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Research Note

Effectiveness of cartap hydrochloride against rice stem borer and leaffolder and its safety to natural enemies

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ABSTRACT: **Four field experiments conducted to evaluate the efficacy of cartap hydrochloride @ 1 kg a.i. / ha in comparison with check insecticide carbofuran during 1999 (I crop season), 2000 (I crop season) and 2001 (I and II crop seasons) showed that cartap hydrochloride treatment in nursery five days before pulling rice seedlings had reduced incidence of dead hearts (35.6 %) and white ear (28.4 %) caused by yellow stemborer, *Scirpophaga incertulas* Walker and reduced leaf damage by leaf folder, *Cnaphalocrocis medinalis* Guenee by 47.7 per cent with increased grain yield in comparison with check insecticide (carbofuran) drenched seedlings. The cartap hydrochloride drenched seedlings supported higher population of natural enemies like spiders (*Tetragnatha* sp.) while other natural enemies like damselflies (*Agriocnemis* sp.), green mirid bugs (*Cyrtorhinus lividipennis*) and larval parasitoids (*Stenobracon* sp.) were on par with the untreated plots.**

KEY WORDS: Carbofuran, cartap hydrochloride, leaffolder, natural enemies, rice, stem borer

Rice is infested by a number of insect pests from the time of sowing till its harvest (Gupta and Verma, 2001). The estimated yield loss due to insects varied from 10 to 20 per cent of total yield (Pathak and Khan, 1994). The application of carbofuran was found promising in the management in rice stem borer (Purohit *et al.*, 1987) but its application caused resurgence of leaf folder (Singh *et al.* 1995). Keeping this in view, experiments were conducted at Regional Agricultural Research Station, Pattambi during the periods of 1999, 2000 and 2001 to manage both stem borer and leaf folder by assessing its safety to natural enemies in the rice ecosystem.

The experiments were conducted during four cropping seasons *viz.*, *Rabi* 1999, *Kharif* 2000, *Kharif* 2001 and Rabi 2001 at Regional Agricultural Research Station, Pattambi. The susceptible rice variety Jyothi was treated with cartap hydrochloride @ 1kg a. i. / ha and carbofuran @ 1kg a. i. / ha in nursery five days before pulling. Twenty-five days old nursery treated seedlings were transplanted to main field in a plot size of 24 sq m with six replications with an untreated control. The experiments were laid out in a completely randomized block design. The stem borer damage was assessed by per cent tiller damage at 25 and 55 days after transplanting for dead heart damage. For white ear, per cent ear heads affected was assessed at 70 days after

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transplanting. Leaf folder damage was assessed by per cent leaf damage at 10 days before and after boot leaf stage.

The count was taken on ten randomly selected hills per plot. The natural enemy population was assessed at 30 and 50 days after transplanting by 10-15 net sweeps per plot walking diagonally covering the entire plot. Finally net grain yield per plot was also studied.

The results showed that deadhearts and white ear symptoms caused by stem borer was reduced by 13-72 per cent and 3-35 per cent respectively in cartap hydrochloride drenched seedlings @ 1 kg a. i. / ha in all the crop seasons as in Table 1and 2. The pooled analysis of all crop seasons also showed similar result with reduced dead heart (35.6 per cent) and white ear (28.4 per cent) damage caused by stem borer in cartap hydrochloride treated seedlings and were superior over the check insecticide (carbofuran) (Table.5). The results were in confirmation with earlier studies by Mazumdar and Chakravorty (1994) and Gubbiah *et al.* (1995).

The leaffolder damage was reduced by 19-84 per cent in the seedlings treated with cartap hydrochloride @ 1 kg a. i./ ha in all the seasons (Table 3). The pooled analysis also showed that leaffolder incidence was reduced by 47.7 per cent in cartap hydrochloride treated seedlings and superior to carbofuran treated seedlings which conforms to earlier study by Suresh and Balasubramanian (2001). The carbofuran treated seedlings suffered increased leaf folder damage as presented in Table 5.

Table 1. Effect of cartap hydrochloride on the incidence of dead heart

Treatment	1999 II Crop (% DH)	2000 I Crop (% DH)	2001 I Crop (% DH)	2001 II Crop (% DH)
1. Nursery drenched with cartap hydrochloride @ 1 kg a. i. /ha	6.36	21.05	13.25	11.25
2. Nursery drenched with carbofuran @ 1 kg a. i. /ha	9.64	19.77	14.74	12.08
3. Control	22.66	24.24	16.58	13.24
CD (p = 0.05)	6.86	3.40	4.94	5.99

DH-Dead Heart

Table 2. Effect of cartap hydrochloride on the incidence of white ear

Treatment	1999 II Crop (% WE)	2000 I Crop (% WE)	2001 I Crop (% WE)	2001 II Crop (% WE)
1. Nursery drenched with cartap hydrochloride @ 1 kg a. i. /ha	12.64	8.74	8.95	13.98
2. Nursery drenched with carbofuran @ 1 kg a. i. /ha	11.43	15.71	10.37	14.09
3. Control	15.64	16.30	12.90	14.09
CD (p = 0.05)	4.60	4.24	NS	NS

WE-White ear

Table 3. Effect of cartap hydrochloride on the incidence of leaf folder

Treatment	1999 II Crop(% DL)	2000 I Crop(% DL)	2001 I Crop(% DL)	2001 II Crop(% DL)
1. Nursery drenched with cartap hydrochloride @ 1 kg a. i. /ha	1.23	3.78	12.40	1.14
2. Nursery drenched with carbofuran @ 1 kg a. i. /ha	8.92	9.95	19.51	5.65
3. Control	7.67	8.98	15.31	3.54
CD (p = 0.05)	4.51	3.65	5.05	3.90

DL : Damaged leaves

Table 4. Effect of cartap hydrochloride on grain yield

Treatment	1999 II Crop Grain yield (Kg/ha)	2000 I Crop Grain yield (Kg/ha)	2001 I Crop Grain yield (Kg/ha)	2001 II Crop Grain yield (Kg/ha)
1. Nursery drenched with cartap hydrochloride @ 1 kg a. i. /ha	4396	3408	2196	2453
2. Nursery drenched with carbofuran @ 1 kg a. i. /ha	4514	3013	1635	2281
3. Control	3441	2850	1832	2188
CD (0.05%)	473	395	NS	374

Table 5. Pooled analysis of all the crop seasons

Treatment	DH (%)	WE (%)	DL (%)	Grain Yield (KG/ha)
1. Nursery drenched with cartap hydrochloride @ 1 kg a. i. /ha	13.67[a]	11.48[a]	4.64[a]	3113[a]
2. Nursery drenched with carbofuran @ 1 kg a. i. /ha	14.56[ab]	14.03[ab]	11.01[c]	2861[ab]
3. Control	21.22[b]	16.04[b]	8.88[b]	2576[b]

The net grain yield was more in cartap hydrochloride @ 1 kg a. i. / ha during 2000 I and 2001 II crops (Table 4) and the pooled analysis of all the four crop seasons showed that the seedlings drenched with cartap hydrochloride @ 1 kg a. i. / ha gave higher yield on par with check insecticide, carbofuran (Table 5).

The pooled analysis of all the four crop seasons revealed that the plots treated with cartap hydrochloride @ 1 kg a. i. / ha supported high population of spiders (*Tetragnatha* sp.) while other natural enemies like damselflies (*Agriocnemis* sp.), green mirid bugs (*Cyrtorhinus lividipennis*) and larval parasitoids (*Stenobracon* sp.) were on par

Table 6. Population of natural enemies (Per 10-15 sweeps) under different treatments (pooled analysis)

Treatment	Spiders (*Tetragnatha* sp.)	Damselflies (*Agriocnemis* sp.)	Green mirid bugs (*Cyrtorhinus lividipennis*)	Larval parasitoids (*Stenobracon* sp.)
1. Nursery drenched with cartap hydrochloride @ 1 kg a. i. /ha	1.04	2.40	1.10	1.18
2. Nursery drenched with Carbofuran @ 1 kg a. i. /ha	0.26	1.76	0.60	0.60
3. Control	0.85	1.68	0.50	0.60
CD (0.05%)	0.71	NS	NS	NS

with untreated plots (Table 6). There was increase in the population of spiders, damselflies, green mirid bugs and larval parasitoids by 18.27, 42.86, 54.55 and 49.15 per cent, respectively in cartap hydrochloride treated plots in comparison to untreated plots. This is in confirmation with the previous study of Karthikeyan and Purushothaman (2001) who reported the safety of cartap hydrochloride to natural enemies of rice ecosystem. The earlier studies of different authors did not show the safety of this granular insecticide to natural enemies of rice ecosystem while the present finding showed that cartap hydrochloride was not only effective against rice stem borer and rice leaf folder but also safe to natural enemies like spiders, damselflies, green mirid bug and larval parasitoids present in the rice ecosystem.

REFERENCES

Gubbiah, Revanna, H. P. and Gowda, J. 1995. Efficacy of cartap 4 G against rice stemborer. *Current Research, University of Agricultural Sciences, Bangalore*, **24**: 229-331.

Gupta, A. K. and Verma, R. M. 2001. Comparative effect of some granular insecticides against green leaf hopper (*Nephotettix virescens*) on paddy crop. *Indian Journal of Entomology*, **63**: 109-113.

Karthikeyan, K. and Purushothaman, S. M. 2001. Efficacy of granular insecticides and neem products against rice pests and their safety to natural enemies. pp: 206-207. *Proceedings of the symposium on Biocontrol based pest management for quality crop protection in the current millineum*, July 18-19, 2001, PAU, Ludhiana, Punjab.

Mazumdar, S. and Chakravorty, S. 1994. Chemical control of yellow stem borer *Scirpophaga incertulas* Walker in deep water rice at the time of maximum flooding. *Environment and Ecology*, **12**: 404-408.

Pathak, M. D. and Khan, Z. R. 1994. *Insect pests of rice*. International Rice Research Institute, Manila, Philippines and International Centre for Insect Physiology and Ecology, Kenya, 89 pp.

Purohit, M. S., Shah, A. H. and Raman, S. 1987. Five granular insecticides and four sprayable formulations evaluated for yellow stem borer control. *IRRI News letter*, **12**: 20.

Singh, S., Kushwaha, K. S, Sharma, P. D. and Singh, S. 1995. Resurgence of rice leaf folder, *Cnaphalocrocis medinalis* Guenee due to application of carbofuran granules. *Indian Journal of Entomology*, **57**: 366-372.

Suresh, S. and Balasubramanian, G. 2001. New insecticides for management of yellow stemborer and leaffolder. pp: 18. *Proceedings of the National symposium on Emerging Trends in Pests and Diseases and their Management*, October 11-13, 2001, TNAU, Coimbatore.

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