Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(6): 517-520
Received: 19-09-2018
Accepted: 21-10-2018

Ranu Pathania
Department of Agronomy, CSK HP Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India

Rajendra Prasad
Department of Agronomy, CSK HP Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India

Ranbir Singh Rana
Department of Agronomy, CSK HP Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India

Sudhir Mishra
Punjab Agriculture University, Regional Research Station, PAU Faridkot, Punjab, India

Saurav Sharma
Department of Agronomy, CCS HAU, Hisar, Haryana, India

Correspondence
Ranu Pathania
Department of Agronomy, CSK HP Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India

Growth and yield of wheat as influenced by dates of sowing and varieties in north western Himalayas

Ranu Pathania, Rajendra Prasad, Ranbir Singh Rana, Sudhir Mishra and Saurav Sharma

Abstract
An experiment was conducted during *Rabi* seasons of 2015-16 and 2016-17 to study the effect of five dates of sowing (20th October,5th November, 20th November, 5th and 20th December) on growth, yield attributes and yield of four wheat varieties (VL-829,VL-907,VL-892 and HS-490) on a silty clay loam soil at Palampur (HP), India. Wheat sown on 20th November recorded significantly highest plant height, tillers/m^2, Dry matter accumulation, grains/spike, grain and straw yield. Among varieties, VL-907 recorded significantly highest grains/spike, grain and straw yield and hence recorded significantly highest grain yield.

Keywords: Dates of sowing, varieties, wheat growth, yield.

Introduction
Wheat is one of the most important foods of India as well as Himachal Pradesh and is the second most important crop after rice in India and occupies approximately 29.9 million hectares with production of 94.9 million tonnes (FAO 2014) [5]. In Himachal Pradesh, this crop is presently being cultivated on 0.341 million hectare with a production of 0.680 million tonnes and productivity of 1944 kg ha^{-1} (Anonymous 2013-14) [2]. Date of sowing is most important factors that govern the phenological development of the crop and also efficient conversion of biomass into economic yield. It has been observed that the wheat crop sown at normal date usually have longer crop duration thus they get an opportunity to accumulate more biomass as compared to late sowing and thus it finally resulted in higher grain yield and biological yield. Being a temperature sensitive crop, late sown crop is exposed to low temperature at the time of establishment and to high temperature at the reproductive phase that finally leads to accelerated maturity of crop and thus crops mature early in North Indian condition. This not only affects yield, but also affects the yield components and other aspects of the growth and development of wheat. Tahir *et al*. (2009) [14] reported that delay in sowing affects germination, growth, grain development and produces poor tillering due to winter injury in low temperature and suppressed the yield. It is generally associated with a reduced kernel weight (Radmehr *et al*. 2003) [3], a reduced number of spikes per plant and per unit area (Stapper and Fischer, 1990) [13], harvest index, grain number per spike, and leaf area index (Jessop and Ivins, 1970) [8].

Material and Methods
A field experiment on wheat crop was conducted during 2015-16 and 2016-17 *Rabi* seasons (October- May) at the Experimental Farm of Department of Agronomy CSK HP Krishi Vishvavidyalaya, Palampur (32º6'N, 76º 3'E 1290.8 m elevation) in North Western Himalayas. The soil texture was silty clay loam and acidic in reaction. The soil was rich in organic carbon, rated as high in total nitrogen, medium in available phosphorus and high in potassium in the upper 0-15 cm layer. Field experiment comprising of five dates of sowing (20th October,5th November, 20th November, 5th and 20th December) and four varieties (VL-829,VL-907,VL-892 and HS-490) was conducted in split plot design with three replications. Sowing was done at spacing of 22.5 cm. The crop was fertilized @120:60:40 of N, P_2O_5, K_2O kg/ha, of which half dose of the nitrogen and full dose of phosphorus and potassium was applied as a basal dose and remaining half of nitrogen was applied in two equal splits, first at maximum tillering and second at earing stage. The crop was irrigated twice along with one pre sowing irrigation. During the crop season, mean weekly maximum temperature ranged between 14.3-32.7 ºC and minimum temperature between 1.7-19.4 ºC.

Results and Discussion

Growth

20th November sown wheat took recorded significantly taller plant height (92.8 & 90.2cm) followed by 5th November (90.0 & 89.9 cm), 20th October, 5th December and 20th December respectively during both the years due to favourable weather conditions and crop growing period in optimum sowing dates i.e timely sown 20th November (Table 1). Late sowing also resulted in lesser growth period which forced the crop to flower earlier and also mature earlier which again resulted in lesser plant height. Tewari and Singh (1995) [15] and Tahir *et al*. (2009) [14] also recorded similar results. Among varieties, VL-907 produced significantly tallest plants over other varieties at all stages during both the years. Sowing date had significant effect on number of tillers. 20th November sowing produced significantly higher number of tillers compared to other dates of sowing at all stages. However, it was statistically at par with 5th November. There was a progressive decrease in number of tillers as the sowing date was delayed from 20th November to 20th December. Decline in number of tillers with successive delay in sowing was also reported by Prabhakar *et al*. (2007) [10] and Kumar (2012) [9] under similar agro climatic conditions. Among varieties, VL-907 produced significantly higher number of tillers as compared to other varieties which is significantly at par with VL-829 at harvest during both the experimental years (Table 1). DMA was significantly higher in 20th November sown crop as compared to all other sowing dates *viz*., 20th October, 5th November, 5th December and 20th December sown crop at harvest. The greater reduction in total dry matter and its apportioning in plant under delayed sowing were due to drop in temperature during vegetative phase and sharp rise in temperature during reproductive and maturity phases. The increased temperature during reproductive phase under delayed sowing was due to early completion of the required heat units for anthesis and maturity. These results are in conformity with earlier findings of (Tyagi *et al*. 2004) [16]. During both the years VL-907 produced significantly higher dry matter accumulation being at par with VL-829. Lowest dry matter accumulation is recorded in VL-892 as compare to other varieties.

Table 1: Effect of sowing dates and varieties on growth attributes

Treatment	Plant height (cm) (At harvest)		Tillers m^{-2}(No.) (Earing)		Dry matter accumulation (g m^{-2}) (At harvest)	
Sowing dates	(2015-16)	(2016-17)	(2015-16)	(2016-17)	(2015-16)	(2016-17)
20th Oct.	89.5	88.5	253	254	954	889
05th Nov.	90.0	89.9	254	260	1130	976
20th Nov.	92.8	90.2	264	268	1146	1035
05th Dec.	88.2	85.6	235	218	943	824
20th Dec.	86.8	83.9	218	232	882	746
LSD (P=0.05)	2.3	1.0	8	9	60.7	37.3
Variety						
VL- 829	90.8	88.8	242	246	1045	950
VL- 907	92.1	90.7	263	263	1098	954
VL- 892	86.8	85.1	239	233	949	828
HS- 490	88.1	85.8	234	244	952	845
LSD (P=0.05)	2.8	2.7	18	10	94.2	98.2

Yield attributes

Results obtained (Table 2) indicated that ear length decreased successively and significantly with delay in date of sowing from 20th November to 20th December during both the years. Significantly higher ear length (cm) was observed in 20th November as compared to all other sowing dates at par with 5th November sowing during both the years. Jat *et al*. (2013) [7] also found decrease in ear length with delay in sowing time. Significant difference was observed among varieties in the spike length wherein VL-907 variety had significantly higher spike length which was at par with var. VL-829 in both the years. The reduction in spike length was in turn responsible for reduced number of grains $spike^{-1}$. Amongst dates of sowing, 20th November sown crop produced significantly more number of grains $spike^{-1}$ to the tune of 44 during 2015-16 and 42 during 2016-17 followed by 5th November (Table 2). Though significantly at par with VL-829 during 2016-17 variety VL-907 produced more number of grains $spike^{-1}$ to the order of 44 and 41 during crop seasons. Significantly more number of grains per spike may be because of timely sowing (20th November) provides sufficient period for vegetative growth to the crop, resulting in better yield attributes Behera (1994) [3] also observed similar findings. The data presented in Table 2 revealed that the 1000-grain weight in 20th November (49.4 and 43.5 g) was significantly produced higher grain weight followed by 20th October (41.2 and 41.9 g), 5th November (43.1 and 42.2 g), 5th December (41.1 and 40.5 g) and 20th December (37.9 and 39.3 g) respectively during both the years. The higher 1000 grain weight in early and timely sowing may be due to higher number of grains $spike^{-1}$ (Table 2). Deshmukh *et al*. (2015) [4] also reported that earlier sowing of the crop resulted in higher 1000 grain weight than that the crop sown late in the season.

Yield

A perusal of data in Table 2 revealed that 20th November sowing, remaining at par with 5th November sowing, resulted in significantly higher grain yield during both the years of study with all the remaining three dates (20th October, 5th and 20th December) remaining at par with each other. The highest yield recorded with 20th November sowing was due to significantly higher effective tillers, spike length and grains per spike as well as 1000-grain weight while lowest yield recorded during last date of sowing (20th December) was due to the lowest value of all these yield attributes which may be result of the least time taken to maturity as compared to other date of sowing. The decline in grain yield with delay in sowing may be due to forced maturity of late sown wheat, reduction in dry matter accumulation (Table 1). Moreover, the yield attributes like effective tillers, grains ear^{-1} and 1000-grain weight were reduced (Table 2) under delayed sowing which may be responsible for lesser grain yield. Similar

results have been reported by Gao *et al*. 2014 [6] and Andarzian *et al*. 2015 [1]. Amongst the varieties tested VL-907 gave significantly highest grain yield (4230 kg ha^{-1} during 2015-16 and 3312 kg ha^{-1} during 2016-17) though it was at par with VL-829 as well as with HS-490. The sowing environments significantly influenced the straw yields during both the years revealed that 20th November sown crop produced significantly higher straw yield (6708 kg ha^{-1} during 2015-16 and 6087 kg ha^{-1} during 2016-17). Later two sowings (5th and 20th December) resulted in significantly lower straw yield in comparison to early sowing on 5th and 20th November. The higher yields in timely sown crop on November might be due to the reason that November sown crop received optimum environmental conditions for crop growth and get more time for attaining different phenophases. Similar findings were also reported by Sharma and Kumar (2005) [12] under similar agro climatic conditions of Palampur. Among varieties, VL-907 and VL-829 produced significantly higher straw yield as compared to other varieties during both years. HS-490 and VL-829 remained at par with each other produced significantly lowest straw yield. Harvest index was not significantly affected by different dates of sowing in both two study years. Among varieties none of variety significantly affects the harvest index as compared to all other except during 2016-17 varieties HS-490 and VL-892 significantly higher harvest index as compare to other varieties (Table 2).

Table 2: Effect of treatments on yield and yield attributes of wheat during 2015-16 and 2016-17.

Treatment	Grains/spike (No.)		1000-grain weight		Length of spike (cm)		Grain yield (kg/ha)		Straw yield (kg/ha)		Harvest Index	
Sowing date	(2015-16)	(2016-17)	(2015-16)	(2016-17)	(2015-16)	(2016-17)	(2015-16)	(2016-17)	(2015-16)	(2016-17)	(2015-16)	(2016-17)
20th Oct.	38	37	41.2	41.9	10.5	10.7	3793	3104	5565	5202	0.41	0.38
05th Nov.	41	38	43.1	42.2	10.9	10.9	4287	3439	6573	5635	0.40	0.40
20th Nov.	44	42	49.4	43.5	11.8	11.4	4523	3607	6708	6087	0.40	0.38
05th Dec.	37	36	41.1	40.5	10.5	10.4	3674	2879	5469	4611	0.40	0.38
20th Dec.	36	34	37.9	39.3	10.0	10.3	3631	2742	5456	4653	0.40	0.37
LSD (P=0.05)	3	2	1.8	2.3	0.4	0.5	271	284	497	459	NS	NS
Variety												
VL- 829	39	40	42.3	42.0	10.9	10.7	4150	3302	6200	5907	0.41	0.36
VL- 907	44	41	46.2	44.3	11.2	11.1	4230	3312	6344	6447	0.40	0.34
VL- 892	37	37	40.1	39.3	10.5	10.5	3546	2963	5547	4270	0.39	0.41
HS- 490	38	31	41.6	40.2	10.5	10.6	4001	3038	5725	4326	0.41	0.41
LSD (P=0.05)	3	4	3.8	2.6	0.5	0.4	362	314	416	515	NS	0.03

Summary and Conclusion

Plant height, dry matter accumulation, length of spike, number of grains per spike and 1000-grain weight were significantly higher in 20th November sown crop resulting in significantly higher grain and straw yield. However, it remained at par with 5th November sown crop. Among all varieties, VL-907 recorded significantly higher effective tillers, number of grains per spike, length of spike and higher 1000-grain weight which was at par with VL-829 and resulted in higher grain and straw yield.

References

1. Andarzian B, Hoogenboom G, Bannayan M, Shirali M, Andarzian B. Determining optimum sowing date of wheat using CSM-CERES-Wheat model. Journal of the Saudi Society of Agricultural Sciences. 2015; 14:189-99.
2. Anonymous. Economic survey of Himachal Pradesh (2014-2015). 2013-14, 41-45.
3. Behera AK. Response of wheat (*Triticum aestivum*) varieties to sowing dates. Indian Journal of Agronomy. 1994; 39 (1):171-173.
4. Deshmukh KM, Nayak SK, Damdar, Rupali, Wanjiri SS. Response of different wheat genotypes to different sowing time in relation to GDD accumulation. Advance Research Journal of Crop Improvement. 2015; 6:66-72.
5. FAO. Food and Agriculture Organization of the United Nations. http://FAOSTAT.fao.org [18th April, 2015]. 2014
6. Gao Y, Yang L, Shen X, Li X, Sun J, Duan A, Wu L. 2014. Winter wheat with subsurface drip irrigation (SDI): Crop coefficients, water-use estimates, and effects of SDI on grain yield and water use efficiency. Agriculture Water Management. 2014; 146:1-10.
7. Jat LK, Singh SK, Latare AM, Singh RS, Patel CB. Effect of dates of sowing and fertilizer on growth and yield of wheat (*Triticum aestivum*) in an Inceptisol of Varanasi. Indian Journal of Agronomy. 2013; 58:611-14.
8. Jessop RS, Ivins JD. The effect of date of sowing on the growth and yield of spring cereals. Journal of Agricultural Sciences. 1970; 75:553-557.
9. Kumar Sunil. Impact of weather parameters on the growth and development of wheat varieties in mid hill irrigated conditions of Himachal Pradesh. M.Sc. thesis; p 87. Department of Agronomy, Forages and Grassland Management, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, India. 2012.
10. Prabhakar BN, Halepyati AS, Desai BK, Pujari BT. Growing degree days and photo thermal units accumulation of wheat (Triticum aestivum L. and T. durum Desf.) genotypes as influenced by dates of sowing. Journal of Agricultural Sciences. 2007; 20:594-595.
11. Radmehr M, Ayeneh GA, Mamghani R. Responses of late, medium and early maturity bread wheat genotypes to different sowing date. I. Effect of sowing date on phonological, morphological, and grain yield of four breed wheat genotypes. Iranian Journal of Seed Research. 2003; 21:175-189.
12. Sharma HL, Kumar R. Effect of sowing dates on dry matter accumulation, growth and yield of wheat (*Triticum aestivum*) varieties in North- western Himalayas. Journal of Agronomy 2005; 31:2 2-8.
13. Stapper M, Fischer RA. Genotype, sowing date and plant spacing influence on high-yielding irrigated wheat in southern New South Wales. I. Phasic development canopy growth and spike production. Australian Journal of Agricultural Research. 1990; 41:997-1019.

14. Tahir M, A Ali MA, Nadeem A, Hussain, Khalif F. Effect of different sowing dates on growth and yield of wheat (*Triticum aestivum* L.) varieties in district Jhang, Pakistan. Pakistan Journal Life Society Science. 2009; 7(1):66-69.
15. Tewari SK, Singh M. Influence of sowing date on phase duration and accumulation of dry matter in spikes of wheat (*Triticum aestivum*). Indian Journal of Agronomy 1995; 40(1):43-46.
16. Tyagi PK, Pannu RK, Sharma KD, Chaudhary BD, Singh DP. Post-anthesis dry-matter accumulation and its partitioning in different wheat (*Triticum aestivum*) genotypes under varying growing environments. Indian Journal of Agronomy. 2004; 49 (3):163-167.