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SULFOXAFLOR 24 SC: A NOVEL INSECTICIDE FOR THE MANAGEMENT OF PADDY PLANTHOPPERS

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ABSTRACT

Field trial was conducted at Agricultural Research Station, Gangavati, during *kharif,* 2011-12 to evaluate the efficacy of novel molecule sulfoxaflor belongs to sulfoximine group. Sulfoxaflor 24 % SC (Transform) at different dosages was tested along with standard checks *viz*., Imidacloprid 17.8 SL and Buprofenzin 25 SC for the management of sucking pests of paddy (*Oryza sativa* L). Overall the field trials revealed that, Sulfoxaflor 24 SC @ 438 ml/ha emerged as a best and optimum dose as it registered lowest number of brown planthoppers (4.38/hill) and white backed planthoppers (3.39/hill) at 7 days after first and second spray (pooled) and recorded highest yield of 65.30q/ha. Whereas, Imidacloprid 17.8 SL and Buprofezin 25 SC recorded yield of 58.40and 61.20 q/ha respectively. The foregoing studies indicated that all the dosage tested for sucking pests were proved superior over control and the performance of Sulfoxaflor 24 SC @ 438 ml/ha was superior to other dosages in terms of suppression of pest population, relatively safe to predators and harnessing higher yield.

KEY WORDS
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INTRODUCTION

Rice plant hoppers are major pests across the country especially in irrigated rice where intensive rice cropping is being done. Three species of plant hoppers reported on rice are brown planthopper (BPH), *Nilaparvata lugens* (Stal), white backed planthopper (WBPH), *Sogatella furcifera* (Horvath) and smaller brown planthopper (SBPH), *Laodelphax striatellus* Fallén. First two of these are of economic importance. Brown planthopper is the most destructive pest of rice in Uttar Pradesh, Madhya Pradesh, West Bengal, Andhra Pradesh, Karnataka and Tamil Nadu (Chung *et al.,* 1982, Liu *et al.,* 2003).

The plant hoppers suck the plant sap from the phloem vessels through their proboscis. Due to this, plant starts wilting with outer most leaves drying first and then the entire plant dries up - a symptom often called hopper burn (Patcharin, 2011). BPH and WBPH causes huge crop loss in grain yield ranging from 10-70 per cent (Kulshreshtha, 1974) and 35-95 per cent (Sindhu, 1979), respectively. Hence, these two pests combination (BPH & WBPH) have been emerged as the number one pest which limit the rice production in India.

To date, it is well known that pest has developed high resistance to a variety of chemical insecticides including neonicotinoids compounds (Liu *et al*., 2003). Increases outbreaks and resistance problems in BPH and WBPH has become serious threat in rice production (Wang and Wang. 2007,Balakrishna and Satyanarayana (2013)). These problems therefore urge to search for alternatives to chemical control which are effective and safe to the environment, in this regards present study has been carried to evaluate different dosages of sulfoxaflor insecticides against paddy sucking pests.

MATERIALS AND METHODS

The experiment on evaluations of the Sulfoxaflor 24 % SC against paddy sucking insect pests was carried out at Agricultural Research Station, Ganagavati, Karnataka during *kharif* 2011-12. The experiment was laid out in a randomized block design (RBD) design with 9 treatments replicated thrice. The test product, Sulfoxaflor 24 % SC (supplied by M/s. Dow Agro Sciences India Private Limited) was tested at five different dosages *viz*., 250,313, 375, 438 and 876 ml/ha for their bio-efficacy and was compared with standard checks *viz.,* imidacloprid17.8%SL and buprofenzin 25 % SC against paddy sucking insect pests.Two rounds of spray had been applied at different intervals based on ETL of pests. The standard methodology of Reissig *et al*. (1986) was followed for visual counting of pests. Observations were made on number of both brown planthoppers and white backed planthoppers on 10 hills before imposition of the treatment and 3, 5 and 7 days after imposition of treatments at each spray. Observations before and after application of two sprays were averaged for statistical analysis. Data was subjected to square root transformation and applied to statistical analysis as suggested by Gomez and Gomez (1984). Grain yield from each individual plot was converted to hectare basis and computed statistically. Observations were also recorded on number of natural enemies (*viz*., mirid and spiders on 10 hills).

RESULTS AND DISCUSSION

Observations on pest population were recorded a day before application (DBS), 3 days after application (DAS), 5 DAS and 7 DAS. Natural enemies population and yield was also recorded and presented in table.

Efficacy of Sulfoxaflor 24 SC on BPH population

Observations on number of BPH per hill (average of two applications)was non-significant a day before treatment imposition showing uniformity in the incidence of the pests in the experimental plots (Table 1.). The testing insecticide Sulfoxaflor 24 SC both at 876 and 438 ml / ha (8.93 and 9.52 BPH /hill) were found to be superior over untreated check (20.54/ hill) and even to the standard cheek of both Buprofezin 25 SC @ 1000 ml / ha (10.79BPH /hill) and Imidacloprid 17.8 SL (11.36 BPH /hill) at 3 days after first application The higher dosages of Sulfoxaflor 24 SC excelled statistically over Buprofezin 25 SC and Imidcloprid 17. 8 SL at 5 and 7 days after spray also. The same insecticides at lower dosage were lagged behind over higher dosages but statistically top over standard cheeks (Table 1).

Efficacy of Sulfoxaflor 24 SC on WBPH population

Average of two sprays also showed same trend. Higher dosages of Sulfoxaflor 24 SC namely 876 ml and 438 ml were on par with each other (5.83 and 6.72 hoppers/hill, respectively) but statistically comparable with standard checks imidacloprid 17.8 SL (7.80/hill) and Buprofezin 25 SC (6.55/hills). All dosages of Sulfloxaflor 24 SC were statistically superior over untreated check. These insecticides maintained their efficacy even at 7 days after of application (Table 1).

Yield

Sulfoxaflor 24 SC @ 876/ha recorded highest yield of 67.80 q/ ha and was at par with Sulfoxaflor 24 SC @ 438 ml / ha (65.30 q/ha) and also with standard check Buprofezin 25 SC (61.20 q/ha). The rest of treatments were statically comparable to higher dosages of Sulfoxaflor 24 SC and also with standard checks (Table 2).

Impact on all natural enemies

Population of natural enemies (spiders and mirid bug) activity was moderately low in all chemical treatments when compared to untreated check (Table 3). Significantly highest number of spiders were found in untreated check (6.80/hill) followed by Sulfoxaflor 24 % SC @ 250ml/ha (3.10/hill). Same trend had followed for mirid bug population also, where significantly highest number was found in untreated check (20.37/hill) followed by Sulfoxaflor 24 % SC @ 250ml/ha (10.54/hill) (Table 2).

Table 1: Bio - efficacy of Sulfoxaflor 24 % SC against plant hoppers on paddy

Sl. No	Treatment detail	Dosage (ml /ha)	No. of BPH/hill Average of two applications DBS	1DAS	3 DAS	5 DAS	7 DAS	No. of WBPH/hill Average of two applications DBS	1DAS	3 DAS	5 DAS	7 DAS
1	Sulfoxaflor 24 % SC	250	15 .88 (4. 10)	14. 62 (3. 95)	10. 74 (3 .42)	8. 49 (3. 07)	6. 33 (2. 61)	9.67 (3.25)	9.40 (3.20)	7.82 (2.96)	6.04 (2.63)	4.62 (2.35)
2	Sulfoxaflor 24 % SC	313	16 .14 (4. 13)	15 .30 (4. 03)	10 .56 (3. 98)	7. 93 (2. 96)	5. 97 (2. 63)	9.1 1 (3.17)	7.97 (2.98)	7.23 (2.86)	5.73 (2.58)	4.47 (2.33)
3	Sulfoxaflor 24 % SC	375	15. 29 (4. 01)	13. 44 (3. 79)	9. 97 (3 .28)	6. 34 (2. 69)	4. 66 (2. 37)	8.76 (3.11)	8.20 (3.02)	6.94 (2.81)	5.53 (2.55)	4.08 (2.24)
4	Sulfoxaflor 24 % SC	438	16. 96 (4. 23)	15. 66 (4. 07)	9. 52 (3. 23)	6. 92 (2. 80)	4. 38 (2. 30)	8.45 (3.06)	7.70 (2.93)	6.72 (2.77)	5.28 (2.50)	3.39 (2.08)
5	Sulfoxaflor 24 % SC	876	15. 96 (4. 09)	14 .52 (3. 93)	8. 93 (3. 15)	4. 84 (2. 40)	3. 01 (2. 00)	9.70 (3.26)	8.59 (3.08)	5.83 (2.60)	3.93 (2.21)	1.86 (1.69)
6	Imidacloprid 17.8 SL	125	16. 87 (4. 22)	16. 24 (4. 14)	11. 36 (3. 50)	9. 48 (2. 23)	7. 81 (2. 95)	9.99 (3.30)	8.90 (3.13)	7.80 (2.95)	6.80 (2.78)	5.22 (2.49)
7	Buprofenzin 25 SC	800	17. 59 (4. 29)	16. 78 (4. 20)	10. 79 (3 .43)	7. 97 (2. 99)	6. 22 (2. 67)	10.32 (3.36)	9.89 (3.30)	6.55 (2.73)	6.02 (2.65)	4.54 (2.35)
8	Un treated check		18 .88 (4. 45)	19. 95 (4. 56)	20. 54 (4. 64)	23. 06 (4. 89)	24. 04 (4. 99)	10.22 (3.33)	10.64 (3.41)	11.48 (3.53)	12.13 (3.62)	11.88 (3.59)
	CD		NS	0.68	0.60	0.63	0.63	NS	0.60	0.53	0.48	0.41
	SEm ±		0.23	0.23	0.20	0.21	0.21	0.22	0.20	0.18	0.16	0.14
	CV(%)		9.36	9.88	10.37	12.37	13.87	11.77	11.27	11.07	10.87	10.66

Figures in the parenthesis are $\sqrt{x+1}$ transferred value, DBS- Day Before Spray, DAS- Days After Spray

Table 2: Impact of Sulfoxaflor 24 % SC on natural enemies

Sl.No	Treatment detail	Dosage(ml/ha)	Spiders /10 hills Mean DBS	7 DAS	Mirid bug / 10 hills Mean DBS	7DAS	Yield
1	Sulfoxaflor 24 % SC	250	6. 05 (2. 64)	3. 10 (2. 00)	12 .47 (3. 65)	10. 54 (3 39)	63.10
2	Sulfoxaflor 24 % SC	313	5. 70 (2.58)	2 .30 (1. 81)	12. 48 (3. 66)	10. 17 (3. 33)	63.90
3	Sulfoxaflor 24 % SC	375	5. 70 (2. 57)	2. 10 (1. 75)	12. 60 (3 .68)	9. 43 (3.21)	64.70
4	Sulfoxaflor 24 % SC	438	5. 35 (2. 48)	1 .70 (1. 64)	12 .70 (3.69)	8 .98 (3.13)	65.30
5	Sulfoxaflor 24 % SC	876	5. 60 (2.54)	1 .40 (1. 55)	13. 30 (3 .77)	7. 65 (2.92)	67.80
6	Imidacloprid 17.8 SL	125	5. 00 (2.45)	1. 20 (1. 48)	13. 75 (3. 82)	6. 37 (2.70)	58.40
7	Buprofenzin 25 SC	800	5.35 (2.52)	1.70 (1.64)	14.00 (3.86)	8.70 (3.10)	61.20
8	Un treated check		6.00 (2.65)	6.80 (2.79)	16.30 (4.11)	20.37 (4.62)	38.20
CD			NS	0.33	NS	0.67	11.52
Sem			0.19	0.11	0.25	0.23	3.92
CV			4.76	7.59	11.60	12.15	11.02

Figures in the parenthesis are $\sqrt{x+1}$ transferred value

Overall present results are in agreement with findings of Ghosh *et al.* (2013), who confirmed the superiority of sulfoxaflor 24 % SC compared to other chemicals. In present findings sulfoxaflor and buprofezin performed very good spectrum of action throughout the seasons against BPH and WBPH population and no resurgence phenomenon was noted at all. Sulfoxaflor showed quick knock down in action and restrained to build up the population of BPH to build up the population up to harvesting stage. Buprofezin also performed extremely well to check the population of both pests inspite of its slow in action. Slow action of buprofezin was also witnessed by Asai *et al.* (1983). Among the traditional neonicotinoids, imidacloprid showed lower efficacy than sulfoxaflor. The present results on efficacy of novel molecule against paddy plant hoppers has supported by previous reports of BPH control with new molecules of insecticides (cyazypyr-HGW86 @ 120 g. a.i/ha by Venkatreddy, *et al.*, 2012; flonicamide 50 WG @ 150 g.a. i/ha byMisra, 2009b) and reports of WBPH control (pymetrozine @ 400 g/ha by Muralibaskaran *et al.* 2009: Misra, 2009a on UPI 206).In the present study, sulfoxaflor was found to be quite safe to nymphs and adults of mirid bug (*C. lividipennis*) and spiders along with buprofezin. Heinrichs *et al.* (1984), Krishnaiah *et al.* (1996), and Hedge and Nidagundi (2009) also observed that buprofezin exhibited good degree of safety to mirid bug, *C. lividipennis*.

Sulfoxaflor is one of the latest entrances with strong insecticidal activity against sap feeders. It has novel mode of action with high acute toxicity to all hemipteran pests (Galindez, 2010), because of insecticidal symptoms accompanied by discriminative action with quick knock down effect. Sulfoxaflor is very safe to non-target organisms that prove the high selectivity action to hemipteran group of insect pests particularly planthoppers and leafhoppers.Thus, it may be concluded from the present study that the new sulfoxamine insecticide sulfoxaflor 24 % SC @ 438ml/ha may be recommended for the management of paddy sucking insect pest whose efficacy was at par with its higher dose of 876 ml/ ha.

REFERENCES

Asai, T., Fukada, M., Maekawa, S.andKanno H. 1983.Studies on the mode of action of buprofezin. Nymphicidal and ovicidal activities on the brown rice planthopper, *Nilaparvata lugens* Stal (Homoptera: Delphacidae). *Appl. Entomol. Zool.* **18**: 550-552.

Balakrishna, B. and Satyanarayana , P. V. 2013. Genetics of brown planthopper (*Nilaparvata lugens* Stal.) Resistance in elite donors of rice (oryza sativa l.). *The Bioscan*. **8**: 1413-1416.

Chung, T. C., Sun, C. N. and Hung, C. Y. 1982. Resistance of *Nilaparvata lugens* to six insecticides in Taiwan. *J. Economic Entomology*. **75:** 199-200.

Galindez, A. 2010. Dow AgroSciences: The Growth Equation. February 10, 2010.http://phx.corporate-ir.net/External. File?item= UGFyZW50S UQ9MzEw OT Z8 Q2hpb GRJRD0tMXxUeXBlPTM=&t=1.

Ghosh, A., Das, A., Samantha, A. and Roy, A. 2013. Sulfoximine: A novel insecticide for management of rice brown planthopper in India. *African J. Agricultural Research*. **8:** 4798-4803.

Gomez, K. A. and Gomez, A. A. 1984. Statistical Proceedings for Agricultural Research. *J. Wiley and Sons.* **16:** 644.

Hedge, M. and Nidagundi, J. 2009. Effect of newer chemicals on planthoppers and their mirid predator in rice. *Karnataka J. Agric. Sci.* **22(3):** 511-513.

Heinrichs, E. A., Basilio, R. P. and Valencia, S. L. 1984. Buprofezin, a selective insecticide for the management of rice planthoppers (Homoptera: Delphacidae) and leafhoppers (Homoptera: Cicadellidae). *Environ. Entomol.* **13:** 515-521.

Krishnaiah, N. V., Reddy, A. A. and Ramaprasad, A. 1996. Studies on buprofezin and synthetic pyrethroids against hoppers in rice. *Indian J. Plant Prot.* **24:** 53-60.

Kulshreshtha, J. P. 1974. Field problems in Brown plant hopper epidemics in Kerala (India). *Rice Entomological Newsletter* **1**: 3-4.

Liu, Z. W., Han, Z. J. and Liu, C. J. 2003. Selection for imidacloprid resistance in *Nilaparvata lugens* : cross resistance patterns and possible mechanism. *Pest Management Science.* **59**: 1355-1359.

Misra, H. P. 2009a. Safer novel insecticide molecule for the management of rice brown planthopper,(*Nilaparvata lugens* Stal). *Indian J. Entomology.* **71:** 232-235.

Misra, H. P. 2009b. Management of white backed planthopper (*Sogatella furcifera* Horvath) with new chemicals in rice. *Indian J. Entomology.* **71:** 84-89.

Muralibasakaran, R. K., Suresh, K., Rajavel, D. S. and Palanisamy, N. 2009. Bio-efficacy of Chess 50 WG against rice green leafhopper *Nephotettis virescens* and white backed planthopper, (*Sogate lla furcifera,* Horvath). *Pestology*. pp. 37-39.

Patcharin, K. 2011. Brown Planthopper (*Nilaparvata lugens*) and Pest Management in Thailand. *Conference on International Research on Food Security, Natural Resource management and Rural*

Development. pp. 5 -7.

Reissig, W. H., Heinrichs, E. A., Litsinger, J. A., Moody, K., Fiedler L. and Mew, T. W. 1986. Insect pests of rice.*In: Illustrated guide to integrated pest management in rice in tropical Asia. IRRI, Phillipines.* pp. 175-186.

Sindhu, G. S. 1979. Need for varieties resistant to white backed planthopper in Punjab. *International Rice Research Newsletter*. **14:** 6-7.

Venkatreddy, A., Sunitha Devi, R. and Reddy, D.V.V. 2012. Evaluation of Cyazypyr- a new molecule against major insect pests of rice.*Pestology*. **22:** 27-30.

Wang, Y. H. and Wang, M, H. 2007. Factors affecting the outbreak and management tactics of brown planthopper in china recent years. *Pestic. Sci. Admi*. **25:** 49-54.