

Bioassay Studies on Residual Effects of Sulfosulfuron on the Succeeding Field and Vegetable Crops

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Sulfosulfuron belongs to sulfonylurea group of herbicides, which is known for its longer persistence in the soil. Sulfosulfuron is an effective broad-spectrum herbicide widely used for controlling *Phalaris minor* in wheat. This herbicide is degraded by chemical hydrolysis and by soil micro-organisms and its degradation highly depends upon soil type, soil pH, soil moisture and temperature. The residual toxicity of sulfosulfuron may be due to the formation of stable and highly persistent metabolites (Blair and Martin, 1988). So, pot and field studies were initiated to find out carry-over effect of sulfosulfuron applied at 25 g ha⁻¹ to wheat on succeeding vegetable and field crops, both in the field and in the pots.

Three bioassay studies were conducted during 2003 and 2004 in pots and field at the experimental farm of the Department of Agronomy, Agrometeorology and Forestry in order to study residual toxicity of sulfosulfuron on the succeeding crops.

Experiment I

Soils from four fields of the farmers in Bathinda district treated with sulfosulfuron in wheat at recommended (25 g ha⁻¹), double the recommended dose (50 g ha⁻¹) and unsprayed plots during **rabi** 2002-03 were collected. The soil from 0-30 cm soil depth from each location of the respective treatment was put in iron rectangle measuring 9" x 4" by keeping four replications per treatment. Ten seeds of cotton variety F-846 were sown on May 29, 2003 per rectangle after applying water to these pots. Later on regular watering of these pots (rectangles) was done and experiment was terminated one month after sowing after recording plant population per rectangle, mean

plant height and mean fresh weight per plant. Similarly, soil samples were taken from sulfosulfuron treated (recommended and double than recommended) and untreated plots from the permanent experiment at PAU research farm to find out its carry-over effects when applied to wheat on succeeding crop of cotton. Plastic pots with diameter of 4 inches were filled with soil belonging to above three treatments. Six replications per treatment were kept. Five seeds of cotton var. F 846 were sown per pot on May 29, 2003. This trial was terminated 30 days after sowing after recording population, height and fresh weight of cotton plants. Sulfosulfuron at 25 g ha⁻¹ or 50 g ha⁻¹ in wheat did not affect the growth and development of following cotton crop at any of the locations.

Experiment II

Another bioassay trial in the field, where sulfosulfuron was or was not applied (control) on *P. minor* biotypes, was conducted to study the effect of sulfosulfuron residue, if any, on succeeding field and vegetable crops during **kharif** 2004. Both the treatment plots were sown on March 23, 2004 with 10 crops in two lines each. Thinning was performed to maintain proper plant population and spacing between the plants. Experiment was terminated 45 days after sowing after recording data on plant height and fresh weight from 10 representative plants per crop per plot. Similarly, soil treated with and without sulfosulfuron was put in iron rectangles measuring 9" x 4". Same crops were sown in these rectangular blocks on March 19, 2004 by keeping eight replications. Thinning was done so as to maintain same number of plants in each block. Experiment

Table 1. Residual effect of sulfosulfuron on the succeeding field and vegetable crops (2004)

Crops/treatments	Pot experiment		Field experiment	
	Plant height (cm)	Fresh weight (g plant ⁻¹)	Plant height (cm)	Fresh weight (g plant ⁻¹)
Maize				
Sulfosulfuron	33.0*	7.25*	38.2*	27.38*
Untreated	41.3*	8.75*	49.0*	41.25*
Moong				
Sulfosulfuron	24.4	13.93*	36.8*	26.47
Untreated	27.0	16.13*	45.8*	31.58
Bottle gourd				
Sulfosulfuron	59.6*	42.50*	89.2*	242.50*
Untreated	75.1*	59.53*	109.6*	417.50*
Chappan kaddu				
Sulfosulfuron	27.3	19.09*	49.2	138.0*
Untreated	31.5	23.56*	55.6	166.5*
Tar				
Sulfosulfuron	45.5	20.75	69.0*	146.67*
Untreated	48.3	22.80	79.6*	177.50*

*Indicates that the difference between the two values is significant within the crop/parameter.

was harvested 45 DAS and data on plant height and fresh weight were recorded for all the crops. Test crops in these experiments were maize, moong, groundnut, *desi* cotton, American cotton, mash, okra, bottle gourd, *chappan kaddu* and *tar*.

Plant height and fresh weight of maize and bottle gourd were significantly reduced both in field and pot experiments in sulfosulfuron treated soil as compared to untreated ones (Table 1). Yadav *et al.* (2004) also reported residual effect of sulfonylurea herbicides applied to wheat on succeeding crop of maize. Fresh weight of moong in pots was significantly less, whereas its height was less in field trial in the sulfosulfuron residual plots. There was significant reduction in fresh weight accumulation by *chappan kaddu* in treated soil both in pot and field experiments. Also carry-over effect

of sulfosulfuron was noticed on *tar* under field conditions only and not in pot conditions. No carry-over effect of this herbicide was noticed on groundnut, *desi* cotton, American cotton, mash and okra. Similarly, Yadav *et al.* (2003) reported no residual effect of sulfosulfuron applied to wheat at 25 or 50 g ha⁻¹ on succeeding crop of cotton.

Experiment III

Soil from the farmer's field in Kum Kalan village (Distt. Ludhiana) was brought where sulfosulfuron was applied at recommended dose continuously from last six years and from untreated plots. Both types of soils were filled in plastic pots with diameter of 4". Total 10 crops including vegetable and field crops were sown and six

Table 2. Effect of continuous application of sulfosulfuron in wheat on the dry matter (mg plant⁻¹) of succeeding crops (2004)

Treatment	Field pea	Carrot	Spinach	Sunflower	Raya	Winter maize
Sulfosulfuron	171.5**	099.4**	133.9**	115.1**	094.1*	123.1**
Untreated	238.4**	178.1**	140.4**	201.4**	101.3*	169.9**

*, **Significant at P=0.05 and P=0.01 level, respectively.

replications for each treatment were kept. The test crops were field pea, carrot, methi, turnip, spinach, sunflower, berseem, *gobhi sarson*, raya and winter maize. All the crops were sown on January 22, 2004. Later on regular watering of these pots was done and thinning was done soon after the germination so as to maintain five plants per pot in all the crops. The experiment was terminated 40-45 days after sowing and dry matter of plants per pot was recorded and converted to dry weight per plant. The data were statistically analyzed using student's t-test at 1 and 5% level of significance.

Dry weight per plant in methi, turnip, berseem and *gobhi sarson* was not affected due to continuous use of sulfosulfuron in wheat (Table 2). Field pea, carrot, sunflower, spinach, raya and winter maize, grown in soil treated with recommended dose

of sulfosulfuron showed less dry matter per plant as compared to untreated plots.

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