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Effect of seeding methods and weed management on wheat (*Triticum aestivum*)

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ABSTRACT

A field experiment was conducted during rabi 2005-06 and 2006-07,to study the effect of seeding methods and weed management on wheat (Triticum aestivum) at C.S. Azad University of Agriculture and Technology,Kanpur.Furrow seeding 20 cm apart resulted in significantly higher yield attributes,grain yield and net profit than broadcast sowing of wheat.Among the weed control methods, Pendimethalin pre-emergence@ 1 kg a.i./ha+post-emergence of Isoproturon @ 1kg a.i../ha and 2,4-D@0.75 kg a.i./ha, recorded significantly highest grain yield (45.78q/ha), straw yield (70.46q/ha) and net profit (Rs.39844/ha). This method of weed control gave 20.0, 9.2 and 8.1 % higher grain yield and 32.7, 15.9, and 13.4 % higher net profit than under the methods of weedy check, Pendimethalin pre-emergence @ 1 Kg a.i./ha and post-emergence application of Isoproturon @ 1Kg a.i./ha + 2,4D @ 0.75 Kg a.i./ha, respectively.The same method of weed control reduced weed intensity and weed dry biomass significantly compared to other methods, by procing highest weed control efficiency.

Key words : Wheat, Furrow seeding, Broadcasting, Herbicides, Economics

INTRODUCTION

Maintenance of optimum well distributed plant population per unit area is one of the fectors responsible for higher wheat yield. In indo-gangetic plains of north India, tillage operations and sowing of wheat are done generally by owned or hired tractor. Most of the tractor owners do not have seeding machines, thus sowing is done through broadcasting seed either before or after ploughing. The recommended method 'furrow seeding" is adopted only on limited area. Wheat crop is also infested with a number of weeds due to adoption of same crop sequence every year in a particular area. Some of the grassy weeds resemble with wheat in morphological characters and are not easily identified by the farmers, thus defy all manual mechanical attempts to control them. Seeding methods of wheat may also effect the weed intensity (Pandey and Kumar, 2005). Keeping above points in view, the present investigation was undertaken on seeding methods and weed management in wheat crop.

MATERIALS AND METHODS

The field experiment was conducted at Students' Instructional Farm of C.S. Azad University of Agriculture and Technology, Kanpur (Uttar Pradesh) during winter seasons of 2005-06 and 2006-07. The soil was sandy loam in texture, low in organic carbon (0.40%), available P(10.9kg/ha) and available K (176kg/ha) with 7.8 pH. The treatments comprised of 3 seeding methods (M_1- Seed broadcast before last ploughing and planting ; M_2- Seed broadcasting after last ploughing but before planking ; M_3- Furrow seeding 20cm apart) and 4 weed control methods (W_0- Weedy check ; W_1-Pendimethalin pre-emergence @ 1.0 kg a.i./ha; W^2- Post - emergence spray of 2,4-D @ 0.75kg a.i./ha + post - emergence of Isoproturon @ 1.0kg a.i/ha; W_3- Pendimethalin pre-emergence @ 1.0 kg a.i./ha + post - emergence of Isoproturon @ 1.0 kg a.i./ha and 2,4-D @ 0.75 kg a.i./ha). Experiment was conducted in split- plot design with seeding methods in main plots and weed control methods in sub-plots, replicated four times. Wheat variety PBW-343 was sown on 27.11.2005 and 5.12.2006 using seed rates of 100 and 125kg/ha, respectively.

The recommended dose of 120kgN, 60kg P205 and 40kg K20/ha was applied to the crop. Full dose of P and K along with half dose of N were applied basal and remaining N in two equal splits at tillering and boot stage.The crop received 4 irrigations in first year and 5 in second year crop. Weed count and weed dry biomass were recorded 120 days after sowing from an area enclosed in a quadrate of 0.25 m^2 randomly selected at 3 places in each plot. Weed count were subjected to square test transformation (x+0.5) before statistical analysis. Pre-emergence application of herbicides was done 2 days after sowing while the post emergence application was done 30 days after sowing, using the knap-sack sprayer fitted with flat-fan nozzle.

RESULTS AND DISCUSSION

Weed :

The major weed flora observed in the experimental plots included Chenopodium album, Convolvulus arvensis, Anagallis arvensis, Phallaris minor, Cyperus rotundus and Cynodon dactylon. In the plots of weedy check, Cyperus rotundus (36.45%), Cynodon dactylon (20.26%) and Anagallis arvensis (18.72%) dominated during 2005-06.

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In second year, Chenopodium album (32.29%), Convolvulus arvensis (16.77)% and Phallaris minor (16.14%) were dominated.

Seeding methods of wheat could not affect the weed intensity significantly while weed dry weight was influnced only during 2006-07 when furrow seeding (M_3) showed significantly minimum and M_1 method showed maximum dry weight of weeds (Table 1). The reduction in weed dry weight under furrow seeding (M_3) may be attributed to poor growth of weeds because of competition created by canopy of crop plants in nearby area of crop row (Pandey and Kumar, 2005). Weed control treatments W_2 and W_3 significantly lowered the weed count and weed dry biomass than weedy check (W_o). Among the weed control methods W_3 recorded significantly lower weed dry biomass than rest of the methods. Weed control efficiency was also found highest in W_3 method of weed control. Lower dry weight of weeds under W_3 method was due to broad spectrum activity of herbicides on weeds germination and also on established plants of both narrow and broad leaf weeds as both types of herbicides were used in pre and post emergence application in this method. The results are in accordance to the findings of Sharma and Pahuja (2001).

Yield attributes:

Furrow seeding (M_3) recorded maximum shoots / m^2 (307 – 434), ear length (10.79 – 8.23 cm), grains/ear (42.31 – 53.41), and grain weight / ear (2.01-2.28g), being significantly higher than M_1 seeding method in all cases (Table 1). M_2 method of seeding also recorded higher value of these yield indices than M_1 method, but margin of difference was significant only during 2006-07. The best performance of furrow seeding (M_3) could be attributed to lesser inter-row competition between crop plants for essential inputs including space. On the other hand, poor performance of broadcast sown crop (M_1 and M_2) might be due to severe intra crop competition for essential inputs. These results support the findings of Gogoi and Kalita (1995). Weed control treatments recorded significantly higher values of shoots/m^2, ear length, grains/ear and grain weight/ear than weedy check. Significantly maximum values of these yield attributes were recorded under W_3 method of weed control, whereas W_1 and W_2 methods remained at par with each other in almost all yield attributes during both years. The best performance of W_3 method was attributed to effective weed control (Table 1) which restricted the competition between weed and crop plants for nutrients,

Table 1 : Effect of seeding methods and weed management on yield attributes of wheat and weed dynamics

Treatments	No. of shoots/ .M^2		Length of ear (cm)		Grains/ear		Grain wt./ ear (g)		Weeds/ mM^2 at 120 DAS		Weed dry (g/m^2) at 129 DAS		Weed control efficiency (%)	
	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07
Seeding method														
M_1	296.25	397.56	10.72	7.75	40.62	47.98	1.90	2.07 (340.30)	6.38 (58.75)	7.70	45.10	39.49	31.15	15.37
M_2	300.25	401.11	10.78	8.09	41.56	52.34	1.98	2.15 (38.05)	6.20 (55.70)	7.50	48.30	36.69	26.26	21.37
M_3	306.56	433.90	10.79	8.23	42.31	53.41	2.01	2.28 (53.46)	7.32 (46.86)	6.88	42.20	31.29	35.57	32.94
S.E.±	3.27	6.80	0.05	0.05	0.60	0.53	0.04	0.01	0.68	0.61	2.20	1.06	-	-
C.D. (P=0.05)	8.07	16.63	N.S.	0.12	1.48	1.32	0.09	0.03	N.S.	N.S.	N.S.	2.43	-	-
Weed control method														
W_1	309.75	410.75	10.81	8.00	41.41	51.13	1.97	2.16 (61.08)	7.84 (56.95)	7.58	35.12	37.65	46.38	19.30
W_2	312.83	402.57	10.75	8.03	41.75	51.06	1.99	2.17 (44.60)	6.71 (51.12)	7.18	37.60	34.43	42.59	26.21
W_3	335.66	450.12	11.13	8.38	44.33	52.90	2.12	2.26 (42.88)	6.58 (36.27)	6.06	31.10	24.56	52.52	47.36
W_0	245.83	380.00	10.38	7.70	38.50	49.90	1.79	2.07 (0.03)	8.10 (70.74)	8.44	65.50	46.66	-	-
S.E.±	2.47	7.24	0.09	0.17	0.58	0.73	0.04	0.03	0.80	0.84	2.10	1.28	-	-
C.D. (P=0.05)	5.08	14.89	0.20	0.35	1.19	1.50	0.09	0.06	1.15	1.21	4.13	2.63	-	-

Parenthasis values are original

Table 2 : Effect of seeding methods and weed management on yield and net profit of wheat

Treatment	Grain yield (q/ha)			Straw yield (q/ha)			Net profit (Rs./ha)		
	2005-06	2006-07	Mean	2005-06	2006-07	Mean	2005-06	2006-07	Mean
Seeding method									
M_1	34.39	46.61	40.50	53.25	70.57	61.91	27245	38615	32930
M_2	35.10	48.46	41.78	53.50	73.41	63.46	28422	41267	34845
M_3	35.55	51.95	43.75	55.96	75.69	65.83	28875	45116	36996
S.E. $\pm$	1.45	1.38	-	5.80	2.73	-	290	1386	-
C.D. (P=0.05)	N.S.	3.40	-	N.S.	N.S.	-	710	2820	-
Weed control methods									
W_1	35.71	48.13	41.92	53.16	73.74	63.45	28042	40703	34373
W_2	35.18	49.20	42.34	54.61	73.45	64.03	28208	42035	35122
W_3	36.87	54.69	45.78	60.11	80.80	70.46	31091	48596	39844
W_0	32.29	44.00	38.15	49.08	64.91	57.00	24718	35327	30023
S.E. $\pm$	0.75	0.94	-	1.54	2.01	-	585	1601	-
C.D. (P=0.05)	1.54	1.92	-	3.16	4.13	-	1200	3256	-

moisture and space. Thus, crop plants developed better and attained highest values of different yield attributes. Kumar *et al.* (1996) also reported similar results.

Yield and economics :

Seeding methods influenced the grain yield significantly (Table 2) during second year of study. Furrow seeding resulted significantly highest grain yield while both methods of broadcasting seed remained at par with each other. Furrow seeding produced 1.97 q/ha or 4.72% and 3.25 q/ha or 8.02% higher grain yield compared to M_2 and M_1 methods, respectively on mean basis of both year. Straw yield also behaved in the same manner but differences could not touch the level of significance. Higher grain yield under furrow seeding method was owing to higher number of shoots per unit area, which reduced weed infestation and provided conducive environment for proper growth and development of crop plant and yield attributes to the desirable extent. On the contrary, improper depth and uneven distribution of seeds in broad casting caused significant reduction in plant population per unit area, which provided sufficient space to grow weed and resulted poor yield attributes and grain yield (Pandey and Kumar, 2005). Weed control treatments resulted significantly higher grain and straw yields than weedy check. Among weed control methods, W_3 produced significantly highest grain and straw yields, while W_1 and W_2 methods yielded at par with each other. On mean basis over years, W_3 produced 3.44 q/ha or 8.12 %, 3.86 q/ha or 9.21 % and 7.63 q/ha or 20.00 % higher grain yield compared to W_2, W_1 and W_0 treatments, respectively. These higher yields under W_3 method are attributed to higher values of all yield indices because of effective weed control as in this method, both type of weedicides were applied by both pre-emergence and post-emergence time of application. Pandey *et al.* (2005).

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