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Scenario of Herbicide Use in Wheat in Rice-Wheat Cropping System

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After the proven herbicide resistance in wheat (Malik and Singh, 1995) alternate herbicides *viz.,* clodinafop, sulfosulfuron and fenoxaprop were recommended to control resistant biotypes of *Phalaris minor*; which became popular in the whole wheat growing zone. Fenoxaprop could not sustain for more than six years and phased out in 2004. Continuous use of sulfosulfuron also started showing decreased effectiveness in 2007 and thereafter it became the second preference after clodinafop. More farmers started using clodinafop and the extension agencies received reports on reduced efficiency of clodinafop also since 2009. In order to assess the scenario of herbicide use in wheat, the present investigation was planned so that the possible reasons may be depicted in respect of decreasing bio-efficacy of alternate herbicides in wheat under rice-wheat cropping system. A well structured proforma seeking information on herbicides use including area under wheat, brand or type of herbicide, time of application, type of spraying nozzle, volume of spray (quantity of water used per unit area) and grain yield was used. A total of 263 and 145 farmers were interviewed during 2008-09 and 2009-10 randomly across the district Kurukshetra to ascertain the said information.

The farmers used mainly four herbicides (clodinafop, sulfosulfuron, clodinafop + metsulfuron and sulfosulfuron+metsulfuron) in wheat during the years 2008-09 and 2009-10 (Fig. 1). Innovative farmers though very few, managed the weeds by adopting crop rotation and did not even apply herbicides. Large number of farmers (45-46%) preferred clodinafop formulations over other herbicides. Among survey farmers, 21 and 12% used sulfosulfuron during 2008-09 and 2009-10, respectively. In order to control the complex weed flora (grassy+broad leaved weeds), 27-29% farmers applied metsulfuron in addition to clodinafop covering 26-30% area under wheat. Some farmers (3 to 8%) used ready mix formulation of sulfosulfuron + metsulfuron (Total) to kill both grassy as well as broad leaved weeds in single shot.

The farmers adopting crop-rotation harvested maximum grain yield (4890 to 5040 kg/ha) of wheat grown without herbicides (Fig. 2). Yadav and Malik (2001) also suggested crop rotation for control of resistant *P. minor*. Application of clodinafop registered 2.7 to 13.2% yield advantage over sulfosulfuron during the years. Use of sulfosulfuron+metsulfuron also controlled the complex weed flora more efficiently than

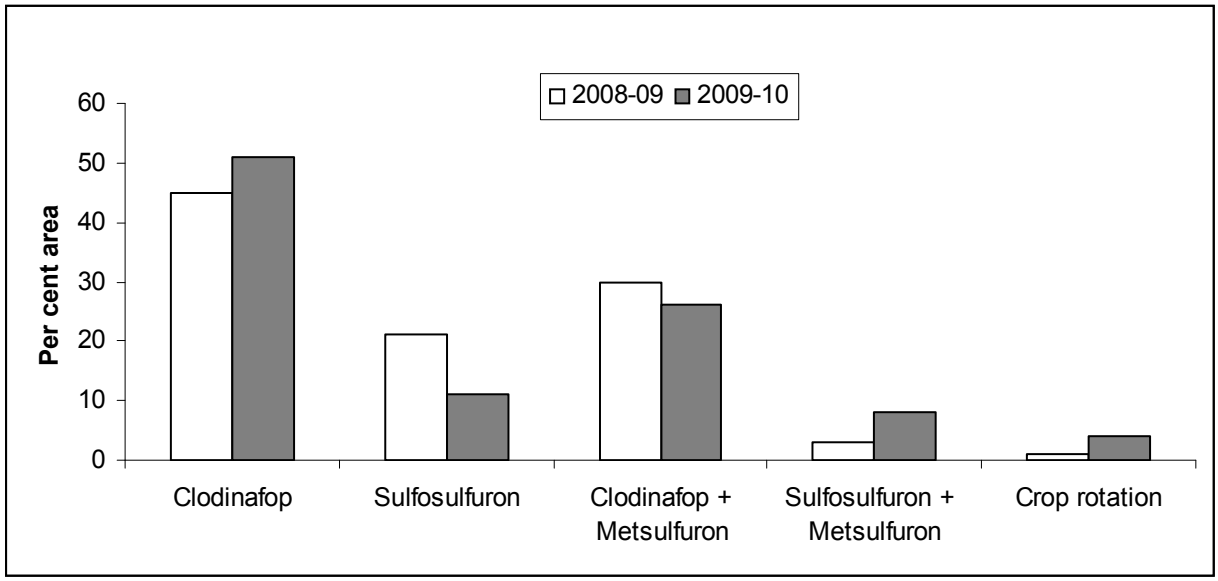

Fig. 1. Area under wheat sprayed with different herbicides.

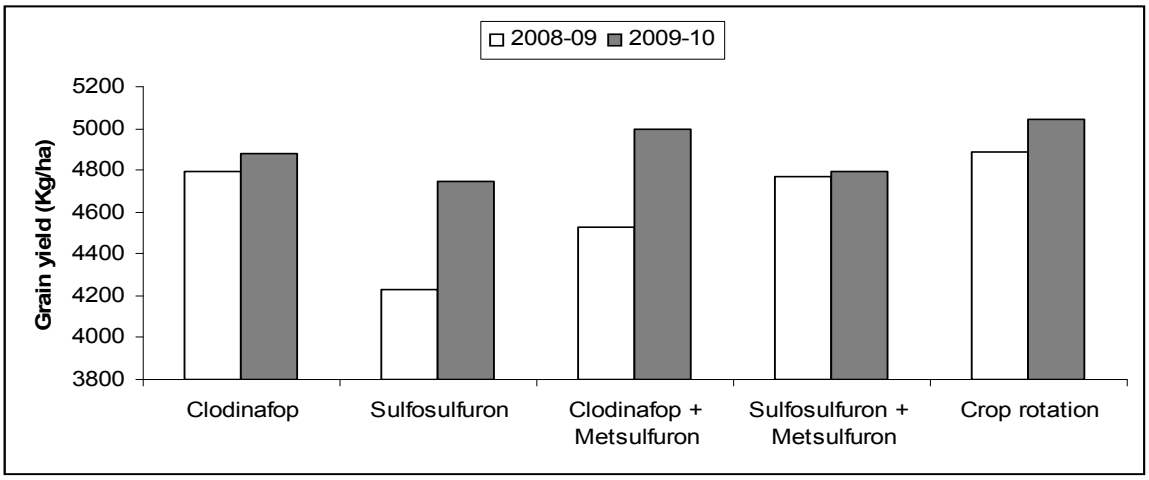

Fig. 2. Grain yield of wheat obtained under different herbicides.

with the application of sulfosulfuron alone as shown by yield gain of 12.7% during the year 2008-09 (Fig. 2). Farmers using metsulfuron along with clodinafop also reported 2.4% higher grain yield than clodinafop alone during the year 2009-10.

Many farmers (44 to 54%) farmers applied herbicides at 30-40 days after sowing (DAS) in about 42 to 52% area but still other farmers applied the herbicides late (Table 1). About 35-38% farmers used the herbicides at 41-50 DAS and about 11-17% farmers applied very late i. e. beyond 50 DAS in an area of 11-16%. The farmers received 6-27% lesser grain yield with delayed application.

Still 58-68% farmers used flood jet nozzle for spraying herbicides in 57-64% area of wheat during the years 2008-09 and 2009-10 (Table 1). Only 38-42% farmers applied herbicides in wheat using flat fan in an area of 36-43% under wheat. Use of recommended nozzle registered 8-9% more grain yield in comparison to flood jet nozzle. Majority of farmers (74-85%) used 300 l water/ha though still below the recommendations (500 to 600 l/ha). Even 8-15% farmers used spray volume of 225 l/ha. Poor and partially covered weeds with herbicides could not be controlled efficiently and this resulted in 15% grain yield reduction due to decreased volume of spray from 300 to 225 l/ha.

Table 1. Pattern of herbicides spray techniques in wheat

Spraying components	Per cent farmers		Per cent area		Grain yield (kg/ha)	
	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
Time of application (DAS)						
30-40	54	44	52	42	4860	5100
41-50	35	38	37	42	4450	4800
> 50	11	17	11	16	3830	4530
Type of nozzle						
Flood jet	68	58	64	57	4460	4700
Flat fan	38	42	36	43	4830	5130
Volume of spray (water in l/ha)						
225.0	15	8	20	6	4300	4320
262.5	11	8	8	10	4570	4670
300.0	74	85	72	84	4930	4950

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