

## EFFICIENCY OF WARFARIN AGAINST CERTAIN ALBINO RODENTS UNDER LABORATORY CONDITIONS

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### ABSTRACT

Some toxicity studies of warfarin (0.02% hydroxy coumarin) were carried against the albino norway rat, *Rattus norvegicus* and house mouse *Mus musculus*. The gained results were concluded as follows:

#### A-The Norway rat *Rattus norvegicus* :

The warfarin bait consumption for each non choice and choice feeding test was 8.7 gr and 4.5 gr for one day. The albino norway rat males were more palatable (37.9%) to warfarin bait than females (31.9%). Warfarin gave 83.3% and 50% mortality for non choice and choice test. The average time to death was nearly equal for the obliged and free feeding test which was 5.7 day and 6 days for the albino norway rat. The reduction of rat body weight who objected to the warfarin bait was - 5.43 gm and 0.7 gm.

For both tests non choice and choice feeding respectively:

#### B-The house mouse *Mus musculus*

The house mouse males and females consumed 2.6 and 2.5 gm/day/individual and 1.8 and 1.9 gm/day/individual for warfarin bait under non choice and choice feeding system respectively. The palatability of house mouse was 45.1%. The warfarin bait gave 83.4% and 50% for non choice and choice feeding test. The results cleared that the body weight reduction it was -2.6 gr and -2.5 gr. for both non choice and choice feeding system. The general average of time to death in both obliged and free tests were respectively 7.7 and 8.0 days.

### INTRODUCTION

Development of anticoagulant rodenticides started in the mid 1940,s. All the earlier compounds were about equal effective, but in some countries , Notably the UK and parts where resistance has appeared, their efficiency has now decreased nevertheless, some differences in the efficiency of various anticoagulants have been showed by laboratory tests these are not sufficiently important to influence use in different countries. This is more related to financial considerations and availability.

These compounds have two main advantages over the older, acute poisons compounds, firstly they do not induce bait or poison shyness and secondary they are safer to use. If anticoagulants have any disadvantage, it is that death of rats and mice generally takes at least six or seven days treatments, must therefore be carried out for this period and often for longer, this paper deals with the effect of warfarin (0.02% hydroxycoumarin) on the albino norway rat, *Rattus norvegicus* and the house mouse *Mus musculus* under laboratory conditions.

Aconcise review of the development and evaluation of anticoagulants was present by Giban (1958), Row and Redfern (1965), Greves *et al.*(1974), Dubock (1980) and Asran *et al.*(1992).

## MATERIAL AND METHODS

The needed individuals of albino norway rat and house mouse were brought from Abou Rawash village, Giza district, Giza Governorate, for every strain and for each experiment 10 (5 males and 5 females). The albino norway rat, *Rattus norvegicus* and house mouse *Mus musculus* were weighted to the nearest gram and sex determined. Animals were retained in individual cages, 42 24 17 cm for a maximum for two weeks before initiating tests. Abnormally large or small animals or obviously pregnant individuals were omitted from the experiment.

Two feeding methods were carried out namely, choice and non choice tests were conducted on bait base (unpoisoned bait) and the bait of warfarin (0.02% hydroxycoumarin). The choice described by Htun and Brooks (1979), two cups were provided to individually caged animals, one contain plain bait wheat and the other warfarin treated wheat (1:19 by wheat). Thirty grams of treated and untreated food was provided daily, intake of poison and blain baits were recorded and computed to g/kg body of the tested animals and the palatability was calculated according to the following equation:

$$\% \text{ palatability} = A/A+B \times 100$$

A: the consumed weight of poison bait

B: the consumed weight of plain bait

Water was available to albino rat and mice through the experiments

Mortality was observed daily and recorded for three weeks after poisoning. The mean death length in days was calculated.

In non choice test, warfarin treated wheat was offered for 4 days to the albino rat and mice. Bait consumption was recorded daily and weighted to the nearest 0.01 gram. Another group of 5 rats and 5 mice of both sexes was caged singly with unpoisoned bait and enough water for a period of three weeks till the animals of two testes died.

## RESULTS AND DISCUSSION

**A- Effects of warfarin on the albino norway rat, *Rattus norvegicus* under laboratory conditions.**

**A-1-Average of poison bait consumption:**

The presented data in Table (1) proved that, females consumed more quantity from warfarin bait than male, the consumption was 9.2 gm for female and was 8.2 gm for male under non choice test meanwhile, males and females consumed 4.7 gm and 4.3 gm under choice test. In general the individual consumption for both tests were 8.7 gm and 4.5 gm for day/ individual.

**A-2-Palatability**

Data in Table (1) show the palatability of the albino norway rat, *Rattus norvegicus* to the tested anticoagulant material Warfarin, (0.02% hydroxycoumarin) which mixed with wheat (1 part warfarin : 19 part bait). Palatability of males and females was 37.9% and 31.9% respectively. At general the average of the palatability was 34.9% for tested animal.

Ngazizah-I *et al.* found that there was no significant difference in acceptability between the three baits (0.003% brodifacoum, 0.01% chlorophacinon and 0.1% warfarin) under laboratory and field condition.

**A-3-Mortality:**

Warfarin gave entirely kill for males when was offered to the albino norway rat under inforce feeding system and gave 66.7% for females under free feeding system Table (1). The gained results cleared also that the killing percentages for males and females of the target animals which were respectively 66.7% and 33.3% for choice test.

Nunez-F and Ibarra-L (1996) found that chlorophacinone and warfarin were the less efficient anticoagulant, giving 100% mortality only at the beginning of the 5<sup>th</sup> day of treatment.

Asran, *et al.*(1992) found that warfarin 0.05% gave reduction in rat population 64.2% when used against Nile rat *Arvicanthis niloticus*

**A-4-Time to death:**

The presented data in table (1) cleared that the average time to death (5.7 and 6.0 days) for non choice and choice feeding tests respectively. The results proved that there no noticeable variations between males and females for their response to warfarin and day of death.

Geaves *et al.*(1974) estimated that the whole tested rat and mice which fed on 0.1% calciferol for 2 days died. Though illness usually reduced food intake after the first 24 hr. the poison 0.1 which is consider to be the lowest concentration suitable for use against *Rattus norvegicus* and *Mus musculus*.

**A-5-Body weight reduction:**

The presented data in Table (1) show that the rate of the body weight reduction and its percentages for the albino rats who fed on warfarin bait were (-8.7 gm and 10.3%) and (-2.2 gm and 1.6%) for males and females in non choice feeding test and were (-0.83 gm and 1.0%) and (2.3 gm and 2.6%) in the other test. The data cleared that there are a fluctuation in females body weight under choice test.

**B-Effect of the warfarin on the house mouse *Mus musculus*:**

**B-1-The average of poison bait consumption:**

The gained results in Table (2) revealed that the average individual consumption of warfarin bait per day was 2.6 gm and 1.9 gm for each non choice and choice feeding test for the tested animal. The presented data proved that there is no more differences between warfarin bait consumption for males and females under non choice and choice tests which was (2.6 and 2.5 gm) and (1.8 and 1.9 gm) respectively.

Asran *et al.*(1997) found that the consumed quantity of racumine by females under non choice test was more than males.

**B-2-Palatability:**

The recorded data in Table (2) appeared that the palatability of albino house mouse males was 51.4% and was 38.8% for females under laboratory conditions. These figures proved that the males accepted the investigated material more than females. Generally the palatability average of the albino house mouse *Mus musculus* to warfarin was 45.1%

Table (1) Effect of Warfarin (0.02% Hydroxy coumarin) on poisonous bait consumption, Palatability, Mortality Body reduction and Time to death of the albino Norway rat, *Rattus norvegicus* under laboratory conditions (25± 2°C & 65 ± 5 RH)

Feeding system	Sex	Weight		Poison bait consumption (gr)	Average plain bait cons.	Palatability %	Mortality %	Average of poison bait cons G/kg of body w	Average of plain bait cons G/kg of body w	Body weight reduction		Time to death in days		
		Before	After							-R.O.W	**R%	Aver	max	Min
Non choice	♂	84.3	75.7	8.2		100	97.4			-8.6	10.2	5	7	5
	♀	140	137.8	9.2		66.7	66.0			-2.2	1.6	5	7	5
	average	112.2	106.8	8.7		83.3	81.7			-5.43	5.9	5.7	7.0	5
Choice	♂	83.3	82.5	4.7	7.7	66.7	56.4	92.4		-0.8	1.0	7.0	9	5
	♀	88.0	90.3	4.3	9.2	33.3	48.9	104.5		+2.3	2.6	5.0	5.0	5.0
	average	85.7	86.4	4.5	8.5	50	52.6	98.5		0.7	0.82	6.0	7.0	5.0
Control	♂	83.5	88.5		12.3	0.0	159.8			5.0	6.0	-	-	-
	♀	80.5	86.0		11.1	0.0	137.9			5.5	6.8	-	-	-
	average	82	87.3		11.7	0.0	148.8			5.3	6.4	-	-	-

Table (2) Effect of Warfarin (0.02% Hydroxy coumarin) on poisonous bait consumption, Palatability, Mortality, Body weight reduction and Time to death of the albino house mouse, *Mus musculus* under laboratory conditions (25± 2°C & 65 ± 5 RH)

Feeding system	Sex	Weight		Poison bait consumption (gr)	Average plain bait cons.	Palatability %	Mortality %	Average of poison bait cons G/kg of body w	Average of plain bait cons G/kg of body w	Body weight reduction		Time to death in days		
		before	After							RO W	**R%	Aver	max	Min
Non choice	♂	32.2	29.0	2.6			100	80.7		-3.2	9.9	8.3	11	6
	♀	27.5	25.5	2.5			66.7	91.0		-2.0	7.3	7.0	7	7
	average	29.8	27.3	2.5			83.4	85.9		-2.6	8.5	7.7	9	6.5
Choice	♂	29.5	28.4	1.8	1.7	51.4	33.3	51.0	57.6	-1.1	3.7	6.0	6.0	6.0
	♀	26.5	24.7	1.9	3.0	38.8	68.7	66.7	105.3	-3.8	13.3	10	12	8
	average	29.0	26.5	1.9	2.3	45.1	50	53.9	81.4	-2.5	8.5	8	9	7
Control	♂	28.5	29.5	-	4.0		0.0	-	146.6	1	3.5	-	-	-
	♀	25.3	26.9	-	4.1		0.0	-	163.3	1.7	6.5	-	-	-
	average	26.9	28.2	-	4.0		0.0	-	154.9	1.4	5.0	-	-	-

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Palmateer and Meccan (1976) found that the ratio of palatability : mortality will drop to acceptance falls to 5-10%.

### B-3-Mortality:

According to the data in Table (2) which refer that mortality for males and females was (100% and 66.7%) for non choice feeding test and was (33.3% and 66.7%) for the choice feeding test respectively. On the other hand the average of mortality percentages of the investigated animals *Mus musculus* were 83.4% and 50% for each of forced and free feeding system. Also the results assured that there is a positive correlation between the mortality and each of palatability and average of poison bait consumption.

Bradfield and Gill (1984) found that bromfenacoum 0.002%, 0.005% and 0.01% in pinhead quantmeal bait gave complete kill to mice using non choice feeding test

### B-4-Time to death:

The longest time to death in day was 11 and shortest was 6 days with average 8.3 days for males and it was 7.0 in females for non choice test. Meanwhile the time to death under choice test was (6 and 10 days) for males and females of *Mus musculus*. The general average of time to death in both obliged and free tests were respectively 7.7 and 8.0 days table (2).

Greaves *et al.*(1974) estimated that the whole tested rat and mice which fed on 0.1 calciferol for 2 days died. Though illness usually reduced food intake after the first 24 hr. The poison at 0.1% which is considered to be the lowest concentration suitable for use against *Rattus norvegicus* and *Mus musculus*.

### B-5-Body weight reduction:

The presented data in Table (2) show that the rate of the body weight reductions and its percentages of the albino house mouse *Mus musculus*, who fed on warfarin (0.02% hydroxy coumarin) for 4 days under both tests non choice and choice were (-3.2 gm and 9.9%) and (-2.0 gm and 7.3%) and were (-1.1 gm and 3.7%) and (-3.8 gm and 13.3%) for males and females respectively. The gained results show the general average of mice body weight reduction for non choice test was (-2.6 gm and 8.6%) and was (-2.5 gm and 8.5%) for choice test.

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كفاءة الوارفارين (٠,٠٢% هيدروكسي كومارين) على الفار الترويجي وفؤيرة  
المنازل السلالة الالبينو تحت الظروف المعملية  
طلعت محمد سليمان قشطه  
معهد بحوث وقاية النباتات مركز البحوث الزراعية - الدقى - الجيزة .

#### ١- تأثير الوارفارين على الفار الترويجي سلالة الالبينو:

كان متوسط الاستهلاك اليومي من طعم الوارفارين ٨,٧ جرام و ٤,٥ جرام فى اليوم لكل من نظامى التغذية الاجبارية والاختيارية وكانت قابلية الفار الترويجي لطعم الوارفارين ٣٤,٩% وكانت الاناث اقل قابلية للطعم من الذكور . اعطى طعم الوارفارين نسب موت كاملة (١٠٠%) فى الذكور بينما اعطى ٦٦,٧% فى الاناث فى ظروف التغذية الاجبارية بينما اعطى ٦٦,٧% و ٣٣,٣% فى الذكور واثاث الفسار الترويجي على التوالي وكان متوسط وقت الموت ٥,٧ يوم عنما غذيت الفئران اجباريا بينما كان متوسط وقت الموت ٦ يوم فى التغذية الاختيارية .

#### ٢- تأثير الوارفارين على الفار السيسى:

من النتائج يتضح ان استهلاك الذكور والاناث من طعم الوارفارين متقارب (٢,٦ جرام/يوم/فرد و ٢,٥ جرام/يوم/فرد) وكانت القابلية للطعم فى الذكور (٥١,٤%) اكبر من الاناث (٣٨,٨%) . وقد سجلت نسب موت بمتوسط ٨٣,٤% فى نظام التغذية الاجبارية بينما كان متوسط نسب الموت ٥٠% فى نظام التغذية الاختيارية وكان وقت الموت فى ظروف التغذية الاجبارية هو ٧,٧ يوم بينما كان ٨ يوم فى ظروف التغذية الاختيارية .