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Studies on Chemical Weed Control Measures in Wheat (*Triticum aestivum* L.)

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Abstract: A two years study was carried out to see the effect of various herbicides and hand weeding on weed control in wheat. For weed density and grain yield highly significant differences were recorded between treatments and weedy check. The lowest weed density was observed in hand weeding (3.50) which was statistically at par with Puma super + 2,4-D (5.38), Puma super + Buctril M (5.63), Dicuran MA 60 (6.13) and Tolkan (6.75) while the highest weed density was observed in the weedy check (42.38). The maximum grain yield of 2957 kg ha⁻¹ was obtained in hand weeding and was statistically comparable with the yields of Puma super combined with 2,4-D (2649 kg ha⁻¹) and Buctril M (2612 kg ha⁻¹) and Dicuran alone (2556 kg ha⁻¹). The lowest yield was exhibited by weedy check (1606 kg ha⁻¹) and was statistically at par with Panther (2003 kg ha⁻¹).

Key words: Wheat, weed flora, weed control, herbicides

Introduction

With the commissioning of Chashma Right Bank Canal (CRBC), D.I.Khan has emerged as the food basket of NWFP. The wheat (*Triticum aestivum* L.) production both vertically as well as horizontally has increased through cultivation of new approved cultivars like Inqilab-91, Bakhtawar-92, Daman-98 and Dera-98 and the cultivation of barren dry land which now have come under CRBC command area. The losses to wheat crop due to weed competition ranging from 10 to 60%. Hand weeding is sometimes impracticable for the weeds like *Galium aparine*, *Melilotus parviflora* and *Avena fatua* etc. due to very high density and germination over a prolonged period of time. Thus, for better economic returns screening of an economical and environmentally friendly herbicide is important. Competition of crop with weeds, particularly in early season decreases the production of wheat and yield depression due to weeds has been recorded as 16.16% in 1978-79 and 29.03% in 1981-82 crops (Qureshi, 1982). Weeds rob the plant food materials and deprive the crop plants of moisture, light, CO₂ and space in wheat (Anderson, 1983).

Yield losses due to weeds in wheat could be as high as 100% in thorny weeds like *Carthamus oxycantha* (thistle), *Cirsium arvense* (canada thistle) and *Alhagi camelorum* (camel's thorne). The recent invasion of wheat fields in D.I.Khan by the catchweed bedstraw (*Galium aparine*) locally known as "Kingri" is inflicting a catastrophic loss to wheat production since its introduction in late 80's. Verma and Bhardwaj (1957) and Baluch *et al.* (1968) tested 2,4-D Sodium salt and 2,4-D ester in different concentrations and observed that weeds were effectively controlled and resulted in better grain yield. Khan (1964) observed 97% mortality of major weeds by spraying weedicides and reported 10% increase in grain yield. Rajput *et al.* (1988) concluded that hand weeding gave higher yield than the chemical control treatments. The manual labour is not only expensive, but also becoming scarce and time consuming.

Weeds not only a factor of low yield but also effect the quality of crop and the yield losses due to weeds ranged between 17-25%. Khan (1982) noticed in his studies that Buctril M was used against weeds in wheat and 24.74% higher yield was obtained than weedy check. Makhdoom (1982), Makhdoom and Memon (1982), Shad (1987) and Mahmood and Sandhu (1988) found Dicuran MA 60 as the most effective in controlling weeds and increasing the grain yield by 58% in wheat crop. Mulder (1970), Mohibullah and Ali (1974), Gowda and Siddappa (1980), Saeed *et al.* (1982)

and Riaz *et al.* (1988) observed excellent control of weeds in wheat through Tribunil 70 WP and an increase of 25% in grain yield against control. Chandrakar and Chandrawanshi (1985) observed that due to narrow spacing mechanical hoeing replaced by herbicides proves more practical, effective and economical means of controlling wheat weeds. Sarwar and Nawaz (1985) reported 96% weed control through Tribunil 70 WP, Arelon 70 WP and Dicuran MA 60. The effectiveness of different herbicides in wheat crop studied by Angiras and Modgal (1981), Bhan (1987) and Ahmad *et al.* (1989) reported that Arelon increases the grain yield by 36.7%. Hassan *et al.* (1996) manifested in their studies that hand weeding, Dicuran MA 60 and Agmol Combi effectively controlled the weed flora in wheat and increased the grain yield significantly.

Therefore, the present experiments were conducted at Agricultural Research Institute, D.I. Khan during 1997-98 and 1998-99 to investigate the efficacy of different herbicides with a relevance to hand weeding.

Materials and Methods

The experiment was laid out in randomized complete block design at Agricultural Research Institute, D.I. Khan. Wheat cultivar Inqilab-91 was planted in November, 1997-98 and 1998-99 in rows 30 cm apart in a plot size of 5 × 2 m². The recommended seed rate of 125 kg ha⁻¹ was used. Fertilizer was applied at 120-90 NP kg ha⁻¹. All P and half N was applied before sowing and the remaining half N at second irrigation. The herbicides were sprayed with knapsack hand sprayer fitted with T-jet nozzle after the emergence of weeds in proper moisture conditions. Data on weed density were recorded 35 days after herbicides application in a 1 m² area in each treatment. The mean data of weed density and grain yield were subsequently subjected to ANOVA under MSTAT computer programme (Table 1).

Results and Discussion

Weed density: There were highly significant differences ($p < 0.01$) between various weed control measures (Table 2). The lowest weed infestation was recorded in hand weeding (3.50) which was statistically at par with Puma super + 2,4-D (5.38), Puma Super + Buctril M (5.63), Dicuran MA 60 (6.13) and Tolkan (6.75) while the highest weed density was observed in the weedy check (42.38). The most effective weed control was observed in the combination of Puma Super with 2,4-D and Buctril M which indicated the best control of

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Table 1: Treatments employed during 1998-99

| Trade Name | Common Name | Dose kg/Lit ha ⁻¹ |
|------------------------------|---|------------------------------|
| Dicuran MA 60 | Chlorotoluron + MCPA | 2.25 |
| Tolkan 50 WP | Isoproturan | 2.00 |
| Buctril M | Bromoxynil + MCPA | 1.50 |
| Sencor 70 WP | Metribuzin | 0.25 |
| Panther 550 SC | Isoproturan | 0.75 |
| Puma Super 75 EW | Fenoxaprop-P-Ethyl | 1.25 |
| Logran | Terbutryn + Triasulfuron | 0.25 |
| Puma Super 75 EW + 2, 4-D | Fenosaprop-P-Ethyl + Sodium 2, 4 Dichloro Phenoxyacetate | 1.25 + 1.7 |
| Puma Super 75 EW + Buctril M | Fenoxaprop-P-Ethyl + Bromoxynil + MCPA | 1.25 + 1.5 |
| Hand Weeding | ----- | ----- |
| Weedy check | ----- | ----- |

Table 2: Effect of herbicides on weed flora in wheat

| Treatments | Weed Density (m ²) | | |
|------------------------------|--------------------------------|---------|-----------|
| | 1997-98 | 1998-99 | Mean |
| Dicuran MA 60 | 4.50 | 7.75 | 6.13 ef |
| Tolkan 50 WP | 5.50 | 8.00 | 6.75 def |
| Buctril M | 9.75 | 7.50 | 8.63 cde |
| Sencor 70 WP | 11.50 | 8.75 | 10.13 bcd |
| Panther 550 SC | 13.75 | 12.75 | 13.25 b |
| Puma Super 75 EW | 10.75 | 11.25 | 11.00 bc |
| Logran | 5.75 | 10.75 | 8.25 cde |
| Puma Super 75 EW + 2, 4-D | 4.50 | 6.25 | 5.38 ef |
| Puma Super 75 EW + Buctril M | 5.30 | 6.00 | 5.63 ef |
| Hand Weeding | 2.50 | 4.50 | 3.50 f |
| Weedy Check | 39.50 | 45.25 | 2.38a |
| Mean | 10.30 | 11.70 | |

*Means followed by a letter(s) in common, do not differ statistically at $p < 0.05$

Table 3: Effect of weed control measures on the yield of wheat

| Treatment | Grain Yield (kg ha ⁻¹) | | |
|------------------------------|------------------------------------|----------|--------|
| | 1997-98 | 199/8-99 | Mean |
| Dicuran MA 60 | 2135 | 2977 | 2556ab |
| Tolkan 50 WP | 2031 | 2852 | 2442bc |
| Buctril M | 1979 | 2803 | 2391bc |
| Sencor 70 WP | 1771 | 2736 | 2253bc |
| Panther 550 SC | 1354 | 2653 | 2003cd |
| Puma Super 75 EW | 1823 | 2704 | 2263bc |
| Logran | 2031 | 2641 | 2336bc |
| Puma Super 75 EW + 2, 4-D | 2188 | 3111 | 2649ab |
| Puma Super 75 EW + Buctril M | 2031 | 3192 | 2612ab |
| Hand Weeding | 2396 | 3519 | 2957a |
| Weedy Check | 1198 | 2014 | 1606d |
| Mean | 1903 | 2836a | |

*Means followed by a letter(s) in common, do not differ statistically at $p < 0.05$

both grassy as well as broad leaf weeds. Puma Super alone controlled the *Avena fatua* and *Phalaris minor* and had no phytotoxic effect on broad leaf weeds. On the other hand Buctril M alone only controlled the broad leaf weeds and not the grassy weeds. Hence the efficacy of Puma super and Buctril M individually was not good in controlling both types of weeds. The poorest performance in the herbicides was recorded in plots treated with Panther due to high weed infestation. The average values of the weed density across the treatments and the interaction for the years and treatments were statistically not significant. These results are in agreement with the findings of Makhdoom (1982), Makhdoom and Memon (1982), Shad (1987), Mahmood and Sandhu (1988) and Hassan *et al.* (1996).

Grain yield: The yield data when averaged across the years highly significant differences were noticed among the treatments ($p < 0.01$) (Table 3). The maximum yield of 2957 kg ha⁻¹ was registered in hand weeded plots and was statistically comparable with the yields of Puma super combined with 2,4-D (2649 kg ha⁻¹) and Buctril M (2612 kg ha⁻¹) and Dicuran alone (2556 kg ha⁻¹). The lowest yield was exhibited by weedy check (1606 kg ha⁻¹) and was statistically at par with the plots treated with Panther (2003 kg ha⁻¹).

Similar results were obtained by Rajput *et al.* (1988) and Hassan *et al.* (1996) who concluded that hand weeding gave higher yield than the chemical control treatments but the manual labour is not only expensive, but also time consuming. The herbicidal treatments were equally effective and

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convenient. The other herbicidal treatments viz. Tolkan, Buctril M, Logran and Puma Super were significantly better than control in terms of grain yield. The yield data was highly significant difference ($p < 0.01$) between the average yield of years. Significantly higher yield of 2836 kg ha^{-1} was in 1998-99.

These results are in conformity with the findings of Mulder (1970), Mohibullah and Ali (1974), Gowda and Siddappa (1980), Khan (1982), Qureshi (1982), Saeed *et al.* (1982) and Riaz *et al.* (1988) who reported excellent weed control and an increase of more than 25% grain yield in wheat was obtained through herbicides. Angiras and Modgal (1981), Sarwar and Nawaz (1985), Bhan (1987), Ahmad *et al.* (1989) and Hassan *et al.* (1996) also reported 96% weed control through Tribunil 70WP, Arelon 70WP and Dicuran MA 60 and reported 36.7% increase in grain yield.

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