The Journal of Animal & Plant Sciences 19(3): 2009, Pages:126-129
ISSN: 1018-7081

EFFECT OF SEED RATES SOWN ON DIFFERENT DATES ON WHEAT UNDER AGRO-ECOLOGICAL CONDITIONS OF DERA GHAZI KHAN

A. U. Malik, M. Ahmad alias H. A. Bukhsh and I. Hussain*

Agriculture Adaptive Research Complex, Dera Ghazi Khan
*Agriculture Adaptive Research, Punjab, Lahore
Corresponding author e-mail: asmat_awan@yahoo.com

ABSTRACT

A field experiment was conducted to evaluate the effect of different seed rates on different sowing dates to suggest the appropriate seed rate of wheat for different sowing dates in the agro ecological conditions of the Dera Ghazi Khan zone. The wheat was sown with three sowing dates (D_1) 15th November, (D_2) 30th November and (D_3) 15th December, using three seed rates *viz*: (S_1) 125, (S_2) 150, and (S_3) 175 kg ha^{-1}, respectively. The experiment was laid out in randomized complete block design with split plot arrangement, keeping sowing dates in main plot and seed rates in sub plot with three blocks. The plot size was 6m x 25 m. It was observed that delayed sowing decreased grain yield due to decrease in germination count m^{-2}, number of grains spike^{-1} and 1000-grain weight where as increase in seed rate did not affect grain yield. The interactive effects of sowing dates and seed rates were significant. The highest grain yield (3360 Kg ha^{-1}) was recorded when 125 kg ha^{-1} was used for sowing on 15th November. Thus, wheat should be preferably sown on 15th November with seed rate of 125 kg ha^{-1} in Dera Ghazi Khan zone.

Key Words: Wheat, sowing dates, seed rates, yield and its components.

INTRODUCTION

Wheat (*Triticum aestivum* L.) belongs to Poaceae family, an important food crop of Pakistan. It is being eaten through out the country daily three times. During last 10 year period from 1998-99 to 2007-08, it was cultivated on 37 % of the total cropped area of the country. During this period, wheat was cultivated on an area of 9062 thousand hectares, showing an increase of 5.9 percent over last year's area of 8550 thousand hectares. The size of wheat crop is provisionally estimated at 23.4 million tons, 11.7 percent more than last year crop (Anonymous, 2008-09). Wheat-Cotton cropping system is the most popular practicable cropping pattern. The scarcity of the labour for cotton picking and long flowering span of the cotton varieties wastes a lot of time of the farmers to harvest it. Because of this reason, it becomes harder for the farmer to sow wheat at its appropriate time (Ihsanullah, *et al*., 2002; Hameed *et al*., 2003). Late sowing of wheat tends to reduce germination count and number of tillers unit area^{-1} because of sharp rise in temperature during tillering phase of the crop and ultimately yield is decreased (Soomro and Oad, 2002; Sadeghipour, 2008). The optimum time for the sowing of wheat in Southern Punjab is 15th October to 15th November but sowing of wheat used to continue up to 15th December (Akhtar *et al*., 2002). In order to solve/mitigate the deleterious effects of delayed sowing several agronomists (Aslam *et al*., 2003, Ahmad *et al*., 2007) suggested to increase the seed rate to compensate the reduction in germination count and number of tillers unit area^{-1} (Jan *et al*., 2000). Although number of grains spike^{-1} and 1000-grains weight are reduced in this way (Khan *et al*., (2002, Mehrvar and Asadi, 2006; Khan *et al*., 2002), yet the over all grain yield per unit area is increased (Shah *et al*., 2006), concluded that by increasing seed rate of wheat delayed sowing could be compensated, although number of grains spike^{-1} & 1000-grains weight was reduced. Keeping in view the above review, a study was designed to evaluate the production potential of wheat with different seed rates to mitigate the problem of late sowing.

MATERIALS AND METHODS

The experiment was conducted on a sandy clay loam soil at farmer's field. The climate of the region is semi-arid and subtropical. The experimental area is located at 30.12^{o}' North, 71'.26' East and at an altitude of 120 meters above sea level. As soil of the experimental area was quite uniform, a composite and representative soil sample to a depth of 30 cm was obtained with soil auger, prior to sowing of the crop. The sample was analyzed for its various physio-chemical properties (saturation %age 36; pH 7.8; organic matter 0.83 %). Percentage of sand (65), silt (15) and clay (20) was determined by Bouyoucos hydrometer method using one percent sodium hexametaphosphate as a dispersing agent. Textural class (Sandy clay loam) was determined by using the international textural triangle (Moodie *et al*., 1959). Soil was analyzed for its various chemical properties by using the methods as described by Homer

and Pratt (1961). Total Nitrogen, available Phosphorus (P) and Potassium (K) in soil were 0.043 %, 1 ppm and 125 ppm, respectively. Total rain received during the growing period of the crop (64.5 mm**)** and which was below average. The treatments were, three sowing dates, (D_1) 15th November, (D_2) 30th November and (D_3) 15th December, and three seed rates *viz*: (S_1) 125, (S_2) 150, and (S_3) 175 kg ha^{-1}, respectively. The experiment was laid out in randomized complete block design with split plot arrangement, randomizing sowing dates in main plots and seed rates in subplots with four replications. The net plot size measured 6 m x 25 m.

Before seed bed preparation, presoaking irrigation of 10 cm was applied. When soil reached at proper moisture level, the seed bed was prepared by giving four cultivations with a tractor mounted cultivator. Each time soil was cultivated to a depth of 8-10 cm. Planking was given, after every two times cultivations. The crop was sown on November, 15th, 30th and 15th December of 2008. The seed was drilled with the help of single row-hand drill using seed rate 125, 150 and 175 kg ha^{-1}**.** The wheat cultivar BK-2002 was used as test variety. The NPK was applied @ 200, 100, 50 kg ha^{-1}, respectively. Urea, diammonium phosphate and sulphate of potash were used as sources of N, P and K fertilizers, respectively. All potash and phosphatic and half dose of N fertilizer was applied at the time of sowing, while the remaining N was top dressed at first irrigation stage of the crop. In addition to rainfall received during the growing period of the crop, six irrigations were applied as and when needed at different plant developmental stages till the physiological maturity of the crop. Every irrigation was approximately of 7.5 cm. Weeds were kept under control by hand weeding.

The observations recorded during the course of study were: germination count m^{-2}, number of tillers m^{-2}, number of grains $spike^{-1}$, 1000-grain weight (g), grain yield.

Procedures used for recording the data pertaining to the above mentioned parameters were germination count and number of tillers m^{-2} was taken by applying 1 m^{-2} quads randomly for five times in every treatment and then counting the germinated plants and number of tillers m^{-2}. Number of grains $spike^{-1}$ was averaged from total number of grains of ten randomly selected spikes from each subplot. Five samples each of 1000 grains were taken at random from the seed lot of each subplot, weighed and then averaged to determine 1000-grain weight. Seed yield was recorded on subplot basis and then converted into mounds $acre^{-1}$.

The data were analyzed by the "MSTAT" statistical package on a computer (Freed and Eisensmith, 1986). When a significant "F" value was obtained for treatment effect, least significant differences (LSD) test at 0.05 P was applied to determine the significance of the treatment means (Steel *et al.*, 1997).

RESULTS AND DISCUSSION

There was significant effect of different sowing dates on germination count. The highest germination count (140.4 m^{-2}) was recorded when wheat was sown on 15th November, whereas the lowest germination count (113.0 m^{-2}) was given when sown on 15th December. There was significant variation among different seed rates regarding germination count. The highest germination count was observed when 175 kg ha^{-1} seed rate was used, where as lowest germination count was recorded when 125 kg ha^{-1} seed rate was used. Interactive effects of different sowing dates and seed rates were found to be significant. Sowing of wheat on 30th November with seed rate of 150 kg ha^{-1} resulted in the maximum germination count m^{-2} (142.3), where as sowing of wheat on 15th December with seed rate of 175 kg ha^{-1} resulted in minimum germination count m^{-2} (116.7). These results are in line with the findings of Jan *et al*., (2000) Soomro and Oad (2002) and Sadeghipour (2008) who stated that by increasing seed rate delayed sowing could be ameliorated by increasing germination count m^{-2}.

There was significant variation in number of tillers m^{-2} regarding sowing dates of wheat. The maximum number of tillers m^{-2} (285.8) was recorded when wheat was sown on 30th November, where as minimum number of tillers m^{-2} (120.9) was noted when wheat was sown on 15th December. Similarly, there was significant variation in number of tillers m^{-2} regarding seed rates. The maximum number of tillers m^{-2} (254.8) was observed when seed rate of wheat was used 175 kg ha^{-1}, where as minimum number of tillers m^{-2} (198.1) was recorded when seed rate of wheat was used 150 Kg ha^{-1}. Interactive effects of sowing dates and seed rate on number of tillers m^{-2} was significant. Sowing of wheat on 30th November with seed rate of 175 kg ha^{-1} resulted in the maximum number of tillers m^{-2} (313.7), where as sowing of wheat on 15th December with seed rate of 125 kg ha^{-1} resulted in minimum number of tillers m^{-2} (103.3). These results are in conformity with the findings of Jan *et al*., (2000), Soomro and Oad (2002) and Sadeghipour (2008) , who stated that by increasing seed rate delayed sowing, could be ameliorated by improving tillering capacity.

There was significant effect of sowing dates on number of grains $spike^{-1}$. Maximum number of grains $spike^{-1}$ (40.44) was noted when wheat crop was sown on 15th November, where as minimum number of grains $spike^{-1}$ (31.89) was counted when crop was sown on 15th December. There was no significant effect of using different seed rates on number of grains $sipke^{-1}$. However, interactive effects of sowing dates and seed rates on number of grains $spike^{-1}$ were significant. Sowing of wheat on 15th November with seed rate of 125 kg ha^{-1} resulted in the maximum number grains $spike^{-1}$

(43.67), where as sowing of wheat on 15th December with seed rate of 175 kg ha^{-1} resulted in minimum number of grains spike^{-1} (103.3). These results are in conformity with the findings of Mehrvar and Asadi (2006) and Khan *et al*., (2002), who stated that by increasing seed rate of wheat delayed sowing could be compensated, although number of grains spike^{-1} were reduced.

There was significant effect of sowing dates on 1000-grain weight. The highest 1000-grain weight (38.64 g) was noted when wheat crop was sown on 30th November, where as the lowest 1000-grain weight (33.47 g) was counted when crop was sown on 15th December. There was significant effect of using different seed rates on 1000-grain weight of wheat crop. The heaviest 1000-grain weight (38.18 g) was recorded, when 125 kg ha^{-1} of seed rate was used, where as the lightest 1000-grain weight (34.74 g) was observed when 175 Kg ha^{-1} seed rate was used. Interactive effects of sowing dates and seed rates on 1000-grain weight were significant. Sowing of wheat on 15th November with seed rate of 125 kg ha^{-1} resulted in the heaviest 1000-grain weight (41.43 g), where as sowing of wheat on 15th December with seed rate of 175 kg ha^{-1} resulted in the lightest 1000- grain weight (31.25 g). These results are in conformity with the findings of Khan *et al*., (2002) Mehrvar and Asadi (2006), who stated that by increasing seed rate of wheat delayed sowing could be compensated, although 1000-grain weight were reduced.

There was significant effect of sowing dates on grain yield. The highest grain yield (32.12 md acre^{-1}) was noted when wheat crop was sown on 30th November, where as the lowest grain yield (24.04 md acre^{-1}) was counted when crop was sown on 15th December. There was no significant effect of using different seed rates on grain yield of wheat crop. However, the interactive effects of sowing dates and seed rates on grain yield were significant. Sowing of wheat on 15th November with seed rate of 125 kg ha^{-1} resulted in the highest (3360 Kg ha^{-1}), where as sowing of wheat on 15th December with seed rate of 175 kg ha^{-1} resulted in the lowest grain yield (27.12 md acre^{-1}). These results are in conformity with the findings of Ihsanullah (2002), and Hameed *et al*., (2002), Shah *et al*., (2006) who stated that by increasing the seed rate , although number of grains spike and 1000-grain weight are reduced in this way , yet the over all grain yield unit area is increased.

Conclusion: It is suggested to the farmers of Dera Ghazi Khan that wheat should be preferably sown on 15th November with seed rate of 125 kg ha^{-1} for better production.

Table 1. Evaluation of the effect of different seed rates on different sowing dates in wheat under agro-ecological conditions of Dera Ghazi Khan

Parameters	Germination count m^{-2}	No. of tillers m^{-2}	No. of grains spike^{-1}	1000-grain weight (g)	Grain Yield (Kg ha^{-1})
Sowing Dates (D)					
D_1= 15th November	140.4a	247.3b	40.44a	37.78a	3173.45a
D_2= 30th November	131.1b	285.8a	37.89b	38.64a	3116.15a
D_3= 15th December	113.0c	120.9c	31.89c	33.47b	24.04b
LSD (1) =	5.269*	17.39*	1.709*	2.895*	139.11*
Seed Rate (Kg ha^{-1}) (S)					
S_1=125	128.1ab	201.1b	37.22	38.18a	2835.56
S_2=150	126.1b	198.1b	37.11	36.97a	2909.66
S_3=175	130.3a	254.8a	35.89	34.74b	2919.54
LSD (2) =	2.888*	6.993*	N.S	1.650*	N.S
Interaction (D x S)					
D_1x S_1	138.0ab	235.2e	43.67a	41.43a	3360.00a
D_1 x S_2	142.3a	211.7f	40.67ab	36.44cde	2910.00bc
D_1 x S_3	141.0a	295.0b	37.0bcd	35.48de	2919.50bc
D_2 x S_1	132.7c	264.7d	36.0cde	38.92abc	3185.31ab
D_2 x S_2	127.3d	279.0c	38.0bc	39.51ab	2963.01bc
D_2 x S_3	133.3bc	313.7a	39.67abc	37.48bcd	3162.58ab
D_3 x S_1	113.7ef	103.3h	32.0ef	34.19e	2801.96c
D_3 x S_2	108.7f	103.7h	32.67def	34.96de	2835.56c
D_3 x S_3	116.7e	155.7g	31.0f	31.25f	2679.45d
LSD (3)	5.002*	12.11*	4.337*	2.858*	276.54*
C.V= %	7.08	8.01	6.17	5.47	6.14

The means in columns bearing same letters do not differ significantly ($p<0.05$)

Table 2. Weather data recorded at adaptive research farm Dera Ghazi Khan

Month	Temperature (°C)		R.H	Rain fall
	Min.	Max.	(%)	(mm)
Nov, 2007	15	25	87	-
Dec, 2007	10	20	75	3 mm(10.12.07)
Jan, 2008	05	17	85	20 mm(10.1.08)
Feb, 2008	07	20	80	2.5 mm(2.2.08)
March, 2008	17	30	85	3 mm(6.3.08), 12 mm(31.3.08)
April, 2008	20	31	76	8 mm (4.4.08), 16 mm (5.4.09)

REFERENCES

Ahmad, N., M. Rahim and U. Khan (2007). Evaluation of different varieties, seed rates and row spacing of Groundnut, planted under agro-ecological conditions of Malakand Division. J. Agron., 6(2): 385-387.

Akhtar, M., M. S. Cheema, L. Ali and M. Ali (2002). Sowing date cum varietals trial on wheat. Asian J. Pl. Sci., 1(5): 550-551.

Anonymous (2008-09). Government of Pakistan, Ministry of Food, Agriculture, and Cooperatives, Food and Agriculture Division, Economic Wing. Crop production (by districts), 1998-99 to 2008-09. Islamabad: GOP, Ministry of Food, Agriculture, and Cooperatives.

Aslam, M., M. Hussain, M. AKhtar, M. S. Cheema and L. Ali (2003). Response of wheat varieties to sowing dates. J. Agron., 2(4):190-194.

Freed, R.D. and S.P. Eisensmith (1986). M. Stat. Micro Computer Programme, Michigan State University Agric. Michigan, Lansing, USA.

Hameed E., W. A. Shah, A. A. Shad, J. Bakht and T. Muhammad (2003). Effect of sowing dates and seed rates on yield and yield components of wheat Asian J. Pl. Sci., 2(6): 467-474.

Homer, D.C. and P.F. Pratt (1961). Methods of analysis for soil, plants and water. Univ. of California, Div. of Agri. Sci., USA, pp.150-196.

Ihsanullah, A. Jan. F. H. TAj, I. A. Khan and N. Khan (2002). Effect of sowing dates on yield and yield components of Mash bean. Asian J. Pl. Sci., 1(6): 622-624.

Jan, A., I. Hamid and M. T. Jan (2000). Yield and yield components of wheat as influenced by seed rate and sowing dates. Pak. J. Biol. Sci., 3(2):323-325.

Khan, A. Z., H. Khan, R. Khan, Adel Ghoneim and A. Ebid (2002). Effect of sowing dates and seed rates on yield and yield components of wheat. Trends in Applied Sci. Res., 2(6): 529-534.

Mehrvar M. R. and H. Asadi (2006). Agronomical and economical assessment of planting methods and seeding rates in irrigated wheat. J. Agron., 5(4): 626-633.

Moodie, C. D.., N. W. Smith and R. A. Mc Greery (1959). Laboratory Manual for soil fertility development in corn and subsequent grain yield. Crop Sci.11:368-372.

Sadeghipour, O. (2008). Response of Mung bean varieties to different sowing dates. Pak. J. Biol. Sci., 11(16): 2048-2050.

Shah, W. A., J. Bakht, T. Ullah, A. W. Khan, M. Zubair and A. A. Khakwani (2006). Effect of sowing dates on the yield and yield components of different wheat varieties. J. Agron., 5(1):106-110.

Soomro, A., and F. C. Oad (2002). Yield potentials of wheat genotypes under different planting times. J. Applied Sci., 2(7): 713-714.

Steel, R.G.D., J.H. Torrie and D.A. Dickey (1997). Principles and Procedures of Statistics. A Biometrical Approach, 3rd Ed. McGraw Hill Book Co., New York, 172-177.