J. Glob. Innov. Agric. Soc. Sci., 2018, 6(3): 80-83
ISSN (Online): 2311-3839; ISSN (Print): 2312-5225
http://www.jgiass.com

EFFICACY OF DIFFERENT WEEDICIDES AGAINST BROAD LEAVES WEED IN WHEAT CROP AT DEPALPUR, OKARA, PUNJAB, PAKISTAN

Hafiz Muneeb Ahmad[1,*], Muhammad Ayyub[1], Rao Muhammad Ashfaq[1], Mansoor ul Hasan[2], Muhammad Sagheer[2], Qurban Ali[3], Habib urRehman[4], Muhammad Yasir[1], Faizan Amjad[2] and Nasim Akhtar[3]

[1]Pest Warning and Quality Control of Pesticides, Punjab, Lahore, Pakistan; [2]Department of Entomology, University of Agriculture, Faisalabad, Pakistan; [3]Entomological Research Institute, Ayub Agricultural Research Institute, Faisalabad, Pakistan; [4]Punjab Bioenergy Institute, University of Agriculture, Faisalabad, Pakistan; [3]Dept. of Chemistry, Government College for women, Gulshan colony, Faisalabad, Pakistan
[*]Corresponding author's e-mail: muneebahmadaopp@gmail.com

Weed competes with crops for water, nutrients and light so weed infestation is one of the major threats to crop. Present investigation was aimed to evaluate the comparative efficacy of different herbicides for weed management in wheat crop under agro-climatic conditions of Pakistan. This experiment was conducted following the randomized complete block design (RCBD) with three replications. Three herbicides were used for weed management in wheat crop. The post emergence application of weedicides was carried out with following dose rate (Noble 200/200 EC @ 500 ml a.i. per acre, Centus 75 WDG@ 13.5 g a.i. per acre, Lancelot 45% WG @ 12.5 g a.i. per acre. There was a control plot for comparison. For each treatment, there were replications. The significantly affected parameters were plant height cm, number of tillers m^{-2} and grain yield kg ha^{-1}. Results showed that maximum weed control was recorded for Lancelot 45% WG whereas minimum value was for weedy check. The weedicides Lancelot 45% WG @ 12.5 g a.i. per acre was applied at post emergence performed well and exhibited effectively weed control and better yield in wheat**.** Minimum post treatment weed emergence (15%) was observed in treatment o f Lancelot 45% WG whereas maximum (78.33%) weed emergence was in control treatment. Maximum plant height (99.33 cm) was recorded for Lancelot 45% WG. Similarly, maximum number of tillers m^{-2} recorded for Lancelot 45% WG were 372. The maximum value of grain yields of 3694 kg ha^{-1} was observed in Lancelot 45% WG treated plots followed by Centus 3548 kg·ha^{-1}

Keywords: Herbicides, post emergence, synthetic formulations, Bromoxynil, Tribenuron Methyle, Aminopyralid, Florasulam

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the main cereal grain crop in the globe. It is the staple food of people of Pakistan. Its contribution is 9.1 percent to the value added in agriculture and to GDP is 1.7%. During 2017-18, it was grown on an area of 8.734 million ha^{-1} with an annual production of 25.5 million tons (Anonymous, 2017-18) which is far below the yield level obtained in other wheat growing countries of the world. Every effort is being made to meet the wheat requirements of the country. There are many reasons for low yield of wheat crop but weed infestation is the basic and major component of low yield in crop production system. With the advent of new short stature varieties, weeds competition has become even more severe.

The estimated annual losses due to weed infestation may be more than 10 billion rupee in Pakistan (Ahmad, 1992) It is imperative to check the weed infestation due to their high competitive ability and high reproductive potential. Only due to high weed infestation, average yield losses in wheat crop are about 25-30 in Pakistan (Nayyar *et al.,* 1994). Weeds compete with crops mainly for light, nutrients, water and CO_2 for canopy development and other growth requirements (Anderson, 1983). Weeds utilize three to four times more nitrogen, potassium and magnesium than a weed free crop (Schwezel and Thomas, 1971). Shad (1987) reported that yield losses due to weed are in proximity of 17-25 percent which in terms of wheat grain comes to about 2.43 to 3.57 million tons annually.

The weed control has been practiced since the time immemorial by manual labour and/or animal drawn implements, but these practices were laborious, tiresome and expensive due to increasing cost of labour. Weed management increases the cost of production and thus it is necessary to device such methods which could reduce not only the cost of production but also save time and labor. Among the weed control methods, the chemical control is the easiest one of the recent origins, and the most successful alternative method. Chemical weed control enables farmers to obtain higher yields per unit area with an overall lower production cost. The chemical method of weed control can provide us abrupt and promising results. Herbicides are a quick tool to control dense weed populations. Moreover, the control is more effective as the weeds even within the rows

are killed which invariably escape, because of morphological similarity to wheat, during mechanical control. Selective herbicides reduce the need for hand weeding. The effectiveness of herbicides is affected by time, rate and method of application.

Out of total import of herbicides worth Rs. 2.2 billion, 63% were used on wheat alone during 2004 in Pakistan. Herbicides are frequently used to increase crop yield through effective weed control, but excessive and non-judicious use of herbicides has posed many environmental and health problems (Jabran *et al.*, 2008). According to an international survey, over 295 biotypes of 177 weed species have evolved resistance to herbicides (Heap, 2005). These environment and health hazards and resistance development issues, therefore, have forced to develop some environment friendly technologies for weed control (Jabran *et al.*, 2008).

Chemical weed control is more economical than conventional method (Cheema *et al.*, 1988). Reports are available on the efficacy of different herbicides in wheat (Khan *et al.*, 1999; Qureshi *et al.*, 2002). Noble and Lancelot are most commonly used broad-leaved herbicides in the region but there are several reservations on the use of these herbicides as high application often involves the heavy expenditures and causes environmental hazard in addition to adverse affects on wheat crop. Similarly, low application could result the problem of low or no control of weeds and weed resistance etc. The herbicide use in Pakistan is not widely practiced as in the agriculturally advanced nations. The interest around the testing of graminicides (Walia *et al*., 1998; Ormeno and Diaz, 1998) indicates the problem posed by grasses whereas, the studies of Khan *et al.* (1999) showed synergistic response on combined use. In another studies researchers obtained an effective control of weeds in wheat through chemicals (Khan *et al*., 2003).

The objectives of the present studies were to determine the efficacy of different most effective and economical herbicides as compared to hand weeding in controlling weeds and to detect their effect on the yield and yield components of wheat crop under conditions of Pakistan

MATERIALS AND METHODS

The experiment was conducted at fix Integrated Pest Management (IPM) Farm, 40-D, Tehsil Depalpur, District Okara during 2017-18. The experiment was laid out in a randomized complete block design (RCBD) design with three replications. Seeds of wheat plant were obtained from Punjab seed corporation Sahiwal. Seeds were surface sterilized with 70% ethanol followed by gentle shaking in 10% chlorox solution for 2 - 3 min and subsequently washed with distilled water and then cultivated in field in November of 2017-18.

Throughout the growing season recommended irrigation practices were carried out. Four treatments were made in each replication with a size of 5×1.8 m^2. Row to row distance was kept at 25 cm apart. All the weedicide were applied as post emergence as presented in (Table 1). All the weedicides were applied with the help of a knapsack sprayer 20 days after sowing when the wheat crop was in the 5-6 leaf stage. Different herbicides rates were determined in terms of active ingredient or acid equivalent per acre treated, or as pounds or volume of commercial product per acre. Active ingredient indicates the amount of non-acid herbicide in a formulation. Acid equivalent indicates the amount of an acid herbicide in a formulation.

To avoid any misuse of the weedicides all the precautionary measures were taken to spray them successfully. The data were recorded on the parameters weed density, number of tillers·m^{-2}, plant height cm and grain yield kg ha^{-1}.

Table 1. Different herbicides used for weed management in wheat crop during 2017-18.

Herbicides (Trade Name)	Common Names
Noble 200/200 EC	Bromoxynil + Mcpa
Centus 75 WDG	Tribenuron Methyle
Lancelot 45% WG	Aminopyralid + Florasulam
Weedy check	Control

***Statistical analysis*:** Data were taken for year 2017-18 and combine mean was calculated. The data of all the parameters were then individually subjected to ANOVA technique by using the MSTATC computer software. Fisher's Protected LSD test (Steel and Torrie, 1980) was used for the separation of means.

RESULTS

The data recorded on weed density m^{-2}, number of tillers m^{-2}, plant height cm and grain yield kg ha^{-1}were significantly affected by the different herbicides treatments. The results for the studied traits are presented as under:

***Weed control efficiency (%)*:** Data analysis showed that different herbicides significantly affected the weed control efficiency. The data of weed control efficiency presented in (Table 2). The maximum weed efficiency was recorded for Lancelot 45% WG while the minimum value was recorded for Centus 75 WDG.

Table 2. Comparative weed control efficiency (%) using different herbicides in wheat crop in district Okara.

Herbicides	Weed control efficiency (%)
Noble 200/200 EC	21.33 b
Centus 75 WDG	22.33 b
Lancelot 45% WG	15.00 b
Weedy check	78.33 a
LSD value at 5% @ level	9.21

***Plant height (cm)*:** Different herbicides significantly affected the plant height cm (Table 3). Statistical analysis showed that

maximum plant height (cm) was recorded for Lancelot 45% WG while the minimum plant height was recorded in weedy check

***Number of tillers m^{-2}*:** Different herbicides significantly affected the number of tillers m^{-2} (Table 3). Statistical analysis showed that maximum number of tillers m^{-2}was recorded for Lancelot 45% WG while the minimum number of tillers m^{-2} was recorded in weedy check.

Table 3. Plant height cm and Number of tillers m^{-2} as affected by different herbicides in wheat crop in district Okara.

Herbicides	Number of productive tillers m^{-2}	Plant Height (cm)
Noble 200/200 EC	367.67 a	95.33 ab
Centus 75 WDG	357.00 b	93.33 b
Lancelot 45% WG	372.00 a	99.33 a
Weedy check	337.00 c	85.67 c
LSD at 5% @ level	9.06	5.50

***Grain yield (kg·ha^{-1})*:** All herbicides for weed management significantly affect grain yield (Table 4) demonstrated the effect of different herbicides on grain yield. The maximum value of grain yields of 3694 kg ha^{-1} was observed in Lancelot 45% WG treated plots followed by Centus 3548 kg ha^{-1}. Minimum value of grain yields of 3218 kg·ha^{-1} was observed in weedy check plots.

Table 4. Grain yield (kg·ha^{-1}) as affected by different herbicide treatments in wheat crop in district Okara.

Herbicides	Grain Yield (kg ha^{-1})
Noble 200/200 EC	3570.00 b
Centus 75 WDG	3557.67 b
Lancelot 45% WG	3682.00 a
Weedy check	3224.67 c
LSD value at 5% @ level	25.37

DISCUSSION

The prosperity of our people depends to a large extent on good wheat harvests. Weeds are a major problem and reduce the yield of wheat. Weeds reduce the crop yield, deteriorate the quality of farm produce and hence reduce the market value of wheat. The control of weeds is basic requirement and major component of management in the production system (Young *et al*., 1996). The chemical control method is one of the recent origins, which is being emphasized in modern agriculture (Taj *et al*., 1986). Furthermore, if the chemical control is tested in areas where wheat is intercropped with sugarcane, it may provide fruitful results (Marwat *et al.,* 2005).

Weeds control by chemical method, aiming balance shifting of the agro-ecosystem in favor of cultivated crop, which proved to be relatively more efficient and economical. The efficacy of herbicides, however, depends more upon their formulation in addition to time, methods and rates of application (Majid *et al*., 1985). The maximum weed efficiency was noted for Lancelot45 % WG while minimum value was observed for Centus 75 WDG (Table 2). These results are in line with Khan *et al.* (2002) who reported that herbicides application effectively controlled weeds. These findings are also in conformity with those of Shahid (1994), who reported that herbicides significantly reduced weed density. Similarly, Malik *et al*. (2009) stated that Bromoxonil @ 1.25 L·ha^{-1}, Mcpa @ 1.25 L·ha^{-1} gave maximum control of Broad-leaved weeds in wheat out of varying herbicides applied at different doses.

The best performance of Lancelot 45% WG and other herbicidal applications could be attributed to the best control of weeds due to minimal weed competition which caused an increased flow of nutrients towards the grain and ultimately yield was increased. These results are supported by Khan *et al.* (1999), Khan *et al*. (2001) and Walia *et al*. (1998) who reported that herbicidal treatments significantly increased the grain yield in wheat.

The maximum number of tillers m^{-2} was noted for Lencelot 45% WG whereas minimum number was reported in weedy check. These results showed that maximum weed control enhanced the production of fertile tillers m^{-2} which subsequently contributed towards the increase in wheat yield. These results are in agreement with the work of Hassan *et al*. (2003) who obtained an increase in tillering with the application of different herbicides.

The low yield (3218kg·ha^{-1}) in weedy check plots indicated that weeds utilize maximum resources of the main crop which ultimately reduced the crop yield. These results are in conformation with those of Safdar *et al*. (2011) who applied Puma Super 75 EW and Buctril Super 60 EC at different doses to control broad leaved in wheat.

***Conclusion*:** Weeds are a major problem and reduce the yield of wheat. Weeds reduce the crop yield, deteriorate the quality of farm produce and hence reduce the market value of wheat. The efficacy of herbicides; however, depends more upon their formulation in addition to time, methods and rates of application. The results of our study reveals that weeds can be effectively controlled using new formulation of herbicides. From three herbicides used in study, Lancelot 45 % WG was most effective in weeds control. Minimum post treatment weed emergence (15%) was observed in treatment o f Lancelot 45% WG whereas maximum (78.33%) weed emergence was in control treatment. Maximum plant height (99.33 cm) was recorded for Lancelot 45% WG. Similarly, maximum number of tillers m^{-2} recorded for Lancelot 45% WG were 372. The maximum value of grain yields of 3694 kg ha^{-1} was observed in Lancelot 45% WG treated plots followed by Centus 3548kg·ha^{-1}.

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