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## Performance of Wheat Genotypes Under Different Dates of Sowing in Southern Part of Kailali District, Nepal

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### ABSTRACT

An experiment was conducted at Kailali district to study the performance of wheat genotypes under different sowing from December, 2017 to April, 2018. The field experiment was conducted in Randomized Complete Block Design with a total of 18 treatments consisting of 2 dates of sowing (November 4 and November 20) and 9 wheat genotypes (WH1105, HD2733, HD2824, HD2967, Borlaug100, HD3086, PBW550, NL971 and PBW373). Grain yield (5.802 ton/ha), spike length (17.94 cm) and biomass yield (13.16 ton/ha) of NL 971 was highest. HD 2733 had highest number of effective tillers (519.1/ m<sup>2</sup>) while number of grains per spike (59.80) was highest in HD 2967. PBW 373 had lowest grain yield (4.551 ton/ha), Borlaug 100 was the variety with minimum number of tillers per m<sup>2</sup> area (401.3), minimum spike length (15.14 cm) was observed in HD 2733, HD 3086 had lowest no. of grains per spike (42.12). Grain yield (5.328 ton/ha), effective tillers per m<sup>2</sup> (475.5), spike length (16.95 cm), number of grains per spike (53.12), biomass yield (11.45 ton/ha) was recorded maximum in wheat sown on 20th Nov. Grain yield (4.893 ton/ha), effective tillers (435.1), spike length (15.66 cm), grains per spike (49.59) and biomass yield (10.49 ton/ha) was recorded minimum in wheat sown on 4th Nov. Maximum test wt. (50.83 g) was found in HD 2733 of 20th Nov. and the lowest test wt. (40.47 g) was found in PBW 550 of 20th Nov.

## INTRODUCTION

### Background

Nepal is an agro based country. It is geographically distinguished into three major regions, Terai region, hilly region and himalayan region out of which only terai and small portion of hilly and himalayan region is suitable for cultivation. Agriculture is an important sector in the Nepalese economy contributing about third of its GDP and engaging about two thirds of its population (MOAD, 2016a). Wheat (*Triticum aestivum*) or gahun belonging to the family poaceae is the world most widely cultivated cereal crop. As a winter season crop wheat is still playing vital role in establishing the food grain production in the country. Wheat contains more protein [8-15% (grain) and 8-13% (flour)] than other cereals (Mathur, Suman, Meena, & Anuradha, 2017). Wheat proteins are of special significance. Besides their significance in nutrition, these are mainly concerned with providing the characteristic substance 'gluten', which is very essential for bakers (Macritchie, 1984).

There are many factors which are responsible for low average yield of wheat. Therefore some efforts have been made to increase the yield by introduction of high yielding varieties, balanced fertilizer application and efficient use of irrigation facilities. But still there are some factors upon which attention have not been made to increase the overall yield. One of the limiting factors is date of sowing. Sowing time significantly influence the yield and other yield attributing characteristics. There are still many factors which are responsible for low average yield. One of such environmental factors is untimely planting and it affects yield of wheat crop considerably

(Saini, Dhadwal, & Nanda, 1988; Ikeh & Ndaeyo, 2021). For supplying food to the increasing population timely sowing of seed along with timely application of fertilizers are crucial. The problem of post anthesis heat stress is highly responsible for low wheat yield. Therefore efforts should be made to minimize the effect of temperature variation caused due to changed sowing date by choosing appropriate sowing date.

The ongoing scenario of the country shows that because of the increasing rate of population growth, 1.35% in country and 1.86% in Kailali district (Statistics, 2017), the area occupied by (MOAD, 2016b) (MOAD, 2016b) overall agricultural commodity goes on rapid way of decreasing because of increased use of land for human settlement. Area under the wheat cultivation in Nepal is 762373 ha (2071/72) and this area under the wheat cultivation decreased by 1.2% and falls to 753470 ha in 2072/73 (AICC, 2074).

### Hypothesis

**H1:** wheat varieties sown at different dates have variation in their performances.

### Objectives

#### General objective

To assess production performance of different wheat genotypes sown at different dates

#### Specific objectives

- To find out performance of each wheat genotype at each sowing date in terms of yield and yield attributes.
- To compare the performance of each wheat genotype at both sowing date.
- To find out best genotype at each sowing date

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## MATERIALS AND METHODS

### Location:

This research is carried out at Kailari rural municipality and Dhangadhi submetropolitan

### Physic-chemical properties of the soil at the experimentation site

The soil sample from the research plot was taken and the pH content of the soil was found to be and it is suitable for wheat. The nitrogen, phosphorus and potash content of the research field was found to be high as per the soil report. The land was ploughed and leveled once at 30th Oct. for 4th Nov. sowing and again at 15th Nov. for 20th Nov. sowing. 300 kg FYM was applied in the research plot on 4th Nov. and 20th Nov. for the two sowing dates and the field was ploughed, made fine and pulverized. The whole field was divided into 36 small plots each with 16 m<sup>2</sup> at each sowing dates 4th Nov. and 20th Nov. respectively. Each small plot was separated with rope in each side. Treated seed was sown at each sowing dates with the seed rate of 120 kg/ha. The seeds were sown continuously in the rows spaced at 20 cm. The sowing was done manually on 4th Nov. for early sowing and 20th Nov. for normal sowing with the seed rate of 120kg/ha. 1st irrigation was done at 17 days of seeding date and 2nd irrigation at 66 days of seeding date in case of both seeding date. The crop was fertilized with 100:50:50 kg NPK/ha, through urea, diammonium phosphate and muriate of potash respectively. 1/3rd N and full dose of phosphorous and potash was given at the time of at sowing and remaining 2/3rd nitrogen was top dressed at 40 and 75 days after sowing respectively.

### Yield and yield attributing characters

No. of Effective tillers, Average of spike length, No. of total grains in 5 spikes, TAGB in NHA, Grain yield in NHA, Thousand grain wt. and Grain moisture.

The obtained data was systematically arranged, tabulated in Microsoft excel program and graph and figure was drawn. Various analytical software such as Genstat and M-stat was utilized for the analysis of the data obtained. Duncan test was carried out at 5% level of significance.

## RESULTS AND DISCUSSION

Highest value of number of effective tillers was seen in HD 2733 (519.1) which were at par with HD 3086 (518.8) while lowest number of tillers was seen in Borlaug 100 (401.3). Highest value of effective tillers was seen in wheat sown in 20th November (475.5) and lowest value in case of wheat sown in 4th Nov. (435.1)

Effect of varieties on biomass yield was seen highly significant. Highest value for biomass yield was seen in NL 971 (13.16) and lowest was seen in HD 2824 (10.12) which was at par with WH 1105 (10.47), HD 2967 (10.19), Borlaug 100 (10.18), PBW 550 (10.30) and PBW 373 (11.22). Similarly effect of date of sowing on biomass yield was also seen significant. More biomass yield was seen in wheat sown in 20th Nov. (11.45) and less in case of wheat sown in 4th Nov. (10.49).

Effect of varieties on grain yield was seen significant.

Highest value for grain yield was seen in NL 971 (5.802) which was at par with WH 1105 (5.684) and lowest value for grain yield was seen in PBW 373 (4.551) which was at par with HD 2824 (4.752) and HD 2733 (4.814). More grain yield was seen in wheat sown in 20th Nov. (5.328) and less grain yield in case of wheat sown in 4th Nov. (4.893). Effect of varieties on test weight was seen highly significant. Highest value for test wt. was seen in HD 2733 (48.73) and lowest in PBW 550 (43.14). Highest value for test wt. was seen in 20th Nov. sowing (59.9) and lowest test wt. was seen in 4th Nov. sowing (44.6). Highest value for spike length was seen in NL 971 (17.94) and lowest value in HD 2733 (15.14). More spike length was seen in wheat sown in 20th Nov. (16.95) and less spike length in case of wheat sown in 4th Nov. (15.66). PBW 550 (10.4, 10.5 cm) produced the highest spike length which was significantly higher than PBW 621 (9.9, 9.3 cm) and HD 2967 (9.1, 8.8 cm). Highest value for no. of grains per spike was seen in HD 2967 (59.80) and lowest value in HD 3086 (42.12) which was at par with HD 2733 (43.23). Highest value for no. of grains per spike was seen in HD 2967 (59.80) and lowest value in HD 3086 (42.12) which was at par with HD 2733 (43.23).

**Table 1:** Effects of Varieties and Date of sowing on No. of effective tillers, Spike length and No. of grains per spike at Kailali district in 2017/18.

Treatment	No. of effective tillers	Spike length	No. of grains per spike
Variety			
WH 1105	407.9 <sup>bc</sup>	15.66 <sup>cd</sup>	56.53 <sup>ab</sup>
HD 2733	519.1 <sup>a</sup>	15.14 <sup>d</sup>	43.23 <sup>c</sup>
HD 2824	429.6 <sup>bc</sup>	17.38 <sup>ab</sup>	50.23 <sup>d</sup>
HD 2967	408.3 <sup>bc</sup>	16.30 <sup>bcd</sup>	59.80 <sup>a</sup>
Borlaug 100	401.3 <sup>c</sup>	16.21 <sup>bcd</sup>	54.95 <sup>bc</sup>
HD 3086	518.8 <sup>a</sup>	15.36 <sup>cd</sup>	42.12 <sup>c</sup>
PBW 550	492.5 <sup>ab</sup>	16.26 <sup>bcd</sup>	51.70 <sup>cd</sup>
NL 971	464.4 <sup>abc</sup>	17.94 <sup>a</sup>	48.58 <sup>d</sup>
PBW 373	455.9 <sup>abc</sup>	16.52 <sup>bc</sup>	55.10 <sup>bc</sup>
SEm(±)	26.77	0.422	1.543
LSD(0.05)	75.99 <sup>**</sup>	1.199 <sup>***</sup>	4.379 <sup>***</sup>
Date of Sowing			
4 November	435.1 <sup>b</sup>	15.66 <sup>b</sup>	49.59 <sup>b</sup>
20 November	475.5 <sup>a</sup>	16.95 <sup>a</sup>	53.12 <sup>a</sup>
SEm(±)	12.62	0.199	0.727
LSD(0.05)	35.82 <sup>**</sup>	1.696 <sup>***</sup>	2.064 <sup>***</sup>
CV(%)	16.6	7.3	8.5
Grand Mean	455.3	16.31	51.36

Means in the column followed by same letter(s) in each treatment do not differ significantly at (p=0.05) by DMRT. DAS=Days After Sowing, SEm= Standard Error of Mean, - LSD=Least Significant Difference and CV= Coefficient of Variance.

**Table 2:** Effects of Varieties and Date of sowing on Biomass yield, grain yield and thousand grain wt. at Kailali district in 2017/18.

Treatment	Biomass yield	Grain yield	Test wt.
Variety			
WH 1105	10.47 <sup>b</sup>	5.684 <sup>a</sup>	44.73 <sup>cd</sup>
HD 2733	11.48 <sup>ab</sup>	4.814 <sup>b</sup>	48.73 <sup>a</sup>
HD 2824	10.12 <sup>b</sup>	4.752 <sup>b</sup>	46.67 <sup>abc</sup>
HD 2967	10.19 <sup>b</sup>	5.164 <sup>ab</sup>	45.94 <sup>bc</sup>
Borlaug 100	10.18 <sup>b</sup>	5.031 <sup>ab</sup>	46.76 <sup>abc</sup>
HD 3086	11.65 <sup>ab</sup>	5.171 <sup>ab</sup>	47.83 <sup>ab</sup>
PBW 550	10.30 <sup>b</sup>	5.025 <sup>ab</sup>	43.14 <sup>d</sup>
NL 971	13.16 <sup>a</sup>	5.802 <sup>a</sup>	45.56 <sup>bcd</sup>
PBW 373	11.22 <sup>b</sup>	4.551 <sup>b</sup>	45.57 <sup>bcd</sup>
SEm(±)	0.579	0.2475	0.814
LSD(0.05)	1.644 <sup>**</sup>	0.7027 <sup>*</sup>	2.312 <sup>***</sup>
Date of Sowing			
4 November	10.49 <sup>b</sup>	4.893 <sup>b</sup>	44.6 <sup>b</sup>
20 November	11.45 <sup>a</sup>	5.328 <sup>a</sup>	59.9 <sup>a</sup>
SEm(±)	0.273	0.1167	0.384
LSD(0.05)	0.775 <sup>*</sup>	0.3313 <sup>*</sup>	1.090 <sup>***</sup>
CV(%)	14.9	13.7	5
Grand Mean	10.97	5.111	46.10

Means in the column followed by same letter(s) in each treatment do not differ significantly at (p=0.05) by DMRT. DAS=Days After Sowing, SEm= Standard Error of Mean, LSD=Least Significant Difference and CV= Coefficient of Variance.

**Table 3:** Interaction effect of Date of sowing and Varieties on heading DAS at Kailali district in 2017/18

		Heading DAS							
Treatments		Varieties							
DOS	WH	HD	HD	HD	Borlaug	HD	PBW	NL	PBW
	1105	2733	2824	2967	100	3086	550	971	373
4 Nov.	75.25 <sup>f</sup>	92 <sup>a</sup>	92.25 <sup>a</sup>	92 <sup>a</sup>	76.75 <sup>f</sup>	69 <sup>g</sup>	65.50 <sup>g</sup>	82 <sup>cde</sup>	82 <sup>cde</sup>
20 Nov.	79 <sup>def</sup>	89.25 <sup>ab</sup>	92 <sup>a</sup>	94 <sup>a</sup>	78.75 <sup>def</sup>	77 <sup>ef</sup>	74.75 <sup>f</sup>	85.25 <sup>bc</sup>	83.75 <sup>cd</sup>
SEm(±)									1.594
LSD									4.524 <sup>*</sup>

Means in the column followed by same letter(s) in each treatment do not differ significantly at (p=0.05) by DMRT. DAS=Days After Sowing, SEm= Standard Error of Mean, LSD=Least Significant Difference and CV= Coefficient of Variance.

**Table 4:** Interaction effect of Date of sowing and Varieties on Test wt. at Kailali district in 2017/18.

		Test Weight							
Treatments		Varieties							
DOS	WH	HD	HD	HD	Borlaug	HD	PBW	NL	PBW
	1105	2733	2824	2967	100	3086	550	971	373
4 Nov.	41.22 <sup>hi</sup>	46.64 <sup>bc</sup>	45.97 <sup>cde</sup>	42.39 <sup>g</sup>	44.70 <sup>ef</sup>	45.61 <sup>d</sup>	45.81 <sup>cd</sup>	45.12 <sup>d</sup>	43.75 <sup>fg</sup>
		def	fg	hi	gh	efg	efg	efg	
20 Nov.	48.23 <sup>ab</sup>	50.83 <sup>a</sup>	47.38 <sup>abc</sup>	49.49 <sup>a</sup>	48.82 <sup>ab</sup>	50.04 <sup>a</sup>	40.47 <sup>i</sup>	46 <sup>cdefg</sup>	47.40 <sup>abc</sup>
	cde		def	bc	cd	b			def
SEm(±)	1.152								
LSD	3.269 <sup>***</sup>								

Means in the column followed by same letter(s) in each treatment do not differ significantly at (p=0.05) by DMRT. DAS=Days After Sowing, SEm= Standard Error of Mean, LSD=Least Significant Difference and CV= Coefficient of Variance.

**Table 5:** Interaction effect of Date of sowing and Varieties on Maturity DAS at Kailali district in 2017/18.

					Maturity DAS				
Treatments					Varieties				
DOS	WH	HD	HD	HD	Borlaug	HD	PBW	NL	PBW
	1105	2733	2824	2967	100	3086	550	971	373
4 Nov.	139.3 <sup>cd</sup>	141 <sup>ab</sup>	139.5 <sup>cd</sup>	142.3 <sup>a</sup>	142 <sup>a</sup>	139 <sup>cd</sup>	140 <sup>bc</sup>	139.3 <sup>cd</sup>	141 <sup>ab</sup>
20 Nov.	127 <sup>g</sup>	129 <sup>f</sup>	131.5 <sup>e</sup>	138.3 <sup>d</sup>	127.3 <sup>g</sup>	129 <sup>f</sup>	129.3 <sup>f</sup>	129.5 <sup>f</sup>	130.3 <sup>ef</sup>
SEm(±)					0.468				
LSD					1.328***				

Means in the column followed by same letter(s) in each treatment do not differ significantly at (p=0.05) by DMRT. DAS=Days After Sowing, SEm= Standard Error of Mean, LSD=Least Significant Difference and CV= Coefficient of Variance.

Interaction effect of date of sowing and varieties on days to heading was found significant. Early heading was found in PBW 550 of 4th Nov. sowing.(65.50),which was at par with HD 3086 of 4th Nov. sowing.(69) and delay heading was found in HD 2967 variety of 20th Nov. sowing (94),which was at par with HD 2733 sowing of 4th Nov. (92),HD 2824 sowing at 4th Nov (92.25),HD 2967 sowing at 4th Nov (92) and HD 2824 sowing at 20th Nov.(92)

Interaction effect of Date of sowing and Varieties on days to maturity was found highly significant. Early maturity was found in WH 1105 at 20th Nov. sowing (127) whereas HD 2967 in 4th Nov. matured later. (142.3) which was at par with Borlaug 100 at 4th Nov. sowing (142).

Interaction effect of Date of sowing and Varieties on Test wt was found highly significant. Highest test wt. was found in HD 2733 sowing of 20th Nov. sowing.(50.83) and lowest test wt. was found in PBW 550 sowing of 20th Nov. sowing (40.47).

## CONCLUSIONS

The effect of sowing dates and varieties on yield and concerned yield attributes of wheat was successfully conducted in the farmer's field. There was no significant effect of sowing date on greenness value of the different wheat varieties. Significant variations were observed in the different parameters in response to the different varieties and sowing dates. Highest grain yield was found in the wheat variety NL 971 followed by WH 1105 and lowest in PBW 373. Similarly 20th Nov. sowing had more grain yield than 4th Nov. sowing.

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