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FIELD EFFICACY OF THREE TYPES OF INSECTICIDES AGAINST LARVAE OF *MUSCA DOMESTICA* BREEDING IN EQUINE MANURE AND THEIR EFFECTS ON PREDATORY MITES

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ABSTRACT

The field efficacy of Actellic (organophosphate), Neporex (insect growth regulator) and Ficam (carbamate), at the application rates of 2-4, 0.4-0.8 and 0.1-0.2 g AI/m2 respectively, was studied against the larvae of *Musca domestica* L. Results of treatments involving horse manure indicated that Actellic and Neporex produced sharp decrease of larval numbers (close to zero) for 21d. But there was a slight recovery in larval numbers 14 d following treatment with Ficam. The populations of predator mites were not affected due to insecticidal applications.

INTRODUCTION

Equine manure piles in stables provide suitable habitat for breeding of many muscoid flies, in particular, the house fly *Musca domestica* L. At seasonal peaks, *M. domestica* becomes a great nuisance to people and to the precious race horses. At peak times (March-October) control measures should be undertaken to reduce fly population densities to a minimum nonnuisance levels.

The present practical method of choice for the control of flies which breed in different types of manure (horse, sheep, cattle, poultry) is the application of insecticides against larvae and adults (Cunningham and Eden, 1970; Yates and Sherman, 1970; Hurd *et al*., 1979:Mulla and Axelrod,1983;Mohsen et.al.,1986;Killy et.al.,1987). Many investigators stressed on the value of predatory mites, as biocontrol agent, while controlling fly populations by insecticides suggesting the approach of integrated fly control (Axtell, 1963, 1966,1968, 1970; Mohsen *et al*., 1986). Mohsen *et al*. (1986) tested 9 insecticides and formulations against mixed populations of *M. domestica* and predator mite *Macrocheles muscaedomesticae* (Scopoli) and found that Temephos, Diflubenzuron and Methoprene were selective in their effects against *M. domestica* producing no harmful effects on *Mc muscaedomesticae*.

This paper presents data on the efficacy of 3 types of insecticides against *M. domestica* breeding in equine manure and their effects on predatory mites under field conditions.

MATERIALS AND METHODS

The insecticides tested in this study were:

- Actellic (primiphos-methyl 50% EC, organophosphate) [O-2-diethyl-amino-6-methylpyrimidin-4-yl OO-dimethyl phosphorothioate], supplied by ICI, England.
- Neporex (cyromazine 50% WP, insect growth regulator) [2-cyclopropyl-amino-4,6-diamino-s-triazine], supplied by Ciba-Geigy, Switzerland.
- Facam (bendiocarb 80% W, carbamate) [2,2-dimethyl-1,3-bezodioxol-4 yl methylcarbamate], supplied by Camco, England.

Field efficacy of three insecticides

Field evaluation of the 3 inescticides against *M. domestica* was undertaken in 1988 (29 Oct.-19 Nov.) at the horse stables of the Horsemanship Club located 15 km west of Baghdad. Approximately 15 kg of fresh horse dung, containing numerous immature stages of *M. domestica* and predator mites, were placed in plastic containers (used to collect garbage), measuring 32 cm diameter and 45 cm high. The depth of dung was approximately 40 cm. The surface area of the dung was 805 cm2. Each insecticide was applied by pouring 1 l of distilled water containing the necessary amount of chemicals plus 1 percent sugar to attain the final concentration per surface area (g AI/m^2) of Actellic (2-4), Neporex (0.4-0.8) and Ficam (0.1-0.2). The lower concentrations are the label recommended doses by the specific insecticide manufacturer. Each treatment was replicated 2 times and was run with 1 control which received only l of distilled water. The efficacy of insecticides against larvae of *M. domestica* and their effects on predator mites were assessed by counting the number of larvae and mites at periods of pretreatment, 1-d, 7-d, 14-d and 21-d posttreatment in 250 g of surface (depth of 5-10 cm) horse dung samples.

In the laboratory, larvae of *M. domestica* were stored and counted and each dung sample was extracted in picric acid by a modified Tullgren funnels for mite collecting. The moisture content was determined for each dung sample. In the field, surface dung temperature was measured at each sampling date.

RESULTS AND DISCUSSION

Fauna of Mites:

The fauna of mites in the samples of horse dung was composed of 4 families and 9 species (Table 1). Species of Macrochelidae and Acaridae were most abundant throughout the experimental period followed by species of Parasitidae and Uropodidae.Mahmood and Al-Dulaimi (1988) listed 6 spaecies of predator mites collected from various animal manure and found that *Mc.muscaedomesticae, Macrocheles glaber* (Muller) and *Macrocheles medarius* (Berl.) were most abundant in cattle, horse and sheep manure. In an earlier study, Mahmood and Al-Dulaimi (1986) suggested that *Mc. muscaedomesticae* may be used as a biocontrol agent against *M. domestica* breeding in manure due to its efficiency in destroying eggs and 1st instar larvae.

Table.1: Fauna of mites present in the horse manure samples (250 g) and their relative abundance.

Species	Relative abundance
Family Acaridae	
Caloglyphus berlesei (Michael)*	+++
Lardoglyphus sp.*	+++
Family Macrochelidae	
Macrocheles muscaedomesticae (Scopoli)	+++
Macrocheles medarius (Berl.)	+++
Family Parasitidae	
Parasitus consanguineus Oudemans & Voidts	++
Parasitus fimetorum (Berl.)	++
Family Uropodidae	
Fuscoropoda vegetans (De Geer)	+
Poulodinychus sp.	+

*not predacious

Efficacy of insecticides against house fly larvae:

The results of efficacy study of Actellic, Neporex and Ficam against larvae of M. domestica are shown in table 2. The number of larvae declined sharply to almost zero for 21 d after the application of Actellic at 2 and 4 gAI/m².Neporex effect (at o.4 and 0.8 g AI/m²) started 7 d postreatment and the number of larvae remained at zero level for 21 d posttreatment (Table 2).Neporex is known to induce insect growth regulating effect (IGR) in treated insects involving inhibition of pupation and eclosion (Mulla and Axelrod, 1983).Careful examination, in our study, revealed that many Neporex-treated larvae were dead prior to pupation with their integument darkened in a similar manner as described by Mulla and Axelrod (1983). Mohsen and Al-Chalabi (1988) reported that Neporex demeonstrated a broad-spectrum of lethal and developmental activity against the mosquito Culex quinquefasciatus Say when applied to larval medium at 0.05-0.1 ppm involving direct kill of larvae and pupae, significant delay in pupation and emergence and decrease of fecundity and egg hatchability. The application of Ficam at 0.1 and 0.2 g AI/ m²) resulted in sharp decrease of larval numbers at d-7 but slight recovery commenced 21d post treatment

Table 2: Average numbers of *M. domestica* larvae and predator mites (2 samples of 250 g) present in horse manure pre- and post treatment with Actellic, Neporex and Ficam.

Insecticide/concentration gA/ m²	Average no. of larvae and predator mites per 250 g of horse manure posttreatment (d)				
	Pretreatment	1	7	14	21
M. domestica larvae					
control	50	51	70	33	18
Actellic 2	45	0	0	0	0
4	36	0	0	3	2
Neporex 0.4	33	46	0	1	0
0.8	80	81	0	0	0
Ficam 0.1	137	0	5	0	4
0.2	24	0	2	12	7
Predator mites					
control	700	1100	280	300	190
Actellic 2	720	300	185	300	190
4	850	172	145	90	51
Neporex 0.4	864	373	582	452	107
0.8	961	783	525	165	97
Ficam 0.1	615	217	482	501	117
0.2	683	657	542	433	165
Date	29/10	30/10	5/11	12/11	19/11
Dung temperature(°C)	28	28	19	15	14
Moisture content (%)	69	70	64	66	63

Effect of insecticidal application on mites:

The average numbers of predator rmites in 250 g of horse manure samples pre- and posttreatment with Actellic, Neporex and Ficam are presented in Table 2. The population of predator mites was apparently less affected by insecticidal treatment when compared with the population of target fly. The decline in numbers of mites in all of the dung samples seems to be mainly due to temperature decrease rather than the insecticidal effect as figures show in Table 2. With the large numbers of predator mites present in horse dung samples it is expected that the decline in numbers of *M. domestica* larvae is largely due to a combined activity of insecticides and predator mites (Families Macrochelidae, Parasitidae and Uropodidae). Some of these mites, i.e., *Mc. muscaedomesticae* and *Glyptholaspis confusa* (Fao) may produce more than 90 percent reduction in fly population alone without insecticidal application (Axtell, 1963). Predator mites may be successfully implemented in integrated fly control. Axtell (1968, 1970) studied the effect of fly larviciding of dipterans breedingin poultry ranches and concluded that excellent fly control was possible with adulticiding rather that larviciding due to the detrimental effects of nonselective insecticides on predator mite populations .

The results of the present study demonstrated that larviciding of *M. domestica* in horse manure with the supplier recommended doses of Actellic, Neporex and Ficam provided fly control for 21 d with no harmful effect against predator mite population.

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الفعالية الحقلية لثلاث انواع من المبيدات الحشرية ضد يرقات الذباب المنزلي *Musca domestica* التي تتكاثر في براز الخيول وتأثيراتها على الحلم المفترس

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الخلاصة

درست الفعالية الحقلية للمبيدات أكتلك (مبيد فوسفوري عضوي)، نيبوركس (مبيد منظم لنمو الحشرات)، فيكام (مبيد كاربامیت) باستخدام التراكيز (٢-٤)، (٠,٤-٠,٨)، (٠,١-٠,٢) غم من المادة الفعالة لكل متر مربع على التوالي ضد يرقات الذبابة المنزلية *Musca domestica* L. التي تتكاثر في براز الخيول في نادي الفروسية. بينت النتائج ان اعداد الذباب استمرت منخفضة قريباً من الصفر لمدة ٢١ يوم وذلك بعد رش المبيدين اكتلك ونيبوركس أما المبيد فيكام فان الذباب استرجع نشاطه بشكل طفيف بعد ١٤ يوم من المعاملة. ولم يتأثر الحلم المفترس بسبب المعاملة بالمبيدات الثلاث.