



Investigation on Suitable Wheat Genotypes for Late Sown Condition in Central Terai Region of Nepal

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ABSTRACT

A field experiment was carried out at Regional Agricultural Research Station, Parwanipur, Bara during 2017 and 2018 to identify suitable wheat genotypes for late sown conditions. The coordinated varietal trial was laid out in alpha lattice design in two replications using twenty wheat genotypes including three standard check varieties Bhrikuti, RR21 and Gautam. There was highly significant to significant difference in grain yield, thousand grain weight and days to heading among the genotypes in both the years. The result demonstrated that highest grain yield was observed in genotype NL 1369 (2559 kg ha⁻¹) followed by NL 1202 (2453 kg ha⁻¹) and Gautam (2023 kg ha⁻¹) during 2017. Similarly, in 2018, genotype NL 1298 (3914 kg ha⁻¹) and NL 1362 (3853 kg ha⁻¹) produced better grain yield followed by Gautam with 3841 kg ha⁻¹. These genotypes were found bold and plump grain with thousand grain weight of BL 4868 (53g), BL 4818 (46g), NL 1360 (43g) and BL 4708 (39g) respectively. The phenological observation reflected that the genotypes BL 4708 (61 days), NL 1326 (65 days), and Gautam (69 days) were found early heading in 2017. Similarly, BL 4868 (67 days), BL 4866 (67 days), NL 1298 (67 days) and Gautam (69 days) were found early in heading days in 2018. The outstanding genotypes will be further evaluated in the outreach research sites and will be considered for the varietal release process.

Keywords: Late sown, Coordinated Varietal Trial, Genotype, Yield attributing character.

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INTRODUCTION

Wheat (*Triticum aestivum* L.) is prominent staple food after rice in Nepal. It is grown 740,150 hectares with 1856191 metric tons and national average productivity is 2.508 kg/ha [8]. Average yield of wheat is very low among the wheat growing countries in the South Asia. With the delay in sowing time from first fortnight of November to first fortnight of December, a decline in yield at 32 kg/ha/day has been reported [9]. Wheat grown in the north-eastern plains is exposed to high temperature coupled with high humidity [2]. Recent effort has focused on breeding for earlier maturing cultivars that escape terminal heat stress and encompass resistance to diseases associated with warm humid environments [3]. It has already been established that high temperature stress can be a significant factor in reducing yield and quality of wheat [11]. Wardlaw [12] reported that mean temperature greater than 15–18°C following anthesis can result in decrease in grain weight at maturity. Annual mean temperature during the growing period of wheat in Terai is 15°C to 30°C [6]. Early maturing varieties- Adoption of early varieties showed 10% yield advantage over long duration varieties [5]. Increase the efficiency of plant selection and by providing new opportunities for exploration of genetic resources [8]. On the average it was estimated that for every 1°C rise in temperature there was a 7-8% loss in grain yield [7].

MATERIAL AND METHODS

The experiment was conducted at Regional Agricultural Research Station, Parwanipur, Bara during winter season of 2017 and 2018. The experiment was laid out in alpha lattice design with two replication. Twenty wheat genotypes were tested along with three checks namely RR21, Bhrikuti and Gautam. Seeding was done on 25th December with 25 cm row spacing. The gross plot size was 5×2 m² (10m²).

Normal cultural practices were followed during crop production. The fertilizer was given @ 100:50:25NPK Kg ha⁻¹ as per recommendation. Full dose of Phosphorus, Potash and half dose of Nitrogen was applied as basal dose. Remaining nitrogen was applied in two split dose at three weeks and seven weeks after seed sowing. The quantitative traits like days to heading, days to maturity, plant height (cm), grains per spike, thousand grain weight (g) and grain yield (Kg ha⁻¹) were recorded. The data of the observed traits were statistically analyzed by ADEL-R software.

RESULTS AND DISCUSSION

Days to Heading

Days to heading was recorded when 50% flowering was observed in the every genotype in a research plot. In both years 2017 and 2018, the days to heading showed significant difference ($P < 0.001$). In 2017, BL 4708 was observed early heading in 60 days of sowing followed by NL1326 (64 days), RR-21 (65 days) of sowing. During 2018 in NL1298, BL4866, BL4868 and check variety RR21 were found earliest in heading (67 days) followed by NL1345, NL1358 in 68 days.

Table 1: Yield and its attributing traits of late sown irrigated wheat genotypes in CVT during 2017 at RARS, Parwanipur

SN	Genotype	DH	DM	PHT(cm)	Grsp	SPMS	TGW(gm)	GY(kg ha ⁻¹)
1	BL4699	67	103	96	41	295	41	2222
2	BL4707	67	103	78	35	345	35	1502
3	BL4708	60	103	86	44	320	44	2317
4	NL1202	68	102	90	49	347	49	2452
5	NL1307	70	102	82	46	273	46	1946
6	NL1325	66	100	80	43	322	43	2046
7	NL1326	60	102	85	44	377	44	2417
8	NL1327	68	104	82	30	224	30	2031
9	BL4818	70	103	93	39	301	39	2349
10	BL4820	68	103	97	41	293	41	2394
11	NL1298	66	101	78	42	393	42	2406
12	NL1311	69	102	81	46	299	46	1996
13	NL1317	69	103	87	39	406	39	1999
14	NL1318	68	103	83	39	388	39	2106
15	NL1322	70	104	84	43	358	43	2353
16	NL1368	71	104	85	30	286	30	2055
17	NL1369	64	101	84	54	296	54	2558
18	BHRİKUTI	69	102	78	40	311	40	1805
19	RR 21	65	100	94	33	337	33	1373
20	GAUTAM	69	104	87	45	297	45	2073
GM		67.475	103	85.83	41.42	323.67	41.425	2120.33
F-test		<0.001	0.06	0.012	0.04	0.56	0.04	0.002
CV%		2.51	1.172	4.81	12.67	15.15	12.6	7.41
LSD ^{0.05}		3.53	2.511	8.61	10.95	102.35	10.95	327.83

Note:DH refers to days to heading, DM indicates days to maturity, PHTfor Plant height(cm), Grps for grains per spike, TGW for 1000 grain weight(g) and GY represents grain yield((kg ha⁻¹)

Days to maturity

The days to maturity of the genotypes is an important parameter in the Terai especially in late sown conditions. The days to maturity was recorded when 75% of the populations peduncle turned yellow. Non significant difference was observed during 2017 while highly significant variation was observed for days to maturity in 2018. The genotypes were matured between 100 to 111days of sowing. Genotypes NL1325, RR21 and NL1358 were found early maturing having the days to maturity of 100,100 and 104 respectively.

Plant height

The plant height was greatly influenced by the time of sowing. In 2017, Plant height of the genotypes differed significantly ($P < 0.001$). The plant height was ranged from 78 to 97 cm for the genotypes wherein highest plant height (97 cm) was observed in BL4820and lowest plant height (78 cm) was recorded in BL

4707 during 2017. On the other hand, range of plant height varied from 68 to 98 cm in 2018 where genotype BL4820 was found tallest (98 cm) and NL1298 was found dwarf (68 cm).

Grains per spike

The number of grains per spike is one of the important yield attributing factors. The grains per spike showed significant difference ($P < 0.05$) in 2017 but non significant variation was observed during 2018. The genotypes NL1369, NL1202 and NL1307 produced the higher number of grains per spike of 54, 49 and 46 respectively. In 2018, the genotype BL4820 produced highest grains per spike (51) followed by NL1369 and NL1362 with 50 grains per spike.

Thousand Grain weight

In 2017, the statistical analysis on 1000 grain weight showed significant difference ($P < 0.05$) among entries (Table 1). The Thousand kernel weight of all the genotypes varied from 30 to 54 g. Maximum 1000 grain weight was recorded from NL1202 (54 g) and NL1307 (46 g). Similarly in 2018, 1000 grain weight was observed highly significant ($P < 0.001$) difference among genotypes (Table 2). BL4868 recorded highest 1000 grain weight of 53 g followed by BL4818 (46 g) and NL1358 (43 g).

Table 2: Yield and its attributing traits of late sown irrigated wheat genotypes in CVT during 2018 at RARS, Parwanipur

SN.	Genotype	DH	DM	PHT	GrPS	SPL(cm)	SPSM	TGW(g)	GY(kg ha ⁻¹)
1	BL 4818	70	109	96	44	9.89	327	46	3536
2	BL 4820	70	105	98	51	9.54	278	42	3423
3	NL 1298	67	106	68	47	8.88	291	38	3914
4	NL 1318	70	108	84	48	9.24	279	39	3489
5	NL 1322	71	107	73	40	8.38	282	38	3145
6	NL 1368	72	108	84	39	8.41	342	38	3245
7	NL 1369	70	105	82	50	8.54	271	41	2987
8	BL 4866	67	105	91	40	8.96	231	39	3406
9	BL 4868	67	108	84	45	9.72	270	53	3635
10	NL 1344	69	105	74	46	8.56	240	36	3367
11	NL 1345	68	105	77	46	8.96	265	40	2637
12	NL 1349	71	111	85	46	9.04	234	41	2635
13	NL 1350	71	111	78	49	9.4	230	35	3101
14	NL 1358	68	104	82	46	9.5	226	43	2991
15	NL 1360	69	107	80	44	8.84	244	43	2884
16	NL 1362	69	106	91	50	9.53	257	37	3853
17	NL 1367	73	111	87	49	8.41	275	39	3078
18	Bhrikuti	69	105	78	48	9.4	297	40	3476
19	RR 21	67	105	89	40	10.41	203	38	2624
20	Gautam	69	106	86	47	11.05	268	41	3841
GM		69.55	107.07	83.38	45.87	9.23	265.75	40.3	3263.5
F-test		<0.001	<0.001	<0.001	0.16	0.006	12.74	<0.001	<0.001
CV%		1.2	1.11	2.3	6.79	4.4	0.34	4.16	5.8
LSD _{0.05}		1.74	2.49	4.11	6.5	0.84	70.64	3.5	399.99

Note: DH refers to days to heading, DM indicates days to maturity, PHT for Plant height(cm), Grps for grains per spike, TGW for 1000 grain weight(g) and GY represents grain yield((kg ha⁻¹)

Grain yield

Grain yield is the most important trait of concern for any breeding program and also for all the crops under consideration. In both years, the grain yield was found statistically significant ($P < 0.001$) among genotypes (Table 1 and Table 2). However, NL 1202 produced the maximum grain yield of 3452 Kg ha⁻¹ followed by NL1298 with grain yield of 3914 Kg ha⁻¹ and check variety Bhrikuti produced the grain yield of 1805 Kg ha⁻¹.

DISCUSSION

The wide variation in temperatures due to diverse agroecological and agro-climatic variations in Nepal during wheat cultivation. The late sown wheat suffers from higher temperature which influenced plant growth and days to heading and grain yield. Similar conditions were also explained by Mondal *et al.* [6]. Late sowing wheat crop faces higher temperature stress early in the growing period which affects the crop growth and grain yield explained by previous worker [6]. On the average, every 1°C rise in

temperature there was a 6-20% loss in grain yield in South Asia and eastern Gangetic wheat growing region by simulation studies which is in agreement with [1, 4]. Increased temperature affects the plant height, Days to heading and days to maturity. Such findings was also reported by [5]. Early heading genotypes performed well in areas suffering from terminal heat stress that can produce good this finding is in agreement with result described by [4] in their study. The grain yield per hectare per day was estimated to understand the importance of the crop growing time with respect to final grain yield which is also consistent with the earlier studies [7-10]. The early maturing, high yielding wheat genotypes identified from the trial and evaluated in farmers field trials.

CONCLUSION

Based on aforementioned results it can be concluded that genotypes NL1369, NL1202, NL1298 and NL1362 high yielding and early maturing. The genotypes will be further evaluated in the subsequent years and most promising genotypes considered for the varietal trials for release as varieties.

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CONFLICT OF INTREST

Authors declared there is no conflict of interest

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