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EVALUATION OF THE EFFECTIVENESS OF LIGHTED BLUE STICKY TRAPS IN THE MONITORING OF THE OCCURRENCE OF WESTERN FLOWER THRIPS (*FRANKLINIELLA OCCIDENTALIS* PERGANDE)

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Abstract: In presented studies not significant effect of the illumination of blue sticky traps with red pulsating light on their effectiveness in the monitoring of the western flower thrips (*Frankliniella occidentalis* Pergande) was found. Observed increase of the number of caught imagines on lighted blue sticky traps was not statistically significant in comparison to the control combination (blue sticky traps without any light).

Key words: monitoring, lighted sticky traps, western flower thrips

INTRODUCTION

In the protection of greenhouse cultivations, an early monitoring of pests has an essential importance. It permits to control effectively the pests still before any damages occur on the plants. In the monitoring of harmful insects occurring on plants cultivated in greenhouse, coloured sticky traps have proven to be useful. The action of these traps consists in the fact that their colour lures the flying forms of insects, which get stuck to the traps whose catching surfaces, are covered with glue (Baranowski and Górski 1991; Górski 1999; 2001).

In the Department of Plant Protection Methods, Horticultural Faculty of Agricultural University in Poznań, studies on the increasing of the effectiveness of coloured sticky traps in the monitoring of pests of greenhouse plants have been carried out for many years.

The objective of the presented studies was the evaluation of the effectiveness of blue sticky traps lighted with a red pulsating light in the monitoring of the occurrence of western flower thrips (*Frankliniella occidentalis* Pergande).

MATERIAL AND METHODS

The studies on the effectiveness of the lighted sticky traps in the monitoring of the occurrence of western flower thrips (*F. occidentalis* Pergande) were carried out in 2000, in a greenhouse at the Experimental Station "Marcelin", Horticultural Faculty of Agricultural University in Poznań. The observations were carried out in the cultivation of dwarf bean "Golden Saxa" cultivar intensively attacked by western flower thrips. The pest was monitored with the blue sticky traps. The dimensions of the traps were 100×200 mm and they were produced of plastic material. The catching surfaces of the traps were covered with entomological glue for the catching of insects. The traps were illuminated with diode bicycle lamps with a red pulsating light, produced by "Romet" Co. in Poznań. The length of dominating wave (λ_D) of red light was 650 nm. Flash frequency of red pulsating lamp was 2 light stimuli per second.

The effectiveness of the traps was evaluated using two methods of illumination.

In the first experimental series, the lamp was placed over the sticky traps at a distance of 50 mm from its upper edge, so that red pulsating light illuminated at the same time both catching surfaces. The effectiveness of these traps was compared with the effectiveness of control traps without any light.

In the second experimental series, the lamp was placed in the 50 mm behind the trap, so that it illuminated mainly the back surface of the traps, however, the light was partially visible also on the front surface of the trap. In the control combination, the sticky traps were used without light.

In both experiments, the sticky traps were hung in a vertical position, i.e. with the shorter edge upwards, so that the lower edge of the trap was at the height of the plant tops. After 7 days from the date of the installation of traps, the traps were removed and the number of the caught imagines was counted. The removed sticky traps were replaced with new ones. Twice in the week, the location of the traps was changed in order to eliminate the effect of the place of their location on the number of the caught insects. In each tested combination, 5 sticky traps were installed. Both experimental series were replicated 5 times. The obtained results were statistically analysed basing on Duncan's test at the significance level of $\alpha = 0.05$.

RESULTS

The results of the effect of blue sticky traps lighted by red pulsating light on the number of caught imagines of western flower thrips (*F. occidentalis* Pergande) are shown in table 1.

The highest increase of the effectiveness of the traps by 12.57% in relation to control combination was recorded when the red pulsating light was falling on the back catching surface of the sticky traps. However, the analysis of variance made on the basis of Duncan's test at the significance level of $\alpha = 0.05$ did not show any significant differences between the results obtained in the studied combinations.

In turn, the illumination of the sticky traps with a red pulsating light falling from above on the sticky trap and illuminating at the same time both catching surfaces of the trap caused a small increase of the caught insects, i.e. by 4.61% in relation to the

Table 1. Effect of the lighting of the blue sticky traps with a red pulsating light on the number of caught imagines of western flower thrips (*F. occidentalis* Pergande)

Analysed sticky traps	Number of caught insects pcs/trap	Increase percentage in relation to control
Blue sticky trap – lamp is placed behind the trap	484.86 a	12.57
Control – blue sticky trap without any light	423.87 a	
Blue sticky trap – lamp is placed over the trap	714.46 a	4.61
Control – blue sticky trap without any light	681.53 a	

* Mean values marked with the same letter do not differ at the significance level $\alpha = 0.05$ according to Duncan's test

control combination. Also in this case, the analysis of variance carried out on the basis of Duncan's test at the significance level of $\alpha = 0.05$ did not show any significant differences between the results obtained in the studied combinations.

DISCUSSION

The pulsating light has a wide application in the everyday life of man. It is used in order to increase the perception in road traffic, i.e. in light signaling, for the marking of road works, cars, one-track vehicles. The presented studies aimed at the determination of the reaction of western flower thrips to pulsating light, knowing earlier the positive reaction of human eyes to that type of light.

In these studies not significant increase reaction of western flower thrips to blue sticky traps illuminated with a red pulsating light was found.

In the literature, there are no data referring to the application of pulsating light in the monitoring of the pest occurrence. One can only find fragmentary information referring to the reaction of insects to the appearing and disappearing light stimuli. Szwanwicz (1956) reported that the reaction of insects to changing light stimuli (appearing and disappearing) is significantly stronger in comparison to that of man. Insects' are able to receive 200–300 light stimuli per second, while man can distinguish not more than 20–30 stimuli per second. The high sensitivity of insects' eyes to the appearing and disappearing light stimuli is closely connected with their construction. In the eye of an insect, the surrounding is visible as a system of points with different intensity of light, i.e. as mosaic picture. Just this mosaic picture developing in the insects eye permits to perceive exactly the smallest changes taking place in the surrounding environment including pulsating light (Szwanwicz 1956).

In the literature, one can find information referring to the usage of sticky traps with a continuous light emission in the monitoring of pest. However, this information does not refer to the *F. occidentalis*, but to other dangerous pests of greenhouse cultivations, i.e. greenhouse whitefly (*Trialeurodes vaporariorum* Westwood). Baranowski and Górski (1991) who investigated different constructional solutions of yellow sticky traps found that the imagines of greenhouse whitefly react most intensively to an illuminated cylindrical screen. This type of trap caught by 435.54% more heteropters than a cylindrical screen without light. The high effectiveness of the cylindrical screen results from the fact that this trap lures the insects both during the day and in the night. According to Ascerno (1983), the visual effect of illu-

minated cylindrical screen can be increased by the installation of yellow light bulbs. Macdowall (1972) wrote about the usage of illuminated traps in the catching of *T. vaporariorum*. That author concluded that this type of a trap could be used instead of chemical protection. A high effectiveness of illuminated traps in the control of *T. vaporariorum* was found by Novikova et al. (1988). Those authors applied illuminated traps in the cultivation of tomato and reduced the pest population in 85.5%.

Wardlow and O'Brnie (1988) carried out studies on the control of sciarid flies (*Sciaridae*) in a mushroom-growing cellar with the application of polyethylene foil strips covered with entomological glue for catching insects. They observed that the number of the caught insects on the traps hanging close to light bulbs was always greater than on the traps remote from the bulbs. On the basis of those observations, they constructed sticky traps with light by installing light bulbs over the foil strips causing thereby a significant increase of the number of caught insects.

CONCLUSION

The illumination of blue sticky traps with red pulsating light has not significant effect on their effectiveness in the monitoring of the occurrence of the western flower thrips (*F. occidentalis* Pergande). It was found that observed increase of the number of caught imagines on lighted blue sticky traps was not statistically significant in comparison to the control sticky traps without any light.

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POLISH SUMMARY

OCENA SKUTECZNOŚCI DZIAŁANIA PODŚWIETLANYCH, NIEBIESKICH TABLIC CHWYTNYCH W MONITOROWANIU WYSTĘPOWANIA WCIORNASTKA KALIFORNIJSKIEGO (*FRANKLINIELLA OCCIDENTALIS* PERGANDE)

Badania nad skutecznością działania podświetlanych, niebieskich tablic chwytnych w monitorowaniu występowania wciornastka kalifornijskiego (*Frankliniella occidentalis* Pergande) prowadzono w 2000 roku, w szklarni znajdującej się na terenie Stacji Doświadczalnej „Mar-

celin" Wydziału Ogrodniczego Akademii Rolniczej im. Augusta Cieszkowskiego w Poznaniu. Owady odławiano na niebieskie tablice chwytne o wymiarach 100×200 mm. Do podświetlenia tablic chwytnych zastosowano diodowe lampki rowerowe o czerwonym świetle pulsującym, produkowane przez firmę „Romet" z Poznania.

W badaniach stosowano dwa sposoby podświetlenia niebieskich pułapek chwytnych. W pierwszej serii doświadczenia, lampkę umieszczono nad tablicą chwytną, w odległości 50 mm od górnej jej krawędzi. W drugiej serii, lampkę zawieszono w odległości 50 mm za pułapką chwytną. Kontrolę stanowiły tablice chwytne bez podświetlenia. Określono liczbę imagines odłowionych na powierzchniach chwytnych pułapek.

Oświetlenie tablic chwytnych czerwonym światłem pulsującym, padającym na tylną powierzchnię chwytną pułapek spowodowało statystycznie nieistotny wzrost liczby odłowionych imagines, wynoszący 22,59% w stosunku do kombinacji kontrolnej (tablice chwytne bez podświetlenia).

Z kolei oświetlenie tablic chwytnych czerwonym światłem pulsującym padającym z góry na pułapkę spowodowało wzrost liczby wyłowionych owadów o 4,61% w stosunku do kombinacji kontrolnej. Również i w tym wypadku nie wykazano statystycznie istotnych różnic w stosunku do kombinacji kontrolnej.