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PERFORMANCE OF SOME SPRAYERS USED FOR SPRAYING DIFFERENT INSECTICIDES ONION AGAINST THRIPS INFESTING AND GARLIC PLANTS

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ABSTRACT: The effectivness of jojoba oil [(plant extract) (El-Kanze 2000), polo (diafenthiuron) and cyanox (cyanophos), applied at the recommended rate (1 R) and 3/4 recommended rate (3/4 R) on onion and garlic plants using four types of spraying volumes L./fad., knapsack sprayer (CP-3) was connected with nozzle Tx-6 on hand lance at 35 l./fed., and nozzle flat fan E04-80 at 110 l./fed., knapsack motor sprayer (Kubota) at 95 (l./fed.) and conventional sprayer 300 (l./fed.) at Shiba village Sharkia Governorate during 2004-2005 season.

The obtained results revealed that knapsack sprayer (CP-3) connected with nozzle TX-6 recorded a highest insecticidal efficiency for adults and nymphs of *Thrips tabaci* comparing to other sprayer for each three tested insecticides. This is due to the small size droplets which causes an improved coverage on the all sides of plant and interleaves and gave best distribution.

Its also, data showed that there were significant differences between the efficiency of (1R) and (3/4 R) on each tested insecticides in each tested type of sprayer. So, *Thrips tabaci* could be controlled at 3/4 R of each tested insecticide by using nozzle TX-6 on hand lance with knapsack sprayer to diminish the hazards and accumulation in the environment.

Key wards: Jojoba, sprayer, nozzle, coverage, hazards.

INTRODUCTION

Thrips tabaci (Lind.) is a serious pest affecting onion and garlic crops in Egypt, therefore, the chemical contr-ol through IPM programme is necessary to reduce the annu-al losses in crops caused by this insect. Effectiveness of insecticides is not only dep-endes on the material used, but also on other factors such as application technology, ex-act time of application, rate of application, weather condition and the sound method of pesticide to places where the pest is present within certain limits, smallest droplet the better is the actual efficacy. Accordingly, the application methods of pesticide has decisive influence on the pesticidal action against the target pest. Moreover measu-res among to minimizing drift or dropping the sprayed droplets during application are highly required economically and environmentally El-Gendy (2000).

For insecticide applications, spray droplet size is important for insect control, when small droplets are applied, ensuring the arrival and homogenous coverage of the spraying solution to the places inhibits the immature stages of the thrips which ensconced between internal leaves. Many efforts have been directed toward determ-ining droplet size effect on insect control affecting row crops *Wofford et al.* (1987).

MATERIALS AND METHODS

Field experiments were carried out at Shiba village Sharkia Governorate, Egypt. Onion variety Giza and garlic variety Balady were sown at November 1st 2004 in six feddans area, small plots of one kerate 175 m^2 each (10.0 x 17.5 m.) with 18 rows were used. Three ground sprayers commonly used for pesticides application were selected to perform the scope of this research. The insecticides were jojoba oil at rate of one liter (L)/100 L water, cyan-ophos [(cyanox) 50% E.C.] at rate 200 ml/100 L water and diafenthiuron (polo) 50% SC. at rate 100ml/100 L water. The insecticides were applied at recommended and 3/4 recommended rates. Each block contains untreated polt as control. Spray started at 30/12/2004, experiment was carried out by examining ten plants taken randomly from each plot and count numbers of adults and nymphs of

Thrips tabaci, pre-spray and 2, 5, 8, 11 and 14 days after spray. Initial effect (2 days after spray) and residual effect (means of 5, 8, 11 and 14 days after spray) was calculated according to *Henderson and Tilton* equation (1955). Spray coverage on onion and garlic plants and wire holder, targets as produced by four different spraying volumes and three tested insecticides against *Thrips tabaci* were showed in Table 3 and 5. Each treatment was replicated three times, thus comprising 145 plots

Treatments were arran-ged in a randomized complete block design. Knapsack sprayer (CP-3) was connected with nozzle Tx-6 on hand lance at 35 l/fed., knapsack sprayer (CP-3) was connected with nozzle flat fan E04-80 at 110 l/fed., pneumatic knapsa-ck motor sprayer (Kubota) at 95 l/fed., and conventional sprayer at 300 l/fed. were tested. The technical data and sprayer parameters of the tested ground spraying equip-ments used are illustrated in Table 1. Water sensitive paper size 26 ×76 mm. deve-loped by *Ciba Geigy* were hanged on clover seedlings and on ground selected in parallel position to the ground wire collectors (Hindy 1992) at about one meter between two adjusted seeding in order to estimate the spray lost on the ground between plants. All necessary corrections and calculation connected with such technique of measurem-ents and determination of droplets were conducted acc-ording to *Anonymous* (1978). Sizing of droplets is a nece-ssary and frequent routine procedure for the assessment of agricultural spray applicat-ions (*Johnstone and Huntington* 1970). The spread factor of used sensitive paper was 2.2 (*Ciba Geigy*1990).

RESULTS AND DISCUSSION

The initial, residual and total effect of two rates of tested pesticides; jojoba oil, diafenthiuron 50% Sc and cyanophos 50 % at two sprays on adults and larvae of *Thrips tabaci* on onion and garlic plants using four techniques of spraying is summarized as follows:-

a) Onion Plants

Data in Table 2 show the effect of tested compo-unds after 48 hours from spraying (initial effect), the results indicated that there were significant differences between two rates (1R and 3/4 R) of each tested insecticide when applied with hydraulic sprayer

Table 1: Technical specifications of the spraying techniques applied on onion and garlic plants

Item	Knapsack motor sprayer (Kubota)	CP-3 sprayer		Conventi - onal sprayer	Conditions
Pressure source	Pneumatic	Hydraulic		Hydraulic	-
Nozzle type	-	Solid cone	Flat fan	Hollow cone	-
Nozzle serial nr.	-	Tx-6	E04-80	Local	-
Number of nozzle	1	1	1	1	-
Pressure (kg/cm)	-	1-3	1-3	2.06	Mean
Tank capacity (L)	20	20	20	16	Useful
Spray volume (l/fed.)	95	35	110	300	-
Working speed (km/h)	2.4	All treatments		-	Mean ±5%
Swath width (m)	1.0	1.0	1.0	0.75	Effective
Spray hight (m)	0.50	All treatments			Mean
Flow rate (l/min)	0.900	0.235	1.050	2.16	
Spraying technique	Target all treatment				
Speed of accelerator	Full power speed for all treatments				
Productivity (fed./h)	0.6	0.6	0.6	0.4	Working

Table 2 : Percentage reductions of thrips infestation on onion plants as affected by the type of insecticides and different application techniques tested during season 2004-2005

Insecticides	Spraying volume (l/fed.)	Rate of application	First spray			Second spray			General effect of two sprays
			Initial effect	Mean of residual	Total effect	Initial effect	Mean of residual	Total effect	
Jojoba	95	1R	64.97 c	55.87 ef	54.09de	37.99fghi	63.94cd	58.75cde	56.42 de
		3/4R	22.10 i	29.13 n	27.73 o	34.96hij	68.73 b	61.98 bc	44.68 h
	35	1R	67.76 a	75.42 a	73.88 a	69.46a	88.86 a	84.98 a	79.43 a
		3/4R	56.16 b	57.04 e	55.86 cd	43.37 def	66.96 bc	62.29 b	59.58 bc
	110	1R	45.72 c	49.64 gh	48.86 fg	27.05 l	55.61 h	49.89 hi	49.38 f
		3/4R	34.16 ef	42.34 ijk	40.70 ijkl	27.9 l	26.63 m	26.88 n	33.79 m
	300	1R	67.33 a	65.98 cd	66.25 b	44.24 cd	57.8de	55.09 ef	60.67 b
		3/4R	19.82 i	34.76 lm	31.77 n	34.23ij	47.12 j	44.54 kl	38.16 kl
Cyanophos	95	1R	32.274fg	33.15 mn	32.95 mn	53.94 b	41.18k	43.74 l	38.35 kl
		3/4R	26.95 gh	30.83 ml	37.69kl	35.47 ghij	36.8 l	36.53 m	37.11 l
	35	1R	40.18.d	62.63 d	58.14cd	39.3 efgh	65.17gh	52.79gh	55.47 e
		3/4R	30.25 fgh	54.06 efg	49.39fg	21.52m	37.01 l	33.91 m	41.65 i
	110	1R	35.25 fgh	38.65 kl	37.97kl	42.56 cde	56.39 h	53.62 hj	45.8 h
		3/4R	27.56 gh	45.57 hi	41.96hijk	27.2 l	39.26 kl	36.85 m	39.41 jk
	300	1R	37.99 de	54.0 efg	50.79 ef	39.9 defg	48.52 j	46.79 jk	48.79 fg
		3/4R	26.01 h	42.18 ijk	38.96 kl	21.87 m	38.73 l	35.36 m	37.16 kl
Diafenthiuron	95	1R	12.05 jk	72.31 ab	60.34 c	29.85 kl	63.93 ed	57.11 de	58.73 bcd
		3/4R	10.36 j	64.39 hi	39.19 jkl	9.42 n	60.05 ef	49.92 hi	44.56 h
	35	1R	30.0 fgh	68.77 bc	61.02c	45.19 c	63.58 d	59.90 bcd	60.46 b
		3/4R	13.76 j	53.23 efg	45.33 gh	33.07 jk	51.33 i	47.68 ij	46.51 gh
	110	1R	8.13 jk	52.27 fg	43.44 hij	32.5 jk	58.98 efg	53.68 fg	48.56 fg
		3/4R	7.09 jk	44.2 ij	36.77 lm	25.49lm	64.96 j	42.67 l	39.72 ij
	300	1R	12.47 k	72.19 ab	60.3 c	50.86 b	57.33 fgh	56.04 ef	58.17 cd
		3/4R	7.65 k	51.35 fg	44.61 hi	36.35 fghij	46.16 j	44.07 kl	44.09 hj
L.S.D.			5.115	4.109	4.007	4.021	2.966	2.810	2.359

(CP-3) which connected with nozzle Tx-6 on hand lance at 35 l/fed. and the other methods of sprayers except diafen-thiuron.

Concerning the initial effect, the results revealed that jojoba oil and cyanophos were more effective than diafenthiuron compound. The three tested compounds recorded 67.76, 56.16, 40.18, and 30.25, 30.0 and 13.76 % reduction in infestaion for the 1st spray while during the 2nd one recorded 69.46, 43.37, 39.3, 21.52, 45.19 and 33.07% reduction in infest-aion respectively.

Concerning the residual effect, the results revealed that, jojoba oil at full recommended rate (1R) was gave highest effect when sprayed with nozzle Tx-6 (75.42 and 88.86 % reduction) while jojoba when applied with conventional sprayer at 3/4 R rate gave lowest effect (29.13%) after 1st spray and gave 26.63% reduction when sprayed with flat fan nozzle after 2nd spray comparing with others.

The tested insecticides for two rates at four methods of sprayers could be arranged according to their general effect on *Thrips tabaci* in descending order to three groups as follows : High effect group [(jojoba-1R-Tx-6 nozzle) , (jojoba-1 R-motor sprayer) ; (diafenthiuron-1R-Tx-6 nozzle), (diafenthiuron-1 R-flat fan nozzle), (jojoba-3/4 R- Tx 6 nozzle) and (diafenthiuron-1R-motor sprayer)], its recorded 79.43, 62.03, 60.46, 59.58, 58.73 and 58.17 % reduction respectively.

In general CP-3 sprayer connected with nozzle Tx-6 on hand lance at 35 l./fed. spray volume recorded a high insecticidal efficiency for adult and nymphs of *Thrips tabaci* comparing to other sprayers. This is may can be attributed to the lowest volu-me of (VMD) and highest spray deposion (No/cm^2) which obtained under the mentioned technique with all pesticides in comparison to other ones (Table 3) , and that may be enable the droplets of move early and reach to all portions of the plant and that means best distribution and good coverge. The median diameter (VMD) in Table 3 were 130, 135 and 133 μ and droplet number(N), N/cm^2, 165, 185, 110 μ /cm^{2}for cyano-phos, jojoba and diafenthiuron, respectively which causes an improved coverage on the all sides of plants & interleaves and gave best distribution.

It may be clear that tested insecticides could be applied at the recommended rate in CP-3 sprayer connected with nozzle Tx-6 on

Table 3 : Spray coverage on onion plant ,wire holder and contamination of applicator, targets as produced under different spraying volumes and three insecticides against *Thrips tabaci*

Insecticides	Equipment	Knapsack motor sprayer (Kubota)						CP-3 TX-6 nozzle						CP-3 Flat fan nozzle (E04-80)						Conventional sprayer					
	Spraying volume (l/fed)	95						35						110						300					
	Rate of application	Recommended			3/4 Recommended			Recommended			3/4 Recommended			Recommended			3/4 Recommended			Recommended			3/4 Recommended		
	Droplet spectrum / Target &position	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%
Jojoba	Onion Plants	165	81	81.0	157	73	82.0	135	185	76.4	135	171	76.3	235	61	57	229	65	55.1	655	14	32.6	654	15	32.0
	Wire holder	161	13	13.0	163	12	13.5	130	51	21.1	140	47	20.9	208	43	40.2	201	48	40.7	615	15	34.8	615	16	34.0
	Contamination of applicator	150	6	6.0	151	4	4.5	127	6	2..5	113	6	2.8	185	3	2.8	171	5	4.2	501	14	32.6	497	16	34.0
Cyanop h or	Onion plants	157	95	77.8	159	97	76.5	130	165	69.9	129	160	68.4	205	97	58.8	200	103	63.2	650	15	30.6	647	17	32.7
	Wire holder	153	18	14.7	151	17	13.9	126	67	28.4	123	64	27.4	163	55	33.3	173	49	30.1	611	17	34.7	608	18	34.8
	Contamination of applicator	147	9	7.5	149	8	6.6	76	4	1.7	37	10	4.2	137	13	7.9	142	11	6.7	500	17	34.7	506	17	32.7
Diafenthiuron	Onion Plants	164	83	79.0	161	87	77.6	133	110	68.8	131	97	83.6	206	75	55.1	197	81	55.1	651	16	34.8	650	17	35.4
	Wire holder	159	15	14.3	154	17	15.2	129	45	28.1	111	13	11.2	170	52	38.2	169	57	38.8	612	15	32.6	600	15	31.2
	Contamination of applicator	153	7	6.7	150	8	7.2	80	5	3.1	90	6	5.2	153	9	6.7	153	9	6.1	495	15	32.6	500	16	33.4

VMD = volume median diameter N/cm² = droplet numbers/cm² %No. = percentage number of droplets

hand lance at 35 l/fad. spray volume to diminish the hazards and accumulation in the environment.

These results are in agreement with those obtained by *Forde and salt* (1978), they reported that the effectiveness of an insecticide will depends on the efficiency of transfer of the active ingredient from nozzle to the plant surface and the efficiency of transfer from that surface to the target insect. The influence of gravity can be modified to assists this process by adjusting the size of the spray droplets and the density of the carrier. Although penetration and deposition on upward and downward surface can be increased by the use of air-assisted sprayer. The limitation imposed by gravity and wind restrick the use of fine droplets (< 80 μm) which might provide more effective treatment once retained on the plant. These results are in agreement with those obtained also by *Hofman* (1991), *Emara et al.* (1995) and *Ammar* (2003).

b) Garlic Plants

Data presented in Table 4 show the effectiveness of three tested compounds against onion thrips, *Thrips tabaci* infestation during two successive sprays.

After 1st spray, statistical interpretation of the data indicated that the recommended rate of jojoba sprayed with nozzleTx-6 exceeded of all rest tested compounds sprayed with other sprayers, it was reduced population reduction 77.51 % as a initial effect, while 3/4 R of polo which sprayed by CP-3 sprayer was connected with flat fan nozzle E04-80 was the last one (12.25%). The other compounds were arranged between them.

On the other hand, diafenthiuron(1R) was more effective as a residual insecticide when sprayed by CP-3 sprayer was connected with nozzle Tx-6 (84.22%).

After 2nd spray, the initial effect (after 2 days) of tested materials could be grouped into two categories according to their efficacy in checking the population of *Thrips tabaci* nymphs and adults. The first category included the most effective materials being jojoba when sprayed with four method of sprayers and diafenthiuron (1R) when sprayed with nozzle Tx-6 and motor sprayer. The second category occupied the next position as to its effectiveness and included cyanophos at all sprayer methods and diafenthiuron (3/4R)when sprayed with nozzle Tx-6. As a

Table 4: Percent reductions of thrips infestation on garlic plants as affected by the type of insecticides and different application techniques tested during season 2004-2005

Insecticides	Spraying volume (l/fed.)	Rate of application	First spray			Second spray			General effect of two sprays
			Initial effect	Mean of residual	Total effect	Initial effect	Mean of residual	Total effect	
Jojoba	95	1R	59.11 b	75.13 bcde	71.92	69.97 a	60.92 d	62.73 c	67.33 b
		3/4R	41.73 de	57.89 gh	54.66 fgh	51.36 d	67.87	64.57 c	59.62 def
	35	1R	77.51 a	68.05 cde	69.94 a	69.41 a	82.17 a	79.62 a	74.78 a
		3/4R	60.44 b	72.23 bc	69.87 a	65.33 b	57.63 e	59.17 d	64.52 bc
	110	1R	44.8 cd	70.31 bcde	65.21 b	37.38 e	55.63 ef	52.0 e	58.61 def
		3/4R	36.0 gh	50.67 ij	47.74 ij	23.2 h	42.42 j	38.6 kl	43.17 klm
	300	1R	58.6 b	66.77 cdef	65.14 b	58.4 c	73.31 b	70.33 b	67.74 b
		3/4R	38.67 efg	56.77 hi	53.15 gh	15.1 jk	39.95i	34.98 m	44.07 kl
Cyanophos	95	1R	47.1 c	67.57cdef	63.48 bc	31.57 f	64.77 gh	43.73 ij	53.60 ghi
		3/4R	33.09 hi	67.33 cdef	60.48 cd	22.0 i	54.41 f	47.93 fg	54.21 gh
	35	1R	40.2 ef	69.98 bcde	64.02 bc	36.63 e	53.76 f	50.37 ef	57.2 efg
		3/4R	34.29 hi	62.20fg	56.61 defg	27.2 g	48.35 g	44.12 hij	50.37 ij
	110	1R	36.75 fgh	72.65 bc	65.47 b	16.8 j	17.45 m	17.32 p	41.4 klm
		3/4R	33.09 hi	60.47 gh	54.39 efgh	12.64 kl	26.95 l	24.09 o	39.54 m
	300	1R	53.22 b	74.33 b	70.1 a	27.2 g	54.14 h	41.55jk	55.83 fgh
		3/4R	34.29 hi	66.36 def	59.94 cd	25.12 gh	41.15 i	37.94 lm	48.96 j
Diafenthiuron	95	1R	31.0 ij	65.98 ef	58.98 de	13.02 kl	47.09 gh	40.28 kl	49.63 j
		3/4R	19.5 l	58.77 gh	50.92hi	7.09 m	46.84 gh	38.89 kl	44.91 k
	35	1R	25.17 k	84.22 a	72.41 a	5.71 mn	57.63 e	47.24 fgh	59.83 de
		3/4R	17.2 l	71.3 bcde	60.48 cd	4.32 mn	33.33 j	27.53 h	44.01 klm
	110	1R	18.73 l	51.52ij	44.96 j	10.86 l	41.56 i	35.42 m	40.19 lm
		3/4R	12.25 m	76.31 j	39.5 k	3.8 h	30.7 k	25.32 no	32.41 n
	300	1R	27.71 jk	72.54 bc def	63.57 bc	17.84 ij	72.38 b	61.47 d	62.52 cd
		3/4R	15.08 m	68.53 bcde	57.84 def	10.34 l	55.32 ef	46.32 ghj	52.08 hij
L.S.D.			3.562	5.064	3.776	2.681	2.415	2.997	3.521

general effect of two sprays, it appears that, jojoba when sprayed with nozzle Tx-6 gave the highest effect (74.78%) then jojoba when sprayed with conventional sprayer (67.33%), jojoba (1R) sprayed with motor sprayer (67.74%) and nozzle Tx-6 (64.52%). The last effective one was diafenthiuron(3/4R) when sprayed with nozzle flat fan (E04-80).

c) Spray Coverage on Onion and Garlic Plants and Artificial Targets as Produced by CP-3, Kubota and Conventional Sprayers

The efficiency of the tested techniques was evaluated quantitatively with the knowledge of deposited spectrum of droplets on onion plants. The CP-3 sprayer with two different nozzles Tx-6 nozzle and flat fan nozzle E04-80, fixed rotary disc mounted on knapsack motor sprayer (Kubota) and conventional sprayer were used. In general, all the tested spraying techniques gave satisfactory coverage but the best one was sprayed with Tx-6 nozzle which gave volume median diameter (VMD) on onion plants ranged between 130-135 μ/m and N/cm^2 ranged between 110-185 droplet/cm^2 for 1R in Table 3 and on garlic plants ranged between 136-140 μ/cm^2 (VMD) for 1R, 130-136 μ/cm^2 (VMD) for 3/4 R and N/cm^2 118-160, 115-167 drops, respectively (Table 5). However, Kubota motor sprayer at 95 l/fad. gave more or less the best coverage, i.e. 165 μ/cm^2 (VMD) and 81 droplet per squire centimeter on onion plants Table 3 applied with jojoba, while the use on garlic plants Table 5 was 170 μ/cm^2 (VMD) and 87 droplet/cm^2.

d) Contamination of Applicator Outside the Treated Onion and Garlic Field

Data also in Tables 3 and 5 showed that, contamination of applicators was occurred in the care of using knapsack motor sprayer Kubota. VMD ranged between 147 – 153 μ VMD and 4 – 9 droplet/cm^2 on oni-on (Table 3) and 149 – 160 μ VMD and 12 – 8 droplet N/cm^2 on garlic (Table 5), while contamination of applicator was recorded by CP-3 sprayer with connected nozzle Tx-6 (73 – 127 μ/cm^2 only) and 4-6 droplet per cm^2) on onion and (74-130 μm), 7 -13 droplet per cm^2 on garlic.

These results with contamination of the applicators head and legs was detected clearly by means of Kubota sprayer due to the huge amount of air current produced by its atomizer. In case of CP-3 sprayer, slight

Table 5 : Spray coverage on garlic plant ,wire holder and contamination of applicator, targets produced under different spraying volumes and three insecticides against *Thrips tabaci*

Insecticides	Equipment	Knapsack motor sprayer (Kubota)						CP-3 TX-6 nozzle						CP-3 Flat fan nozzle(E04-80)						Conventional sprayer					
	Spraying volume (l/fed)	95						35						110						300					
	Rate of application	Recommended			3/4 Recommended			Recommended			3/4 Recommended			Recommended			3/4 Recommended			Recommended			3/4 Recommended		
	Droplet spectrum / Target &position	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%	VMD µ	N/Cm²	No%
Cyanophos	*	169	93	74.4	167	95	1.36	136	160	68.9	131	167	67.6	221	100	59.2	210	96	57.5	645	11	35.5	640	13	34.2
	**	160	21	16.8	159	23	5.65	129	65	18.0	127	69	27.9	160	56	33.1	180	60	35.9	601	8	27.2	559	13	34.2
	***	151	11	8.8	149	12	10.8	80	7	3.1	78	11	24.2	135	13	7.7	145	11	6.6	550	17	37.3	575	12	31.6
Jojoba	*	170	87	78.3	169	87	1.27	40	142	64.5	136	149	63.7	225	63	55.3	215	65	59.6	650	14	33.3	655	16	32.0
	**	165	15	13.5	163	16	6.93	137	69	31.4	131	72	30.8	180	45	39.5	187	40	36.6	649	13	30.9	648	17	34.0
	***	160	9	5.1	159	8	13.8	130	9	4.1	124	13	.5	175	6	15.2	155	4	3.8	625	15	35.8	630	17	34.0
Diafenthiuron	*	12	90	77.6	170	89	1.32	136	118	63.4	130	115	61.2	215	71	51.4	211	69	53.9	651	18	63.9	635	18	35.3
	**	163	17	14.2	161	19	6.21	130	59	31.7	126	63	33.5	181	56	40.6	183	51	39.8	625	11	23.9	611	17	33.3
	***	159	9	7.7	155	10	11.8	81	9	4.9	74	10	15.3	175	11	8.0	47	8	6.3	525	18	39.3	600	16	31.4

VMD = volume median diameter N/cm² = droplet numbers/cm² % No. = percentage number of droplets

* Garlic plants ** Wire holder *** Contamination of applicator

contamination of the leg region only was observed from environmental point of view it is recommended to use hand sprayer.

These results are in agreement with those obtained by *Scott et al.* (1974), *El-Maghraby* (1979), *Wofford et al.* (1987), *Ammar* (1997) and *El-Maghraby et al.* (1998).

Finally, it can be recommended that, CP-3 spr-ayer when it was connected with nozzleTx-6 on hand lance at 35 l/fad. spray volume is useful in control of *Thrips tabaci* management program in Egypt. Development of management program to both pesticide and sprayer machine would be reasonable approach of control any pest.

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كفاءة بعض آلات الرش المستخدمة فى رش بعض المبيدات الحشرية ضد تربس البصل الذى يصيب كلا من البصل والثوم

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تم تقييم ثلاث مركبات من مجاميع مختلفة وهي الجوجوبا (*Simmondsla chinensis* (Link) (مستخلص نباتي) ومركب السيانوكس (مجموعة مركبات الفوسفور العضوية) ومركب البولو (مجموعة مركبات ثيوبوريا) ضد حشرة التربس التى تصيب نباتات البصل والثوم وذلك من خلال استخدام ثلاث آلات رش مختلفة وهى الرشاشة الظهرية CP-3 مع نوعين من البشابير هما Tx-6 ، (E04-80) والموتور الظهري كوبوتا والرشاشة العادية. وكانت حجوم سائل الرش المستخدمة هي ٣٥ ، ١١٠ ، ٩٥ ، ٣٠٠ لتر/فدان على التوالى وذلك فى قرية شبية مركز الزقازيق - شرقية وقد تم رش المركبات الثلاثة رشتين متعاقبتين باستخدام التركيز الموصي به وثلاث أرباع التركيز الموصي به فى الموسم الزراعي ٢٠٠٤-٢٠٠٥ .

وقد أظهرت الرشاشة الظهرية (CP-3) ذات التشغيل اليدوي كفاءة عالية عند تزويدها بحامل الرش الرمحى المركب عليه البشبوري Tx-6 بحجم رش قدره ٣٥ لتر/فدان نتيجة صغر حجم قطرات الرش وزيادة عددها فى السنتيمتر المربع وبالتالى ثباتها على أوراق نباتي البصل والثوم مع تقليل الفاقد من المبيد على الأرض وعلى جسم العامل القائم بعملية الرش والتىعند استخدمها حقق مركب الجوجوبا على البصل نسبة مئوية لخفض تعداد الحوريات والحشرات الكاملة للتربس تقدر بـ ٧٩,٤٣% ، بينما حقق الجوجوبا باستخدام موتور الرش الظهري انخفاض في التعداد قدره ٦٢,٠٣% كمتوسط اجمالى لتأثير رشتين متعاقبتين .

وعلى الثوم حقق الجوجوبا انخفاض فى النسبة المئوية لتعداد الحوريات والحشرات الكاملة للتربس ٧٤,٧٨% عند استخدام الرشاشة الظهرية CP-3 المزودة بحامل الرش الرمحى المزود بالبشبوري Tx-6 بينما حققت الرشاشة العادية بحجم رش ٣٠٠ لتر/فدان انخفاضا قدرة ٦٧,٧٤% وكان المركبان الاخرين اقل تاثيرا.

كما أظهرت الدراسة أن الموتور الظهري كوبوتا والرشاشة الظهرية CP-3 المزودة بحامل الرش الرمحي المركب عليه البشبورى Tx-6 أعطيا أقل نسبة فاقد بين النباتات وكانت فى البصل ١٤,٧% و ٢٨,٤% وفى الثوم ١٦,٨% و ١٨% ويأتى فى المؤخرة الرشاشة العادية التى اعطت٣٤,٧ % وذلك عند استخدام السيانوكس على البصل بالتركيز الموصى به ، بينما اعطت كلا من الرشاشتين على الثوم ٣,١ % و ٤٧,٣ % على التوالى. ومن جهة أخرى كانت نسبة التلوث على عامل الرش فى حالة الرشاشة العادية أعلاها بينما كانت اقل نسبة تلوث على عامل الرش فى حالة استخدام الرشاشة الظهرية CP-3 المزودة بحامل الرش الرمحي المركب عليه بشبوري Tx-6 .

وبناءا على ما سبق فانه يمكننا التوصية باستخدام المستخلص النباتي الجوجوبا بالتركيز الموصي به وذلك للوصول الى أعلى معدل من الابادة لحشرة تربس البصل وتقليل الفاقد على الأرض من محلول الرش بالإضافة إلى اقل نسبة تلوث تصل الى العامل القائم بعملية الرش وحفاظا على البيئة وذلك ضمن برامج المكافحة المتكاملة للتربس على كلا من البصل والثوم .