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THE IMPACT OF (AREA) SIZE, HEIGHTS AND POSITIONS OF YELLOW STICKY TRAPS ON THE ATTRACTION OF THE WHITEFLY, *Bemisia tabaci* (GENNADIUS)

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ABSTRACT

The experiment was conducted in the fall growing season of 2013 at farmer field in Badrashin province, Giza Governorate. The present study is to investigate and determines the suitable area (size), heights and direction positions of the yellow sticky traps to utilize those factors as new tools while implement the Integrated Pest Management strategy. Statistical analysis was showed presence highly significant differences between the tested trap sizes .The Data indicated that , the tested trap sizes can be arranged descending as follow: 200 >160 >80 >40> 20 Cm² in both tomato and cabbage fields. Moreover, the traps with 10 x 20 cm was captured the highest number of the *Bemisia tabaci*, adult, 38.33 and 566.27 (adults/trap) in tomato and cabbage crop, respectively. Data indicated that, there was an irreversible relationship between the number of the adults caught by the trap and its height. Where, the trap with 20 cm height above the ground surface recorded the highest captured whitefly adult per trap (63.33, 18.33 and 23.76 adult/trap in tomato, cabbage and uncultivated part (control), respectively). The results cleared that, the free hanging position type caught the highest number (164.87 adult/trap), but the reversible type caught the lowest number (19.07 adult/trap).The tested trap position arranged descending according its captures values as follow: free hanging> horizontal position> 45° angel towards north> vertical towards north > reversible trap, where its capture values were 164.87, 125.56, 109.30, 60.80 and 19.06 adult/trap. The trap with size 10X20 Cm², 20 Cm above the ground surface and free hanging recorded the highest capture of *B. tabaci*. The previous specification can be used to provide a clear picture about the population density of the whitefly in different crops at different period and use as implement tolls in the integrated pest management program.

Keywords : *Bemisia tabaci*, yellow sticky trap, size, height and position, free hanging , horizontal, (45°) angle, vertical type, reversible trap.

INTRODUCTION

The whitefly, *Bemisia tabaci* is one of the most destructive insect pests causing serious crop protection problems in many parts of the world, Africa, Europe, USA and West Asia. *B. tabaci* is a pest of an extremely wide range of host plants, and the recorded hosts are increasing. It attacks crops grown outside in the tropics and sub-tropics including cotton, soybean, cassava, and many other vegetable crops. Also, it causes damage to crops grown in the open field and greenhouse such as cucumber, peppers, tomatoes and ornamental plants. In addition to the whitefly, *B. tabaci* .it also known as the sweet potato and it has been recorded in the United States since the late 1800s. However, in 1980s in Egypt *B. tabaci* became an extreme economic pest. It transmitted the TYLC viruses to tomato plants while it's feeding causes indirect effect as physiological disorder to different crops, such as tomato irregular ripening and squash silver leaf disorder

The monitoring population is essential to detect insect problems in crops and to estimate whether control measures have been successful (Milligan *et al*., 1988).Efforts to develop integrated pest management (IPM), systems aimed at environmentally friendly strategies to reduce insecticide use will help re-implement the ecological equilibrium of predators, parasitoids, and microbial controls that were once in place.

As per recommendation from the United State Department of Agriculture (USDA) an integrated program that focuses on prevention and relies on cultural and biological control methods when possible. So, it has become very essential to control the whitefly within proper strategy like IPM program. In additional to the chemical insecticides used to control the whitefly, the yellow sticky traps have been shown a significant role in monitoring and decline the pest population density in the field of infestation, (Al-Ajaln, 2005). So, there was a prerequisite to implement the uses of the yellow sticky traps as a tool in regards to monitor and measuring the status whiteflies, and many other insects *viz*, aphids, leaf miners, thrips, leafhoppers and certain other insect pests (Liburd *et al*., 1998; Kim *et al*., 1999; Kumawat et *al*., 2000; Doukas, 2002; Fiedler and Sosnowska, 2002). However, the trap location and trap height have effect on capture numbers of insects (Bruck and Lewis, 1998; Toscano *et al*., 2002).Therefore, the present study is to investigate and determines the suitable areas (size), heights and direction positions of the yellow sticky traps to utilize those factors as new tools while implement the Integrated Pest Management strategy.

MATERIALS AND METHODS

The experiment was conducted in the fall growing season of 2013 at farmer field in Badrashin province, Giza District. The experiment area was about three Feddans divided to three equaled parts. The 1st part transplanted by tomato (variety Castel Rock), the second part was uncultivated part (isolated area), while the 3rd part was transplanted by cabbage. The two studied crops were transplanted in the first day of August 2013.

The traps used in this study were constructed from yellow cardboard and coated by insect adhesive (stickers).

All the traps except those used in the trap height experiment were held by small wooden sticks, 50 cm. above the ground surface at distance of one meter away from each other in the field. The experiment was completely randomized designed. The study was carried out to investigate the effects of trap size, height and position on the whitefly population. The yellow sticky trap replaced five times during the tested period (15 days) for each one experiment and transferred to the laboratory and the number of the whitefly adults captured was counted and recorded for each trap.

1-Trap size:

It was investigated to study how trap's size effects on the number of the whitefly adult caught. The experiment was conducted in 16 to 31 August of 2013.The length of each trap was similar to each other (10 cm) but their width ranged from 2-20 cm. Five different sizes of traps were used. Each size was changed five times in the field. The tested trapped size was 2 x 10, 4 x

10, 8 x 10, and 16 x 10 and 20 x 10 Cm .. The effect of crop type on the attraction level of the whitefly was also studied by placing the above mentioned traps in tomato and cabbage crops.

2-Trap height:

The obtained results from the first experiment indicated that the size 10 x 20 Cm was more attractive and was used as standard size with the tested trap heights. To study the effect of trap height on capture whitefly adult, this experiment was conduct in 1 to 15 September 2013. The tested height was 20, 50,100, 200, 300, and 400Cm. above the ground surface at distance of one meter between each other. This experiment was conduct in tomato, cabbage and uncultivated field.

3-Trap position

This experiment was conducted on 16 to 30 September 2013 from the two previous experiments the more suitable size and height were 10 x 20 cm and 20 cm above the ground respectively were used. The experiment was conducted in tomato field only. Five different positions were used *viz*, free hanging, horizontal position, 45° angel towards north, vertical towards north and the reversible trap.

4-Data analysis

Statistical analyses (ANOVA) obtained data were performed by using COSTAT program. Also the different between conducted by using Duncan multiple range tests ($p<0.05$) in this program.

RESULTS AND DISCUSSION

The obtained results from this study investigated the effects of trap size, trap height and trap position on the whitefly adult population as the followings:

1-Trap size:

Statistically analysis in table 1 showed presence highly significant differences between the tested trap sizes. Data in table 1 showed, the tested trap size can be arranged descending as follow: 200 >160 >80 >40> 20 Cm^2 in both tomato and cabbage fields.

The traps with 10 x 20 cm was captured the highest number of the insect, 38.33 and 566.27 (adults/trap) in tomato and cabbage crop, respectively. This finding is in accordance with the Aziz and Al- Ajaln (2005). Meanwhile, the lowest number of the captured insects were 2.33 and 17.67 (adults/trap) in tomato and cabbage crop, respectively in the trap size of 10 x 2 cm. the obtained results revealed, there were directly positive relation between trap size and captured adult whitefly. Figure (1) illustrated that, the % capture of five tested trap size placed in both tomato and cabbage fields recorded 57.51, 20.42, 16.39, 3.77, and 1.90 % for the trap sizes, 10x20, 10x16, 10x8, 10x4 and 10x2, respectively.

Table (1): The effect of the trap' s size on the captured of the whitefly *Bemisia tabaci* adult, on the tomato and cabbage fields.

Size of trap	Mean numbers / trap in tomato field				Mean numbers / trap in cabbage field			
	R1	R2	R3	Average	R1	R2	R3	Average
20 cm²	2.4	2.4	2.2	2.33 E	17.8	17.6	17.6	17.67 E
40 cm²	7.8	7.6	7.6	7.67 D	32	32	32	32.00 D
80 cm²	16.4	16.4	16.2	16.33 C	156	156	156	156.00 C
160 cm²	19.4	19.4	19.2	19.33 B	195.4	195.4	195.2	195.33 B
200 cm²	38.4	38.4	38.2	38.33 A	566.4	566.2	566.2	566.27 A
F.test				**				**

R = Replicate

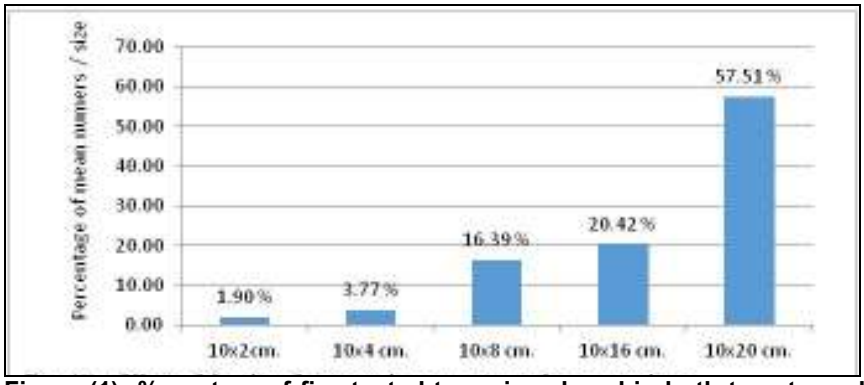

Figure (1): % capture of five tested trap size placed in both tomato and cabbage fields.

2- Trap height:

The data in table 2 was indicated that, there was an irreversible relationship between the number of the adults caught by the trap and its height. Statistical analysis was showed that, there were highly significant among the tested trap heights, where the trap with 20 cm height above the ground surface recorded the highest captured whitefly adult per trap (63.33, 183.33 and 23.76 adult/trap in tomato, cabbage and uncultivated part (control), respectively). However, the trap with 400 cm height above the ground surface recorded lowest caught whitefly adult per trap (1.0, 0.67 and 0.67 adult/trap in tomato, cabbage and uncultivated part (control), respectively). Figure (2) illustrated the % capture of six tested trap height placed in tomato, cabbage and uncultivated fields were recorded 72.15, 16.01, 6.94, 2.67, 1.60 and 0.62 % for the trap heights, 20, 50, 100, 200, 300 and 400 cm, respectively. Meanwhile, Gencsoylu (2007) found that horizontal and vertical positions at two heights (25 and 30 cm), the 30 cm height was largest captured population of the whitefly.

Table (2): The effect of the trap ' s height above the ground surface on the attraction of the adults of the whitefly, *Bemisia tabaci*

	Mean numbers / trap ' height		
Height of trap	**Tomato part**	**Cabbage part**	**Uncultivated part**
20 cm.	63.33 A	183.33 A	23.67 A
50 cm.	20.33 B	30.00 B	9.67 B
100 cm.	9.33 C	8.33 C	8.33 C
200 cm.	2.33 D	5.33 D	2.33 D
300 cm.	1.33 E	1.67 E	3.00 E
400 cm.	1.00 F	0.67 F	0.67 F
F. test	**	**	**

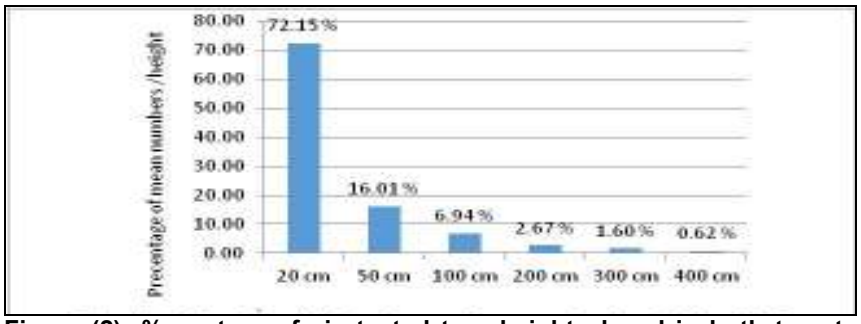

Figure (2): % capture of six tested trap height placed in both tomato, cabbage and uncultivated fields.

3- Trap position:

Figure (3) illustrated that the free hanging position type caught the highest number (164.87 adult/trap), but the reversible type caught the lowest number (19.07 adult/trap).The tested trap position arranged descending according its captures values as follow: free hanging> horizontal position> 45° angel towards north> vertical towards north > reversible trap, where its capture values were 164.87, 125.56, 109.30, 60.80 and 19.06 adult/trap. Meanwhile, Gencsoylu (2007) found that there were no significant between horizontal and vertical positions on the captured population of whitefly in cotton crop. However, Idriss et al. (2013) and Idriss et al., (2012) they revealed that, there were a relationships between the trap direction and captured whitefly adult. Thus, all the data obtained would assure the importance of the position of yellow sticky trap on the attraction level of the whiteflies. This result also is in accordance with lipurd *et al*., (1998).

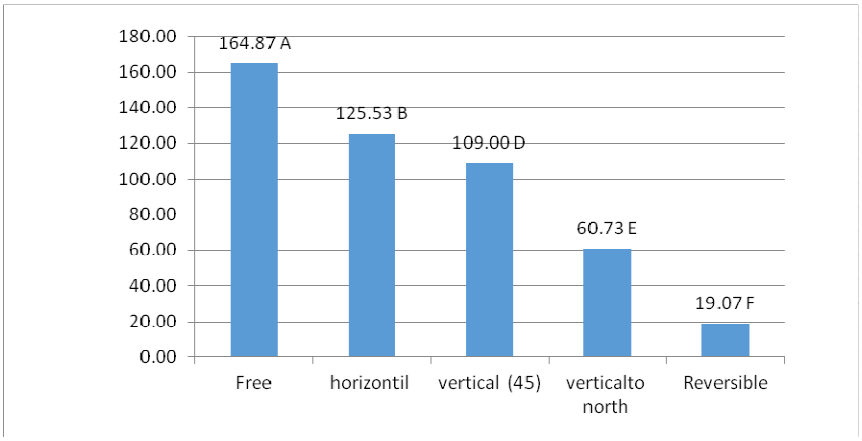

Figure (3): The effects of different trap position on the captured whitefly adult in tomato field.

CONCLUSION

Data in the present investigation indicated that, the (area) size, height and position of yellow sticky trap had significant effect in capture of *Bemisia tabaci* adult. The trap with size 10x20 Cm, 20 Cm above the ground surface and free hanging recorded the highest capture of *Bemisia tabaci*. The previous specification can be used to provide a clear picture about the population density of the whitefly in different crops at different period and use as implement tolls in the integrated pest management program.

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تاثير مساحة ،ارتفاع ووضع المصايد الصفراء اللاصقة على جذب الحشرات الكاملة للذبابة البيضاء

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أجريت هذه الدراسة بمنطقة البدرشين بمحافظة الجيزة للموسم الخريفي لعام ٢٠١٣ لتحديد أنسب حجم وارتفاع واتجاه وضع المصيدة الصفراء اللاصقة لحصر الحشرات الكاملة للذبابة البيضاء على محصولى الطماطم والكرنب البلدي. وقد اظهرت نتائج التحليل الإحصائي وجود فروق معنوية بين المساحات االمختلفة للمصائد وقد اشارت النتائج الى انا يمكن ترتيب مساحات المصائد تصاعديا على النحو التالي ٢٠٠ >١٦٠>٨٠>٤٠>٢٠ في كل من الطماطم واكرنب ، وجد أن حجم المصيدة ١٠×٢٠ سم كان الاعلى جذباً للتعداد حيث سجل ٣٨.٣٣ و ٥٦٦.٢٧ حشرةكاملة/مصيدة فى الطماطم والكرنب على التوالى.

وقد اثبتت النتائج وجود علاقة عكسية بين تعداد الحشرات المنجذبة وارتفاع المصيدة حيث ان الارتفاع الاقرب الى سطح الارض (٢٠ سم) كان الافضل فى جذب حشرة الذبابة البيضاء.

وبالنسبة لاتجاه وضع المصيدة وجد ان الوضع "الحر" هو الاعلى فى جذب الذبابة يليه الوضع الافقى ثم الوضع ٤٥ درجة اتجاه الشمال ثم الوضع الرأسي اتجاه الشمال واقلهم الوضع المعكوس. حيث كانت قيم المصائد كالآتي(١٦٤,٨٧، ١٢٥,٥٦ ، ١٠٩,٣٠ ، ٦٠,٨٠ ، ١٩,٠٦) حشرة كاملة/للمصيدة.

ومن هنا يمكن استنتاج ان حجم وارتفاع واتجاه موضع المصيدة عوامل ضرورية فى حصر تعداد الذبابة البيضاء ولذلك فان هذه الدراسة تعطي بيانات ومعلومات جيدة لانسب حجم وارتفاع واتجاه موضع المصيدة عند تطبيق برامج المكافحة المتكاملة للذبابة البيضاء.

ومن النتائج السابقة يمكن تقديم صورة واضحة عن الكثافة العددية للذبابة البيضاءعلى المحاصيل المختلفة وفي مختلف العروات كما يمكن ادراج مواصفات المصيده ضمن برامج المكافحة المتكاملة.