

Periodic Research

Toxicological Studies of Nerium Oleander Leaf Extract in Choice and No Choice Test against Rattus Norvegicus



Chandra Prabha

Lecturer,
Deptt. of Zoology,
Vedanta P.G. College,
Reengus, Sikar, Rajasthan



Kavita Sahni

Assistant Professor,
Deptt. of Zoology,
Govt. Girls College, Chomu,
Jaipur, Rajasthan.



Kuldeep Nitharwal

Veterinary Officer,
Deptt. of Animal Husbandry,
First Grade Veterinary Hospital,
Ramgarh Shekhawati,
Sikar, Rajasthan

Abstract

Nerium oleander is an evergreen shrub or small tree in the family Apocynaceae. The toxicity of *Nerium oleander* is considered extremely high and it has been reported that in some cases only a small amount had lethal or near lethal effects. In the present investigation toxicological study was done in choice and no choice test to find out the acceptability of the *Nerium oleander* leaf extract bait and percent mortality of animals treated with the bait. The bait was prepared by mixing the leaf extract and bajra flour in 1:1 and 2:1 ratio respectively along with 2% sugar as additive. During no choice test, in 1:1 and 2:1 ratio of bait 28.5% and 42.85% mortality was observed respectively. During choice feeding test in 1:1 ratio, no mortality was observed while in 2:1 ratio, 41.66% mortality was observed. Therefore it was concluded that higher proportion of leaf extract in bait cause greater mortality in rats.

Keywords: Apocynaceae, Bajra Flour, Bait, Mortality.

Introduction

The rodents cause economic losses in agricultural crops, stored food, human and livestock health which demand better means for reducing rodent population to boost up agricultural production and also to lessen public and livestock health problems. Although several methods are being used in the world to minimize these losses by eliminating rodents but the main method for controlling rodent population is the use of chemicals. The indiscriminate use of these chemical rodenticides have resulted hazards to human beings, domesticated wild life and environment. The extensive and continuous application of pesticides without adequate ecological considerations in pest control has led to develop a high degree of resistance (Ishijuka *et al* 2008). Therefore, now it has become necessary to search for an alternate means of rodent control, which can minimize the use of these chemical rodenticides. Hence this is a great opportunity for us to use the toxic plants to prepare herbal toxicant for the control of rodents. *Nerium oleander* is a toxic plant (Soundararajan and Karrunakaran 2010), keeping this in view, the present study was undertaken to find out the acceptability of the *Nerium oleander* leaf extract bait and percent mortality of animals treated with the bait.

Materials and Methods

1. Bait Formulation

Bait was prepared by mixing the leaf extract and bajra flour in different ratio along with 2% sugar. Acclimatized and individually caged healthy rats were randomly divided into two groups of eight animals each. One group was provided with 1:1 and the other group was provided with 2:1 ratio of extract and flour respectively for the period of three days. Active ingredient intake, mean poison bait intake was calculated and mortality and time to death was recorded.

2. Choice Test

In choice feeding test an alternate plain food was provided along with the poison bait. Palatability of poison bait in comparison to plain bait was worked out for three days. Mean daily intake, mean of total intake, mean active ingredient intake, days to death and percent mortality was noted.

3. No Choice Test

Extract mixed bait was provided to randomly selected eight, acclimatized and individually caged healthy rats for 24 hrs. Water was available *ad libitum*. Time to death and percent mortality was also recorded.

Results and Discussion

During **no choice test**, in 1:1 and 2:1 ratio of bait 28.5% and 42.85% mortality was observed respectively after 24 hours feeding with *Nerium oleander* leaf extract at 100% concentration. The days to death for 1:1 and 2:1 ratio of the bait were 4-6 and 1-3 respectively (Table 1).

During **choice feeding test** in 1:1 ratio, no

mortality was observed while in 2:1 ratio, 41.66% mortality was observed. Days to death were 3-5. Mean bait intake of leaf extract at 100% concentration was significantly ($P<0.01$) lower than plain bait (Table 2). Therefore it was concluded that higher proportion of leaf extract in bait causes greater mortality in rats.

Table No. 1
Toxicity of *Nerium oleander* leaf extract against *Rattus norvegicus* (No choice)

Ratio of extract and flour in bait	Exposure period (hrs)	Mean body weight (gms.)	Mean poison bait intake (gm/100g b.wt.)	Mean active ingredient intake (mg/100g b.wt.)	Mortality (%)	Days to death	
						Mean	Range
1:1	24	124.85±1.05	11.90±0.25	1191.2±25.47	28.5	5	4-6
2:1	24	125.13±0.91	8.98±0.34 ^a	888.37±40.50	42.85	2	1-3

Values are expressed as mean ± S.E.

a = $P<0.05$

Table No. 2
Toxicity of *Nerium oleander* leaf extract against *Rattus norvegicus* (Choice test)

Ratio of extract and flour in bait	Exposure period (days)	Mean body weight (gms.)	Mean bait intake (gm/100g. b.wt.)		Mean active ingredient intake (mg/100g b.wt.)	Mortality (%)	Days to death	
			Plain Bait	Poison bait			Mean	Range
1:1	3	137.42±0.87	8.15±0.12	6.39±0.7	643.29±3.78	Nil	-	-
2:1	3	143.71±0.93	5.16±0.007	4.74±0.08 ^a	475.49±4.76	41.66	4	3-5

Values are expressed as mean ± S.E.

a = $P<0.01$

The observations are in agreement with the results of Jensen *et al* (2003), who tested capsaicin treated poultry diets in no-choice and choice feeding trials at four poultry farms against rodents in New York. In no choice test, at all farms, overall consumption of treated diets by rodents was significantly less than consumption of the control diet.

The results observed in this experiment are also in consonance with the report of Teshome *et al* (2010) where it was observed that in choice test, the rats consumed an average of 17 times more plain food than poisoned bait. In the no-choice test, the rats only ate slightly more poisoned bait than the rats that had a choice between poisoned bait and plain bait. Their total consumption of food in no-choice test was on average less than the consumption in choice test.

Aslani *et al* (2007) conducted toxicity study on *Nerium oleander* in goats. Clinical signs of toxicosis in goats began to appear about 1 hr after receiving the oleander and included abdominal pain, frequent urination, bradycardia, tachycardia depression, weakness and convulsive movement and death at the end stage.

Mean poison bait intake of *Nerium oleander* leaf extract decreased significantly to that of plain bait in toxicological study, it might be due to variation in flavour or toxic effects of the plant or the presence of some constituents in the leaf extract, such as tannins (Onwuliri *et al* 2006) which may cause the observed reduced food intake. Tannins have been shown to reduce feed intake in animals fed tannin diets, which was attributed to the astringent property of tannins and induction of internal malaise in mammals (Hotellier and Delaveau'1975 and Toma *et al* 2009). Santhi *et al* (2011) made a qualitative phytochemical study on *Nerium oleander* leaf extract and confirmed the presence of various phytochemicals like carbohydrates, cholesterol, protein, amino acid,

alkaloids, flavonoids, tannins, saponins, cardiac glycosides, terpenoids and phlobatins in their aqueous leaf extract followed by ethanol, ethyl acetate, diethyl ether and chloroform.

Nerium oleander is a toxic plant and contains tannins, therefore it is concluded that reduction in bait consumption is due to toxicity of the plant and presence of tannins. Further programme should be undertaken to develop a new herbal pesticide with the compounds isolated from *Nerium oleander*.

References

- Aslani M R, Movassaghi A R, Janati-Pirouz H and Karazma M 2007 Experimental oleander (*Nerium oleander*) poisoning on goats: a clinical and pathological study. Ir. J. Vet. Res. 8 (1) 58-63
- Hotellier F P and Delaveau P 1975 Nauclefine and Nauclefine constituents of *Nauclea latifolia*. Phytochem. 14 1407-1411
- Ishijuka M, Tanikaw T, Tanaka K D, Heewon M, Okajima F, Sakamoto K Q Fujita, S. 2008 Pesticide resistance in wild mammals-mechanisms of anticoagulant resistance in wild rodents. J. Toxocol. Sci. 33 (3) 283-291
- Jensen P G, Curtis P D, Dunn J A, Austic R E and Richmond M E 2003 Field evaluation of capsaicin as a rodent aversion agent for poultry feed. Pest. Manag. Sci. 59 (9) 1007-1015
- Onwuliri F C, Mawak J D, Wonang D L and Onwuliri E A 2006 Phytochemical, toxicological and histopathological studies of some medicinal plants in Nigeria. Int. J. Nat. Appl. Sci. 2 (3) 225-229
- Santhi R, Lakshmi G, Priyadarshini A M and Anandaraj A L 2011 Phytochemical screening of *Nerium oleander* leaves and *Momordica charantia* leaves. Int. Res. J. Pharm. 2 (1) 131-135

7. Soundararajan T and Karrunakaran C M 2010 Micropropagation of *Nerium Oleander* through the Immature Pods. J. Ag. Sci. 2 (2) 181-193
8. Teshome M Kassa H Charles K 2010 The Toxicity of plant material, *Drimia altissima* (*Urginea altissima*), against the field rat, *Arvicanthis abyssinicus*: A potential non-synthetic rodenticide. Ethiop J Health Dev. 24 (3) 175-179
9. Toma I, Karumi Y and Geidam M A 2009 Phytochemical screening and toxicity studies of the aqueous extract of the pods pulp of *Cassia siberiana* DC (*Cassia kotchiana* Oliv.). African Journal of Pure and Applied Chemistry.3 (2) 26-30