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Research Article

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Management of *Scriptothrip Dorsalis* (Thysanoptera; Thripidae) in Chilli Crop

Shahnaz Naz[1], Jan Muhammad Marri[1], Abdul Waheed Solangi[1], Sajjad Ali Khuhro[1,2] and Abdul Ghani Lanjar[1]

[1]Department of Plant Protection, Faculty of Crop Protection, Sindh Agriculture University, Tandojam-Pakistan
[2]Department of Agriculture, Supply & Prices Agriculture, Extension wing, Government of Sindh, Pakistan
Corresponding author email: waheedsolangi@sau.edu.pk
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Abstract

Chilli crop is drastically damaged by chilli thrip due to cryptic in nature and difficult to monitor the population till damge symptoms become visible. Simultaneously, this noxious pest mainly controlled by the use of chemicals, which lead to several problems. The main purpose of the present research is to monitor, manage and keep thrip population below economic thresh hold level (ETL) by using various colour (Yellow, Blue, Green & Whitesheets) sticky traps on various trap heights (30, 60,90 & 120 centimeters) were instlled in Randomized complete block design (RCBD) with three replications at fazal stop,Tandoallahyar during March, 2018 for the management of chilli thrip population efficiently. As a results of scouting experiment, it was confirmend that the yellow color sticky trap was significantly attracted highest number of *Scirtothrips dorsalis* than other sticky traps with significant differences ($F=11.58$; $df=259$, $P<0.001$), also the maximum thrips were captured on traps which were installed at 90cm height as compared to other heights. During management trial, the significant reduction in thrip population was recorded in IPM plots, t-test showed a significant difference ($t=6.11$, $F=0.75$; $df=114$, $P<0.0001$) in IPM and conventional plots. Since, the yellow color sticky trap attracted much more number of thrips at the height of 90cm. Thus, it is recommended as important components of IPM for the management of thrip in chilli agri-eco system.

Key words: IPM, Chilli, *Scriptothrip dorsalis*, Color Sticky Traps and heights.

Introduction

Capsicum (*Capsicum annum* L.) is also known as bell pepper are considered one of the most essential vegetable crop and extremely grown all over the world (Gopal *et al*., 2018; Manasa *et al*., 2018). It has colossal profitable, nutritional and medicinal values (Choudhary *et al*., 2009). Globally, Asian countries are the largest producer of chilli (Talpur *et al.*, 2016) Chilli crop were cultivated on an area of 63.6 thousand hectares with a production of 171.7 thousand tons in Pakistan (MNFSR, 2022). In contrast, thriving production of Chilli is affected by several factors including; adverse ecological conditions, diseases, insects and arachnidan pest (Orobiyi *et al.*, 2013; Samota *et al*., 2018). Several biotic & abiotic factors significantly affect the the quantity and quality of chilli (Hosamani *et al*., 2005). Several studies have been documented that chilli crop is damaging by over 39 genera and 51 species of insect species (Hosamani *et al*., 2005). Among the insect chilli thrip *Scirtothrips dorsalis* is considered one of the most destructive pest chilli crop leading 30 to 50 percent yield loss in every season (Bhede *et al*., 2008). Nowadays, this pest is mainly controlled through synthetic insecticides (Segnou *et al*., 2013), but chemical control does not always effective due to its small size and obscure feeding habit. Consequently, severe insect outbreaks, environmental pollution, insecticide-related food poisoning, and farmer illnesses are frequently reported (Halder *et al*., 2014). To reduce the use of chemicals and to avoid the further resistance in this pest, alternative and eco-friendly control strategies are needed. Recently a numbers of studies have been conducted to controlling the chilli thrip (Mainali *et al*., 2010), consequently color sticky traps are more appropriate and could reduce the extensive population of thrip species. Colored sticky traps could be a simple and low-cost method for determining the relative abundance of insects. Therefore, to determine the impact of color sticky traps on appropriate trap height of *S. dorsilas* in chilli agroecosystem. Thus, the present study not only provides the information to understand the behavioral response of this pest but also suggests some clues to develop the new control methods for other closely related orders.

Material and Methods

Two experiments were conducted; experiment-I for the thrip scouting and monitoring purpose. Whereas, experiment-II was conducted for the mangment purpose (to keep thrip population below economic enjury level) of chilli thrip.

Scouting and monitoring of thrip Experimental procedure: Chilli seed bed was raised in commercial area on 15-03-2018 and 35 days old seedling were transplanted into the main field after thirty five days. Spacing in between row to row were 60cm and plant to plant were 40 cm. The size of plot was selected for experimental purpose was 10 x 15m. Four different colored sticky traps were selected via yellow, blue, whitesheet and green to determine the activity of *S. dorsalis.* The trail was planned in Randomized Complete Block Design (RCBD) with three replications at fazal stop, chambar road, Tandoallahyar surroundings during March, 2018. The data were collected 2, 7 & 10 days after trap installation. No synthetic chemicals were applied into chilli crop from nursery till to end of crop.

Preparation of colored sticky traps: Different colored card board and sticky material (grease) were bought from commercially available market. Each colored card board fixed with woody stick. Size of trap plates was (15 × 20 cm) and coated with a special sticky material (grease) and placed in the vertical position and fixed with the help of wooden poles at the different heights above the ground level in chilli field. The sticky material was replaced every two days after installation (DAI). The sticky traps were positioned at the same distance from every corner in each plot.

Different trap heights: Three different colored sticky traps (three replications of each color) were randomly placed on different areas of chilli crop. Traps were fixed vertically on T-shaped sticks at four different heights (30, 60, 90 and 120 cm).

Management to keep thrip below economic enjury level: For management purpose, only yellow sticky trap as IPM tool and white sheet as a control (conventional) plots were installed at 90cm height above ground level and data were recorded as experiment-I.

Data observation: Observation of captured *Scriptothrips dorsalis* population per square inch of each colored sticky trap was recorded after two days interval (DAI) and simultaneously population were also recorded on chilli crop of both experiments (thrips scouting and monitoring).

Data analysis: To determine the competency of treatments, collected data were analyzed by using different statistically software (SPSS advanced software (IBM 21 version) and the means were compared by LSD test at ($P < 0.05$), for management experiment data were analyzed for difference between treatments observed using t-test and) relationship between treatments was calculated using the Originpro 2015.

Results

Scouting/ monitoring of thrip population on chilli crop

Effect of traps colour: The results (Fig. 01) revealed that overall captured *S. dorsalis* per square inch area of various colored sticky traps. There were a significant differences between all treatments ($P<0.001$). The yellow trap continuously captured significantly more (13.41±2.92) *S. dorsalis* numbers per sq. inch area as compared to the other trap colors tested, the minimum (1.23±0.25) number of chilli thrips were captured at white sheet

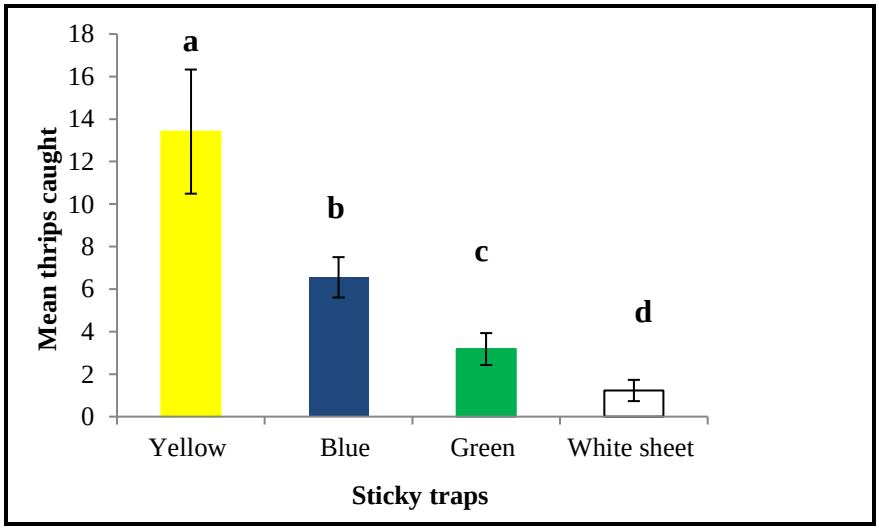

Figure 01 Impact of different color traps on the population of chilli thrip.

Effect of trap heights: Mean comparisons showed that installed traps at 90 cm above the ground attracted more thrips as compared to installed at 30, 60 and 120 cm heights, statistical analysis showed a significant result within treatments (P<0.001) (Figure 2). Based on the results of the present study, installed traps at 90cm were suitable for scouting and monitoring of thrip population.

Management of chilli thrip

IPM and conventional (Yellow sticky traps vs. no sticky trap) plots: Figure 04 revealed that the IPM plots showed thrip population below economic injury level (EIL), after instalation of yellow sticky traps the thrip population could not exceed from the EIL. The mean thrip population was well declined in IPM plots and recoded as 4.16±1.29 per leaf. Whereas, plots with no sticky trpas showed highest thrip population (15.63±5.15) per leaf. Also, t-test showed significant differnces between IPM and conventional plots (t=6.11, F=0.75; df=114, P<0.001).

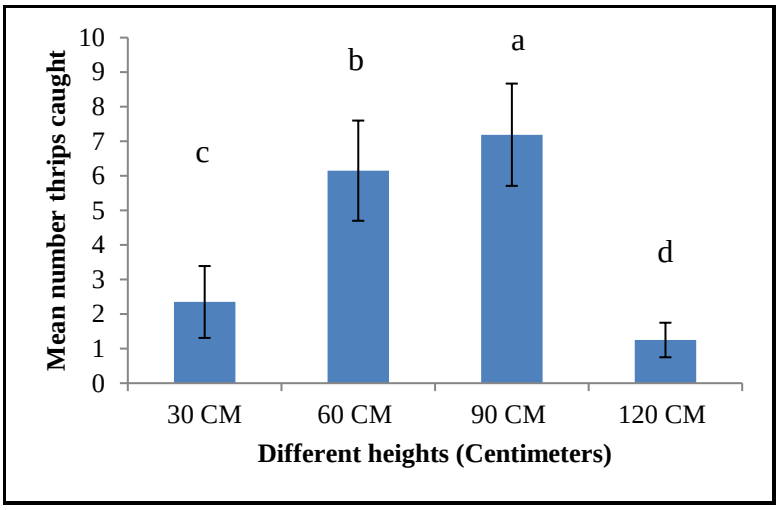

Figure 02 Efficiency of trap heights (centimeters) on thrip population.

Correlation of sticky trap height and thrip population: The correlation results regarding mean thrip population indicated that there were significant (P<0.001) but negative relationship (y=0.039xR^2-0.60) between trap heights and thrip population (Table 01).

Table 1. Relationship between trap heights and thrip population in chilli crop.

Trap heights (cm)	R	R^2	S.E	P value
30	0.72	0.58	0.30	0.008
60	0.51	0.70	0.09	0.001
90	0.70	0.65	0.15	0.001
120	-0.39	0.60	0.22	0.002

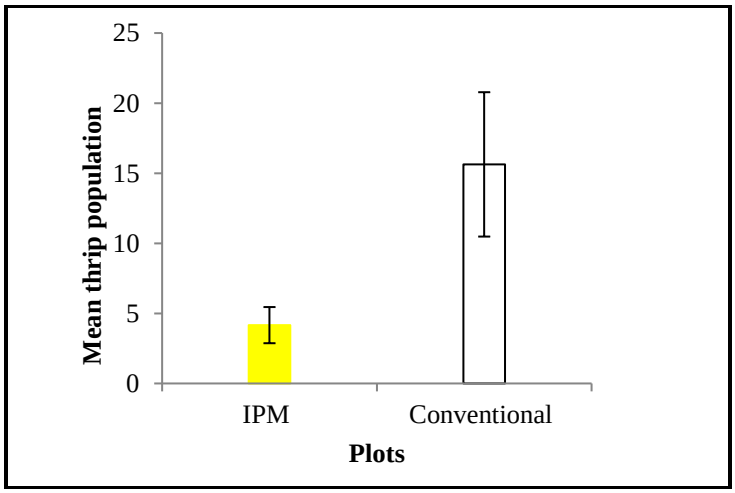

Figure 04 Thrip population per leaf in IPM and Non-IPM plots.

Yield and cost-benefit ratio: The figure 05 reveals per acre yield differences and cost/benefit ratio of IPM and conventional plots. It is observed that IPM plots produced highest yield (50 munds) per acre and conventetial plots showed lowest (35 munds) per acre chilli yield. Similarly, the higher cost benefit ratio (3:13) was recorded of IPM plots than the conventional plots (1:29).

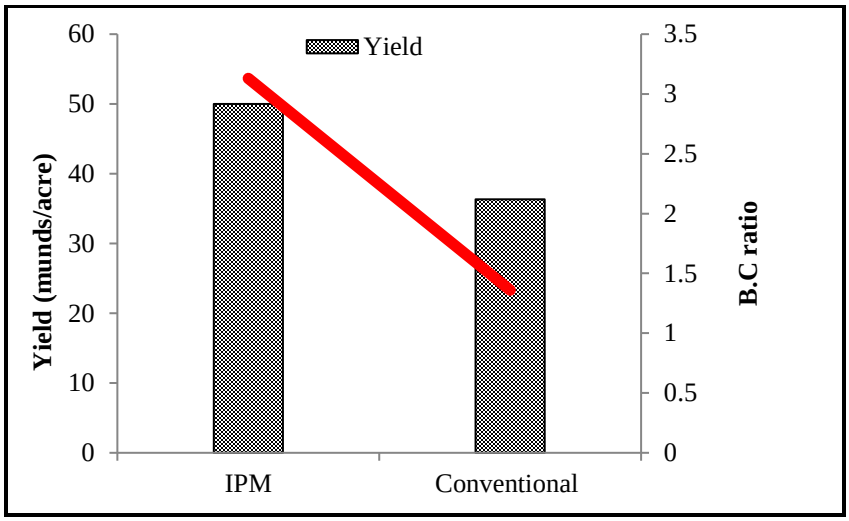

Figure 5 Yiled and cost benefit ratio at IPM and Non-IPM plots after installation of sticky traps.

Discussion

Chilli and kitchen garden crops are usually economically important and consumable, but insect pests infestation significantly reducing the value of the crops. However, *S. dorsilas* is not only suck the cell sap of the plant, but also lead to stunt the development and growth of the plant (Samota *et al*., 2018) and causes "chilli leaf curl" also called Murda disease, and vector of several diseases (Hodges and Evans 2005; Chiemsombat *et al*., 2008*).* Successfully management of this noxious pest is the first and key step to determine proper control methods for monitoring and minimize the population. Different IPM approaches have been used to suppress the insect pest population below the economic threshold level (ETL) throughout the cropping season (Ravikumar *et al*., 2017; Latha and Hunumanthraya 2018). Colour sticky traps are frequently used for monitoring and controlling the population of herbivorous insects (Devi and Roy 2017; Lim *et al*., 2013). Few studies suggested that blue colored sticky traps captured more thrips (Antignus, 2000), where yellow sticky traps are known to capture a significantly higher number of whiteflies (Gorski 2003). Similarly, in the present study, yellow color sticky trap was most attractive as compared to Blue and Green; these findings are very much similar to (Masatoshi *et al.* 2009; Malik *et al.* 2012) reported that yellow color was found most efficient color and used to capturing winged insects, compared to other colors (Devi and Roy 2017). Similarly, Reddy and Rajan 2016 showed that yellow sticky traps can considerably capture *B. tabaci* during the development period of the plant. However, recent studies proved that among all three different colors yellow colored sticky trap confirmed high capturing ability against chilli thrip. The lowest thrip population was observed on a plot where the yellow-colored sticky trap at 90cm height was installed. This condition confirmed the efficiency of the treatments, which yellow color sticky trap captured more numbers of thrip, and consequently, the population was reduced on the crop. Therefore, a yellow-colored sticky trap exhibited its properness over other colored sticky traps and can be installed in field crops for trapping the chilli thrips as the main IPM tool to overcome the thrips as well as other homopteran pests.

Conclusion

In the present study, yellow color sticky trap at the height of 90cm found most effective against monitoring and mangement of chilli thrip as compared to blue, green and white sticky traps. In addition, the maximum yield and the higher cost benefit ratio was recorded of IPM plots (having yellow sticky traps on 90cm height) than the conventional plots (no sticky traps). Thus, the yellow colored stick trap at appropriate height (90cm) are recomnded to combat with the thrip population, to get more profit from chilli crop.

Author's Contribution

Current manuscript is the part of the Ph.D thesis the initial idea, data collection, methodology and write up was contributed by first author Ms. Shehnaz Naz Pathan and major supervisor Prof. Dr. Jan Muhammad Marri while results and suggestions and proofreading was contributed to other authors.

Conflict of interest

The authors have declared no conflict of interest.

Reference

Antignus, Y. 2000. Manipulation of wavelength-dependent behaviour of insects: an IPM tool to impede insects and restrict epidemics of insect-borne viruses. *Virus Research*, **71**: 213-220.

Arno, J., R. Albajes and R. Gabarra. 2006. Within-plant distribution and sampling of single and mixed infestations of *Bemisia tabaci* and *Trialeurodes vaporariorum* (Homoptera: Aleyrodidae) in winter tomato crops. *Journal of Economic Entomology*, **99**: 331-340.

Choudhary, B. R., and S. A. Fageria. 2009. Text book on production technology of vegetables (Kalyani publishers), **2**: 66-67.

Chiemsombat, P., O. Gajanandana, N. Warin, R. Hongprayoon, A. Bhunchoth and P. Pongsapich. 2008. Biological and molecular characterization of tospoviruses in Thailand. *Archives of Virolology*, **153**: 571-577.

Devi, M. S. and K. Roy. 2017. Comparable study on different coloured sticky traps for catching of onion thrips, *Thrips tabaci* Lindeman. *Journal of entomology and zoology studies*, **5** (2): 669-671.

Gopal, G. V., K. V. Lakshmi, B. S. Babu, and P. K. Varma. 2018. Seasonal incidence of chilli thrips, *Scirtothrips dorsalis* hood in relation to weather parameters. *Journal of entomology and zoology studies*, **6** (2): 466-471.

Halder, J., A. B. Rai and M. H. Kodandaram. 2014. Parasitization preference of Diaeretiella rapae (McIntosh) (Hymenoptera: Braconidae) among different aphids in vegetable ecosystem. *Indian Journal of Agricultural Sciences*, **84**(11): 1431-1433.

Hodges, G. S. and G. A. Evans, G. A. 2005. An identification guide to the whiteflies (Hemiptera: Aleyrodidae) of the Southeastern United States. *Florida Entomologist*, **88** (4): 518-533.

Hosamani, A. C., Thulasiram K., Patil B. V., Bheemana M. and Hanchinal S. G. 2005. Fenpropathrin (Meothrin) 30 EC an ideal insecticide for chilli (*Capsicum annum* L) pest management. *Pestology*, **24** (2):21-24.

Latha, S. and L. Hunumanthraya. 2018. Integrated management of insect and mite pests of chilli under hill zone of Karnataka, *Journal of Entomology and Zoology Studies*, **6** (2): 2770-2773.

Lim, U. T., E. Kim, and B. P. Mainali. 2013. Flower model traps reduced thrips infestations on a pepper crop in field. *Journal of Asia-pacific Entomology*, **16**:143-145.

Mainali, B. P. and U. T. Lim. 2010. Circular yellow sticky trap with black background enhances attraction of *Frankliniella occidentalis* (Pergande) (Thysanoptera: Thripidae). *Journal of Applied Entomology and Zoology*, **45**:207-213.

.Malik, M. I., R. D. Khuhro, K. H. Dhiloo, B. Zaman and S. N. Khuhro. 2012. Response of sucking insect complex to various colors of sticky traps in okra crop. *Pakistan Journal of Entomology*, **27** (2):181-186.

Manasa, C., M. H. Tatagar, J. B. Gopali, M. P. Basavarajappa, M. Shankar and S. H. Ramanagouda. 2018. Biointensive approaches for the management of chilli pest complex. *Journal of entomology and zoology studies*, **6** (4): 1870-1874.

Masatoshi, T., M. Shinichi and K. Nobuhiro. 2009. Color attraction of Yellow Tea Thrips (*Scirtothrips dorsalis* Hood). *Japanese Journal of Applied Entomology and Zoology*, **39**:299-303.

Ministry of National Food Security and Research. 2022. Government of Pakistan, Islamabad.

Orobiyi, A., A. Dansi, P. Assogba, L. Y. Loko, M. Dansi, R. Vodouh, A. Akouegninou and A. Sanni. 2013. Chili (*Capsicum annuum* L.) in southern Benin: production constraints, varietal diversity, preference criteria and participatory evaluation. *International journal of agricultural and social sciences*, **3** (4): 107-120.

Ravikumar, A., S. Manisegaran, C. Chinniah and V. Janahiraman, 2017. Induced Systemic Resistance through Organic Based IPM Module against Pest Infesting Chilli. *International Journal of Current Microbiology and Applied Sciences*, **6** (5): 1084-1094.

Reddy, P. V. R. and V. V. Rajan, 2016. Too many sticky traps are detrimental to beneficial arthropod fauna. *Current Biotica*, **9** (4): 303-305.

Sang, M. K., A. Shrestha, D. Y. Kim, K. Park, C. H. Pak and K. D. Kim. 2013. Biocontrol of Phytophthora Blight and Anthracnose in Pepper by Sequentially Selected Antagonistic Rhizobacteria against Phytophthoracapsici. *Plant Pathology journal*, **29** (2):154–167.

Samota, R. G., B. L. Jat and M. D. Choudhary. 2018. Varietal screening of chilli, *Capsicum annum* L. against major sucking insect pests. *Journal of entomology and zoology studies*, **6** (1): 995-999.

Segnou, J., A. Amougou, E. Youmbi, J. Njoya. 2013. Effect of Chemical Treatments on Pests and Diseases of Pepper (*Capsicum annuum* L.). *Greener Journal of Agricultural Sciences*, **3** (1): 12-20.

Sen, S., S. K. Pathak and M. L. Suiam, 2016. Is the Use of Yellow Sticky Trap Detrimental to Natural Enemy Complex of Tea Pests? *American-Eurasian Journal Agriculture & Environmental Scienes*, **16** (9): 1597-1601