

Field Evaluation of Anticoagulants and Detection of Rodent Resistance

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ABSTRACT

The anticoagulant rodenticides consumption at Etag El - Baroud district from 1989 to 1998 were recorded . The total amounts were 230.599 tons in 64200 feddans . Seven types were found . There were warfarin, coumatetralyl, chlorophacinone ,bromadiolone difenacoum and difacinone . Coumatetralyl was the most widely used compound (91.819 tons) .On the other hand the amount of anticoagulant rodenticides consumed from 1980 to 1989 were 861.250 tons in the same area (The Egyptian / German Control Project). Rodent population density and species were survived at Etag El - Baroud district in 1998, four common species with different ratio were found . The dominant species were *Rattus rattus* , followed by *Mus muscuuls* then *Arvecanthis niloticous* and *Rattus norvegicus* .

Field trials for detection of resistance to tested floucoumafin and coumatetralyl were carried out . Foucoumafin was more effective than coumatetralyl . These results were parallel to the bait consumption and the number of points with take divided on number of points with take on day two . The LT_{50} values were 8and 20 days for the tested rodenticides , respectively.

INTRODUCTION

Anticoagulant resistance is a major loss of efficacy in practical conditions where the anticoagulant has been applied correctly, the loss of efficacy being due to the presence of a station of rodent with a heritable and commensurately reduced sensitivity to the anticoagulant *Buckel* (1994). In most countries, warfarine is undoubtedly the most commonly used anticoagulant, but resistance to warfarine has increasingly become a problem *Meehan* (1994). A few species of rodents have a naturally low sensitivity to certain anticoagulants. The Egyptian spiny mouse, *Acomys cahirinus* a minor comensal pest in the Near East is a natural curiosity in being relatively tolerant of all the anticoagulant rodenticides that have been tested against it, *Mahmoud and Redfern* (1981). The ship rats *Rattus rattus* are also relitively tolerant of several first - generation anticoagulants, *Greaves et al* (1976), *Khirallah and Kandil* (1995) and *El - Gendy et al* (1996). The aim of this study was to survey of consumed rodenticides at Etay El - Baroud district during 1989 - 1998, determine the rat index of rodent species and to evaluate the response of field rodents to two anticoagulant rodenticides baits. Coumatetralyle and floucomafin against ship rats *Rattus rattus* under field conditions.

MATERIALS AND METHODS

Field survey of previous used rodenticides was conducted to record the previously applied rodenticides at Etay El - Baroud region during the last 10 years. The data were obtained from the records of the agriculture Credit Bank at Etay El - Baroud and also from the records of the Egyptian Project for rodent control. Field experiments were carried out to determine the population density of rodents as well as the species frequency by using 60 open door wire traps distributed in four plots (fifteen traps each) at 6.0 PM (the active time of rodents). The traps were collected at 7.0 AM daily for inspection during 1998 (two days each month) *MAFF* (1975).

$$\% \text{ of special species frequency} = \frac{\text{No. of special species captured / day} \times 100}{\text{Total No. of rats captured / day}}$$

The field study was conducted in two wheat fields after harvest at Etay El - Baroud Center El -Behera Governorate during 1998 . All the poison bait treatments carried out using the method described by Drummond and Rensson (1973) for testing the resistance for anticoagulants in the field. The treated of rodenticides coumatetralyl 0.375% and floucoumafine 0.005 % and untreated food (control) carried out in plots of one feddan each. The treatment was replicated twice in each of two areas . The first one were no anticoagulant rodenticides were applied before as infested from its back history. Each replicate was one experimental unit containing 20 bait stations . The bait were laid in surplus amounts (250 g each) , for the first time on a Monday and sites of the infestations are visited subsequently every Wednesday , Friday and Monday . At every visit to a site after the first , that is after 2,4,7,9,11,...n days of baiting the baits takes by rats are counted and topped up with fresh poison bait . The largest number of baits usually ,but not always, show takes on day 2 of a treatment . The bait consumption and number of bait stations visited by rats during the experimental period in treated plots were determined and recorded . The rate of bait consumption for each treatment was calculated , tabulated and graphed Drummond and Rensson (1973) .The log - time probits regression line of the reduction density was drawn to determine LT_{50} and LT_{95} after repeated exposure to the bait. This line was fitted by X^2 test Swaroop (1966) and the confidence limits between which LT_{50} might be expected to lie with 95% probability were estimated , Litchfield and Wilcoxon (1949).

RESULTS AND DISCUSSION

Table (1) present the total amounts used of different rodenticides in field application at Etay El - Baroud Center during the successive years

Table (1) : Survey of consumed anticoagulants at Etay El - Baroud district El - Behera Governorate during 1989 - 1998.

Rodenticides Used in tons*	Years												Total
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Coumatetralyl	20.96	13.72	13.426	12.78	9.575	8.679	6.279	2.24	2.10	2.06			91.81
Brodifacoum	3.35	4.65	1.23	0.0	0.0	0.0	0.0	0.0	0.0	0.0			9.23
Bromadiolone	0.0	0.0	3.08	2.32	3.2	2.35	0.0	0.0	0.0	0.0			10.95
Difenaoum	0.0	0.0	0.0	0.60	1.2	1.34	0.0	0.0	0.0	0.0			3.14
Difacinone	0.0	0.0	0.0	0.0	0.0	0.0	1.05	1.20	1.60	1.10			4.95
Chlorophacinon	12.5	8.46	8.4.0	5.30	4.6	3.23	2.07	0.0	0.0	0.0			44.56
Warfarin	21.60	10.65	10.4	8.80	7.9	4.56	2.04	0.0	0.0	0.0			65.95
Total	58.41	37.48	36.536	29.8	26.47	20.15	11.43	3.44	3.70	3.16			230.59

Total area 64200 Feddans

- Source of data : - The Agric . Credit Bank and the Egyptian Rat Control at Etay El - Baroud district El - Behera Governorate.

Table (2) : - Rat index of rodent species distribution in Etay El- Baroud , El - Behera Governorate during 1998.

Month	Rat index*	<i>Rattus rattus</i>		<i>Arvic. Niloticus</i>		<i>Mus musculus</i>		<i>Rattus, norvegicus</i>	
		M	F	M	F	M	F	M	F
Jan.	0.02	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.0
Feb.	0.08	0.02	0.02	0.01	0.01	0.02	0.0	0.0	0.0
Mar.	0.04	0.02	0.02	0.0	0.0	0.0	0.0	0.0	0.0
Apr.	0.06	0.02	0.02	0.0	0.0	0.0	0.0	0.01	0.01
May	0.04	0.0	0.02	0.0	0.0	0.01	0.01	0.0	0.0
Jun.	0.06	0.02	0.02	0.0	0.0	0.0	0.0	0.02	0.0
Jul.	0.04	0.02	0.0	0.0	0.0	0.0	0.0	0.01	0.01
Aug.	0.02	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0
Sep.	0.02	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0
Oct.	0.04	0.02	0.02	0.0	0.0	0.0	0.0	0.0	0.0
Nov.	0.08	0.02	0.02	0.0	0.0	0.01	0.01	0.01	0.01
Dec.	0.06	0.02	0.02	0.0	0.0	0.02	0.0	0.0	0.0

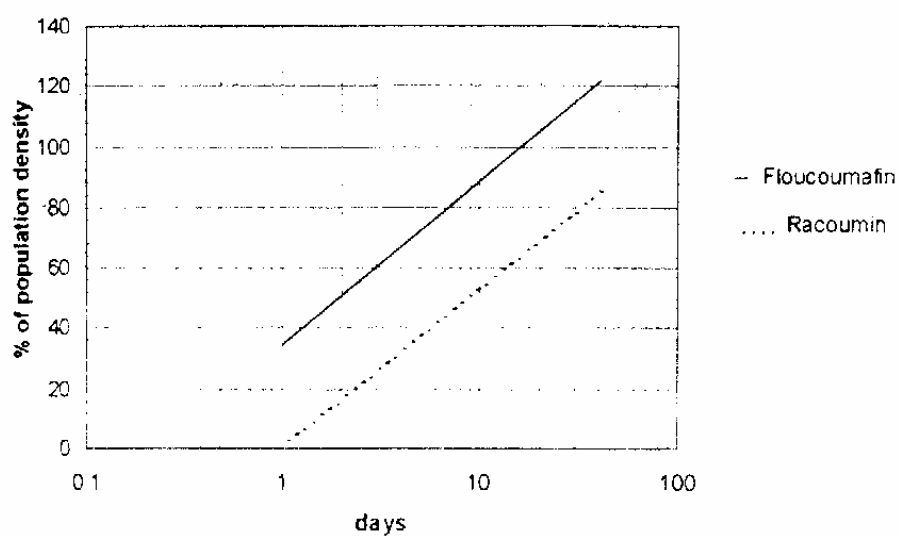
* Rat index = Number of rodent / Number of traps per day (MAFF, 1975)
Total number of traps = 60 / plot (Feddan)

Table (4) : The comparative effectiveness of coumatetralyl 0.375 % and floucomafin 0.005 % in wheat farms at Etay El -Baroud district El-Behera Governorate 1998.

Treatment	Total of bait consumption (g)	Rat reduction after 21 days as %	LT50 days	Confidence Limit	LT95	Slope	X ²
Control	20632±112	0.0	0.0	0.0	0.0	0.0	0.0
Couma- tetralyl farm 1	6528±**65	55±**4.5	20 ^a	18.1	51.6	2.9	0.82
farm 2	2929±**55	44±**3.1	26 ^a	15.7	46.3	2.8	1.3
Flocou- mafin farm 1	5456±**46	100±**2.2	8 ^{ab}	7.14	15.9	2.4	1.8
farm 2	2501±**39	100±**2.1	11 ^{ab}	7.96	17.1	2.2	2.3

**Significant at 0.01 a)Significant from control (ab) Significant from control and coumatetralyl/Tabular X² for d. f. (14) at probability 95 % = 23.7

Fig (1) Log - time probite lines for Coumatetralyl (0.0 375 %) and Floucoumafin (0.005 %) baits against percent of wild rats density in wheat farms.



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الملخص العربي

دراسات حقلية ومعملية للمبيدات المسيلة للدم وتقدير صفة المقاومة تحت الظروف الحقلية

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تم عمل حصر لكميات المبيدات المسيلة للدم والمسجلة في كل من بنك التسمية والائتمان الزراعي والمثروع المصري لمكافحة فأر الغيط في مركز إيتاي البارود - بحيرة وذلك في الفترة من عام ١٩٨٩ - وحتى عام ١٩٩٩ ووجد أن إجمالي الكمية المستهلكة ٢٣٠,٥٩٩ طن وذلك في إجمالي مساحة ٦٤٢٠٠ فدان عبارة عن سبعة أنواع هي الوارفارين - الراكومين - الرات كلر - الأستورم - الفينال وكان أكثر المبيدات استخداما هو الراكومين (٩١.٢١٩ طن) . تم تقدير الكثافة العددية للفئران في مركز إيتاي البارود موسم ١٩٩٨ . مع العلم أن الكمية المستهلكة منذ عام ١٩٨٠ حتى عام ١٩٨٩ كانت ٨٦١.٢٥٠ طن من المبيدات المسيلة للدم وذلك خلال المثروع المصري الألماني لفأر الحقل . وتلاحظ أنه يوجد أربعة أنواع من الفئران منتشرة في هذه المنطقة وهي الفأر المتسلق و هو أكثر الأنواع انتشارا لتوافر البيئة الملائمة من نخيل وأشجار يليه فؤيرة المنازل ثم فأر الغيط والفأر النرويجي . وتم إجراء التجارب الحقلية لمقارنة كفاءة مركبين أحدهما من الجيل الأول وهو الراكومين (الكوماتراليل) والثاني من الجيل الثاني وهو الأستورم (الفلوكومافين) وتبين أن مركب الفلوكومافين كان الأكثر تأثيرا بأهل تركيز حيث أن كمية الطعوم المستهلكة ثلاثة كيلو جرامات وكان الزمن اللازم لموت ٥٠ % من الأفراد هي ٨ يوما بينما عند استخدام الراكومين كانت تصل إلى حوالي سبعة كيلو جرامات في ٢٠ يوما ومن هذه النتائج يتضح أن مبيد الراكومين بدأت تظهر لها صفة المقاومة في منطقة إيتاي البارود بمحافظة البحيرة تحت الظروف الحقلية مما يستوجب عدم الاعتماد على مركب واحد لمكافحة الفئران .