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YELLOW STICKY TRAP CATCHES AS INDICATOR FOR THE COTTON WHITEFLY *Bemisia Tabaci* (GENN.) POPULATION AND ITS PARASITOIDS

Awadalla, S. S. [1], M. H. Bayoumy[1], M. A. Khattab[2]and A. H. Abd El-Wahab[2]

[1]Mansoura University, Faculty of Agriculture, Economic Entomology Department, Mansoura 35516, Egypt.

[2]Piercing-Sucking Insect Department, Plant Protection Research Institute, ARC, Egypt

ABSTRACT

The relationship between yellow sticky trap (YST) captures of *Bemisia tabaci* (Genn.) and its parasitoids, *Encarsia lutea* (Masi).and *Eretmocerus mundus* (Mercet).and those populations measured by leaf samples (LS) was evaluated. Traps were placed in experimental fields of cotton, soybean, and eggplant at Kafr El-Sheikh district during two successive seasons 2012 and 2013. Throughout the season, the trend of increasing numbers of parasitoids on traps paralleled the increase in numbers of whiteflies. Furthermore, the numbers of whitefly and parasitoid adults captured with YST were significantly correlated with those recorded from leaf samples of the three host plants, with an exception for parasitoids on soybean during both seasons. A relatively non- glabrous soybean leaf may be a suitable texture for parasitoid searching, resulting in high number of parasitoids visited and captured by YST followed by low numbers of parasitized hosts in this crop. The highest significant numbers of whitefly and parasitoid adults were captured by YST at 60 cm above the ground (≈ top of the plant) for the three host plants over each season. Vertical distribution of eggs by whitefly females on leaves near to the top of plant and on lower surfaces gives clear evidence that females are negative to temperature and extensive light. The number of parasitoids caught by traps was higher than those recorded by leaf samples of the three plants. This might led to low parasitism rates and consider as disadvantage of YST. Because the same trend was recorded for whitefly on the three host plants, YST could be advantage for whitefly control (i.e., trade off). Nevertheless, sticky traps placed within crops may be useful for detecting changes in whitefly parasitoid populations at a particular site and specific locations. There were significantly differences among months in numbers of whitefly and parasitoid adults captured by YST with the highest numbers trapped in September of both seasons. Thus, regular treatments of insecticide applications should be stopped at that time to give the opportunities for biocontrol agents to regulate their host population.

Keywords: Aphelinidae, biocontrol, cotton whitefly, *Encarsia*, *Eretmocerus*, trade off

INTRODUCTION

The diverse cropping landscape in the Egypt includes eggplant, cotton, and soybean, all are important host-crops of *Bemisia tabaci* (Gennadius) (Homoptera: Aleyrodidae). Eggplant is normally grown in small areas whereas cotton and soybean are grown in large areas. The cotton whitefly, *B. tabaci* biotype complex is one of the most serious pests in more than 90 countries and districts in tropical, subtropical and adjacent temperate zones (Perring 2001).

Studies have shown that host plant species can affect the abundance of whiteflies, as well as parasitoid abundance and rate of parasitism. Simmons *et al*. (2002) reported that two *Brassica* species and *Vigna anguiculata* (L.) were more conducive to parasitism of *B*. *tabaci* than *Cucumis sativus* L. and *Lycopersicon esculentum* Miller. Qiu *et al*. (2005) demonstrated that *Eretmocerus* sp. nr. *furuhashii* Rose and Zolnerowich was more effective on non-glabrous crop varieties than glabrous plants for biological control of *B*. *tabaci*. Stansly *et al*. (1997) found that a greater proportion of *B*. *argentifolii* was parasitized by *Encarsia pergandiella* Howard on tomato than on collard and eggplant in a greenhouse choice test.

The high populations of *B*. *tabaci* have resulted in a large increase in the use of insecticides in the Çukurova Region. Insecticides often become ineffective against *B. tabaci* due to the development of resistance in its populations (Özgür and Şekeroğlu 1986). Currently, the most common management approach is with pesticides; however, more efficient and environmentally sound methods are needed. Other methods like yellow sticky traps could be an effective tool not only in monitoring the pest population, but also in pest control. However, these traps might affect on the natural enemies population.

Yellow sticky traps are widely used to monitor for the presence of whiteflies (Gerling and Horowitz 1984; Byrne *et al*. 1995; Riley and Ciomperlik 1997; Hoelmer and Simmons 2008) and have also been used to survey for the presence and relative abundance of parasitoids and predators of whiteflies (Dowell and Cherry 1981, Udayagiri *et al*. 1997) and other pests and their natural enemies (Neuenschwander 1982, Esker *et al*. 2004, Musser *et al*. 2004). Yellow sticky traps of different shapes, configurations, exposure time, durations and trap placements inside and outside crop fields have been studied to refine the adult sampling techniques (Melamed-Madjar *et al*. 1982; Naranjo *et al.* 1995; Natwick *et al.* 1995). Aphelinids in the genera *Encarsia* and *Eretmocerus* are the most prevalent parasitoids of *Bemisia* species (Gerling 1990; Polaszek *et al*. 1992; De Barro 1995). The native *Encarsia* and *Eretmocerus* parasitoids of *B. tabaci* are captured by yellow sticky cards placed in field crops (Hoelmer *et al*. 1998; Simmons 1998; Simmons and Jackson 2000). Parrella *et al*. (1991) found that that yellow traps caught large numbers of *Encarsia formosa* Gahan that had been released against *B. tabaci* in greenhouses.

Although a few studies have reported correlations between populations of whiteflies and their parasitoids with surveys using yellow sticky cards (Riley and Ciomperlik 1997; Qiu and Ren 2006), there is relatively little information that relates the number of trapped whitefly parasitoids on sticky cards to population trends in the adjacent or surrounding field crops. Therefore, we conducted several studies to examine the relationship of yellow sticky trap captures of parasitoids of *B. tabaci* to the population of parasitoids as measured by leaf samples of parasitized whiteflies.

MATERIALS AND METHODS

This study was carried out at Sakha Agricultural Research Station Farm, Kafr El-Sheikh district on three crop plants: Cotton, *Gossypium barbadense* L., Eggplant *Solanum melongena* L., and soybean, *Glycine max* (L.), during two successive growing seasons (2012 and 2013). The experiments were conducted to determine the relationship between number of insect adults, either whitefly or parasitoids adults, captured by yellow sticky traps (YST) and that recorded from field plant samples. For each growing season, an area of about one feddan was divided into four equal plots for each crop. The cotton (variety Giza 86) was sown at the third and fourth weeks of April in the first and second season, respectively. The soybean (variety Crawford) and eggplant (variety Black beauty) were planted at mid-May during the two seasons of study. All plots were received the common agricultural practices without any chemical treatments throughout the entire growing season.

To estimate the population of *B. tabaci* (leaf sample LS), weekly sample of 25 leaves of cotton and eggplant and 25 leaflets of soybean were chosen at random from each plot representing upper, middle and lower levels of the main stem. The collected samples were transferred in plastic bags to the laboratory for inspection of the different immature stages of whitefly using a binocular microscope. From each leaf, one $inch^2$ was determine on the abaxial surface, represented the different directions of the leaf, to count the numbers of whitefly and parasitoid stages. Afterwards, plant samples were kept in Petri dishes until emergence of parasitoids. The emerged parasitoids were identified at the laboratory of Biological Control Research Department, Plant Protection Institute, Doki, Egypt.

15 × 20 cm yellow sticky trap cards that were coated with non-soluble adhesive on both sides (tropical formula: The Tanglefoot Co., Grand Rapids, MI) were suspended vertically on T-shaped sticks. For each crop tested, three traps (one per each height) per each plot (i.e., 3 heights × 4 replicates) were hanged at different heights (40 cm above the ground, 60 cm above the ground, and 20 cm above the plant top). Traps set at different heights were placed in a row at the center of the plot.

Traps were replaced weekly until the end of growing season. The insects caught on the traps (i.e., whiteflies, parasitoids) were counted under a binocular microscope in the laboratory. The sticky substance was dissolved with paint thinner to remove the insects for identification when necessary. To study the effect of YST heights, host plants, and seasons, number of catches, either for whitefly adults or for parasitoid adults, were analyzed using three-way ANOVA for the three treatment factors. A completely randomized block design was used with 14 replicates (i.e., 14 samples) for 14 weeks investigations. In the event of a significant interaction, a separate two-way ANOVA was conducted independent variables. In the event of a significant effect for any independent variable, separate one-way ANOVA was applied. Treatment means were separated by the Bonferroni test ($\alpha = 0.05$) when data were normally distributed and variances homogeneous (Shapiro-Wilk test). All statistics were conducted using SigmaPlot (2004).

To study the relation between flight activity of whitefly adults and their progeny distributed on the plant, correlation relationship between the monthly means of number of adults captured by YST and number of immature stages recorded from leaf samples LS on each host plant was analyzed. The same procedure was applied for insect parasitoids. Pearson Product-moment correlation (*r*) was used to test this relationship.

RESULTS

Effect of yellow sticky trap heights on number of whitefly adults captured

MANOVA revealed that there were significant effect of trap heights and host plant on number of whitefly adults captured in YST, but this effect for season and other treatment * treatment interaction was absent (Table 1). To study the effect of YST heights (H1 = 40 cm above the ground, H2 = 60 cm above the ground, and H3 = 20 cm above the top of plant) on the mean number of whitefly adults captured on the three host plant (cotton, soybean and eggplant) during the two growing seasons; statistical analysis showed that there were no significant differences among the populations of whitefly captured per each height on the three host plants during both season (H1: $F = 0.515$, df = 2,9, $P > 0.05$; H2: $F = 0.524$, df = 2,9, $P > 0.05$; H3: $F = 0.52$, df = 2,9, $P > 0.05$, in 2012 season, Fig.13) and (H1: $F = 0.215$, df = 2,6, $P > 0.05$; H2: $F = 0.25$, df = 2,6, $P > 0.05$; H3: $F = 0.589$, df = 2,6, $P > 0.05$ in 2012 season).

Table 1: Three-way ANOVA of effects of yellow sticky trap heights, host plants, and season of study on the yearly means of number of whitefly adults captured at Kafr El-Sheikh district.

Treatment factors	df	*F*	*P*
Main effects			
Trap height	2	22.01	< 0.001
Host plant	2	6.55	< 0.01
Season	1	1.91	ns
Interaction			
Height * season	2	0.13	ns
Height * host plant	4	1.28	ns
Host plant * season	2	0.73	ns
Height * host * season	4	0.57	ns
Error	234		

To study the effect of YST heights on number of whitefly adults captured during the months of sampling, statistical analysis revealed that there were significant differences among the three heights of YST for each host plant investigated. On cotton plants, there were significant differences among the mean numbers of adults captured by the three heights during June, July and September in both seasons of study but in August was not during the two season (June: $F = 13.54$, df = 2,6, $P < 0.01$; July: $F = 54.49$,

df = 2,6, $P < 0.001$; August: $F = 0.578$, df = 2,6, $P > 0.05$; September: $F = 26.59$, df = 2,8 , $p < 0.001$ in the first season) and (July: $F = 39.74$, df = 2,8, $P < 0.001$; August: $F = 1.29$, df = 2,6, $P > 0.05$; September: $F = 25.63$, df = 2,6, $P < 0.001$ in the second season). The highest numbers of whitefly adults captured by YST were in September on the three host plants during both seasons of study.

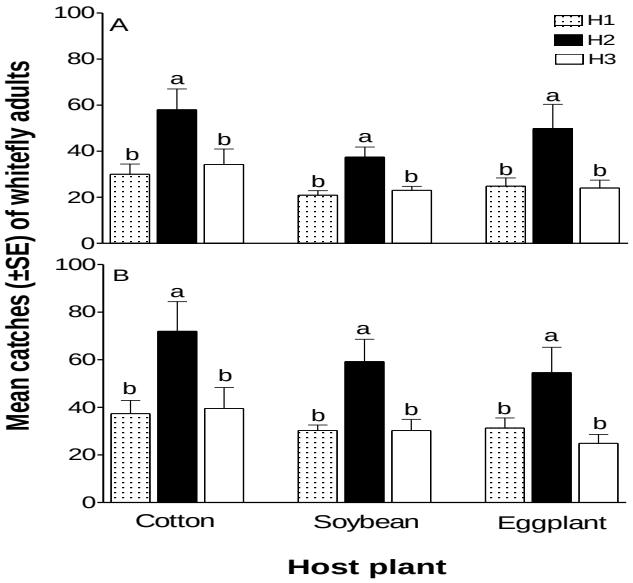

Figure 1: Yearly means (±SE) of whitefly adults captured by yellow sticky traps at different trap heights (H1: 40 cm above the ground, H2: 60 cm above the ground, H3: 20 cm above the plant top) during 2012 (A) and 2013 (B) seasons at Kafr El-Sheikh district. Means separated using Bonferroni test (α = 0.05).

To test the effect of YST heights on the mean numbers of whitefly adults captured throughout the whole season of each host plant examined, monthly mean counts were analyzed using one-way ANOVA. In respect to first season, statistical analysis showed that there were significant differences among the numbers trapped by the three heights of yellow sticky on eggplant, cotton, and soybean plants (F =4.78, df = 2,39, $P < 0.05$; $F = 4.66$, df = 2,39, $P < 0.05$; and F =10.06, df = 2,39, $P < 0.001$ respectively). The highest number per sample (58.01 ± 8.15) was recorded on cotton, while the lowest was 37.45 ± 3.93) on soybean plants (Fig. 1A). In respect to the second season, statistical analysis showed that there were significant differences among the three trap heights in numbers of adults captured in the three host plants (cotton: $F = 5.01$, df = 2,39, $P < 0.05$; soybean: $F = 3.17$, df = 2,39, $P< 0.05$; and Eggplant: $F = 7.26$, df = 2,39, $P < 0.01$). The highest number per sample (71.98 ± 10.38) was recorded on cotton, while the lowest was 54.56 ± 9.16) on eggplant crop (Fig. 1B).

Effect of yellow sticky trap heights on number of parasitoids captured

MANOVA revealed that there were significant effect of trap heights, host plants, and seasons on number of whitefly adult adults trapped in YST, but this effect for various treatment * treatment interactions was absent (Table 2). To study the effect of YST heights on the number of the two aphelinid parasitoid adults (*E. lutea* and *E. mundus*) captured on the three host plant, statistical analysis showed that there were no significant differences among the populations of parasitoids captured per height on the three host plants during the two seasons of the study (H1: $F = 0.312$, df = 2,9, $P > 0.05$; H2: $F = 0.322$, df = 2,9, $P > 0.05$; H3: $F = 0.412$, df = 2,9, $P > 0.05$ during the first season) and (H1: $F = 0.712$, df = 2,6, $P > 0.05$; H2: $F = 0.751$, df = 2,6 , $P > 0.05$; H3: $F = 0.791$, df = 2,6, $P > 0.05$ during the second season).

Table 2: Three-way ANOVA of effects of yellow sticky trap heights, host plants, and season of study on the yearly means of parasitoid (*E. lutea* and *E. mundus*) adults captured at Kafr El-Sheikh district.

Treatment factors	df	*F*	*P*
Main effects			
Trap height	2	33.37	< 0.001
Host plant	2	6.79	< 0.01
Season	1	12.42	< 0.001
Interaction			
Height * season	2	0.52	ns
Height * host plant	4	0.36	ns
Host plant * season	2	0.89	ns
Height * host * season	4	0.24	ns
Error	234		

To study the effect of YST height on number of parasitoid adult trapped during the months of sampling for each host plant during each season, statistical analysis revealed there were significant differences among the mean numbers captured by the three heights during June, August and September of both seasons on the three host plants, but there were not significant differences in July (cotton: June, $F = 15.61$, df = 2,6, $P < 0.01$, July: $F = 3.75$, df = 2,6, $P > 0.05$, August: $F = 16.531$, df = 2,6, $P < 0.001$, and September: $F = 32.19$, df = 2,8, $P < 0.01$; Soybean: June: $F = 18.72$, df = 2,6, $P < 0.001$, July: $F = 5.35$, df = 2,6, $P > 0.05$, August: $F = 25.432$, df = 2,6, $P < 0.01$, and September $F = 29.45$, df = 2,8, $P < 0.01$, Eggplant: June: $F = 34.75$, df = 2,6, $P < 0.01$, July: $F = 2.25$, df = 2,6, $P > 0.05$, August: $F = 45.314$, df = 2,6, $P < 0.001$, and September: $F = 65.15$, df = 2,8, $P < 0.01$). In respect to the second season, there were no significant differences among the three heights in number of adults captured by the three heights in cotton and eggplant crops at July and August, but at September was (cotton: July, $F = 6.84$, df = 2,6, $P > 0.05$; August: $F = 24.31$, df = 2,6, $P > 0.05$; September: $F = 38.81$, df = 2,6, $P < 0.001$; Eggplant $F = 10.12$, df = 2,6 , $P > 0.05$; August: $F = 11.51$, df = 2,6, $P > 0.05$; September: $F = 46.31$, df = 2,6, $P < 0.001$). In respect to soybean plants, inversely outputs of analysis compared

to the two other crops were obtained (July: F = 12.31, df = 2,6, P > 0.05; August: F = 42.11, df = 2,6, P < 0.01; September: F = 31.61, df = 2,6 , P < 0.001). The highest numbers of parasitoids trapped by YST were during either August or September on the three host plants during both seasons of the study.

The yearly mean numbers of whitefly aphelinid parasitoid adults captured by the three heights of yellow sticky traps significant differed on the three host plants during the first season (cotton: F = 4.41, df = 2,39, P < 0.05; soybean, F = 9.77, df = 2,39, P < 0.05; eggplant: F = 6.10, df = 2,39, P < 0.01). The highest mean number (55.73 ± 8.94) was recorded on cotton plants, while the lowest (31.93 ± 3.86) on soybean (Fig. 2A). In respect to the second season, statistical analysis showed that the same significant differences (cotton: F = 4.29, df = 2,39, P < 0.05 ; soybean: F = 7.4, df = 2,39, P < 0.01; and Eggplant: F = 5.01, df = 2,39, P < 0.05). The highest mean number (69.88 ± 10.38) was recorded on cotton plants, while the lowest (52.55 ± 8.91) on eggplant (Fig. 2B).

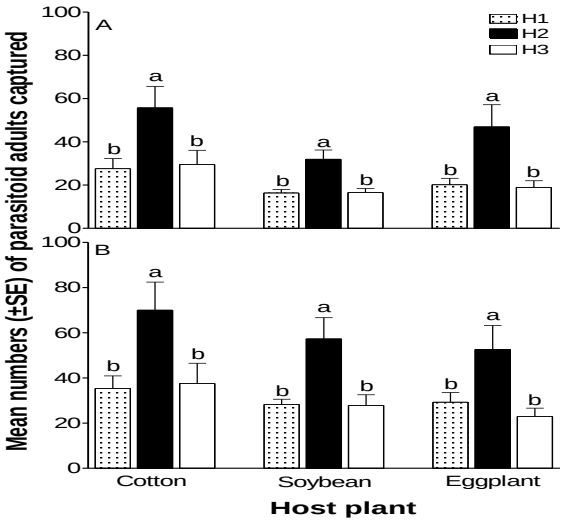

Figure2:Yearly means (±SE) of parasitoid adults (*E. lutea* and *E. mundus*) captured by yellow sticky traps at different trap heights (H1: 40 cm above the ground, H2: 60 cm above the ground, H3: 20 cm above the plant top) during 2012 (A) and 2013 (B) seasons at Kafr El-Sheikh district. Means separated using Bonferroni test (α = 0.05).

Relationship between yellow sticky trap catches (YST) and leaf sample populations (LS) :

The relation between flight activity of whitefly adults and their progeny distributed on the plant as well as for their parasitoids was determined. To test the relationship between number of whitefly captured by yellow sticky traps and number of immature stages recorded from field samples as well as between number of parasitoid adults trapped by YST and that of immature stages recorded from leaf samples**(**LS**)** , correlation relationship was applied for each season on each host plant (Figs. 3-6).

Statistical analysis revealed that the number of whitefly captured by YST significantly correlated with the number of immature stages of whitefly recorded on in the plant samples of cotton and eggplant during the first and second seasons, but was not for eggplant (Figs. 3 and 4). In respect to insect parasitoids of cotton whitefly, statistical analysis showed that there was significant relationship between numbers of parasitoid adult catches by YST and numbers of immature stages of parasitoids recorded in field samples in cotton and eggplant fields during the first and second season of the study, but not in soybean field during both seasons of the study (Figs. 5 and 6).

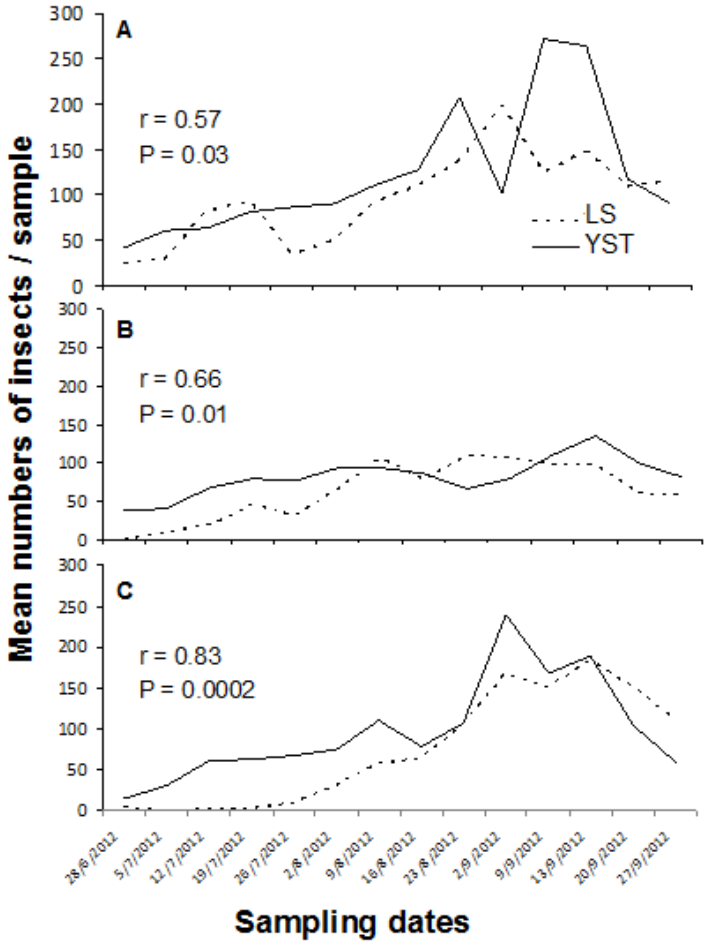

Figure3: Relationship between weakly mean numbers of whitefly caught by yellow sticky traps (YST) and those of immature stages recorded on leaf samples (LS) on cotton (A), soybean (B), and eggplant (C) crops during season 2012 at Kafr El-Sheikh district.

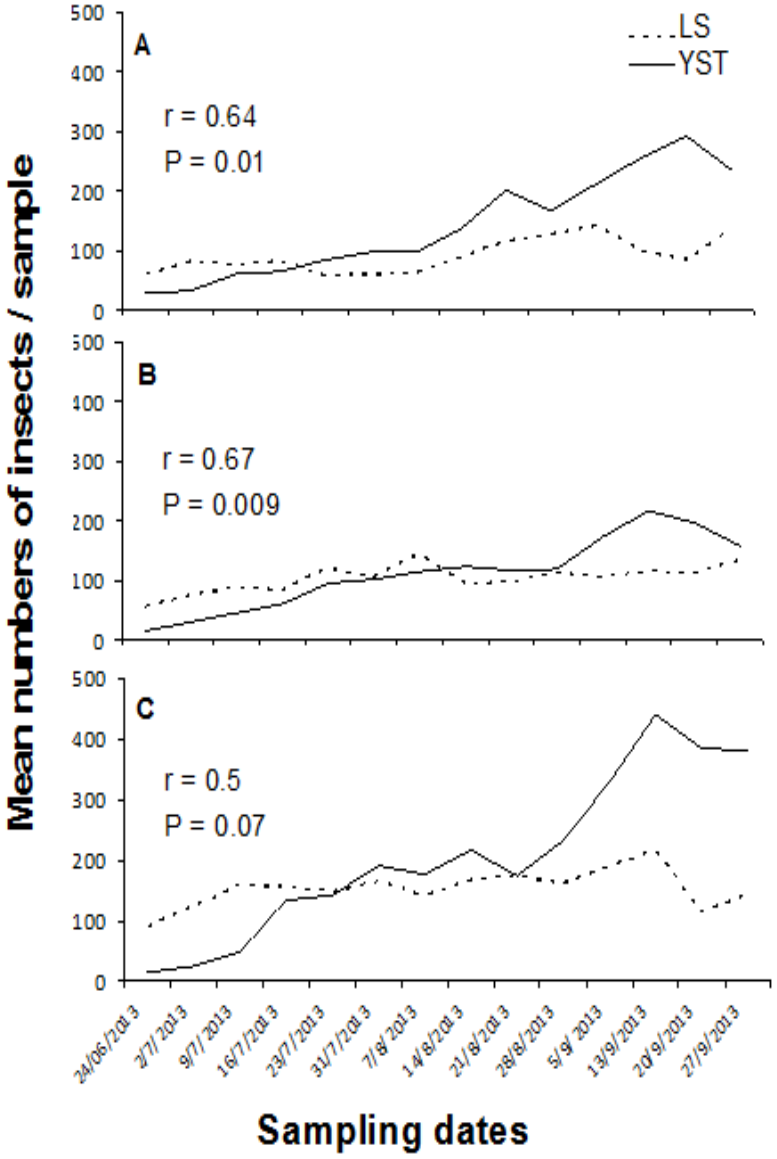

Figure 4:Relationship between weakly mean numbers of whitefly caught by yellow sticky traps (YST) and those of immature stages recorded on leaf samples (LS) on cotton (A), soybean (B), and eggplant (C) crops during season 2013 at Kafr El-Sheikh district.

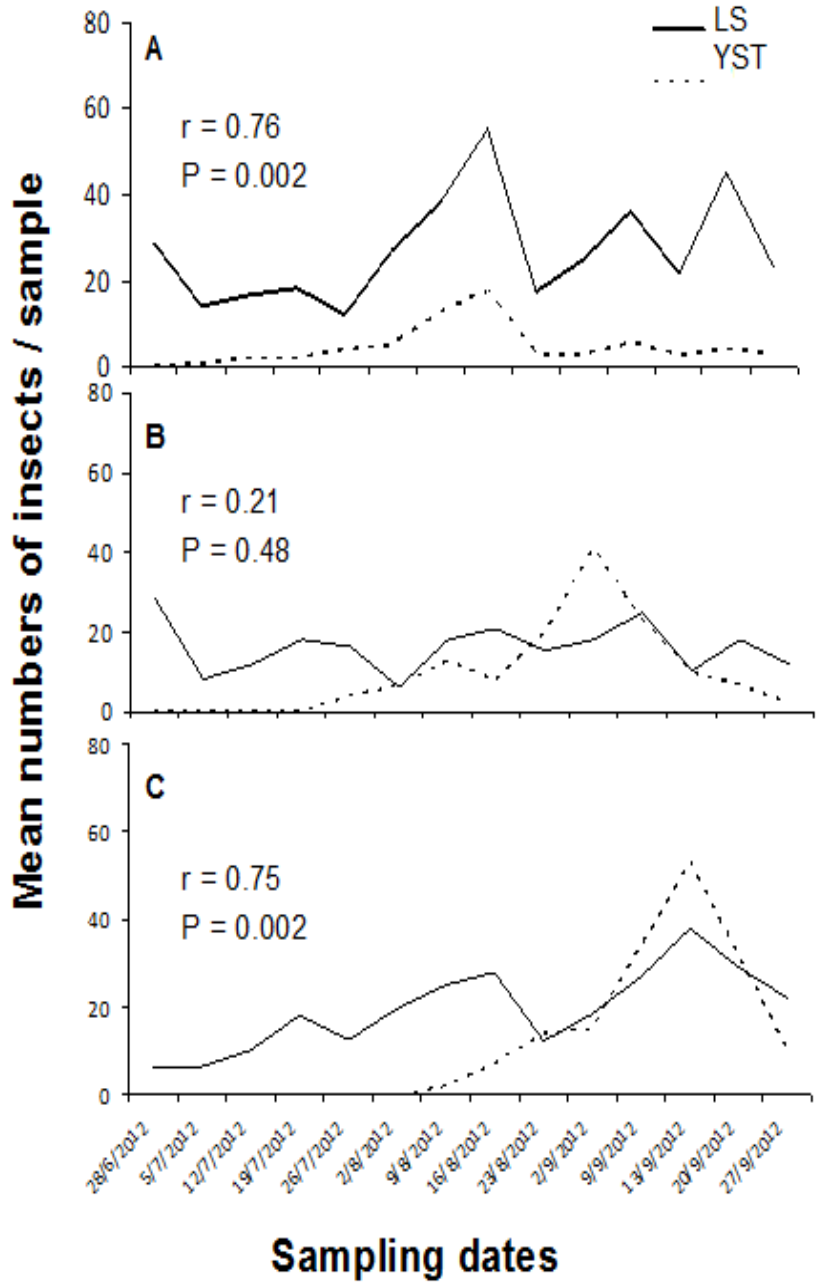

Figure5:Relationship between weakly mean numbers of whitefly parasitoids (*E. lutea* and *E. mundus*) captured by yellow sticky traps (YST) and those of immature stages recorded on leaf samples (LS) on cotton (A), soybean (B), and eggplant (C) crops during season 2012 at Kafr El-Sheikh district.

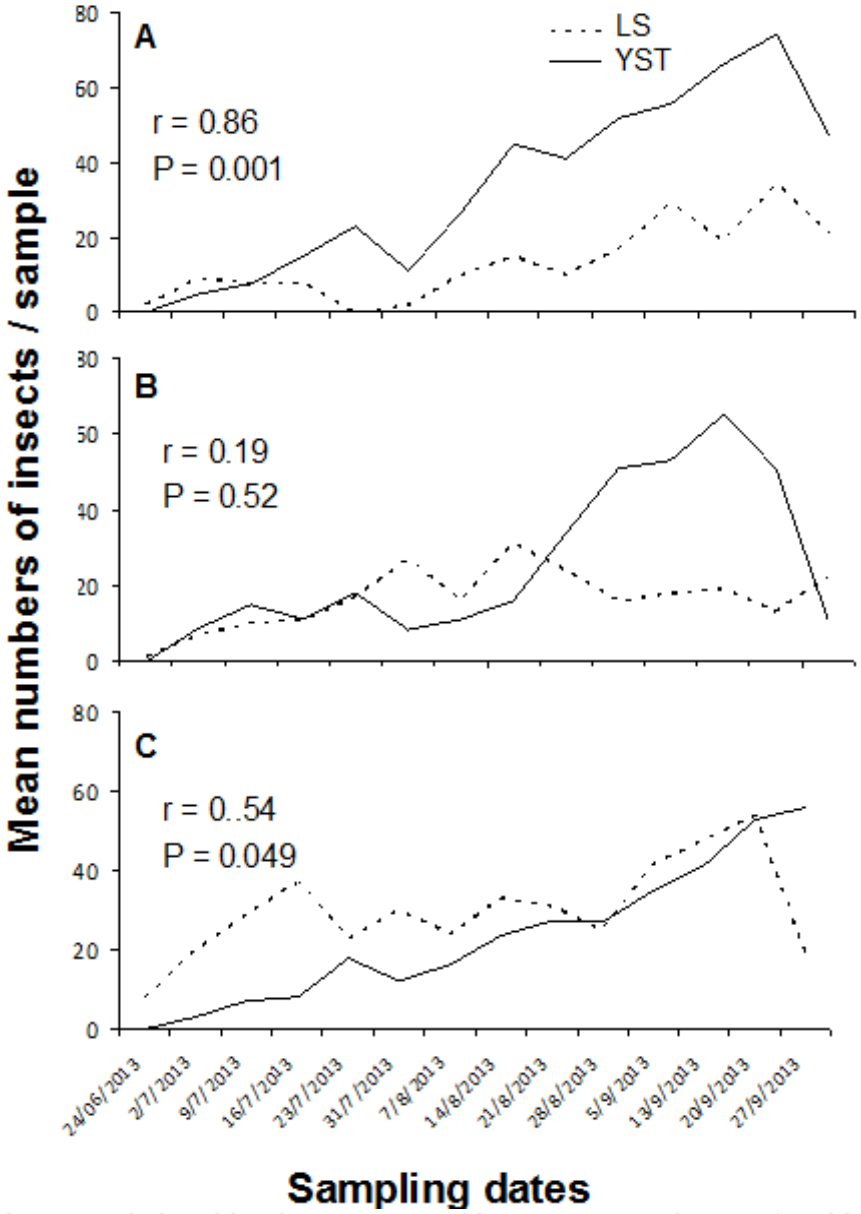

Figure6:Relationship between weakly mean numbers of whitefly parasitoids (*E. lutea* and *E. mundus*) captured by yellow sticky traps (YST) and those of immature stages recorded on leaf samples (LS) on cotton (A), soybean (B), and eggplant (C) crops during season 2013 at Kafr El-Sheikh district.

DISCUSSION

Although each of host plant and yellow sticky trap height had strong effects on numbers of whitefly adults attracted to the field, the host plant * trap height interaction effect was absent. This means that whitefly adult depend on plant odors firstly to discriminate its hosts, then it flying towards the middle of plant depend on visual stimuli to distribute their eggs. The height of yellow sticky traps was reported to affect incidence of capture of parasitoids of *B. tabaci* in tomato (Qiu and Ren 2006). In that report, traps which were maintained at 30 cm above the canopy captured fewer *Eretmocerus* and *Encarsia* spp. than traps maintained at the same level as the top of the tomato plants. In the current study, higher numbers of whitefly caught in YST fixed 60 cm above the ground (≈ top of the plant) than those fixed at either 40 cm above the ground or 20 cm above the plant top in the three host plants examined. The same results were observed by Atakan and Canhilal (2004) in Turkey. Gencsoylu (2007) in Turkey, found that the larger number of *B. tabaci* captured by YST was at 30 cm above the ground than 25 cm above the top of the cotton plant. These significant numbers were corresponded with significant numbers of parasitoid caught on the same height. This could be because the high number of parasitoids emerged from the leaves near to the top was closed to sticky traps. Vertical distribution of eggs by whitefly females on leaves in the middle of plant and on lower surfaces (i.e., abaxial surface, Naranjo and Flint, 1994; Sequeira and Nanajo 2008) gives clear evidence that females are negatively response to temperature and extensive light.

Numbers of whitefly parasitoids captured strongly affected by each of trap height, host plant, and year. Parasitoids are very sensitive to change in weather factors from year to year. The capture of adult whiteflies and parasitoids is strongly influenced by environmental conditions and other factors affecting population dynamics such as mortality, emergence, and overall abundance (Gerling and Horowitz 1984, Ohnesorge and Rapp 1986, Simmons 1998, Simmons and Elsey 1995, Simmons and Jackson 2000, Simmons *et al.* 2002). The abundance of *B. tabaci* and associated parasitoids, based on sticky card catches, differed between the two cowpea fields (Simmons and Jackson 2000) at the South Carolina location. It is not uncommon for different numbers of whiteflies and parasitoids to be captured during different times of the growing season and at different locations in South Carolina (Simmons 1998). Moreover, previous research reported that relatively low numbers of *Bemisia* were captured during the mild but cooler months in coastal South Carolina (Simmons and Elsey 1995).

The trend in numbers of adult parasitoids caught by yellow sticky traps was similar to the trend in parasitized whiteflies based on leaf samples in cotton and eggplant plants, but less similar in the soybean field during both seasons of the study. A relatively non- glabrous soybean leaf may be a suitable texture for parasitoid searching, resulting in high number of parasitoids visited and captured by YST followed by low number of parasitized hosts in this crop. Qiu *et al*. (2005) demonstrated that

Eretmocerus sp. nr. *furuhashii* Rose and Zolnerowich was more effective on non-glabrous crop varieties, like soybean in this study, than glabrous plants for biological control of *B. tabaci*.

There were correlation between numbers of whitefly adults captured by YST and numbers of its progeny on leaf samples of the three host plants. As well, the same is reported for the parasitoids, but only on cotton and soybean plants. However, number of whitefly and parasitoids captured in YST were higher than those of immature stages recorded from leaf samples. Yellow sticky traps are known to be highly attractive to whiteflies, when field populations of whiteflies are low, the traps may have a disproportionate impact on numbers of whiteflies trapped compared with parasitoids. In our study, also yellow YST captured high number of parasitoids paralleled to the top of plant (i.e., 60 cm), but not above the top and bottom of the plant for the three host plants. We could not say that the yellow color has an effect in attractive the parasitoids, but may be the high kairomonal stimuli released from the higher number of whitefly in the middle of the plant has high impact on parasitoid searching. Parasitoid searching activity may be related to capture. Webb and Smith (1980) and van de Veire and Vacante (1984) reported increased trap catches of the parasitoid *E. formosa* in greenhouses as unparasitized nymphs of its host, *Trialeurodes vaporariorum* (Westwood), decreased in number. They suggested that increasing the searching was responsible.

In this study, YST captured higher numbers of whitefly than parasitoid adults in the field. In a related laboratory trap study, but using yellow sticky card sections in Petri dishes, Simmons (1998) reported that *B. tabaci* adults were captured 1.3 times more frequently than *Encarsia pergandiella.* The same trend also reported by Hoelmer and simmons (2008) in a field study. Those data and data herein suggest that there is a slightly greater propensity for the whitefly to be attracted to the yellow sticky cards than either of its parasitoid species. Correlating the numbers on traps to the parasitoid populations provided by immature stage populations on leaf samples was achieved. Such a correlation should be possible, but further studies relating numbers of traps, trap surface area, and placement to other measures of population size are required. However, our results suggest that sticky traps placed within crops may nevertheless be helpful in (i) monitoring the whitefly parasitoid populations and activity, and therefore determine the best time for pest control treatment (ii) detecting the presence of these parasitoids at particular site and specific locations, (iii) determining the control decisions based on detecting the rate of infestation by whitefly. The number of whitefly parasitoid adults caught by traps in this study was higher than those recorded by leaf samples of the three plants. This might led to low parasitism rates and consider as disadvantage of YST, however, YST could be an advantage method for whitefly control (i.e., trade off). Finally, it could be concluded that although the high population of whitefly and its parasitoids captured by YST was in September on the three host plant examined, regular treatments of insecticides should be stopped at that time to give the opportunities for biocontrol agents to regulate the population of their hosts.

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المصائد الصفراء اللاصقة كمؤشر لتعداد ذبابة القطن البيضاء وطفيلياتها

سمير صالح عوض الله[1]، محمد حسن بيومي[1]، محمدعبدالحافظ خطاب[2]و أحمد حسن علي عبدالوهاب[2]

1. **قسم الحشرات الأقتصادية بكلية الزراعة جامعة المنصورة**
2. **قسم الحشرات الثاقبة الماصة بمعهد بحوث وقاية النباتات مركز البحوث الزراعية.**

أجريت هذه الدراسة لتقييم العلاقة بين أعداد الحشرات الكاملة للذبابة البيضاء التي تم اصطيادها وطفيلياتها بواسطة المصائد الصفراء اللاصقة وكذلك الأعداد المسجلة لكليهما من خلال عينات الأوراق الحقلية. المصائد تم وضعها في حقول القطن وفول الصويا والباذنجان علي ثلاث إرتفاعات (40 و 60 سم فوق الأرض و 20 سم فوق سطح النبات) في منطقة كفر الشيخ خلال موسمين متتاليين2012 و2013. خلال الموسم كان معدل الزيادة في أعداد الطفيليات بالمصائد يوازي الزيادة في أعداد الذبابة البيضاء بالمصائد وعلاوة علي ذلك كان أعداد الحشرات الكاملة للذبابة البيضاء والطفيليات بواسطة المصائد الصفراء اللاصقة مرتبط بصورة معنوية بتلك الأعداد المسجلة من العينات الورقية علي الثلاث عوائل النباتية خلال موسمين الدراسة مع استثناء الطفيليات علي محصول فول الصويا وقد يرجع ذلك لطبيعة الأوراق غير الملساء نسبيا والتي تكون مفضلة لبحث الطفيليات ونتج هذا من أن أعداد كبيرة من الطفيليات زارت المحصول ومسكت بواسطة المصائد الصفراء اللاصقة في هذا المحصول وعليه تم تسجيل أعداد قليلة من ذريتة علي العينات الورقية. أعلي أعداد من الذبابة البيضاء أو الطفيليات تم تسجيلها علي المصائد اللاصقة علي ارتفاع 60 سم فوق سطح الأرض (ما يقرب من منتصف النبات) علي الثلاث عوائل النباتية خلال كلا الموسمين. توزيع البيض بواسطة إناث الذبابة البيضاء علي الأوراق في منتصف النبات وعلي السطح السفلي للأوراق يعطي دليل واضح ان إناث الذبابة البيضاء تكون سالبة الاستجابة للحرارة والضوء الشديد.

عدد الطفيليات التي تم إصطيادها بواسطة المصيدة كان أعلي من الأعداد المسجلة في العينات الورقية للثلاث عوائل النباتية وهذا ربما يؤدي إلي معدلات تطفل منخفضة ويعتبر عيب من عيوب المصائد الصفراء اللاصقة وعلي العكس من ذلك قد يكون ميزة في اصطياد أو مكافحة الذبابة البيضاء. ومع ذلك فإن المصائد الصفراء الموضوعة داخل المحاصيل ربما تكون مفيدة لملاحظة التغيرات العددية في مجموع طفيليات الذبابة البيضاء في محصول معين وكذلك للتنبؤ بأعداد تلك الطفيليات في نفس المنطقة. لوحظ وجود اختلافات معنوية بين شهور الدراسة في أعداد الذبابة البيضاء والطفيليات الممسوكة بواسطة المصائد الصفراء اللاصقة مع أعلي أعداد قنصت خلال شهر سبتمبر في كلا الموسمين ولهذا ينصح بالتوقف أو الترشيد في استخدام المبيدات الحشرية في ذلك الوقت لإعطاء الفرصة كاملة لعوامل المكافحة الحيوية لتنظيم تعداد عوائلها.

قام بتحكيم البحث

أ.د / عبد البديع عبد الحميد غانم	**كلية الزراعة – جامعة المنصورة**
أ.د /احمد محمود على سالمان	**كلية الزراعة – جامعة سوهاج**