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Performance of Wheat Genotypes under Irrigated Conditions in Far Western Terai of Nepal

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Abstract

Wheat, the most important food crop in terms of food and nutrition security in Nepal, production could not meet the demand of growing population due to limited use of high yielding variety and use of inappropriate variety in the context of increasing heat stress during ripening. For assessing the performance of different wheat genotypes, this study was carried out during November 2022 to April 2023 at Agronomy Farm of Far Western University, Kailali, Nepal. The study was designed in Randomized complete block design (RCBD) with three replications. Eleven genotypes with nine Nepal lines and two Bhairhawa lines were evaluated and compared with a popular variety, Vijay for their performance at Tikapur condition. The result revealed the highest grain yield from NL 1506, recording 3.36 t/ha, which was statistically at par with NL 1452, NL 1488 and BL 5116 at 5% level of significance. The popular variety Vijay yielded only 3.02 t/ha which was statistically at par with NL 1638, but was inferior to NL 1450. Statistically poor performance was observed in the genotypes NL 1445 and BL 4984.

Keywords**:** Effective tiller, grain diameter, phenology, yield attributes

Introduction

Wheat (*Triticum aestivum* L.), a major food crop belonging to Poaceae family provides sufficient calories as well as huge amount of protein to majority of people across the globe. It is the key staple food crop in more than 40 countries in the world (Shiferaw et al., 2013; Chaves et al., 2013), grown over 219153830 ha land, which produced 808441568.18 tons in the year 2022 (FAOSTAT, 2024). This crop is important both in terms of food and nutrient security, as wheat grains contain 14.7% protein, 78.10% carbohydrates, 2.1% fat, sufficient amount of thiamine, vitamin B, zinc, iron, selenium and magnesium as well as dietary fibres (Kumar et al., 2011; Velu et al., 2015). In Nepal, it is third important cereal crop of Nepal after rice and maize in terms of area and production, occupying 20.56% of total area under cereals making 19.9% of the total cereal production. Wheat crop alone contributed 5.67% to the total AGDP of the country during the year 2022 (MoALD, 2023).

Despite significant contribution of wheat to Nepal and Nepali people, the production and productivity is low in most of the wheat growing districts. Wheat crop faces several issues like improper water and nutrient management, delayed sowing and increased insect-pest infestations with severe changes in weather pattern during the growing seasons as has been observed in Tikapur. Similarly, wheat varieties perform poorly in rain fed condition than irrigated, given the similar inputs (Sayar et al., 2005). Most of these issues could be addressed by replacing the current low yielding varieties with high yielding appropriate varieties (Prasai & Shrestha, 2015), and providing sufficient irrigation during the critical growth stages at different locations, as the water requirement of wheat crop is 266.9-500mm, which is higher than other crops including maize (Deo et al., 2017). Also, more than 75% of wheat growing area in the terai region is irrigated, and hence the evaluation of genotypes under irrigated environment is important to suggest the suitable high yielding varieties for improving production and productivity of wheat.

More than 60% of wheat in Nepal is produced from terai region (Subedi et al., 2020), and Kailali is one of the major wheat growing terai district, where it is grown in over 34944 ha land. Also considered as wheat super zone of Nepal, Kailali district produced 125252 mt in the year 2021/22 (MoALD, 2023) with the productivity of 3.58t/ha, which is quite higher than other districts of Far Western Province. Owing to the use of popular varieties like Vijay, NL971, Aaditya, Gautam and some other Indian varieties, this district performed better (Yadav et al., 2022). But in the context of increasing cold waves during winter and heat stress during the ripening period, there is still the room for improving the productivity of wheat through testing new varieties and evaluating the genotypes for their performance at different locations.

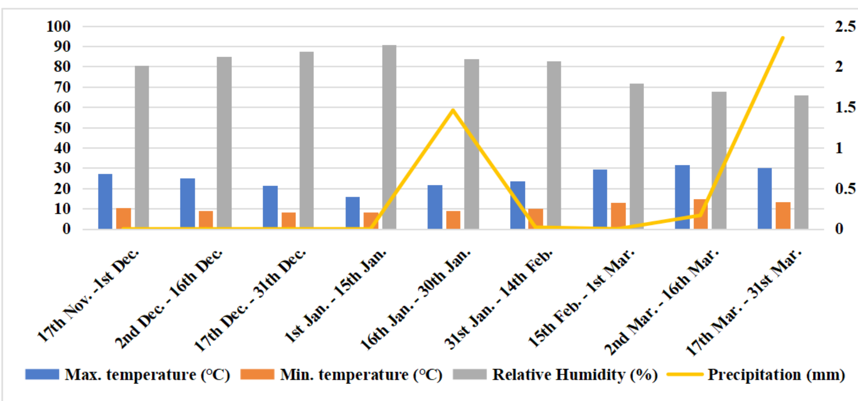
Methods and Procedures

Experimental Site

The study was conducted at Agronomy farm of Far Western University, Faculty of Agriculture Science during the month of November 2022 to April 2023 in Tikapur, Kailali. This place is located in Sudurpaschim Province of Nepal at an elevation of 158 meter above sea level (masl), with geographical coordinates, 28°31'30" North and 81°07'15" East, which falls in the tropical zone. The site had sandy loam soil with pH 6.6 with 1.45 % organic matter content, 0.07 % nitrogen, 17.49 kg/ha phosphorous and 108 kg/ha potassium. The site received a total of 46.05 mm rainfall during the experimental period, with the highest precipitation of 23.1mm at maturity stage as shown in figure 1. The average maximum temperatures during the experimental period were 38.7^{0}C and minimum was 23.11^{0}C; experienced the lowest temperature of 16.5^{0}C during germination stage and the highest reaching 40.51^{0}C at maturity stage.

Figure 1

Weather Condition of the Study Site during the Experimental Period (November 2022 -March, 2023)



Planting Materials

For studying, eleven genotypes (nine NL line and two BL lines) of wheat and a popular variety among the farmers of Tikapur, i.e. Vijay was taken as check in the experiment. All the planting materials were obtained from Regional Agriculture Research Station, NARC, Khajura.

Experimental Design

All the planting materials (genotypes and check variety) were arranged randomly in each replication. The experiment was done in RCBD (Randomized Complete Block Design) with three replications. The total area of the experimental area was 504 m^2 with each plot size 8 m^2 and each replication was maintained at 1m. The distance between each plot was maintained at 0.5 m.

Cultural Practices

Seeds were sown continuously in rows spaced at 25 cm @ 120 kg/ha. The chemical fertilizers were applied @120:50:50 NPK kg/ha, one third nitrogen and full dose of phosphorus and potassium were used as basal application and remaining two third was applied during tillering and anthesis period. Irrigation was applied four times i.e., at tillering, booting, anthesis and grain filling stages.

Data Collection

Data pertaining plant height (PH) and tiller number were recorded at frequent interval and at harvest. Observations were also made on days to heading (DH), days to anthesis (DA), days to senescence (DS), and days to maturity (DM) for each of the genotypes and check variety of wheat. Plant heights were taken from randomly selected 10 plants, days to heading was recorded when 50 percent of the plant population showed visible spikes whereas days to anthesis was recorded when 50 percent plant spikes showed yellow flower. and days to senescence was recorded when 50 percent plant populations' flag leaf dried up. Similarly, days to maturity was recorded, when the seeds produced cracking sound when placed between the teeth. The distance between flag leaf and the base of the spike was considered as peduncle length and length of the spike was measured from base of the spike to the tip of the spike. Yield attributing traits like spike length, grains per spike, and 1000 grain weight were recorded from randomly selected plants, at the time of harvest whereas grain yield and straw yield were taken from 1 m^2area for each of the genotypes and check variety of wheat.

Statistical Analysis

MS Excel 2007 was used for Data entry, processing, correlation and regression analysis. Software R studio version 4.3.0., package "doe bioresearch" was used for Analysis of variance (ANOVA) and mean estimation.

Results and Discussion

The results obtained for all the growth and yield parameters are tabulated and discussed under different sections.

Plant Stand

Among the genotypes, NL 1437 showed significantly highest plant stand compared to all the genotypes followed by NL 1638, NL 1503 and Vijay. Plant stand was the lowest in NL 1506, which was only 151.33 per square meter. This indicates the use of higher seed rates for the genotypes, which performed poorly over Vijay.

Table 1

Plantstand and Tiller Count Per Square Meter of Wheat Genotypes at Tikapur, Kailali, 2023

Genotypes	Number of plants	Tillers (60 DAS)	Tillers (80 DAS)	Effective tillers	Tiller sterility %
NL 1638	215.00^{ab}	302.66^{a-c}	297.00^{a-d}	245.33^{ab}	17.44^{c-e}
NL 1437	219.66^{a}	318.66^{ab}	310.00^{a-c}	237.66^{a-c}	23.29^{a-c}
NL 1509	188.66^{cd}	283.66^{b-d}	273.66^{c-e}	214.00^{b-e}	21.62^{a-d}
NL 1503	200.66^{a-c}	295.00^{a-c}	316.33^{ab}	231.66^{bc}	26.13^{a}
NL 1506	151.33^{g}	242.66^{de}	228.66^{f}	193.33^{de}	15.42^{de}
BL 5116	165.33^{e-g}	341.66^{a}	325.00^{a}	265.33^{a}	18.14^{b-e}
NL 1488	153.66^{fg}	234.66^{de}	247.33^{ef}	187.33^{e}	24.15^{ab}
BL 4984	187.00^{c-e}	255.66^{c-e}	265.00^{d-f}	209.00^{c-e}	20.67^{a-d}
NL 1445	179.66^{c-e}	316.00^{ab}	309.33^{a-c}	238.00^{a-c}	23.09^{a-c}
NL 1452	178.33^{c-e}	283.00^{b-d}	270.66^{c-f}	224.00^{b-d}	17.22^{c-e}
NL 1450	176.66^{d-f}	271.66^{b-e}	275.66^{b-e}	220.00^{b-d}	20.20^{a-e}
Vijay	194.33^{b-d}	228.33^{e}	245.33^{ef}	210.33^{c-e}	14.24^{e}
SEm (±)	7.94	17.16	14.50	10.93	2.12
F-test (0.05)	***	**	**	**	*
LSD value	23.29	50.34	42.53	32.06	6.24
CV	7.46	10.57	8.96	8.49	18.31
Grand mean	184.19	281.13	280.33	223	20.13

LSD: Least Significant Difference; CV: Coefficient of Variation; SEm: Standard Error of Mean; *: significant at ≤0.05 level of significance; **: significant at ≤0.01 level of significance; ***: significant at ≤0.001 level of significance; DAS: Days after sowing

Tiller Count

Most of the genotypes tested in the study were quick in showing up the tillers i.e. they formed maximum tillers at 60 DAS, as is observed from the decline in number of tillers during 80 DAS (Table 1). But the genotypes like NL1503, NL1450, BL4984, NL1488 were found to develop the tillers until 80 DAS, similar to the check variety Vijay. The result showed significant increase in number of tillers at both 60 and 80 DAS, with the highest obtained from BL 5116. This genotype (BL 5116) was prolific in bearing both the effective tillers and total number of tillers, where only 18% tillers were ineffective. The lowest number of tillers was obtained from NL 1506, which also had statistically lesser number of effective tillers. Similarly, the genotypes NL 1506, NL 1488, BL 4958 showed significantly lesser number of effective tillers, when compared with the check variety Vijay. Considering the effective tillers, all the genotypes performed equally or better than Vijay. NL 1503 and BL 1488 had the highest tiller sterility i.e., spike bearing tillers where the lowest. But the check variety Vijay had the highest number of spikes bearing tillers, as is observed from the tiller sterility percentage. NL 1638 had comparatively higher number of effective tillers and relatively lower sterility percentage. Variation in total number of tillers and effective tillers among the genotypes were also reported in several researches (Khan et al., 2021; Siyal et al., 2021), which might be due to the differences in environmental response among the varieties (Rahman et al., 2009). Variation in root architecture and hormonal balances among the genotypes might have impacted the tiller number differently (Nagel et al., 2015; Hodgkinson, 2017)). During tiller formation, the temperature reached 24.98^{0}C, and genotypes might have responded differently to this low temperature. Bos and Neuteboom (1998) reported the effect of temperature and light responses on variation in tiller count.

Table 2

Plant Height of Wheat Genotypes at Tikapur, Kailali, 2023

Genotypes	Plant height (cm)			
	PH (40 DAS)	PH (60 DAS)	PH (80 DAS)	PH FINAL
NL 1638	20.16^{f}	32.66^{g}	64.16^{f}	82.83^{d}
NL 1437	23.90^{c-e}	44.00^{de}	75.90^{b-d}	86.66^{b-d}
NL 1509	25.96^{a-c}	48.80^{bc}	78.53^{a-c}	86.43^{b-d}
NL 1503	24.40^{b-d}	41.00^{ef}	70.20^{e}	83.13^{cd}
NL 1506	23.13^{de}	38.00^{f}	75.26^{cd}	86.53^{b-d}
BL 5116	21.56^{ef}	33.23^{g}	65.50^{f}	90.36^{ab}
NL 1488	25.70^{a-d}	47.83^{b-d}	79.96^{ab}	94.26^{a}
BL 4984	26.53^{a-c}	50.46^{ab}	80.80^{a}	88.23^{bc}
NL 1445	26.66^{ab}	43.13^{de}	72.73^{de}	88.80^{b}
NL 1452	26.40^{a-c}	45.83^{b-d}	77.53^{a-c}	86.16^{b-d}
NL 1450	24.23^{b-e}	45.56^{c-e}	78.83^{a-c}	87.50^{b-d}
Vijay	28.13^{a}	54.06^{a}	79.80^{ab}	94.40^{a}

SEm (±)	0.93	1.62	1.41	1.82
F-test (0.05)	***	***	***	**
LSD value	2.73	4.76	4.15	5.34
CV	6.54	6.43	3.27	3.58
Grand mean	24.73	43.71	74.93	87.94

LSD: Least Significant Difference; CV: Coefficient of Variation; SEm: Standard Error of Mean; *: significant at ≤0.05 level of significance; **: significant at ≤0.01 level of significance; ***: significant at ≤0.001 level of significance; DAS: Days after sowing

Plant Height

The results showed that plant height increased rapidly in BL 5116 at later growth stages (80DAS), when compared with other genotypes and had significantly taller plants, though smaller than the check variety Vijay, in table 2. Similarly, the genotype NL 1488 was statistically at par with Vijay in showing plant height, which was 94cm at the time of harvest. Significant variation in plant heights were observed among the genotypes tested with the genotype NL 1638 having statistically smallest plant height. Apart from these, BL 5116 performed statistically better than others in plant height, indicating its comparable performance at Tikapur condition. These results are in line with several findings (Poudel et al., 2020; Prasai & Shrestha, 2015), where variation in plant heights were observed among genotypes and varieties. Parents of these genotypes might differ greatly and hence variation in plant heights was observed, which could be used for improving these traits in breeding programs (Ljubicic et al., 2013). Wang et al. (2019) have reported apical dominance in certain wheat genotypes to be responsible for their increased plant heights.

Days to Heading

The study revealed highly significant differences in days to heading among different wheat genotypes, where the check variety Vijay was quick to show heads taking only 77.33 days followed by NL-1509 (80.33 days), NL 1488 (81.33 days) and NL 1450 (81.6 days), as observed in table 3. Similarly, the genotype NL 1638 took higher number of days for heading i.e., 91.00 days. Between Bhairahawa lines used in the study, BL 4984 was quick in heading taking 82.66 days, whereas BL 5116 took nearly 90 days to reach the same stage. The development of grain production per plant was also directly influenced by plant height and days to 50% heading (Anwar et al., 2009). Early maturity varieties are bred to yield optimum during short life cycle (Aljazairi et al., 2014), whereas some varieties extend their vegetative growth for performing better. Stresses related to temperature, nutrient availability, moisture conditions also shorten the time to reach heading and maturity in some varieties (Ihsan et al., 2016), whereas others may be able to tolerate drought condition (Ali, 2019; Farooq et al., 2011). Garg et al. (2013) has reported cooler temperature increases the grain filling and maturity period.

Days to Anthesis

The days to anthesis in wheat genotypes varied from 82 days to 94.33 days, with a mean of 87.77 days, according to the study, which were statistically significant. Similar to heading, Vijay took statistically lesser number of days to flowering and pollination followed by NL1509 and NL1488 respectively. But the genotype NL-1638 took longer time to reach the anthesis, which was statistically at par with BL5116 followed by NL 1452. But when compared with check variety Vijay, NL 1509 took 2 days more to reach anthesis stage though the difference was 3 days for heading. The days to anthesis varied in line with heading as observed in table 3. The genotypes having longer duration for heading shows delayed anthesis as compared to those with earlier heading, which is in line with research finding (Upadhyaya & Bhandari, 2022).

Table 3

Phenology of Wheat Genotypes at Tikapur, Kailali, 2023

Genotypes	Days to 50% heading	Days to 50% anthesis	Days to 50% senescence	Grain filling period	Days to maturity
NL 1638	91.00^{a}	94.33^{a}	121.33^{a}	27.00^{g}	134.00^{ab}
NL 1437	84.00^{c}	87.00^{cd}	117.33^{d-f}	30.33^{de}	130.33^{d-f}
NL 1509	80.33f	84.00^{f}	115.66^{f}	31.66^{b-e}	128.33^{fg}
NL 1503	84.66^{c}	88.00^{c}	121.33^{a}	33.33^{a-c}	134.33^{a}
NL 1506	86.66^{b}	89.66^{b}	119.33^{bc}	29.66^{ef}	129.66^{ef}
BL 5116	90.00^{a}	93.66^{a}	121.00^{ab}	27.33^{fg}	133.00^{a-c}
NL 1488	81.33^{ef}	85.00^{ef}	118.66^{cd}	33.66^{ab}	129.33^{e-g}
BL 4984	82.66^{d}	86.33^{de}	117.33^{d-f}	31.00^{c-e}	129.66^{ef}
NL 1445	86.00^{b}	88.00^{c}	120.66^{ab}	32.66^{a-d}	131.33^{c-e}
NL 1452	86.33^{b}	90.00^{b}	121.33^{a}	31.33^{b-e}	132.00^{b-d}
NL 1450	81.66^{de}	85.33^{ef}	118.00^{c-e}	32.66^{a-d}	129.33^{e-g}
Vijay	77.33^{g}	82.00^{g}	116.33^{ef}	34.33^{a}	127.33^{g}
SEm (±)	0.44	0.53	0.63	0.80	0.69
F-test (0.05)	***	***	***	***	***

LSD value	1.30	1.55	1.85	2.35	2.03
CV	0.91	1.04	0.91	4.45	0.91
Grand mean	84.33	87.77	119.02	31.25	130.72

LSD: Least Significant Difference; CV: Coefficient of Variation; SEm: Standard Error of Mean; *: significant at ≤0.05 level of significance; **: significant at ≤0.01 level of significance; ***: significant at ≤0.001 level of significance; DAS: Days after sowing

Days to Senescence

The days to senescence in wheat genotypes varied from 115.66 days to 121.33 days, with a mean of 119.02 days. The result showed highly significant variances in the days to senescence among the wheat genotypes. Among them, NL 1638, NL 1503 and NL 1452took longest days to reach senescence followed by BL 5116 and NL 1445.But the genotype NL 1509 took only 115.66 days to reach senescence, which was 1 day lesser than the check variety Vijay. Some genotypes matured quickly and on time but some genotypes matured forcefully due to higher temperature during grain filling, and hence difference in days to senescence was observed. Higher temperature during flowering, grain filling and ripening might prepone or postpone the days to senescence (Farooq et al., 2014; Hill & Li, 2022).

Grain Filling Period

Photosynthesis period showed statistically significant differences among treatments, where the longest grain filling period was observed in Vijay taking more than 34 days followed by NL1488 and NL 1503 requiring 1 day lesser than the check variety Vijay. However, the genotype NL1638 took only 27.00 days for filling up the grains**.** The genotype BL 5116 required only 27.33 days for grain filling, which was nearly a week lesser than the check variety Vijay. Varieties adapted to certain environment with optimal growing conditions might require certain grain filling period for optimum yield, but it might not be the case with other gentoypes compared in this study. In contradictory to our findings, Jocković et al. (2014) reported that grain filling period was not significantly correlated with grain yield, and hence could be concluded that the extension of the period of grain filling is not a simple strategy that can be used to increase the yield.

Days to Maturity

The study revealed that the genotype NL 1509 and NL 1488 matured 1 day and 2 day later than the check variety Vijay. Wheat genotypes varied greatly in reaching the maturity stages as is observed in Table 3. But delay in maturity was observed in the genotype NL-1503 and Nl 1638, which took additional one week than Vijay. Again, between the Bhairawa lines, BL 4984 matured 4 days earlier than BL 5116. There was a positive genotypic connection between days to maturity and plant^{-1} grain yield, plant^{-1} number of tillers, and plant^{-1} 1000-grain weight (Anwar et al., 2009). So, the varieties having long days to maturity have more grain yield due to more nutrient uptake, more growth, more energy conversion, extended photosynthesis period. Maurya et al. (2020) also reported positive and significant association between the grain yield and the days to maturity.

Spike Length

Significant variations in spike lengths were observed across the genotypes used in the study, as is observed in Table 4. The result showed that spike length was statistically highest in in NL 1506 followed by NL 1452 and NL 1488, which were more than 10 cm. The smallest NL 1503 had the smallest length of spike followed by NL 1638, which were less than 9 cm. In the study, average spike length of wheat was 9.58. But when compared to the check variety, Vijayhad smaller spikes than both the Bhairawa lines. These results were in line with the findings by Bhattrai et al. (2017) who reported that the spike length differs between genotypes.

Peduncle Length

Effect of wheat genotypes on peduncle length were found to be highly significant. The longest length of peduncle was recorded in Vijay i.e. 26.66 cm, followed by BL 4984 i.e. 21.10 cm and the least in NL-1506 i.e. 13.46 cm. The average peduncle length recorded in the study was 18.55 cm. When compared between the Nepal lines, NL 1488 (19.88 cm), had the longest peduncle whereas NL 1506 (13.46 cm), had the smallest. According to Rebetzke et al. (2011), increased crop radiation usage efficiency and grain yield has been reported to increase due to shorter peduncle length.

Table 4

Yield Attributing Traits of Wheat Genotypes at Tikapur, Kailali, 2023

Genotypes	Spike length (cm)	Peduncle length (cm)	Grain per spike (no.)	Seed length (mm)	Seed diameter (cm)	Thousand grain weight (g)
NL 1638	8.80^{de}	16.93^{f}	40.55^{cd}	6.31^{d}	3.62^{b-d}	48.66^{d}
NL 1437	9.50^{cd}	18.03^{d-f}	40.55^{e-g}	6.74^{bc}	3.54^{de}	50.33^{cd}
NL 1509	9.26^{c-e}	17.16^{ef}	40.88^{b-d}	6.35^{d}	3.52^{de}	52.00^{bc}
NL 1503	8.66^{e}	17.16^{ef}	31.22^{g}	6.51^{cd}	3.72^{a-c}	50.00^{cd}

NL 1506	10.43^{a}	13.46^{g}	43.38^{a-c}	6.28^{d}	3.80^{a}	54.00^{ab}
BL 5116	9.80^{a-c}	19.23^{cd}	37.61^{d-f}	6.78^{bc}	3.48^{e}	45.00^{e}
NL 1488	10.30^{ab}	19.80^{bc}	46.88^{a}	6.84^{ab}	3.76^{ab}	55.33^{a}
BL 4984	9.63^{bc}	21.10^{b}	38.55^{de}	6.73^{bc}	3.49^{de}	50.66^{cd}
NL 1445	9.56^{b-d}	18.66^{c-e}	33.11^{g}	7.01^{ab}	3.70^{a-c}	55.00^{a}
NL 1452	10.30^{ab}	16.50^{f}	39.50^{cd}	6.89^{ab}	3.68^{a-c}	52.00^{bc}
NL 1450	9.63^{bc}	17.96^{d-f}	44.72^{ab}	6.39^{d}	3.62^{c-e}	49.66^{cd}
Vijay	9.16^{c-e}	26.66^{a}	34.38^{fg}	7.14^{a}	3.80^{a}	54.33^{ab}
SEm (±)	0.26	0.57	1.39	0.11	0.04	0.98
F-test (0.05)	**	***	***	***	***	***
LSD value	0.77	1.68	4.08	0.32	0.13	2.88
CV	4.76	5.36	6.21	2.91	2.23	3.31
Grand mean	9.58	18.55	38.81	6.66	3.64	51.41

LSD: Least Significant Difference; CV: Coefficient of Variation; SEm: Standard Error of Mean; *: significant at ≤0.05 level of significance; **: significant at ≤0.01 level of significance; ***: significant at ≤0.001 level of significance; DAS: Days after sowing

Grains Per Spike

The number of grains per spike varied significantly across the genotypes in the study, which ranged from 31.22 to 46.88. The highest number of grains per spike was observed in NL 1488 i.e., 46.88, followed by NL 1450 i.e., 44.72, NL 1506 i.e., 43.38, which were far more than the check variety Vijay. The genotypes NL 1503 produced significantly lowest number of grains per spike, among all the genotypes compared in the study. Only NL 1503 and NL 1445 produced statistically lowest number of grains per spike, which were even lower than the local check Vijay. Some varieties have shown higher number of grains per spike where as some show lesser number of grains per spike. Regmi et al. (2021) also reported significant correlation between grain yield and number of grains per spike, indicating its important contribution. The number of spikes per plant is closely linked to the tillering ability, with higher number of spikes per plant correlating with higher yield potential due to certain number of grains being produced by each spike (Frantová et al., 2022).

Seed Size

The effects of genotypes were observed in both the seed length and diameter. The genotype NL 1445 was found to be slightly inferior to local check Vijay in the length of seed, which recorded more than 7 cm. Statistically smallest seed length was observed in NL 1638, which was only 6.31 cm. But, when compared among the genotypes for the seed diameter, NL 1506 and Vijay were statistically superior over all the genotypes compared in the study. The seed diameter of Bhairahawa lines were found to be lower than the Nepal lines with BL 5116 having the smallest diameter. Both the seed diameter and lengths were statistically the highest in the local check, Vijay.

Table 5

Grain Yield, Straw Yield and Harvest Index of Wheat Genotypes at Tikapur, Kailali, 2023

Genotypes	Grain yield (t/ha)	Straw yield (t/ha)	Harvest Index
NL 1638	3.07[a-c]	7.31[a]	0.29[f]
NL 1437	2.81[bc]	6.29[b]	0.31[f]
NL 1509	2.84[bc]	4.52[d]	0.38[ab]
NL 1503	2.97[a-c]	5.79[b]	0.33[de]
NL 1506	3.36[a]	5.85[b]	0.36[bc]
BL 5116	3.25[a]	4.89[cd]	0.39[a]
NL 1488	3.26[a]	4.95[cd]	0.39[a]
BL 4984	2.70[c]	5.82[b]	0.31[ef]
NL 1445	2.69[c]	6.34[b]	0.29[f]
NL 1452	3.30[a]	5.93[b]	0.35[cd]
NL 1450	3.18[ab]	5.71[bc]	0.35[cd]
Vijay	3.02[a-c]	4.74[d]	0.38[a]
SEm (±)	0.13	0.28	0.007
F-test (0.05)	*	***	***
LSD value	0.40	0.83	0.02
CV	7.83	8.71	3.89
Grand mean	3.04	5.68	0.35

LSD: Least Significant Difference; CV: Coefficient of Variation; SEm: Standard Error of Mean; *: significant at ≤0.05 level of significance; **: significant at ≤0.01 level of significance; ***: significant at ≤0.001 level of significance; DAS: Days after sowing

Thousand Grain Weight

The results showed significant variation in thousand grain weight among the genotypes tested in the study. NL 1488 had the plumpest seed weighing 55.33 grams for thousand grains, which was statistically superior over all genotypes. Similarly, the thousand grain weight of NL 1445 was also found to be higher than Vijay weighing 55 grams. The genotype BL 5116 had the lightest seed measuring only 45.00 gram owing to smaller diameter of the seed. Shorter grain filling period and high temperature build up, during ripening and maturity, were observed in wheat, which are sown late, as in our condition. This has also been reported by Poudel et al. (2020).

Grain Yield

The grain yield was found to be significantly highest in NL 1506, which was statistically at par with NL 1452, NL 1488 and BL 5116 at 5% level of significance, table 5. Similarly, the genotypes NL 1450 and NL 1638 were statistically superior over the local check Vijay in yielding the total amount of grains per ha. The local check variety, Vijay yielded lesser than Bhairawa line 5116 but higher than BL4984. Poudel et al. (2021) also reported that variation of yield is due to genotypes. In the similar locations like Tikapur, all these lines whose performance were superior to Vijay in grain yield could be suggested for further trials, considering participatory varietal selection, based on the qualities preferred by farmers.

Harvest Index

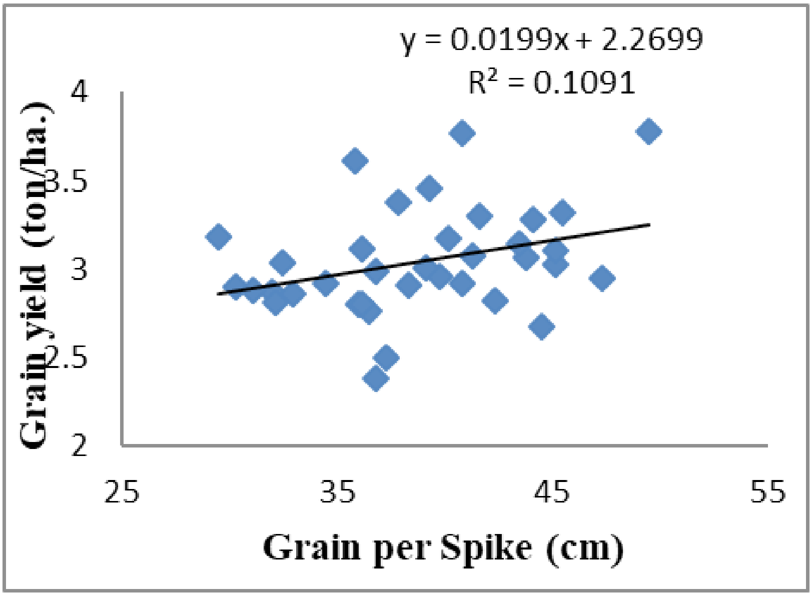
The result showed significant variations in the harvest index with the highest obtained for the genotype BL 5116 and NL 1488, with the value 0.39 indicating the efficiency in accumulation of dry matters in grains. The harvest index obtained from Vijay was statistically at par with these genotypes. The NL 1638 was found to be inferior (i.e., 0.29) in yielding harvest index, among all the genotypes tested in the study.

Correlation and Regression Study

The study showed significant positive correlation between spike length and grain yield with correlation coefficient, r=0.43; grains per spike and grain yield (r= 0.33); harvest index and plant height (r=0.44),) whereas non-significant but negative correlation was observed between grain yield and peduncle length (r=-0.25).

Figure 2

Relationship between Grain Yield and Spike Length (left) and Grain Yield and Grains Per Spike (right) at Kailali, Nepal 2023



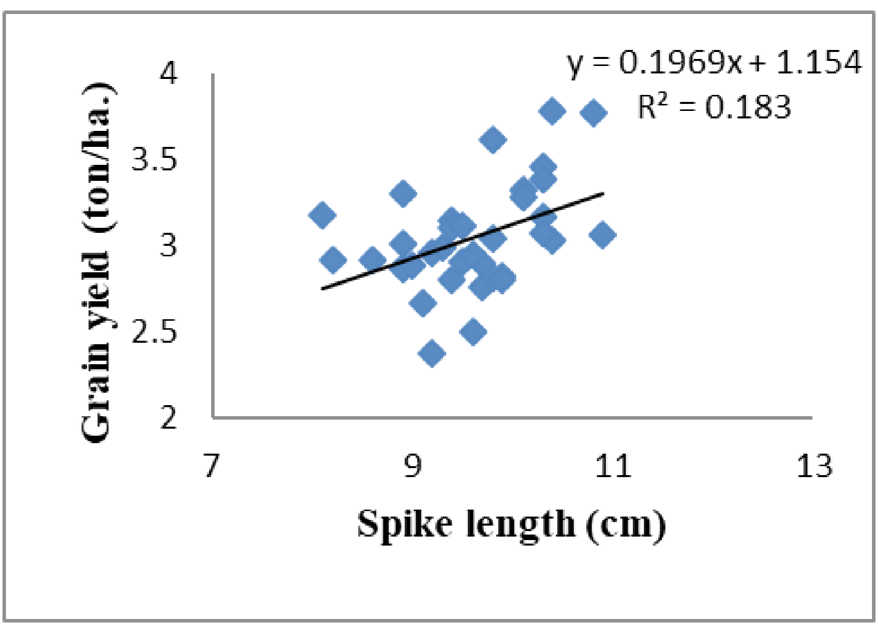
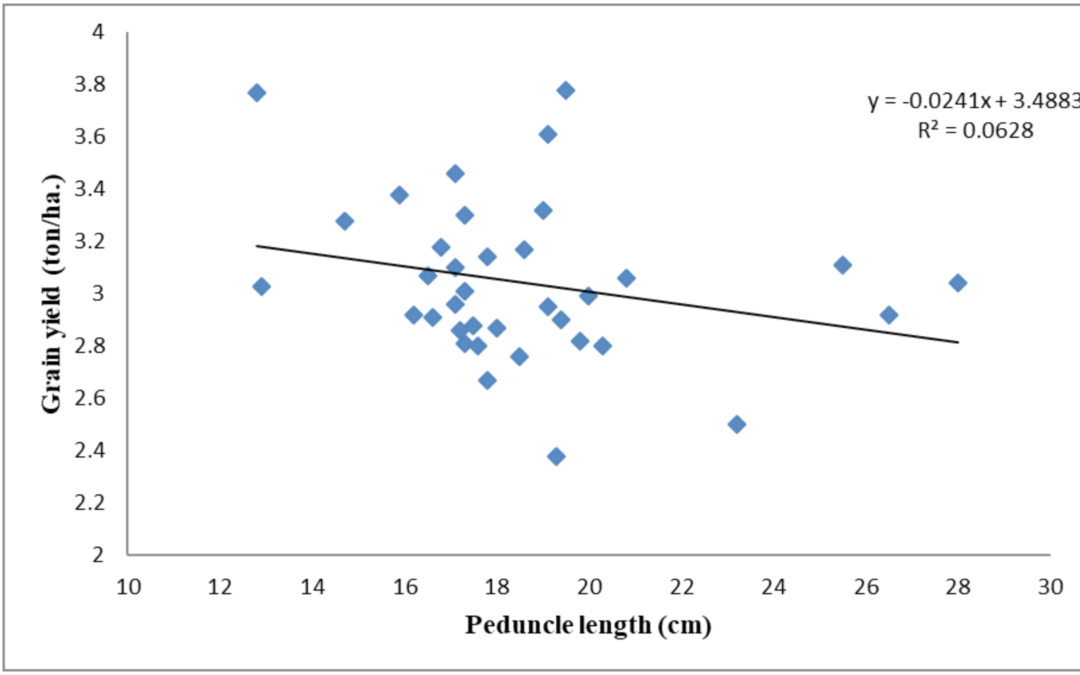


Figure 3

Correlation between Grain Yield and Peduncle Length at Kailali, Nepal 2023



Conclusion

The performance of few wheat genotypes belonging to Nepal lines were superior in grain yield over the popular variety Vijay. Some of the superior performing genotypes had higher number of grains per spike, whereas some had the heavier seeds, and others possessed higher number of effective tillers than Vijay variety of wheat. Considering the traits like effective number of tillers in BL 5116, bold grains in NL 1488 and higher number of grains per spikes in NL1506, these genotypes could be suggested for evaluations at different locations after harvest of paddy in far western province.

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