strawberry necrotic shock virus, tobacco steak virus, tomato spotted wilt virus.

Thrips is also a vector of *Alternaria porri* which is a pathogen of fungal diseases.

- **Iris Yellow Spot:** *Iris yellow spot tospovirus*

  Diamond-shaped chlorotic lesions appear on the infected scape and leaves. Due to IYS the death of cells or tissues (Necrotic) may occur.

- **Leaf Curl Diseases:**

Due to heavy infestation of *T. tabaci* the tip of the leaves becomes curled. After sucking the huge cells sap cause curling of leaves.

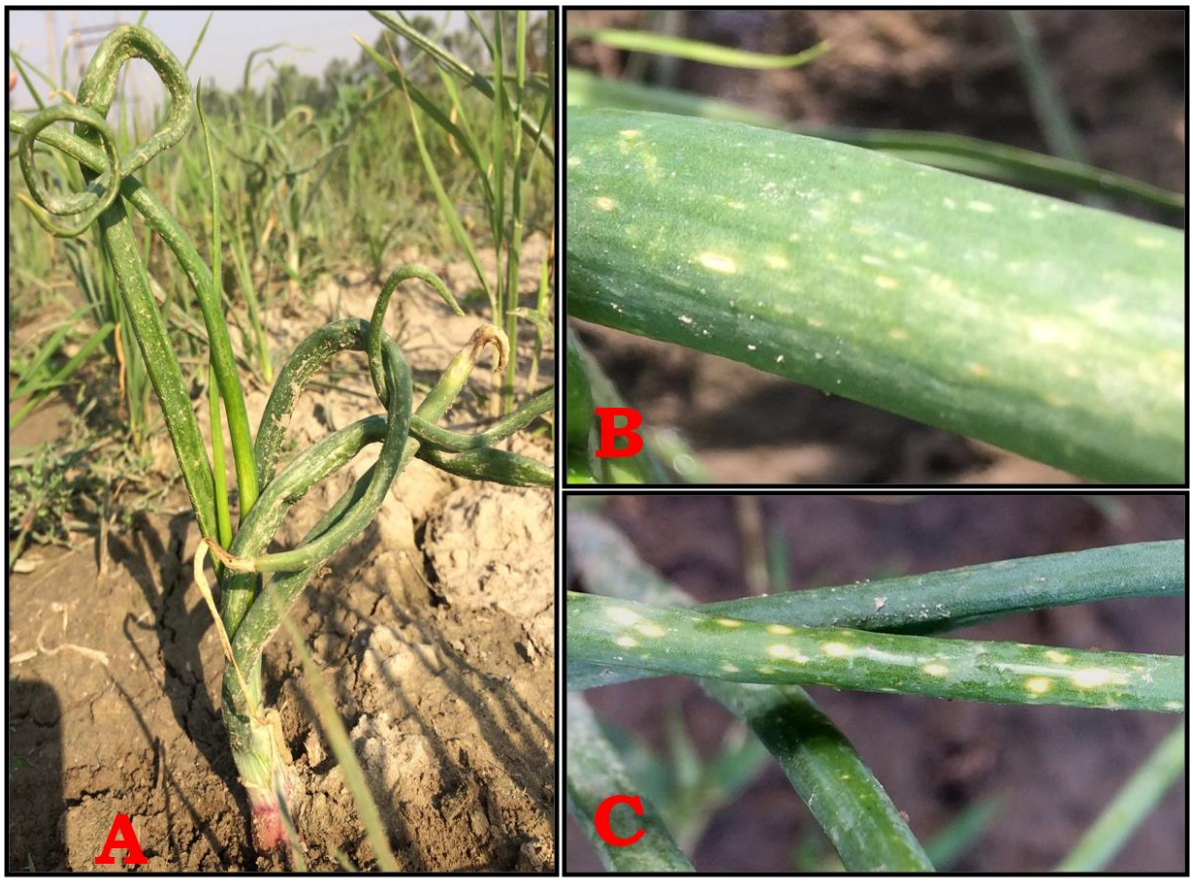

Fig 11: Diseases transmitted by *T. tabaci* in onion (A- Leaf curling, B and C- Iris yellow spot virus)

Natural Enemies:

T. tabaci has many natural enemies including the predators and parasitoids. The major natural enemies are *Orius. tantillus (*Hemiptera), *Brumoides. suturalis* (Coleoptera), Hoverfly(Diptera).

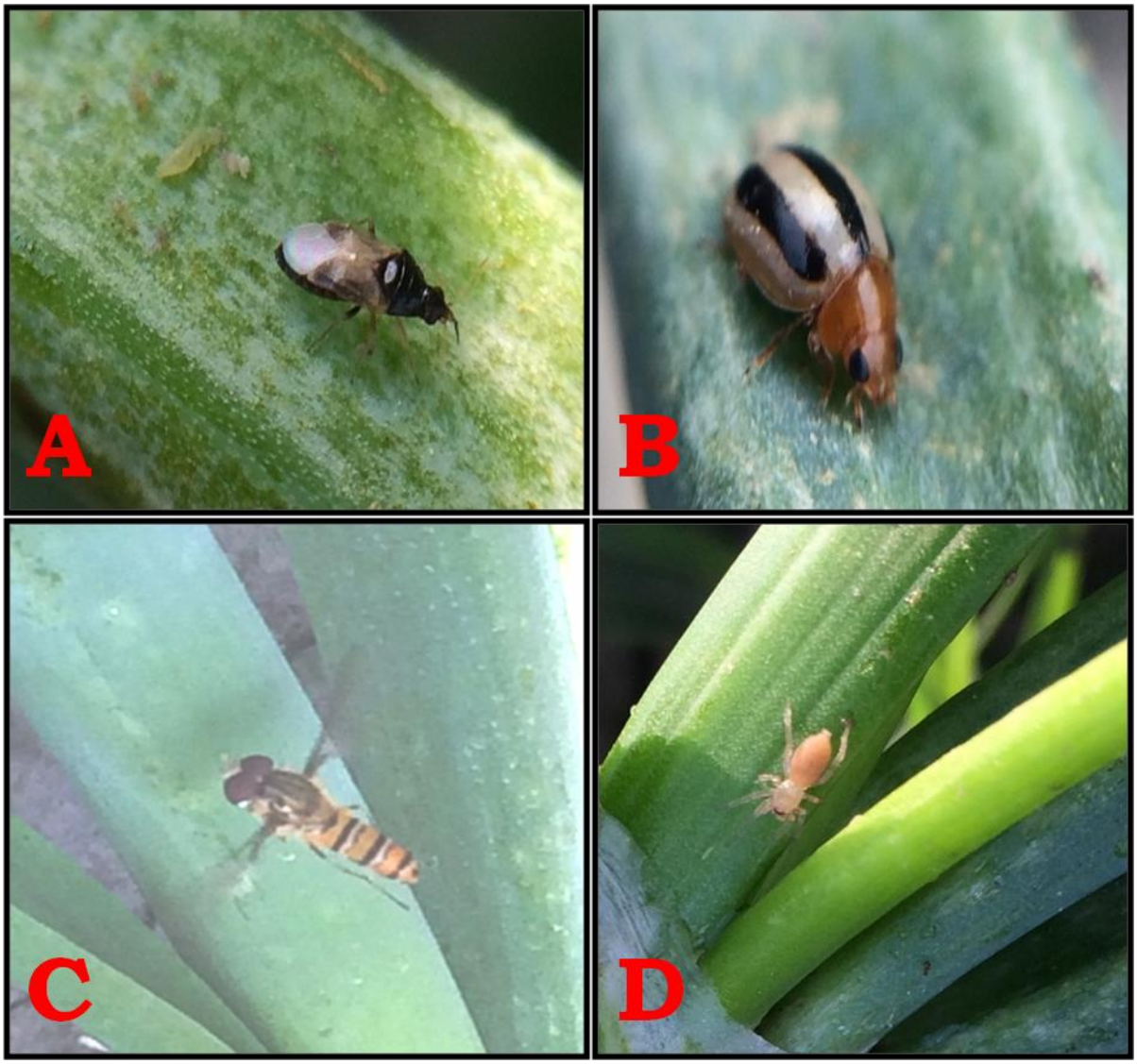

Fig12 : Natural enemies present on onion crop (A- Pirate minute bug (*Oriu tantillus*); B- Three-striped lady beetle (*Brumoides. suturalis)*; C- Hoverfly; D- Spider)

Silent finding of present status of research work

- Incidence of thrips started after 45 days in early date of sowing (12-12-2017) and gradually increase upto maturity.
- Maximum population of thrips was recorded in third week during the month of March (21-3-2017) in early, recommended and late sowing (Fig 4). Average thrips population were ranged from 122 to 158 nymph/adults and early sowing (122 nymph and adults) was found lowest population as compared to other date of sowing (Fig 5).
- Mainly thrips were observed in the middle of three leaves due to softness texture and high contain of sugar (fig.9)

- Nymph and adult scrapped the cell sap and moved upward towards tip of leave and appeared silver patches symptoms on leaves (Fig 10) .
- Due to heavy infestation 'Iris Yellow Spot Virus' and 'Leaf Curl' Diseases was observed (fig.11).
- Natural enemies like *Orius. Tantillus,* Hoverfly and *Brumoides. suturalis* also found in research field (fig.12)

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