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CONVENTIONAL VERSUS CHEMICAL WEED CONTROL IN WHEAT

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Conventional versus chemical weed control studies were carried out on wheat crop during 1982-83 & 1983-84 on a sandy loam soil. Weed control treatments consisted of direct seeding (No tillage), seed-bed preparation, one 'Dab', two 'Dab', weedicide (Dicuron MA @ 2kg/ha) and hand weeding. The conventional and chemical weed control practices suppressed weed population. Maximum yield 44.87 q/ha (two years average) was obtained where Dicuron MA was applied after emergence. 'Dab' the commonly used practice was the next best choice. The difference between one & two 'Dabs' was not significant, hence one 'Dab' appears to be the more suitable practice. Hand weeding was less economical compared the use of weedicide and 'Dab'.

INTRODUCTION

The introduction of high yielding wheat varieties having high fertilizer and irrigation requirements has resulted in tremendous increase in weed population in wheat fields. The control of weeds in cereals constitute one of the biggest problem in agriculture. The extent of losses caused by weeds is alarming, on an average 15-20% yield reduction due to weeds has been estimated. On weight basis this amounts to a loss of about 1.5-2.5 million tons per year and in monetary terms Rs. 2,500 million per year (Ahmad et al. 1982). Furthermore, it has been reported that the crop yield may be increased by about 37% by complete control of weeds (Jalis and Shah, 1984). Experimental studies have shown that weeds consume at least as much of NPK fertilizer as the crop plant (Ghauri,1983) Control of weeds is, therefore, essential for obtaining higher yield and better quality of the produce.

Weed control by manual or mechanical means is in practice since long but with the introduction of labour-intensive-cropping system, the traditional practice of controlling the weeds through mechanical practices (hand pulling, hoeing

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mowing, burning, machine tillage etc..) have become expensive. In order to control weeds, a large number of man-hours have to be devoted. In Japan 25-40% of the agricultural man-power is employed for weed control in rice (Jalis and Shah, 1982). In other Asiatic countries 25 to 170 man-hours/acre are devoted to control weeds in field crops, 50 to 60 man-hours are required for manual hoeing (Jalis and Shah 1982). Chemical weedicides have been shown to be beneficial and very effective means for controling weeds in wheat. It was, therefore, considered appropriate to compare mechanical and chemical weed control methods under the agro-climatic conditions of Faisalabad, Pakistan.

MATERIALS AND METHODS

The effect of cultural and chemical weed control practices was studied on the yield of wheat on a sandy loam soil with very low organic matter at Ochkera Farm University of Agriculture, Faisalabad during 1982-83 & 1983-84. Cultural practices consiated of no tillage, preparation of land before sowing, one Dab'*, two 'Dabs', hand weeding and Dicuron MA 60 (Chlorotuluron + MCPA) @ 2 kg/ha. Dicuron MA @ 2kg/ha was sprayed when the crop was at 2-3 leaf stage, after calibration with a Knapsack sprayer fitted with 4 flat fan nozzle on a specially made boom. The treatments were replicated three times in 24x8 m plots, using randomized complete block design. Duncan's Multiple Range Test was used to establish statistical significance among treatment means. Economic analysis was done using Marginal Rate of Return (Perrin *et al* 1979).

RESULTS AND DISCUSSION

Weed infestion has created alarming situation in most of the wheat fields in recent years. The situation demands appropriate steps for effective control of weeds. In this study weed population comprised of broad leaved weeds such as 'Bathu' (*Chenopodium album*), 'Shahtra' (*Fumaria indica*), 'Piazi' (*Aspodelus tenuifolius*), 'Billi Booti' (*Anagallis arvensis*), 'Maina' (*Medicago denticulata*), 'Lohli' (*Convolvulus arvensis*), 'Pohli' (*Carthamus oxyacantha*), whereas grassy weeds were 'Dumbi' grass (*Phalaris minor*), 'Jangli Jai' (*Avena fatua*), 'Deela'

*It is the practice of giving two to three cultivations when land comes in proper moisture condition after soaking irrigation. The field is planked and the weeds are allowed to germinate for about a week before final preparation of seed-bed.

(*Cyperus rotundus*), and 'Khabbal' grass (*Cynodon dactylon*). It is interesting to note that 'Deela' and 'Khabbal' grass though the summer (Kharif) season weeds, were found considerably active during early and later stages of wheat growth due to mild winter season during the course of the study. Weed population from an area of one meter square from each experimental plot was recorded and weed control percentage is given in Table-I

The data indicate that although cultural and chemical weed control practices controlled most of the broad leaved weeds, except seed-bed preparation whereas weed population (*Chenopodium album, Asphodelus tenuifolius, Anagallis arvensis, Carthamus oxyacantha*) increased probably due to favourable conditions for germination of these weeds. The control of grassy weeds, particularly *Avena fatua* and *Phalaris minor*, was not satisfactory with hand weeding because of identification problem at early stage of the crop. Convolvolus proved to be hardy and with-stood different cultural practices and was found resistant even to Dicuron MA.

Crop yield in "final analysis" is the index showing the difference between the treatments. Two years data regarding weed control practices included in this study show that weed control practices have out-yielded direct seeding and seed-bed preparation (Table 2). The lower yield in these treatments was probably due to intense competition between weed and crop plant within weed control practices, the use of Dicuron MA @ 2 kg/ha gave the highest yield, through effective weed control. The effectiveness of chemical weedicides has been demonstrated by various research workers (Kataria and Kumar, 1981, Misra, 1966, Ubrizsy, 1969 and Veleva, 1983). Cultural practices also gave reasonably high yield.

The data further show that one 'Dab', two 'Dab' and hand weeding are equally effective,indicating that there is no advantage in using two'Dab' (Ahmad *et al*, 1982 and Khan, 1982). It may also be concluded that, depending upon the availability of labour and credit facilities, either cultural or chemical weed control practices can be successfully used to get rid of the weeds. It is, however, suggested that the small farmers may continue using conventional cultural practice while the large wheat growers, facing shortage of labour, may adopt both mechanical or chemical weed control.

Table 1. *Effect of cultural versus chemical weed control on % mortality of weeds*

Weeds	*Seed-bed preparation		One 'Dab'		Two 'Dab'		Dicuron MA		Hand Weeding	
	1982-83	1983-84	1983-83	1983 84	1992-83	1983-84	1982-83	1983-84	1982-83	1983-84
Chenopodium album	—20 6	—28.3	80.9	84.9	84.1	81.1	92.0	89 5	100	100
Famaria indica	23.2	16 9	76.7	60.5	71.4	65.5	94.1	95.2	100	100
Aspodelus tenuifolius	—11.8	10.7	93.5	100	100	100	98.0	98.6	92.9	93 3
Anagallis arvensis	—20.0	—21.7	33.3	29,0	56.6	43.7	93.3	88.6	83.0	90.0
Medicago denticulata	13.8	6.6	77.5	60.0	88.7	51.1	98.3	96.0	91.15	97.0
Convolvolus arvensis	22.2	8.7	60.0	42.5	60.0	70.0	62.5	67.1	71.0	61.2
Carthamus oxyacantha	—30.4	—15.1	50.0	63.6	69.6	60.0	100	100	71.0	61.2
Phalaris minor	—12.5	—21.6	67.5	60.2	80.0	73.3	100	100	15.6	14.5
Avena fatua	— 5.3	—19.2	16.6	20.5	90.0	82.4	90.0	90 2	65.0	60.0
Cyperus rotundus	—15.3	—30.7	61.5	67.8	73.8	80.7	96.5	93.3	44.7	46.9
Cynodon daclylon	—25.0	—26.9	15.0	10.0	35.0	23 0	83.5	76.0	27.7	37.5

*Treatments compared with no tillage = control

Table 2. *Effect of chemical versus cultural weed control practices on grain yield (q/ha.)*

Treatments	1982-83	± increase over control	1983-84	± increase over control	Two years average
No tillage	25.84c	–	17.18c	–	21 51
Seed-bed prepared	28.07c	2 23	20.48c	3.3	24.27
One 'Dab'	35 64b	9.8	39.92b	22.74	37.78
Two 'Dab'	38.13ab	12 29	40.89ab	23.71	39.51
Dicuran MA @ 2 kg/ha	44.61a	18.77	45.13a	27.95	44.87
Hand Weeding	37.39b	11.55	37.85b	20 66	37.61

Any two means not sharing a letter in common differ significantly at 5% probability level.

The presence of weeds in wheat not only hinder the harvesting operation but also more time is required to complete the harvesting operation (Table 3). A wide range of variation in the time, required for harvesting the weedy and weed-free plots, was noted. Minimum time was spent for harvesting the plots where the weeds were removed either by cultural practices or chemical control. Similarly, harvesting costs also varied with the weed control practices. Relative cost of harvesting the crop from no-tillage plots increased over seed-bed preparation, whereas, there was a decrease in other treatments.

The control of weeds by chemical and cultural methods involves some sort of expenditure which is ultimately important from economic point of view. To compare economics of the cultural and chemical weed control practices, net benefit curve for variable costs and net benefits was developed (Perrin *et al*, 1979). It is evident from fig. I and Table 4 that application of weedicide Dicuron MA @ 2 kg/ha was quite profitable compared to other common cultural control practices. It is also interesting to note that among the cultural weed control methods, only one 'Dab' is a practice which gives higher returns while other operations are not economical. It can also be seen (Figs. 1 and Table 4) that hand weeding which is a recommended practice under our conditions is more costly and less economical as compared to one 'Dab' and Dicuron MA @ 2 kg/ha treatments.

Table 3. *Effect of Chemical versus cultural weed control practices on time taken to harvest one ha. (Hours) and relative cost incurred*

Treatments	Hrs. to harvest one ha.		Man-days to harvest ha.		Cost of harvest (Rs.)		Average Cost (Rs.)	Relative Cost (Rs.)
	1982-83	1983-84	1982-83	1983-84	1982-83	1983-84		
No Tillage	65.39c	62.78d	8.17	7.84	245.1	235.2	240.05	106.19
Seed-beed prepared	60.42b	60.18d	7.55	7 51	226.5	225.6	226.05	100.00
One 'Dab'	52.08a	51.21c	6.51	6.40	195.3	192.0	193.65	85.66
Two 'Dab'	48.31a	49.18bc	6.03	6.14	180.9	184.2	182.55	80.75
Dicuran MA @ 2 kg/ha	45.71a	44.55a	5.71	5.56	171.3	166.8	169.05	74.78
Hand weeding	47.16a	45.42ab	5.89	5.67	176.7	170.1	173.4	76.70

Any two means not sharing a letter in common differ significantly at 5% probability level.

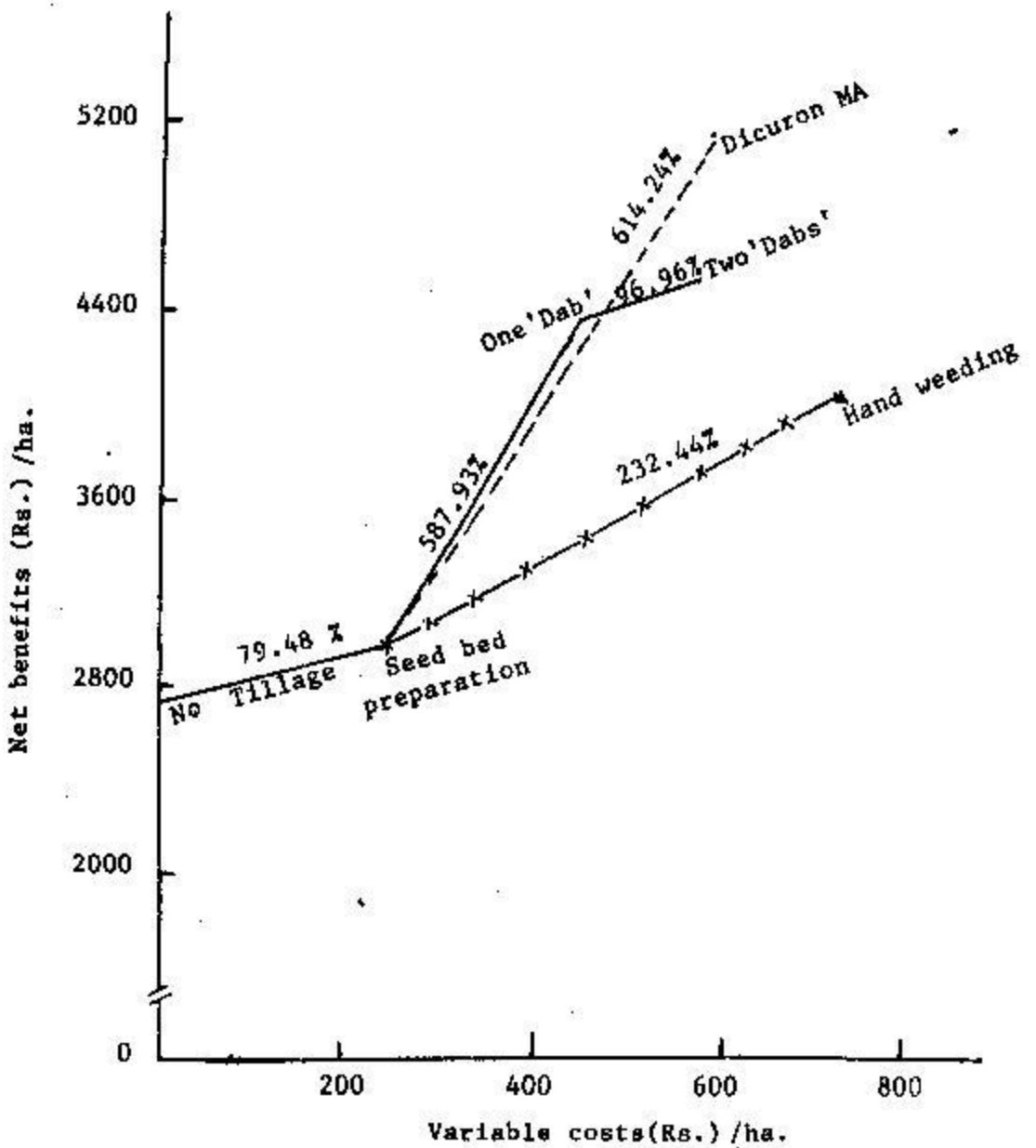

Fig.1: Net benefit curve for variable costs and net benefits of cultural versus chemical weed control practices in wheat.

Table 4. *Dominance analysis for variable costs and net benefits,*

Treatments	Variable Costs (Rs.)	Net Benefits (Rs.)	%MRR
No tillage Seed-bed	00	2758.80	—
preparation	225.00	2937.14	79.48
One 'Dab'	450.00	4305.71	587.93
Two 'Dab'	562.50	4504.80	96.96
Dicuron MA	588.00	5166.86	614.24*
Hand Weeding	725.00	4099.34	232.44*

*Marginal Rate of Return over seed-bed prepparation.

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