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Research Paper

Molluscicidal activity of two pesticides against Macrochlamys indica

Bhavsar Smita S. and Patel Nisar G.
P.G. & Research Centre, Deptt. Of Zoology, Pratap College, Amalner,
Dist- Jalgaon, 425401

ABSTRACT

*The two pesticides Thiamethoxam (Arrow 25% WG) and Diafenthiuron (Pegasus 50% WP) were tested to observe their molluscicidal activity against the terrestrial snail Macrochlamys indica at various concentrations, test carried out against the adult snails for 24 hours. The result revealed that the Thiamethoxam was more effective than that of Diafenthiuron. Thiamethoxam exhibited marked potency with LC50 value 5100ppm followed by Diafenthiuron with LC50 value 6400ppm.**Key words**: Thiamethoxam, Diafenthiuron, molluscicidal activity, Macrochlamys indica, terrestrial snail.*

Introduction

Snails and slugs are among the most bothersome pests in many garden and landscape situations. Land molluscs including slugs and snails are considered of an economic importance among the animals and pests attacking different types of plants causing economic damage to a wide variety of plant including vegetables, forage crops, tree fruits, shrubs, flowers, green cover and newly sown lawn grasses. Moreover, they play an important role in transmitting and spreading diseases to cultivated plants (Godan, 1983).

Control of snails and slugs on different crops is heavily dependent on the use of pesticides that limit the effect of these pests below the damaging level. Hence, the synthetic molluscicides or pesticides are the most effective available at present for the control of terrestrial gastropods (El-Wakil and Radwan, 1991; Hanafy et al., 1998; Hussein et al., 1999; El-Khodary et al., 2001; Heiba et al., 2002; Genena, 2003; Abd-El-All, 2004; Ismail et al., 2005 and Zedan et al., 2006).

Various attempts were made for detecting the molluscicidal effects using several pesticides including carbamates which are potent class of molluscicides; application of synthetic molluscicides is remaining as the effective method for controlling mollusk pests, particularly over large areas (Radwan et al., 1992; Schuytema et al., 1994; Heiba et al., 2002 and Miller et al., 1988). However, some of these pesticides are environmentally very stable, which meant that the risk of accumulation is very high and as a result, permission to use them as pesticides has been restricted (Ohayo et al., 1997). Thus we are in need for new and safe pesticides or molluscicides with different modes of action.

The land snail Macrochlamys indica belong to the family Zonitidae, subfamily Ariophantidae, genus Macrochlamys and M. indica was for a long time identified with Helix vitrinoides, a shell of unknown origin and described as imperforate. M. indica was occurred from Calcutta to Cawnpore, India. The first complete description of this species was given by Godwin-Austen and the name M. indica is accepted (Blandford et al., 1908). M. indica feed on variety of living plants as well as on decaying plant matter. Thiamethoxam is a systemic pesticide belonging to the neonicotinoid class of chemistry and Diafenthiuron is thiourea compound. The present study was to evaluate the toxicity effect of Diafenthiuron (1-tert-butyl-3-(2,6-di-isopropyl-4phenoxyphenyl)thiourea) and Thiamethoxam (EZ)-3-(2-chloro-1,3-thiazol-5-ylmethyl)-5-methyl-1,3,5-oxadiazinan-4-ylidene(nitro)amine on Macrochlamys indica. After survey of literatures it has been found that meager work has been done in relation to effect of pesticide on Macrochlamys indica and therefore the problem is selected.

Material and Method

The adult snails M. indica were collected from infested nurseries, local gardens and field crops in Amalner region. The obtained snails were transferred to laboratory and then kept in plastic containers filled with moist sterilized sandy loamy soil and fed on fresh leaves of lettuce and leafy vegetables. Under laboratory conditions snails were acclimatized for 2-3 days.

The experiments were carried out under laboratory conditions. The adult and healthy snails were chosen for toxicity test. The molluscicidal activity of compounds Thiamethoxam and Diafenthiuron was carried out against the adult snails for 24 hours. Stock solutions of toxicants were prepared and further diluted as per the necessity. Ten adult snail individuals with approximately similar size were taken from stock culture to plastic cups. Each cup was then covered with muslin cloth held by rubber bands. Each of the above mentioned pesticides and the control were replicated ten times. The tested snails were examined, where the dead individuals were counted and removed. Mortality percentages were recorded. Data analyzed by appropriate statistical methods.

Results and Discussion

The six pesticides bensultap, chlorpyrifos-ethyl, deltamethrin, diazonixy, lambda-cyhalothrin and methomyl were laboratory tested by Genena et. al. (2008) and observed molluscicidal activity against the two land snails, Monacha cantiana (Montagu) and Eobania vermiculata (Muller). It was evident that deltamethrin belonging to pyrethroid group exceeded other pesticides and showed high initial toxicity of 70.0% and 93.3% against M. cantiana and E. vermiculata, respectively after three days of exposure. However, methomyl belonging to carbamate group surpassed other pesticides and gave 100.0% mortality after seven and 12 days for the two land snails, M. cantiana and E. vermiculata,

respectively. On the other hand, chlorpyrifos-ethyl exhibited the lowest mortality percentages against the tested land snails. Obviously, methomyl proved to be the most effective pesticides followed by deltamethrin, bensultap, lambda-cyhalothrin, diazonixy then chlorpyrifos-ethyl against the two land snails. Afzal et al. (2002); Ulaganathan and Gupta (2004); Dewar et al. (2004) and Mainfisch et al. (2001) demonstrated that from the novel compound thiamethoxam exhibits exceptional systemic characteristics and provides excellent control of a broad range of commercially important pests. The new compounds showed potent activities against M. indica. In addition, the infection rate and prepatent period of M. indica snails were remarkably controlled on exposure to the tested pyrazoline and isoxazoline derivatives. (Toche et al., 2009).

The snails intoxicated with lethal concentrations of Thiamethoxam and Diafenthiuron, during the first hour, the snails still moved actively. After five to six hours, they secreted lucent mucus. The snails became inactive and immobile. After 12 hours, some snails died. Snails those have not given any response or muscular contraction when being touched with a pin inside the shell were considered dead. No dead snails were found in the untreated cups during the run of experiment. The LC50 of Diafenthiuron was obtained at 6400ppm and that of Thiamethoxam was at 5100ppm which is less than that of Diafenthiuron. Therefore at low concentration Thiamethoxam seems to be more effective than Diafenthiuron. The LC50 values of Thiamethoxam and Diafenthiuron are shown in Table.

In conclusion, additional research is needed to evaluate the molluscicidal effect of the tested pesticides against the economically terrestrial snails under field conditions.

	Concentration In ppm	Mortality % (Mean ±SE) for 24hrs
Control	0000	00.0±0.0
Diafenthiuron	6200	44.0±1.4
	6300	46.6±0.84
	6400	50.4±1.8
	6500	52.4±1.44
	6600	55.9±1.29
Thiamethoxam	4900	44.5±0.65
	5000	47.2±1.56
	5100	50.2±1.76
	5200	52.4±1.44
	5300	54.7±1.61

Table

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