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Adoption Status of Herbicide Use in Wheat in Bhilwara District of Rajasthan, India

K. C. Naagar[1]*, C. M. Yadav[1], R. L. Solanki[2] and B. L. Asiwal[3]

[1]Krshi Vigyan Kendra Bhilwara, Maharana Pratap University of Agriculture and Technology, Udaipur-313001, Rajasthan, India
[2]Krishi Vigyan Kendra Chittorgarh, Rajasthan, India
[3]Krishi Vigyan Kendra Sikar (Raj), India

**Corresponding author*

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A B S T R A C T

The study was carried out in Bhilwara district of Rajasthan state with a sample of 140 wheat growers to study the adoption status of herbicide use for weed control in wheat crop. The data revealed that the adoption status of herbicide use was at moderate level. Majority of respondents had fully adopted the recommended dose and method of herbicide application. The variables *e.g.* education, Scientism, socio-economic status, knowledge level of farmers about herbicides, extension contact, mass media exposure and weed infestation were found significantly associated with adoption status of chemical weed control in wheat crop.

Introduction

Wheat (*Triticum* spp.) is one of the most important grain crops which are grown in approximately 220 million ha worldwide, about half of which is in developing countries. India is the second largest producer of wheat in the world contributing about 99.70 million tonnes of grains with productivity of 3.37 tonnes/ha from the area of 29.58 million hectares, Rajasthan is contributing about 10 percent area and 9 per cent production of India (Ramdas *et al.*, 2019). Weed problem is one of the major barriers responsible for low productivity of wheat. The weed in India cause about ₹ 825 billion (USD 11billion) was estimated due to weeds alone in 10 major crops of India viz. groundnut (35.8%), soybean (31.4%), green gram (30.8%), pearl millet (27.6%), maize (25.3%), sorghum (25.1%), sesame (23.7%), mustard (21.4%), direct-seeded rice (21.4%),

wheat (18.6%) and transplanted rice (13.8%) reported by Gharde *et al.,* (2018). In agriculture, weeds causes more damage compared to insects, pests and diseases but due to hidden loss by weeds in crop production, it has not drawn much attention of agriculturists. The uses of herbicides have revolutionized weed control due to non-availability and high cost of labours.

Weeds have been associated with the crops since inception of agriculture. It has been recognized that cultivation of crops have been a continuous struggle with weeds because they compete with crops plants for nutrient, space, light and water. Better and profitable crop production is very difficult without good weed control practice. With modern crop production technologies, wheat production has increased few folds. Weed problem has also increased. After green revolution era with the large scale adoption of dwarf wheat genotypes along with improved methods of irrigation and fertilizer application, weed flora has under gone a considerable change. By these dwarf genotypes to achieve full yield potential of wheat crop, weed management is must to overcome the losses caused by weeds. The traditional method of manual weeding in wheat has not been efficient for weed control because of their morphological similarity with wheat crop until flowering, severe infestation weeds, scarcity of labour etc. To overcome of these problems, the herbicide (chemical) weed control shows to be the only solution as it is efficient, less time consuming, labour saving and economic. Apart of the benefits of herbicidal weed control in wheat crop, its adoption in Bhilwara district has not been as encouraging with the farmers as it should be. In order to enhance the adoption of herbicide for weed control, it was considered necessary to know the present status of adoption of recommended herbicides for wheat crop in Bhilwara.

Materials and Methods

The present study was carried out by KVK Bhilwara of Rajasthan state. Multistage random sampling techniques were followed to select the wheat growers for data collection. Two blocks namely, Kotri and Mandalgarh were selected randomly from the Bhilwara district. Four villages were selected randomly from two blocks followed by random selection of 35 farmers from each village. Thus total sample sizes of 140 respondents were selected for this study.

Adoption status was measured with the help of schedule develop in accordance with recommended package of practices for weed control in wheat crop by MPUAT, Udaipur. The schedule developed was thoroughly examined. To ascertain the adoption status the farmers were asked about actual use of each and every recommendations concerning chemical weed for wheat crop.

The response of respondents about adoption of chemical weed control for wheat crop were recorded on three point continuum *i.e.* "Full adoption", "partial adoption" and "no adoption". Where ever, the three point continuum method was not possible, the response of farmers were obtained as "yes" or "no" and score of one for "yes" and zero for "no" were assigned. The data so collected were tabulated and analyzed by using appropriate statistical tools.

Results and Discussion

The adoption of herbicides (chemical weed control) practices varies from person to person and aspect wise also. An attempt has been made in this study to find out the adoption status of herbicides in wheat crop. The results obtained are presented in the following sub heads:

Overall adoption status

The respondents were categories into low, medium and high adoption score. Their distribution is given in Table 1.

The data presented in Table 1 revealed that majority (56.43%) of the respondents had a medium level of adoption status of recommended herbicidal weed control in wheat crop. Only 17.14 per cent of the respondents fall in low adopters category, while, about 26.43 per cent was high adopters. The overall adoption scores of the respondents ranged from 8 to 31 having mean adoption 20.30 against the maximum possible adoption score of 45 and the minimum possible score was zero. The mean adoption (20.30) of farmers about herbicidal weed control in wheat crop was 65.48 per cent, which may be considered as moderate level of adoption. These results are also supported by Singh (1998) who reported that majority of the respondents fall in medium level of adoption category.

It can be concluded on the basis of above findings that farmers are using herbicides for weed control in wheat crop but they are yet to adopt full recommendations. The major reasons for non adoption or partial adoption were due to application of herbicide not at proper time, dose, water requirement /ha for spraying, method of application. Some of the farmers were adopting broadcast method which was also not recommended. Therefore, it is suggested that there is need to put extensive efforts to motivate farmers to adopt recommended herbicidal weed control for wheat crop.

Extent of adoption herbicidal weed control

Adoption of herbicidal weed control by farmers might not be uniform in wheat crop. Therefore, the recommended practices for chemical weed control in wheat crop included in the study to determine the extent of adoption were divided into four component practices namely adoption of recommended herbicide, time of application, recommended dose of herbicide and method of application of herbicides by the respondents. The results as obtained on component wise extent of adoption have been presented in Table 2.

Adoption of recommended herbicidal

The results are showed that a single majority of wheat growers (67.86%) had fully adopted the recommended herbicide for the weed control of weeds in crop fields. The remaining 25 per cent were partially adopted and 7.14 per cent wheat growers had not adopted recommended herbicide for weed control. The possible causes for partial and non adoption of recommended herbicides may be, exploitation of farmers by shop keepers, illiteracy, and scarcity of money and high cost of herbicides, adulterated herbicides and lack of demonstrations on proven improved technology. Therefore, the farmers needs to be educated by providing technical guidance and recommended herbicides at a proper time and rate to the farmers.

Recommended dose of herbicides

It was observed from the Table 2 that more than half (53.57%) of the respondents had partially adopted of the recommended dose of herbicide, 30 per cent of respondents had fully adopted and 16.43 per cent did not adopt it. The reason for partial or non adoption of recommended dose of herbicide might be due to lack of knowledge, high cost of herbicides and lack of technical guidance for application of herbicides.

Time of application of herbicides

The study has showed that 60.00 per cent had partially adopted and 12.86 per cent had not adopted the recommended time of application

of herbicides which was so important to protect the wheat crop from weeds which may cause the heavy losses to crop if applied at wrong time. The remaining 27.14 per cent had fully adopted.

Method of application of herbicides

The knowledge and adoption of method of application of herbicides is one of the most important aspects for proper use of herbicides. The method of application varies according to herbicide. Data shows that more than two-third of the respondents (72.86%) had fully adopted the recommended method of application of herbicides in wheat crop. However, there were15.71 per cent respondents who had partially adopted and 11.43 per cent had not adopted the recommended method of application.

Correlation between Socio-physiological traits of respondents and their adoption status of chemical weed control in wheat crop

Further analysis was done in order to find out association and contribution of socio-physiological traits of respondents with their adoption status of herbicidal weed control for wheat crop. The zero order correlation was computed to determine the association between socio-physiological traits and adoption status of herbicidal weed control of wheat growers. The results obtained have been presented in Table 3. The study shows that the socio-economic status (r = 0.626) had positive and highly significant correlation (at 0.01 level of probability) with the adoption of recommended herbicidal weed control in wheat crop. These findings are in conformity with the results of Singh and Patel (1988) and Supe *et al.,* (1990), who observed that socio-economic status had highly significant relationship with the adoption status. Since socio-economic status included several important traits, *viz.*, education, caste, occupation, land holding, social participation, farm power, material possession, house type, family type *etc.*, it was likely to influence the rate of adoption on positive side. Therefore, who is having higher education, more farm power and material possession and higher personal contacts with other progressive farmers and farm functionaries *etc.*, higher would be the adoption of recommended package of practices.

The perusal of data revealed that knowledge (r = 0.346) had positive and highly significant relationship with adoption status. It is one of the most important components of human behaviour which urged the man to do what he knows in his mind. Similar findings were also reported by Jagtap (1995) that knowledge had significant positive relationship with adoption of recommended practices in different crops. The study further revealed that mass media exposure (r = 0.464) had positive and significant correlation (at 0.01 level of probability) with adoption status of herbicidal weed control in wheat crop. It implies that adoption status of the respondents increased with the increase in their frequency of exposure to the mass media. The similar relationship between mass media and exposure and adoption has been reported by Harish (2002)

A perusal of the data Table 3 shows that education of respondents had positive and significant correlation (at 0.05 level of probability) with the adoption of recommended herbicidal weed control practices of wheat crop (r = 0.224). the findings of the study are in agreement with findings of Supe *et al.,* (1990) who also observed that education had positive and significant relationship with the adoption of scientific recommendations. Accordingly, higher the level of education higher would be the adoption of improved technology.

Therefore, the extension workers should try to take into account the educated farmers in the initial stages extension programmes for the success of any programme. The data of Table 3 reveals that operational size of land holding (r = 0.126) and adoption of herbicidal weed control in wheat crop have not been found to be significantly correlated. The findings of the study are in line with the results of Wasnik (1988).

Table.1 Overall adoption status of farmers about herbicidal weed control in wheat crop

N= 140

S. No.	Respondent category	Score Range	Frequency	Percentage
1	Low	8-15	24	17.14
2	Medium	16-23	79	56.43
3	High	24-31	37	26.43

Mean adoption score: 20.70 Adoption score range: 8 – 31

Table.2 Extent of adoption of herbicidal weed control in wheat crop N=140

S.No.	Practice	Adoption status		
		Full adoption	Partial adoption	No adoption
1	Adoption of recommended herbicides	95 (67.86)	35 (25.00)	10 (7.14)
2	Recommended dose of herbicides	42 (30.00)	75 (53.57)	23 (16.43)
3	Time of application	38 (27.14)	84 (60.00)	18 (12.86)
4	Method of application	102 (72.86)	22 (15.71)	16 (11.43)

Figures in parenthesis indicate percentage

Table.3 Correlation coefficient between farmers' adoption status and independent variables

N=140

S.No.	Variables	Correlation -coefficient
1	Education	0.224*
2	Operation size of land holding	0.126
3	Socio- economic status	0.626**
4	Knowledge level of farmers about herbicide	0.346**
5	Mass media exposure	0.464**
6	Extension Contact	0.528**
7	Scientism	0.226*
8	Weed infestation	0.549*

*Significant at 0.05 level of probability; **Significant at 0.01 level of probability

Extension contact (r = 0.528) had positive and highly significant correlation (at 0.01 level of probability) with adoption of recommended herbicidal weed control of wheat crop. This shows that more extension contact between farmers and the extension functionaries more would be the adoption of recommended practices. This variable in fact is an educational input to farmers to get new information regarding agricultural technology. Adoption takes place only after the farmer fully convinced about its relative

advantage. Extension contacts play an important role in this process of adoption. The results of this study are in confirmation with the findings reported by Harish (2002).

Table 3 clearly shows of Scientism was positively and significantly correlated (r = 0.226) with adoption of herbicidal weed control for wheat crop. This psychological variable was taken to see whether farmers are ready to adopt scientific technology or not, and found that a majority of farmers agree with the scientific techniques. The study reveals that weed infestation (r = 0.549) had positive and significant (at 0.05 level of probability) relationship with adoption of herbicidal weed control for wheat crop. This shows that higher the weed infestation in the fields of the wheat higher will be adoption of herbicidal weed control in wheat crop production.

Based on the findings of the study, it can be concluded that majority of the respondents had medium level of adoption status of herbicidal weed control in wheat crop. The component wise adoption analysis revealed that majority of wheat growers fully adopted the recommended herbicides and its method of application. However, the respondents had partially adopted the recommended dose of herbicide and its time of application. The correlation between over all adoption of herbicidal weed control for wheat crop of respondents and socio-economic variables reveals that education, socio-economic status, knowledge level of farmers about herbicides, mass media exposure, extension contact have positive and significant correlation with the adoption of status. This study indicated that a significant majority of respondents had not adopted the herbicidal weed control for wheat crop. Therefore, it would be worthwhile for the extension functionaries to organize trainings, demonstration and also take up different education programmes so that the farmer can get required information and skills to adopt the scientific recommendation.

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