



Research Article

VARIETAL IMPROVEMENT OF WHEAT FOR EASTERN TERAI OF NEPAL

Hari Kumar Prasai

Regional Agricultural Research Station, Tarahara, Sunsari, Nepal

Corresponding address: hkprasai60@gmail.com

Abstract

The regional varietal experiments of wheat were composed by selecting promising genotypes from coordinated varietal trial. Both early and late sown experiments of wheat regional varietal trial (RVT) were seeded in Regional Agricultural Research Station, Tarahara, Sunsari, Nepal in 2014 and 2015. Late sown experiment was seeded after 15 days of early seeding experiment to identify suitable genotypes for delay seeding condition. Amongst the tested genotypes in RVT early of 2014 and 2015, the highest grain yield was produced by BL 3555 (3351 kg/ha) and BL 4018 (3309 kg/ha). Similarly BL 4012, BL 3978, BL 3264 and BL 4406 genotypes also recorded 12-18 percent higher grain yield than the yield of standard check variety, Aditya. All tested characters except spikes/m² included in over year analysis of RVT early was found significantly different due to genotypes. Similarly out of the tested genotypes in RVT (late) of 2014 and 2015, NL 1177 (2933 kg/ha) and BL 3555 (2764 kg/ha) were found high yielding genotypes in combined analysis over year and grain yield of other tested genotypes was observed at par with check variety. Days to heading, maturity, plant height and grain yield of RVT (late sown) experiment were observed significantly different due to genotypes in over year analysis.

Keywords: RVT; early sown; late sown; significant; grain yield; genotypes

Introduction

Wheat (*Triticum aestivum*) occupies third place in terms of area (754474 ha) and production (1883147 Mt) after rice and maize in the country. Out of the total cultivated area and production of cereal crops of the country, wheat accounts 21.67 and 19.69 percent, respectively. The contribution of agricultural and forestry sector in the GDP of the country is 32.61 percent. The national average productivity of wheat is 2496 kg/ha (MOAD, 2014).

Globally, wheat, maize and rice are the major cereal crops which occupy about 40% of the global crop land of 1.4 billion hectare (FAO STAT, 2009). Wheat is the widely cultivated crop and it shows the widest geographical distribution as it is being growing from 67°N to 45°S (Trethowan et al, 2005). Such ability of wheat to grow in wide environments indicates broader genetic variability of wheat crop than rice (Hans and Thomas, 2011). Among the calorie and protein obtained from major cereals crop in the human diet, 17 percent calorie and 19 percent protein is obtained from wheat in the world developing countries (FAO-STAT, 2009).

Assured irrigation facility is available only for 75 percent of the total irrigable area of the country (1.76 million ha). Out of the total wheat cultivated area of the country, 64% area is under irrigation, but it is 79% in Terai region. There is opportunity of wheat cultivation area expansion in that

particular land of Terai which used to remain fallow after rice harvesting due to increase in irrigation facility (MOAD, 2014). About 84 percent area of wheat in Nepal is under rice-wheat cropping system (Pokhrel et al, 1995). Similarly, per capita wheat consumption has increased from 17.4 kg in 1972 to 60 kg in 2007 (Ghimire et al, 2012).

These experiments were carried out in Regional Agricultural Research Station (RARS), Tarahara, Sunsari, Nepal in both years. This research station is located at 26°42' North latitude and 87°16' East longitude, and 136 meter above seas level. The climate of the farm is sub-tropical. The soil texture is dominated by clay loam and the pH of the soil ranges from 6.5-7.0. Nearly available of water table from the surface and high soil moisture sometimes become problem for winter crops experiment. The minimum and maximum temperature of this station was recorded 9.3°C (January) and 35.5°C (April) in 2014 while it was 9.8°C (January) and 33.5°C (July) in 2015 respectively. There was higher precipitation in 2015 (2031.1 mm) than 2014 (1653.8 mm). The occurrence of rainfall from December to March was higher (45.7 mm) in 2015 whereas it was 33.2 mm in 2014 at RARS, Tarahara.

Modern wheat cultivars often exhibit very wide geographical adaption. National Wheat Research Program of the country has released total 22 varieties of wheat from 1960 to 2012. Positive change in agriculture became

possible through technology development. Availability of high yielding varieties to the farmers is one the reason of increased production and productivity of agricultural commodity with the use of identified technologies. These experiments were designed to identify high yielding genotypes of wheat for the farmers of eastern Terai of the country.

Materials and Methodology

Regional Varietal Trial (Early Sown)

The Regional Varietal Trial (RVT) of wheat (early set) was seeded in Randomized Complete Block Design (RCBD) with three replications in both years 2014 and 2015. The same methodologies were applied in RVT (late) for the both years. The plot size of 10 m² was maintained with row to row spacing of 25 cm and seeding was done continuously. The fertilizer was applied at the rate of 100:50:25 NPK kg/ha. Complete dose of phosphorus and potassium, and half dose of nitrogenous fertilizer were applied as basal dose and remaining half dose of nitrogenous fertilizer was applied in two split doses, that is, in 25 and 45 days after seeding. Two irrigations before each top dressing of the fertilizer were also applied. The RVT early was seeded in 13 December 2014 and 11 December 2015 in first and second year's experiment. Total eighteen genotypes namely BL 3264, BL 4018, BL 3555, BL 4341, BL 4350, BL 4012, BL 3401, BL 3978, BL 4318, NL 1140, NL 1164, NL 1177, BL 4406, BL 4407, NL 1191, NL 1194 were included in the experiment of 2014. Traits like days to heading, days to maturity, plant height (cm), panicle length (cm), spikes/m² and grain yield were studied in the experiment of 2014. Similarly, sixteen genotypes namely BL 3263, BL 4018, BL 3555, BL 4012, BL 3978, BL 4406, BL 4407, NL 1177, NL 1193, BL 4335, BL 4341, BL 4463, NL 1190, NL 1127, Bhrikuti and Aditya were included in the experiment of 2015. Bhrikuti and Aditya were included as standard check varieties in both years. Days to heading, days to maturity, plant height (cm), panicle length, spikes/m², gains/spike, 1000 grain weight (gm) and grain yield characters were studied in the experiment of 2015. MSTAT-C and Excel software were used to analyze the data.

Regional Varietal Trial (Late Sown)

Regional Varietal Trial (late sown) experiment of wheat was also carried out in 2014 and 2015 at RARS, Tarahara. Below explained methodology was applied in RVT (late) experiment of both years 2014 and 2015. The experiment was seeded in RCBD design with three replications. The plot size of 10 m² was maintained and fertilizer was applied at the rate of 100:50:25 NPK kg/ha. The complete dose of phosphorus, potassium, and half dose of nitrogenous fertilizer was applied as basal dose. And remaining half dose of nitrogenous fertilizer was applied in two split doses in 25 and 45 days after seeding as top dressing. The experiment was irrigated two times that is, 25 and 45 days after seeding. The experiment was seeded in 29 December

2014 and 26 December 2015 in first and second year of experiment. Total eighteen genotypes namely, BL 3264, BL 4018, BL 3555, BL 4341, BL 4350, BL 4012, BL 3401, BL 3978, BL 4316, NL 1140, NL 1164, NL 1177, BL 4406, BL 4407, NL 1191, NL 1193, Bhrikuti and Aditya genotypes were included in the RVT (late) experiment of 2014. Similarly, sixteen genotypes namely BL 3264, BL 4018, BL 3555, BL 4012, BL 3978, BL 4406, BL 4407, NL 1177, NL 1193, BL 4335, BL 4341, BL 4463, NL 1190, NL 1207, Bhrikuti and Aditya were included in RVT experiment of 2015. Bhrikuti and Aditya were standard check variety. Days to heading, days to maturity, plant height (cm), panicle length (cm), spikes/m² and grain yield traits were studied in the experiment of both year 2014 and 2015. MSTAT-C and Excel software were used to analyze the data

Result and Discussion

Regional Varietal Trial (Early Sown) 2015

Out of the sixteen genotypes included in the RVT (early sown) experiment of 2015, the longest days to heading (78 days) and maturity (106 days) was observed in BL 4463 genotype whereas BL 3978 genotype was found early in heading (71 days) and maturity (99 days). The highest plant height (89.86 cm) was observed in BL 4406 Similarly NL 1177 identified as dwarf (71.80 cm) amongst the tested genotypes. Regarding panicle length of the tested genotypes, longest panicle (11.20 cm) was found in BL 4463 and panicle of BL 3263 and BL 4335 was observed short (8.80cm). The difference in tillers/m² and grains/spike among the tested entries was not found significant. The bold grains (45.47 gm of 1000 grains) were found in BL 4335 whereas low 1000 grain weight (30.03 gm) was found in NL 1190 genotype (table-1). BL 4018 recorded the highest grain yield (3166 kg/ha) whereas BL 4012 (3083 kg/ha) and NL 1207 (3080 kg/ha) identified as second top yielding genotypes in the RVT (early sown) of 2015. The difference in grain yield due to genotypes was found significant. BL 4018 produced 25 percent higher grain yield than standard check Bhrikuti (2527 kg/ha) whereas NL 1207 produced 22 percent more grain yield compared to the same check variety (Table1).

Regional Varietal Trial (Early Sown) 2014

Out of the eighteen genotypes included in the experiment of RVT (early sown) conducted in 2014, NL 1177 genotype was observed late in heading (74 days) and maturity (104 days). Similarly, BL 4018 genotype was found most early in heading (64 days) and maturity (95 days). Similarly NL 1193 also found early days to heading (65 days) and maturity (94 days). In case of plant height and panicle length, highest plant height (97.13 cm) was observed in BL 3978 genotype whereas the shortest plant height was observed in the standard check variety (84.07 cm). The longest panicle (13.33 cm) was found in BL 4341 genotype whereas shortest panicle was observed in NL 1193 (Table-2). These characters of the tested genotypes found

significantly different due to genotypes. The highest grain yield (3939 kg/ha) was produced by the genotype BL 3555 followed by the genotype BL 4018 (3453 kg/ha). The high yielding genotype BL 3555 recorded 38 percent more grain

yield than standard check variety, Aditya (2860 kg/ha) and 73 percent more grain yield than the next standard check variety, Bhrikuti (2282 kg/ha). The difference in grain yield due to genotypes was found significant (Table 2).

Table 1: Grain yield and other ancillary characters of wheat at RVT (early set) in RARS, Tarahara during 2015

S.N.	Genotypes	Days to heading	Days to maturity	Plant height (cm)	Panicle length (cm)	Grains/spike	1000 grain weight (gm)	Grain yield (kg/ha)
1	BL 3263	72.00	100.00	79.86	8.80	36.67	40.65	2576.00
2	BL 4018	71.33	99.00	88.33	10.40	43.00	40.28	3166.00
3	BL 3555	74.00	102.00	79.60	9.20	35.67	42.74	2763.00
4	BL 4012	76.00	104.00	82.00	11.00	43.33	39.48	3083.00
5	BL 3978	71.00	99.00	87.60	9.53	30.67	40.95	2968.00
6	BL 4406	74.00	102.00	89.86	9.66	32.33	42.96	3017.00
7	BL 4407	74.67	102.00	88.80	10.13	41.67	42.60	2513.00
8	NL 1177	77.33	105.00	71.80	9.06	35.33	36.01	1960.00
9	NL 1193	74.00	102.00	85.83	9.60	30.00	39.10	2105.00
10	BL 4335	75.33	103.00	86.00	8.80	32.33	45.47	2811.00
11	BL 4341	77.00	105.00	85.73	10.13	30.73	38.76	1714.00
12	BL 4463	78.00	106.00	85.06	11.20	34.33	38.69	2432.00
13	NL 1190	76.00	104.00	76.53	8.86	35.33	30.03	1588.00
14	NL 1207	74.37	102.00	88.33	10.06	38.37	41.26	3080.00
15	Bhrikuti	76.00	104.00	87.93	9.93	34.00	37.34	2527.00
16	Aditya	72.00	100.00	85.33	9.26	38.33	42.72	2196.00
	Grand mean	74.56	102.62	84.16	9.72	35.75	39.94	2530.00
	F test	**	**	**	*	NS	**	**
	CV%	0.42	0.39	5.18	8.65	14.87	7.96	16.68
	LSD	0.706	0.906	9.780	1.889		7.14	947.5

Note: ** = p value < 0.01, * = p value < 0.05

Table 2: Grain yield and other ancillary characters of wheat at regional varietal trial (early set) in RARS, Tarahara during 2014

S.N.	Genotypes	Days to heading	Days to maturity	Plant height (cm)	Panicle length (cm)	Spikes/m ²	Grain yield (kg/ha)
1	BL 3264	66.00	96.00	92.60	10.06	204.67	3088.00
2	BL 4018	63.67	94.67	95.46	11.00	260.33	3453.00
3	BL 3555	67.00	97.00	92.00	10.40	228.00	3939.00
4	BL 4341	69.00	98.67	95.87	13.33	232.33	2654.00
5	BL 4350	67.67	97.33	92.47	12.73	193.67	2455.00
6	BL 4012	72.00	101.67	89.41	11.86	252.33	2905.00
7	BL 3401	70.33	100.33	90.93	11.86	240.67	2326.00
8	BL 3978	66.00	95.33	97.13	11.86	224.67	2969.00
9	BL 4318	70.67	102.33	89.80	11.73	185.00	2253.00
10	NL 1140	69.00	100.67	87.33	11.53	260.67	2447.00
11	NL 1164	69.33	100.33	94.67	12.93	216.67	2332.00
12	NL 1177	74.33	104.00	88.40	12.06	239.33	2446.00
13	BL 4406	66.00	99.00	92.87	10.80	211.00	3018.00
14	BL4407	66.33	99.33	89.73	11.80	205.33	2702.00
15	NL 1191	66.00	99.00	86.13	10.20	184.67	2156.00
16	Bhrikuti	69.33	101.33	84.07	12.07	195.00	2282.00
17	NL 1193	64.67	94.00	92.93	10.00	206.33	2669.00
18	Aditya	65.33	95.00	93.80	10.53	196.33	2860.00
	Grand mean	67.92	98.67	91.42	11.48	218.72	2719.00
	F test	**	**	**	**	NS	**
	CV%	1.42	2.66	3.03	6.67	17.33	17.10
	LSD	2,148	5.847	6.181	1.707		1036.00

Note: ** = p value < 0.01, * = p value < 0.05

Combined analysis of two year's (2014 & 2015) experimental data of RVT (early set) was also carried out. Amongst the tested genotypes, BL 3555 and BL 4018 identified as high yielding genotypes with the grain yield of 3351 and 3309 kg/ha respectively from over year analysis. BL 3555 recorded 29 and 38 percent higher grain yield than check varieties Aditya and Bhrikuti respectively, and 34 percent more grain yield than national yield of wheat. Similarly, BL 4018 recorded 30 and 37 percent higher grain yield than check varieties Aditya and Bhrikuti respectively, and 32 percent more grain yield than national average. NL 1177 was found late in heading (76 days) and maturity (104 days) whereas BL 4018 and BL 3978 were found early (97

days) in maturity in combined analysis of 2014 and 2015. The highest (92.31 cm) and lowest (76.13 cm) plant height was found in BL 3978 and BL 3264 respectively. The difference in days to heading and maturity, plant height, panicle length and grain yield was found significant due to genotypes in two year's data analysis. In addition to BL 3555 and BL 4018; BL 4012, BL 3978 and BL 3264 identified as promising genotypes. These promising genotypes recorded 32 to 12 percent more grain yield than the yield of standard check Aditya and 24 to 17 percent higher grain yield than next standard check variety Bhrikuti from the analysis of two year data (Table 3).

Table 3: Combined analysis of grain yield and other ancillary characters of RVT (early set) at RARS, Tarahara in 2014-15

S.N.	Genotypes	Days to heading	Days to maturity	Plant height (cm)	Panicle length (cm)	Spikes/m ²	Grain yield (kg/ha)
1	BL 3264	69.00	98.00	76.13	9.43	205.33	2832.00
2	BL 4018	67.50	97.16	91.00	10.70	250.17	3309.00
3	BL 3555	70.50	99.50	85.80	9.80	215.67	3351.00
4	BL 4012	74.00	102.83	85.73	11.43	240.83	2994.00
5	BL 3978	68.50	97.17	92.31	10.70	238.67	2968.00
6	BL 4406	70.00	100.50	91.36	10.23	197.50	2734.00
7	BL 4407	70.50	101.00	89.26	10.97	198.83	2608.00
8	NL 1177	75.83	104.33	80.10	10.57	201.33	2203.00
9	NL 1193	69.33	98.00	89.38	9.80	205.50	2387.00
10	BL 4341	73.00	101.83	90.80	11.73	232.17	2184.00
11	Bhrikuti	72.67	102.67	86.00	11.00	213.17	2404.00
12	Aditya	68.67	97.50	89.57	9.90	200.83	2528.00
	Grand Mean	70.79	100.04	87.37	10.52	216.67	2708.00
	F test						
	Genotypes	**	**	*	**	NS	**
	Year	**	**	**	**	NS	*
	G x Y	**	NS	NS	*		NS
	CV%	0.98	1.95	9.09	7.07	16.69	19.93
	LSD	1.070	3.023	9.234	0.865		627.4

Note: ** = p < 0.01, * = p < 0.05

Table 4: Grain yield and other ancillary characters of wheat at regional varietal trial (late set) in RARS, Tarahara during 2015

S.N.	Genotypes	Days to heading	Days to maturity	Plant height (cm)	Panicle length (cm)	Grains/spike	Grain yield (kg/ha)
1	BL 3264	65.00	92.33	86.86	8.93	36.00	2783.00
2	BL 4018	60.67	89.33	85.20	7.93	29.67	2864.00
3	BL 3555	70.00	97.33	83.40	8.27	30.33	3326.00
4	BL 4012	70.67	98.67	82.73	9.20	36.33	3089.00
5	BL 3978	63.00	91.33	82.20	9.60	30.33	2436.00
6	BL 4406	63.67	91.67	89.07	8.63	24.33	2610.00
7	BL 4407	64.00	92.33	86.80	10.07	24.33	2740.00
8	NL 1177	71.00	99.00	87.93	9.26	36.00	3359.00
9	NL 1193	59.33	90.67	83.00	8.26	24.67	2640.00
10	BL 4335	63.67	91.67	82.80	9.06	27.67	2388.00
11	BL 4341	65.00	93.33	89.73	9.26	21.33	749.00
12	BL 4463	73.33	101.33	85.46	8.86	27.33	1821.00
13	NL 1190	63.00	91.00	80.33	9.46	21.67	2303.00
14	NL 1207	71.00	98.67	86.13	9.06	30.33	2052.00
15	Bhrikuti	70.00	98.00	86.06	9.20	31.67	2699.00
16	Aditya	62.33	90.33	84.66	9.80	35.00	2277.00
	Grand mean	65.97	94.18	85.15	9.05		2508.00
	F test	**	**	NS	NS	**	**
	CV%	2.70	2.66	7.17	12.05	6.72	18.52
	LSD	4.007	5.625			10.72	1027.00

Note: ** = p < 0.01

Regional Varietal Trial (Late Sown) 2015

Out of the tested genotypes, BL 4463 was found late in heading (73 days) and maturity (101 days) whereas standard check Aditya was found earliest in heading (62 days) and maturity (90 days). The difference in heading and maturity days of the tested genotypes was found significant due to genotypes. The difference in plant height, panicle length and spike/m² of the tested genotypes was found non-significant due to genotypes. Maximum number of grains per spike (36) was observed in BL 4012, BL 3264 and NL 1177. Similarly, BL 4335 had lowest number of grains per spike (11). In case of grain yield of the tested genotypes in late sown RVT, NL 1177 recorded the highest grain yield (3359 kg/ha) followed by BL 3555 (3326 kg/ha). BL 4018 and BL 4012 genotypes produced 6 and 13 percent higher grain yield (2864 and 3089 kg/ha) than the yield of standard check Bhrikuti (2699 kg/ha). The lowest grain yield (749 kg/ha) was produced by BL 4341 genotype in late sown condition. The difference in number of grains per spike and grain yield of the tested genotypes was found significant due to genotypes (Table 4).

Regional Varietal Trial (Late Sown) 2014

In RVT (late sown) experiment of 2014, the difference in days to heading and maturity, plant height and panicle length were observed significant due to genotypes. But,

difference in spikes/m² and grain yield of the tested genotypes was found non-significant due to genotypes. The grain yield of the genotypes included in the experiment was observed relatively low compared with the grain yield of the same genotypes in 2015. Certain lands of regional agricultural research station, Tarahara are sometimes become unfit for winter crop due to excess soil moisture in the field (Anonymous, 2015)

Over year analysis of RVT (late sown) was also carried out. BL 4012 genotype has found late in heading (77 days) and maturity (101 days) whereas BL 4018 and Aditya was found early in heading (63 & 64 days) and maturity (94 & 93 days) in over year analysis of 2014 and 2015. The maturity day of high yielding genotypes BL 3555 and NL 1177 has been found 98 and 100 days respectively. The difference in days to heading and maturity due to genotypes was found significant. In case of plant height, highest plant height has been observed in BL 4341 genotype (89.17 cm) whereas BL 3555 was the dwarf genotype (79.57 cm) in the analysis over year. The difference in panicle length and spikes/m² among the tested genotypes was found non-significant due to genotypes. Regarding the grain yield, NL 1177 produced the highest grain yield (2933 kg/ha) followed by BL 3555 (2764 kg/ha). The difference in grain yield due to genotypes was found significant (Table 5 & Table 6).

Table 5: Grain yield and other ancillary characters of wheat at regional varietal trial (late set) in RARS, Tarahara during 2014

S.N.	Genotypes	Days to heading	Days to maturity	Plant height (cm)	Panicle length (cm)	Grains/spike	Grain yield (kg/ha)
1	BL 3264	65.33	95.33	76.33	8.00	180.00	2215.00
2	BL 4018	65.33	95.33	83.60	8.67	176.33	2399.00
3	BL 3555	69.00	99.00	75.73	9.03	170.33	2202.00
4	BL 4341	70.33	100.67	88.60	9.33	168.33	1946.00
5	BL 4350	70.33	100.33	83.07	9.30	175.67	2045.00
6	BL 4012	82.67	103.33	78.87	8.80	175.33	2206.00
7	BL 3401	70.33	100.33	82.53	9.30	177.00	2094.00
8	BL 3978	65.00	95.00	79.33	9.46	164.67	1746.00
9	BL 4316	71.33	101.33	80.00	9.66	197.0	1753.00
10	NL 1140	69.33	99.33	71.60	9.00	149.0	1981.00
11	NL 1164	70.33	100.33	81.47	9.76	181.67	1914.00
12	NL 1177	70.67	100.67	85.93	9.50	165.0	2508.00
13	BL 4406	64.00	94.00	86.26	9.40	183.0	2210.00
14	BL 4407	66.33	96.33	85.07	9.73	154.67	2289.00
15	NL 1191	64.0	94.00	73.46	8.37	142.33	2130.00
16	Bhrikuti	70.00	100.00	80.20	9.00	164.33	1913.00
17	NL 1193	63.00	93.00	81.13	8.40	151.	2293.00
18	Aditya	64.67	95.00	85.73	8.33	134.33	2437.00
	Grand mean	68.44	97.96	81.06	9.05	163.89	2127.00
	F test	**	**	**	*	NS	NS
	CV%	7.21	1.60	4.79	7.03	10.84	13.79
	LSD	11.00	3.496	8.114	1.057		

Table 6: Combined analysis of grain yield and other ancillary characters of RVT (late sown) wheat of 2014 and 2015.

S.N.	Genotypes	Days to heading	Days to maturity	Plant height (cm)	Panicle length (cm)	Spikes/m ²	Grain yield (kg/ha)
1	BL 3264	65.17	93.83	81.70	8.46	194.50	2378.00
2	BL 4018	63.00	93.83	84.40	8.30	194.83	2632.00
3	BL 3555	69.50	98.16	79.57	8.65	190.50	2764.00
4	BL 4012	76.66	101.00	80.87	9.03	186.67	2647.00
5	BL 3978	64.00	93.16	80.87	9.53	182.00	2091.00
6	BL 4406	65.00	92.83	87.67	9.01	199.67	2409.00
7	BL 4407	65.17	94.33	85.93	9.90	163.83	2515.00
8	NL 1177	70.83	99.83	88.56	9.38	199.17	2933.00
9	NL 1193	61.17	91.83	82.21	8.33	194.13	2551.00
10	BL 4341	67.67	97.00	89.17	9.30	173.17	1347.00
11	Bhrikuti	70.00	99.00	83.13	9.10	203.17	2306.00
12	Aditya	63.50	92.67	85.20	9.06	171.00	2357.00
	Grand Mean	66.80	95.62	84.10	9.00	187.73	2411.12
	F test						
	Genotypes	**	**	*	NS	NS	**
	Year	*	**	**	NS	**	**
	Geno x Year	NS	NS	NS	NS	NS	**
	CV %	6.80	2.60	6.05	9.63	16.80	17.99
	LSD	7.046	3.852	7.893			672.7

Conclusion

BL 3555, BL 4018, BL 4012, BL 3978 and BL 3264 genotypes of wheat produced 12 to 32 percent more grain yield than the standard check Aditya and 17 to 39 percent higher grain yield than next standard check Bhrikuti. Similarly, these promising genotypes recorded 13 to 34 percent more grain than the national average grain yield and 8 to 28 percent higher grain yield than average grain yield eastern Terai. So, above mentioned genotypes have been found promising in early sown condition of eastern Terai and is recommended to verify in farmers field of different agro-environments.

Similarly, NL 1177 and BL 3555 genotypes produced 24 to 17 percent higher grain yield than standard check variety Aditya and Bhrikuti. These genotypes recorded 17 to 11 percent more grain yield than the existing national average and 12 to 6 percent higher than average grain yield of eastern Terai. Therefore, it can be concluded that NL 1177 and BL 3555 genotypes are promising for late sown condition of eastern Terai and is recommended to include in outreach research program of different agro-environments.

Acknowledgements

Authors are grateful to the then Regional Director Dr BN Chaudhary and present Regional Director Dr. HK Shrestha for their administrative support in conducting experiments. The authors express heartfelt thanks to the field staffs of RARS, Tarahara for their untiring efforts in conducting the experiments in the field. National Wheat Research Program, Bhairahara also deserve special thanks for supporting genetic material.

References

- Anonymous (2014). Annual Report (2013/14). Regional Agricultural Research Station, Tarahara, Sunsari, Nepal, 2015.
- Anonymous (2015). Annual Report (2014/15). Regional Agricultural Research Station, Tarahara, Sunsari, Nepal, 2015.
- FAO-STAT (2009) Available at <http://faostat.fao.org/site/339/default>
- Ghimire YN, S. Gautam and MB Nepali (2012). Wheat Research and development during 25 years of NARC-CIMMYT collaboration: A review. In: *Proceedings of the 10th National Outreach Workshop* held at Regional Agricultural Research Station, Lumle, Kaski during 27-28 February, 2012. P 320-328.
- Hans-Joachim Braun and Thomas Payne, (2011). Mega environmental Breeding. In: *Physiological Breeding 1 : Interdisciplinary Approaches to Improve Crop Adaptation*. Methew Reynolds, Alistair Park and Debra Mullan (Eds).
- MOAD, (2014). Ministry of Agricultural Development, Agribusiness Promotion and Statistics Division, Singh Durbar, Kathmandu. Statistical Information on Nepalese Agriculture, 2013/2014.
- Nature Genetics (2009) Editorial. The cup half empty **41**: 6. .
- Pokhrel DR, R. Yadav and G. Subedi, 1996. Wheat varietal investigation under late sown irrigated condition for Terai, Tars and Lower Valleys. In: *Summary of the wheat research reports*. National Winter Crops Research Workshop, Regional Agricultural Research Station, Sidharthanagar, Bhairahawa, Nepal.
- Trethowan RM, Hodson D., Braun H.J. and Pfeiffer WH (2005). Wheat breeding environments. In: *Dubin J, Lantican MA and Morris ML (Eds). Impact of International Wheat Breeding Research in the Developing World, 1988-2002*. P 4-11. Mexico, CIMMYT.