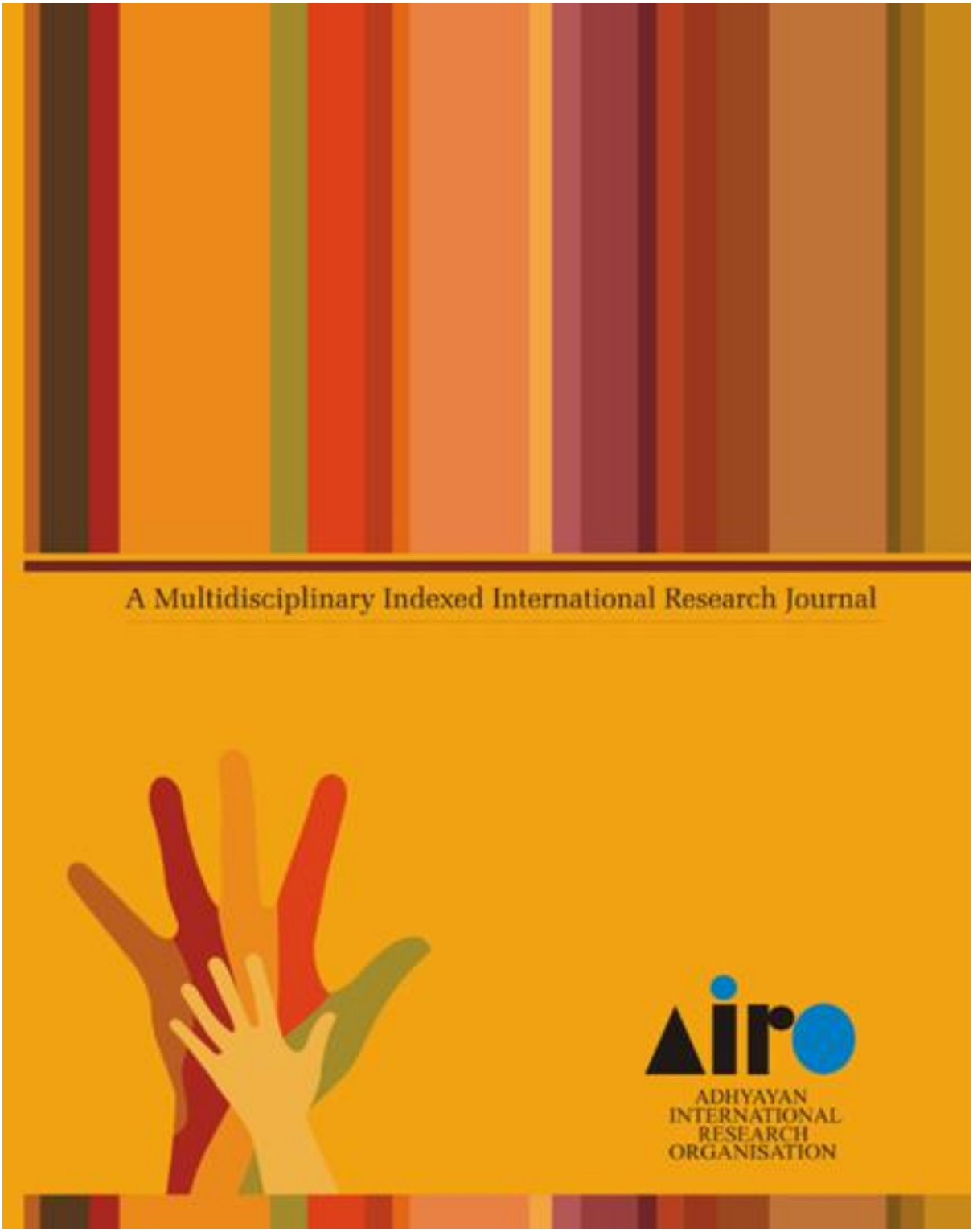
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EVALUATE THE MOLLUSCICIDAL IMPACT OF VINORELBINE ANTITUBULINE DRUG ON SNAIL DENSITY, REPRODUCTION AND VARIOUS DEVELOPMENTAL STAGES OF *LYMNAEA STAGNALIS*

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Abstract

Molluscicides development is of great interest in pest management to avoid the effects on the environment. Vinorelbine is a semi-synthetic vinca alkaloid that has been shown active in many tumor types. The total number of eggs laid by treated and control groups of snails was counted every 24 hrs up to 72 hrs. The present study revealed that the 0.09 ml/l concentration of Vinorelbine was considered as sublethal concentration. In the present research, mortality start on 23rd days in control whenever in all treat groups mortality started on the 6th days for Vinorelbine. The percentage of mortality ranges from 5% to 6% in *Lymnaea stagnalis* of the control group.

Keywords: Molludcicide, Vinorelbine, *Lymnaea stagnalis*

INTRODUCTION

Vinorelbine is a semi-synthetic vinca alkaloid that has been shown active in many tumor types and is currently registered for the treatment of advanced breast cancer and non-small cell lung cancer and it is used in other cancer type such as prostate cancer, lymphomas, gynecologic malignancies. This agent has a generally favorable safety profile, and may be suitable for use in special populations such as the elderly and/or frail patient (Brunello et al., 2009). Like all vinca-alkaloids, vinorelbine prevents cell division by binding with the proteins that make up tubulin. This stops tubulin – which is made up of smaller building blocks or protein monomers – from being built within the cell. Cells require tubulin to form the mitotic spindle in the metaphase stage of cell division (Foulkes et al., 2018). Sukumaran et al., (2004) reported the molluscicidal effect of nicotinanilide and its intermediate compounds against a freshwater snail *Lymnaea luteola*. National and international institutions are both currently giving increasing attention to the study of plant molluscicides in the hope that they may prove cheaper and more readily available than synthetic chemicals.. Many developing countries are reluctant to embark on chemical snail control programmes, using costly synthetic compounds bought from industrialized nations with scarce hard currency (Kloos and McCullough, 1982). Interest on plant molluscicides has increased in recent years, focusing on the ability to demonstrate that its use represents a lower cost and higher availability compared to the use of synthetic chemicals (Quijano et al., 2014). In the present study, effect of sub-lethal exposure of synthetic drug (Vinorelbine) was studied on the reproduction and development of snail *Lymnaea stagnalis*

MATERIALS AND METHODS

Snail Collection

The adult snail *Lymnaea stagnalis* were collected locally from ponds and lakes of Bhopal, Madhya Pradesh. The collected snails

were acclimatized in glass aquarium containing dechlorinated tap water in laboratory condition for 72 hrs and the used as experimental animals.

Batch Experiment

To study the effect of vinorelbine, one group of snails in dechlorinated water was exposed to the sub-lethal concentration antitubiline drugs vinorelbine. The total number of eggs laid by treated and control groups of snails was counted every 24 hrs up to 72 hrs. Since it is difficult to identify a particular spawn, capsule containing eggs from each treated group were incubated at 30º C in covered petridishes containing the same concentration as given to adult snails. The development of embryos was observed under a binocular microscope at regular interval up to their hatching. Percent hatching was studies only with eggs laid after the 24h exposure periods. Dead embryo was removed to avoid any contamination. Survival of young snails was observed up to 72h.

RESULTS AND DISCUSSION

Lymnaea stagnalis is an herbivore, hermaphrodite and oviparous snail. The results of the toxicity of Vinorelbine are summarized in Table 1. Fresh and healthy Lymnaea snail was introduced with different concentration of Vinorelbine. Snail species (*Lymnaea stagnalis*) were randomly placed into two groups; control and experimental groups, the later were treated with sub-lethal concentrations of pure Vinorelbine to determine its effects on fecundity, hatchability, growth and survivability. The exposed snails were kept in standing water for 72 hours. The present study revealed that the 0.09 ml/l concentration of Vinorelbine was considered as sublethal concentration. In the present research, mortality start on 23rd days in control whenever in all treat groups mortality started on the 6th days for Vinorelbine. The percentage of mortality ranges from 5% to 6% in *Lymnaea stagnalis* of the control group. However the mortality of treated groups depends on the concentration of antitibulin drugs in *Lymnaea stagnalis*. The increase in mortality depends on an increase in concentration. The mortality of Vinorelbine so high in the snail as shown in Table 2. The prolong oviposition period of 24 days in control to 5hrs in treated eggs indicates a retardaion in embryonic growth and development in the snails. In the treated group egg masses swelled and become viscous and the egg capsule turned white from a dark cream colour owing to the toxicity of treatments [Vatsala Singh and JN Tiwari, 2012]. Other Chemical molluscicides such as sulphate, copper chloride and the Bayluscides are known to have a strong lethal effect on invasive mollusc species (**R Mezghani-Jarraya et al., 2009**, Kennedy et al. 2006). It has been realised, however, that these molluscicides are toxic to non-target animals and have a long-term detrimental effect on aquatic environments (Belayhun Mandefro et al., 2017).

Table 1: DATA ON TOXICITY OF VINORELBINE ON THE ADULT SPECIMEN OF LYMNAEA

S. No.	Name of antitublin drug	Antitublin drug (conc. in ml/l)	Duration(hrs.)	Mortality(%)	Lethal conc. Value
1.	Vinorelbine	0.7	72	100	LC_{100}
2.	Vinorelbine	0.4	72	50	LC_{50}
3.	Vinorelbine	0.2	72	Nil	LC_0
4.	Vinorelbine	0.09	72	Nil	Sub lethal conc.

Result – 0.09 ml/l conc. of vinorelbine was considered as sub lethal conc.

Table 2: PERCENTAGE, MORTALITY AND REPRODUCTIVE PERFORMANCE OF LYMNAEA AFTER VINORELBINE TREATMENT

Kinds of antitubl in drugs	Antitu blin drugs (conc.)	Tot al no. of sna ils	No. of snail survi ved	Mortalit y(%)	Day on which morta lity starts	Day on whic h matin g starte d	Mati ng peri od (hrs)	Oviposi tion period	Fecundity		Viabi lity
									No. of egg mas ses laid by exp. & cont rol snail grou p	No. of egg mas ses duri ng exp. peri od	
Control	No trace of antitub lin drug	50	40±4 2	5±18	22nd	After 1 day	7-32	After 24 days	10± 12	50± 55	45±5 5
Vinorel bine	0.7	50									
Vinorel bine	0.4	50	17±2 1	41±46	4th	Varie s on differ ent mates	3-4	After 5 hrs	2±3	7±1 0	1±3
Vinorel bine	0.2	50	25±2 8	18±20	5th	Do	Do	Do	4±5	10± 15	12±1 6
Vinorel bine	0.09	50	30±3 2	18±20	6th	Do	Do	Do	6±7	17± 19	12±1 6

CONCLUSION

This is the first evaluation of the molluscicidal effect of Vinorelbine against important snail species *Lymnaea stagnalis*. The study indicated the Vinorelbine is effective at acceptable concentration. Therefore, this drug can play a role in community based snail control activities through further studies on different snail species and life stages. On the other hand, this type of treatment could also provide a rationale for the control of schistosomiasis and other parasitosis. Effectiveness studies in the field condition and evaluation of toxic effects on non-target organisms are the researchers' future prospects.

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