

WEED MANAGEMENT IN WHEAT ON FARMERS' FIELDS OF DASP COMMAND AREA

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ABSTRACT

Weed management studies were initiated in wheat on farmers' fields at 3 locations in the command area of Dir Area Support Program (DASP) during 2000-01 and 2001-02. Three treatments were employed in the studies viz. hand weeded check, herbicide Buctril-M and the unweeded check. Under the most infested site i.e Ajoor Talash about 8 times higher density of weeds was recorded in the two years of studies in the weedy check treated plots vs. Buctril-M. During 2000-01, as compared to the weedy check 12 to 74.64% increase in grain yield at 3 locations was recorded due to the application of Buctril-M. While, the hand weeding increased grain yield to the tune of 3 to 41% over the weedy check. A very lucrative cost effective gain was recorded due to the application of Buctril-M. The ratio oscillated between 2.23 and 7.8 at the three locations. However, for the hand weeded plots the gain in yield was nullified with the additional cost on weeding, thus only a slight increase at Ajoor and Chokytan was recorded, while a severe loss was observed at Samar Bagh. During the subsequent year of study the gain in grain yield due to the application of Buctril-M was less wider ranging between 10 and 29% at 3 locations of studies. However, the cost: benefit ratio was still attractive due to herbicide application varying 1:2 and 1:5.2. The added advantage due to hand weeding was again lower as compared to herbicide use. Thus, the herbicide Buctril-M is recommended for the management of broadleaf weeds in wheat in the area of study.

Key words: On-farm research, herbicides, weed management, wheat.

INTRODUCTION

Wheat (*Triticum aestivum* L. em Thell) is the cereal of choice in most countries of the world. It enjoys unique position among cultivated crops. Firstly, it is grown on the area larger than the area of any other crop. Secondly, it provides more calories and proteins in the world diet than any other crop. Thirdly, the world trade in wheat exceeds trade in all others combined. In Pakistan, during 1999-2000, wheat was grown on an area of 8.30 million ha, with a production of 21 million tons. The area consists of about 6.898 million ha irrigated and 1.332 million ha of un-irrigated land. In NWFP, wheat is grown on an area of about 0.858 million ha. One-third of this area in NWFP is irrigated, while two-third is rainfed (Anonymous, 2000). Wheat crop occupies 197655 ha in Malakand Division of

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which 21% area is in Dir District. The average wheat yield in Dir district is also far below the potential of the improved varieties (Anonymous, 2000). One of the major constraints for the low wheat yield in Dir is the weed competition.

Three years back the country not only attained a self sufficiency, but also exportable surplus of one million tons was available, which unfortunately could not be exported and it was carried over to the current year due to which the market stayed cluttered despite unfavorable weather conditions during the current wheat growing season. Consequently, the production again declined and this year the country is importing wheat again to meet its domestic needs. One of the prime reasons for the increased yield in the recent past was introduction of very effective grass specific herbicides Puma Super and Topik which were feasible to be used due to increased support price of wheat.

Unfortunately, wheat yield ha^{-1} in Pakistan is very low and actual farm yield is about 30-35% of the potential yield. It is 50% of the mean yield realized in nations leading in wheat production like China and Mexico (Anonymous, 1997). Weed interference is one of the important but less noticed constraints, contributing towards low yield of wheat in Pakistan. It has been estimated that annual losses caused by weeds in Pakistan amount to Rs.1150 million which are little more than those caused by diseases (Haq, 1970). Agricultural experts have assessed that weeds cause 17-25% losses in wheat annually (Shad, 1987). Evaluation of Hassan and Marwat (2001) computed Rs. 28 billion annually due to weed infestation in wheat. Studies of Appleby et al., 1976 exhibit that wheat yield proportionately declined as the Italian ryegrass densities increased. The percent reduction tended to be higher in dwarf than tall wheat cultivars. Later studies (Hashim and Radosovich, 1991) also quantified a proportionate decline in wheat yield with increasing Italian ryegrass densities. Carlson (1986) and Khan and Thill (1992) quantified the consequent decline in wheat grain yield as the *Avena fatua* density increased in the plots. Although, different reports are available on the efficacy of different herbicides in wheat (Mohibullah and Ali 1974; Gills and Walia, 1979; Makhdoom and Memon, 1982; Balyan et al., 1983; Riaz et al., 1988; Khan et al., 1999; Khan et al., 2001), the herbicide use in Pakistan is not widely practiced as in the agriculturally advanced nations. Farmers have little orientation in herbicide use, however, they wish to have an effective and economical weed control package, including herbicide use. Recent studies showed that herbicide treatments gave 87.2 to 90.3% weed control with a consequent 19.4 to 25.47% increase in grain yield. Since new products are being added to the arsenal of the chemical weaponry, therefore, this study was undertaken to determine the efficacy of different substituted urea and some other herbicides against weeds and to study the varietal response of wheat if any. An experiment was carried out on wheat in the DASP with the objectives: 1) to find out the best method of weeds control in wheat crop to minimize losses to wheat yields due to weeds and 2). to determine an economical and suitable weeds control method in wheat crop on the basis of cost: benefit ratio.

MATERIALS AND METHODS

Trials were conducted in three different locations on farmers' fields in Upper and Lower Dir districts under Dir Area Support Program (DASP). The experiments were laid out during 2000-01 and 2001-02. Each year two sites were selected in Lower Dir and Upper Dir, for conduct of the experiments. The experiment during both the years were laid out at Talash, Sumarbagh (Khanabad) in Lower Dir and Chukytan in Upper Dir, during 2000-01, while the experiments were planted at Ajoo (Talash), Mano Mandezi (Munda) in Lower and Ghundaki in Upper Dir, during 2001-02. Varieties planted were

Bakhtawar-92 and Nowshera-96 during 2000-01 and only Nowshera-96 during 2001-02. The treatments in the trials during both the years of studies were hand weeded check, herbicide Buctril-M and the un-weeded check. The hand weeding was done twice during the crop season. No weeding was done in the un-weeded check. The data during the course of studies were recorded on weed density m^{-2} at the time of harvesting, No. of spikes m^{-2} (only during 2000-01) and grain yield ($kg\ ha^{-1}$). The cost benefit ratio of the different treatments was also computed during either year of studies. The cost benefit ratio was computed using the following formula for 2000-2001 and 2001-2002:

Cost benefit ratio for 2000-2001 = (Grain yield of a given treatment ($kg\ ha^{-1}$) - Weedy check ($kg\ ha^{-1}$) \times Rs.6 kg^{-1} (prevailing rate at that time)/Variable Cost of weeding ha^{-1} .

Cost benefit ratio for 2001-2002 = The formula stayed the same except the wheat price was Rs. 7.8 kg^{-1} instead of Rs.6 kg^{-1} during the preceding year based on the prevailing market rates. Trials were harvested in the month of May in lower Dir and in the month of June in upper Dir.

Fertilizer was applied @ 120-60 NP $kg\ ha^{-1}$. The experiments were planted on November 11, 16 and 19, 2000. During the second year the planting was completed during the first fortnight of November 2001. The seed rate used was 125 $kg\ ha^{-1}$. Herbicide for weed control was applied in the month of February in 2001 and in the month of January in 2002 when the weed infestations in the plots were observed. The first hand weeding of the concerned treatment was also done the same day. Only broad leaf weeds were found in the experimental plots, hence only Buctril-M was applied for the control of wheat weeds. Farmers in the area were also invited to see the application of herbicide and the weed/crop stage. One of the main objectives of the trial was to educate the farmers in the use of herbicide. Hence, the farmers were involved in the managements of weeds, time and methods of application of the herbicides. They were shown methods of application of herbicides and its importance in weeds control.

RESULTS AND DISCUSSION

Results obtained showed that weeds were significantly controlled by the Buctril-M (Table-1&3). Under the most infested site i.e Ajoo about 8 times higher density of weeds was recorded in the two years of studies in the weedy check treated plots vs. Buctril-M. The data in Table-1 further exhibit that the effect of weed competition was not very drastic on No. of spikes m^{-2} at all the locations of experimentation. However, there was a visible effect on No. of Spikes at all the locations. The increase in spikes contributed towards the higher yield in the weed managed plots as compared to the weedy check (Table-2). During 2001-01, as compared to the weedy check 12 to 74.64% increase in grain yield at 3 locations was recorded due to the application of Buctril-M. While, the hand weeding increased grain yield to the tune of 3 to 41% over the weedy check (Table-2). A very lucrative cost effective gain was recorded due to the application of Buctril-M. The ratio oscillated between 2.23 and 7.8 at the three locations. However, for the hand weeded plots the gain in yield was nullified with additional cost on weeding, thus only a slight increase at Ajoo and Chokytan was recorded, while a severe loss was observed at Samar Bagh (Table-2). During the subsequent year of study the gain in grain yield due to the application of Buctril-M was less wider (Table-4). The increase ranged between 10 and 29% at 3 locations of studies during 2001-2. However, the cost:benefit ratio was still attractive due to herbicide application ranging 1:2 and 1:5.2. The added advantage due to hand weeding was lower as compared to herbicide use (Table-4). These findings are in a great analogy with the work of Shad (1987), Khan et al.

(2003a,b,c), Qureshi *et al.* (2003), Tunio *et al.* (2004), and Hassan, *et al.* (2003), who concluded the increased yield of wheat due to application of various herbicides.

CONCLUSIONS AND RECOMMENDATIONS

Buctril-M treated plots produced the highest yield of wheat grain in all the three locations which could be attributed to the better control of weeds in these plots and consequently avoiding competition. The cost benefit ratio is also significantly higher for Buctril-M exhibiting that application of Buctril-M can bring higher benefits to the farmer. It is therefore, recommended that Buctril-M should be used for broad leaf weed control in wheat.

Table-1. Effect of different weed control methods on No. of weeds and No. of pikes m⁻² during 2000-01

Location	Treatments	Wheat Varieties	No. of weed m ⁻²	No. of spikes m ⁻²
Ajoon Talash (Lower Dir)	Buctril-M	Bakhtawar 92	6	432
	Hand Weeding		20	360
	Weedy Check		52	352
Samarbagh, Khanabad (Lower Dir)	Buctril-M	Bakhtawar 92	20	376
	Hand Weeding		32	252
	Weedy Check		36	228
Chukyatan (Upper Dir)	Buctril-M	Bakhtawar 92	14	550
	Hand Weeding		29	400
	Weedy Check		42	370

Table-2. Grain yield of wheat (kg ha⁻¹) as affected by weed control treatments in dir area during 2000-2001

S.No	Treatments	Ajoon (Lower Dir)	Samar Bagh (Lower Dir)	Chukyaton (Upper Dir)
01	Hand Weeding	4878	4812	5562
02	Buctril-M	5487	5236	6874
03	Weedy Check	4076	4687	3936
04	Wheat grain increase (%) due to chemical control over check	35.00	12.00	74.64
05	Wheat Grain increase (%) due to hand weeding	20.00	3.00	41.00
Cost benefit ratio				
06	Buctril-M	1:5.72	1:2.23	1:7.8
07	Hand weeding	1:1.6	1:0.25	1:1.3

Table-3. Effect of different weed control methods on number of weeds m⁻² and grain yield kg ha⁻¹ during 2001-2002

Location	Treatments	Wheat Variety	No. of weeds m ⁻²	Grain yield kg ha ⁻¹
Ajoos Talsah (Lower Dir)	Hand Weeding	Nowshera 96	20	3829
	Buctril-M		5	3952
	Weedy Check		40	3582
Mano Mandazi, Munda (Lower Dir)	Hand Weeding	-do-	20	3952
	Buctril-M		9	4446
	Weedy Check		30	3582
Ghundaki (Upper Dir)	Hand Weeding	-do-	15	3952
	Buctril-M		7	4446
	Weedy Check		30	3458

Table-4. Grain yield (kg ha⁻¹) as affected by weed control treatments in Dir during 2001-02

S.No	Treatments	Ajoos (L.Dir)	Mano Mandazi (L.Dir)	Ghundaki (U.Dir)
01	Hand Weeding	3829	3952	3952
02	Buctril-M	3952	4446	4446
03	Weedy Check	3582	3582	3458
04	Wheat grain increase (%) due to chemical control over check	10.00	24.00	29.00
05	Due to hand weeding	7.00	10.00	14.00
	Cost: benefit ratio			
06	Buctril-M	1:2	1:4.6	1:5.2
07	Hand weeding	1:0.7	1:1	1:1.3

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