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SUSCEPTIBILITY OF MUSCA DOMESTICA L. AND CULEX PIPIENS L. ADULTS TREATED AS PUPAL STAGE WITH DIAZINON AND ITS COMBINATIONS WITH DIFFERENT CONCENTRATIONS OF NESTAPON

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ABSTRACT

The combined effect of application of sublethal doses fo Diazinon and Nestapon on late pupal stage (2-days bvefore adult eclosion) of Musca domestica and Culex popiens on some biological aspects was investigated.

A negativce correlation exitsts betwen the applied doses nad emergence percentage was observed. The treatments significantly shortened the longevity of adults of both insect species. The combined effect was also extended to induces a significant reduction in the reproductive potentiality of the resulting adults and the rate of hatchabitlity. Complete sterility was acheived at higer doses.

INTORDUCTION

The development of insect resistnce to chemical insecticides led the scientists to seek alternative control methods. In r4ecent years the used of surfactants or adjuvants in conjunction with the pyrethroides, nicotine, rotenoids nad certain organophosphorous and carbamate insecticides markedly increases the toxicity of the mixture over the sum of the toxicities of the components. This phenomenon is commonly termed "Synergism" and has had its most practical ap;ication with certain organophosphorus insecticides, where the use of formulations containig appropriate synergists has resulted in substantial savings in the amounts of the exprensive insecticides necessary for pest control. Extraordinarly, surface active agents are being ther main materials for preparing several agriculture, medicine, cosmotic purposes. Pesticide formulations technology is dependant upon the toxic substance, inert-ingredients and the adjuvants.

Taylor and Schoof (1967), showed that the larvicidal activity has been greatly increased by adding surfactants in small quantities which change the surface tension of insecticide solution. Hussein (1991), came to conclusion that surfactants cleraly affected the cholinesterase activity of C. pipiens larvae in pest control programme. In Egypt, Musca domestica L. and Culex pipiens. L. are the most harmful insects that attack and annoy man and affet his health, however, both species are closely associated in the field.

The present study aims to estimate the synergism between insecticides and surfactants. The variation in the percentage of adult emergence, egg depostion and hatchability were used as creteria to

evaluate the combined effects of insecticide (Diazinon) and surfactant (Nestapon) on M. domestica and C. pipiens.

MATERIALS AND METHODS

All insects tested were obtained from a laboratory culture maintained at 27±2°C and 70±2% R. H. in Entomology Department, Facutly of science, Benha branch, Zagazig University, Egypt. Several methods of adopted by Ibrahim (1986 and 1991) which seemed to be the most statisfactory for the conditions of the present study.

Experiments were carried out to study the cobined effect of exposing late pupal stage (2-days before adult eclosion) of both insect species to Diazinon (0,0-dithyl-0-2 isopropyl-4-methyl pyrimidyl-(6) phosphorothionate) at concentrations of 0.002, 0.004, 0.006,-.008 and 0.01 ppm and Nestapon (sodium-N- dadecyl-Benzene sulphate) as surfactant at fecundity (The number of eggs laid per female), fertility (considered as % hatch) and longevity of both sexes of the resulting adults.

To investigate the above mentioned bilogical aspects, groups of 20 treated male and female pupae were transfered just after treatment to rearing cages 30 X 30 X 30 cm. Till adult emergence.

To study the effect of applied chemicals on the fecundity and longevity of the resulting adults, observations were made on twenty pairs and were taken every day untill and treated insects had died. For estimating the effects on the female fertility, 50 eggs were taken per each concentration and observations were carried out on the egg hatching. Each experiment comprised four replicates and the results were analyzed by Renner's multiple range test (1970).

RESULTS AND DISCUSSION

Table(1) shows the effect of Diazinon and its combinations with different concentrations of Nestapon on the percentage of adult emergence. Nestapon reduced signficnatly the emergence percentages of adults of both insect species. However, the surfactant increased the insecticidal activities. Lc 50 of Diazinon against M. domestica decreased from 0.0281 ppm to 0.0212, 0.0139 and 0.0132 pmm at surfactant concentrations of 0.2, 0.4 and 0.6% respecitvely. The corresponding figures fro C. pipiens were 0.0211, 0.0228 and 0.0125, respectively, as compared with 0.0275 in pupae treated with Diazinon. This reduction in adult emergence was statistically significant (T>0.05) and this effect was much more pronounced in pupal treatments of M. domestica. The reduction was positively correlated with the applied dose. On the other hand, a marked mortality of pupae of both insect species as also observed when Nestapon combined with Diazinon at higher doses.

The effect of pupal treatments was reflected on longevity of the emerged adults. It is clear from results obtained in table(2) that the insecticidal treatments signficnaty shortened the life span of males and females of M. domestica and c. pipiens as compared with control group, whether used alone or in combined with surfactant (table 2).

The treatment of pupae by sublenthal concentrations of Diazinon and insecticide plus surfactant caused a significant reduction in the total number of eggs deposited by the female. This was still accompained by a well marked gradual reduction in the sfertility of such eggs with the increase of dosage. Results obtained are given in table (3) from which it is clear that the significant decrease in female fecundity was observed at Nestapon concentrations of 0.2, 0.4 and

0.6% when appliedf in combination with Diazinon concentrations of 0.002, 0.004 and 0.006 ppm. It is also clear that the egg hatchability was greatly affeted by insecticidal synergism with Nestapon. Results in table (3) indicates that complete sterility of females was achieved at higher doses of Diazinon only (concentrations of 0.008 and 0.0 ppm) or in combined with different concentrations of Nesptapon. (0.2, 0.4 and 0.6)

Wolfenbarger et al., (1967) suggested that surfactants may synergize the toxicants and aid in transporting the toxicant ot the site of activity of pink boll worm Pectinphora gossypiella. Also Mesbah et al., (1982) found that the combinations containing tween-20 and span20, induced slight to moderate synergism and this was due to increase in cuticle permeablitiy. Bowen nad Joes (1985) found that the addition of certain surfgactants to arange of slug pesticides increased their toxicity.

In conclusion, it would appear that there are advantages to use surfactants in insect control programme. These compounds will contribute in improving the insecticidal efficacy, minimize insecticidal polution by using low insecticidal concentrations and also increase the sensitivity of resistant strains to insecticides.

Table (1): Susceptibility of M. domestica and C. pipiens adults to Diazinon and its combinations with different concentrations of Nestapon (Effects on adult emergence).

Nestapon Con. (%)	0		0.2		0.4		0.6	
Diazinon Conc (ppm)	% adult emergence		% adult emergence		% adult emergence		% adult emergence	
	M. domestica	C. pipiens	M. domestica	C. pipiens	M. domestica	C. pipiens	M. domestica	C. pipiens
0.002	48.3	52.1	36.4	42.1	22.9	33.4	13.4	25.7
0.004	25.33	38.4	19.2	25.3	13.2	19.7	8.4	12.3
0.006	14.5	23.5	12.4	18.7	8.6	15.1	5.1	10.1
0.008	8.4	15.1	5.3	12.4	4.2	9.4	3.5	6.5
0.01	3.2	8.1	0	5.0	0	6.7	0	2.9
Control	88.3	83.1	68.1	65.0	43.1	55.0	22.7	35.8
LC_{50} (ppm)	0.0281	0.0275	0.0212	0.0211	0.0193	0.0228	0.0132	0.0125

Table (2): Susceptibility of Musca domestica and Culex pipiens adults to Diazinon and its combinations with different concentrations of Nestapon (Effects on adult longevity).

Nestapon Conc. (%) / Diazenon Conc. (ppm)	Adult longevity in days															
	0				0.2				0.4				0.6			
	M. domestica		C. pipiens		M. domestica		C. pipiens		M. domestica		C. pipiens		M. domestica		C. pipiens	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0.002	22.3	24.1	22	23.5	18.7	20.1	20.7	21.5	15.1	17.0	16.2	18.5	11.3	14.9	15.5	16.5
0.004	19.3	22.3	20.5	21.3	15.3	17.5	16.5	16.0	13.4	11.3	13.1	14.2	9.1	11.5	11.5	12.1
0.006	15.1	18.7	16.5	17.2	12.4	13.4	11.3	12.5	9.2	8.1	12.1	13.0	6.3	7.5	10.5	11.2
0.008	12.1	15.5	10.1	13.2	9.4	10.1	10.1	12.0	6.1	5.3	8.3	10.1	4.2	9.2	6.2	5.1
0.01	5.3	8.1	6.1	T	2.4	T	T	T	T	T	T	T	T	T	T	T
Control	25.6	23.0	22.1	22.5	22.1	20.1	20.1	21.3	19.5	20.1	15.2	18.0	15.2	18.9	14.5	16.3

T: Adults died within 24 hrs.
M: male
F: female

Table (3): Susceptibility of Musca domestica and Culex pipiens adults to Diazinon and its combinations with different concentrations of Nestapon.

(Effects on female fecundity and egg hatchability).

Nestapon conc. (%)	No of eggs Laid/Female/day								% Egg hatch.							
	0		0.2		0.4		0.6		0		0.2		0.4		0.6	
Diazenon Conc. (ppm)	M. domestica	C. pipiens	M. domestica	C. pipiens	M. domestica	C. pipiens	M. domestica	C. pipiens	M. domestica	C. pipiens	M. domestica	C. pipiens	M. domestica	C. pipiens	M. domestica	C. pipiens
0.002	8.2	14.2	6.3	18.1	4.2	8.0	3.7	4.5	75.2	73.5	45.1	42.7	38.1	35.1	22.3	25.1
0.004	6.9	10.3	4.2	8.5	3.4	6.2	2.1	4.6	63.1	58.1	23.1	18.5	12.1	9.2	9.2	5.3
0.006	5.2	8.2	3.7	6.1	3.5	5.0	2.3	-	25.8	23.1	11.1	5.3	5.4	4.1	5.0	
0.008	1.0	3.4	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-
0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Control	8.4	14.6	8.4	14.3	7.8	12.3	7.0	11.7	88.3	82.4	76.4	65.2	51.0	43.1	35.2	38.0

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"حساسية الاطوار اليافعه للذبابة المنزلية موسكا دومستكا والبعوضة المنزلية كيولكس بيبينز المعاملة فى طور العذراء بمبيد الديازنيون وخلطة مع تركيزات مختلفة من النستابون"

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تم دراسة التأثير المشترك للجرعات تحت الممتية للديازنيون والنستابون لطور العذراء المتقدم (يومين قبل التحول الى الطور اليافع) للذبابة المنزلية موسكا دومستيكا والبعوضة المنزلية كيولكس بيبينز على بعض المظاهر البيولوجية. لوحظ أن العلاقة ما بين الجرعة المعطاه والنسبه المئوية لخروج الطور اليافع تكون سلبيه. تؤدى المعاملة الى قصر معنوى فى عمر الاطوار اليافعة لكلا الجنسين ولقد امتد التأثير المشترك للمبيد والمادة ذات النشاط السطحى ليحدث تناقص معنوى فى الكفاءة التناسلية ومعدل الفقس للبيض الذى تضعه الاناث الناتجه. أدى استخدام الجرعات العالية الى حدوث عقم تام .