ICLASS 2009, 11Th International Annual Conference on Liquid Atomization and Spray Systems, Vail, Colorado USA, July 2009

Effect of Surfactants and Their Concentrations Against *Phalaris Minor* Control in Wheat (*Triticum aestivum)*

A.S.Tomar* and V.R.Thakre
Division of Bioscience, Institute of Pesticide Formulation Technology
Gurgaon-122016 (Haryana) India

Abstract

Phalaris minor Retz (littleseed canary grass) is a dominant grassy weed in the north-western wheat belt states of India and can cause complete wheat crop failure if not controlled. Surfactants are generally added with herbicides to improve the biological efficacy, maintain efficacy under adverse conditions, reducing environmental hazardous by minimizing drifts etc. In this context studies were undertaken to test the efficacy of sulfosulfuron with different concentration of surfactants against grasses and broadleaf weeds in wheat crop. The addition of 0.3% Rallis surfactant with sulfosulfuron 75 WG @ 25 g ha $^{-1}$ significantly decreased total weed count per m^2 (10.6 to 6.0) and dry weight g/ m^2 (15.7 to 8.1) as compared with sulfosulfuron 75 WG @ 25 g ha $^{-1}$ alone without any phytotoxic effect on wheat crop. With the increase in the surfactant concentration from 0.1to 0.5% grass weed control efficacy of sulfosulfuron increased gradually.

Key words: ***Phalaris minor*,** Sulfosulfuron 75WG, Surfactant

Introduction

Phalaris minor is the dominant grass weed of wheat in rice-wheat zone of north-western India. Yield losses due to *P. minor* are estimated from 25-50% and, under severe infestations losses may go upto 80% (Bhullar et al., 2002). *P. minor* can be controlled by different methods and of these, the use of herbicides (chemical method) is growing importance due to quick and efficient kill of these target weed. However, with the continuous use of same herbicide may lead to development of resistance. *P minor* has developed resistance to the widely used herbicide i.e. isoproturon (Walia et al., 1997). The resistance biotypes of this weed required 2-8 times more dose of isoproturon compared to susceptible biotypes for the same level of control (Malik and Singh, 1993). Newly recommended herbicides for wheat i.e., sulfosulfuron have shown effective control of *P. minor* in wheat *(*Singh, 1998).

Surfactants are generally added with herbicides to improve the biological efficacy, maintain efficacy under adverse conditions, reducing environmental hazards by minimizing drifts, etc (Combellack, 1995). Mixing of herbicides with surfactants has been advocated as a strategy to increase weed control efficiency and to avoid resistance evaluation. In this context studies were undertaken to test the efficacy of sulfosulfuron with different concentrations of surfactants in comparison with isoproturon against *P. minor* in wheat.

Materials and Methods

Field experiment was conducted during the winter season in 2006 and 2007 at experimental research farm of Institute of Pesticide Formulation Technology, Gurgaon, India. The experimental field soil was sandy loam in texture with ph 7.8 and an organic matter content of 0.37%. Wheat Cv. HD -1553 was sown at row to row spacing of 20cm using a seed rate of 100kg/ha on December 1, 2006 and November 26, 2007 respectively. The post emergence herbicide treatments comprised sulfosulfuron @ 25 g ha $^{-1}$ with 0.3% surfactant (supplied by Rallis India Ltd), sulfosulfuron @ 25 g ha $^{-1}$ with different concentrations of surfactant (supplied by Standard Surfactant Ltd) ranging from 0.1 to 0.5% and isoproturon @ 1.88 kg ha $^{-1}$ with 0.3% surfactant (supplied by Standard Surfactant Ltd) along with untreated control.

The herbicides were applied 35 days after sowing (DAS) of wheat crop. The herbicide spraying was done with a knapsack sprayer having a flat fan nozzle using 400 liters water/hectare. Fertilisers, irrigations and other cultural practices were applied in accordance with standard local practices for wheat crop. Weed counts and their dry weights were recorded at 60 days after spraying by placing a quadrat of 0.5m x 0.5m randomly at three spot in each plot. The weed population, and yield data were subjected to statistical analysis.

*Corresponding author (Email: tomarajeetYahoo.com)

Results and Discussion

Effect on Weeds

The weed flora dominant in the experimental field were *Phalaris minor, Chenopodium album* and *Melilotus alba* during both seasons. Based on the average of two seasons maximum weed population 37.1(plants/m^2) and dry weight (62.5g/ m^2) were observed in weedy plots (table 1). It was revealed that a significant reduction in total weed count per m^2 was recorded under all the treatments doses when compared with weedy check plots.
The addition of 0.3% Rallis surfactant with sulfosulfuron 75 WG @ 25 g ha^{-1} significantly decreased total weed count per m^2 (10.6 to 6.0) and dry weight g/ m^2 (15.7 to 8.1) as compared with sulfosulfuron 75 WG @ 25 g ha^{-1} alone. It was also found that addition of SSL's surfactant concentration from 0.1 to 0.5% decreased the total number of weed count per m^2 and dry weight g/ m^2 gradually. The addition of SSL's surfactant 0.3% to isoprutron @ 1800.00 g ha^{-1} had no advantage against the reduction of total number of weeds as well as on dry weight g/ m^2. The addition of surfactant with sulfosulfuron 75 WG @ 25 g ha^{-1} might have helped for more retention of herbicides on leaves hence increased the absorption of the herbicides. Similar findings with increased rates of surfactant with sulfosulfuron in wheat were also recorded earlier by Balyan et al., 2000 and Chhokar et al., 2001.

Effect on Crop

It was revealed that significantly higher yield was recorded under all the treatments over weedy check due to significant reduction of total number of weeds in herbicide treated plots. The addition of 0.3% Rallis surfactant and SSL's surfactant with sulfosulfuron 75 WG @ 25 g ha^{-1} significantly increased the grain yield over weedy check as well as over sulfosulfuron 75 WG @ 25 g ha^{-1} alone. Among the treatments a significant higher yield (4665 kg/ha) was observed in sulfosulfuron 75 WG @ 25 g ha^{-1} + 0.3 % SSL's surfactant when compared with sulfosulfuron 75 WG @ 25 g ha^{-1} alone. No visual phytotoxicity of sulfosulfuron was observed on wheat crop. Better crop yield in sulfosulfuron 75 WG @ 25 g ha^{-1} with surfactant treated plots over weedy check was owing to 60 to 95% control of dominant grassy weeds, providing reduction in weed competition. Mixing of herbicides with surfactants has been advocated as a strategy to increase weed control efficiency and to avoid resistance evaluation (Bhullar et al., 2002).

References

1. Balyan, K.S., Singh, S., Malik, R.K., *Indian J. Weed Science* 32:190-193 (2000).
2. Bhullar, M.S., Walia, U.S., Brar, L.S., Gill, G., *International Workshop on Herbicide Resistance Management & Zero Tillage in Rice-Wheat Cropping System,* Hissar, India, March 2002, pp. 30-33.
3. Chhokar, R.S., Chauhan, D.S., Sharma, R.H., Singh, R. *Pestology* XXV:16-18(2001).
4. Combellack, J.H., *FKI Bulletin No*.193:336-344(1995).
5. Malik, R.K., and Singh, S., International *Symposium on Integrated Weed Management for Sustainable Agriculture,* Hissar, India, Nov. 1993, pp.225-238.
6. Singh, S., *PhD Thesis,* University of Strathclyde, Glasgow, Scotland, UK, (1993).
7. Walia,U.S., Brar, L.S., Dhaliwal,B.K., *Plant Protec. Quarterly* 12:138-140 (1997).

Table 1 : Population and dry matter of weeds as influenced by different rates of sulfosulfuron and surfactants in wheat

Herbicide	Dose (g/ha)	Surfactant (conc %)	Time of application	Weed population * /m^2(60DAS)		Dry weight of Weeds* (g/m^2)	Plant Height (cm)	Grain yield (Kg/ha)
				P. minor	other weeds			
Weed free	-	-		-	-	-	108	4664
weedy	-	-		28.6	8.5	62.5	107	3818
Sulfosulfuron 75WG (Rallis India)	25.0	-	Post-em	8.0	2.6	15.7	108	4240
Sulfosulfuron 75WG (Rallis India)	25.0	0.3 (Rallis)	Post-em	4.5	1.5	8.1	108	4552
Sulfosulfuron 75WG (Rallis India)	25.0	0.1 (SSL)	Post-em	4.2	1.3	7.8	107	4662
Sulfosulfuron 75WG (Rallis India)	25.0	0.3 (SSL)	Post-em	3.5	1.2	6.0	108	4665
Sulfosulfuron 75WG (Rallis India)	25.0	0.5 (SSL)	Post-em	3.6	1.2	5.8	107	4599
Isoproturon 75WP	1800	-	Post-em	4.7	1.6	8.9	107	4217
Isoproturon 75 WP	1800	0.3 (SSL)	Post-em	4.2	1.5	8.2	108	4206
c.d (0.5%)				1.54	1.05	1.17	2.21	242

*means of two years
DAS- Days After Spray