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AN APPROACH TO FIND EFFECTIVE AND ECONOMICAL STRATEGY FOR CONTROLLING WEEDS IN WHEAT IN NWFP

Mohammad Khan[1], Nazeer Hussain Shah[1] Gul Hassan[2], Habibullah[3]
Nazir Ahmad[3] and Zahoor-ul-Haq[1]

ABSTRACT

Two experiments were conducted to study the effects of three different spacings, four seed rates and weed control at Cereal Cops Research Institute, Pirsabak, Nowshera during 2004-2005 in order to develop a viable and economically feasible weed management strategy for wheat growers in NWFP. The design of the experiments was split-split plot having weed control in main plots, seed rates in sub plots and spacings in sub sub plots. The fertilizers were applied at the rates of 120-90-60 NPK kg ha^{-1}. It was concluded that chemical weed control was found more effective and economical as compared to spacings and seeding rates for controlling weeds in wheat. The integration of chemicals with row spacing and seed rate could result in the effective management of weeds and increasing grain yield. Further studies are recommended to confirm our findings.

Key words: Wheat, weed control, spacing, seed rate, grain yield, integrated weed management.

INTRODUCTION

Wheat is a major food grain crop in Pakistan. It is essentially better from nutritional point of view than most of the other cereals. Wheat culture both in NWFP and the country is the backbone of the whole agricultural system. The total cultivated area and production under wheat crop was 842.2 thousand hectares and 1163.4 thousand tons yield was produced in NWFP during 2003-2004, respectively (Anonymous, 2004).

Wheat *(Triticum aestivum* L.*)* is often infested with numerous types of weeds, which compete with crop plants for water, mineral nutrients, space, light, etc. resulting in yield depression. Thus, weed control is considered an important tool to increase wheat production in NWFP and the country at large. These unwanted plants may reduce yield as much as 100 percent, depending on the weed species present in their density. The weeds also affect the quality of grain and interfere with harvesting.

Buctril-M applied @ 1.5 L ha^{-1} at post emergence increased the grain yield by 46.56 quintals ha^{-1} and other growth components like number of spikelets per spike and the 1000 grain weight, by controlling the maximum number of broadleaf weed population (Jalis and Muhammad, 1980a&b). The grain yield was enhanced by 41.22 and 35.5 percent in wheat cultivars 'RS- 17' and 'LU-26', respectively, with Brominal-M application @ 2.5 L ha^{-1} (Saeed *et al.* 1982). A satisfactory control of *Chenopodium album* L., *Convolvulus arvensis* L. and *Asphodelus tenuifolius* Cav. has also been reported with application of Buctril-M @ 4.39 L ha^{-1} (Baluch *et al.* 1969). Application of Actril- D @ 2.00 to 3.75 L ha^{-1} provided 90 percent control of the weeds of wheat and also helped in doubling the grain yield (Abbasi, 1979). Use of Buctril-M @ 1.5 L ha^{-1}, at the post emergence stage in wheat, increased the grain yield by 13.55 percent which was primarily due to increase in the number of tillers, number of spikelets per spike and grain weight

[1]Cereal Crops Research Institute, Pirsabak, Nowshera – Pakistan
[2]Department of Weed Science, NWFP Agricultural University, Peshawar – Pakistan
[3]Agricultural Research Institute, Tarnab, Peshawar – Pakistan

(Jalis and Muhammad, 1980a). Mann *et al.* (2002;2004) integrated the zero tillage with normal weed management practices for an effective weed management.

Both grassy and broad leaf weeds pose a severe threat to wheat production in NWFP. Grassy weeds are difficult to be identified at early stage of their development because of their mimicry to wheat and hence their manual control is difficult. Broadleaf weeds can easily be identified and controlled except for some perennial weeds such as field bindweed, Canada thistle and prickly dock. Among grassy weeds, wild oat, canary grass and annual blue grass are the most important species infesting wheat crop (Hassan, et al., 2003). However, wild oat has been the most prevalent and noxious weed in wheat crop in NWFP (Hassan and Khan, 2005).

In case of broad leaf group, there are score of them prevalent in the wheat crop, however, field bindweed, common lambs quarters, sun spurge, common medic, fumitory, canada thistle, prickly dock, puncture vine, speedwell, wild mustard and wild carrot are the most common spread species. However, because of more competitive abilities and difficulty in controlling canada thistle, field bindweed, broad leaf dock, medic, sun spurge and prickly dock have become major problem of NWFP wheat cultivation. Hence, studies were carried out at Cereal Crops Research Institute, Pirsabak, Nowshera with the objectives to find out an effective integration of cultural and chemical weed control strategies for economical and viable control of weeds in wheat crop in NWFP.

MATERIALS AND METHODS

Two separate experiments were planted on 2nd and 19th November 2004, respectively in a split plot design having weed control and no weed control treatments in main plots, four seed rates (75,100,125,150 kg ha^{-1}) in sub plots and three row spacings 10,18,and 25 cm in sub-sub-sub-plots (Table-1) in six rows five meter length were planted with wheat variety Saleem, 2000 on both seeding dates. Fertilizers were applied @ 120: 90: 60 NPK kg ha^{-1} in each trial in a way that half dose of nitrogen and full dose of phosphorus and potash were applied at the time of seedbed preparation and other half nitrogen was applied with the first irrigation. Herbicides in the form of Buctril super @ 0.74 L ha^{-1} + Puma super @ 1.25 L ha^{-1} were applied when soil was moist after first irrigation at 2-3 leaf stage of weeds. The season was rainy, so no further irrigations were applied. The experiment was harvested as net plot 5m^2 on 25th and 29th May, respectively, and grain yield data were recorded. The data were analyzed by using MStatC computer programme.

Table-1. Detail of treatments applied in the experiment.

Spacing (cm)	Seed Rate (kg ha^{-1})	Weed Control	
		Buctril super + Puma super	No weed control
10	75	--do--	--do--
	100	--do--	--do--
	125	--do--	--do--
	150	--do--	--do--
18	75	--do--	--do--
	100	--do--	--do--
	125	--do--	--do--
	150	--do--	--do--
25	75	--do--	--do--
	100	--do--	--do--
	125	--do--	--do--
	150	--do--	--do--

RESULTS AND DISCUSSION

Data regarding grain yield are shown in Tables-2 & 3. The data indicated that there were significant effects of herbicides application on grain yield in both the experiments. Higher grain yield of 3726 and 2811 kg ha^{-1} was obtained with the application of Butril- super + Puma super in the first and second dates of sowing, respectively, while the lower yield of 3244 and 2140 kg ha^{-1} was obtained in no weed control in both the experiments, respectively (Tables-2&3).The response of yield was similar as reported by Awan *et al.* (1986), Hassan, *et al.* (2003) and Jalis and Muhammad (1980a&).

Increase in seed rate as integrated with 125 kg ha^{-1} showed the highest wheat yield (4197 and 3007 kg ha^{-1}) with the application of tank mixed herbicides. While grain yield decreased with increase in seed rate without application of herbicides, in both experiments (Tables-2&3), probably because of intraspecific competition of wheat for nutrients at the increased seed rates. The data presented in Table-3 for 2^{nd} experiment also confirms the results of 1^{st} experiment. The interaction of weed control with the row spacing manifested the highest grain yield (4170 kg ha^{-1} in the herbicide mixture involving the widest row space i.e 25 cm. Under the no weed control the widest row space also emerged as the highest row spacing indicating that 25 cm space was required in wheat for the better penetration and interception of light (Table-2). The trend also prevailed in the second experiment (Table-3), whereby the highest grain of 3185 kg ha^{-1} was harvested from the herbicide mixture + 25 cm row spacing and 2635 kg ha^{-1} involving the same row space under no weed control input. The results are partially similar with Khan *et al.* 2004, who obtained reasonable effect of herbicides and seed rates on wheat grain yield. The 3-way interaction of weed control x spacing x seed rate manifested the highest grain yield 4459 kg ha^{-1} in the first experiment involving herbicide mixture x 125 kg ha^{-1} seed rate and 25 cm row spacing (Table-2). In the subsequent experiment the highest grain yield of 3452 and 3437 kg ha^{-1} was harvested from the interaction of herbicide mixture under 25 cm row width involving 75 and 125 kg seed rate ha^{-1} (Table-3). These findings are in a great analogy with the work of Marwat *et al.* (2003a&b)

In this study, the wheat grain yield significantly increased with increase in spacing. The study showed that seed rate as well as spacing are not as important as herbicides in controlling weeds but this varies with different factors as higher wheat grain yield with lower densities of weeds .The application of Afalon @ 0.79 kg ha^{-1} at pre-emergence stage with first irrigation, produced the maximum number of tillers per plant by showing the significant weed control (Jalis *et al.* 1977).

Therefore, it is concluded that chemical weed control is the best and economical way to control weeds in wheat, if applied in a proper way at 2-3 leaf stage. Although the spacing had positive trend in increasing the grain yield.

Table-2. Effects of three spacings, four seed rates and weed control on grain yield of wheat in the First experiment.

Weed Control management	Spacing	Seed rate (kg ha^{-1})				
Buctril super + Puma super	Cm	75	100	125	150	Mean
	10	3178	3570	3740	3444	3483
	18	3022	2718	4392	3970	3525
	25	3770	4177	4459	4274	4170
	Means	3323	3488	4197	3896	3726
No weed control	10	3141	3155	3429	3170	3242
	18	3533	3385	2592	2378	2972
	25	4029	3289	3644	3195	3537
	Means	3569	3276	3222	2911	3244
$LSD_{0.05}$ for weed control x seed rate interaction				23.40		

Table-3. Effects of three spacings, four seed rates and weed control on grain yield of wheat in the Second experiment.

Weed Control management	Spacing	Seed rate (kg ha^{-1})				
Buctril super + Puma super	cm	75	100	125	150	Mean
	10	2133	2252	2363	2170	2229
	18	3400	3037	3222	2422	3020
	25	3452	2763	3437	3089	3185
	Means	2995	2684	3007	2560	2811
No weed control	10	1681	1622	1585	1407	1574
	18	2363	2281	2259	1948	2212
	25	2778	2644	2636	2481	2635
	Means	2274	2182	2160	1945	2140
$LSD_{0.05}$ for weed control x seed rate interaction			13.94			

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