OPEN ACCESS

International Journal of Applied Sciences and Biotechnology

A Rapid Publishing Journal

ISSN: 2091-2609

Indexing and Abstracting

CrossRef, Google Scholar, Global Impact Factor, Genamics, Index Copernicus, Directory of Open Access Journals, WorldCat, Electronic Journals Library (EZB), Universitätsbibliothek Leipzig, Hamburg University, UTS (University of Technology, Sydney): Library, International Society of Universal Research in Sciences (EyeSource), Journal Seeker, WZB, Socolar, BioRes, Indian Science, Jadoun Science, Jour-Informatics, Journal Directory, JournalTOCs, Academic Journals Database, Journal Quality Evaluation Report, PDOAJ, Science Central, Journal Impact Factor, NewJour, Open Science Directory, Directory of Research Journals Indexing, Open Access Library, International Impact Factor Services, SciSeek, Cabell's Directories, Scientific Indexing Services, CiteFactor, UniSA Library, InfoBase Index, Infomine, Getinfo, Open Academic Journals Index, HINARI, etc.

CODEN (Chemical Abstract Services, USA): IJASKD

Vol-4, Issue-1 (March, 2016)

Available online at:
http://www.ijasbt.org
&
http://www.nepjol.info/index.php/IJASBT/index

SEM-Biotech Publishing

Impact factor*: **1.422**
Scientific Journal Impact factor#: **3.419**
Index Copernicus Value: **6.02**

*Impact factor is issued by Universal Impact Factor. Kindly note that this is not the IF of Journal Citation Report (JCR).
#Impact factor is issued by SJIF INNO SPACE; **Impact factor is issued by INFOBASE INDEX.

D. Marasini et al. (2016) Int J Appl Sci Biotechnol, Vol 4(1): 27-31
DOI: 10.3126/ijasbt.v4i1.14335

ISSN (Online): 2091-2609
DOI Prefix: 10.3126/ijasbt

International Journal of Applied Sciences and Biotechnology (IJASBT)

Research Article

EFFECT OF DATE OF SOWING ON YIELD AND YIELD ATTRIBUTES OF DIFFERENT WHEAT VARIETIES UNDER CONVENTIONAL TILLAGE IN SUB-HUMID CONDITION OF CHITWAN DISTRICT OF NEPAL

Dinesh Marasini[1*], Santosh Marahatta[1], Surya Mani Dhungana[2]and Ramesh Acharya[1]

[1]Department of Agronomy, Agriculture and Forestry University, Rampur, Chitwan, Nepal
[2]Department of Agricultural Economics and Agribusiness Management,
Agriculture and Forestry University, Rampur, Chitwan, Nepal
[*]corresponding author email: dineshmarasini2006@gmail.com

Abstract

A field experiment was conducted at the Agronomy farm of Institute of Agriculture and Animal Science (IAAS), Rampur during winter season of 2014/2015 to find out the response of wheat varieties under different sowing dates. There was 9 treatments consisting three date of sowing (November 14, November29 and December 14) in main plot and three varieties namely Tillotama, Danfe and Vijay in sub-plot and were arranged in split plot design with three replications. The grain yield was significantly higher (3.09 tha^{-1}) at November 14 whereas highest straw yield was recorded for November 29 sown wheat (5.61 t ha^{-1}). Effective tiller (414) and number of grain per spike (34.34) were highest for November 29 sown wheat. The late sown wheat had more sterile floret (42.65%) while early sown wheat had highest thousand grain weight (51.23 g). Danfe had highest straw yield (5.87 t/ha). Effective tiller/m^2 (419) and sterility percentage (43.35%) of Danfe was highest. Number of grains per spike (37.89) of Tillotama was highest and thousand grain weight (57.09 g) of Bijay was found highest. The grain yield of Bijay (3.30tha^{-1}) was highest when it was sown at November 29.

Keywords: Date of sowing; effective tiller; grain yield; sterility percentage

Introduction

Wheat (*Triticum aestivum L.*) belongs to family Poaceae and is very important crop as it contributes major portion of staple food for the world's population and provides more calories and protein in the world's diet than any other cereal (CIMMYT, 2002).It is third important cereal crop after rice and maize in Nepal. It accounts for 22.58% area (754243 ha) of total cereal crop and 20.13% 1727346 (tones) of the total cereal production of the country with productivity of 2.29 t ha^{-1} (MoAD, 2014).Wheat in Nepal in is grown on winter season. In Terai it is grown after Rice and same is the case in lowland of mid-hills. But in uplands of mid hills it is followed by maize. Among the total wheat growing area in Nepal 58.26% is in Terai which includes 79.21% of irrigated land and 20.62% of un-irrigated land. Among 34.95% of production area in hills 41.69% of land is irrigated and 53.16% of land is un-irrigated. Mountain region consist of 6.78% of total wheat growing area among this 36.41% of land is irrigated and 56.79% of land is un-irrigated (MoAD, 2012). The wheat growing area in Chitwan is 8750 ha with an average productivity of 3.10 $Mtha^{-1}$(MOAD, 2012) (Subedi *et al*.,1991) reported that several technical constraints such as low inherent soil fertility, poor yield stability over the season, disease and sterility problem are associated with low productivity of wheat.

Depending on the weather condition, topography and harvesting of the preceding crop, sowing of wheat is done from first week of November to late December. Under rice-wheat cropping pattern the wheat sowing may reach up to late December and this cause to yield reduction of wheat by about 50% (Ahmed *et al*., 1975). Early planting of wheat increases number of tillers per meter square, number of grains per spike and grain weight of wheat which ultimately increases the yield (Qasim, 2008). The higher yield of wheat was found in normal sowing (Nov. 14th) (Qasim, 2008). Among the various factor associated with lower production of wheat time of sowing is important. Time of sowing is important so if seeding date could be adjusted the crop escape the period of high

humidity combined with high temperature (Wall, 1991). So sowing time significantly influences the growth and yield attributes of the wheat. The optimum sowing time for wheat irrespective of varieties was observed from November 20 to December 5. However, with minimum yield loss it could be practiced up to December 20. Timely sowing of wheat is always desirable for higher yield. Delay in sowing from 15 November to December 15 decreased the grain yield by 32.6% and 27.4% 1995/1996 and 1999/2002, respectively with mean reduction of 45 kg ha^{-1}. Delay sowing resulted in poor grain yield. (NARC, 2002)Thus sowing time significantly influences the growth and yield attributes, grain and Straw yield of wheat.

Thus, this research was focused to determine the effect of date of sowing and varieties on growth, yield and yield attributes of wheat grown under conventional tillage condition in sub humid condition of Chitwan with the following objectives:

- To determine the optimum sowing dates for different varieties under conventional production system for Chitwan condition.
- To access the effect of sowing dates on yield attributes and yield of different wheat varieties under conventional management.

Materials and Methods

Location

The experiment was conducted at IAAS Agronomy Research Farm, Rampur, and Chitwan, Nepal during main wheat growing season November 2014 to April 2015.

Physic-chemical properties of the soil at the experimentation site

Soil samples from five different spots of each replication were taken randomly which shows the texture determined by hydrometer method was found as sandy loam texture where sand (63.1%) was found dominant compared to silt (28%) and clay (8.9%) among the overall physical properties of soil. Organic matter content was found to be low (3.28%), total nitrogen was also found to be low (0.16%), was found as low (46.62 kg ha^{-1}) and available potassium was found as well as low (82.8 kg ha^{-1}) in upper soil.

The site is situated in subtropical humid climatic belt of Nepal. The maximum temperature during winter rises up to 27 ^{0}C. The relative humidity (RH) commences rising up from May (average 50%) and reaches to maximum (100%) in December and January.

The experiment was laid out in strip plot design with the combination of 9 treatments consisting of three varieties (tillotama, danfe and vijay) and 3 different sowing dates(November 14, November 29, December 14), and each treatment was replicated 3 times. The total area of the subplot was 5m X 4m (20 m^2). The row spacing was maintained 20 cm with continuous sowing in the row consisting of 25 rows in each plot.

The field was plowed twice before 15 days of sowing and weeds residue in the field were removed manually. The lad was prepared manually with good tilth one day prior to sowing.

The crop was fertilized with 80:40:20 kg NPK ha^{-1} through urea, Di-Ammonium Phosphate and Muriate of potash, respectively. The seed rate used in the experiment is 120 kg ha^{-1}.

Yield and yield attributing characters

Effective tiller per meter square, Number of grains per spike, Thousand grain weight ,Sterility percentage, Grain yield and straw yield , Harvest Index (HI)

The collected data subjected to analysis of variance. Gen Stat 15th edition, MSTAT was used for data analysis. All the analyzed data were subjected to DMRT for mean comparison by selecting 5% level of significance. Simple correlation and regression analysis were run between selected parameters wherever necessary with the help of MS-Excel and SPSS with the reference of Gomez and Gomez (1983).

Result and Discussion

Yield Attributes

Effective tiller per meter square

The average number of effective tillers per square meter was 399.00 which was ranged from 414.00 to 391.00 depending upon the treatments. The effect of sowing date was found to be non-significant for effective tiller per meter square, the effective tiller per meter square of November 29 sown wheat was found comparatively higher (Table 1). The varieties of wheat had significant effect on effective tiller per meter square. The effective tiller per meter square of Bijay variety was found lowest (360.00) and is significantly lower than Tillotama (417.00) and Danfe (419.00). Both Tillotama and Danfe had statistically similar effective tillers per square meter (Table 1)

Grains per spike

The average number of grains per spike was 32.62 which was ranged from 29.44 to 37.89 depending upon the treatments. Sowing date and variety had significant effect on number of grains per spike (Table 1). Grain per spike of wheat sown on December 14 was lowest (30.32) and is significantly different then November 14 (33.19) and November 29 (33.34). Sowing of wheat at November 14 and November 29 had statistically similar number of grains per spike (Table 1). Tillotama had highest number of grains per spike (37.89) which was significantly higher than Danfe (30.53) and Bijay (29.44). Both Danfe and

Bijay had statistically similar number grains per spike (Table 1).

Thousand grain weight

The average thousand grains weight was 45.91 g which was ranged from 41.38 g to 57.09 g depending upon the treatments (Table 1). Sowing date has no significant effect on thousand grains weight of wheat crop while varieties had significantly influenced the thousand grains weight. Delaying the sowing of wheat decreased the thousand grains weight (Table 1). The thousand grains weight of Bijay was higher (57.09 g) and significantly higher than Tillotama (41.38 g) and Danfe (39.26 g). Later two varieties had similar thousand grain weight (Table 1).

Sterility percentage

The average sterility percentage was 41.17% which was ranged from 37.04% to 43.13% depending upon the treatments (Table 1). Sowing dates had no significant effect on sterility but the effect of varieties was significant. The sterility of December 14 sown was highest (42.65%) compared to earlier sowing (Table 1). The sterility of Tillotama was lowest (37.04%) which was significantly higher than that of Danfe (43.35%) and Tillotama (43.13%). Later two varieties had statistically similar sterility percentage (Table 1).

Grain and straw yield

Grain yield

The average grain yield was 2747.00 t ha^{-1} which was ranged from 2128.00 tha^{-1} to 3152.00 tha^{-1} depending upon the treatments (Table 2). Sowing date has no significant effect on grain yield of wheat but varieties had significant influenced. Delaying the sowing dates decreased the grain yield of wheat. November 14 sowing had highest grain yield (3097.00t ha^{-1}) (Table 2). The yield of variety Bijay was significantly higher (31.52.00t ha^{-1}) than Danfe (2128.00t ha^{-1}) and statistically similar with Tillotama (2963.00 t ha^{-1}) (Table 2).

Table 1: Yield attributes (effective tillers per square meter, number of grains per spike, thousand grains weight and sterility percentage) of wheat influenced by the sowing dates and varieties at Rampur, Chitwan, Nepal in 2014-1015

Treatments	Yield attributes			
	Effective tillers per square meter	**Number of grains per spike**	**Thousand grain weight (g)**	**Sterility percentage**
Sowing dates				
November 14	390.00	33.19 [a]	51.23	40.17
November 29	414.00	34.34 [a]	43.68	40.15
December 14	391.00	30.32 [b]	42.81	42.65
SEM (±)	23.10	0.69	2.15	1.36
LSD(=0.05)	Ns	2.71	Ns	Ns
Varieties				
Tillotama	417.00 [a]	37.89 [a]	41.38 [b]	37.04 [b]
Danfe	419.00 [a]	30.53 [b]	39.26 [b]	43.35 [a]
Bijay	360.00 [b]	29.44 [b]	57.09 [a]	43. 13 [a]
SEM (±)	17.40	1.67	1.21	1.54
LSD(=0.05)	53.60	5.14	3.72	4.74
CV, %	13.10	15.3	7.9	11.2
Grand mean	399.00	32.62	45.91	41.17

Note: DAS, Days after sowing. Treatment means followed by common letter(s) within column are not significantly different among each other based on DMRT at 0.05 level of significance.

Table 2: Grain yield (t ha^{-1}), straw yield (t ha^{-1}) and harvest index (%) of wheat influenced by the sowing dates and varieties at Rampur, Chitwan, Nepal in 2014-1015

Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest index (%)
Sowing dates			
November 14	3097.00	5350.00	33.02
November 29	2702.00	5616.00	29.39
December 14	2443.00	5478.00	27.83
SEM (±)	189.60	192.00	1.54
LSD(=0.05)	Ns	Ns	Ns
Varieties			
Tillotama	2963.00 a	5301.00	32.48 a
Danfe	2128.00 b	5879.00	23.75 b
Bijay	3152.00 a	5264.00	34.00 a
SEM (±)	105.50	247.90	0.86
LSD(=0.05)	325.20	Ns	2.65
CV, %	11.50	13.60	8.60
Grand mean	2747.00	5481	30.08

Note: DAS, Days after sowing. Treatment means followed by common letter(s) within column are not significantly different among each other based on DMRT at 0.05 level of significance.

Table 3: Interaction effect of sowing dates and varieties on grain yield (t ha^{-1}) and harvest index (%) at Rampur, Chitwan, Nepal in 2014-1015

Sowing dates	Grain yield (t ha^{-1})			Harvest Index (%)		
	Varieties			Varieties		
	Tillotama	**Danfe**	**Bijay**	**Tillotama**	**Danfe**	**Bijay**
November 14	3673.00 ^{a}	2474.00 ^{de}	3144.00^{abc}	36.76 ^{a}	27.70 ^{de}	34.59 ^{ab}
November 29	2554.00^{cde}	2245.00 ^{e}	3309.00^{ab}	29.17 ^{cde}	24.78 ^{e}	34.21 ^{ab}
December 14	2661.00^{cde}	1665.00 ^{f}	3002.00^{bcd}	31.50 ^{bcd}	18.79 ^{f}	33.21 ^{abc}
SEM (±)	241.3			1.961		
LSD(=0.05)	768.2			6.24		
CV, %	11.5			8.6		

Note: DAS, Days after sowing. Treatment means followed by common letter(s) within column are not significantly different among each other based on DMRT at 0.05 level of significance.

Straw yield

The average straw yield was 54.81 t ha^{-1}. Sowing dates and varieties both do not have significant effect on straw yield of wheat. The straw yield of November 29 sown wheat and that of Danfe varieties were higher (Table 2).

Harvest index

Sowing dates had no significant effect on HI of wheat. HI of November 14 sown wheat was comparatively higher. Varieties had significant effect on the HI. The HI of Bijay was highest which was significantly higher than Danfe and statistically at par with Tillotama (Table 2).

Interaction effects between sowing dates and varieties on grain yield and harvest index

The interaction of sowing dates and varieties had significant effect on grain yield. The yield of Bijay was highest at November 29 and is statistically similar with the yield at early and late sowing. Danfe had highest grain yield at early sowing which is significantly higher than December 14 sowing and statistically at par with November 29 sowing. Tillotama had highest grain yield than other varieties when sowing at November 14. Significantly lower grain yield of wheat obtained at November 29 and December 14 sowing (Table 3).

Interaction of variety and sowing date had significant effect on harvest index. The harvest index of Bijay was highest at early sowing which gradually reduces with delay in sowing but was statistically similar at all three dates. Danfe had highest harvest index at November 14 which gradually decreases with delay in date of sowing. The harvest index of Danfe at November 14 and November 29 was statistically similar and significantly higher with December 14 sowing. The harvest index of Tillotama at November 14 was highest which was significantly higher than the later sowing (Table 3).

Conclusion

Sowing date had no significant effect on yield attributing characters (Harvest Index, Thousand grain weight, sterility percentage and effective tiller/m^2) but grain per spike of wheat was significantly affected by sowing date. Grain per spike of November 29 sown wheat was highest followed by November 14 and December 14 sown wheat. The sterility of late sown (December 14) wheat was highest which leads to decrease in yield of late sown wheat. Thousand grain weight and harvest index which were non-significant to sowing date were found highest at November 14 sown wheat but the effective tiller per meter square was found highest for November 29 sown wheat variety.

Variety had significant effect on above mentioned yield attributing characters. Grain per spike of Tillotama was highest and lowest in Bijay and sterility of Tillotama was lowest and Danfe was highest. Thousand grain weight and Harvest Index of Bijay was highest and lowest in Danfe. The effective tiller per meter square of Danfe was highest and lowest in Bijay.

Straw yield kg/ha was found non-significant in case of both sowing date and variety. Straw yield of November 29 sown wheat and Danfe was highest. Sowing date had no significant effect on grain yield of wheat. The grain yield of November 14 sown wheat was highest. The variety had significant effect on grain yield of wheat the yield of Bijay was highest and Danfe was lowest.

The interaction of date of sowing and variety was significant on plant height at 45,60,75,90 and 105 DAS. At 45 and 60 DAS plant height of November 14 sown Tillotama, November 29 sown Danfe and November 14 sown Bijay was highest. At 75 DAS plant height of December 14 sown Tillotama, Bijay and Danfe was found highest. At 90 DAS plant height of November 29 sown Bijay, Tillotama and Danfe was highest. At 105 DAS November 29 sown Tillotama and bijay had highest plant height but in case of Danfe November 14 sowing had highest plant height.

The interaction of sowing date and variety was significant in case of Harvest Index and grain yield (kg/ha^{-1}). The harvest index of all three varieties sown at November 14 was highest. The grain yield of November 14 sown Tillotama and Danfe was highest and in case of Danfe November 29 sowing had highest yield.

References

Ahamed, KU, Nahar, K and Fujita, M (1975) Sowing date mediated heat stress affects the leaf growth and dry matter partitioning in some spring wheat (*Triticum aestivum* L.) cultivars. *The IIOAB Journal*.**1:**8-16.

CIMMYT (2002) Wheat the vital grain of civilization and food security: Wheat annual report. Mexico, DF.

Gomez, KA and Gomez, AA (1983) Statistical procedures for agricultural research: John Wiley & Sons.

MoAD (2012) Statistical information on Nepalese Agriculture 2012: Ministry of Agriculture and Development, Agribusiness Promotion and Statistics Division. Kathmandu, Nepal

MoAD (2014) Statistical information on Nepalese Agriculture 2014: Ministry of Agriculture and Development, Agribusiness Promotion and Statistics Division, Kathmandu, Nepal

NARC (2002) Annual Report 2001/2002: National Agriculture Research Council (NARC). Khumaltar, Nepal.

Qasim, M (2008) Sowing date effect on yield and yield components of different wheat varieties and amrajalam. J agric. Pakistan.

Subedi, KD, Budhathoki, CB, Subedi, M and G.C, YD (1991) Response of wheat genotypes to sowing date and boron fertilization aimed at controlling sterility in a rice-wheat rotation in Nepal. *Plant and soil*.188 (2):249-256. DOI: 10.1023/A:1004202725382

Wall, PP (1991) Wheat crop management in warmer area: a review of issue and advances. Mexico: CIMMYT.