Asian Journal of Plant Sciences

ISSN 1682-3974

science alert

ANSInet
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http://ansinet.com

Asian Journal of Plant Sciences 3 (1): 87-90, 2004
ISSN 1682-3974
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Response of Newly Developed Wheat Cultivars/Advance Lines to Planting Dates in the Central Agro-ecological Zone of NWFP

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Abstract: An experiment was conducted at Cereal Crops Research Institute Pirsabak Nowshera during 2002-03 on six wheat cultivars/advance lines to identify the best suitable time of planting in the central agro-ecological zone of NWFP. Randomized complete block design was used with 3 replications. Six planting dates were used from October 25th to December 15th with 10 days increment. Data were recorded on Days to 50% heading, Days to maturity, Plant height and Grain yield. Maximum number of days (132) to 50% heading were recorded when planting was done on October 25th Minimum number of days (114) were reported when planting was done on December, 15th. Maximum number of days (178) to maturity were recorded when planting was done on October 25th. Number of days to maturity decreased as planting was delayed with 10 days increment. Minimum number of days (130) were recorded when planting was delayed till 15th of December. Highest plant height (98 cm) was recorded when planting was done on October 25th and November 05th. Plant Height decreased as planting was delayed. Minimum Plant height (85 cm) was recorded when planting was delayed till 15th of December. Maximum grain yield (3937 kg ha^{-1}) was recorded when planting was done on November 05th. Grain yield decreased as planting was delayed with 10 days increment. Minimum grain yield (2274 kg ha^{-1}) was observed when planting was done on 15th of December. A negative correlation was recorded between planting dates and days to 50% heading, days to maturity, Plant height and Grain yield. The yield losses due to late planting recorded were 8% when planting was done on November 15th, 22% loss when planting was done on 25th November, 34% losses were incurred when planting was done on December 5th and 42% losses were recorded when planting was further delayed till December 15th. Hence it is concluded that first two weeks of November is the best time for obtaining higher yields from the recommended cultivars.

Key words: Wheat, planting dates, plant height, grain yield

INTRODUCTION

Wheat is the most important staple food of masses in Pakistan. Food requirements of the country are increasing due to rapid increase in population. Wheat productivity enhancement is possible only through increase in yield per unit area as expansion in wheat acreage is not very likely due to rapid urbanization. Area under wheat crop has increased from 6.7 million ha in 1980-81 to 8.093 million ha in 2002-03. During the same period average yield also increased from 1634 to 2354 kg ha^{-1}. The restricted expansion in wheat cropped area and slower growth rate in wheat productivity has made it harder for Pakistan to export this year in order to meet the needs of its growing population as compared to 1.7 million tons export in 2001-02. Wheat production was 19.235 million tones during 2002-03. Punjab is the dominant wheat producing province contributing 81% of the national wheat production, Sind 11, NWFP 5 and Baluchistan 3%[1].

Cereal Crops Research Institute Pirsabak Nowshera is running a continuous campaign of developing Wheat, Maize and Barley varieties along with the best production technology package for different agro-ecological zones of NWFP. Wheat breeding section of this institute has released several varieties of wheat from time to time. However timely planting of suitable cultivar in a target area has a greater impact on the productivity of the variety. Early sowing has shown better result with regard to yield when compared with late planting.

The objective of this study was to determine the best suitable time of planting for the newly released wheat varieties/advance lines of Cereal Crops Research Institute Pirsabak for NWFP. The study was also aimed to quantify the losses occurred due to late planting.

MATERIALS AND METHODS

An experiment was conducted at Cereal Crops Research Institute Pirsabak Nowshera to identify the best suitable time of planting for newly released wheat varieties/advance lines and to quantify the losses in yield due to late planting during 2002-2003 under irrigated

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condition. Three wheat varieties namely Saleem-2000, Haider-2000, Nowshera-96 and three advance lines PR-74, PR-76 and PR-77 were tested in a Randomized Complete Block Design with three replications from October 25th to December 15th with a 10 days interval. Planting was done with the help of hand hoe. Each plot consisted of six rows 30 cm apart and 5 meter long. Uniform seed rate of 100 kg ha^{-1} was used. Fertilizer was applied at the ratio of 120-60 kg ha^{-1} of NP in the form of Single Super Phosphate (SSP) and Urea. SSP was applied as basal dose at the time of planting while urea was applied in split doses half at planting and half with first irrigation. The central four rows were used for collection of data. Days to 50% heading were recorded when 50% of the heads emerged from the plants. Days to maturity was recorded when 90% of the plants have reached physical maturity. Plant height was recorded from the base to the tip of the aunds. Grain yield was recorded by manually harvesting the central four rows and then threshing them on the experimental thresher. Yield per plot was converted to yield per hectare. Data were analyzed statically according to Randomized Complete Block Design[2].

RESULTS AND DISCUSSION

Days to 50% heading: Planting dates (PD) significantly affected days to 50% heading (Table 1). Maximum number of days (132) to 50% heading were recorded when planting was done on October 25th and minimum number of days (96) were reported when planting was done on December, 15th (Table 2). However, number of days (122) to 50% heading were the same when planting were done on November 15th and December 5th. Moreover significant differences were observed among lines/cultivars for days to 50% heading across the planting dates. Haider took the maximum number of days (121) to 50% heading among the lines/cultivars. It is evident from the data (Table 2) that late sowing in December provide shorter period for the vegetative growth of the crop. The results are in confinement with those of Khalifa *et al.*[3].

Days to maturity: Planting dates significantly affected days to maturity (Table 1). Maximum number of days (178) to maturity were recorded when planting was done on October 25th (Table 3). Number of days to maturity decreased as planting was delayed with 10 days increment. Khalifa *et al.*[3] reported the same results. Minimum number of days (130) were reported when planting was delayed till 15th of December. As the total number of Growing Degree Days (GDD) decreases the yield components are also affected[4] and hence the economic yield of crop suffers negative trend. Haider took maximum number of days (159) to maturity. It is clear from the data (Table 3) that late sowing in December provide shorter period for the vegetative/reproductive growth of the crop. The results are in agreement with those of Sandhu *et al.*[5].

Plant height: Plant height was also significantly affected by varying planting dates (Table 1). Maximum plant height (98 cm) was recorded when planting was done on October 25th and November 05th (Table 4). However, plant height decreased as planting was delayed[6]. Minimum Plant height (85 cm) was reported when planting was delayed till 15 th of December. Haider and Nowshera gave the highest plant height (97 cm) across planting dates followed by PR-74. As both the cultivars are recommended for rainfed areas they excel in height comparatively. The data (Table 4) reveals that late sowing in December provide shorter period for plant growth and compels the plant to complete its life cycle earlier.

Grain yield: Grain yield was significantly affected by planting dates (Table 1). Maximum grain yield (3937 kg ha^{-1}) was recorded when planting was done on November 05th (Table 5). Grain yield decreased as planting was delayed with 10 days increment. Minimum grain yield (2274 kg ha^{-1}) was observed when planting was done on 15th of December. As the total number of Growing Degree Days (GDD) decreases the yield components are also affected[4] and hence the economic yield of crop suffers negative trend. PR-77 gave the highest grain yield (3532 kg ha^{-1}), while Haider gave the lowest grain yield (2965 kg ha^{-1}). The reason for low yield can be attributed to the excessive rains and heavy down pours in the growing season of 2002-03 which resulted in lodging, as Haider is comparatively tall variety recommended for barani areas of NWFP. Saleem among the cultivars gave the highest yield of 3433 kg ha^{-1} across all the planting dates as this variety has been released for normal and late sowing for the irrigated areas of NWFP[7]. It is obvious from the data (Table 5) that late sowing in December provide shorter growth period for the crop and hence confirms negative correlation between planting dates and grain yield. The yield losses due to late planting recorded were 8% when planting was done on November 15th, 22% loss when planting was done on 25th November, 34% losses were incurred when planting was made on December 05th and 42% losses were recorded when planting was further delayed till December 15th in comparison to the highest yield (3937 kg ha^{-1}) obtained

Table 1: Analysis of variance of days to 50% heading, days to maturity, plant height and grain yield of wheat varieties/advance lines as affected by planting dates

		Mean squares			
SOV	d.f	Days to 50% heading	Days to maturity	Plant height	Grain yield
Planting Dates(PD)	5	2717.08**	5252.03**	559.08**	8488484.81**
Rep(Plant. Dates)	12	2.00	0.68	15.69	156276.14
Varieties(Var)	5	41.41	5.59	282.72	880969.28**
PD x Var	25	5.57**	2.69**	23.98**	347337.79*
Error	60	0.60	0.70	10.01	182908.56
Total	107				

* = Significant at 1% level of probability ** = Significant at 5% level of probability

Table 2: Days to 50% heading of wheat varieties/advance lines as affected by planting dates at CCRI during 2002-03

	Varieties/Advance Lines						
Planting dates	PR-74	PR-76	PR-77	Saleem	Haider	Nowshera	Mean
Oct, 25	132	130	130	130	139	129	132a
Nov, 05	125	123	125	125	126	124	125b
Nov, 15	121	122	121	123	124	121	122c
Nov, 25	122	121	122	121	124	120	122c
Dec, 05	113	113	113	113	116	114	114d
Dec, 15	96	95	94	95	99	97	96e
Mean	123	122	122	122	126	121	

*Means followed by the same letter are not significantly different. Lsd value = 0.5204

Table 3: Days to Maturity of wheat varieties/advance lines as affected by planting dates at CCRI during 2002-03

	Varieties/Advance Lines						
Planting dates	PR-74	PR-76	PR-77	Saleem	Haider	Nowshera	Mean
Oct, 25	177	178	179	177	178	178	178a
Nov, 05	169	171	171	171	173	170	171b
Nov, 15	163	163	165	161	164	162	163c
Nov, 25	156	156	157	157	157	156	257d
Dec, 05	148	149	148	148	150	148	149e
Dec, 15	132	131	129	131	130	129	130f
Mean	158	158	158	158	159	157	

*Means followed by the same letter are not significantly different. Lsd value = 0.56

Table 4: Plant Height of wheat varieties/advance lines as affected by planting dates at CCRI during 2002-03

	Varieties/Advance Lines						
Planting dates	PR-74	PR-76	PR-77	Saleem	Haider	Nowshera	Mean
Oct, 25	102	97	100	92	100	98	98a
Nov, 05	105	96	97	92	97	100	98a
Nov, 15	102	95	90	90	100	102	97a
Nov, 25	93	93	94	92	99	100	95b
Dec, 05	93	85	85	80	93	94	88c
Dec, 15	83	82	84	78	93	87	85d
Mean	96	91	92	87	97	97	

*Means followed by the same letter are not significantly different. Lsd value = 2.0

Table 5: Yield kg ha^{-1} of wheat varieties/advance lines as affected by planting dates at CCRI during 2002-03

	Varieties/Advance Lines						
Planting dates	PR-74	PR-76	PR-77	Saleem	Haider	Nowshera	Mean
Oct, 25	3829	4084	4078	4017	3619	3298	3820ab
Nov, 05	4161	3502	4438	3807	3519	4194	3937a
Nov, 15	3749	3337	3724	4000	3265	3696	3629b
Nov, 25	3154	3041	3381	2888	2805	3213	3080c
Dec, 05	2263	2628	2817	3103	2335	2368	2586d
Dec, 15	1206	2739	2756	2783	2247	1914	2274e
Mean	3060	3222	3532	3433	2965	3114	

*Means followed by the same letter are not significantly different. Lsd value = 285

from planting done on November 5th. The results are consistent with those of Singh and Uttam[8], Karim *et al.*[9], Lone *et al.*[4] and Riaz *et al.*[16].

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