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Evaluation of colour traps to monitor insect vectors of sugarcane white leaf phytoplasma

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Abstract

The present study was conducted to evaluate the attractiveness of various colour sticky traps and light tarps at sugarcane field in Phandon village, Kumpawapi district, Udon Thani Province, Northeast region of Thailand for the insect vectors of sugarcane white leaf phytoplasma, the leafhoppers *Matsumuratettix hiroglyphicus* (Matsumura) and *Yamatotettix flavovittatus* Matsumura to. In sticky traps experiment, yellow, blue, white, green, orange and colorless (control) were used. A higher number of the putative vectors, *Matsumuratettix hiroglyphicus* and *Yamatotettix flavovittatus* were trapped on blue and yellow as compared to white, orange, green and colorless (control) sticky traps. In light traps experiment, yellow, green, black light-blue and black color light sources were used. With regard to treatment colour light traps with black light-blue trapped significantly higher numbers of both leafhoppers followed by black, green and yellow traps. The light traps were found significantly more attractive to both species of insect vectors compared to sticky traps, as lower number of insect vectors were trapped on sticky traps. In conclusion, a trap with black light-blue colour was the best attractive equipment for monitoring the of insect vectors of sugarcane white leaf phytoplasma in sugarcane fields.

Key words: *Matsumuratettix hiroglyphicus*, *Yamatotettix flavovittatus*, color sticky traps, light traps.

Introduction

Sugarcane is an important economic crop grown in Thailand. Sugarcane white leaf (SCWL) is the most destructive disease of sugarcane in this country and it is caused by plant pathogenic phytoplasma, spread through sugarcane stocks and transmitted plant to plant by leafhoppers, *Matsumuratettix hiroglyphicus* (Matsumura) and *Yamatotettix flavovittatus* Matsumura. Their transmission rates were found 55 and 45 percent respectively (Hanboonsong *et al*., 2006). Thus, to monitor the population level of phytoplasma insect vectors *Matsumuratettix hiroglyphicus* and *Yamatotettix flavovittatus* in sugarcane fields is important for management of the disease.

Trapping methods are principal tools in insect pest management programs. The ability to attract specific arthropod species is depending on the different trapping equipments. The different colour sticky traps are used to monitor leafhopper species on many crops (Kersting *et al*., 1997; Chu *et al*., 2000; Lessio and Alma, 2004; Raja and Arivudainambi, 2004).

The yellow colour traps were significantly more attractive for vector of sesame phyllody phytoplasma, *Orosius orientalis* (Kersting *et al*., 1997) and potato leafhopper, *Empoasca fabae* (de Gooyer *et al*., 1998). Ramamurthy *et al*. (2010) studied the different numbers of insects species caught by light traps with different light sources.

The objective of this study was to evaluate the most suitable trapping method for monitoring populations of *Matsumuratettix hiroglyphicus* and *Yamatotettix flavovittatus* in sugarcane fields.

Materials and methods

This experiment was conducted at farmers' field in Phandon village, Kumpawapi district, Udon Thani Province, Northeast region of Thailand during May to October 2010. It was conducted to evaluate the attractiveness of *Matsumuratettix hiroglyphicus* and *Yamatotettix flavovittatus* to (30 cm x 20 cm) sticky card of yellow, blue, white, green, orange and colourless (control) traps. The experiment was carried out using Randomized Complete Block Design with six replications. The colour sticky cards were placed in the field above the plant canopy and adjusted to canopy height later in the season. The traps were collected and replaced every two weeks.

Light traps with different colour light sources; yellow, green, black light-blue (BLB) and black light with glue on transparent plastic sheets (50 cm x 50 cm) and two replications were used in this experiment. It was carried out at the experimental field of sticky color traps. The traps were placed inside the field of 1 m distance from the border row. All light traps were adjusted to a height of 1 m and checked every two weeks at dark hours of 18:00 – 21:00 p.m..

All different colour sticky traps and light traps that caught insects were kept in plastic boxes and transferred to the laboratory for identification of leafhoppers species and counting of individuals at each evaluation date. Data were subjected to analysis of variance (ANOVA) and the treatment means were separated by least significant difference (LSD) at 5% probability level.

Table 1. Mean numbers of *M. hiroglyphicus* and *Y. flavovittatus* caught on sticky traps of different colours in sugarcane field from June to October 2010.

Sticky trap colours	Mean numbers of	
	M. hiroglyphicus (±SE)/trap/day	*Y. flavovittatus* (±SE)/trap/day
Blue	3.08±0.31a	10.73±0.92a
Yellow	2.50±0.16b	7.88±1.02b
Orange	0.83±0.16c	5.83±1.08c
White	0.75±0.13c	4.42±0.48cd
Green	0.61±0.08cd	4.08±0.45d
Colorless	0.19±0.07d	2.19±0.45e

*Means within a column not followed by the same letter are significantly different ($p<0.05$) by LSD.

Table 2. Mean numbers of *M. hiroglyphicus* and *Y. flavovittatus* caught on light traps with different colours light sources in sugarcane field from June to October 2010.

Light trap with colour light source	Mean numbers of	
	M. hiroglyphicus (±SE)/trap/day	*Y. flavovittatus* (±SE)/trap/day
Black light-blue	203.38±37.88a	449.65±30.07a
Black	127.75±30.50b	174.75±30.03b
Green	54.75±12.75bc	119.79±10.36b
Yellow	10.88±1.13c	22.00±5.72c

*Means within a column not followed by the same letter are significantly different ($p<0.05$) by LSD.

Results

The results of the study indicated that blue colour sticky traps were the most attractive followed by yellow for the leafhopper vectors of sugarcane white leaf phytoplasma, *M. hiroglyphicus* and *Y. flavovittatus*. The orange, white, green and colourless (control) sticky traps were less attractive than yellow (table 1).

On the other hand, mean number of insect vectors captured on light traps with different colour light sources exhibited a significant difference at all treatments. The results showed that the highest population of *M. hiroglyphicus* and *Y. flavovittatus* was trapped on light traps with black light-blue followed by black, green and yellow light, respectively (table 2). This result clearly indicated that black light-blue light trap was the most attractive for the main insect vectors of SCWL phytoplasma.

Discussion

In the previous study, the yellow and orange color sticky traps were significantly attractive for leafhopper, *Empoasca decipiens* in cotton (Demirel and Yildirim, 2008). The red colour sticky traps caught more *Scaphoideus titanus*, grapevine 'flavescence dorée' phytoplasma vector than white, yellow or blue (Lessio and Alma, 2004). Our results showed that significantly higher numbers of *M. hiroglyphicus* and *Y. flavovittatus* were generally trapped on colour light traps. Our results indicate that the active movement behaviour of SCWL insect vectors could be evening or when it is dark and it showed insect vectors are attracted by light source. We suggest that light trap with black light-blue light source is the best for monitoring the populations of the insect vector species, *M. hiroglyphicus* and *Y. flavovittatus* in sugarcane fields.

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