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Effects of Some Botanical Oils for the Control of Onion Thrips (*Thrips Tabaci* Lind.; Thysanoptera: Thripidae).

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***Abstract**: The field experiment was carried out in two successive seasons (2006/2007-2007/2008) in Gezira State. The experiments aimed at studying the efficacy of some botanical oils including sesame, cotton, groundnut and sunflower oils on thrips, Thrips tabaci (Lind.) population compared to the standard commercial insecticide Karate 5% EC (lambda–cyhalothrin). The results indicated that all botanical oil treatments were apparently very effective against the onion thrips compared to the untreated control. Significant differences in the number of insects were encountered on onion plant in both seasons 2006/07, 2007/08. Sesame oil was found to be more effective in controlling the pest followed by groundnut oil, cotton oil and sunflower oil, respectively. The oil treatments decreased thrips population within 2-7days.The data revealed that the best performance of the tested oils was obtained when the higher concentrations were administered in all treated plots. Karate treatment gave the best control of onion thrips and this was reflected in the high percentage mortality.*

1. INTRODUCTION

Onion (Allium cepa L.) is one of the most important vegetable crops worldwide, used by all people for its nutritional and medicinal values. The plant originated in southeast Asia, and introduced in Sudan long time ago (Hala, 2001).The main producing areas for onion in Sudan are : Kassala in the Eastern State, Dongola and Shendi in the Northern State, Zalengi in Darfur State, Gezira and Rahad Schemes (Elhassan, 1994). Onion is the main vegetable crop in the Gezira State, which represents about 42% of the total vegetables area grown in the Gezira Scheme and 28% of the whole area grown in the Scheme.

The crop suffers from the attack of many insect pests and diseases, which significantly affect the yield quantitatively and qualitatively. In the field, the crop is attacked by various insect pests but onion thrips (Thrips tabaci) is considered as one of the most important limiting factors affecting both productivity and quality of onion and caused tremendous losses to the crop if not well managed (Bakheit, 1993) Onion is normally transplanted during October when the thrips population is negligible under Gezira conditions.Transplanting afterwards renders the crop under severe thrips attack. Early transplanted onion can produce higher yields because they are usually well established, before the onset of infestation which later becomes severe. However, late transplanted onion attracts thrips which rapidly multiplies, increase the extent of damage and produces lower yield.

Chemical insecticide application is the most commonly used control measure and intensively adopted by farmers. Large-scale usage of pesticides has become a source of great concern because of its possible effects on human health and on non target components of the environment (Elzorgani and Abbadi, 1978).

Integrated pest management (IPM) strategies were directed towards implementation of various control practices, such as cultural, biological, chemical measures and resistant cultivars inorder to judiciously managing the pests and diseases without disturbance to the biological equilibrium and intoxication to the environment. Thus minimizing the number of sprays and reducing the cost of crop production (Abdelrahman et al., 1992). Obviously, the research needed is to find alternative methods of control, complementary and not antagonistic to chemical control. This paper reported on the efficacy of some edible oils in comparison to the conventional standard insecticide application for the control of onion thrips.

2. MATERIALS AND METHODS

The study was carried out in two seasons (2006/2007 and 2007/2008), in the Gezira Scheme, Massalamia Group, Nidiana block. In each season the experimental area was prepared according to the standard recommended land preparation procedures adopted by farmers for successful onion production (Kannan and Mohmmed 2004).

The efficacy of some botanical oils ; including cotton oil , sesame oil, sunflower oil and groundnut oil for the control of onion thrips in onion were tested in comparison to the standard commercial insecticide Karate 5% EC (lambda –cyhalothrin)/ during two production seasons (2006/07 and 2007/08). The oils were obtained from Wad Medani local market i.e. refined oils, for ease of being obtained by vegetable growers later on. Oils were diluted with water and applied as aqueous solutions mixed with few drops of liquid soap and Molass (as an anti UV light). The

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onion variety used was Saggai obtained from a known source at the vegetables central market, Wad Medani , Sudan .In both sites and during both seasons each experiment was arranged in a Randomized Complete Block design (RCBD) with three replications. The experimental fields in both sites consisted of 14 treatments. Botanical oils were evaluated at 3 different rates. The treatments and their dosage rates were as follows:

1-Sesame oil at the rate of 1.5% concentration (Ses. 1.5%)
2- Sesame oil at the rate of 2.5% concentration (Ses. 2.5%)
3-Sesame oil at the rate of 5% concentration (Ses.5.0 %)
4-Cotton seed oil at the rate of 1.5% concentration (Cott. 1.5%)
5-Cotton seed oil at the rate of 2.5% concentration (Cott. 2.5%)
6-Cotton seed oil at the rate of 5% concentration (Cott. 5.0 %)
7-Groundnut oil at the rate of 1.5% concentration (G/N. 1.5%)
8-Groundnut oil at the rate of 2.5% concentration (G/N. 2.5%)
9-Groundnut oil at the rate of 5% concentration (G/N. 5.0%)
10-Sunflower oil at the rate of 1.5% concentration (S/F. 1.5%)
11-Sunflower oil at the rate of 2.5% concentration (S/F. 2.5%)
12-Sunflower oil at the rate of 5% concentration (S/F. 5.0%).
13-Karate 5% EC (lambda–cyhalothrin) at the rate of 150 ml /fed.(7 .5% g a.i / fed.)
14- Untreated Control (UTC)

The experimental data had been attained through regular periodical surveys, the assessed botanical oils recorded. This plants were rand when sprayable level of 5-7 insects/ plant was attained. Spraying was performed through knapsack sprayer emitting spray volume of 20 gallons / feddan. Efficacy of the tested products was evaluated against thrips at pre and post- spray counts at regular intervals of 2,4,7,10,14 and 21 days after spraying. Evaluation of the biological efficacy of the product was based on the percentage mortality and product performance at each spray and the performance throughout the seasons were determined. The percentage mortality was calculated as follows:

$$\% \text{ mortality} = \frac{\text{pre spray count} - \text{post spray count}}{\text{pre spray count}} \times 100.$$

The data were subjected to the Analysis of Variance (ANOVA) after transformation, if needed, and the values of the grand mean, standard error and coefficient of variation were calculated. Duncan's Multiple Range Test (DMRT) was used to separate means among treatment.

3. RESULTS AND DISCUSSION

Data in table 1 showed that the different treatments harboured almost variable populations of onion thrips and highly significant differences between the treatments were observed. The same results were obtained from the third and the fourth count of the first spray. Generally, it was observed that Karate treatment hosted significantly less number of thrips population compared to all treatments.

In table 2 the data indicated that, percentage mortality was significantly higher in all treatments after spray counts in comparison to the untreated control. The different oil treatments displayed variable performance at the different concentration as to the pest incidence.

Regardless of the different times of spray, the data in Table 3 clearly indicated that the Karate treatment always hosted significantly less number of thrips compared to all treatments. The level of thrips population decreased significantly after application of the tested products compared to the untreated control. It is apparent from the results presented in Table 4 that the percentage mortality was significantly higher in all treatments at post spray counts. This insures that the products tested were very effective in controlling the pest. Karate had the best performance against the pest while the different oil treatments displayed variable performance at the different concentration as to the pest incidence. The consistent results in the general performance throughout the two seasons confirmed beyond doubt the effectiveness of the higher concentrations of sesame, cottonseed and groundnut oils, respectively in controlling thrips However, these tested oils were refined ones for the sake of their availability to the vegetable grower from the local market. Crude oils could have been more potent as reported by Jacobson (1953) for groundnut and cottonseed oils. However, the use of sesame oil to control whitefly on tomato in Sudan was recommended by Yassin *et.al. (*1982). Again, Elamin(1995) reported that sesame oil (refined) at 2 – 3 % as oil water emulsion + Agaral (or liquid soap) led to significant decrease in TYLCV and significant increase in yield. It should be mentioned that the type of oil, as reported by Cranshaw (1999) can greatly affect its activity. This could possibly be explained in terms of botanical origin. i.e. plant sp. as well as the treatment the oil receives. Accordingly, further experimentation with crude botanical oils for the control of thrips on onion could lead to more positive results.

Table (1): Effects of some botanical oils and Karate on thrips population (season 2006/07). Mean No. of thrips / 5 plants.

Treatments	Pre1st spray	1st Post1st spray √ x	2nd Post1st spray √ x+1	3rd Post1st spray √ x	4th Post1st spray	5th Post1st spray	Pre-2nd spray	1st Post 2nd spray √ x	2nd Post 2nd spray	3rd Post 2nd spray
1.Ses.1.5%	(22.8) a	(14.0) 3.7 b	(8.1) 3.0 b	(17.3) 4.2 d	(23.2) cd	(23.2) cd	(23.2) a	(11.1) 3.3 a	(18.3) b	(22.9) cd

2.Ses.2.5%	(21.7) a	(11.5) 3.3 b	(9.3) 3.2 bc	(17.5) 4.2 d	(20.8) bc	(20.8) abc	(20.8) a	(8.8) 2.9 a	(19.5) b	(23.2) cd
3.Ses. 5%	(21.2) a	(9.8) 3.1 b	(7.9) 2.9 b	(14.4) 3.8 cd	(18.7) bc	(18.7) a	(18.7) a	(6.6) 2.7 a	(18.6) b	(19.4) bcd
4.Cott1.5%	(19.9) a	(14.6) 3.7 b	(10.3) 3.3 bc	(19.3) 4.4 de	(23.1) bc	(23.1) cd	(23.1) a	(11.6) 3.3 a	(21.1) b	(23.0) cd
5.Cott.2.5%	(22.4) a	(12.6) 3.5 b	(14.2) 3.9 bc	(19.7) 4.4 de	(18.7) bc	(18.7) a	(18.7) a	(9.1) 3.0 a	(20.3) b	(17.1) bc
6.Cott. 5%	(18.5) a	(9.2) 3.0 b	(12.4) 3.6 bc	(14.3) 3.8 cd	(19.3) bc	(19.3) ab	(19.3) a	(12.4) 3.4 a	(20.9) b	(14.4) b
7.G/N 1.5%	(19.1) a	(8.9) 2.9 b	(10.2) 3.3 bc	(17.7) 4.2 d	(22.6) cd	(22.6) bc	(22.6) a	(8.0) 2.8 a	(22.8) b	(25.1) d
8. G/N2.5%	(19.1) a	(7.1) 2.6 a	(15.6) 4.1 bc	(17.3) 4.2 d	(21.3) bc	(21.3) abc	(21.3) a	(6.6) 2.5 a	(20.9) b	(19.2) bcd
9. G/N 5%	(22.5) a	(11.0) 3.2 b	(8.9) 3.1 bc	(9.3) 3.1 b	(19.3) bc	(19.3) ab	(19.1) a	(6.4) 2.5 a	(18.4) b	(20.8) bcd
10.S/F.1.5%	(19.6) a	(11.8) 3.4 b	(9.6) 3.2 bc	(17.0) 4.1 d	(26.4) d	(26.4) d	(26.4) a	(8.3) 2.9 a	(20.9) b	(23.6) d
11.S/F.2.5%	(20.5) a	(7.9) 2.7 ab	(9.6) 3.2 bc	(12.0) 3.3 bc	(19.9) bc	(19.9) abc	(19.9) a	(6.7) 2.6 a	(20.1) b	(19.5) bcd
12.S/F. 5%	(21.2) a	(9.5) 3.1 b	(13.5) 3.8 bc	(9.4) 3.0 b	(22.0) bcd	(22.0) abc	(22.0) a	(7.5) 2.7 a	(19.1) b	(20.3) bcd
13.Karate 5%EC	(20.0) a	(1.9) 1.4 a	(1.3) 1.4 a	(4.5) 2.3 a	(12.6) a	(18.7) a	(20.3) a	(13.5) 3.5 a	(11.8) a	(6.4) a
14. UTC	(20.3) a	(10.4) 3.2 b	(16.7) 4.2 c	(24.8) 4.2 e	(32.3) e	(32.3) d	(32.3) b	(9.3) 3.0 a	(39.4) c	(33.0) e
SE±	1.9	0.5	0.3	0.2	1.3	1.1	1.2	0.4	1.4	2.1
CV%	15.9	26.5	16.9	9.5	10.7	8.5	9.0	23.2	12.0	8.8

Table (1) Cont.

Treatments	**Pre 3rd spray**	**1st Post 3rd spray**	**2nd Post 3rd spray**	**Pre 4th spray**	**1st Post 4th spray**	**2nd Post 4th spray √ x**	**3rd Post 4th spray**	**4th Post 4th spray**	**5th Post 4th Spray √ x+1**
1.Ses1.5	(22.9) a	(16.7) cd	(24.8) e	(24.8) b	(7.0) abcd	(12.2) 3.5 defg	(4.6) a	(3.7) ab	(2.3) 1.7 ab
2.Ses.2.5	(23.2) a	(14.0) cd	(22.9) de	(22.9) b	(4.5) abc	(10.0) 3.2 bcde	(3.6) a	(3.1) ab	(2.3) 1.8 abc
3.Ses.5%	(19.4) a	(9.6) ab	(15.3) bcde	(20.7) b	(3.2) a	(7.5) 4.2 b	(3.5) a	(3.4) ab	(1.8) 1.7 ab
4.Cott.1.5 %	(23.0) a	(16.2) cd	(24.6) bcde	(24.6) b	(7.0) abcd	(10.1) 3.2 bcde	(4.4) a	(4.2) abc	(2.9) 1.9 bc
5.Cott.2.5%	(32.7) a	(15.9) cd	(18.9) bc	(20.1) b	(6.4) abc	(11.9) 3.4 defg	(3.7) a	(3.9) abc	(2.2) 1.7 ab
6.Cott 5%	(22.8) a	(13.0) bc	(15.3) cde	(23.1) b	(8.5) cd	(9.0) 3.0 bcd	(3.2) a	(3.9) abc	(2.3) 1.8 abc
7.G/N1.%	(25.0) a	(17.9) d	(21.3) cde	(21.3) b	(5.2) abc	(14.7) 3.8 fg	(4.7) a	(4.0) abc	(2.8) 2.0 bc
8.G/N2.%	(19.2) a	(17.1) d	(21.2) bcde	(21.2) b	(5.7) abc	(10.5) 3.2 bcde	(4.0) a	(4.7) bc	(2.0)1.7 ab
9. G/N %	(20.8) a	(14.7) cd	(20.5) bcde	(20.5) b	(4.3) ab	(9.4) 3.1 bcde	(4.9) a	(3.0) ab	(2.0) 1.7 ab
10.S/F. %	(23.6) a	(17.5) d	(20.7) de	(20.7) b	(7.3) bcd	(11.4) 3.4 cdef	(4.4) a	(2.9) ab	(2.7) 1.9 bc
11.S/F. %	(19.5) a	(14.4) cd	(23.4) bcd	(23.4) b	(6.6) abcd	(13.3) 3.6 efg	(4.7) a	(3.8) ab	(1.8) 1.7 ab
12.S/F%	(20.3) a	(14.6) cd	(18.4) de	(24.5) b	(6.0) abc	(7.2) 2.7 b	(3.6) a	(3.5) ab	(2.0) 1.7 ab
13Karate 5%EC	(21.9) a	(6.5) a	(8.5) bcd	(14.5) a	(3.1) a	(4.3) 2.1 a	(3.5) a	(2.4) a	(1.0) 1.4 a
14. UTC	(33.0) b	(46.8) e	(33.2) a	(33.2) c	(10.6)	(16.1) g	(7.3) b	(6.0) c	(4.3) 2.3 c
SE±	2.1	1.1	1.7	1.8	1.2	0.2	0.6	0.6	0.1
CV%	16.5	12.0	14.5	13.6	33.1	9.8	25.4	29.4	13.6

- **Actual figures in parenthesis**
- **Data transformed to** $\sqrt{x}$

Table (2): Percentage mortality (%M) and general performance (G.P) on season 2006/07

Treatments	**%M.**	**G.P 1st spray counts**	**%M.**	**G.P 2nd spray counts**	**%M.**	**G.P 3rd spray counts**	**%M.**	**G.P.T.**
1.Ses. 1.5%	(36.3) 32.3 b	(18.3) cd	(52.0) 46.3	(18.3) def	(26.3) 30.8 bcd	(19.0) de	(71.7) 57.9 ab	(15.7) fg
2.Ses. 2.5%	(48.3) 43.8 ab	(17.0) bcd	(58.3) 50.0	(18.0) cdef	(39.7) 39.0 abcd	(18.0) cde	(80.3) 63.8 ab	(14.3) cdefg
3.Ses. 5%	(54.0) 47.3 ab	(15.3) bc	(64.3) 53.4	(15.7) bcd	(51.0) 45.6 ab	(15.3) b	(85.0) 67.4 a	(12.0) b
4. Cott.1.5%	(33.3) 30.6 b	(19.7) d	(51.3) 46.0	(19.3) f	(29.3) 32.6 bcd	(20.0) e	(71.7) 58.0 ab	(16.0) g
5. Cott.2.5%	(41.3) 40.0 b	(17.3) bcd	(51.0) 45.3	(17.3) bcdef	(33.0) 34.9 bcd	(17.3) bcd	(67.7) 55.5 ab	(14.3) cdefg
6. Cott.5%	(50.0) 45.9 ab	(15.7) bc	(37.0) 35.8	(16.3) bcde	(42.3) 40.5 abc	(16.0) bc	(60.0) 53.0 b	(13.3) bcd
7. G/N.1.5%	(51.0) 46.1 ab	(17.7) bcd	(62.7) 52.8	(18.7) ef	(28.3) 32.1 bcd	(18.7) de	(75.3) 60.6 ab	(15.3) efg
8. G/N.2.5%	(63.3) 53.1 ab	(17.3) bcd	(69.0) 56.4	(17.0) bcdef	(15.0) 22.2 cd	(17.7) cde	(71.7) 58.0 ab	(14.3) cdefg
9. G/N. 5%	(55.3) 48.4 ab	(14.7) ab	(67.7) 55.5	(15.0) b	(27.0) 27.1 bcd	(16.0) bc	(79.7) 63.1 ab	(13.0) bc
10.S/F.1.5%	(40.3) 39.2 b	(19.7) d	(67.0) 55.3	(19.3) f	(24.3) 29.0	(19.0) de	(65.0) 53.8 b	(15.0) defg

					bcd			
11.S/F.2.5%	(60.3) 52.2 ab	(15.0) ab	(66.3) 54.6	(15.3) bc	(22.3) 26.2 bcd	(16.3) bc	(70.3) 57.9 ab	(14.0) cdef
12 S/F. 5%	(54.3) 47.6 ab	(16.3) bc	(65.7) 54.3	(16.7) bcdef	(27.0) 30.0 bcd	(17.3) bcd	(75.7) 60.5 ab	(13.7) bcde
13. Karate5% EC	(90.7) 72.6 a	(10.3) a	(36.3) 32.5	(11.7) a	(69.7) 57.0 a	(11.3) a	(77.0) 62.2 ab	(9.0) a
14 . UTC	(50.0) 45.1 ab	(25.0) e	(44.3) 41.7	(26.3) g	(0.0) 1.8	(28.7) f	(67.7) 55.4 ab	(23.3) h
SE±	9.0	0.9	7.9	0.8	6.0	0.7	3.8	0.5
CV%	33.4	9.3	28.1	8.3	33.6	6.5	11.3	6.3

- **Actual figures in parenthesis**
- **Data transformed to** $\sqrt{x}$

Table (3): Effects of some oils and Karate on thrips population (season 2007/08). Mean No. of thrips / 5 plants.

Treatments	**Pre1st spray**	**1st Post1st spray √ x**	**Pre-2nd spray**	**1st Post 2nd spray √x**	**Pre-3rd spray**	**1st Post 3rd spray**	**Pre-4th spray**	**1st Post 4th spray √ x**
1. Ses.1.5%	(20.3) a	(11.0) 3.3 bc	(19.7) abc	(11.7) 3.4 ab	(21.3) ab	(17.0) b	(21.3) b	(11.3) 3.4 bcd
2. Ses.2.5%	(21.3) a	(9.3) 3.1 b	(21.7) bc	(8.0) 2.8 ab	(21.0) ab	(18.0) b	(20.3) ab	(11.3) 3.4 bcd
3. Ses. 5%	(22.3) a	(11.3) 3.4 bc	(19.7) abc	(9.7) 3.1 ab	(21.0) ab	(17.7) b	(20.3) ab	(7.0) 2.6 a
4. Cott.1.5%	(23.0) a	(17.3) 4.2 bc	(20.0) abc	(12.0) 3.5 ab	(21.3) ab	(17.3) b	(20.3) ab	(13.0) 3.6 cd
5. Cott.2.5%	(21.7) a	(13.7) 3.7 bc	(22.0) c	(14.0) 3.7 ab	(19.3) a	(17.3) b	(21.0) ab	(10.7) 3.3 bcd
6. Cott. 5%	(22.3) a	(10.7) 3.2 b	(20.7) abc	(17.3) 3.8 b	(20.3) ab	(16.7) b	(20.7) ab	(8.0) 2.8 ab
7. G/N1.5%	(21.3) a	(10.3) 3.1 b	(21.3) abc	(14.3) 3.8 b	(21.3) ab	(17.0) b	(20.7) ab	(12.7) 3.6 cd
8. G/N2.5%	(23.3) a	(9.7) 3.1 b	(21.7) bc	(13.3) 3.6 ab	(20.7) ab	(17.0) b	(20.7) ab	(14.0) 3.7 d
9. G/N 5%	(21.7) a	(12.3) 3.4 bc	(20.7) abc	(13.0) 3.6 ab	(23.3) b	(15.7) b	(21.0) ab	(11.0) 3.3 bcd
10.S/F.1.5%	(22.3) a	(11.0) 3.3 bc	(21.3) abc	(15.0) 3.9 b	(21.7) ab	(18.3) b	(21.0) ab	(12.0) 3.5 bcd
11.S/F.2.5%	(20.3) a	(12.3) 3.5 bc	(19.3) abc	(16.0) 4.0 b	(21.7) ab	(17.7) b	(22.3) b	(12.7) 3.6 cd
12.S/F.5%	(19.0) a	(15.3) 3.9 bc	(20.0) abc	(9.7) 3.1 ab	(21.0) ab	(18.0) b	(21.3) b	(9.3) 3.0 abc
13. Karate5%EC	(22.7) a	(3.3) 1.8 a	(19.0) a	(6.3) 2.5 a	(20.3) ab	(9.7) a	(20.3) b	(13.0) 3.6 cd
14 . UTC	(22.0) a	(19.7) 4.4 c	(24.7) d	(32.3) 4.4 c	(35.7) c	(52.0) c	(60.0) c	(47.7) 6.9 e
SE±	1.6	0.4	0.78	0.36	1.2	1.4	0.6	0.2
CV%	12.6	18.5	6.5	17.3	9.1	13.0	4.7	9.6

- **Actual figures in parenthesis**
- **Data transformed to** $\sqrt{x}$

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Table (4): Percentage mortality (%M) and general performance (G.P), season 2007/08

Treatments	**%M.**	**G.P 1st spray counts**	**%M.**	**G.P 2nd spra counts**	**%M.**	**G.P 3rd spray counts**	**%M.**	**G.P.T.**
1.Ses. 1.5%	(70.3) 58.1 ab	(14.0) bcd	(42.0) 40.3 abc	(14.3) bcde	(10.7) 16.0 d	(15.3) bcd	(54.3) 47.6 abc	(15.0) cde
2.Ses. 2.5%	(41.0) 39.6 b	(13.3) bcd	(65.3) 48.7 ab	(13.7) bc	(29.7) 33.0 abc	(15.0) bcd	(55.0) 47.9 abc	(14.0) bc
3.Ses. 5%	(53.7) 47.2 abcd	(12.3) b	(47.0) 43.3 abc	(12.7) b	(29.7) 33.0 abc	(14.0) b	(60.0) 50.8 ab	(13.0) ab
4. Cott.1.5%	(25.7) 30.2 e	(16.0) d	(36.0) 36.8 abc	(15.7) de	(16.0) 20.1 cd	(16.0) bcd	(44.0) 42.0 abcd	(15.7) de
5. Cott.2.5%	(27.7) 31.7 de	(15.7) d	(29.7) 32.9 bcd	(15.3) cde	(33.7) 35.3 ab	(15.7) bcd	(43.7) 41.3 abcd	(15.0) cde
6. Cott.5%	(63.3) 53.1 abc	(12.7) bc	(42.3) 40.3 abc	(14.0) bcde	(39.0) 38.2 ab	(14.7) bc	(61.7) 51.8 a	(13.7) bc
7. G/N.1.5%	(46.7) 43.0 ab	(14.0) bcd	(30.3) 32.6 cd	(14.7) cde	(31.0) 33.6 ab	(15.7) bcd	(53.3) 47.0 abc	(15.0) cde
8. G/N.2.5%	(60.0) 50.8 ab	(15.3) cd	(34.7) 36.0 abc	(15.3) cde	(20.3) 26.7 bcd	(16.0) bcd	(43.7) 41.3 abcd	(16.0) e
9. G/N. 5%	(46.7) 43.1 bcd	(13.7) bcd	(42.3) 40.4 abc	(14.7) cde	(23.7) 28.8 abcd	(15.3) bcd	(58.0) 49.6 ab	(14.3) bcd
10.S/F.1.5%	(37.0) 37.4 cde	(14.7) bcd	(31.3) 34.1	(15.7) de	(34.0) 35.2 ab	(16.7) cd	(42.7) 40.8	(15.7) de

			bcd				bcd	
11.S/F.2.5%	(44.0) 41.5 bcde	(14.7) bcd	(17.3) 20.2 d	(16.0) e	(27.7) 31.7 abc	(17.0) d	(46.7) 43.6 abc	(16.0) e
12 S/F. 5%	(24.3) 29.2 e	(14.7) bcd	(32.3) 34.5 abcd	(14.7) cde	(32.7) 34.8 ab	(15.7) bcd	(61.3) 51.6 ab	(14.7) cde
13. Karate5% EC	(77.3) 62.4 a	(8.0) a	(59.3) 50.4 a	(9.3) a	(43.3) 41.8 a	(10.3) a	(39.3) 38.7 cd	(11.7) a
14 . UTC	(0.0) 1.8 f	(22.7) e	(0.0) 1.8 e	(26.7) f	(0.0) 1.8 e	(34.7) e	(39.0) 38.6 cd	(38.3) f
	4.9	0.9	4.7	0.6	4.2	0.6	3.2	0.5
CV%	20.6	10.3	22.6	6.5	24.2	6.2	12.6	4.8

- **Actual figures in parenthesis**
- **Data transformed to** $\sqrt{x}$

4. CONCLUSION

The results of this study demonstrated the effectiveness of the botanical oils such as sesame oil, cotton seed oil, groundnut oil and sunflower oil for the control of onion thrips. From the results obtained it can be concluded that :

1- There was a considerable variation between the insecticide Karate and oils treatments as to thrips control.

2- Karate exhibited an outstanding performance in the pest suppression.

3- Oil treatments potential of efficacy was only expressed at the higher concentration rates (5.0 %)

4- During this study, it was noticed that sesame oil was more effective in controlling onion thrips.

5- These results demonstrated that the oil sprays decreased the onion thrips population density for two weeks after spray. So, it is suggested that this protection period could be increased if the oils spray is supplemented by chemical such as Karate used with low dosage rate. The emulsion oil / water / insecticide such as Karate with low dose must be applied when weather conditions are suitable

It is well known that pesticides in general are extremely hazardous and very expensive particularly in developing countries. It is therefore, possible to mitigate the pest menace and reduce damage through disseminating the culture and adoption of the use of non – chemical measures to combat these pests, particularly in food crops.

This study laid a base line information of using such oils and other products of plant origin to control insect pests on other vegetable and edible crops.

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