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Efficacy of Tow Sampling Methods for Monitoring, Control and Estimating Seasonal Abundance of Onion Thrips, *Thrips Tabaci* Lindeman (Thripidae: Thysanoptera) on Onion in Iraq

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Abstract Onion thrips, *Thrips tabaci* Lindeman, are economic pest of Alliums worldwide and considered as important pest infesting onion and other field crops in Iraq . There are no detailed studies about their biology and control. Field studies were conducted at the College of Agriculture, Baghdad to evaluate the effectiveness of two sampling methods for estimating population density from seedlings to crop maturity by the means of plant counts and sticky colored traps. Results indicated that adults number remained low (less than 5 thrips per plant) until the beginning of February when a first peak of 13 adult / plant occurred, Then the number begins to increase to a first peak of 32 thrips per plant and finally a second peak of 72 thrips per plant in March, Then onion thrips begins to decline to below 5 thrips per plant at harvest by the first week of May. Results showed a good correlation between thrips numbers estimated by plant counts and sticky traps, White or blue sticky traps are significantly attractive for onion thrips than yellow traps and strongly suggested for monitoring and reducing population densities in onion fields. Numbers of onion thrips observed during March and April can cause severe damage to onion plants during this period, So, a control meaures should be applied, otherwise it's lead to an economic loss in yield and quality of bulbs.

Keywords: Onion thrips, *Thrips tabaci* , sticky color traps , sampling , monitoring , onion , Iraq.

Introduction

Onion are subject to attacks by arthropod pest especially onion maggot, *Delia antiqua* and onion thrips, *Thrips tabaci* Lindemman which are considered to be the key pest worldwide, (Lorbeer *et al*., 2001). Fournier *et al*. (1995) in Canada reported that infestations of yellow onions resulted in 34.5% and 43%

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yield loss with seasonal averages of 149 and 172 thrips per plant respectively. Onion thrips have a wide range of host plants and population move from one crop to another when conditions change (Shelton *et al.,* 1987) Thus, the temporal and spatial arrival of onion thrips population into onion fields is variable (Gangaloff, 1999) . Larvae and adult feed on onion leaves which cause a patches or liners of silver color spots which finally lead to distorted and influence the process of photosynthesis, and cause a reduction in yield and quality of bulbs, as well as the infested plants ripen faster, Numbers of thrips on a crop may affected by weather conditions, Numbers can increase rapidly in dry weather and decrease rapidly after rain. A high population of thrips could cause a severe damage especially at seedling stage. Ibrahim and Adesiyun (2010a) in Nigeria reported that onion thrips began to colonize onion seedlings after germination, and then numbers rise during March and increased to its peak in May (Sedaration *et al*., 2010). According to Al-Faisali (1981) Populations of onion thrips in onion and cotton fields in Iraq may fluctuated depending on environmental conditions , such as plant age , time and amount of rain and temperatures, The highest density in cotton field at the end of April and the beginning of May.

Direct Plant counts were used by many researcher's to estimate onion thrips on onions (Liu, 2004; Liu and Chu, 2004; and Macintre – Allen , 2005). Various color traps are commonly used for monitoring thrips species on many cultivated crops (Lu, 1990; Carrizo, 2001 ; Liu and chu, 2004 ; Atakan andCanhilal, 2004; Chen *et al*., 2004). In another study , pale blue color traps were found to be most attractive to onion thrips comparing with white , green, yellow , gray , and red ones (Lu, 1990) . There are no detailed studies about the biology and control of the onion thrips in Iraq , So this study were conducted to evaluate the effectiveness of two sampling methods , Direct plant counts and sticky color traps for monitoring population density of *T. tabaci* and timing of the control measures in the onion fields.

Materials and methods

Field experiments were conducted at the College of Agriculture, Baghdad. Onion seeds of cultivar Early Texas Grano were cultivated on 20th of September, 2010 and were raised in the nursery for 8 weeks before transplanting to the field. Nursery was divided into equal plots of 20 cm apart. Field was divided into rows of 5 m long in spacing of 75 cm between rows and 10 cm between plants. Each treatment consisted of 5 rows. All experiments were laid out according to complete randomized block design (CRBD) with three replications for each treatment. The seedlings received normal agriculture practices (Dawood, 2006).

Onion thrips sampling was carried out at regular intervals until transplanting of the seedling to the field. Onion thrips counts were made in two ways:

Plant counts

Onion thrips larvae and adults were estimated by randomly lifting 3 plants from each replicate and were placed in a labeled polyethylene bags, Samples were put in the freezer for about two hours to immobilize thrips movement before counting thrips numbers, Then all leaves of the plant were separated from the base ,and everyone was beaten against a white sheet of paper ,Then , thrips numbers were isolated and counted by using a magnifying lens (2x) (Alserawy, 1985).

Assessment of onion thrips numbers by sticky cards

Two sticky sided cards of three colors (yellow, blue and white) in the size of 10 x 20 cm from Russell IPM UK were used to monitor adult thrips activity in the nursery and in the onion field .Traps were positioned at top of the plant canopy by using adjustable wooden stalk, sticky traps were spaced at 3 m in the nursery and 10 m in the field. Traps were randomized as (CRBD) with three replication for each treatment. The one first recorded reading on 26 October 2010 and has been monitoring these traps at weekly intervals during the onion growing season and counting thrips numbers and replaced them every two weeks with new ones. Thrips counts made after taking the sticky cards to the laboratory and numbers were counted by using a magnifying lens (2x).

Data were subjected to analysis of Variance (ANOV) and the means were separated by according to least significance differences lest (LSD) at the p= 0.05 level of significance (SAS, 2001).

Results and discussions

Seasonal abundance of onion thrips, T. tabaci has been studied in two ways: plant counts. Fig.1 shows the population density of larvae and adults of onion thrips , *T. tabaci* from germination to harvest, thrips started colonizing seedlings in an significant numbers below 5 thrips/ plant until end of December in the nursery. Thrips numbers began to increase gradually after the seedlings were transplanted to the field, when the numbers of larvae rose to 10 / plant during the first week of February, and reached two peaks of 33 and 70 thrips/ plant during the third weeks of Feb. and March respectively, However, Adults numbers remained low (less than 5 thrips per plant) until the first week of

March, when a first peak of 13 Adults / plant was occurred. Adults' numbers then declined below 2 thrips/ plant, until a second peak of 15 thrips/ plant was recorded during the second week of April. The possible reason for the increase in thrips population between February and mid of April may be due to the temperature where it became more conducive to growth and development of the insects as well as suitable for the growth of seedlings of onions, This agrees with the findings of Hsu *et al*. (2010) that seedlings are usually larger and be more attractive to thrips, also he pointed out that thrips numbers in onion fields are constantly changing with time. The number of larvae and adults of onion thrips began to decline gradually during the last week of April may be due to the maturity of the crop and the leaves became older and unfavorable to thrips feeding. Similarly, Kannon and Mohammed (2001) observed that there was a steady increase of thrips population from February and March and a sharp decline in April during the growing season. Salguero-Navas *et al*. (1999) and Edelson *et al*. (1986) found that host phenology play an important role in population dynamics, with younger plants being able to support greater densities than older plants. Fournier *et al*. (1995) and Ibrahim, and Adesiyun(2010b) found that rainfall during the season wash more than 70% of onion thrips. Edelson *et al*. (1986) mentioned that thrips numbers below 9 thrips per plant during the growing season may not cause economic loss to the crop of onion, but when it increases to 24 thrips/ plant shall be have a significant effect in reducing holds plants. Also, the infested plants will mature faster time and reduces the size of bulbs (Kritzman *et al*., 2000).

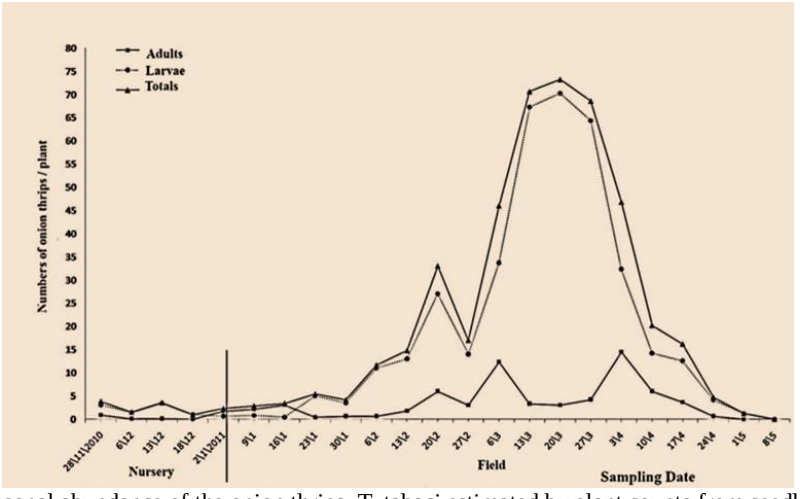

Fig. 1. Sesonal abundance of the onion thrips, T. tabaci estimated by plant counts from seedling stage in the nursery to harvest during the growing season 2010/2011

It can be concluded from these results that the numbers of onion thrips observed during March and April can cause severe damage to onion plants during this period, So a control measures should be applied, otherwise it's lead to an economic loss in yield and quality of bulbs.

Use of sticky colored traps

Results in Table 1 and Fig. 2 show the number of onion thrips, *T. tabaci* caught in sticky traps in the Nursery and onion field starting from 26th of January 2010. Adultsthrips was low during the first four weeks of October reaching 2.38, 1.12 and 0.86 thrips/ trap for blue, white and yellow traps respectively. Blue traps catches significantly the highest numbers of 6.42 followed by 3.98, 1.78 thrips/ trap for the white and yellow traps. The low numbers of thrips caught in the sticky traps was probably due to the small size of seedling, the presence of alternative hosts, and the inadequate environmental factors especially temperatures, the average temperatures during November in the nursery ranged between (10-22) c^{o}. This agrees with findings of Lewis (1973) that the population density of onion thrips, *T. tabaci* affected by environmental factors, especially temperatures. Average temperatures during the period of the first month of the study (November) between 10 – 22 C^{o}.Then ,Total thrips catches in the sticky traps increased gradually during December reaches , 4.04 , 2.86 and 1.2 thrips / trap caught in Nursery for blue , white and yellow traps respectively. Total numbers of onion thrips caught in blue traps were significantly different from total numbers caught in white and yellow traps, probably due to the uv reflected from this color which fall within the wavelengths (400–500) nm and this what Eric *et al*. (2007) found that blue traps attracting the highest number of the western flower thrips *Frankliniella occidentalis* when comparing three colors of traps (red , green and blue).

Table 1. Numbers of onion thrips, *T. tabaci* caught in the nursery in different sticky color traps during the season 2010/2011

Traps color	No. of onion thrips, *T . tabaci* caught during the month of		
	October	November	Totals numbers of onion thrips caught in nursery
Blue	2.38 a	4.04a	6.42 a
White	1.12b	2.86a	3.98b
Yellow	0.86b	1.20b	2.06b
LSD 0.05	0.671	1.661	1.781

*Values followed by the same letter with in the same column do not differ from each other significantly (P>0.05)

In the field, results in Table 2 and Fig. 2 shows that traps catches of onion thrips began to increase gradually since the beginning of January until reached its peak during April as traps catches were , 751.72 , 964.7 and 74.9 thrips/ trap/ month for the blue , white and yellow trap respectively . Figure (2) shows two peaks of onion thrips, the first at the end of march and the second during the first week of May . It is noted from table 2 that the total numbers of onion thrips caught in the three types of colored traps varied between blue, white amounting to 1431.16 and 1605.03 thrips/ trap/ Month respectively, on the one hand and between yellow traps on the other hand (174.37) thrips/ trap/ Month , this means that the two – color blue and white traps canbe used in monitoring and find out times of peaks , and this confirm the results reached by many authors (Lu,1990 ;Cho *et al*., 1995a ; 1995b; Liu and Chu, 2004 and Gangaloof , 1999) that blue sticky traps may play important role in estimating the numbers of onion thrips in onion fields.

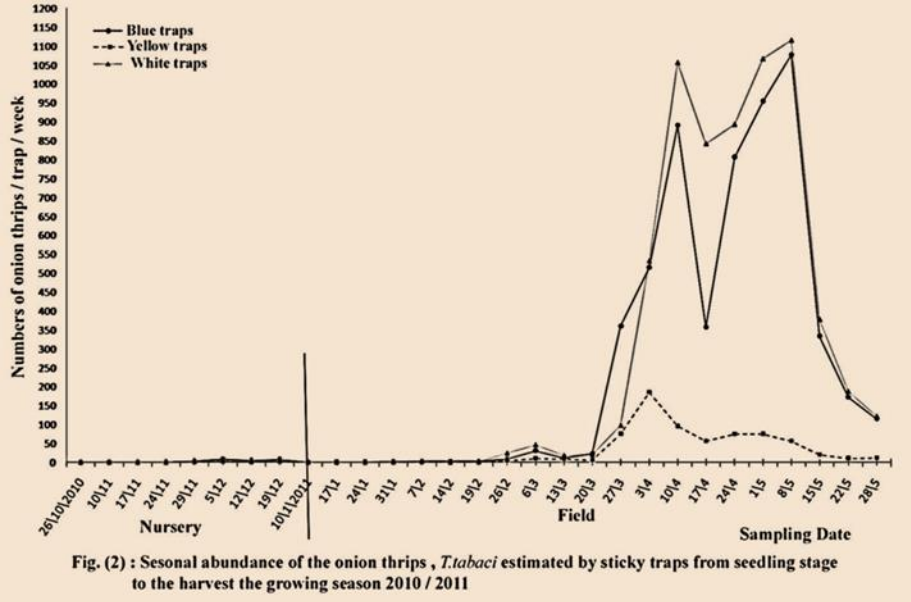

Fig. (2) : Sesonal abundance of the onion thrips , *T.tabaci* estimated by sticky traps from seedling stage to the harvest the growing season 2010 / 2011

Fig. 2. Sesonal abundance of the onion thrips, *T. tabaci* estimated by sticky traps from seedling stage to harvest during the growing season 2010/2011

Figure 2 shows that numbers of onion thrips caught in traps has decreased during the second week of may be due to lack of suitable weather condition or / and the activity of some predators that have been observed in the onion field during the study period such as , Thrip predator , *Aelothrips* sp. , anthocorid bug , *orius albidipennis* Reuter and other predators which led to the decline in the numbers of onion thrips unexpectedly , this is referred to by Fathi et al.

(2008) in Iran that *Orius niger* was an important role in reducing the population density of larvae and adult of onion thrips in potato fields. This, as well as on the progress of plants in age and its unsuitability for feeding thrips with near the time of harvest , where all of these things considered inappropriate for living onion thrips. Kisha (1977) reported that independent of transplanting date, thrips bred only between February and April and that high temperature and low humidity from April on wards were responsible for sudden population decline of onion thrips.

It seems clear from these results shown in Table 1 and Figures 1 and 2 that it is not easy to determine the number of onion thrips generations using sticky traps or the visual plant count, where numbers of thrips may be washed off plant to the soli by rainfall during the season, and this affects the numbers which will cause a sudden population decline.Al- Faisali (1981) has pointed to the existence of 13 overlapping generations in Iraq. Also, many strong dust storms occured several times during the season which has a negative impact on thrips numbers. When comparing these two sampling methods of onion thrips, each method has its advantages in estimating of thrips population. It is clear that the sticky traps were easy to apply and can be used throughout the times of the crop, especially for monitoring and to time out the control measures. Direct count method can be used to give a good estimate of thrips larvae.

Table 2. Numbers of onion thrips,*T.tabaci* caught in onion filed in different sticky color traps during the season 2010/2011

Traps color	No. of onion thrips, *T. tabaci* caught in onion filed during the month of						
	January	February	March	April	May	Totals No. of onion thrips during the season	Mean No. of thrips/ traps/month
Blue	1.22a	11.22b	226.97a	751.72b	434.05a	1431.6a	204.51b
White	0.9a	17.9a	166.97b	964.7a	450.62a	1605.03a	229.29a
Yellow	0.62a	4.3c	68.4c	74.9c	24.12b	174.37b	24.91c
LSD 0.05	0.67	3.68	21.32	33.13	19.29	180.7	20.95

*Values followed by the same letter with in the same column do not differ from each other significantly (P>0.05)

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