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Herbicide adoption pattern in rice and wheat among Haryana farmers

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ABSTRACT

A systematic study on herbicide adoption by farmers in rice and wheat growing areas of Haryana conducted during 2008-2009, revealed that in Sirsa and Fatehabad districts of state, 95% farmers applied herbicide to control weeds in transplanted rice whereas in north-eastern Haryana, all farmers applied herbicides in rice crop. In Sirsa and Fatehabad districts, EC formulation of butachlor was the choice of 45% farmers followed by anilofos (26%), pretilachlor (12%) and oxadiargyl (8%). In Karnal, Kurukshetra, Ambala and Kaithal districts, pretilachlor was the first choice of 42% farmers followed by butachlor (24%) None of the farmer used anilofos. Even 11% farmers used pyrazosulfuron not approved by CCS HAU, Hisar for effective weed control. Twenty two (22) per cent farmers also applied post-emergence herbicide bispyribac-sodium in addition to pre-emergence herbicide because of poor control given by pre-emergence herbicides. In all 50-60% farmers applied herbicides timely (3 DAT). In Sirsa and Fatehabad, splash method of herbicide application is most popular used by 54% farmers where as, in north-eastern Haryana mixing of herbicide with DAP at 3-7 DAT, is most popular method used by 61% farmers. None of farmer in north-eastern districts used sand mix application of herbicide in rice which was the only method approved by CCSHAU, whereas in Sirsa and Fatehabad, only 8% farmers used this technology. In wheat, 94 -96% farmers of state used herbicide to control *P. minor* and other weeds. In Hisar, sulfosulfuron was the choice of majority of farmers (56%) followed by clodinafop (28%) where as in Kurukshetra 44 % farmers used sulfosulfuron + metsulfuron (RM), 14% meso+iodosulfuron (Atlantis) and 16% used various brands of sulfosulfuron and only 20% used clodinafop. None of farmer used fenoxaprop and only 4% farmers of Hisar used isoproturon. In Kurukshetra, 66% farmers used flat fan nozzle but in Hisar majority of farmers (52%) used hollow cone nozzle which is the main reason for poor efficacy of herbicides at farmer's fields. Eighty six farmers in Kurukshetra used recommended brands of sulfosulfuron+ metsulfuron (RM) as against 25% of sulfosulfuron.

Key words: Chemical control, Herbicide adoption pattern, Rice, Weed management, Wheat

Weeds are responsible for heavy reduction in rice and wheat crops grown in rice-wheat/rice-sugarcane-sugarcane-wheat, rice-potato-wheat and cotton-wheat cropping patterns among different districts of Haryana state. Little seed canary grass (*Phalaris minor*), which is a very serious weed of wheat in rice-wheat cropping system in N-W India has developed resistance against isoproturon (Malik and Singh 1995). To tackle the resistance problem fenoxaprop-p-ethyl, sulfosulfuron and clodinafop-propargyl have been recommended (Malik and Yadav 1997) and are being used by the farmers on large scale. Various herbicides have been recommended for the control of weeds especially in wheat and rice and are being used by the farmers on large scale. Sometimes, there are complaints by poor efficacy of herbicides at some locations especially

against *P. minor* in wheat and *Echinochloa glabrescence* in rice. So, it becomes evitable to assess the gap in technology, so that further refinement can be made. Some times there is some lacuna on the part of farmers in adoption of herbicide technology leading to erratic results. Keeping it in view, a systematic survey of rice and wheat growers on herbicide adoption level was conducted in Sirsa, Fatehabad, Ambala, Hisar, Kaithal, Karnal and Kurukshetra districts of state known as rice and wheat bowl of Haryana.

MATERIALS AND METHODS

Survey on information regarding adoption pattern of herbicides in rice was conducted in Rania (Sirsa) and Jakhhal (Fatehabad) blocks during *Kharif* 2008 and different rice growing villages of north-eastern Haryana comprising Ambala, Karnal, Kurukshetra and Kaithal districts during

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Kharif 2009. In all 78 and 117 rice growing farmers were interviewed during 2008 and 2009, respectively. Similarly information on herbicide adoption in wheat was collected from farmers of Hansi and Narnaund tehsils of Hisar during 2007 and Shahbad and Ladwa tehsils of Kurukshetra district during Rabi 2008. In all 50 farmers were interviewed during each year.

RESULTS AND DISCUSSION

Herbicide adoption pattern in rice

In Sirsa and Fatehabad districts, 95% farmers applied herbicide to control weeds in transplanted rice where as in north-eastern Haryana, 100% farmers used herbicides to control weeds in transplanted rice (Table 1). Five percent farmers in Sirsa and Fatehabad did not apply any herbicide because of no weed infestation owing to good control achieved by them in previous years. In Sirsa and Fatehabad, 45% farmers applied herbicide at recommended time (3 DAT) where as 50% farmers applied late up to 7 DAT because of late emergence of weeds due to heavy puddling done at transplanting time and to avoid stress to crop due to early application of herbicide but In Karnal, Kurukshetra, Ambala and Kaithal, majority of farmers (60%) applied herbicide at recommended time (3 DAT) where as 40% farmers applied late up to 7 DAT. In Sirsa and Fatehabad, various brands of butachlor and anilofos were more popular among 45% and 26% farmers, respectively. Only 8% farmers used oxadiargyl for effective weed control and 12% farmers used pretilachlor where in north-eastern districts of state, 42% used pretilachlor and only 24% preferred to use butachlor. Only 15% farmers used oxadiargyl and 11% farmers applied pyrazosulfuron not approved by CCS HAU Hisar for effective weed control. Twenty two per cent farmers also applied post emergence herbicide bispyribac- sodium in addition to pre-emergence herbicide because of poor control given by pre-emergence herbicides owing to poor water level maintained at the time of herbicide application.

In Sirsa and Fatehabad districts, 54% farmers applied herbicides by splash method by making holes in the lid of bottle where as 30% farmers applied herbicide by mixing in DAP applied at 3-7 DAT. In north-eastern Haryana, 61% farmers applied herbicides by mixing in DAP where as 39% farmers applied by splash method by making holes in the lid of bottle or bottle supplied by pesticide dealers exclusively made for this purpose. Sand mix application of herbicide recommended method by university was not adopted by any of the farmers in north-eastern Haryana where as in Sirsa and Fatehabad, only 8% farmers used this technology. Malik *et al.*(2012) reported that during

Kharif 2009 in Jind district of Haryana, 96% farmers use herbicides to control weeds in transplanted rice. In addition, 10% farmers also used post-mergence herbicide bispyribac sodium due to poor control achieved with use of pre-emergence herbicides. 58% farmers in Jind Applied herbicide late(7DAT)and among different herbicides pretilachlor was the choice of 44% farmers.

In Hansi and Narnaund, 96% farmers used herbicide to control *P. minor* in wheat out of which 56% used Adoption pattern of weed management technology in wheat

Table 1. Adoption of weed management technology in rice among Haryana farmers

Particular	No. of farmers (%)	
	2008	2009
<i>Application of recommended herbicide</i>		
Application of herbicide at recommended dose	40	77
Application of herbicide less than recommended dose	55	23
Application of herbicide higher than recommended dose	0	0
Herbicide not used	5	0
<i>Use of other methods of weed control</i>		
Hand weeding	0	0
Crop rotation	0	0
Herbicide not applied due to good control in previous years	5	0
<i>Application time</i>		
Application of herbicide at recommended time	45	60
Application of herbicide after recommended time	50	40
Herbicide not applied	5	0
<i>Method of herbicide application</i>		
Sand mixed application	8	0
Soil mixed broadcast	0	0
DAP mixed broadcast	30	61
Urea mixed broadcast	11	4
Spray of herbicide	0	22
Making small holes in lid of bottle (Splash method)	54	39
Herbicide not applied	5	0
<i>Use of different herbicide</i>		
Butachlor	45	24
Anilofos	26	9
Pretilachlor	15	42
Oxadiargyl	8	15
Pyrazosulfuron (not approved by university)	0	11
Pre-em herbicide + bispyribac-sodium (in addition to pre-emergence herbicide)	0	22
No herbicide	5	0

various brands of sulfosulfuron and 28% used clodinafop. None of farmer used fenoxaprop in both Hisar as well as Kurukshetra district. only 4% farmers in Hisar used isoproturon whereas in Shahbad Markanda and Ladwa tehsils of Kurukshetra where rice-potato-sunflower/rice-wheat or rice-wheat/rice-sugarcane-sugarcane-wheat were the main cropping sequences, 94% farmers used herbicide to control *P. minor* in wheat crop out of which 44% used sulfosulfuron + metsulfuron (RM) available with trade name Total, 14% used meso + iodosulfuron R.M. (Atlantis), 16% used various brands of sulfosulfuron where as only 20% used clodinafop (Table 2). None of farmer used fenoxaprop and isoproturon where as only 6% farmers did not apply any herbicide due to no *P. minor* infestation in wheat grown after 2-3 years of sugarcane and sunflower cultivation. Poor efficacy of fenoxaprop against resistant population of *P. minor* is well documented by Dhawan *et al.* (2009) and Punia *et al.* (2010) which is the main reason for not being used by the farmers.

Herbicide sulfosulfuron + metsulfuron (RM) available with trade name 'Total' in market was the choice of only 4% farmers in Hisar where as 44% used this herbicide in Kurukshetra having good efficacy against clodinafop resistant population reported from some areas in this district (Punia *et al.* 2008). In Hansi and Narnaund of Hisar, 78% farmers applied herbicides at recommended time as against 84% in Kurukshetra and only 54% farmers used recommended dose where as in Kurukshetra, 72% farmers used recommended dose of various herbicides. In Hisar, only 36% farmers used flat fan nozzle where as majority of farmers (52%) used hollow cone nozzle which is the main reason for poor efficacy at farmers fields but in Kurukshetra 68% farmers used flat fan nozzle. In Kurukshetra, 62% farmers used 300-375 litres of water and 74% farmers used recommended brands of various herbicides as approved by CCS HAU, Hisar, whereas 60% farmers in Hisar used less than recommended quantity of water which is another reason for poor control and phytotoxic effect of herbicides on crop. Lathwal *et al.* (2010) in a survey of wheat farmers of Kurukshetra district during 2008-09, found that 74% farmers used 300-375

Table 2. Adoption of weed management technology in wheat among Haryana farmers

Particular	No. of farmers (%)	
	Hisar (2007)	Kurukshetra (2008)
<i>Application of recommended herbicide</i>		
Application of herbicide at recommended dose	54	72
Application of herbicide less than recommended dose	42	22
Application of herbicide higher than recommended dose	0	0
Herbicide not used *	8	6
<i>Use of other methods of weed control</i>		
Hand weeding	0	0
Crop rotation	0	6
Herbicide not applied due to good control in previous year	8	0
<i>Application time</i>		
Application of herbicide at recommended time	78	84
Application of herbicide after recommended time	18	10
Herbicide not applied	8	6
<i>Type of nozzle used</i>		
Flat fan	36	66
Hollow cone	52	12
Flood-jet	6	16
Power spray	0	0
Sand or urea mix	2	0
Herbicide not applied	8	6
<i>Use of different herbicide</i>		
Sulfosulfuron	56	16
Clodinafop	28	20
Fenoxaprop	0	0
Sulfosulfuron+metsulfuron	4	44
Metribuzin	2	0
Meso + iodosulfuron	2	14
Isoproturon	4	0
No herbicide	8	0
<i>Use of water for herbicide spray</i>		
200 L/ha	24	0
225 L/ha	38	10
260 L/ha	8	22
300 L/ha	12	28
375 L/ha	8	34
Sand or urea mix	2	0
No herbicide use	8	6

Table 3. Recommended brands of different herbicides used by farmers in Kurukshetra district (2008)

Herbicide	Recommended brand	Unrecommended brand	% farmers using recommended brands
Sulfosulfuron	1	3	25.0
Clodinafop	8	2	80.0
Sulfosulfuron + metsulfuron (RM)	19	3	86.3
Meso + iodosulfuron (RM)	7	0	100.0
Total (mean)	35	12	74.4

litres of water/ha with only 40% farmers using flat fan nozzle to spray various herbicides in wheat. Eight six (86%) farmers in Kurukshetra used recommended brands of sulfosulfuron+ metsulfuron(RM) as against 25% of sulfosulfuron (Table 3).

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