Journal of crop and weed 2(1) : 78-80 (2005)

Effect of some herbicides on molluscs (*Pila globosa* Swainson) – an important nontarget fauna of low land crop ecosystem

P. BHOWMIK, A. BANERJEE, MD. MOHASIN AND A. K. SOMCHOUDHURY

Department of Agricultural Entomology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, West Bengal

ABSTRACT

A laboratory experiment was conducted to study the main as well as interaction effect of some herbicides on the mortality of one mollusc (*Pila globosa*), an important nontarget fauna found in agricultural ecosystem. Four herbicides (ml or g / l of water) viz. paraquat 24% SL @ 10 ml and 20 ml, 2, 4-D Na salt 80% @ 5 g and 10 g, glyphosate 41% SL @ 10 ml and 20 ml and 2, 4-D + glyphosate @ 12 ml and 24 ml at different period of exposure were evaluated. It was found that mollusc released on paraquat treated soil, applied at double to that of recommended dose caused maximum mortality. However, all the tested herbicides were safe to the mollusc species at recommended dosages in terms of mortality, and treatments were statistically at par. Increase of exposure period subsequently increased mortality of mollusk species. The experiment was analyzed using asymmetrical factorial design.

Key words: Herbicide, molluscs

Snail is considered as an important fauna present in crop ecosystem particularly in low land agricultural crops in the coastal belts of West Bengal. These animals are of great importance to mankind not only due to its food value but also for other reasons like their use in road construction, lime production, making ornamentals and jewellaries, poultry feed preparation and last but not the least it indirectly helps in organic matter decomposition. Indiscriminate use of relatively high doses of broad-spectrum pesticides including herbicides in paddy ecosystem, which is quite natural to obtain higher yield, may adversely affect the snail or mollusc population. Therefore, the question about the fate of pesticides particularly herbicidal residues on nontarget fauna like snails is of prime interest to the ecologically oriented scientific community. However, some works have been done on *Biomphalaria alexandrina* Ehrenberg and *Bulinus truncatus* Audouin (Abou-El-Hassan *et al.*, 1990; Zidan *et al.*, 1990), *Stagnicola elodes* Say (Henry *et al.*, 1994) and *Pseudosuccinea columella* Say (Tate *et al.*, 1997) to study the molluscicidal impact of some herbicides. Keeping in view, the present investigation was carried out to study the effect of some commonly used herbicides on *Pila globosa* Swainson one of the most abundantly found snail species in low land paddy field of West Bengal.

MATERIALS AND METHODS

The laboratory experiment was conducted in the Research Complex Building of Bidhan Chandra Krishi Viswavidyalaya located at Kalyani, Nadia, West Bengal (9.75 msl). The experiment was carried out in twenty seven (27) aquarium (measuring – 1.5m X 1.0m X 1.0m) creating a simulated low land crop ecosystem. For this purpose, a thin bed of sand (2 cm) was placed at the bottom of the aquarium and water was poured into the aquarium upto a level of 15 cm from bottom. Paddy seedlings were planted at 4 cm apart in two rows. Eight herbicidal treatments viz. paraquat 24% SL @ 10 ml and 20 ml, 2, 4- D Na Salt 80% @ 5 g and 10 g, glyphosate 41% SL @ 10 ml and 20 ml, 2, 4-D + glyphosate @ 12 ml and 24 ml were applied mixing in 1 litre water in every cases on a weed free plot (1 sqm each) and the treated soils, which were collected (2 h after application) separately, were placed at the bottom of the aquarium. The snails were released in the simulated paddy ecosystem (@ 10 snails / aquarium) and each of the aquarium was covered. The experiment was replicated thrice with an untreated check. Observations were recorded at an interval of 24, 48 and 72 hours after the release of the snails. Since, main effect of two factors i.e. treatment and exposure period and their interaction was considered during the course of experiment, asymmetrical factorial design was employed and the data were corrected using Abbott's formula (1925).

RESULTS AND DISCUSSION

It can be seen from Table 1, that, the minimum mortality was brought about by 2, 4- D Na salt 80% @ 5g/lit (0%) and the mortality were negligible in case of other herbicides at recommended dosages (1.11% in case of paraquat 24% SL, glyphosate 41% SL as well as the mixture formulation of 2, 4 – D + glyphosate). Maximum mortality (11.11%) was recorded in case of paraquat 24% SL applied @ 20 ml followed by glyphosate 41% SL applied @ 20 ml (6.67 %). This supports the findings of Schuytema *et al.* (1994) who also obtained higher mortality of snail when fed with

paraquat treated diets compared to the diets treated with glyphosate though their test species was different (*Helix aspersa* Muller). However, it may be said that the herbicides tested at recommended doses were safe to the snail species and thus can be used to control aquatic weeds in paddy ecosystem. None of the snails showed mortality 24 hours after the release (0.00%). Initial effect of herbicides on snails increased significantly to the tune of 2.08 % at the end of 2nd day with a gradual increase (9.17 %) at the end of 3rd day.

From Table 2 it is clear that the interaction between herbicidal treatments and exposure period were significant indicating the difference in mortality between all the treatments.

ACKNOWLEDGEMENT

The authors are thankful to Prof. R. K. Ghosh, Department of Agronomy, B. C. K. V. for providing the herbicides.

Table 1 Simple effect of some factors on the mortality (%) of mollusks

Sl. No.	Treatments	Dose (ml or g / l)	Mean Mortality (%)
1.	**Herbicides**		
	Paraquat 24% SL	10	1.11 (6.05)*
	Paraquat 24% SL	20	11.11 (19.47)
	2,4- D Na Salt 80%	5	0.00 (4.05)
	2,4- D Na Salt 80%	10	2.22 (8.57)
	Glyphosate 41% SL	10	1.11 (6.05)
	Glyphosate 41% SL	20	6.67 (14.97)
	2,4-D + Glyphosate	12	1.11 (6.05)
	2,4-D + Glyphosate	24	6.67 (14.97)
2.	**Exposure period (days)**		
	1		0.00 (4.05)
	2		2.08 (8.29)
	3		9.17 (17.63)
		Herbicides	**Exposure period**
	S. Em ±	1.768	1.082
	C. D. (p= 0.05)	5.039	3.086

*Figures in parentheses are angular transformed values.

Table 2 Effect of interaction between herbicides and exposure period on the mortality (%) of mollusc, *Pila globosa* Swainson in paddy ecosystem

Exposure periods (Days)	Herbicides							
	Paraquat (10ml/l)	Paraquat (20ml/l)	2,4-D Na salt (5g/l)	2,4-D Na salt (10g/l)	Glyphosate (10 ml/l)	Glyphosate (20 ml/l)	2,4-D + Glyphosate (12 ml/l)	2,4-D + Glyphosate (24 ml/l)
1	0.00 (4.05)*	0.00 (4.05)	0.00 (4.05)	0.00 (4.05)	0.00 (4.05)	0.00 (4.05)	0.00 (4.05)	0.00 (4.05)
2	0.00 (4.05)	6.67 (14.97)	0.00 (4.05)	0.00 (4.05)	0.00 (4.05)	3.33 (10.51)	0.00 (4.05)	3.33 (10.51)
3	3.33 (10.51)	16.67 (24.09)	3.33 (10.51)	6.67 (14.97)	3.33 (10.51)	13.33 (21.41)	3.33 (10.51)	6.67 (14.97)
S. Em ±								3.06
C. D. (p= 0.05)								8.73

*Figures in parentheses are angular transformed values.

REFERENCES

Abbott, W. S. 1925. A method of computing the effectiveness of insecticides. *J. Econ. Ent.*, **18**: 265-267.

Abou-El-Hassan, A. A., Zidan, Z. H., Zidan, A. A., Al-Zemaity, M. S. and Ragab, F. M. 1990. Molluscicidal activities of certain herbicides against schistosomiasis snail vectors. *Egyptian Zournal of Bilharziasia*, **12**(1-2): 133-144.

Henry, C. J., Higgins, K. F. and Buhl, K. J. 1994. Acute toxicity hazard assessment of Rodes, X-77 Spreader and Chem-Trol to aquatic invertebrates. *Archives of Environmental Contamination and Toxicology*, **27**(3): 392-399.

Schuytema, G. S., Nebekar, A. V. and Griffis, W. L. 1994. Effects of dietary exposure to forest pesticides on the brown garden snail *Helix aspersa* Mu. *Archives of Environmental Contamination and Toxicology*, **26**(1): 23-28.

Tate, T. M., Spurlock, J. O. and Christian, F. A. 1997. Effect of glyphosate on the development of *Pseudosuccinea columella* snails. *Archives of Environmental Contamination and Toxicology*, **33**(3): 286-289.

Zidan, A. A., Zidan, Z. H., Hussein, M. I., Abou-El-Hassan, A. A. and Ragab, F. M. 1990. Influence of herbicide pre-exposure treatments on the molluscicidal activities of certain molluscicides against schistosomiasis snail vectors. *Annals of Agricultural Science Cairo*, **35**(2): 1065-1075.