

Effect of Different Host Plants on the Onion Thrips, *Thrips tabaci* Lind. and the Land Snail, *Monacha* spp. Population Abundance According to Intercropping some Vegetable Crops and the Final Yield

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ABSTRACT

Field experiments were carried out at El-Riad district, Kafr El-Sheikh governorate during three successive seasons, 2014/15, 2015/16 and 2016/17. To study host preference and the effect of intercropping each of lettuce (Roman), onion (Buheirah red) and garlic (sids 40) cultivars, on the onion thrips, *Thrips tabaci* Lind. and the land snail, *Monacha* spp. population abundance and the resulting yield. *T. tabaci* was the high attractive to onion followed by garlic, while lettuce was least attractive during the three successive seasons. It can be noticed the highest monthly average number of *T. tabaci* were recorded in March on onion plantations alone and onion intercropping, with lettuce, followed by garlic plantations alone, garlic (intercropped with lettuce) in the three seasons, while lettuce plantations alone and lettuce intercropping, with onion and with garlic were recorded in February in 2015 and 2016 but it was in March in 2017 season. Also, the highest monthly average number of *Monacha* spp. were recorded in March on lettuce plantations alone and followed by lettuce intercropping, with onion and garlic, while garlic plantations alone, garlic (intercropped, with lettuce) and onion plantations alone and onion (intercropped, with lettuce) were recorded in February or March. It can be noticed that, *Monacha* spp. was the high attractive to lettuce, while garlic and onion were the least attractive during the three successive seasons. The population abundance of thrips and snails differed according to host plant, there were significant differences among host plants ($p \leq 0.05$). The rate of infestation was higher in the sole crops than in those intercropped crops which caused reduction of *T. tabaci* and *Monacha* spp., and almost, significant differences were found ($p \leq 0.05$). The resultant yield, due to intercropping, was also affected. The lettuce, onion and garlic plants intercropped reduced the resultant yield when compared with control.

Keywords: Lettuce, onion, garlic, population, intercropping, thrips, land snail.

INTRODUCTION

Common lettuce, *Lactuca sativa* L. is native to the Mediterranean area and was domesticated in Egypt around 4,500 B.C. (Kerns *et al.*, 2001). Onion (*Allium cepa* L.) is one of the most popular and important vegetables for fresh and dry consumption with Egypt production in the year 2012-13 reached 2.30 million tones (FAO, 2014). Garlic (*Allium sativum* L.) is one of the main important bulbous vegetable crops grown in Egypt for local consumption and exportation and is next to onion in importance (Hamma *et al.*, 2013).

Thrips tabaci (Thysanoptera: Thripidae) were found to be widely distributed on onion and garlic crops and were important insect pests of the crops causing direct and indirect damage which result in yield reduction (Zsofia and Adam, 2012, Paibomesai and McDonald-Muck, 2013 and Zereabruk, 2017). Workman *et al.* (2007) and El-Fakharany and Hendawy (2012) found that onion thrips was the dominant thrips species on lettuce, they concluded that the low numbers of thrips on lettuce and the low rates of reproduction indicate that lettuce is a poor host plant. Abd El-Wahed (2014) and Samy *et al.* (2015) mentioned that land snails, *Monacha* spp. (Gastropoda: Hygromiidae) attack lettuce and onion plants.

The intercropping between some crops is recommended in some cases as one of agricultural practices to achieve integrated pest management (IPM). So, many authors studied its positive and negative effects on the infestation rates of the pests (Trdan *et al.*, 2006 and Metwally *et al.*, 2008). Afifi *et al.* (1990) reported 80% reduction in onion thrips infestation by intercropping of onions and garlic with tomato in Egypt. Also, with Gachu *et al.* (2012) who observed up to 45.2% and 21.6%, reduction of onion thrips density when onion crop was intercropped with spider plant and carrot, respectively. Khaliq *et al.* (2016) found that onion thrips population reduction when onion was intercropped with cotton, tomato, chili and okra, as compared to control.

The objective of this study was to investigate the effect of different host plants on the population abundance of the onion thrips, *Thrips tabaci* Lind. and the land snail, *Monacha* spp. according to intercropping some vegetable crops and the final yield of those crops.

MATERIALS AND METHODS

1. Effect of different host plants and intercropping on the population of *Thrips tabaci* and *Monacha* spp.

For studying the effect of different host plants on the population abundance of the onion thrips, *Thrips tabaci* Lind. and the land snail, *Monacha* spp. according to intercropping some vegetable crops and the final yield of those crops., a field experiment was conducted at El-Riad district, Kafr El-Sheikh governorate during three successive years, 2014/15, 2015/16 and 2016/17. The lettuce, *Lactuca sativa* L. cultivar, Roman, onion (*Allium cepa* L.) cultivar, Buheirah red and garlic (*Allium sativum* L.) cultivar, (sids 40). The experimental area was about one feddan divided into four plots, each crop was represented by four replicates arranged in a complete randomized block design were weekly inspected randomly. Garlic lobes were sown on October, 20 and onion seedlings were planted on December, 10, while lettuce seedlings were transplanted on December, 27 (The crop was grown with the other crop in alternating rows). Those sole crops were planted at the same time of its intercropping date. Inspection started on January 17 and continued weekly till March 28 of each season. Number of snails was counted 3m²/replicate in the field, while thrips was counted 10 plants/replicate.

2. Effect of intercropping on weight production

Impact of the used intercropping on the weight of the final crop production was evaluated. Final total yield was taken from one plot (3 m²), 4 times for each treatment.

3. Statistical analysis

Pests were evaluated for differences between vegetable crops using analysis of variance (ANOVA). Significant differences between the means of these crops were calculated by Duncan's Multiple Rang Test (Duncan 1955).

RESULTS AND DISCUSSION

1. Effect of different host plants and intercropping on the population abundance

The onion thrips, *Thrips tabaci* Lind.

Data in Table (1) showed that, the highest monthly average number of *T. tabaci* during the first season, 2015 were recorded in March on onion alone represented by 456.75 individual/10 plants followed by onion intercropping, with lettuce (402.94). Also, garlic alone and garlic (intercropped with lettuce) were recorded in March represented by 209.63 and 180.75, respectively. While lettuce alone and lettuce intercropping, with onion and with

garlic were recorded in February with 72.38, 55.31 and 45.31 respectively. The high population abundance of thrips was observed in onion plantations alone (240.75) followed by onion (intercropped with lettuce) (190.40) and garlic alone (106.75) when compared with lettuce plantations alone (47.15). The rate of infestation was higher in the sole crops plants than in those intercropped with lettuce, onion and garlic which caused reduction of *T. tabaci* in 2015 season (Table 1).

Statistical analysis revealed that, almost each of seven treatments differed significantly with thrips infestation among vegetable crops ($p \leq 0.05$) (Table 1).

Table 1. Monthly average number of *Thrips tabaci* in different host plants according to intercropping during season, 2014/15 at Kafr El-Sheikh governorate

Host plant	Mean no. of <i>Thrips tabaci</i> / 10 plants \pm SE*			
	January	February	March	Mean
Lettuce only	8.83 \pm 5.31	72.38 \pm 10.57	60.25 \pm 13.70	47.15 \pm 15.92 d
Onion only	30.0 \pm 6.92	235.5 \pm 24.97	456.75 \pm 23.70	240.75 \pm 100.72 a
Garlic only	20.0 \pm 0.47	90.63 \pm 29.86	209.63 \pm 30.25	106.75 \pm 45.23 c
Lettuce with onion				
Lettuce	3.75 \pm 2.13	55.31 \pm 15.18	38.13 \pm 5.03	32.40 \pm 12.39 d
Onion	22.0 \pm 6.12	146.25 \pm 49.54	402.94 \pm 38.77	190.40 \pm 91.69 b
Lettuce with garlic				
Lettuce	5.67 \pm 3.84	45.31 \pm 9.93	33.94 \pm 4.49	28.31 \pm 8.33 d
Garlic	12.75 \pm 1.85	63.94 \pm 20.55	180.75 \pm 31.14	85.81 \pm 40.64 c

In a column, means followed by the same letter are not significantly different at the 5% level by Duncan (1955) *Standard error

Also, data in Table (2) showed that, the highest monthly average number of *T. tabaci* in the second 2016 season on onion plantations alone with 370.13 individual/10 plants followed by onion (intercropped with lettuce) (279.38) were recorded in March. Garlic plantations alone and garlic intercropping with lettuce) were recorded in March represented by 186.25 and 130.0 respectively, while lettuce plantations alone and lettuce (intercropped with onion and with garlic) were recorded in February represented by 56.94, 33.44 and 32.44, respectively. The high population abundance of thrips was

observed in onion plantations alone (158.77) followed by onion (intercropping, lettuce with onion) (131.61) and garlic alone (95.15) when compared with lettuce plantations alone (34.52). The rate of infestation was higher in the sole crops plants than in those intercropped with lettuce, onion and garlic which caused reduction of *T. tabaci* in 2016 season (Table 2).

Statistical analysis revealed that, almost each of seven treatments differed significantly with thrips infestation among vegetable crops ($p \leq 0.05$) (Table 2).

Table 2. Monthly average number of *Thrips tabaci* in different host plants according to intercropping during season, 2015/16 at Kafr El-Sheikh governorate

Host plant	Mean no. of <i>Thrips tabaci</i> / 10 plants \pm SE*			
	January	February	March	Mean
Lettuce only	3.92 \pm 0.84	56.94 \pm 14.52	42.69 \pm 2.46	34.52 \pm 12.95 e
Onion only	12.5 \pm 2.56	93.69 \pm 14.70	370.13 \pm 30.71	158.77 \pm 88.49a
Garlic only	16.33 \pm 0.56	82.88 \pm 26.90	186.25 \pm 26.56	95.15 \pm 40.41 c
Lettuce with onion				
Lettuce	1.33 \pm 0.56	33.44 \pm 6.85	33.38 \pm 1.93	22.72 \pm 8.74 e
Onion	8.33 \pm 1.31	107.13 \pm 33.83	279.38 \pm 30.63	131.61 \pm 64.74 b
Lettuce with garlic				
Lettuce	0.83 \pm 0.49	32.44 \pm 9.43	24.56 \pm 2.13	19.28 \pm 7.77 e
Garlic	8.0 \pm 1.42	56.75 \pm 19.41	130.0 \pm 22.83	64.92 \pm 28.98 d

In a column, means followed by the same letter are not significantly different at the 5% level by Duncan (1955) *Standard error

Results in Table (3) showed that, the highest monthly average number of *T. tabaci* in 2017 season were recorded in March on onion plantations alone represented by 585.38 individual/10 plants followed by onion intercropping with lettuce (436.75). Also, garlic plantations alone and garlic (intercropped with lettuce) were recorded in March by 263.0 and 198.38, respectively, also lettuce alone and lettuce intercropping, with onion and garlic were recorded in March with 59.75, 40.88 and 37.5, respectively. The high population abundance of thrips was observed in onion plantations alone (236.54) followed by

onion (intercropped with lettuce) (192.92) and garlic alone (128.25) when compared with lettuce plantations alone (37.54). The rate of infestation was higher in the sole crops plants than in those intercropped with lettuce, onion and garlic which caused reduction of *T. tabaci* in 2017 season (Table 3).

Statistical analysis revealed that, almost each of seven treatments differed significantly with thrips infestation among vegetable crops ($p \leq 0.05$) (Table 3).

Table 3. Monthly average number of *Thrips tabaci* in different host plants according to intercropping during season, 2016/17 at Kafr El-Sheikh governorate

Host plant	Mean no. of <i>Thrips tabaci</i> /10 plants ± SE*			
	January	February	March	Mean
Lettuce only	3.67±1.57	49.19±6.50	59.75±4.38	37.54±14.06 c
Onion only	17.0±3.86	107.25±20.99	585.38±60.93	236.54±144.16 a
Garlic only	20.58±4.78	101.18±37.51	263.0±39.78	128.25±58.27 c
Lettuce with onion				
Lettuce	1.0±0.62	36.25±10.95	40.88±5.61	26.04±10.29 c
Onion	11.75±2.26	130.25±47.31	436.76±49.61	192.92±103.51 b
Lettuce with garlic				
Lettuce	1.25±0.66	33.81±3.20	37.5±13.01	24.19±9.42 c
Garlic	12.33±4.71	71.25±27.61	198.38±27.95	93.99±44.88 d

In a column, means followed by the same letter are not significantly different at the 5% level by Duncan (1955) *Standard error

As a conclusion, the population abundance of thrips differed according to host plant and *T. tabaci* was the high attractive to onion followed by garlic, while lettuce was least attractive during the three successive seasons. It can be noticed the highest monthly average number of *T. tabaci* were recorded in March on onion plantations alone and onion (intercropped with lettuce), followed by garlic plantations alone, garlic intercropping, with lettuce in the three seasons, while lettuce plantations alone and lettuce (intercropped with onion and garlic) were recorded in February in 2015 and 2016 but it was in March in 2017 season. The rate of infestation was higher in the sole crops plants than in those intercropped with lettuce, onion and garlic which caused reduction of *T. tabaci* in the three seasons. Almost, each of seven treatments differed significantly with infestation thrips among vegetable crops ($p \leq 0.05$).

These results are in agreement with those of Afifi *et al.* (1990) as they reported 80% reduction in onion thrips infestation by intercropping of onions and garlic with tomato in Egypt. Workman *et al.* (2007) found that thrips populations peaked in December to February with greatest numbers in February on lettuce. Hendawy *et al.* (2011) stated that the population density of *T. tabaci* peaked in February, March and April on onion plantations. EL-Fakharany and Hendawy (2012) found that *T. tabaci* was lower in October plantations than those of January plantations on lettuce. El-Fakharany *et al.* (2012^b) found that the population density of *T. tabaci* reached its

maximum abundance at the second, third and fourth weeks of March on garlic plants. Gachu *et al.* (2012) who observed up to 45.2% and 21.6%, reduction of onion thrips density when onion crop was intercropped with spider plant and carrot, respectively. Khaliq *et al.* (2016) found that onion thrips population reduction when onion was intercropped with cotton, tomato, chili and okra, as compared to control. Khan *et al.* (2017) found that *T. tabaci* was the dominant pest species on onion plantations. Zereabruk (2017) found that population density of thrips on onion plants was low in December and progressively increased to reach its maximum degree in March.

The land snails, *Monacha* spp.

Data in Table (4) showed that, the highest monthly average number of *Monacha* spp. during the first season, 2015 were recorded in March on lettuce plantations alone represented by 126.5 individual/3m² followed by lettuce intercropping, with onion and garlic (96.19 and 91.19, respectively). Also, onion plantations alone and onion (intercropped with lettuce) were recorded in March by 14.31 and 7.25, respectively, while garlic plantations alone and garlic intercropping, with lettuce and were recorded in February with 15.31 and 9.06, respectively. The high population abundance of snails was observed in lettuce plantations alone (58.88) followed by lettuce (intercropped with onion and garlic) (43.92 and 41.63, respectively), while it was least on onion plantations alone (5.25), onion intercropping, with lettuce (2.5), garlic plantations alone (7.62) and garlic (intercropped with lettuce) (4.79).

Table 4. Monthly average number of *Monacha* spp. in different host plants according to intercropping during season, 2014/15 at Kafr El-Sheikh governorate

Host plant	Mean no. of <i>Monacha</i> spp. /3m ² ± SE*			
	January	February	March	Mean
Lettuce only	1.0±0.82	49.13±12.38	126.5±14.63	58.88±29.88 a
Onion only	0.0±0.0	1.44±0.58	14.31±4.07	5.25±3.72 c
Garlic only	20.58±4.78	15.31±6.06	7.56±2.74	7.62±3.61 c
Lettuce with onion				
Lettuce	0.75±0.61	34.81±9.58	96.19±10.13	43.92±22.83 b
Onion	0.0±0.0	0.38±0.21	7.25±1.72	2.54±1.93 c
Lettuce with garlic				
Lettuce	0.0±0.0	33.69±12.05	91.19±9.86	41.63±21.76 b
Garlic	0.0±0.0	9.06±4.83	5.31±1.66	4.79±2.1544.88 c

In a column, means followed by the same letter are not significantly different at the 5% level by Duncan (1955) *Standard error

The rate of infestation was higher in the sole crops plants than in those intercropped with lettuce, onion and garlic which caused reduction of *Monacha* spp. in 2015 season (Table 4).

Statistical analysis revealed that, almost each of seven treatments differed significantly with land snail infestation among vegetable crops ($p \leq 0.05$) (Table 4).

Also, data in Table (5) showed that, the highest monthly average number of *Monacha* spp. during the second season, 2016 were recorded in March on lettuce

plantations alone represented by 211.5 individual/3m² followed by lettuce intercropping, with onion and garlic) (159.06 and 147.75 respectively), while garlic plantations alone and garlic (intercropped with lettuce) and were recorded in February with 35.63 and 18.81, respectively also, onion plantations alone and onion (intercropped with lettuce) were recorded in February represented by 14.25 and 8.81, respectively. The high population abundance of snails was observed in lettuce plantations alone (142.0

followed by lettuce intercropping, with onion and garlic) (105.60 and 90.69, respectively), while it was the least on onion plantations alone (7.88), onion (intercropped, with lettuce) (5.0), garlic plantations alone (16.31) and garlic intercropping, with lettuce) (8.71). The rate of infestation was higher in the sole crops plants than in those intercropped with lettuce, onion and garlic which caused reduction of *Monacha* spp. in 2015 season (Table 5).

Table 5. Monthly average number of *Monacha* spp. in different host plants according to intercropping during season, 2015/16 at Kafr El-Sheikh governorate

Host plant	Mean no. of <i>Monacha</i> spp./3m ² ± SE*			
	January	February	March	Mean
Lettuce only	6.75±5.52	207.75±41.40	211.5±64.13	142.0±55.29 a
Onion only	0.0±0.0	14.25±5.59	9.38±2.08	7.88±3.42 d
Garlic only	0.75	35.63±21.14	12.56±3.37	16.31±8.37 d
Lettuce with onion				
Lettuce	6.5±5.31	151.25±43.65	159.06±29.26	105.60±40.55 b
Onion	0.0±0.0	8.81±3.65	6.19±1.38	5.0±2.14 d
Lettuce with garlic				
Lettuce	6.0±4.90	118.31±31.93	147.75±31.55	90.69±35.30 c
Garlic	0.0±0.0	18.81±12.48	7.31±1.92	8.71±4.48 d

In a column, means followed by the same letter are not significantly different at the 5% level by Duncan (1955) *Standard error

Statistical analysis revealed that, almost each of seven treatments differed significantly with land snail infestation among vegetable crops (p≤ 0.05) (Table 5).

The obtained results, in Table (6) showed that, the highest monthly average number of *Monacha* spp. in 2017 season, were recorded in March on lettuce plantations alone (594.56) followed by lettuce intercropping, with onion and garlic (451.0 and 421.13, respectively). Also, garlic plantations alone and garlic intercropping, with lettuce were recorded in March represented by 78.63 and 40.13, respectively followed by onion plantations alone

and onion (intercropped with lettuce) (41.81 and 26.06, respectively). The high population abundance of snails was observed in lettuce plantations alone (239.33) followed by lettuce (intercropped, with onion and garlic) (179.56 and 164.93, respectively), while it was the least on onion plantations alone (10.80), onion intercropping, with lettuce) (9.21), garlic plantations alone (35.1) and garlic intercropping, with lettuce (17.73). The rate of infestation was higher in the sole crops plants than in those intercropped with lettuce, onion and garlic which caused reduction of *Monacha* spp. in 2017 season (Table 6).

Table 6. Monthly average number of *Monacha* spp. in different host plants according to intercropping during season, 2016/17 at Kafr El-Sheikh governorate

Host plant	Mean no. of <i>Monacha</i> spp./3m ² ± SE*			
	January	February	March	Mean
Lettuce only	3.75±3.07	119.69±6.50	594.56±133.46	239.33±147.75 a
Onion only	0.08±0.07	4.63±1.80	41.81±15.33	15.51±10.80 c
Garlic only	0.42±0.34	26.25±7.98	78.63±24.5	35.1±18.81 c
Lettuce with onion				
Lettuce	3.42±2.79	84.25±20.18	451.0±84.80	179.56±112.58 b
Onion	0.0±0.0	1.56±0.55	26.06±7.96	9.21±6.90 c
Lettuce with garlic				
Lettuce	1.67±1.36	72.0±20.99	421.13±89.04	164.93±106.02 b
Garlic	0.0±0.0	13.06±4.67	40.13±18.09	17.73±9.66 c

In a column, means followed by the same letter are not significantly different at the 5% level by Duncan (1955) *Standard error

Statistical analysis revealed that, almost each of seven treatments differed significantly with *Monacha* spp. infestation among vegetable crops (p≤0.05) (Table 6).

As a conclusion, the population abundance of snails differed according to host plant and *Monacha* spp. was the high attractive to lettuce, while garlic and onion were the least attractive during the three successive seasons. It can be noticed the highest monthly average number of *Monacha* spp. were recorded in March on lettuce plantations alone followed by lettuce intercropping, with onion and garlic), while garlic plantations alone, garlic (intercropped with lettuce) and onion plantations alone and onion intercropping, with lettuce) were recorded in February or March. The rate of infestation was higher in the sole crops plants than in those intercropped with

lettuce, onion and garlic which caused reduction of *Monacha* spp. in the three seasons. The intercropping between some crops is an important element in some cases as one of agricultural practices to achieve integrated pest management (IPM). Almost, each of seven treatments differed significantly with infestation *Monacha* spp. among vegetable crops (p≤ 0.05).

These results are in agreement with those of Abdel-Aal (2001) who reported that the population density of *M. cartusiana* increased during spring months. Shetaia *et al.* (2009) found that population dynamics of *M. cartusiana* snail was high at the tested winter crops (egyptian clover, faba bean, pea, lettuce and cabbage) during spring months as compared with winter or autumn months. Abd El-Wahed (2014) encountered high population density of

Monacha spp. on pea, lettuce and cabbage than in carrot and potatoes plantations. Samy *et al.* (2015) found that population densities of *Monacha* spp. were lower in onion plantations than in lettuce and cabbage plantations.

3. Effect of intercropping of lettuce, onion and garlic on net weight production

During 2014/15, 2015/16 and 2016/17, the resultant yield, due to intercropping, was also affected. This intercropping for lettuce, onion and garlic reduced the resultant yield of lettuce (intercropped with onion) (1.38%), lettuce intercropping, with garlic (2.21%), onion intercropping, with lettuce (1.75%) and garlic (intercropped, with lettuce) (2.19%) in the three seasons (Table 7).

Table 7. Effect of intercropping on net weight production

Host plant	Yield weight (kg/m ²) (Mean)			% yield incensement	Yield weight (ton/feddan)		
	2015	2016	2017		2015	2016	2017
Lettuce only	3.68	3.62	3.54	0.0	15.46	15.20	14.88
Onion only	3.01	3.10	3.03	0.0	12.64	13.02	12.73
Garlic only	2.75	2.65	2.82	0.0	11.55	11.13	11.84
Lettuce with onion							
Lettuce	3.63	3.58	3.48	-1.38	15.25	15.04	14.63
Onion	2.95	3.04	2.99	-1.75	12.39	12.77	12.56
Lettuce with garlic							
Lettuce	3.58	3.55	3.47	-2.21	15.04	14.91	14.56
Garlic	2.72	2.58	2.74	-2.19	11.42	10.84	11.51

These results are in agreement with those of Trdan *et al.* (2006) also obtained similar results of thrips suppression and higher onion bulb yield when onion intercropped with white clover, but *Lacy phacelia* intercropped in onion reduced onion yield. Similarly, Kabura *et al.* (2008) revealed that onion and pepper intercropping did not affect bulb size. They also recorded higher total and marketable onion yield in monocrop onion than intercrop. El-Fakharany *et al.* (2012^b) found that the sugar beet plants intercropped with faba bean gave the highest root yield. In the contrary, the intercropping with maize and cabbage plants reduced the resultant yield. Gombac and Trdan (2014) also found least thrips damage to leek plants when intercropped with birds foot trefoil (*Lotus corniculatus* L.) but significantly lower yield was obtained as the intercrop remained pretty competitive with leek plants. Khaliq *et al.* (2016) found that to reducing thrips population, in the onion plots intercropped with chili, okra, tomato also showed positive effects on onion yield.

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تأثير اختلاف العائل النباتي والتحميل على الكثافة العددية لحشرة تريبس البصل *Thrips tabaci* Lindeman والقواقع الأرضية *Monacha* spp. وعلى الناتج النهائي للمحصول ثناء قطب مرسى الفخراني
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أجريت تجارب حقلية بمركز الرياض بمحافظة كفر الشيخ خلال ثلاث مواسم متتالية ٢٠١٤ / ١٥ ، ١٦ / ٢٠١٥ ، ١٧ / ٢٠١٦ لدراسة تأثير اختلاف العائل النباتي وتحميل الخس (روماني) و البصل (بحيري أحمر) والثوم (صنف سدس ٤٠) على الكثافة العددية لتريبس البصل *Thrips tabaci* والقواقع الأرضية *Monacha* spp. كذلك على المحصول النهائي. كان تريبس البصل أكثر إصابة لزراعات البصل يليه زراعات الثوم بينما الخس اقلهم مع وجود اختلافات معنوية بينها سجل أعلى متوسط شهري لتريبس البصل في مارس على زراعات البصل منفرد والمحمل يليه الثوم منفرد و المحمل، بينما سجل في شهر فبراير في الموسم الأول و الثاني وفي مارس في الموسم الثالث في زراعات الخس المنفرد أو المحمل. بالنسبة للقواقع الأرضية كانت الكثافة العددية أعلى في زراعات الخس المنفرد والمحمل عن زراعات البصل والثوم كانت منخفضة في المواسم الثلاثة. أيضا سجل القواقع الأرضية أعلى متوسط شهري في مارس على زراعات الخس المنفرد و المحمل بينما البصل منفرد والمحمل يليه الثوم المنفرد و المحمل سجل في شهر فبراير أو مارس. كما كانت الكثافة العددية للقواقع الأرضية أعلى في زراعات الخس المنفرد و المحمل عن زراعات البصل و الثوم. كانت الكثافة العددية لتريبس البصل و القواقع الأرضية أعلى في الزراعات المنفردة عن المحملة. أدى تحميل المحاصيل إلى تقليل الكثافة العددية لكل من تريبس البصل و القواقع الأرضية. كان ناتج المحاصيل في الزراعات المنفردة أعلى من المحمل عليها ولكن الفروق كانت طفيفة جدا.