Indian Journal of Ecology (2024) 51(1): 206-210
DOI: https://doi.org/10.55362/IJE/2024/4218

Manuscript Number: 4218
NAAS Rating: 5.38

Comparison of Coloured Sticky Traps against Bean Flower Thrips *Megalurothrips distalis* (Karny) (Thysanoptera: Thripidae) in Summer Mung Bean

Harpreet Kaur Cheema, Harkamalpreet Singh[1] and Sandeep Kaur[1]

Department of Plant Breeding and Genetics, [1]Department of Entomology
Punjab Agricultural University, Ludhiana-141 004, India
E-mail: hkcheema@pau.edu

***Abstract*:** Mung bean grown in summer season in Punjab is an additional short duration crop with many benefits. During the hot summer season, the crop is highly prone to attack by bean flower thrips, *Megalurothrips distalis* (Karny) that cause flower shedding resulting in considerable yield losses. Field experiments were conducted in 2018 and 2019 to determine the efficacy of different coloured sticky traps against the pest. Blue coloured sticky traps (both commercial and handmade) were best in trapping bean flower thrips, which was followed by commercial yellow and handmade yellow traps that captured significantly higher thrips than clear, handmade purple and pink traps. Plots with blue traps recorded significantly lesser thrips incidence in flowers and higher grain yields. The study indicated that blue coloured sticky traps were best in attracting bean flower thrips of mung bean.

Keywords: Bean flower thrips, *Megalurothrips distalis*, Mung bean, Coloured sticky traps

Mung bean *Vigna radiata* (L.) Wilczek is an important warm season pulse crop after chickpea and pigeon pea in the Indian sub-continent. It has great importance in the vegetarian diet, due to its high protein content, besides having good amount of vitamins, minerals and bioactive compounds (Zhou et al 2019). In India, it is grown in *kharif* (rainy), spring and summer season in North and *rabi* (winter) season in the South. Under Punjab conditions, cultivating mung bean during summer season is widely accepted as an additional short duration crop for extra income, improvement in soil fertility, efficient land utilization and crop diversification (Dodwadia and Sharma 2012, Kumar et al 2022). Mung bean production is threatened by several biotic and abiotic factors, of which insect pests are of much importance (Nair et al 2019). The crop is attacked by several insect pests such as whitefly, jassids, thrips, stem fly, blister beetle, pod sucking bug, spotted pod borer and tobacco caterpillars causing considerable losses, especially on the main (rainy) season crop. Thrips target legumes especially Vigna group resulting in the considerable loss of crop yield (Hadiya 2017). Bean flower thrips, *Megalurothrips distalis* (Karny) is a major sucking insect pest of mung bean sown in summer season in Punjab that causes extensive flower shedding (Singh et al 2020). Farmers often resort to blanket sprays of un-recommended insecticides and mixtures as soon as flowering starts. To minimize excessive use of insecticide and to safeguard beneficial insects, this practice needs to be avoided. Various management options need to be reconsidered and used collectively for effective, economical and eco-friendly management of the pest. Monitoring of pest population and use of new safer insecticides should be preferred. Possibility of neem-based insecticides and horticultural mineral oils has recently been explored and may be incorporated as an integrated pest management strategy for managing this pest (Singh et al 2020). Management of pests cannot be done without the knowledge of precise pest population densities. Farmers can rely on tapping of flowers/ buds and counting the thrips or use of coloured sticky traps to monitor thrips incidence. Sticky colour cards or traps have been used for monitoring and mass trapping of insects, as compared to time consuming sampling of plants, for an early detection of the pest in horticultural crop ecosystems and some other crops (Muvea et al 2014, Tang et al 2015). Different species of thrips are attracted to different colours. Moreover, the use of coloured sticky traps is risky because some colours like yellow in pea crop may capture more of non-target predatory insects along with target insect pests (Pobozniak et al 2020). Hence, the selection of trap colour for a pest should be based on the proper knowledge. The trap colour for managing the pest should also ensure a high correlation between the size of their population in the crop and the number captured in the trap (Rőth et al 2016). The present study compared the effectiveness of different coloured traps for monitoring bean flower thrips *M. distalis* in summer mung bean aiming to identify the optimal trap colour for monitoring and management of the thrips in mung bean.

MATERIAL AND METHODS

For the comparison of different coloured sticky traps against *M. distalis* in summer mung bean, field trials were conducted at Punjab Agricultural University, Ludhiana (30°90'N, 75°85'E with an elevation of 247 m above mean sea level) during 2018 and 2019. Mung bean short duration variety (TMB 37) was sown in the first week of April in randomized complete block design (RCBD) with eight treatments and three replicates, in the plots of 35m^2 (26 rows of 6 m row length at 22.5 cm spacing) as per recommended agronomic practices (Anonymous 2018). Mean monthly temperatures for the months of April to June ranged from 25.6 to 32.9 °C during the 2018 and 24.7 to 34.6 °C during 2019. Bean flower thrips, *M. distalis* were abundant during this hot and dry period. Trials were conducted under unsprayed conditions and no other insect pest or disease incidence was observed.

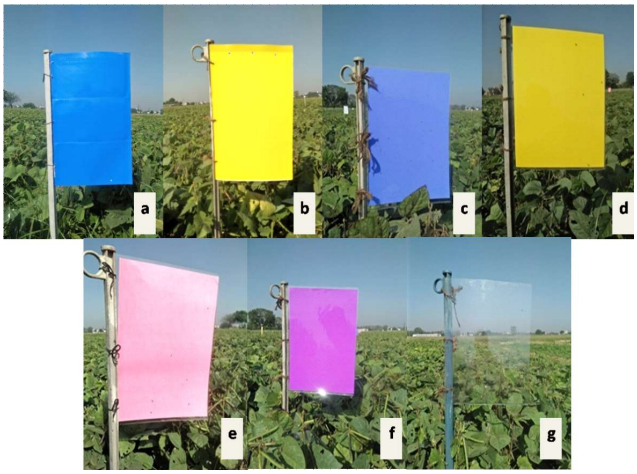

Fig. 1 Coloured sticky traps: (a) Commercial blue (b) Commercial yellow (c) Handmade blue (d) Handmade yellow (e) Handmade Pink (f) Handmade purple (g) Clear (transparent)

There were eight treatments that included blue, yellow, pink, purple, transparent (clear) and one control (without trap) (Fig. 1). The commercial blue and yellow sticky traps were purchased from Pest Control India, Chandigarh. Blue, yellow, pink, purple and clear traps were handmade. They were prepared manually using coloured paper sheets of 33 cm x 22 cm (total area 726 cm^2) and laminated. The handmade coloured traps were smeared uniformly on both the surfaces with castor oil to make them sticky. The traps (both commercial and handmade) were installed in the crop plots at the time of flower initiation stage, one trap per replication. They were mounted vertically using sticks and were positioned such that the lower edges were 5-10 cm above the plant tops. After installation of the traps, observations were recorded for the number of thrips caught per trap for four successive weeks. Count of thrips per trap was recorded using hand held 10X magnifying lens and the traps were replaced every week till the end of the season. In addition to the counts on traps, thrips population was recorded simultaneously from the crop. It was done twice a week for four weeks and expressed as thrips per 10 flowers. Pre-count data of thrips from flowers was recorded for each treatment before installation of the traps.

Statistical analysis: The data by were analysed by Duncans Multiple Range Test (DMRT) (significance level was p= 0.05).

RESULTS AND DISCUSSION

During 20th standard meteorological week (SMW) of 2018 (second week of May), significantly higher number of bean flower thrips were caught on commercial blue (66.67 thrips per trap per week) followed by handmade blue trap and were statistically on par with each other (Table 1). Furthermore, commercial yellow, handmade yellow, handmade purple, clear and handmade pink coloured sticky traps were statistically on par with each other. During 21th SMW, 129.67 thrips were

Table 1. Weekly trap catches of bean flower thrips on different coloured sticky traps in mung bean during 2018 and 2019

Trap	Number of thrips trapped per trap per week									
	2018	2019	2018	2019	2018	2019	2018	2019	Mean (2018)	Mean (2019)
SMW	20th Week		21th Week		22th Week		23th Week			
Crop days	41-47		48-54		55-61		62-68			
Commercial blue	66.67^{a}	36.67^{c}	85.33^{b}	69.33^{a}	150.33^{a}	151.33^{a}	332.00^{a}	216.00^{b}	158.58^{a}	118.33^{b}
Commercial yellow	42.33^{b}	48.66^{b}	64.00^{c}	37.33^{c}	85.00^{c}	74.67^{b}	174.66^{c}	131.33^{c}	91.41^{c}	73.00^{c}
Blue	62.67^{a}	111.33^{a}	129.67^{a}	66.00^{b}	118.33^{b}	155.00^{a}	198.00^{b}	232.00^{a}	127.17^{b}	141.08^{a}
Yellow	39.33^{b}	34.00^{c}	52.00^{d}	28.67^{d}	68.33^{d}	65.00^{c}	132.00^{d}	107.33^{d}	72.92^{d}	58.75^{d}
Pink	33.33^{b}	20.00^{e}	36.67^{ef}	18.67^{e}	31.66^{e}	30.33^{e}	58.67^{f}	48.00^{f}	40.08^{f}	29.25^{f}
Purple	36.67^{b}	24.00^{f}	40.00^{e}	19.00^{e}	33.00^{e}	49.00^{d}	48.00^{f}	70.66^{e}	39.42^{f}	40.75^{e}
Clear	35.00^{b}	28.43^{d}	33.00^{f}	19.67^{e}	74.67^{cd}	49.00^{d}	88.00^{e}	77.33^{e}	57.67^{e}	43.61^{e}

In column treatment means having same letter(s) are not significantly different by DMRT at 5% level of significance. SMW= Standard Meteorological Week

caught on handmade blue trap and were significantly higher than commercial blue and commercial yellow traps. The lowest numbers of thrips were caught on clear followed by pink- and purple-coloured sticky traps. During 22th and 23th SMW of 2018, significantly higher population of thrips was recorded on commercial blue (150.33 and 332.00) followed by handmade blue trap. The mean number of thrips pooled over four weeks of 2018 on commercial blue were 158.58 per trap per week which was highest followed by handmade blue, commercial yellow and handmade yellow traps. Least number of thrips was recorded on purple and pink traps, these were significantly lesser than all other treatments. In 2019, handmade blue traps recorded significantly higher thrips in the 20th, 22ndand 23rd SMW. However, during 21stweek, commercial blue coloured trap recorded significantly higher thrips catch followed by handmade blue trap. The mean number of thrips caught per trap per week pooled over four weeks of 2019 was maximum on handmade blue (141.08 thrips) which was statistically higher than all other treatments and was followed by commercial blue, commercial yellow and handmade yellow-coloured traps (Table 1).

The mean number of thrips per 10 flowers ranged from 5.50-14.57 and 5.33-11.16 thrips with different coloured sticky traps during 2018 and 2019, respectively (Table 2). During 2018, the mean number of thrips were lowest in plots with handmade blue (5.50 thrips) and commercial yellow traps (5.80 thrips) followed by plots with commercial blue and handmade yellow traps. Maximum thrips incidence was found in control plots without traps (14.57 thrips per 10 flowers followed by plots with pink and clear trap. The highest mean of thrips caught per trap per day in 2018 were recorded on commercial blue (35.33) followed by handmade blue trap which was on par with it. However, during 2019, the numbers of thrips per 10 flowers were least in plots with commercial blue and handmade blue traps (5.33) and were significantly lesser than the plots with yellow-coloured traps. Control plots and plots with handmade purple trap recorded higher thrips count of 11.16 and 9.33 thrips per 10 flowers, respectively. The maximum mean number of thrips caught per trap per day was 40.67 on handmade blue trap followed by commercial blue trap (34.00 thrips per trap) which was on par with it, followed by commercial yellow and handmade yellow traps that were the next best treatments. An inverse relation was observed between thrips caught in traps and thrips in flowers of mung bean crop. Overall, plots with blue coloured sticky traps had significantly lower incidence of thrips in flowers during both the years.

The highest mean yield of mung bean crop was recorded from the plot with handmade blue trap (1179 kg ha^{-1}in 2018 and 1244 kg ha^{-1}in 2019) and was significantly better than all other treatments and was followed by commercial blue traps in both the years (Table 2). Lowest yields were recorded in the plots where no trap was installed. The per cent increase in yield over control during two years of study was maximum in handmade blue (57.62, 63.68) followed by commercial blue commercial yellow and handmade yellow. Lowest per cent yield increase over control (up to 2.76%) was recorded with use of pink traps.

Pooled data of two years indicated significantly higher number of thrips caught on commercial blue (138.45) followed by handmade blue trap which was on par with it (Table 3). Commercial yellow and handmade yellow sticky traps were the next best treatments. The lowest number of thrips were caught on handmade pink (34.67) followed by handmade purple and handmade clear trap Significantly higher mean yield was recorded from plots with handmade

Table 2. Bean flower thrips in traps, in flowers and yield of mung bean during 2018 and 2019

Trap	2018					2019				
	Pre-count	Mean number of thrips per day		Yield (Kg ha^{-1})	Per cent increase in yield over control	Pre-count	Mean number of thrips per day		Yield (Kg ha^{-1})	Per cent increase in yield over control
		Per 10 flowers	Per trap				Per 10 flowers	Per trap		
Commercial blue	15.33	6.00^{c}	35.33^{a}	1046^{b}	39.83	14.00	5.33^{a}	34.00^{a}	1122^{b}	47.63
Commercial yellow	15.33	5.80^{b}	20.22^{b}	958^{c}	28.07	14.67	7.00^{b}	21.08^{b}	1054^{c}	38.68
Blue	15.00	5.50^{a}	31.66^{a}	1179^{a}	57.62	13.67	5.33^{a}	40.67^{a}	1244^{a}	63.68
Yellow	14.66	6.00^{c}	16.00^{c}	938^{c}	25.40	14.00	7.42^{bc}	16.21^{c}	980^{d}	28.95
Pink	14.66	9.60^{f}	6.00^{d}	742^{e}	-0.80	14.33	8.50^{cd}	8.13^{e}	781^{g}	2.76
Purple	15.00	7.90^{d}	8.33^{d}	813^{d}	8.68	14.00	9.33^{d}	11.71^{d}	810^{f}	6.57
Clear	14.00	9.20^{e}	11.17^{c}	874^{d}	16.84	13.67	7.58^{bc}	12.25^{d}	950^{e}	25.00
No trap (Control)	15.00	14.57^{g}	0.00^{e}	748^{e}	-	13.33	11.16^{e}	0.00^{f}	760^{h}	

In column treatment means having same letter(s) are not significantly different by DMRT at 5% level of significance

Table 3. Trap catches of bean flower thrips and yield in mung bean (Pooled data of 2018 and 2019)

Trap	Number of thrips trapped per week				Mean number of thrips trapped per week	Pooled yield (Kg ha^{-1})
SMW	20th Week	21th Week	22th Week	23th Week		
Crop days	41-47	48-54	55-61	62-68		
Commercial blue	51.7^{b}	77.33^{b}	150.83^{a}	274.00^{a}	138.45^{a}	1084^{b}
Commercial yellow	45.50^{c}	50.67^{c}	79.83^{c}	152.83^{c}	82.20^{b}	1006^{c}
Blue	87.00^{a}	97.83^{a}	136.67^{b}	215.00^{b}	134.13^{a}	1211^{a}
Yellow	36.66^{d}	40.33^{d}	66.67^{d}	119.67^{d}	65.83^{c}	959^{d}
Pink	26.67^{f}	27.67^{ef}	31.00^{g}	53.33^{f}	34.67^{f}	761^{g}
Purple	30.33^{ef}	29.50^{e}	41.00^{f}	59.50^{f}	40.08^{e}	812^{f}
Clear	31.83^{e}	26.33^{f}	61.83^{e}	82.67^{e}	50.67^{d}	912^{e}

In column treatment means having same letter(s) are not significantly different by DMRT at 5% level of significance

blue trap (1211 kg ha^{-1}) that was followed by commercial blue and commercial yellow traps.

In the present study, bean flower thrips *Megalurothrips distalis* has shown preference towards blue coloured sticky traps over all other coloured traps. Tang et al (2016) and Yan et al (2017) also reported preference of *M. usitatus* (Bagrall) for blue and light blue coloured traps in cowpea over other colours including purple and yellow. Similarly, *M. sjostedti* Trybom on French bean has been reported to be more attracted towards blue trap (Muvea et al 2014). Blue coloured sticky traps were most effective for *S. dorsalis* in open field rose crop (Sridhar and Naik 2015) and on chilli crop as compared to white, yellow, green and pink coloured traps (Hossain et al 2020). Similarly blue traps were useful than yellow for *F. occidentalis* in fruit trees and green house rose (Broughton and Harrison 2012, Khavand et al 2019) and for *F. bispinosa* in olive grove (Allan and Gillett-Kaufman 2018). However, higher efficacy of yellow sticky traps was found for attracting *Thrips tabaci* L. on onion under open field conditions (Mukhtar et al 2022) and *S. aurantii* on avocado (Bara and Laing 2020).

CONCLUSION

The blue sticky traps (both commercial and handmade) were significantly better in attracting bean flower thrips than all other coloured sticky traps in mung bean crop. These traps can be used along with other components of Integrated Pest Management program where detection and monitoring of thrips population is an integral part to decide upon commencement of insecticide application. They are also likely to lessen the population of the pest in the crop. Blue coloured sticky traps have potential against flower thrips in mung bean crop.

REFERENCES

Allan SA and Gillett-Kaufman JL 2018. Attraction of thrips (Thysanoptera) to colored Sticky traps in a Florida olive grove. *Florida Entomologist* **101**: 61-68.

Anonymous 2018. *Package of Practices for Crops of Punjab Rabi 18-19*. Punjab Agricultural University, Ludhiana, pp. 34-36.

Bara GT and Laing MD 2020. Attractiveness of different coloured sticky traps to the South African citrus thrips (*Scirtothrips aurantii* Faure) in avocado, KwaZulu-Natal, South Africa. *African Entomology* **28**: https://hdl.handle.net/10520/EJC-1d4474a102

Broughton JH and Harrison J 2012. Evaluation of monitoring methods for thrips and the effect of trap colour and semi chemicals on sticky trap capture of thrips (Thysanoptera) and beneficial insects (Syrphidae, Hemerobiidae) in deciduous fruit trees in Western Australia. *Crop Protection* **42**: 156-163.

Dodwadia KS and Sharma AR 2012. Effect of tillage and methods of sowing on performance of green gram (*Vigna radiata*) varieties during summer and rainy season. *Indian Journal of Agricultural Sciences* **82**: 462-475.

Hadiya LM 2017. *Biology, population dynamics, evaluation of direct and indirect effects of biotic and abiotic factors on thrips population and chemical control of green gram thrips Megalurothrips distalis (Karny)*. M.Sc. thesis, Junagadh Agricultural University, Junagadh, India.

Hossain MM, Khalequzzaman KM, Alam MS, Mondal MTR and Islam MM 2020. Efficacy of different coloured sticky traps against thrips of chilli. *International Journal of Applied Science and Biotechnology* **18**: 187-90.

Khavand M, Minaei K and Atashi H 2019. Comparison of trapped western flower thrips, *Frankliniella occidentalis* (Thysanoptera: Thripidae) to yellow and blue sticky traps in three different heights on two greenhouse rose cultivars. *Journal of Crop Protection* **8**: 373-377.

Kumar B, Gill PK and Brar NS 2022. Boosting summer mung (*Vigna radiata* L.) production through frontline demonstration in Tarn Taran district of Punjab. *International Journal of Plant and Soil Science* **34**: 508-514.

Mukhtar Y, Mir SH, Shankar U and Rashid S 2022. Standardization and evaluation of coloured sticky traps and their height against onion thrips (*Thrips tabaci* L.). *Indian Journal of Ecology* **49**(5): 2013-2015.

Muvea AM, Waiganjo KHL, Osiemo Z, Nyasani JO and Subramanian S 2014. Attraction of pest thrips (Thysanoptera: Thripidae) infesting French beans to coloured sticky traps with Lurem-TR and its utility for monitoring thrips population. *International Journal of Tropical Insect Science* **34**: 197-206.

Nair RM, Abhay KP, Abdul RW, Bindumadhava H, Tun S, Alam AKMM, Aditya P, Shahid RM, Karimi R, Emmanuel KM, Colin AD, Jagadish R and Roland S 2019. Biotic and abiotic constraints in mungbean production- Progress in genetic improvement. *Frontier Plant Science* **10**: 1340.

Pobozniak M, Tokarz K and Musynov K 2020. Evaluation of sticky trap colour for thrips (Thysanoptera) monitoring in pea crops (*Pisum sativum* L.). *Journal of Plant Disease and Protection* **127**: 307-321.

Rőth F, Galli Z, Tóth M, Fail J and Jenser G 2016. The hypothesized visual system of *Thrips tabaci* Lindeman and *Frankliniella occidentalis* (Pergande) based on different coloured traps' catches. *North-Western Journal of Zoology* **12**: 40-49.

Singh H, Cheema HK and Singh R 2020. Field evaluation of horticultural mineral oils and botanicals against bean thrips, *Megalurothrips distalis* (Karny) (Thysanoptera: Thripidae), in summer mung bean. *Egyptian Journal of Biological Pest Control* **30**: 1-8.

Received 30 July, 2023; Accepted 22 December, 2023

Sridhar V and Naik SO 2015. Efficacy of colour sticky traps for monitoring chilli thrips, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) on rose. *Pest Management in Horticultural Ecosystem* **21**: 101-103.

Tang LD, Zhao HY, Fu BL, Han Y, Liu K and Wu JH 2016. Colored sticky traps to selectively survey thrips in cowpea ecosystem. *Neotropical Entomology* **45**: 96-101..

Yan KL, Tang LD and Wu JH 2017. Color preferences and diurnal rhythm of *Megalurothrips usitatus* (Bagrall) (Thysanoptera: Thripidae). *Chinese Journal of Applied Entomology* **54**: 639-664.

Zhou D, Yousaf L, Xue Y, Hu J, Wu J, Hu X, Feng N, Shen Q 2019. Mung Bean (*Vigna radiata* L.): Bioactive polyphenols, polysaccharides, peptides, and health benefits. *Nutrients* **11**: 1238.