Survey and monitoring of thrips (*Thrips tabaci*) Lindeman in onion crop

Abstract

Thrips (*Thrips tabaci* Lindeman) is a major pest of onion and cause considerable losses in yield. The nymph and adult of thrips feed leaves by piercing and rasping the leaf tissues and causes lengthwise, silvery stippling or blotching on the onion leaves, resulting in the loss of chlorophyll and reduced photosynthetic efficiency. Thrips attack onion at all the stages of crop growth but their count increases from bulb initiation and remain high up to bulb development and maturity. Onion thrips can also transmit several plant pathogens in onion crop that reduced onion bulb size and quality. Therefore, the objective of this survey was undertaken to evaluate the damage percent of thrips in onion crop.Survey was conducted during Kharif 2022 and Rabi 2022-23 .The maximum thrips damge rating scale 3(45%) was recorded at 75 DAT in Kharif season and Rabi season at 75 DAT thrips damage rating scale were recorded 4 (65%).The survey result show that the thrips population and damage percent increased due to increased temperature and relative humidity.

Key words:*Allium cepa* ,*Thripstabaci*,survey

Introduction

Onion (*Allium cepa L.*) is an important vegetable or spices crop cultivated in almost all the states of the country. In India onion is cultivated in 3 seasons ie, *rabi ,kharif* and *late kharif* seasons and maximum area under cultivation is being covered in *rabi* season (about 60-65%). Thrips (*Thrips tabaci* Lindeman) is a regular and potential pest of onion and cause considerable losses as high as 90% in quality and yield (Gupta *et. al*., 1984). Srinivas and Lawande (2004) reported that *Thrips tabaci* could cause yield loss in the range of 46-87% in onion. Waiganjo*et. al*., (2008) estimated the foliage damage of crop around 40-60% which can led to yield losses 10-20% in the crop. Shibru and Negeri .(2014) reported that onion thrips cause damage on yield 23-85%.Onion thrips are an important vector also for several plant viruses such as tomato spotted wilt virus (Kritzman *et. al*., 2002). Failure to control this pest by timely and effective means causes considerable damage and result in immense economic loss by remarkably reduced yield (Anonymous.2000, Jaun, 2002). Insecticides are a major tool for thrips control, but this strategy is inadequate and unsustainable (Manianiа*et. al.,* 2003) because thrips have developed resistance towards various group of insecticides (Lebedev *et. al*., 2013).The farmers have intensively used particularly those insecticides which are used to control this

pest and repeated application of the same group of insecticide could have led to the development of resistance to insecticides (Shitole*et. al.*,2002, Alston & Drost 2008). Pathak *et. al.*, (2018) reported that lowest thrips population and highest onion seed yield was recorded with application of fipronil insecticides. Tirkey *and* Kumar(2017) ,Kurbett*et.al.*,(2015) reported that thiamethoxam was proved to be the most effective for thrips control. Asgar *et. al.*,(2018)suggested that the insecticides reduced thrips population compared to control and highest yield was obtained by the use of Dimathoate. Kumar and Singh (2011), Das*et.al.*, (2017) reported that spry of Imidaclorprid given at 15 days interval recorded lowest thrips population and gave highest gross yield. Pandey *et al.*, (2013) reported that lowest thrips population and highest bulb yield was obtained by applying fipronil.

Origin of onion thrips

Thrips tabaci was first reported by Russian Entomologist *Karl Eduard Lindeman* based on specimens collected in Bessarabia, Russia, that caused severe damage to tobacco plants (Lindeman 1889).

Geographic distribution of onion thrips

The onion thrips is global pest of onion grown between see level and 2000 m (Lewis1973).Onion thrips is a native of the Mediterranean region but has become a major pest of agricultural crops throughout most of the world(Mound1977).

Biology of onion thrips

Thrips life cycle deepened environmental condition, like temperature, humidity and nutrient quality of their food source .Stage in developmental life cycle is the egg, first larval stage, second larval stage, pre pupa, pupa and adult .Because of their small size, this pest species like other thrips connote readily be identified to species even with a hand lens. Adult specimens are usually needed to make species identification under high microscope magnification (Morse *et. al.*, 2005). Brain A.N.2006 mentioned that the biology of onion thrips was as followed the entire life cycle (egg to adult) required about 19 days .Large population are able to develop quickly under dry weather condition where there are many overlapping generations throughout year. Females have a saw -like structure that help to make an incision in plant tissue for egg laying. Eggs are placed singly just under the epidermis of succulent leaf, flower, stem or bulb tissue. Eggs are elliptical, approximately 0.2 mm in length. They are whitish at deposition and change to an orange tint as development conditions. Hatching occurs in 4-5 days. Larvae are whitish to yellowish. There are two larval stages and besides the adults they are the only damaging stages. Larval development is completed in about 9-10 days.

There are two non-feeding stages called the prepupa and pupa does not feed and occur primarily in the soil. Combined prepupal and pupal development in completed in 4-6 days. Adult are about 1 mm in length their body colour ranges from pale yellow to dark brown, wings are un banded and dirty gray. The males are wingless and exceedingly rare while

the female have long, narrow fringed wings. Female live for 12-30 days and lay 50-60 kidney shaped eggs singly inside leaf tissue with a sharpe ovipositor.

Economic importance

Thrips is a serious pest on a wide range of fruit, vegetable, flower and Agronomics crops. Thrips are members of the order Thysanoptera, which contains a number of genera and species. Among species of thrips that attack onion are onion thrips (*Thrips tabaci*).Onion thrips incidence was a major problem due to the damage caused by feeding on vegetative parts which caused discoloration, deformities and reduced marketability the crop thrips may also serve as vectors for plant diseases such as tospovirus (Nault LR 1997).These enveloped viruses are considered among some of the most damaging of emerging plant pathogen around the world. Thrips damage is usually measured as an overall reduction in bulb size and weight of bulb.

Damage symptoms

Thrips tabaci is considered an in direct pest of dry bulb onion because it feeds on leaves rather than the marketable portion of the crop. Thrips feeding on onion leaves causes slivery leaf spot that turn in to white blotches along the leaves due to removal of cellular content followed by the development of silvery patches and curling of leaves (Bailey 1938).*Thrips tabaci* causes significant yield loss despite decades of research on control strategies worldwide (Lewis 1997b).*T.tabci* feeding can reduce onion bulb weight (Kendall and Capinera 1987, Fournier *et.al*.,1995,Rueda *et al*.,2007,Diaz-Monato*et. al.*, 2010,Waiganjo*et. al.*, 2008 and cause up to 60% yield loss. In addition to injury by feeding *T.tabaci* transmits IYSV and is the only confirmed vector of this pathogen (Pozzer*et. al*.,1994,Kritzman *et. al*., 2001).IYSV was first identified on onion in southern Brazil in 1981(Pozzer*et. al*., 1994)and was confirmed in the United states in 1989 and worldwide (Gent *et. al*.,2006).IYSV symptoms on leaves appear as lesions (i.e., straw colour to white, dry, and sometimes elongate) along the edges (Gent *et.al*., 2004)indicated that IYSV infection can reduced bulb size.The IYSV infects onion plants early in the growing season ,onion yield losses may increase(Diaz-Montano *et. al*.,2010).

Weather factors on outbreak of onion Thrips

Relatively high temperatures and lack of rainfall have been associated with increase in onion thrips population , while high relative humidity and rainfall reduce thrips population (Hamdy,M.K. *et. al*., 1994).In addition to their effect on thrips activity, temperature and relative humidity further influence the intrinsic rate of natural increase of the thrips (Murai T.2000). The rate of development of thrips tabaci is positively affected by increased temperature and decreased by increased relative humidity (Hamdy, M.K. and Salem M.*et al*., 1994). The hot and dry weather promotes the increase of *T.tabaci* populations (Bailey1934, Rueda *et al.*, 2007) and the severity of thrips injury (Lewis1973) Additionally water stress may impact the nutritional quality of onion plants and also increases the attractiveness of the plants to thrips .

Material and methods

The survey of onion thrips was conducted during *Kharif* 2022 and Rabi 2022-23in Nashik district taluka Niphad ,Maharashtra .During the survey five villages were selected for survey in and five onion fields in each village for observation of thrips damge scale.The survey conducted twice a season at 45 days after transplanting and 75 days after transplanting.The thrips damage rating scales at least 10 plants randomly in each field should be scored using rating scale given below.

List 1 :Thrips damage Rating
Scale:

Scale	**Foliage damage rating**
1	1-20%
2	21-40%
3	41-60%
4	61-80%
5	81-100%

Results and Discussion

Kharif 2022

The twenty five differentonion fields were surveyed in 5 villages during September and October 2022.The survey for thrips infestation in onion crop was done in all the 25 fields in month of September on 29.09.2022 at different Villages likes – Chitegaon,Chandori,Saikheda ,Chatori and Berewadi of Taluka Niphad District Nashik,Maharashtra.The thrips damage rating scale ranged from 1 to 2 scale were recorded during survey. Based on the survey onion thrips infested fields were recorded 25% at 45 DAT in Saikheda village farmers fields. The mostly farmers transplanting was done of kharif onion in 15thAugust.During the survey period crop is under vegetative stage. At 75 DAT further the survey of thrips infestation was done in same villages and same 25 onion fields at Taluka Niphad District Nashik in month of October on 29.10.2022 .The thrips damage rating ranged from 1 to 3 scale were recorded during survey. Based on the survey onion thrips infested fields were recorded 45% inSaikheda village farmers fields. During the survey period crop is under bulb maturity stage.

Table 1- Thrips damage rating in villages at 45 DAT

Sr.no	Villages	Damage rating
1	Chitegaon	1
2	Chandori	1
3	Saikheda	2

4	Chatori	1
5	Berewadi	1

Table 2- Thrips damage rating in villages at 75 DAT

Sr.no	Villages	Damage rating
1	Chitegaon	1
2	Chandori	2
3	Saikheda	3
4	Chatori	2
5	Berewadi	1

The result show that overall highest thrips damage rating was recorded 2 (25% damage) at 45 DAT in farmers village Saikheda Taluka Niphad. Further the same places survey result show that at 75 DAT the overall highest thrips damage rating was recorded 3 (45% damage) at same village Saikheda Taluka Niphad due to higher temperature of this week. During this period temperature range from 20.24 to 32.42 ^{0}C and relative humidity range from 77.90 to 86.87% in village Saikheda.

***Rabi* 2022-23**

The survey of onion thrips Nashik district taluka Niphadwas conducted during *Rabi* 2022 on 45 DAT and 75 DAT. During the survey five villages were selected for survey in each taluka and five onion fields in each village for observation of thrips damgescale .Thetwenty five different onion fields were surveyed in 5 villages during January and February 2023.

The survey for thrips infestation in onion crop was done in all the 25 fields in month of January at different Villages likes –Chitegaon,Chandori,Saikheda ,Chatori and Berewadi of Taluka Niphad District Nashik,Maharashtra.The thrips damage rating scale ranged 1-2 scale were recorded during survey. Based on the survey onion thrips infested fields were recorded 30% at 45DAT..

At 75 DAT further the survey of thrips infestation was done in same villages and same 25 onion fields at Taluka Niphad District Nashik .The thrips damage rating ranged from 1-4 scale were recorded during survey. Based on the survey onion thrips infested fields were recorded 65%.

Table 3- Thrips damage rating in villages at 45 DAT

Sr.no	Villages	Damage rating
1	Chitegaon	1
2	Chandori	1
3	Saikheda	2

4	Chatori	1
5	Berewadi	2

Table 4- Thrips damage rating in villages at 75 DAT

Sr.no	Villages	Damage rating
1	Chitegaon	2
2	Chandori	2
3	Saikheda	4
4	Chatori	2
5	Berewadi	3

The result show that overall highest thrips damage rating was recorded 2 (30% damage) at 45 DAT in village Saikheda and Berewadi and minimum thrips damage sacle 1 (20%) were recorded in farmers field Chitegaon village Taluka Niphad. Further the same places survey result show that at 75 DAT the overall highest thrips damage rating was recorded 4 (65% damage) at village Saikheda Taluka Niphad due to higher temperature of this week and minimum thrips damage scale 2 recorded in farmers fieldsvillages Chitegaon,Chandori and Chatori. During this period temperature range from 12.05 to 26.28 ^{0}C and relative humidity range from 62.26 to 72.83% in village Saikheda.

Conclusion

Keeping in view the above facts that the present surveys shows that the thrips population and damage rating increased due to increased temperature and relative humidity. Thrips are major insect pest of onion crop, reduce the yield potential. Management of bulb crops pests relies on insecticide use at transplanting. But insecticide resistance can cause control failure that threaten the long-term viability of this strategy.IPM strategies minimize the loss and increase the marketable value of bulb crops. Thrips population was positively correlated with temperature and negatively with relative humidity and rainfall. Cultural practice such as intercropping with carrot, tomato spider plant, mixed cropping, time of planting, spacing, balance nitrogenous fertilizer dose, irrigation application, coloured sticky traps, bio-pesticides, *B.bassiana* , neem oil, basil oil, geranium oil, datura and neem products can also be used for effective control of thrips and some insecticides fipronil, thiamethoxam, dimathoate, imidachlorprid, spinosad, acetamiprid are can also be used for effective control of onion thrips.

Therefore, it needs to focus on the future the management aspects of onion thrips is need attention to the researchers. It's important to develop resistant varieties, use of entomopathogenic fungi, mass rearing and release of natural enemies, use selective

different classes of insecticides within a season to avoid resistance and use all available cultural practices. In addition to these it is necessary to develop alternative tactics that are practical to implement.

Disclaimer (Artificial intelligence)

Authors hereby declare that NO generative AI technologies such as large language models and text to image generators have been used during the writing or editing of this manuscript.

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