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Impact of planting dates on *Thrips tabaci* Lindeman infestation and yield in onion (*Allium cepa* L.) in central India

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ABSTRACT

The aim of the present research work was to investigate the impact of planting dates on thrips populations in onions was monitored throughout two growing seasons and field experiments were carried out for two years (2013-14 to 2014-15) to determine the Impact of planting dates on *Thrips tabaci* Lindeman infestation and yield in onion (*Allium cepa* L.) in central part of India. Plant samples were collected to assess Impact of planting dates on thrips and their abundance. Results showed that the significantly lowest population of onion thrips was recorded on 1st November transplanted onion crop (12.97 thrips/plant), while significantly highest population of onion thrips was recorded on 15th January transplanted onion crop (34.25 thrips/plant). Significantly higher yield was recorded in 1st January transplanted crop (275.83 q/ha), while significantly lowest yield was recorded in 1st November transplanted crop (236.30 q/ha).

Keywords: Impact, Infestation, Onion, Planting date, *Thrips tabaci*, Yield.

INTRODUCTION

Onion (*Allium cepa* Linnaeus) is one of the important vegetable crops of family Alliaceae, originated from Central Asia [3]. It is very important in cookery; hence Germans called it as the "Queen of Kitchen". India is the second largest producer of onion in the world next only to China. In India, onion is cultivated over an area of 1285.00 thousands ha with a production of 23,262.31 thousand tonnes. The productivity of onion in India is very low *i.e.* 18.10 tonnes/ ha as compared to China having 22.05 tonnes/ha and Korea having 57.03 tonnes/ha [2]. In Uttar Pradesh onion occupies 26.85 thousands ha area with a production of 439.64 thousand tonnes and productivity is about 16.37 tonnes/ha while in Madhya Pradesh onion occupies 150.87 thousands ha area with a production of 3701.01 thousand tonnes and productivity is about 24.53 tonnes/ha. The per capita availability of onion is highest in Netherlands (32.99 kg/year), while in India it is 4.51 kg/year, which is quite low [20]. Onion is an export-oriented crop earning valuable foreign exchange for the country. India is traditional exporter of onion, which alone accounts for more than 70 % of exports amongst fresh vegetables. Recently during 2017-18, India has exported it amounting 2135421.57 metric ton, which valued for Rs.438436.00 lakh [2].

Onion thrips, *Thrips tabaci* (Thysanoptera: Thripidae), is a key insect pest in most onion production regions of the world [14]. Out of the 5,000 or so species of thrips recorded so far, only few hundred species are known to attack the cultivated plants [22]. [24] Revealed that *T. tabaci* accounted for over 90% of the total thrips species collected in garlic, onions and leeks. It is a regular and potential pest of onion and causes as high as 90 per cent of yield loss [7, 4, 23, 15]. In case of heavy infestation and severe sucking, the leaves become twisted and whitish streaky patches are developed causing low yield of poor-quality bulbs. Besides causing damage directly by feeding, the crop is also indirectly destroyed by transmitting different viral diseases [27]. *T. tabaci* is widely distributed from tropical to subtropical areas and also into the temperate regions as well [17]. Usually, thrips appear during warm weather of the crop season. The damage is often severe in late planted crops where early stages of crops growth are exposed to high incidence of thrips. Therefore, a suitable planting time should be selected.

Thrips infest onion crop throughout the crop seasons. However, there was significant variation in thrips numbers between the crop seasons [1]. In UP, its population is found maximum in November and February. To reduce the risk of pesticide application and resulting yield losses of onion crop, there is a need of resistant cultivars derived from the genetic sources [19]. The use of onion cultivars resistant to *T. tabaci* would reduce the use of insecticide, to avoid environmental hazards and to minimize the evolution of resistance to insecticides [5]. Researchers currently identified thrips resistant cultivars/genotype that guard against the negative impacts of thrips infestation [10]. The crop loss upto 50 per cent has been estimated in onion due to attack of *T. tabaci* [13]. This pest causes greatest damage during dry seasons when it destroyed 75 per cent of the onion crop [18]. Keeping the year-round planting

on onion in central India in view, an experiment was conducted to identify the most appropriate date for transplanting onion to minimize thrips infestation.

MATERIALS AND METHODS

To study the Impact of planting dates on *Thrips tabaci* Lindeman infestation and yield in onion (*Allium cepa* L.) in central part of India, experiment was carried out at the experimental farm of the Department of Vegetable Science, Chandra Shekhar Azad University of Agriculture and Technology, Kalyanpur, Kanpur (U.P.) during the *Rabi*, 2013-14 and 2014-15. All the glassware used in this study was obtained from Borosil, India and Scott Duran, Germany. Plastic ware, including Eppendorf tubes, micropipette-tips, PCR tubes, etc., was procured from Tarsons, India and Imperial Bio-Medics, India.

Impact of planting dates on *Thrips tabaci*

Raising of nursery of Agri found Light Red variety of onion and its transplanting

The seeds of Agrifound Light Red (ALR) variety of onion were sown in nursery beds started from dated 15th September, 2013 to 01st December, 2013 at 15 days interval for six different planting dates as proposed (1st November, 15th November, 1st December, 15th December, 1st January and 15th January) for the year 2013-14 and similarly for the year 2014-15.

The population dynamics of onion thrips was recorded on the fields as transplanted on above mentioned six dates in Randomized Block Design with three replication and plant spacing 15 cm row to row and 10 cm plant to plant at research centre, Kalyanpur, Kanpur. Except of plant protection measures all other agronomical practices were adopted to raise good and healthy crop. The incidence and damage of onion thrips were noted/ collected on experimental trial in order to identify the species. The thrips population was recorded at weekly interval from the inner most leaves of five randomly selected plants of each replication by using 10 x lens. This population was correlated with the meteorological parameters.

RESULTS AND DISCUSSION

Impact of different dates of planting of onion on the incidence of onion thrips, *T. tabaci*

To find out the most appropriate date of transplanting for the avoidance of major incidence of onion thrips, six different dates of transplanting were evaluated. First date of transplanting was first November during both the years and subsequent dates of transplanting's were at 15 days intervals. The dates of transplanting were compared on the basis of average thrips population per plant as well as average yield in q/ha.

Impact of different planting dates of onion on the incidence of onion thrips, *T. tabaci* and yield of onion bulbs during rabi season 2013-14

The data presented (Table 1) revealed that the thrips population was significantly varied in all the dates of transplanting. The significantly mean lowest population of onion thrips (12.89 thrips/plant) was recorded on 1st November transplanted onion crop, while significantly highest population (34.17 thrips/plant) of onion thrips was recorded on 15th January transplanted onion crop. The data clearly showed that when the dates of transplanting are delayed, the incidence of thrips was also simultaneously increased. The 1st November, date of planting significantly showed the least population of thrips/plant (12.89). Next dates 15th November, 1st December and 15th December were at par in respect of thrips population per plant (18.59, 21.04 and 23.01). The 1st January and 15th January, the dates of transplanting showed the higher thrips population per plant (28.18 and 34.17, respectively).

The yield data recorded on different dates of transplanting (Table 1) differed significantly with each other. Significantly higher yield (275.46 q/ha) was recorded in 1st January transplanted crop while significantly lowest yield (235.62 q/ha) was recorded in 1st November transplanted crop. The yield data (Table 1) showed that the dates of transplanting were delayed then subsequently onion yield was increased. The November transplanting yielded 235.62 and 239.00 q/ha, December transplanting yielded 254.46 and 261.74 q/ha. January transplanting yielded 275.46 and 267.40 q/ha. But the in case of onion thrips the higher population was recorded in late transplanted crop (January) as compared to early (November) transplanted crop.

Impact of different planting dates of onion on the incidence of onion thrips, *T. tabaci* during rabi season 2014-15

The data (Table 1) revealed that the thrips population varied significantly in all the date of transplanting's. The significantly average lowest population of onion thrips (13.05 thrips/plant) was recorded on 1st November transplanted onion crop while significantly highest population (34.32 thrips/plant) of onion thrips was recorded on 15th January transplanted onion crop. The data (Table 1) clearly showed that when the dates of transplanting are delayed, the incidence of thrips was simultaneously increased. The subsequently lower population of onion thrips was recorded in November transplanted crop (13.05 and 18.82 thrips/plant) followed by December transplanted crop (21.26 and 23.31 thrips/plant) and significantly higher population (28.52 and 34.32 thrips/plant) was recorded in January transplanted crop.

The yield data recorded from different dates of transplanting's differed significantly. Significantly higher yield (276.20 q/ha) was recorded in 1st January transplanted crop while significantly lowest yield (236.98 q/ha) was recorded in 1st November transplanted crop. The yield data showed that when the dates of transplanting's were delayed then the yield was also subsequently increased. The yield of November transplanted (236.98 and 240.59 q/ha) and December (256.11 and 262.91 q/ha) transplanted crop was low as compared to January transplanted crop (276.20 and 270.15 q/ha), but in case of onion thrips the higher population was recorded in late transplanted crop (January) as compare to early (November) transplanted crop.

Impact of different planting dates of onion on the incidence of onion thrips, *T. tabaci* (Average of 2013-14 and 2014-15)

The average of data of two years (Table 1) revealed that the thrips population was varied significantly in all the dates of transplanting. The significantly average lowest population of onion thrips (12.97 thrips/plant) was recorded on 1st November transplanted onion crop while significantly highest population (34.25 thrips/plant) of onion thrips was recorded on 15th January transplanted crop. The data (Table 1) clearly showed that when the dates of transplanting are advanced, then the incidence of thrips was simultaneously increased. The subsequently lower population of onion thrips was recorded in November transplanted crop (12.97 and 18.71thrips/plant) followed by December transplanted crop (21.15 and 23.16 thrips/plant) and significantly higher population (28.35 and 34.25 thrips/plant) was recorded in January transplanted crop.

The yield data recorded from different dates of transplanting's differed significantly with each other. Significantly higher yield (275.83 q/ha) was recorded in 1st January transplanted crop while significantly lowest yield (236.30 q/ha) was recorded in 1st November transplanted crop. The yield data showed that when the transplanting's dates were advanced then the yield was subsequently increased. The yield of November transplanted (236.30 and 239.79 q/ha) and December transplanted (255.29 and 262.33 q/ha) was low as compared to January transplanted crop (275.83 and 268.78 q/ha) but in case of onion thrips, the higher population (28.35 and 34.25 thrips/plant) was recorded in late transplanted crop (January) as compared to early (November) transplanted crop (12.97 and 18.71 thrips/plant).

Impact of different planting dates of onion on the incidence of onion thrips

To find out the most appropriate date of transplanting for the avoidance of major incidence of onion thrips, six different dates of transplanting were evaluated. First date of transplanting was first November during both the years and subsequent dates of transplanting were at 15 days intervals. The dates of transplanting were compared on the basis of average thrips population per plant as well as average yield in quintal per hectare.

The data (Table 1) revealed that the thrips population varied significantly in all the dates of transplanting. The significantly average lowest population of onion thrips (12.97 thrips/plant) was recorded on 1st November transplanted onion crop, while significantly highest population (34.25 thrips/plant) of onion thrips was recorded on 15th January transplanted onion crop. The data clearly showed that when the dates of transplanting were advanced, the incidence of thripswas simultaneously increased. The subsequently lower population of onion thrips was recorded in 1st and 15thNovember transplanted crops (12.97 and 18.71 thrips/plant, respectively) followed by 1st and 15th December transplanted crop (21.15 and 23.16 thrips/plant, respectively) and significantly higher population in 1st and 15th January (28.35 and 34.25 thrips/plant, respectively) was recorded. Present findings are more or less supported by the findings of [8], who reported that the onion plants, transplanted early on 14th January harboured the highest population of thrips in Egypt. Relatively low population of thrips was recorded on onion plants which were transplanted on 6thand 28th February. The highest population was recorded on the crop which transplanted on 11th April. They further noticed significantly positive correlation with temperature while its correlation with relative humidity was found negative. Several other workers also have reported that the early planting of the onion crop is avoided from the severe attack of thrips [11, 6, 21, 16, 9, 25]. In the present findings the peak period of attack of thrips was observed in the month of March during both the years. [12] Has also reported that the peak of this pest in March (159.0 thrips/plant).

The yield data recorded from different dates of transplanting differed significantly to each other. Significantly higher yield (275.83 q/ha) was recorded in 1st January transplanted crop, while significantly lowest yield (236.30 q/ha) was recorded in 1st November transplanted crop. The yield data showed that when the dates of transplanting were advanced, then the yield was also subsequently increased. The yield of November (236.30 and 239.79 q/ha) and December (255.29and 262.33 q/ha) transplanted crop was low as compare to January transplanted crop (275.83 and 268.78 q/ha) but in case of onion thrips, the higher population was recorded in late transplanted crop (January) as compared to early November transplanted crop. [26] Have recorded the higher population of thrips (52.89 thrips/plant) in 15th January planting and its higher bulb yield (214.00 q/ha).

To find out the most appropriate date of transplanting for the avoidance of major incidence of onion thrips, six different dates of transplanting were evaluated. The significantly lowest population of onion thrips was recorded on 1st November transplanted onion crop (12.97 thrips/plant), while significantly highest population of onion thrips was recorded on 15th January transplanted onion crop (34.25 thrips/plant). From these results it was concluded that on the advancement of the dates of transplanting simultaneously increased the incidence of thrips per plant.

Significantly higher yield was recorded in 1st January transplanted crop (275.83 q/ha), while significantly lowest yield was recorded in 1st November transplanted crop (236.30 q/ha). The yield data showed that, when the dates of transplanting are forwarded, the yield was also subsequently increased. For both the years (2013-14 and 2014-15) the yield of November transplanted crop (236.30 and 239.79 q/ha) and December transplanted crop (255.29 and 262.33 q/ha) was low as compared to January (275.83 and 268.78 q/ha) transplanted crop but in case of onion thrips the higher population was recorded in late January transplanted crop (34.25 thrips/plant) as compared to early (November) transplanted crop (12.97 thrips/plant).

Table 1: Effect of different dates of transplanting on the incidence of onion thrips, *Thrips tabaci* and yield of onion bulbs during *rabi* season, 2013-14 and 2014-15

S. No	Different dates of planting	2013-14		2014-15		Average of 2013-14 and 2014-15	
		Mean population of thrips/ plant	Mean Yield (q/ha	Mean population of thrips/plant	Mean Yield (q/ha	Thrips population/ plant	Yield (q/ha
1	01 November	12.89 (3.65)*	235.62	13.05 (3.67)*	236.98	12.97 (3.67)*	236.30
2	15 November	18.59 (4.37)	239.00	18.82 (4.39)	240.59	18.71 (4.38)	239.79
3	01 December	21.04 (4.64)	254.46	21.26 (4.66)	256.11	21.15 (4.65)	255.29
4	15 December	23.01 (4.85)	261.74	23.31 (4.88)	262.91	23.16 (4.86)	262.33
5	01 January	28.18 (5.35)	275.46	28.52 (5.38)	276.20	28.35 (5.37)	275.83
6	15 January	34.17 (5.88)	267.40	34.32 (5.90)	270.15	34.25 (5.89)	268.78
SEM ±		**0.17**	**14.32**	**0.11**	**9.01**	**0.10**	**10.01**
CD (P= 0.05)		**0.54**	**45.14**	**0.35**	**28.41**	**0.30**	**31.55**
CV (%)		**6.16**	**9.71**	**4.00**	**6.07**	**3.45**	**6.76**

* Transformed values under parentheses are √ x
Where x= mean value of thrips population

CONCLUSION

However, on 01 January transplanted crop, the thrips population per plant was higher but the yield was found highest (275.83 q/ha). Thus, the date of 1st January for transplanting of onion crop may be recommended. Though the thrips population was higher, which may be in non-feeding stage.

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Conflict of Interest

None declared.

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