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Potential of Chemical Weed Control in Conventional Wheat Production Technology

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ABSTRACT

A detailed study of the recommended cum conventional package of wheat production technology in all possible combinations was conducted for four successive years. The recommended package of technology comprised a fertilizer dose of 140-115-0 kg NPK/ha + 5 irrigations + Chemical weed control, one consisted of a fertilizer dose of 65-65-0 kg NPK/ha + 3 irrigations + no weed control. While the conventional one consisted of fertilizer dose of 65-65-0 kg NPK/ha + 3 irrigations + No weed control. The four years results led to the conclusions that chemical weed control by chlortoluron + MCPA increased the wheat yield to the level of an additional dose of 75-50-0 kg NPK/ha over 65-65-0 kg NPK/ha. In other words, weeds used up the soil nutrients to the extent of 75-50 kg NP/ha when left uncontrolled in wheat. On the other hand increasing either irrigation frequency from 3 to 5 or a fertilizer dose from 65-65 to 140-115 kg NP/ha did not contribute much in making the production technology more productive and economical. According to economic analysis the highest net income of Rs.5612.02/ha with BCR 2.31 was obtained from the production technology of 65-65-0 kg NPK/ha + 3 irrigations + chemical weed control as agaianst Rs.3828.02 with benefit cost ratio (BCR) of 2.02 for the production technology of 65-65-0 kg NPK/ha + 3 irrigation + no weed control and Rs.4238.39 for the recommended technology of 140-115-0 kg NPK + 5 irrigations + chemical weed control. It is thus concluded that chemical weed control in wheat not only saves nutrient losses to the extent of 75 kg N and 50 kg P_2O_5/ha but also increases the net income and wheat yield/ha to a substantial extent (46.60 and 30.61 percent respectively).

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INTRODUCTION

Wheat (*Triticum aestivum* L.) is a major food grain crop of Pakistan and is grown on an area of 7.26 million hectares with a total annual production of 11.70 million tonnes which comes to an average yield of 1.61 t/ha. The present wheat yield per hectare is far below the production potential of our recommended wheat varieties which is attributed to so many factors, out of which proper use of fertilizer, irrigation water and weed control practices are of primary importance. The preliminary research work done in this respect indicates that these factors when applied properly can contribute a lot towards increased wheat production. The average crop yields on farmers fields in Pakistan or elsewhere in Asia are much lower than that usually obtained at experimental farms, where package of these factors is applied.

Grimes *et al* (1962) observed that by increasing the number of irrigations from 3 to 5 the average grain yield of wheat was increased from 32.6 to 40.6 bu/acre. Mus-

tafa and Solangi (1966) found that with an increase in the number of irrigation to wheat crop, the tillering was reduced while 1000 grain weight was increased significantly. Martin (1973) reported that the yield of cereals could be increased upto 25 percent by proper weed control. Giardini and Giovanardi (1974) found that herbicide not only prevented the growth of the weeds but also increased wheat yield to a considerable extent. Solembier and Gomand (1974) obtained the highest yield of 5.17 tonnes/ha due to good control of weeds by chlortoluron application or Peshkova and Valina (1979) stated that application of chlortoluron and simazine at pre-emergence stage gave over 70 percent control of annual weeds without showing any toxic effect on the wheat crop. Phillip (1979) concluded that pre and post emergence application of chlortoluron increased the wheat yield upto 23 percent by controlling the broad leaved weeds. Singh and Seth (1980) stated that wheat grain yield grown on sandy loam soil with low N and P contents, was markedly increased with the application 120 kg N/ha. Further increase in the grain yield occured when P_2O_5 was applied at the rate of 60 kg/ha along with irrigation. Koshta and Raghu (1981) stated that wheat grain yields were increased from 1.85 to 2.16 and 2.34 t/ha by increasing the number of irrigations from 2 to 4 and 6 respectively.

Keeping this in view, it is envisaged to investigate the efficiency of some recommended practices against the conventional ones. The present study was, therefore designed to compare the recommended package of irrigation, fertilizer and weed control practices with that of the traditional one under irrigated conditions at Faisalabad.

MATERIALS AND METHODS

The present studies on the conventional versus recommended wheat production technology were conducted at the "Ochkera" Experimental Farm University of Agriculture, Faisalabad continuously for four years. The confounded treatments in complete factorial form were laidout in a Randomized Complete Block Design with four replications. The net plot size measured 3x10m. The conventional production technology constituted a fertilizer dose of 65 kg N + 65 kg P_2O_5/ha(F_0) + 3 irrigations (I_0) + no weedicide (W_0) while the recommended production technology comprised a fertilizer dose of 140 kg N + 115 kg P_2O_5 (F_1) + 5 irrigations (I_1) + weedicide (W_1). The confounded treatment included F_0 I_0 W_0, F_1 I_0 W_0, F_0 I_1 W_0, F_0 I_0 W_1, F_1 I_1 W_0, F_1 I_0 W_1, F_0 I_1 W_1 and F_1 I_1 W_1.

The seed of wheat variety LU 26 was planted in the last week of November each year with the help of single row hand drill on a well prepared seed bed in rows 25 cm apart using a seed rate of 100 kg/hectare. The experimental soil was poor sandy loam having on an average 0.029 percent N, 7ppm available P_2O_5 and 115 ppm available K_2O. All of the phosphorus and half of nitrogen was applied at the time of sowing, while the remaining half of nitrogen was top dressed with first irrigation. The recommended dose of chlortoluron + MCPA (1.2 kg ai/ha) was sprayed uniformlly four day after first irrigation, when the soil was in good moisture condition.

Irrigation schedule was adjusted according to the confounded treatments. The observations were recorded on weed count per unit area before and after the application of herbicide, plant height at

harvest, number of fertile tiller per unit area, number of grains per spike, 1000-grain weight and grain yield/ha.

For recording data on weed population the total number of different kinds of weeds per unit area were conducted before and after using the weedicide. The spectrum of weeds consisted of *Chenopodium album* Linn (Bathu), *Asphodelus tenuifolius* Cav (Piazai), *Medicago denticulata* (Maina), *Convolvulus arvensis* (Lahli), *Avena fatua* (Jangli Jai), *Vicia sativa* Linn (Rewari) and *Fumaria parviflora* lamk. (Pitpapra Shatara). Similarly a unit area of one m^2 was selected at random at three different places in each plot for recording data on the total number of tillers/unit area and then average was computed. For individual observation on plant height, number of spikelet/pancile and number of grains/pancile, 50 tillers were selected at random from each plot at the time of wheat harvest. The crop was harvested and threshed manually. The grain yield was recorded on plot basis and then converted into per hectare.

The data collected were statistically analysed by using the analysis of variance technique while Duncan's New Multiple Range Test at 5 percent probability level was applied to compare the differences among the treatment means (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

It is evident from table 1 that all the three components of the recommended technology did not help increasing the number of fertile tillers per unit area significantly over the components of farmers technology. However, the maximum number of 330.50 fertile tillers per m^2 was recorded in plots receiving fertilizer and weeding components of the recommended technology at irrigation component of farmer technology (F_1 Io W_1) as against the minimum of 312.00 in case of F_o I_1 W_o treatment. The results further indicated that including the weed control component in the farmer's technology tended to improve the productive stand per unit area over the traditional farmer's technology (Fo Io Wo).

The data on number of grains per spike showed that although there were visible differences among the treatments but the differences did not come up to the level of significance. However, on an average the number of grains per spike ranged between 36.5 to 39.27. This indicated that the variety under study did not show much response to the components of recommended technology in respect of grains per spike.

The table further reveals that the inputs of the recommended technology (F_1 I_1 W_1) did not show considerable effect on the development of grains as compared to farmer's technology, probably because of the low fertilizer response of the variety used in the study. The 1000-grain weight however, varied from 50.57 to 51.77 grams.

The four years data presented in table 2 indicated that a package of F_1 Io Wo (a fertilizer dose of 140-115-0 kg NPK per ha + 3 irrigations and no use of weedicide) and Fo Io W_1 (a fertilizer dose of 65-65-0 kg NPK per ha + 3 irrigations + chemical weed control) produced significantly more grain yield per hectare than Fo I_1 W_1 (65-65-0 kg NPK/ha + 5 irrigations + chemical weed control) package of production technology and were at par with F_1 I_1 W_1 package treatment (140-115-0 kg NPK per ha + 5 irrigations + weedicide). This indicated very interesting phenomenon that chemical weed control by Chlortoluron + MCPA increased the wheat yield to the level of an

Table 1. Yield components of wheat LU-26 under different technology package components.

Package of Technology	No. of fertile tiller/m²	No. of grain /spike	1000-grain weight (gm)
	N.S.	N.S	N.S.
65 + 65 kg NP/ha + 3 irrigations + no weedicide (Fo Io Wo)	313.75	36.56	51.07
140 + 115 kg NP/ha + 5 irrigations + no weedicide (F Io Wo)	316.50	39.17	51.15
65 + 65 kg NP/ha + 5 irrigations + no weedicide (Fo I^1 Wo)	312.00	37.95	50.75
65 + 65 kg NP/ha + 3 irrigations + weedicide (Fo Io W^1)	326.75	38.83	51.55
140 + 115 kg NP/ha + 5 irrigations + weedicide (F^1 I^1 Wo)	319.75	38.71	50.07
140 + 115 kg NP/ha + 3 irrigations + weedicide (F^1 Io W^1)	321.25	38.90	50.72
65 + 65 kg NP/ha + 5 irrigations + weedicide (Fo I^1 W^1)	312.25	38.87	51.77
140 + 115 kg NP/ha + 5 irrigations + weedicide (F^1 I^1 W^1)	330.50	39.27	50.75

N.S = Non significant
Weedicide = Chlortoluron + MCPA at the rate of (1.2 kg ai/ha).

addtional dose of 75-50-0 kg NPK per hectare over 65-65-0 kg NPK per hectare. In other words weeds used up the soil fertility to the extent of 75-50-0 kg NPK per hectare when left uncontrolled in wheat. It was further concluded that the conventional package of wheat production technology can be made more effective simply by including a component of chemical weed control in it, whereas increasing either irrigation frequency from 3 to 5 or a fertilizer dose from 65-65-0 to 140-115-0 kg NPK/ha did not contribute materially in making the production technology more effective and economical. On the other hand substituting the fertilizer component of conventional production technology (65-65-0 kg NPK/ha) by the recommended one (140-115-0 kg NPK/ha) did not increase the wheat yield over Fo Io W_1.

According to the economic analysis as detailed in table 2 the highest BCR of 2.31 was obtained from the production technology of Fo Io W_1 (65-65 kg NP/ha + 3 irrigation + weedicide) followed by the production technology of Fo I_1 Wo (65 + 65 kg NP + 5 irrigations + no weedicide) recording the net income of Rs.4577.27 per ha with BCR of 2.16 as against Rs.4479.14,4461.27, 4238.39, 3992.14, 3828.02 and 3667.39 BCR of 2.01, 2.04, 1.88, 1.85, 2.02 and 1.83 for the production technologies of F_1 I_1 Wo, Fo I_1 W_1, F_1 I_1 W_1, F_1 Io Wo, F_1 Io Wo and F_1 I_1 Wo, respectively.

It is thus concluded from the above results that chemical control of weed in wheat not only saves nutrients losses to the extent of 75 kg N and 50 kg P_2O_5 but also increases the net income and wheat yield per hectare to a substantial extent.

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Table 2 Effect of different package of technology on the grain yield and benefit cost ratio (BCR) of wheat.

Package of technology	Wheat yield t/ha: 1st year	2nd year	3rd year	4th year	average	BCR
65 + 65 kg NP/ha + 3 irrigations + no weedicide (Fo Io Wo)	3.8b	2.85c	3.5ab	2.78b	3.19	2.02
140 + 115 kg NP/ha + 3 irrigations + no weedicide (F1 Io Wo)	4.62a	3.02bc	4.00ab	3.38ab	3.7	2.01
65 + 65 kg NP/ha + 5 irrigations + no weedicide (Fo I1 Wo)	4.11ab	3.16bc	4.00ab	3.04b	3.58	2.16
65 + 65 kg NP/ha + 3 irrigations + weedicide (Fo Io W1)	4.45a	4.02a	4.42a	3.79a	4.17	2.31
140 + 115 kg NP/ha + 5 irrigations + no weedicide (F1 I1 Wo)	4.21ab	3.17bc	3.08b	3.17ab	3.41	1.83
140 + 115 kg NP/ha + 3 irrigations + weedicide (Fo Io W1)	4.20ab	2.97c	4.08ab	3.38ab	3.66	1.85
65 + 65 kg NP/ha + 5 irrigations + weedicide (Fo I1 W1)	3.45b	3.67ab	3.92ab	3.17b	3.67	2.07
140 + 115 kg NP/ha + 5 irrigations + weedicide (F1 I1 W1)	3.43b	3.27bc	4.25a	3.79a	3.81	1.88

[1] Any two means not sharing a letter differ significantly at 5 percent level of probability (DMRT) Weedicide Chlorto luron + MCPA at the rate of (1.2 kg ai/ha)
Weedicide = Chlortoluron + MCPA at the rate of (1.2 kg ai/ha)