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DEMONSTRATION AND EVALUATION OF EFFECT OF WEEDICIDES ON BROAD LEAVED WEEDS ON WHEAT YIELD

A. U. Malik, I. Hussain[*], M. Ahmad alias H. A. Bakhsh, M. A. Haji[**] and M. Ali[***]

Adaptive Research Farm D.G. Khan
[*]Adaptive Research Lahore [**]Soil Conservation, D. G. Khan[***]College of Agriculture, D. G. Khan
Corresponding author e-mail: asmat_awan@yahoo.com

ABSTRACT

A series of field trials were conducted to evaluate the effect of newly introduced weedicide against broad leaved weeds of wheat crop at Adaptive Research Farm, Rakh Chabbri Zareen D.G.Khan during the years 2005-06 to 2007-08. The treatments included: Control/Check (T_1); Pendimethalin @ 1250 ml ha^{-1} (T_2); Buctril-M @ 2500 ml ha^{-1} (T_3); Logran @ 250 g ha^{-1} (T_4); MCPA @ 1250 ml ha^{-1} (T_5); Bromoxonil @ 1250 ml ha^{-1} (T_6). The results revealed that weed management strategies significantly improved the yield and yield parameters during all the three years of experimentation as compared to weedy check (T_1). The highest grain yield (3024 Kg ha^{-1}) was observed, when Buctril-M was sprayed at its recommended dose in year 2007-08, while the same trend of yield ha^{-1} was observed during rest of the study years (2256 Kg ha^{-1} & 2344 Kg ha^{-1} in year 2005-06 & 2006-07, respectively). Increase in yield was justified by the more number of tillers 261.0 m^{-1} (2005-06), 263.0 m^{-1} (2006-07) and 262.3 m^{-1} (2007-08), more number of grains per spike; 42.0 (2005-06), 43.0 (2006-07) and 43.3 (2007-08) and 1000-grains weight: 44.0 g (2005-06), 45.0 g (2006-07) and 40.2 g (2007-08) during the given period of study. So, it is concluded that broad leaf weeds in wheat crop can be controlled and managed well with the application of Buctril-M @ 2500 ml $ha^{-1.}$

Keyword: wheat, weeds, weedicide, broad leaf weeds.

INTRODUCTION

Wheat (*Triticum aestivum* L) belongs to family "Poaceae" and ranked first in world cereal crops. It is a staple food of people in Pakistan and 1/3 world's population. It is grown both in irrigated and rain fed areas with an annual production of 21.4 million tons (GOP, 2008).

Although there are many factors responsible for low yield of wheat, but weed infestation has emerged as the most important one. Weed populations continue to persist in agricultural fields despite repeated application of weed control practices and poose a recurrent and ubiquitous threat to agricultural productivity (Riaz *et al*., 2009). Weeds are plants of native value, those compete for space, water, nutrients and carbon dioxide thus limiting the availability of basic requirements of the economic crop and decrease yield up to 20-40% (Oad *et al.*, 2005). Yield losses from 5% to 100% have been reported in different crops of different areas depending upon the weed density, frequency, type and intensity of competition for growth / yield components (Ashiq *et al*., 2003). The losses due to weeds have also been estimated from 13% to 14.6%; 20% to 21% in South Asia while 8.0% to 9.5% in USA (Zimdhal, 1993). Further, weeds also increase harvesting costs, reduce quality of product, and increase fire hazards (Arnon, 1972).

These losses caused due to weeds can be managed by different approaches such as manual methods, mechanical methods, allelopathic weed control, biological weed control and chemical control. Among all these methods, chemical weed control is the most improved weed control technique. This method involves the use of chemicals commonly known as Herbicides or Weedicides. Chemical weed control is usually easy, highly effective and the most economical approach to weed control (Marwat *et al*., 2008). Unlike manual and mechanical methods, chemical weed control is less dependent on weather and hence the most practicable for use during the critical period of weed-crop competition (Bibi *et al*., 2008).

Most of the weeds with reticulate venation of simple and compound structure of leaf and dicotyledonous weeds are broad leaves. These weeds are characterized by broad and shady leaves with tap root system so, but it does not mean that they do not compete with wheat for nutrients or moisture. However, they also do compete with for sun light, CO_2 assimilation and anchorage (Arnon, 1972; Khalil *et al*., 2008). The important broad leaved weeds found in the cultivated fields of Punjab are; *Carthamus oxyacantha* (Pohli), *Anagallis arvensis* (Billi Booti), *Chenopodium album* (Bathu), *Convolvulus arvensis* (Lehli), *Cirsium arvense* (Leh), *Medicago polymorpha* (Maina), *Melilotus indica* (Senji) and *Rumex dentatus* (Jangli Palak) (Ahmad *et al*., 1993; Ashiq *et al*., 2003).

In irrigated areas, weed problem is becoming sever due to increased cropping intensity with the result

that weed management through following hoeing, harrowing and cultivation practices has becoming impossible. If weeds are controlled by proper weed control approaches at the time of seeding or immediately afterwards, crop plants can make the best use of soil and environmental resources leading to enhanced crop productivity (Marwat *et al*., 2008; Akhter *et al*., 1991).

Present investigation was the designed to evaluate the effect of different herbicides on weeds and yield of wheat under agro ecological conditions of Dera Ghazi Khan.

MATERIALS AND METHODS

Field trials were conducted during the years 2005-06 to 2007-08 (three years) at Adaptive Research Farm (Rakh Chabbri Zaren), D. G. Khan. Each experiment was laid out in Randomized Complete Block Design with three replications. The selected fields were divided into 18 plots with plot size each 5m × 19m. The sample soil was analyzed for its various properties (Saturation %age 40; Electrical Conductivity 3.50 mS/cm; pH 7.94; organic matter 0.83 %). Percentage of sand (65), silt (15) and clay (20) was determined by Bouyoucos hydrometer method using one percent sodium hexa-metaphosphate as a dispersing agent. Textural class (Sandy clay loam) was determined by using the international textural triangle (Moodie *et al*., 1959). Soil was analyzed for its various chemical properties by using the methods as described by Homer and Pratt (1961). Total Nitrogen, available Phosphorus (P) and Potassium (K) in soil were 0.038 %, 1 ppm and 147 ppm, respectively.

Before seed bed preparation, *rouni* irrigation of 10 cm was applied. When soil reached at proper moisture level, the seed bed was prepared by giving four cultivations with a tractor mounted cultivator. Each time soil was cultivated to a depth of 8-10 cm. Planking was given, after every two times cultivations. The seed was drilled with the help of single row-hand drill using seed rate 125-175 kg ha^{-1}**.** The wheat cultivar Ufaq-2002 was used as test variety. The NPK was applied @ 200, 100, 50 kg ha^{-1}, respectively. Urea, diammonium phosphate and sulphate of potash were used as sources of N, P and K fertilizers, respectively. All potash and phosphatic and half dose of N fertilizer was applied at the time of sowing, while the remaining N was top dressed at first irrigation stage of the crop.

During the weed management trial, five weedicides i.e Pendimethalin, Buctril-M, Logran, MCPA and Bromoxonil were sprayed in different treatments. Among these weedicides pendimethalin was used as pre-emergence weedicides. A weedy check plot was maintained to compare the treatment means. Volume of spray (300 L ha^{-1}) was determined by calibration as described by Rao, (1993). Spraying with knapsack hand sprayer fitted with T-jet nozzle at pressure of 207 kp were applied at 30 days after sowing of wheat.

The plant parameters *viz.* number of tillers m^{-2}, number of grain per spike, 1000-grains weight and grain yield were recorded. The statistical analysis was carried out by the "MSTAT-C" statistical package (Freed and Eisensmith, 1986). LSD test at $p<0.05$ was used to compare the treatment means (Steel *et al.*, 1997)

RESULTS AND DISCUSSION

Productive tillers m^{-2}: Data pertaining to the number of productive tillers m^{-2} is presented in table 1. Maximum number of productive tillers (263.00 m^{-2}) were obtained with the application of Buctril-M (T_3) during 2006-07, while minimum number of tillers were found in weedy check (T_1) *i.e* 209.00 m^{-2} during the year 2007-08, likewise the year 2006-07 where the maximum tillers (263 m^{-1}) were obtained from T_3. The minimum number of tillers m^{-1} were recorded in T_1; 212.0 (2005-06), 208.0 (2006-07) and 209.0 (2007-08). The least number of tillers recorded in weedy check (T_1) might be due the presence of too many weeds, thus weed crop competition was at peak (Figure 1).

Number of grains $spike^{-1}$: Number of grains per spike presented in table 1 shows that the treatments have significant effect on the number of grains per spike. The maximum number of grains (43.33) were obtained from T_3 during 2007-08, where as this value was statistical at par with T_4 (Logran) during 2005-06 (41.0) and 2007-08 (42.0) and T_6 in the year 2005-06 (40.0), where Bromoxonil was applied. At par values of these weedicides show that all these have the potential to reduce weed competition (Figure 2).

1000-grains weight (g): The final grain yield is the function of combined effect of the entire individual yield components nourished under applied inputs and 1000-grains weight is most important. The individual comparison of treatment means showed that higher 1000-grains weight (45.00 g) was recorded from the plot where Buctril-M (T_3) was applied. Where as this value was statistical at par with T_6 (Bromoxonil) during 2005-06 (40.0). The same was reported by Abbas, (2007) and Bibi *et al*. (2008), who concluded that weedicides have significant effects on 1000-grains weight. However, in all three years the treatment T_3 gave the best results i-e 44.0 g (2005-06), 45.0 g (2006-07) and 40.2 g (2007-08). The minimum grains (33.00 g), (31.0 g) and (24.8 g) were observed in the weedy check (T_1) during three years 2005-06, 2006-07 and 2007-08, respectively (Figure 3). More grain weight in herbicide treatment than weedy check was due to better growth and development of wheat plant in the absence of weeds plant. Less 1000-grains weight in weedy check is attributed due to weed-crop competition.

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Figure 1. Effect of weedicides on number of Grains per Spike

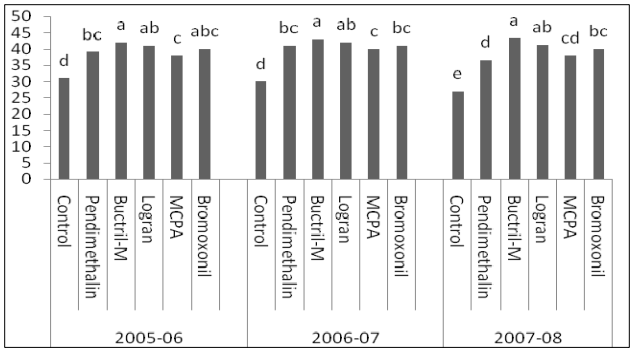

Figure 2. Effect of weedicides on 1000-grains weight (g)

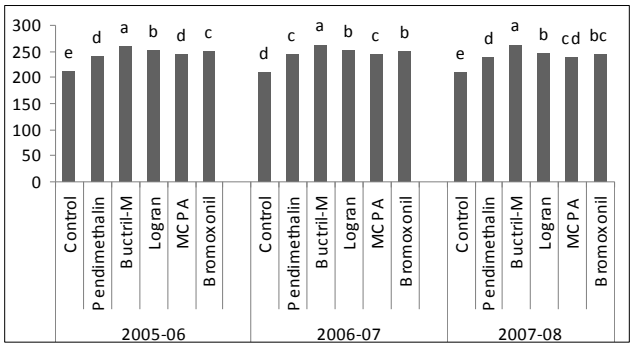

Figure 3. Effect of weedicides Number of Tillers (m^{-2})

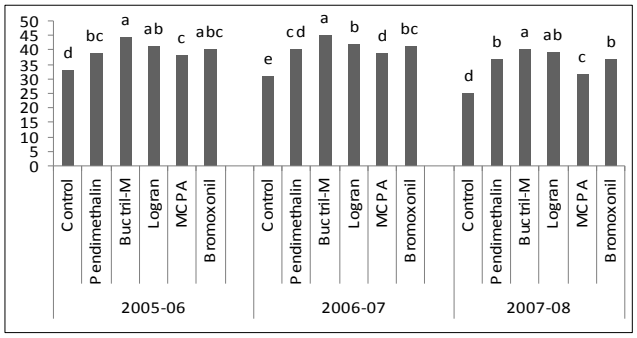

Figure 4. Effect of weedicides on Grain Yield (Kg ha^{-1})

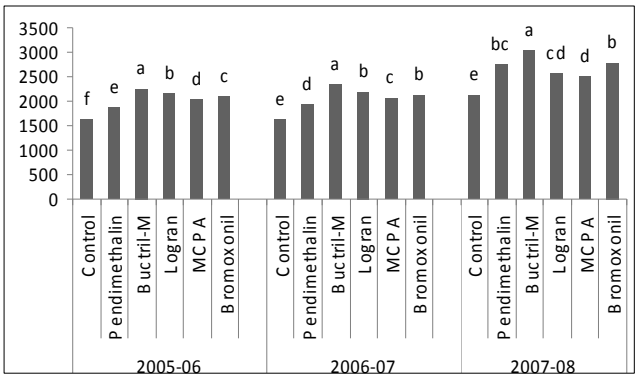

Table 1. Effect of weedicides on number of tillers & number of grains per spike

Treatments	Number of tillers (m^{-2})			Grains $Spike^{-1}$		
	2005-06	2006-07	2007-08	2005-06	2006-07	2007-08
Control/ Weedy Check	212.0e	208.0d	209.0e	31.0d	30.0d	27.0^{e}
Pendimethalin	240.0^{d}	244.0^{c}	237.3^{d}	39.0^{bc}	41.0^{bc}	36.6^{d}
Buctril-M	261.0^{a}	263.0^{a}	262.3^{a}	42.0^{a}	43.0^{a}	43.3^{a}
Logran	253.0^{b}	251.0^{b}	246.3^{b}	41.0^{ab}	42.0^{ab}	41.3^{ab}
MCPA	243.0^{d}	244.0^{c}	239.7^{cd}	38.0^{c}	40.0^{c}	38.0^{cd}
Bromoxonil	249.0^{c}	250.0^{b}	244.3^{bc}	40.0^{abc}	41.0^{bc}	40^{bc}
LSD ($p<0.05$)	3.49	2.79	2.34	2.91	1.59	2.67

The means in columns bearing same letters do not differ significantly ($p<0.05$)

Table 2. Effect of weedicides on 1000-grain weight (g) and grain yield (Kg ha^{-1})

Treatments	1000-grains weight (g)			Grain Yield (Kg ha^{-1})		
	2005-06	2006-07	2007-08	2005-06	2006-07	2007-08
Control/Weedy Check	33.0^{d}	31.0^{e}	24.8d	1629.0^{f}	1633.0^{e}	2116.1^{e}
Pendimethalin	39.0^{bc}	40.0^{cd}	36.8^{b}	1880.0^{e}	1946.0^{d}	2748.7^{bc}
Buctril-M	44.0^{a}	45.0^{a}	40.2^{a}	2256.0^{a}	2344.0^{a}	3024.0^{a}
Logran	41.0^{ab}	42.0^{b}	39.1^{ab}	2156.0^{b}	2177.0^{b}	2560.0^{cd}
MCPA	38.0^{c}	39.0^{d}	31.6^{c}	2026.0^{d}	2053.0^{c}	2499.0^{d}
Bromoxonil	40.0^{abc}	41.0^{bc}	36.8^{b}	2092^{c}	2120.0^{b}	2770.0^{b}
LSD ($p<0.05$)	2.91	1.72	1.87	53.38	58.64	197.2

The means in columns bearing same letters do not differ significantly ($p<0.05$)

Grain yield (Kg ha^{-1}): Final grain yield per hectare is the function of combined effect of the individual yield components such as number of productive tillers m^{-2}, number of grains per spike and 1000 grain weight. It is clear from the table 2, that the highest grain yield (3024 Kg ha^{-1}) was obtained by the application of Buctril-M (T_3) during year 2007-08, likewise during other years *i-e* 2256 Kg ha^{-1} (2005-06) and 2344 Kg ha^{-1}(2006-07). Increase in yield of treatment could be attributed due to increase in number of grain per spike and 1000-grains weight. These results are in conformity with Lal *et al.*, (1996), Ray *et al.*, (1996), Marwat *et al.*, (2008) and Jarwar *et al.*, 1999, who stated that application of Buctril-M increased final grain yield on account of increase of number of grains per spike and 1000-grain weight.

Conclusion: It is concluded from the results that chemically broad leave weeds can be managed well by the spray of Buctril-M, however, timing of spray and doses may be adjusted according to weed intensity and crop competition.

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