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Research Article

EVALUATION OF WHEAT GENOTYPES IN FAR WESTERN HILLS OF NEPAL

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Abstract

Coordinated Varietal Trial (CVT) and Advanced Varietal Trial (AVT) of wheat were conducted at Regional Agricultural Research Station, Doti during the year 2012 and 2013. Microplot Yield Trial (MPYT) were conducted during the year 2013. Total 20 genotypes were included in CVT experiment of both years. Although the difference in grain yield due to genotypes was not found significant during the year 2012, NL 1144 recorded the highest grain yield (4309 kg/ha) followed by NL 1140 (4295 kg/ha) and NL 1147 (4165 kg/ha) respectively. But in the year 2013, NL 1097 produced the highest grain yield (4641 kg/ha) followed by NL 1135 (4383 kg/ha) and NL 1164 (4283 kg/ha) respectively. Statistically, the difference in grain yield due to genotypes was not found significant in the year 2013. Combined analysis over years was also carried out. Out of 20, only 10 genotypes were included in the CVT experiment, which were found similar in both years. Genotypes NL 1097 (4079 kg/ha), NL 1140 (3814 kg/ha) and NL 1093 (3773 kg/ha) were found high yielding genotypes for river basin agro-environment of far western hills. Statistically, effect of year in tested characters was found significant whereas treatment effect was observed non-significant. Similarly, 20 genotypes of wheat were included in AVT of wheat during the year 2012 and 2013. Out of the genotypes included in AVT during the year 2012, KISKADEE No.1recorded the highest grain yield (3824 kg/ha) followed by CHEWINK No. 1 (3643 kg/ha) and WK 2120 (3583 kg/ha). Statistically all the tested characters except grain yield were found significantly different due to genotypes. But in the same experiment of the year 2013, WK 2412 genotype recorded the highest grain yield (4407 kg/ha) followed by WK 2411 (4329 kg/ha) and Munal-1 (4054 kg/ha). Statistically the difference in grain yield and other tested characters were found significantly different. Due to dissimilarity in the tested genotypes we could not carry-out the combined analysis over years. Total 30 genotypes were included in the MPYT experiment of the year 2013. Genotype WK 2272 recorded the highest grain yield (6080 kg/ha) followed by the genotypes WK 2274 (5152 kg/ha) and WK 2278 (4480 kg/ha) respectively. Statistically, the difference in grain yield and other tested characters were found significantly different due to genotypes.

Keywords: Wheat genotypes; evaluation; CVT; AVT; MPYT; FFT; PVS; grain yield; far western hills

Introduction

Wheat (*Triticum aestivum*) is the third most important cereal crop in terms of area (754243 ha) and production (1727246 Mt) of the nation. But, wheat is the first crop in area coverage (52192 ha) and production (101045 Mt) in far western hills. The average productivity of wheat in far western hills is 15.45% lower (1936 kg/ha) compared to its national average productivity (2290 kg/ha). Among the total cultivated area (3091000 ha) of the country, about 67% cultivated area (759579 ha) is under rainfed agro-ecosystem. Due to low productivity of wheat, its input/output ratio in irrigated and un-irrigated condition is only 1.216 & 1.275 respectively (MoAD, 2012/13). Out of the tested entries of wheat during 2009/10, WK 1806 produced the highest grain yield (3250 kg/ha) followed by 3EBWYT514 and WK 1204 (3041 kg/ha) in Doti district whereas in Dadeldhura district, the genotype WK 1789 produced the highest grain yield (2500 kg/ha) followed by the genotypes 3EBWYT 515 (2468 kg/ha) and WK 1204 (2166.67 kg/ha) respectively. These promising genotypes of wheat produced 28-36% higher grain yield than the farmers' local in Doti district and 32-53% higher grain yield compared to farmers' local in Dadeldhura district (HK Prasai *et al*, 2011).

NL 1097 (4079 kg/ha), NL 1140 (3814 kg/ha), NL 1093 (3773 kg/ha) and NL 1135 (3620 kg/ha) genotypes of wheat have been identified as promising for river basin agro-environment of far western hills. Similarly, Danphe-1 (5254 kg/ha), Munal-1 (5231 kg/ha) and Kiskadee (5202 kg/ha) genotypes of wheat have been identified as promising for mid hills agro-environment of far western hills (RARS, 2012/13).

The modern varieties and improved farming practices have had a large impact on improved crop cultivation. Most of the increased production and productivity came from the availability of high yielding varieties as farmers gradually replaced their low yielding traditional varieties with high yielding. This positive change in agricultural development

has resulted from the technological progress, which helped to benefit to millions of people and contributed to sustaining food security in the face of growing population pressure to some extent on limited natural resources.

Materials and Methods

The Coordinated Varietal Trial (CVT) and Advanced Varietal Trial (AVT) were carried out at Regional Agricultural Research Station (RARS), Bhagetada, Doti in 2012 and 2013, whereas Micro plot Yield Trial (MPYT) was carried out during 2013. The experiments was located at altitude of 610 m above mean sea level on 29°15' north latitude and 80°55' east longitudes. The soil was light texture, low organic matter (1-2 %) and acidic in nature containing pH 6. All experiments were carried out in Randomized Complete Block Design. Total twenty genotypes namely BL 3819, NL 1042, NL 1044,NL1073,NL1093,NL 1094,NL1097,BL3814, BL 3978, BL 1009,NL 1133,NL 1135,NL 1136,NL 1140,NL 1144,NL 1143,NL 1147,Gautam,Bhrikuti and RR 21 were included in the CVT experiment of the year 2012.Similarly, BL 3978, NL 1093, NL 1094, NL 1097, NL 1135, NL 1140, NL1143, BL 4316, BL 4341, BL 4343, BL 4347, BL 4350, NL 1164, NL1169, NL1171, NL1172, NL1177, Gautam, Bhrikuti and RR 21genotypes of wheat were included in the CVT experiment of the year 2013. The genotypes was seeded the plot size of 8m^2 and it was replicated twice in both year.

Total 20 genotypes namely WK 2110,WK 2192,WK 1661,WK 2120,WK 1487,WK 2130,WK 2190, WK 2135,WK 2191, WK 1204, WK 2144,WK 2189,Chewink-1, WK 2137, Kiskadee-1, WK 2181, WK 2156,WK 2186,WK 2154 and Chyakhura-1 were included in the AVT experiment of the year 2012. Similarly, WK 1118, WK 1792,WK 2407,WK 2408, WK 1204,WK2409, WK 2410,WK 2411, WK 2412,Munal-1, WK 1153, WK 2148, WK 2152, WK 2183, Chyakhura-1, WK 2123, WK 2180 and WK 1481 genotypes of wheat were included in the AVT experiment of the year 2013. The genotypes were seeded in the plot size of 4 m^2 and it was replicated three times in both years.

Total 30 genotypes of wheat namely WK 2208, WK 2216, WK 2244, WK 2245,WK 2246,WK 2248, WK 2284, WK 2254, WK 2259, WK 1204, WK2261,WK 2272, WK 2273,WK 2274,WK 2278, WK 2290, WK 2291, WK 2293, WK 2294, Munal-1, WK 2296,WK 2297,WK 2189,WK 2245, WK 2413, WK 2408,WK 2414,WK 2415,WK2412 and WK 1481 were included in micro-pot yield experiment carried out at RARS, Doti during the year 2013. These genotypes were seeded in the plot of 2 m^2 area and it was replicated three times.

The planting time of wheat for all trials was November for all years. The chemical fertilizers were applied at the rate of 80:60:40NPK kg/ha in all experiments. Half dose of nitrogenous fertilizer and full dose of phosphorus and potash was applied as basal dose and remaining half dose of nitrogenous fertilizer was applied after 21 days of seeding, that is, after first irrigation. Irrigation was applied five times during the crop cycle. Cultural practices and plant protection measures were applied as per recommendation.

Table 1: Grain yield and other ancillary characters of wheat genotypes in CVT during 2012

S.N.	Genotypes	Heading days	Maturity days	Plant height (cm)	Grain yield (kg/ha)
1	BL 3819	106.5	142.5	95	2665
2	NL 1042	92.5	132	95	3869
3	NL 1044	101	139	82	2193
4	NL 1073	93	133	91	2848
5	NL 1093	102	138	104	3676
6	NL1094	101	135	95	2780
7	NL1097	101	137.5	98	3517
8	BL 3814	101.5	137	105	3034
9	BL 3978	90	128.5	102	3330
10	BL 1009	95	134	126.5	3430
11	NL 1133	104.5	139	102.5	3084
12	NL 1135	105.5	140.5	86.5	2887
13	NL1136	102	140	91.5	3723
14	NL 1140	94	132	88.5	4295
15	NL1144	100	136	103.5	4309
16	NL 1143	99.5	136	93	2469
17	NL1147	100.5	137.5	98.5	4165
18	Gauam	102	139	95	3279
19	Bhrikuti	103	139	89	2285
20	RR 21	92	131.5	103.5	3336
	F-test	**	**	**	NS
	CV %	0.59	0.93	6.29	12.90
	$LSD_{0.05}$	1.22	2.65	12.79	

Result and Discussion

The results of the experimental trials showed that there was variation in growth, grain yield and yield components of wheat genotypes among and within years. Grain yield is resultant of genetic capacity, environmental conditions and agronomic practices. This trait is affected from yield components (Dogan, 2002; Pireivatlou *et al.*, 2011); therefore yield and yield components could be considered and studied in breeding programs (Carew *et al*., 2009). Out of the genotypes included in the CVT experiment of the year 2012, NL 1144 recorded the highest grain yield (4309 kg/ha) followed by NL 1140 (4295 kg/ha), NL 1147 (4165 kg/ha), NL1042 (3869 kg/ha), NL 1136 (3723 kg/ha) and NL 1093 (3676 kg/ha) respectively. Statistically, the difference in heading days, maturity days and plant height were found significant but the difference in grain yield due to genotypes was not found significant (Table 1). Although the difference in grain yield due to genotypes was not observed significant, these promising genotypes produced 12.17 to 31.41% higher grain yield compared to the grain yield of standard check Gautam. Amongst the tested entries of the year 2013, NL 1097 produced the highest grain yield (4641 kg/ha) followed by NL1135 (4383 kg/ha), NL 1135 (4383 kg/ha), NL 1164 (4283 kg/ha), NL 1171 (4091 kg/ha) and BL 4316 (4000 kg/ha) respectively. Statistically, the difference in heading days, maturity days, and grain/spike were found significant whereas the differences in tested traits such as plant height, spikes/m^2 and grain yield was not found significant due to genotypes (Table 2). The high yielding genotype, NL 1097, produced 17.25% more grain yield compared to the grain yield of the standard check Gautam.

NL 1097 (4079 kg/ha), NL 1140 (3814 kg/ha) and NL 1093 (3773 kg/ha) genotypes of wheat identified as promising from the combined analysis over year (2012-2013). Statistically, the effect of treatment in days to heading and maturity was found significant whereas effect of year in the tested characters was observed significantly different. Grain number per spikelet was considered as the main yield component in wheat by Hsu and Walton (1971). It was found significant for years and interaction between years and genotypes but non-significant for genotypes (Table 3).

Table 2: Grain yield and other ancillary characters of wheat genotypes in CVT during 2013

S.N.	Genotypes	Heading days	Maturity days	Plant height (cm)	Spikes/m^2	Grains/spike	Grain yield (kg/ha)
1	BL 3978	93	134.5	98.45	68.7	36.25	3450
2	NL 1093	109.5	145	105.5	67.2	48.95	3950
3	NL 1094	109	140	102.35	65.75	54	3583
4	NL1097	107	146.5	102.6	81.85	39.4	4641
5	NL 1135	111.5	147.5	93.1	60.45	46.25	4383
6	NL1140	100	135.5	98.35	81.6	30.5	3333
7	NL 1143	105.5	140	100.75	78.35	47.25	3716
8	BL 4316	103.5	143	104.6	69.35	63.5	4000
9	BL 4341	105	140.5	108.45	64.6	33.25	2866
10	BL 4343	99.5	143	98.6	70.75	43.15	3691
11	BL 4347	107	141.5	105.25	70.95	42.25	3483
12	BL 4350	108	142	100.35	56.5	47.6	3199
13	NL 1164	102.5	140.5	109.7	61.95	46.4	4283
14	NL 1169	104	138.5	102.85	69.2	41	3883
15	NL 1171	107.5	142	103.6	68.5	41.25	4091
16	NL 1172	98	140.5	100.6	68.2	31	3516
17	NL 1177	110	147	102.45	67.85	37.15	3616
18	Gautam	108	146	109.5	63.1	4135	3958
19	Bhrikuti	110.5	147	93	46.75	43.5	3533
20	RR 21	106	143.5	108.35	65.7	26.95	3076
	F-test	**	**	NS	NS	*	NS
	CV %	2.68	2	4.85	20.23	18.28	14.25
	$LSD_{0.05}$	5.91	5.95			16.08	

Table 3: Combined analysis of grain yield and other ancillary characters of wheat genotypes over years (2012-2013)

S.N.	Genotypes	Heading days	Maturity days	Plant height (cm)	Spikes/m^2	Grains/spike	Grain yield (kg/ha)
1	BL 3978	91.5	131.5	100.22	68.85	31.95	3390
2	NL 1093	104.75	140.25	105	60.35	35.17	3773
3	NL1044	105	137.5	98.67	64.12	39.62	3182
4	NL1097	104	142	100.3	72.92	32.47	4079
5	NL 1135	108.5	144	89.8	87.47	34	3620
6	NL 1140	97	133.75	93.42	86.55	33.55	3814
7	NL 1143	102.5	138	96.87	76.67	38.57	3105
8	Gautam	105	142.5	102.25	61.3	32.57	3619
9	Bhrikuti	106.75	143	91	51.62	32.5	2909
10	RR 21	99	137.5	105.2	71.47	28.95	3122
	Treatment (A)	**	**	NS	NS	NS	NS
	Year (B)	**	**	*	NS	*	**
	A x B	NS	*	NS	NS	*	*
	CV %	2.13	1.03	7.67	15.86	23.82	12.04

Table 4: Grain yield and other ancillary characters of wheat in AVT during 2012

S.N.	Genotypes	Heading days	Maturity days	Plant height (cm)	Grain yield (kg/ha)
1	WK 2110	99.33	146	116.67	3354
2	WK 2192	114.33	148.67	122.33	2882
3	WK 1661	100	139.33	101	3368
4	WK 2120	99.67	142.67	118	3585
5	WK 1487	98.33	142	125	3036
6	WK 2130	109.67	149	93.67	2995
7	WK 2190	110.33	151.33	87	2992
8	WK 2135	100	139.33	91	2985
9	WK 2191	106.33	146.33	122.33	3097
10	WK 1204	104	144	82.33	3038
11	WK 2144	112.33	149	110.33	3290
12	WK 2189	97.67	137.67	113	2604
13	Chewink-1	102.67	140.33	99.67	3643
14	WK 2157	98.67	139.33	117.33	2834
15	Kiskadee-1	102	141	100.33	3824
16	WK 2181	101.67	140.33	99.33	2895
17	WK 2156	96.67	138.67	120.67	3088
18	WK 2186	102	141	101.67	3149
19	WK 2154	99.33	139.67	98	3268
20	Chyakhura-1	102	139.67	99.33	3310
	F-test	**	**	**	NS
	CV %	1.78	1.81	7.95	15.73
	$LSD_{0.05}$	3.02	4.27	13.92	

Total 20 genotypes of wheat were included in the AVT experiment of the year 2012. Out of the tested genotypes, Kiskadee-1 (3824 kg/ha), Chewink-1 (3643 kg/ha), WK 2120 (3585 kh/ha), WK 1661 (3368 kg/ha) and WK 2110 (3354 kg/ha) identified as promising genotypes of wheat. Statistically, all traits included in the experiment except grain yield were found significantly different due to genotypes (Table 4). These promising genotypes produced 10.40 to 25.87% higher grain yield compared to standard check variety WK 1204. Out of the genotypes included in the AVT experiment during the year 2013, WK 2412 (4407 kg/ha), WK 2411 (4329 kg/ha), Munal-1 (4054 kg/ha), WK 2408 (4007 kg/ha) and WK 2123 (4002 kg/ha) identified as promising genotypes of wheat by producing more than 4Mt/ha. Statistically, the differences in days to heading, days to maturity plant height, spikes/m^2, grains/spike and

grain yield was found significantly different due to genotypes (Table 5). These promising genotypes produced 13.78 to 24.45% higher grain yield compared to the grain yield of the standard check, WK 1204.

Total 30 genotypes of wheat were included in the MPYT carried out during the year 2013. Amongst the tested entries, WK 2272 recorded the highest grain yield (6080 kg/ha) followed by WK 2274 (5152 kg/ha), WK 2278 (4480 kg/ha) and WK 2414 (4222 kg/ha). Statistically, the difference in heading days, maturity days, plant height, spikes/m^2, grain/spike and grain yield were found significantly different (Table 6). These high yielding genotypes produced 13.80 to 63.88% higher gain yield compared to standard check, WK 1204.

Table 5: Grain yield and other ancillary characters of wheat in AVT during 2013

SN	Genotypes	Heading days	Maturity days	Plant height (cm)	Spikes/m^2	Grains/spike	Grain yield (kg/ha)
1	WK 1118	114.67	149	105.97	62.33	47.17	2724
2	WK 1792	113	147	105.4	55.9	38.86	2512
3	WK 2407	111.67	145	93.23	59.63	28.67	2702
4	WK 2408	111	147.67	102.07	70.63	39.28	4007
5	WK 1204	111	148.67	101.9	65.8	47	3541
6	WK 2409	108.67	147.33	105.83	54.3	48.73	3626
7	WK 2410	111.67	149	109.13	61.23	41.3	3350
8	WK 2411	103	144.67	100.57	66.53	43.37	4329
9	WK2412	108.33	146.33	94.2	84.23	31.5	4407
10	Munal-1	108.67	147.67	103.13	68.13	36.4	4054
11	WK 1153	98.33	143.67	128.13	72.13	32.33	3237
12	WK 2148	114.33	147	181.8	56	43.4	2450
13	WK 2152	101.33	146.33	129.63	67.8	34.27	3316
14	WK 2183	109.33	145.33	102.33	59.97	39.37	2948
15	Chyakhura-1	106.33	146.67	108.73	62.97	42.17	3993
16	WK 2123	109	147.33	95.83	76.73	39.43	4002
17	Chewink-1	108.33	148	102.13	66.03	42.77	3871
18	WK 2128	114.33	150.33	110.07	68.13	40.03	3912
19	WK 2180	108.33	149.33	105.9	55.73	47.2	3797
20	WK 1481	104.67	147	147.7	49.63	42.3	3199
	F-test	**	*	**	**	**	**
	CV%	2.79	1.35	4.85	13.74	14.87	18.12
	$LSD_{0.05}$	5.01	3.27	8.63	14.58	9.89	1047

Table 6: Grain yield and other ancillary characters of wheat in MPYT during 2013

SN	Genotypes	Heading days	Maturity days	Plant height (cm)	Spikes/m^2	Grains/spike	Grain yield (kg/ha)
1	WK 2208	108	138.5	132.35	88.85	33	3375
2	WK 2216	105.5	137	138.1	69.35	38.6	3625
3	WK 2244	101.5	129.5	138.35	58.6	47.7	3483
4	WK 2245	127	153	118.6	76.35	33.35	3057
5	WK 2246	103.5	139	130.6	70.35	43	3325
6	WK 2248	103.5	137	128.35	62.85	45.5	3470
7	WK 2284	109	143.5	139.35	60.35	47.8	3801
8	WK2254	106.5	140.5	120.25	71.75	31.5	3012
9	WK 2259	106.5	129.5	94.6	62.85	28.55	2190
10	WK 1204	102	133.5	100.45	58.75	42.15	3710
11	WK 2261	106.5	135	119.45	67.95	39.9	3027
12	WK 2272	105	141	108.1	76.1	44.6	6080
13	WK 2273	108	134	96.85	72.25	29.5	2677
14	WK 2274	111	145.5	103.85	90.6	37.1	5152
15	WK 2278	109	145	138	88.1	38.85	4480
16	WK 2290	102.5	137	82.25	41.35	55.85	3155
17	WK 2291	102.5	134.5	103.85	65.85	40.9	3807
18	WK2293	126.5	156	109.75	49.35	54.65	2547
19	WK 2294	110	146.5	128.25	50.45	39.2	2670
20	Munal-1	110	144.5	89.35	61.75	36.7	3356
21	WK 2296	113.5	147	103.35	69.35	58.65	3307

SN	Genotypes	Heading days	Maturity days	Plant height (cm)	Spikes/m^2	Grains/spike	Grain yield (kg/ha)
22	WK 2297	107.5	137.5	106.75	71.2	34.6	3977
23	WK 2189	99	129	133.25	81.1	33.75	3610
24	WK 2245	109	143	130.7	81.85	39.3	3705
25	WK 2413	106	141	94	77.35	43.9	3726
26	WK 2408	105	142.5	99.35	69.7	40.85	3685
27	WK 2414	101.5	136	101.25	75.6	39.95	4222
28	WK 2415	106	142	104.2	61.85	44.5	3860
29	WK 2412	102.5	133.5	93.1	72.2	39.25	3432
30	WK 1481	105.5	142	147.85	55.35	30.65	2812
	F-test	**	**	**	*	**	**
	CV %	2.01	2.4	5.05	17.58	16.69	19.77
	$LSD_{0.05}$	4.41	6.84	11.81	24.68	13.8	1437

Conclusion

The wheat genotypes namely NL1097, NL 1140 and NL 1093 were found promising genotypes for river basin agro-environment (546 meter above sea level) of far western hills. These promising genotypes were similar to standard check variety Gautam and Bhriuti in their maturity and grain yield. So, these promising genotypes need to be tested more in regional varietal trials of far western hills before they are recommended for those regions.

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References

Carew R, Elwin GS, Cynthia G (2009) Factors Influencing Wheat Yield and Variability: Evidence from Manitoba. Canada. *J. Agric. Applied Econ.* **41**(3):625-639.

Dogan R (2002) Determination of Grain Yield and Some Agronomic Characters of Bread Wheat (*Triticum aestivum* L.) Lines. *J. Uludag Univ. Agric. Fac.* **16**(2): 149-158.

Hsu P and Walton PD (1971) Relationships between yields and its components and its structure above the flag leaf node in spring wheat. *Crop Sci.* **11**: 190-193. DOI: 10.2135/cropsci1971.0011183X001100020007x

MoAD (2012/13) Ministry of Agriculture Development. Agri-BusinessPromotion and Statistical Division, Singh Durbar, Kathmandu. Statistical information on Nepalese agriculture (2012/2013).

Pireivatlou AGS, Aliyev RT and Lalehloo BS (2011) Grain filling rate and duration in breadwheat under ırrigated and drought stressed conditions. *J. Plant Physiol. Breed.* **1**(1): 69-86.

Prasai, HK, Shrestha SP, Joshi BP and Bhandari HS (2011) Performance evaluation of wheat and chickpea genotypes at command areas of RARS, Doti. Paper presented at National Winter Crops Workshop held at RARS, Lumle.

RARS (2012/13) Annual report of RARS (Regional Agricultural Research Station), Doti, 2070/71