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EFFECT OF WEEDING ON THE YIELD OF WHEAT

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A 2 year field experiment was conducted at the Regional Agricultural Research Station of BARI, Ishurdi during November to March 1991-92 & 1992-93 with eight weeding treatments such as continuous weeding (control), weed free upto 20, 30 and 40 days after emergence of crop, no weeding, weeding after 20,30 and 40 days after emergence of crop. The main infesting species of weed was *Cyperus rotundus.* The grain yield and yield components were significantly influenced by weed competition treatments. The greater the weed competition period, the greater was the crop loss. The critical period of weed competition ranged from 20 to 30 days after emergence. The grain yield losses due to unrestricted weed growth throughout the crop cycle was 25.7%.

Key words: Weeding, Yield, Wheat.

Introduction

Wheat is regarded as the second important cereal in Bangladesh next to rice which is grown in winter season. Wheat is nutritionally richer than rice with 12% protein content as against 8% in rice. Hence, wheat cultivation supplements the food gap and human health is improved by sufficient intake of wheat products. Varieties have been developed to suit the relatively mild winters of Bangladesh. These are grown successfully under both irrigated and dry land conditions. Appropriate technology has been developed to grow the crop under these diverse growth conditions. Even in two or three crop systems, wheat is being grown as an important component. Much has been achieved in terms of varietal improvement, fertilizer response, tillage and soil moisture manipulation, etc. Weed management has not received any attention so far (Ghosh 1987). Weed control has become a serious problem in high yielding dwarf varieties of wheat, where applications of high doses of fertilizers and frequent irrigations are considered to be most essential for achieving high yields. High doses of fertilizers are conductive not only to crop growth but also to weed growth. Weeds growing in association with the crop utilize considerable amount of nutrients and deprive the crop to express its yield potential. Weeds take about 30-40% plant nutrients applied to the crop (Rahman and Goffer 1986) and reduce the yield of wheat if not properly controlled (Schroeder 1989; Moussa and Bank 1990; Yaduraju and Ahuja 1990; Challaiah *et al* 1993). The present study was, therefore, undertaken to find out the effect of weeding on the yield of wheat and to identify the critical period of weed control to get the maximum yield.

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Materials and Methods

The experiemnt was conducted at the Regional Agricultural Research Station of Bari, Ishurdi during the period from November to March 1991-92 and 1992-93. The land was medium high having clay loam soil with a pH value 7.5 which is basic. The experiment was laidout in randomized complete block design with four replications. The eight weeding treatments were continuous weeding (control) of weed free upto 20, 30 and 40 days after emergence (DAE) of crop, no weeding, weeding after 20,30 and 40 DAE. The unit plot size was 15 m^2. Fertilizers @ 100-60-40-20 $kg^{-1}ha$ of N, P_2O_5, K_2O and S were used. Entire doses of P_2O_5, K_2O and S along with 50% of N were applied during final land preparation. The rest half of N was applied as top dress at crown root initiation (CRI) stage (20-30 DAE). The variety Akbar was sown on 22 November 1991 and 25 November 1992. The seeds were drilled behind hand plough at 20 cm inter-spaces. Weeding was done by mechanical weeding by Nirani (hand hoe). All other intercultural operations such as thinning, irrigation etc. were the same in each plot.

Harvesting was done on 15 March 1992 and 19 March 1993. Data on yield components were taken from 10 randomly selected plants per plot and for yield estimation the whole plot was harvested at 13.5% moisture basis. The intensity of weed infestation was calculated following the formula of Miah and Rahman (1968). Data were analyzed statistically and the mean differences were adjusted by LSD (Steel and Torrie 1960). Observation on number of weeds was made from three randomly located quadrates, 1 m^2 each in all plots.

Results and Discussion

The weed species infesting the experimental plots were *Cyperus rotundus, Cynodon dactyion, Chenopodium album, Eclipta prostrata, Gnaphalium Luticalbum, Dactyloctenium aegyptium, Physalis heterophylla* and *Leucus aspera* which constitute the major weed population. In total 3.98 weeds competed with one hill of wheat of which 1.91 belonged to the family *Cyperaceae*, 0.89 to *Chenopodiaceae*, 0.11 to *Compositae*, 0.32 to *Greanineae* and 0.48 to *Solanaceae* (Table 1). Of the nine weed species of the experimental plots, *Cyperus rotundus, Chenopodium album, Physalis heterophylla* and *Cynhodon dactylon* dominated over the other five species in their extent of infestation, constitution 91% of the total weed vegetation. *Cyperus rotundus*, which has been termed by Singh *et al* (1989) as the most notorious weed of upland crops in the world, topped the list in the extent of infestation (Table 1). This species grows simultaneously with the wheat plants in tough competition with each other, specially at the early stage of crop growth. As *Cyperus rotundus* is a C_4 plant, its photosynthetic yield is 2 to 3 times more than wheat (Mamum *et al* 1986). Its adaptability to high temperature and more light intensities and the rate of CO_2 fixation is also more as compared to wheat due to the presence of bundle sheath cells which are absent in wheat. On the other hand, the rate of photorespiration is less in *Cyperus rotundus*. In this experiment, about two plants of *Cypeurs rotundus* competed with one plant of wheat.

Weed competition for different duration with the wheat crop showed a significant variation in the yields and yield components. The tallest plant, the highest length of spike, the high-

Table 1

Infesting species of weeds in wheat with their intensity of infestation (Pooled data of 1991-92 and 1992-93)

Local name	Scientific name	Weeds no.m^{-2}	% of total weeds	Intensity
Mutha	*Cyhperus rotundus* L.	151.25	48.89	1.91
Durba	*Cynodon dactylon* (L) Pers	25.34	7.98	0.32
Bathua	*Chenopodium album* L.	70.45	22.19	0.89
Keshuti	*Eclipta prostrata* (L.)L	8.20	2.58	0.10
Shetamuli	*Gnaphalium luticalbum* L	3.16	1.00	0.01
Kakpaya ghash	*Dactyloctenium aegyptium* (L.) Wild	12.40	3.91	0.16
Foahka begon	*Physalis heterophylla* Nees	38.20	12.03	0.48
Shetodrone	*Leucus aspera* Spreng	7.25	2.28	0.09
Others		1.20	0.48	0.02
Total		317.45	--	3.98

Table 2

Yield and yield components of wheat as affected by weed competition (Pooled data of 1991-92 and 1992-93)

Treatment number	No. of spikes m^{-1}	Plant height (cm)	Length of spike (cm)	No. of grain spike^{-1}	1000-grain weight (g)	Yield (kg ha^{-1})	% Yield reduction over T1
T_1	254	78.70a	10.20a	50.60a	49.68a	5425a	-
T_2	255	78.50a	9.70bc	46.12cd	46.47bc	3931de	15.1
T_3	258	78.00a	9.93ab	49.80ab	48.35ab	4406b	2.7
T_4	278	78.02a	9.55bcd	45.35d	47.12bc	4362b	3.7
T_5	273	70.50b	0.07c	39.90f	42.13e	3601f	25.7
T_6	261	76.00ab	9.85ab	48.21bc	47.92ab	4275bc	5.9
T_7	263	74.50ab	9.40cde	43.15e	45.05cd	4075cd	11.0
T_8	269	73.00ab	9.20de	40.33f	43.25de	3831ef	18.2
LSD(.01)	NS	6.3	0.4	2.1	2.4	342	--
CV(%)	9	4	4	3	2	5	--

NS,not significant; T_1, continuous weeding (control); T_2, weeding upto 20 DAE; T_3, weeding upto 30 DAE; T_4, weeding upto 40 DAE; T_5, no weeding; T_6 ,weeding after 20 DAE; T_7, weeding after 30 DAE; T_8, weeding after 40 DAE.

est number of grain per spike, the maximum grain weight and the highest grain yield were obtained from the continuous weeding treatment i.e. control (Table 2). With the decrease in weed free period or with the extension of duration of weed competition, the yield and yield components were affected. The worst effect of weed competition on the yield and yield components was noted when the weeds were allowed to compete with the crop till harvest i.e. no weeding (Table 2). This is in agreement with Schroeder (1989), Challaiah *et al* (1993), Sharma *et al* 1991) and Mamun *et al* (1986), who reported that weed competition would reduce the grain yield in wheat by reducing the crop vigor, tillering, seed size and kernel weight. In this study, the grain yield loss due to weed competition was 25.7%.

The grain yield in the treatment of weed free upto 20 days after emergence (DAE) of crop was at par with those of weeding after 30 and 40 DAE but significantly lower than those of weed free upto 30 DAE or more (Table 2). This means that keeping the crop weed free for the first 20 days after emergence is equivalent to weeding after 30 and 40 DAE and keeping the crop weed free from 20 DAE onwards would save the crop from the ravages of the weeds. However, from Table 2 it was observeed that though the grain yield from the continuous weeding treatment was highest, it was almost identical with those of the treatments weed free upto 30 and 40 DAE. Possibly the weeds germinated after 30 DAE would have no impact on the grain yield. Thus, from the study it waas revealed that a weed free period between 20 to 30 DAE is essential in wheat to have an optimum yield. In other words, the critical period of weed competition in wheat ranged from 20 to 30 DAE in this study. The results are in agreement with the findings of Bainade and Patel (1991), Rahman and Goffer (1986) and Verma and Srivastava (1989) who reported that for the first 28 days the weed grew profusely and competed vigorously with wheat crop for nutrients resulting in reduced grain yield.

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