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THE EFFECT OF SOME COMMERCIAL BORON COMPUNDS ON THE EMERGENCE OF THE ADULT CAT FLEA *CTENOCEPHALIDES FELIS*

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ABSTRACT

The treatment of cat flea larvae Ctenocephalides felis with dust of boron compounds, Pestex R.X. (Borax), Mop Up (Boric acid), Roach Prufe (Orthoboric acid) and Sodium tetraphenyl borate significantly decreased the adullt emergence at various tested concentrations, (2.6, 6.5., 12.1, 25.2. and 63 mg / in^2). This latent effect increased with the increase of concentration. The tested boron compounds can be arranged according to their effectiveness on the adult emrgence as follows: Roach Prufe, Mop Up, Pestex R.X. and finally sodium tetraphenyl borate. The lowest adult emergence was 0, 1.3, 2.7 and 21.3% respectively at the highest concentration. (63 mg / in^2). This showed that there was no resistance to these compounds for its recent applications. The lasting effect of their liquid preparations were lower than that of dust preparations, indicating that their effect depends on the concentration and method of application. The liquid preparations of Pestex R.X. and Sodium tetraphenyl borate had insignificant effect on the adult emertence at any testd concentration. Whereas the higher concentrations (1 and 2%) exhibited significant effects only for Mop Up and Roach Prufe. The tested compounds can be generally used for controlling cat flea, Ctenocephalides felis with minimum resistance and less hazards to human and household animals.

INTRODUCTION

Borax use in manufacture of glass and soap (Keen *et. al.*, 1976), & Boric acid used for control cockroaches in closed places, (Ebeling, 1971). The cat flea, *Ctenocephalides felis* acquiued resistance against common insecticides, (Fox *et. al.*, 1968), Brawn and Pal, 1971 and El-Gazzar *et. al.*, 1986). The present study aims at determining the effect of various concentrations of commercial compounds of boron, [Mop Up (Boric acid), $B(OH)_3$], Roach Prufe

(Orthoboric acid, $H_3B\ O_3$), Pestex R.X. (Borax, Sodium tetraborate, $Na_2B_4O_7 .\ 10\ H_2O$) and Sodium tetraphenyl borate (Na B $(C_6H_5)_4$) in liquid and dust on the adult emergence of treated cat flea larvae under conditions of 26 ± 1 C° and 75 ± 5% relative humidity.

MATERIALS AND METHODS

The above mentioned commercial compounds were used as dust at concentrations, 2.6, 6.5, 12.1, 25.2 and 63 mg/in^2. Each concentration was thouroghly mixed with 3 gm of larval breeding medium, (Hudson and Prince, 1958) and then added to 25 of the 3 rd larval instars of the cat flea, *Ctenocephalides felis* kept on a piece of carpet (5 in^2) in a wax cup 100 ml in size. Each experiment was made of three replicates. The same compounds were tested also in a liquid form at concentrations, 0.1, 0.5, 1 and 2%, sprayed on a piece of carpet (5 in^2) kept in a wax cup (100 ml). The 25 of the 3 rd larval instars with 3 gm of the larval breeding medium were put on the treated carpet after drying. There were 3 cups with 75 larvae per each concentration of tested compounds. There were other 3 cups with larvae and larval breeding medium without treatment as a control group. The cups were covered with organdy cloth to prevent escap of emerged adults and kept for 3 weeks under laboratory conditions of 26 ± 1 C° and 75 ± 5% relative humidity. The emerged adults were counted for each tested concentration of both kinds of preparations, (dust and liquid) of these compounds. The data were analysed according to Duncan, 1951.

RESULTS AND DISCUSSION

The adult emergence of larvae of the cat flea, *Ctenocephalides felis* was significantly affected by various tested concentrations of Pestex R.X. dusts, (2.6, 6.5, 12.1, 25.7 and 63 mg / in^2, (Table 1). There was significant progressive decrease in the adult emergence with increasing of concentration. This effect was recorded from the lowest tested concentration, (2.6 mg / in^2). The lowest and highest percentage of emergence, (27 and 40%) were recorded at

Table (1): The effect of Pestex R.X. (Borax) on the adult emergence of *Ctenocephalides felis*.

Form of Compound	Con.	Emerged adult				Letter
		No.	%	Range	Mean ± S.E.	
Dust (mg / in^2)	Ck.	67	89.3	21-23	22.33 ± 0.67	A
	2.6	30	40.0	7-13	10.00 ± 1.73	BX
	6.5	22	29.3	7-8	7.33 ± 0.33	BCX
	12.1	16	21.3	4-7	5.33 ± 0.88	CDX
	25.2	11	14.7	2-5	3.67 ± 0.88	DX
	63.0	2	2.7	0-1	0.67 ± 0.33	EX
liquid (%)	Ck.	64	85.3	20-23	21.33 ± 0.88	A
	0.1	54	72.0	16-20	18.00 ± 1.15	A
	0.5	46	61.3	12.20	15.33 ± 2.40	A
	1.0	46	61.3	10-20	15.33 ± 2.91	A
	2.0	43	57.3	10-18	15.00 ± 2.89	A

N.B.:

- The means with the same letters are insignificant, ($P \geq 0.05$).
- Total larvae examined in each concentration = 75 larvae.
- Con. = Concentration.

concentrations 63 and 2.6 mg / in^2. This agrees with the findings of Patterson *et. al.*, (1989), conclusion that some of the inert dust e.g. davisal silica gel and pyrophylite had signifincant effect on the adult emergence of cat flea, *Ctenocephalides felis.*

The liquid preparations of this commercial compound had no significant effect on the adult emergence at any tested contcentration. This indicated that the dusts of Pestex R.X. was highly effective than that of liquid preparations. The Mop UP, (Boric acid) dusts had significant effect on the adult emergence at various concentrations, (Table 2). Thus emergence decreased significantly with increasing of concentration. The minimum adult emergence (1.3 %) was rcorded at the highest concentration, (63 mg / in^2). This result agrees with that of Ebeling, (1968), reporting that this compound, (Boric acid) had long residual effect against cockroaches. The adult emergences of cat flea at the highest concentrations of liquid preparations, (1 and 2%) were decreased, (65.3 and 62.7% emergence repectively). These indicated that this compound was effective against adult emergence of the cat flea, and this effectiveness was higher in dusts than liquid preparations. Table (3), showed that the dust of Roach Prufe, (Orthoboric acid) retarded the adult emergence at all tested concentrations. The lowest concentration, (2.6 mg / in^2) also lead to decreasing completely, (0 %) at the highest concentration, (36 mg / in^2). This indicatd that the dust of Roach Prufe was highly effective on the adult emergence than other compounds. The highest concentrations, (1 and 2%) of liquid preparations of Roach Prufe had significant effects also on the adult emergence, (60 and 56% respectively).

The dust of Sodium tetraphenyl borate had significant effects on this emergence at various concentrations, (Table 4). This reduction in the adult emergence was significantly recorded at the lowest concentration, (56% emerged cat fleas at 2.6 mg / in^2). The minimum value of emergence, (21.3%) was obvious at the highest concentration, (63 mg / in^2). The liquid preparations of this compound had lower significant effects than other tested compounds. Generally, the latent lasting effect of these boron compounds on the adult emergence of the cat

Table (2): The effect of Mop Up (Boicx acid) on the adult emergence of *Ctenocephalides felis*.

Form of Compound	Con.	Emerged adult				Letter
		No.	%	Range	Mean ± S.E.	
Dust (mg/in^2)	Ck.	67	89.3	21-23	22.33 ± 0.67	A
	2.6	39	52.0	8-17	13.00 ± 2.65	BX
	6.5	25	33.3	7-10	8.33 ± 0.88	CX
	12.1	13	17.3	2-6	4.33 ± 1.20	CDXY
	25.2	10	13.3	2-5	3.33 ± 0.88	DX
	63.0	1	1.3	0-1	0.33 ± 0.33	DX
liquid (%)	Ck.	64	85.3	20-23	21.33 ± 0.88	A
	0.1	57	76.0	19-00	19.00 ± 0.00	AB
	0.5	54	72	16.20	18.00 ± 1.15	AB
	1.0	49	65.3	14-19	16.33 ± 1.45	B
	2.0	47	62.7	14-18	15.67 ± 1.20	B

N.B.:

- The means with the same letters are insignificant, ($P \geq 0.05$).
- Total larvae examined in each concentration = 75 larvae.
- Con. = Concentration.

Table (3): The effect of Roach Prufe Orthoboric acid) on the adult emergence of *Ctenocephalides felis.*

Form of Compound	Con.	Emerged adult				Letter
		No.	%	Range	Mean ± S.E.	
Dust (mg / in^2)	Ck.	67	89.3	21-23	22.33 ± 0.67	A
	2.6	24	32.0	7-10	8.00 ± 1.00	BX
	6.5	8	10.7	2-3	2.67 ± 0.33	CY
	12.1	5	6.7	1-2	1.67 ± 0.33	CDY
	25.2	3	4.0	0-3	1.00 ± 1.00	CDX
	63.0	0	0.0	0	0	DX
liquid (%)	Ck.	64	85.3	20-23	21.33 ± 0.88	A
	0.1	61	81.21	19-21	20.33 ± 0.67	AB
	0.5	52	69.3	17.18	17.33 ± 0.33	ABC
	1.0	45	60.00	12.18	15.00 ± 1.73	BC
	2.0	42	56.00	8.19	14.00 ± 3.22	C

N.B.:

- The means with the same letters are insignificant, ($P \geq 0.05$).
- Total larvae examined in each concentration = 75 larvae.
- Con. = Concentration.

Table (4): The effect of sodium tetraphenyl borate on the adult emergence of *Ctenocephalides felis*.

Form of Compound	Con.	Emerged adult				Letter
		No.	%	Range	Mean ± S.E.	
Dust (mg/in^2)	Ck.	67	89.3	21-23	22.33 ± 0.67	A
	2.6	42	56.0	9-20	14.00 ± 3.21	B
	6.5	34	45.3	6-17	11.33 ± 3.18	BC
	12.1	29	38.7	9-12	9.67 ± 1.20	BC
	25.2	25	33.3	4-11	8.33 ± 2.18	BC
	63.0	16	21.3	4-7	5.33 ± 0.88	C
liquid (%)	Ck.	64	85.3	20-23	21.33 ± 0.88	A
	0.1	58	77.3	17.20	18.33 ± 1.10	A
	0.5	51	68.0	13-21	15.20 ± 2.40	A
	1.0	50	66.7	12.22	15.10 ± 2.80	A
	2.0	47	62.7	12.19	15.80 ± 2.51	A

N.B.:

- The means with the same letters are insignificant, ($P \geq 0.05$).
- Total larvae examined in each concentration = 75 larvae.
- Con. = Concentration.

flea, *Ctenocephalides felis* were significantly recorded from their lowest concentration, (2.6 mg / in^2) onward, there was no emergence absolutely at the higher concentration, (63 mg / in^2) of Roach Prufe. Similar results were arrived by Moor (1972) who rported that the dusting with boric acid followed by pyrenone spray was effective for controlling german cockroaches. The highest concentrations, (1 and 2%) only of the liquid preparations of these tested boron compounds were also significantely effective on the adult emergence. These compounds can be arranged according to their effectiveness on the adult emergence as follows: Rouch Prufe (Orthoboric acid), Mop Up (Boric acid), Pestex R.X. (Sodium tetraborate) and finally sodium tetraphenyl borate. The effectiveness of liquid preparations of these compounds were relatively similar at the higher concentrations,(1 and 2%), without significant effect at the lower concentrations, (0.1 and 0.5%). The miniumu adult emergence were recorded at the highest dust concentration, (63 mg / in^2) for them (0, 1.3, 2.7 and 21.3 % respectively). Generally, these boron compounds can be used against the cat flea with minimum resistance and less hazards to human and household animals.

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أثر بعض مركبات البورون التجارية علي خروج الطور البالغ لبرغوث القط *Ctonocophalides felis*

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الملخص

يتناقص خروج الطور البالغ تناقص معنويا بعد معاملة يرقاتها بمسحوق مركبات البورون الآتية وذلك تبعا لفعاليتها هكذا :-

Postex R.X. (Borax), Mop Up (Boric acid), Roach Prufe (Orthoboric acid) and Sodium tetraphonyl borate.

وذلك عند جميع التركيزات المختبرة ، (٢ر٦ ، ٥ر٦ ، ١ر١٢ ، ٢ر٢٥ ، ٦٣ مجم / بوصة^{٢}). ويزداد هذا الاثر بزيادة تركيز هذه المركبات . وقد كان أكبر الاثر لها عند أعلى تركيز وهو (٦٣ مجم / بوصة) هكذا علي التوالى : صفر ، ١ر٣ ، ٢ر٧ ، ٣ر٢١٪.

ويدل ذلك علي عدم وجود مناعة لدى براغيث القطط لهذه المركبات ، وقد يرجع ذلك إلى حداثة استخدامها فى مكافحة الحشرات . وقد وجد أن محاليل هذه المركبات أقل تأثيرا على خروج الاطوار البالغة عن مساحيقها . وأن جميع تركيزات محاليل Pestox R.X. and Sodium tetraphenyl borate ليس لها أثر فعال على خروج هذه الاطوار ، بينما ظهر هذا الاثر عند محاليل التركيزات المرتفعة ،(١ ، ٢٪) لمركبات Mop Up (Boric acid) and Roach Prufe (Orthoboric acid) ويدل ذلك على أن فعالية هذه المركبات لاتتوقف فقط على تركيزاتها بل تتوقف أيضا على هيئة استخدامها. وعلى ذلك فانه يمكن استخدام هذه المركبات فى مقاومة برغوث القط *C. felis* وذلك نظرا لقلة مناعة البراغيث لها وقلة خطورة هذه المركبات على الحيوان والانسان .