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Standardization and Evaluation of Coloured Sticky Traps and their Height against Onion Thrips (*Thrips tabaci* L.)

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***Abstract*:** Onion (*Allium cepa* L.), a highly commercial vegetable crop, witnesses significant yield loss by onion thrips (*Thrips tabaci* L.) in the context. The field experiment was conducted at Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir (SKUAST-K) in rabi 2019-20 to evaluate the efficacy of colour and height of sticky traps in mitigating the population of *T. tabaci* on onion under open field conditions. Four different coloured sticky traps (yellow, blue, green and white) were installed at four different heights (25, 50, 75 and 100 cm) in 15th standard week. Yellow sticky traps had highest efficacy in attracting the population of onion thrips followed by blue, green and white traps, respectively. The traps installed at 75cm above ground had highest efficacy in attracting the maximum population of onion thrips followed by traps installed at 100, 50 and 25cm, respectively.

Keywords: Onion, *Allium cepa*, *Thrips tabaci*, Coloured sticky traps, Standardization

Onion (*Allium cepa* L.), belonging to family Amaryllidaceae, is a highly prized vegetable crop consumed in almost every household throughout the globe (Gopal 2015, Hafeez et al 2016). However, a large magnitude of insect pest is the major impediment in causing economic damage in terms of qualitative and quantitative loss from seedling up to harvesting stage in the successful cultivation of onion. Among various insect pests, thrips, *Thrips tabaci* L. (Thysanoptera: Thripidae) is a major pest of onion that damages the crop in almost all the growth stages. *T. tabaci* is a polyphagous pest and is known to damage other important agricultural and horticultural crops (Daine and Daniel 2008, Mohan et al 2016). In last two decades, this pest has become a serious concern in onion in almost all agro-climatic zones of the world (Diaz-Montano et al 2011, Al-Karboli and Al-Anbaki 2014). The damage is inflicted by both nymphs and adults of *T. tabaci* which reduce the crop production and productivity by sucking the plant sap and thus develop silvery areas on the affected plant parts. They cause significant yield loss ranging from 34 to 59 per cent (Waiganjo et al 2008, Nault and Shelton 2008, Diaz-Montano et al 2011). Malik et al (2004) recorded decline in onion yield from 11500 to 4406 kg/ha when mean number of thrips increased from 5.41 to 11.77 thrips per plant, respectively. Besides, thrips also cause indirect damage to crop by transmitting lethal plant virus belonging to different genera like sobemovirus, tospovirus, ilavirus, carmovirus and machlomovirus (Kritzman et al 2001, Hsu et al 2010). To manage *T. tabaci* on onion, farmers make repeated application of insecticides, more often from the same class, that remains persistent in the environment for a long period of time. However, this practice leads to several concerning issues like pest resistance, secondary pest outbreak, environmental contamination, biomagnification of pesticide residues and disturbance in normal ecosystem functioning. Therefore, the non-chemical management of insect pests should be adopted to avoid the emerging pesticide problems and this could be done by reliance of farmers on management practices that are non-toxic to non-target organisms and are ecofriendly at the same time. Therefore, keeping in view the importance of onion crop and the adverse effect of pesticide application to control onion thrips, the present research was carried out to evaluate the effect of sticky traps in managing the population of *T. tabaci* on onion.

MATERIAL AND METHODS

A field experiment was conducted at SKUAST-K in rabi season, 2019-20. The seeds of onion variety “Yellow Globe” were sown in mid-October in the nursery bed of 1x3 m under greenhouse conditions. The onion seedlings were transplanted in the field during November, 2019 as per the package of practices recommended by SKUAST-K. The plot size was 3x3 m^2 with five replications. The distance from row to row and plant to plant was maintained at 15cm x 30 cm, respectively. In first experiment, four sticky cards *viz*., yellow, green, blue and white (Pheromone chemicals Hyderabad,

Telangana, India) of size 12x10 cm were placed at a height of 70 cm from the ground level in onion field in 15th standard week to evaluate the attractiveness of thrips to different trap colors. In another experiment, four different coloured sticky traps (yellow, blue, green and white) were installed at four different heights (25cm, 50cm, 75cm and 100 cm) above the ground to evaluate the appropriate height for sticky trap installation for checking *T. tabaci* population. The data was collected at weekly intervals from commencement of thrips in the onion field till harvest of the crop. The number of thrips/card/week were recorded as total catch per card. The thrips stuck on the traps were counted using 10 x lens at weekly intervals. Ten such counts were made during the entire cropping period and average number of thrips captured was analyzed statistically.

Statistical analysis: The weekly data on thrips in different types of sticky traps were counted in all the replications separately throughout the cropping season. Further, the data was subjected to Tukey HSD test by using SPSS 20.0 IBM pack to draw valuable inferences.

RESULTS AND DISCUSSION

Colour of traps: The maximum population of *T. tabaci* was attracted to yellow coloured sticky traps (32.38 thrips/trap) after 70th day of installation of traps in the field. It was followed by blue (21.64 thrips/trap) and green coloured sticky traps (15.02 thrips/trap). However, white coloured sticky traps were least effective in attracting the population of *T. tabaci,* (8.66 thrips/trap after 70 days of installation of traps) (Table 1). The results are in agreement with Gharekhani et al (2014) where maximum population of *T. tabaci* was attracted to yellow sticky traps followed by blue and white coloured traps, respectively. Similarly, Demirel and Cranshaw (2005) reported that neon yellow coloured sticky traps had highest efficacy in attracting *T. tabaci* and *Frankliniella occidentalis* while as blue and white coloured traps failed to attract any of the *Thrips* species on *Brassica* sp. The highest efficacy of yellow sticky traps against *T. tabaci* has also been reported by Demirel and Yildirim (2008) on cotton and Jenser et al (2001) on tobacco. Other species of thrips have also revealed their strong affinity towards yellow traps such as *Scirtothrips perseae* on avocado (Hoddle et al 2002) and *Thrips calcaratus, Taeniothrips in-cortsequem, Neohydatothrips tiliae* on deciduous forests (Rieske and Raffa 2003).

Height of traps: The efficiency of height of yellow, blue, green and white sticky traps against *T. tabaci* was evaluated in rabi 2019-20 (Fig. 1). The perusal of the collected data revealed that yellow sticky traps installed at 75cm from the ground had maximum effectiveness in attracting the population of *T. tabaci* (32.48 thrips/trap) after 70 days of installation of traps. It was followed by 100, 50 and 25cm after 70th day of installation of yellow sticky traps. Similarly, blue sticky traps installed at 75 cm above ground recorded the maximum population of thrips followed by those installed at 100, 50 and 25 cm, respectively. The similar trend was observed in green and white sticky traps where the traps installed at 75cm from the ground attracted a greater number of thrips than the traps installed at 100, 50 and 25cm, respectively. The present results corroborate with Gharekhani et al (2014) where sticky traps installed at 70cm above ground surface attracted maximum population of immature and adult thrips as compared to the traps installed

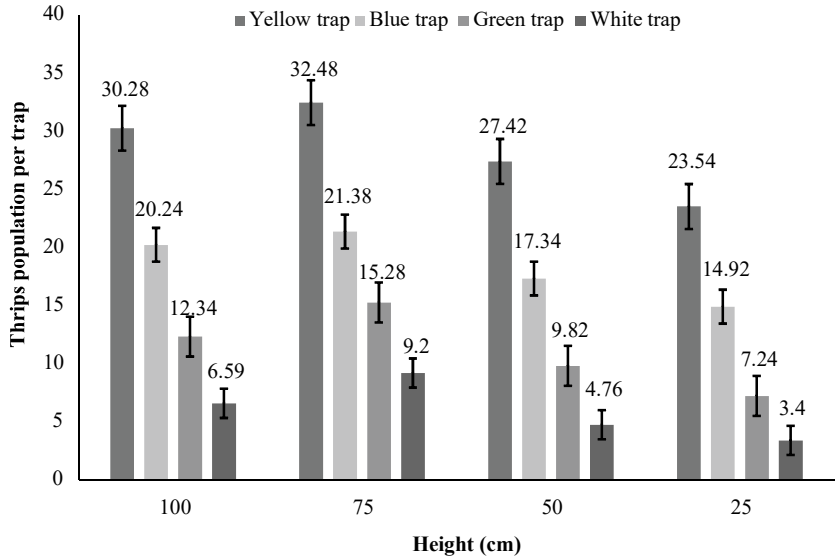

Fig. 1. Efficacy of height of different sticky traps against *T. tabaci* on onion (Mean ±standard error)

Table 1. Efficacy of different coloured sticky traps against *T. tabaci* in *rabi* 2019-20

Sticky trap	Thrips population/trap (days after installation of traps)									
	7	14	21	28	35	42	49I	56	63	70
White	0.40	1.80	3.20	4.80	9.60	12.80	17.80	14.80	12.00	9.40
Green	2.20	4.60	8.40	11.20	15.80	19.20	27.40	23.80	19.80	17.80
Yellow	4.60	12.60	17.80	26.00	37.40	42.60	52.40	47.00	43.20	40.20
Blue	2.40	3.80	9.60	16.60	23.00	28.60	40.60	35.40	29.40	27.00
CD (p=0.05)	1.10	2.99	1.73	2.01	2.65	2.92	1.99	2.47	2.31	2.71

at 100, 50 and 30cm above the ground. The sticky traps installed between 0.70 and 0.95m above the ground surface had highest efficacy in attracting *T. tabaci* population (Macintyre-Allen et al 2005). Mo et al (2008), after examining the congregation of thrips at various parts of the plant, reported that adults of onion thrips always congregate at upper parts rather than the lower parts of plant. The similar trend was observed in present findings where maximum population of adult thrips assembled on the sticky traps installed at 75-100cm above ground as compared to others.

CONCLUSION

The yellow sticky traps installed at 75cm above ground had highest efficacy in attracting the population of onion thrips. The traps should be installed right after transplanting the onion seedlings so that a continuous check is kept over the incidence of thrips in the field. However, sole reliance on yellow sticky traps to limit the population buildup of thrips on onion should not be advocated. Rather, integration of sticky traps with other components of location specific Integrated Pest Management should be followed wherein chemical application should only be done after proper surveillance programmes.

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