

EVALUATION OF PLANTING TIME AND SEEDING RATE IN WHEAT (*TRITICUM AESTIVUM* L.)

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ABSTRACT

A long term review of experimental data (1991-92 to 2003-2004) was undertaken at Wheat Research Institute, Faisalabad to settle the ongoing controversy on the subject. Optimum planting time in wheat, in contrast to planting practice in Punjab, is limited to a short period between October 25 and November 15. The yield suffers 10 percent decline if planting is delayed from November 10 to 25. The decline yield in successive planting increases, as the planting is delayed. Any food self-sufficiency campaign would remain fruitless if crop is planted after 15th November.

Seeding rates currently recommended by the Agriculture Department are inconsistent with research outcomes. The data show that low seed rate (100 kg/ha) is better than higher seed rate (175-200 kg/ha). Five to ten kg additional seed is required in late planting. The higher seed rate represents wastage and adds to production cost. The dense plantings have also proved as conducive for the spread of insect pests and diseases.

KEYWORDS: *Triticum aestivum*; sowing timing; seeding rates; Pakistan.

INTRODUCTION

Planting time and seeding rates in wheat are key factor for the crop success (2, 5, 10, 12, 13, 14) irrespective of their importance these have been a matter of controversy. Cropping system in Punjab and recommendations of Agriculture Department have led to wheat planting over an extended period of time from late October to early part of January (11). The late crop suffers heavy yield losses (1, 3, 5, 11). Late planting by the farmers is a routine activity (11) due to availability of late varieties and departmental recommendations. Keeping in view the yield losses due to late planting it appears that optimum planting time, as against the practice, is at variance with field practice. The department, however, continue recommending wheat planting upto mid December.

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Seeding rate in recent years has seen upward revision. At one time as much as 200 kg seed per hectare was recommended with a mixed acceptance. Several farmers are now reverting to old recommendation of lower seed rates. More seed added nothing to yield (9, 11, 12, 13, 15). Farmers, on the other hand, were complaining of higher incidence of aphid. Dense planting changes the microclimate of the field. Shade provides safe breeding place and increases humidity which is helpful to disease and insect spread (11).

In view of this controversial situation it was necessary to be scientifically specific on the subject. Research data of many aspects of wheat is available at Wheat Research Institute, Faisalabad. So a long-term review extending over 9-13 years of planting time and seeding rate was undertaken to find the correct answer on these two important factors.

MATERIALS AND METHODS

Research on planting time is a regular activity of Wheat Research Institute, Faisalabad. Each year a set of 12-16 varieties/lines are planted at 15 days interval starting from October 25 to January 10. Six plantings (October 25, November 10, November 25, December 10, December 25 and January 10) followed uniform planting pattern and other field practices. Each entry was planted in a 1.8 x 6.0 meter plot in RCBD with three replications. Yield and other agronomic data were collected at harvest. The experiments followed the recommended production techniques. Thirteen years data from these experiments (1991-92 to 2003-04) were compared (Table 1, 2 and 3).

Similarly a large number of seeding rate experiments were undertaken from time to time during the past 25 years. The results of these seed rate trials are summarized in Tables 4, 5, and 6.

RESULTS AND DISCUSSION

1. Planting time

The data (Table 1) show the yields of different planting date experiments over 13 years period. The means at the end of the Table 1 indicate comparative yield for each planting date. Plantings of October 25 and November 10 produced higher yield. The yield decreased in later plantings. The rate of

decrease in yield is successively more as we go late in the season (Table 2). For example, if planting is delayed from November 10 to November 25, 9.76 percent yield is lost and an equal amount of yield is lost (8.68) if planting is delayed from November 25 to December 10. But the rate of yield loss in subsequent planting dates (December 25 and January 10) is 18.88 and 21.82 percent, respectively. The planting for yield maximization, therefore, should be confined to October 25 and November 10 (1, 3, 12). The second fortnight of November entails a heavy loss. Ten percent loss is very considerable which may cause wheat deficiency for the nation. The planting after November 25 is really detrimental to wheat production and yield reduction is almost at an arithmetic rate.

Table 1. Yield data (kg/ha) of sowing date trials (1991-92 to 2003-04)

Year	October 25	November 10	November 25	December 10	December 25	January 10
1991-92	5119	5692	4988	4756	4226	2566
1992-93	4638	5161	4917	5046	3821	2746
1993-94	5523	5448	5222	5048	4437	3240
1994-95	5301	5080	4360	4264	3276	2499
1995-96	4666	4677	4500	4170	3036	4209
1996-97	5820	5123	4766	4444	3931	3144
1997-98	5087	5132	4282	3470	2745	2125
1998-99	4727	4650	4167	3162	2631	1887
1999-00	5238	5364	5166	4856	3819	2532
2000-01	5234	5377	5074	4346	3122	2567
2001-02	5898	5736	4591	4092	3861	3025
2002-03	4652	5157	4784	4191	2986	2479
2003-04	5113	5061	4236	3983	3333	2340
Means	5155	5204	4696	4288	3478	2719

Table 2. Yield reduction in wheat with delayed planting

	Oct.25	Nov. 10	Nov. 25	Dec. 10	Dec. 25	Jan. 10
Yield (kg/ha)	5155	5204	4696	4288	3478	2719
Reduction (kg/ha/day)		3.2	-34	-27	-54	-51
Reduction (%)		0.95	-8.90	-16.81	-32.53	-47.25
			-9.76	-17.60	-33.16	-47.75
				-8.68	-25.93	-42.09
					-18.80	-36.59
						-21.82

The yield of October 25 planting was slightly lower to that of November 10. Theoretically October 25 planting should yield higher since it gives crop a

longer growing period (4). In six years out of 13, the October planting yielded higher than November 10 planting. The yield in other years was lower perhaps due to frost incidence. The crop planted on October 25 is often hit by frost in Punjab which aborts the grains and the heads show partial sterility (15). This, however, can be corrected if the farmers make a proper variety selection (9). Farmers should avoid early heading varieties like AS 2002 and Iqbal 2000 for October planting. By selecting appropriate variety increased yield in October 25 planted crop is feasible. The data from Arid Zone Research Institute, Bhakkar (1) (Table 3) prove this contention. No-frost year clearly established the superiority of October 25 planting over November 10 planting. In view of above data wheat planting time in Punjab needs revision. The optimum wheat planting time is from October 25 to November 15. The crop planted after mid November should be considered late and December planting which entails as much as 33 percent losses should be considered very late. Naturally, food self-sufficiency campaigns would remain short of targets with such high level losses.

Table 3. Effect of sowing date on wheat yield*

Sowing date	Yield (kg/ha)
25-10-2003	4949
05-11-2003	4840
15-11-2003	4285
25-11-2003	4285
05-12-2003	3835
15-12-2003	3233
25-12-2003	2825

2. Seed rate

The data for seeding rate trials of the year 1979, 2000, 2001 and 2002 revealed that seed rate varied from 75 to 200 kg per hectare with 25 kg incremental steps. During 1979, the lowest seed rate (75 kg/ha) produced higher yield. Higher seed rate (100 and 125 kg/ha) were statistically at par with 75 kg per hectare seed rate. Higher seed rate gave lower yield. Different seed rates tried on farmers field during the same year proved equal. It indicated that lower seed rates were as good as higher. In the trials conducted during 2000, again 100 kg seed rate was as good as 125 and 150 kg per hectare. Higher seed rates (175-200 kg/ha) produced less yield. During 2001 all seed rates tried stood at

par. In 2002, again lower seed rates (100-125 kg/ha) performed better. So lower seed rates during these four years were consistently better. In contrast, 175 and 200 kg seed rates showed no superiority in any experiment. However, 150 kg per hectare performed better in one year, 2000. The data in Table 5 show the effect of seed rates tested with graded fertilizer doses. The highest but equal yields were given by 37.5, 50 and 62.5 kg per hectare seed rates (3710, 3527 and 3531 kg/ha) Higher and lower seed rates were inferior in yield. In Table 6 again 75 kg and higher seed rates were equal. Even in late planting (Table 6) during December 100 kg seed rate was comparable to higher seed rates. A review of data (Table 4, 5 and 6) thus shows no superiority of seed rates above

Table 4. Effect of seed rate on wheat yield

Seed rate (kg/ha)	Yield (kg/ha)				
	1979		2000	2001	2002
75	3306a	*3285a	4796bcd	4956a	5225a
100	3188ab	3316a	5093ab	4932a	5053abc
125	3175ab	3247a	5053abc	5212a	5176ab
150	3084c	3326a	5191a	4876a	4783bcd
175	2032cd	-	4669cd	5121a	4687cd
200	2849d	-	4817bcd	5074a	4555d

*Conducted at farmers fields.

Table 5. Effect of seed rate and fertilizer on wheat yield during 1978-79

Seed (kg/ha)	Yield (Kg/ha)					
	F1	F2	F3	F4	F5	Mean
12.5	1534	3527	4071	4078	3507	3344
26.0	1534	3678	4177	4384	3606	3475
37.5	1541	3917	4476	4503	4110	3710
50.0	1460	3898	4164	4211	3905	3527
62.5	1447	3626	4021	4298	3759	3531
75.0	1309	3540	4177	4118	3386	3305
87.5	1368	3451	3826	4164	3228	3209
100	1388	3426	3705	4169	3241	3186
125	1447	3547	3999	3678	3194	3174
150	1435	3520	3932	3572	2949	3083
175	1401	3421	3846	3426	3001	3031
200	1455	3646	3441	3055	2591	2848
Mean	1442	3599	4026	3972	3431	--

F1 (0-0-0 kg NPK/ha), F2 (50-50-0 kg NPK/ha), F3 (100-100-0 kg NPK/ha), F4 (150-100-0 kg NPK/ha), F5 (200-150-0 kg NPK/ha)

Table 6. Effect of seed rate on wheat yield* (1999-2001)

Seed rate (kg/ha)	November sowing	December sowing
25	4393 c	3692 c
50	5490 b	3949 c
75	5584 ab	4436 b
100	5752 ab	4800 a
125	5580 a	4990 a
150	5659 ab	4986 a
175	5760 ab	5037 a
200	5650 ab	4954 a

*2 years average over planting time, row spacing and seed rate

100 kg per hectare. High seed rate obviously adds to the expenditure. An increase of 25 kg seed per hectare requires 150,000 tons extra seed in Punjab worth Rs. 1.8 billions. This would add nothing to farmers yield. So higher seed rate recommendations are not consistent with the research outcomes and only inflationary in nature. So the field observations point to the futility of added seed. Researchers and farmers report higher incidence of aphid in dense crops. Such crops are also prone to lodging due to high interplant competition and therefore, become weaker.

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