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ORIGINAL ARTICLE

Studies on heritability and genetic advance estimates in timely sown bread Wheat (*Triticum aestivum* L.)

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ABSTRACT
The experiment was conducted at the Student Research Farm of Acharya Narendra Deva University of Agriculture and Technology Kumarganj Ayodhya Uttar Pradesh India. Experiment I comprised 57 wheat genotypes including 3 checks (PBW 575, HI 1563, and RAJ 3777) sown in augmented block design in 3 blocks during Rabi 2021-22 to asses molecular diversity among genotypes. Experiment II consists of 12 genetically diverse wheat varieties and 36 crosses. The experimental material was evaluated in Randomized Complete Block Design replicated in two environments/ conditions (E1= Timely sown; E2= Late sown) with 3 replications by crossing 12 lines, including three testers (FLW-15, KRL-1-4, HD-2967,) and Three checks (PBW757, DBW187, HI1563, RAJ3777 and). 3 parents and 3 checks (12 lines + 3 testers + 3 checks) during rabi 2022-23. The data will be recorded on 12 quantitative characters. The mean sum of squares due to treatments was highly significant for all the characters studied except the number of tillers per plant 7.44 in E1 and 6.52 in E2. The grain yield per plant (g) among parents ranged from 9.00 g (BRW 3806) to 19.96 g (WH 1252) in timely shown (E1). The grand mean (15.68±0.72) was more than the parents (14.91) and less than crosses (16.42). Among the crosses, it ranged from 11.00 g (WSM-138 × HD2967) to 23.37 g (RWP-2019/41 × KRL-1-4) in E1. Best five crosses have been recorded higher grain yield per plant (g) in E1 - RWP-2019/41 × KRL-1-4 , BRW-3806 x FLW-15, RWP-2019/41 x HD-2967, KHTW-01 x HD-2967, WH-1252 x FLW-15 and HS- 645 x NW-5054 and grain yield per plant (g) among parents it ranged from 7.20 g (BRW 3806) to 15.60 g (RWP-2019/38) in late shown (E2). The grand mean value (14.06±0.56) was more than the parents and less than crosses in E2. Among the crosses, it ranged from 9.00 g (WSM-138 × HD2967) to (RWP-2019/41 × KRL-1-4) in E2. Best five crosses have been recorded higher grain yield per plant (g) in E2 condition- RWP-2019/41 × KRL-1-4, RWP-2019/41 × HD2967, BRW 3806 × FLW-15, KHTW- 01 × HD2967 and GW 477 × FLW-15 are the crosses may be used genotype because their performance are higher and stable in both environmental conditions. The high estimate of heritability in broad sense (>60%) was recorded for all characters like- biological yield per plant (g), grain per spike, plant height (cm), number of tillers per plant, 1000-grain weight (g), grain yield per plant (g), panicle length (cm), number of spikelet's per spike, flag leaf area (cm²) And the high estimate of heritability in a broad sense (>60%) in late sown (E2). All characters like, biological yield per plant (g), Number of tillers per plant, Grain yield per plant (g), Grain per spike, Plant height (cm). The high estimates of Genetic Advance as per cent of Mean (>15%) were found in these characters- plant height (cm) and biological yield per plant (g), in timely sown (E1). High heritability coupled with high genetic advance in per cent of mean was recorded for plant height (cm), biological yield per plant (g), grain per spike, harvest index (%), number of tillers per plant, number of spikelet's per spike, panicle length (cm), and grain yield per plant (g) in both timely sown (E1) and late sown (E2).
***Keywords**: heritability, Grain per spike, Grain yield, bread Wheat*

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INTRODUCTION

Wheat (*Triticum aestivum* L.), an allohexaploid (2n=6x=42), represents the prominent cereal crop within the Poaceae family (order Poales) with its origins traced back to Southwest Asia (Turkey). Wheat is a self-pollinated crop and can be grown successfully in both tropical and subtropical areas. Wheat is the principal food crop in most areas of the world and also occupies a prominent position in Indian agriculture after rice. Owing to the high nutrient content and suitability to all agro-climatic regions, wheat is considered as the king of all cereal crops. Wheat is also an important crop of India not only in terms of acreage, but also in terms of its versatility for adoption under a wide range of agro-climatic conditions and crop growing situations. Wheat is classified into two major types: (1) the hexaploid bread wheat (2n = 6x = 42, AA BB DD) and (2) the tetraploid durum wheat (2n = 4x = 28, AA BB). Currently, at the global level, bread wheat accounts for 95% of all the wheat produced. Based on growth habit, wheat is classified into spring wheat and winter wheat, covering about 65 and 35% of the total global wheat production area, respectively [2, 3].

Breeding efforts have resulted in various varieties of hexaploid wheat, having improved yield and grain characteristics. Varieties and advanced lines with different morphological and economic characteristics are now available as breeding stock. For further progress, knowledge of breeding behavior, particularly of combining ability and type of gene action for the various traits, is necessary. The estimates of combining ability variances and effects can give an indication of the relative magnitude of genetic variance [4, 5]. Heritability estimates provide information about the traits that are transmitted from parents to their offspring and it has a crucial role in selection criteria to improve grain yield. Due to maximum genetic diversity, wheat provides opportunity to develop new potential genotypes with wider adaptation by hybridization and recombination of desired genes. Increased grain yield of wheat crop is mainly concerned to wheat breeders, so throughout the world they have been utilizing the available genetic resources to change the existing varieties and evolving new crop varieties to meet the ever-changing requirements of the societies. The study of genetic diversity of plants determines their potential for improved efficiency and hence their use for breeding, which eventually may result in enhanced food production A high genetic diversity means that there are more chances of selecting and evolving better varieties. Genetic diversity can be estimated using pedigree analysis, morphological, physiological, and cytogenetic characters or molecular markers. Molecular markers increase the efficiency of genotypes selection because their expression is independent of environmental effects, more convenient and reliable, and need-less time.

MATERIAL AND METHODS

Experimental materials

Table 1. List of 12 genotypes lines used for line x tester analysis in wheat

S.N.	Genotypes	S.N.	Genotypes	S.N.	Genotypes
1	NGSN/JKSN261	21	MP 1358	41	HD 3086
2	T-BH-1/46	22	DBW 332	42	FLW-15
3	HW-2036	23	VL 3022	43	HD-2967
4	HD-2967	24	HPW 373	44	KRL-1-4
5	LBR1-N1/02	25	HPW360	45	DBW-222
6	KRL-1-4	26	HPW 368	46	BRW 3806
7	DBW-187	27	UP 2903	47	KHTW- 01
8	KRL-99	28	UP2938	48	DWAP 1608
9	NW 1076	29	MP1323	49	DWAP 1925
10	PBW 822	30	HS 681	50	DWP-278
11	PBW 821	31	DBW 319	51	GW 477
12	PBW 752	32	VI Geheu 2028	52	WH 1252
13	UP 3043	33	WAP 2212	53	RWP-2019/41
14	WH1270	34	DBW 372	54	RWP-2019/38
15	VL3020	35	HS 679	55	RWP-2019/32
16	VL 2021	36	HI1650	56	WSM-138
17	DBW302	37	DBW 187	57	57.AKAW-4

The present study conducted at Main Experiment Station of Genetics and plant Breeding, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during Rabi, 2021-2022 and 2022-23, and the experimental material for present investigation will be derived by crossing 12 lines (BRW-3806, KHTW-1, DWAP-1608, DWAP-1925, DBW-278, GW-477, WH-1252, RWP-2019-41,

RWP-2019-38, RWP-2019-32, WSM-138, AKAW-4, including three tester (FLW-15, KRL-1-4, HD-2967,) and Three checks (PBW757, HI1563 and RAJ3777) . 12 parents and 3 checks (12 lines + 3 testers + 3 checks) will be evaluated in Randomized Complete Block Design replications in two environments/ conditions (E_1= Timely sown; E_2= Late sown) with 3 replications. Each plot consists of single row of 3m length having row to row and plant to plant distance of 30cm and 10 cm, respectively. Five competitive plants in each parent and F1 will be randomly selected for taking observations in each replication.

Experimental Methodology

The experimental material consisting 42 treatments (36 F_1's + 3 testers + 3 checks) were sown in Randomized Block Design with three replications under two environments *i.e.*, Timely sown (E_1) (15 November, 2021) and late sown (E_2) 15 December, 2021) during *rabi* 2021-22. Each plot consists of single row of 3m length having row to row and plant to plant distance of 30 cm and 10 cm, respectively. Five competitive plants in each parent and F_1 will be randomly selected for taking observations in each replication.

RESULT AND DISCUSSION

Mean and range:

All the treatments have been presented in Appendix showed mean performance and range for fourteen characters under sodic soil. The general mean and range are given in Table 2 and 3.

Grain yield per plant (g):

The grain yield per plant (g) among parents it ranged from 9.00 g (BRW 3806) to 19.96 g (WH 1252) in timely shown (E1). The grand mean (15.68±0.72) was more than the parents (14.91) and less than crosses (16.42). Among the crosses, it ranged from 11.00 g (WSM-138 × HD296) to 23.37 g (RWP- 2019/41 × KRL-1-4) in E1. Best five crosses have been recorded higher grain yield per plant (g) under sodic soil in E1 - RWP-2019/41 × KRL-1-4 (23.37 g), BRW-3806 x FLW-15(22.43 g), RWP-2019/41 x HD-2967 (22.33), KHTW-01 x HD-2967 (19.90), WH-1252 x FLW-15 (19.00) and HS-645 x NW-5054 (23.10). And grain yield per plant (g) among parents it ranged from 7.20 g (BRW 3806) to 15.60 g (RWP-2019/38) in late shown (E2). Whereas, the grand mean value (14.06±0.56) was more than the parents (12.99) and less than crosses (14.79) in E2. Among the crosses, it ranged from 9.00 g (WSM-138 × HD2967) to 22.80 g (RWP-2019/41 × KRL-1-4) in E2. Best five crosses have been recorded higher grain yield per plant (g) under sodic soil in E2 condition- RWP-2019/41 × KRL-1-4 (22.80 g), RWP- 2019/41 × HD2967 (20.33), BRW 3806 × FLW-15 (20.90 g), KHTW- 01 × HD2967 (18.60) and GW 477 × FLW-15 (18.00) are the crosses may be used as tolerant genotype because their performance are higher and stable in both environmental conditions.

Days to 50% flowering:

The days to 50 per cent flowering among parents ranged from 74.49 (GW 477) to 85.00 days (WSM-138) in timely shown (E1). The general mean value (76.94 ± 1.75) was less than the mean of parents (77.93 days) and at per than the crosses (76.26 days) in E1. Among the crosses, it varied from 70.00 days (AKAW-4 × FLW-15) to 84.00 days (DBW- 278 × FLW-15) in E1. Best five crosses early days to 50 per cent flowering in E1- DBW- 278 × FLW-15 (84.00 days), DWAP 1925 × FLW-15 (82.00 days), DWAP 1925 × HD2967 (81.00 days), KHTW- 01 × HD2967 (80.00 days) and DWAP 1608 × KRL-1-4 (80.00 days) in E1. And days to 50 per cent flowering among parents it ranged from 69.33 (FLW-15) to 82.00 days (WSM-138) in late shown (E2). The general mean value (72.41 ± 1.77) was less than the mean of parents (74.40 days) and at per than the crosses (71.26 days). Among the crosses, it ranged from 65.00 days (AKAW-4 × FLW-15) to 79.00 days (DBW-278 × FLW- 15) in E2. Best five crosses early days to 50 per cent flowering in E2- DBW-278 × FLW-15 (79.00 days DWAP 1925 × FLW-15 (77.00 days), DWAP 1925 × HD2967 (76.00 days), RWP-2019/32 × HD2967 (75.00 days), KHTW- 01 × HD2967 (75.00 days) and DWAP 1608 × KRL-1-4 (75.00 days).

Days to maturity:

The Days to Maturity duration of parents varied from 116.32 (BRW 3806) to 130.00 days (KRL-1-4) in timely shown (E1). The general mean value (123.56 ±2.58) was less than the mean of parents (124.94 days) and at par crosses (123.91 days) in E1. Among the crosses, 117.00 days (DBW-278 × FLW-15) matured earlier, while 132.00 days (RWP-2019/41 × KRL-1-4) recorded late maturity in E1. Best five crosses for early days to maturity under sodic soil in E1- WSM-138 × HD2967 (117.00 days), DBW-278 × FLW-15 (117.00 days), DWAP 1925 × KRL-1-4 (117.00days), AKAW-4 × KRL-1-4 (117.67 days) and GW 477 × KRL-1-4 (118.00 days) in E1.

And days to maturity duration of parents varied from 112.32 (BRW 3806) to 128.34 days (KRL-1-4) in late shown (E2). The grand mean value (**117.80** ± 2.74) was less than the mean of the parents (120.91 days) and at par crosses (117.29 days) in E2. Whereas, the crosses, it ranged from 107.00 days (DWAP 1925 × KRL-1-4) matured earlier, while DWAP 1925 × FLW-15 (127.00 days) recorded late maturity in

E2. Best five crosses for early days to maturity under sodic soil in E2 - DWAP 1925 × KRL-1-4 (107.00days), AKAW-4 × KRL- 1-4 (107.67) GW 477 × KRL-1-4 (108.00days), VL3014 x KRL-99 (109.00 days), WSM-138 × HD2967 (112.00days), and DBW-278 × FLW-15 (112.00days).

Plant height (cm):

The plant height among parents DWAP 1608 recorded shortest height (60.38 cm), whereas longest height (92.00 cm) of HD2967 in timely shown (E1). The grand mean (80.15±1.91) was at per than the parents (77.44) and crosses (81.10) in E1. Among the crosses, RWP-2019/38 × HD2967 (62.00 cm) recorded shortest height, while AKAW-4 × KRL-1-4 (96.00 cm) showed longest height in E1. Best five short height crosses under sodic soil in E1- RWP-2019/38 × HD2967 (62.00 cm), KHTW- 01 × HD2967 (66.00 cm), BRW 3806 × KRL-1-4 (66.34 cm), DBW-278 × HD2967 (68.00 cm) and BRW 3806 × HD2967 (72.00 cm). And plant height among parents DWAP 1608 (56.38) recorded shortest height, whereas HD2967 recorded (91.00 cm) longest height in late shown (E2). (Table 4.3). Whereas, the grand mean (76.35±1.94) was at per than parents (74.04) and crosses (76.76) in E2. Among the crosses, it ranged from RWP-2019/38 × HD2967 (57.00 cm) recorded shortest height, while DWAP 1608 × FLW-15 (93.00 cm) was having longest height in E2. Best five short height crosses under sodic soil in E2 - RWP-2019/38 × HD2967 (57.00 cm), KHTW- 01 × HD2967 (61.00 cm), BRW 3806 × KRL-1-4 (61.34 cm), DBW-278 × HD2967 (63.00 cm), BRW 3806 × HD2967 and AKAW-4 × HD2967 (67.00 cm).

Flag leaf area (cm2):

The flag leaf area (cm2) among parents KRL-1-4 recorded lowest flag leaf area (16.50 cm), whereas highest flag leaf area (23.50 cm) of DWAP 1608in timely shown (E1). The grand mean (22.43±0.85) was less than the parents (20.72) and more than crosses (23.36) in E1. Among the crosses, WSM-138 × FLW-15 (19.10 cm) recorded lowest flag leaf area, while DBW-278 × FLW-15 (28.90 cm) showed highest flag leaf area in E1. Best five crosses that have higher flag leaf area under sodic soil in E1- DBW-278 × FLW-15 (28.90 cm), WSM-138 × HD2967 (28.47cm), AKAW-4 × HD2967 (27.03 cm), DWAP 1925 × FLW-15 (26.70 cm) and RWP-2019/41 × FLW-15 (26.70cm). And flag leaf area (cm^2) among parents KRL-1-4 (15.50) recorded lowest flag leaf area, whereas DWAP 1608 recorded (21.83 cm) highest flag leaf area in late shown (E2). (Table 4.3). Whereas, the grand mean (20.23±0.88) was more than parents (19.19) and also less than crosses (20.69) in E2. Among the crosses, it ranged from WSM-138 × FLW-15 (16.10 cm) recorded lowest flag leaf area, while DBW-278 × FLW-15 (25.90 cm) was having highest flag leaf area in E2. Best five crosses that have higher flag leaf area under sodic soil in E2- DBW-278 × FLW-15 (25.90 cm), WSM-138 × HD2967 (25.47 cm), WSM-138 × KRL-1-4 (24.80 cm), AKAW-4 × HD2967 (24.03 cm), and PBW-778 x NW-5054 (22.86 cm).

Number of tillers per plant:

The number of tillers per plant among parents it ranged from 3.09 (KRL-1-4) to 9.12 (GW 477) in timely shown (E1). The grand mean (5.48±0.33) was more than the parents (5.91) and the less than crosses (5.18) in E1. Among the crosses, it ranged from 3.00 (WSM- 138 × KRL-1-4) to 8.00 (WSM-138 × HD2967) in E1. Best five crosses that have higher number of tillers per plant under sodic soil in E1- WSM-138 × HD2967 (8.00), AKAW-4 × KRL-1-4 (7.00), RWP-2019/32 × HD2967 (7.00), DWAP 1608 ×HD2967 (7.00) and WH 1252 × KRL-1-4 (7.00).

And number of tillers per plant among parents it ranged from 2.76 (KRL-1-4) to 7.95 (GW 477) in late shown (E2). Whereas, the grand mean value (4.65±0.24) was more than both the parents (5.14) and less than the crosses (4.48) in E2. Among the crosses, it ranged from 2.00 (WH 1252 × FLW-15) to 7.00 (WSM-138 × HD2967 and WH 1252 × HD2967) in E2. Best five crosses that have higher number of tillers per plant under sodic soil in E2-WSM-138 × HD2967 and WH 1252 × HD2967 (7.00), AKAW-4 × KRL-1-4 (7.00), WH 1252 × HD2967 (6.67), DWAP 1925 × KRL-1-4 (6.00) and RWP-2019/41 × KRL-1-4 and RWP-2019/41 × FLW-1 (6.00). These are the crosses may be used as sodic soil tolerant genotype because their performance is higher and stable in both environmental conditions.

Panicle length (cm):

The panicle length among parents WH 1252 recorded shortest length (17.50), whereas longest length (32.60) of KRL-1-4 was observed in timely shown (E1).. The grand mean (22.68 ±0.90) was more than the parents (22.62) and the less than crosses (22.60) in E1 Among the crosses, BRW 3806 × HD2967 (17.50) recorded shortest length, while RWP- 2019/32 × FLW-15 (27.70) was having longest length in E1 Best five crosses that have longer spike length under sodic soil in E1- RWP-2019/32 × FLW-15 (27.70), WSM-138 × FLW-15 (26.90), DWAP 1925 × HD2967 (25.70), AKAW-4 × KRL-1-4 (25.60), GW 477 × HD2967 (24.70) and RWP-2019/32 × HD2967 (24.70), and panicle length among parents WH 1252 recorded shortest length (14.50) whereas longest length (31.93) of KRL-1-4 was observed in late shown (E2). Whereas, the grand mean value (20.17±0.99) was more than the parents (20.9) and less than the crosses (20.27) in E2.

Among the crosses, it ranged from BRW 3806 × HD2967 (15.50) recorded shortest length whereas WSM-138 × HD2967 (25.70) recorded longest length in E2. Best five crosses that have longer spike length under sodic soil in E2- WSM-138 × HD2967 (25.70), WSM-138 × FLW-15 (23.90), DWAP 1925 × HD2967 (23.70), AKAW-4 × KRL-1-4 (23.60, GW 477 × HD2967 and WSM-138 × KRL-1-4 (22.70).

Number of spikelets per spike:

The number of spikelets per spike among parents it ranged from 14.20 (KRL-1-4) to 22.37 (RWP-2019/38) in timely shown (E1). The grand mean (18.53 ±0.92) was more than the parents (17.92) and less than crosses (18.94) in E1. Among the crosses, it ranged from 10.00 (RWP-2019/38 × HD2967) to 24.00 (RWP-2019/32 × KRL-1-4) in E1. Best five crosses that have higher number of spikelets per spike under sodic soil in E1- (RWP-2019/32 × KRL-1-4 (24.00), WH 1252 × KRL-1-4 (23.03), DBW-278 × FLW-15 (23.00), WSM-138 × FLW-15 (23.00) and DBW-278 × HD2967 (23.00). And number of spikelets per spike among parents it ranged from 13.20 (BRW 3806) to 19.90 (RWP-2019/32) in late shown (E2). Whereas, the grand mean (16.63±0.86) was more than the parents (16.42) and less than crosses (16.85) in E2. Among the crosses, it ranged from 7.67 in the case of RWP-2019/38 × HD2967 to 22.00 in case of RWP-2019/32 × KRL-1-4 in E2. Best five crosses that have higher number of spikelets per spike under sodic soil in E2- RWP-2019/32 × KRL-1-4 (22.00), WH 1252 × KRL-1-4 (21.03), DBW-278 × FLW-15 (21.00), DBW-278 × HD2967 (20.67) and RWP-2019/41 × HD2967 (20.37).

Grains per spike:

The grain per spike among parents it ranged from 38.82 (BRW 3806) to 58.80 (GW 477) in timely shown (E1). The grand mean (48.36±1.18) was more than the parents (47.07) and the less than crosses (48.94) in E1. Among the crosses, it ranged from 38.00 (RWP- 2019/38 × HD2967) to 63.33 (RWP-2019/41 × HD2967) in E1. Best five crosses that have higher grain per spike under sodic soil in E1- RWP-2019/41 × HD2967 (63.33), KHTW- 01 × KRL-1-4 (58.90), DWAP 1925 × FLW-15 (58.00), RWP-2019/38 × KRL-1-4 (56.90) and WH 1252 × FLW-15 (56.00). And grain per spike among parents it ranged from 34.82 (BRW 3806) to 54.80 (GW 477) in late shown (E2). Whereas, the grand mean value (45.19±1.23) was more than both the parents (43.43) and less than the crosses (45.94) in E2. The crosses ranged from 35.00 (RWP-2019/38 × HD2967) to 60.33 (RWP-2019/41 × HD2967) in E2.

Best five crosses that have higher grain per spike under sodic soil in E2- RWP-2019/41 × HD2967 (60.33), KHTW- 01 × KRL-1-4 (55.90), RWP-2019/38 × KRL-1-4 (53.90), WH 1252 × FLW-15 (53.00), WH 1252 × HD2967 (52.67) and WH 1252 × KRL-1-4.

Heritability and genetic advance:

In the present investigation, heritability and genetic advance are presented in Table 4. the high estimate of heritability in broad sense (>60%) was recorded for all characters like- biological yield per plant (g) (95.91), grain per spike(93.44), plant height (cm) (92.32), number of tillers per plant(91.59), 1000-grain weight (g) (90.63), grain yield per plant (g) (88.45), panicle length (cm) (86.29), number of spikelets per spike(84.86), flag leaf area (cm^2) (82.30), harvest index (%) (80.82), days to maturity(64.54), and days to 50% flowering (60.92), in timely sown (E1) .

And the high estimate of heritability in a broad sense (>60%) in late sown (E2). all characters like- biological yield per plant (g) (95.07), Number of tillers per plant(95.01) Grain yield per plant (g) (93.48), Grain per spike (93.09), Plant height (cm) (92.51), Biological yield per plant (g) (89.19), 1000-grain weight (g) (88.31), Harvest index (%) (87.33), Panicle length (cm) (86.61), Number of spikelets per spike (85.80), Flag leaf area (cm2) (78.71), Days to 50% flowering (65.55), and Days to maturity(62.87),

The high estimates of Genetic Advance as per cent of Mean (>15%) were found in these characters- plant height (cm) (16.05), and biological yield per plant (g) (15.74), in timely sown (E1) under sodic soil condition. The moderate estimates (05 - 15 %) of genetic advance as per cent of mean recorded for the characters, grain per spike (10.85), & days to maturity (7.12) harvest index (%) (06.48), and 1000-grain weight (g) (6.16), panicle length (cm) (5.30), and number of spikelets per spike (05.08), in E1. And the low estimates (<5) of genetic advance as percent of mean were recorded in grain yield per plant (g) (4.74), days to 50 % flowering (4.30), flag leaf area (cm^2) (04.19), and number of tillers per plant (2.66), in E1. And high estimates of Genetic Advance as per cent of Mean (>15%) are found in late sown (E2) under sodic soil condition for plant height (cm) (16.58), biological yield per plant (g) (16.08), and exhibited. And moderate estimates (05 - 15 %) of genetic advance as per cent of mean recorded for the characters, in E2, grain per spike (10.94), & days to maturity (7.12), harvest index (%) (07.70), 1000-grain weight (g) (6.27), panicle length (cm) (5.92) grain yield per plant (g) (05.19). And the low estimates (<5) of genetic advance as per cent of mean were recorded in number of spikelets per spike (04.96), days to 50 % flowering (4.99), flag leaf area (cm^2) (03.80), and number of tillers per plant (2.55), in E2.

High heritability coupled with high genetic advance in per cent of mean was recorded under sodic soil for plant height (cm), biological yield per plant (g), grain per spike, harvest index (%), number of tillers per plant, number of spikelets per spike, panicle length (cm), and grain yield per plant (g) in both timely sown (E1) and late sown (E2) under sodic soil condition and grain yield per plant (g) in late sown (E2). We find these traits good for heritability and genetic advance. In earlier studies, high genetic advance in per cent of mean coupled with high heritability have also been reported by Chaudhary *et al.* [4], Bayisa *et al*. [1], Jaiswal *et al*. [6], Sabit *et al.* [9], Mohanty *et al*. [8] and Sathisha *et al*. [10], Kumar *et al.* [7].

Table 2. Mean performance for 12 quantitative characters of 12 parental lines and 36 hybrids of wheat in timely sown (E1) conditions.

S.N	Line	Characters											
		Days to 50% flowering	Days to maturity	Plant Height (cm)	Flag Leaf Area (cm2)	Tiller/ Plant	Panicle length (cm)	No. of spikelets per spike	Grai n per spike	Biological yield (g)	1000 grain weight(gm)	Harvest index (%)	Grain yield per plant (g)
1	BRW 3806	74.98	116.32	63.30	18.67	4.15	18.00	15.20	38.82	42.96	27.50	20.95	9.00
2	KHTW- 01	76.67	121.30	60.98	19.50	6.55	22.50	17.23	42.20	47.17	28.47	25.97	12.25
3	DWAP 1608	74.63	123.29	60.38	23.50	5.50	19.50	18.31	50.80	48.83	27.63	25.65	12.50
4	DWAP 1925	79.30	125.24	65.67	20.10	6.52	17.96	21.50	45.50	49.83	35.70	29.31	14.60
5	DBW-278	74.97	129.00	73.66	22.50	7.12	20.13	18.84	55.50	75.50	29.47	18.02	13.60
6	GW 477	74.49	126.66	77.99	20.49	9.12	25.49	16.95	58.80	48.99	24.80	25.71	12.60
7	WH 1252	80.00	123.45	85.00	21.50	4.55	17.50	16.83	47.70	69.38	32.53	28.77	19.96
8	RWP-2019/41	79.00	129.00	83.53	22.50	6.50	19.37	20.90	44.80	46.20	36.03	37.66	17.40
9	RWP-2019/38	76.96	127.28	90.00	21.30	8.90	22.50	22.37	44.80	65.23	35.37	26.99	17.60
10	RWP-2019/32	82.00	121.65	83.79	20.20	7.60	19.63	20.90	52.30	51.30	37.90	30.24	15.50
11	WSM-138	85.00	126.53	85.67	19.60	5.20	17.53	16.93	41.50	74.60	33.53	20.00	14.90
12	AKAW-4	76.00	127.33	69.22	21.83	7.80	25.70	16.13	42.17	53.94	28.37	31.14	16.80
	Tester												
1	HD2967	78.00	124.00	92.00	21.80	4.00	29.86	17.00	46.50	51.90	39.80	31.91	16.50
2	KRL-1-4	82.00	130.00	89.00	16.50	3.09	32.60	14.20	44.97	54.53	35.30	27.91	15.20
3	FLW-15	75.00	123.00	81.33	20.80	5.00	31.03	15.50	49.70	59.37	31.90	25.80	15.30
	Mean	77.93	124.94	77.44	20.72	6.11	22.62	17.92	47.07	55.98	32.29	27.07	14.91
	Min	74.49	116.32	60.38	16.50	3.09	17.50	14.20	38.82	42.96	24.80	18.02	9.00
	Max	85.00	130.00	92.00	23.50	9.12	32.60	22.37	58.80	75.50	39.80	37.66	19.96

Continue…

	Hybrids												
1	BRW 3806 × HD2967	77.00	120.00	72.00	22.50	4.11	17.50	18.00	42.00	55.70	33.18	25.69	14.31
2	BRW 3806 × KRL- 1-4	74.00	126.00	66.34	25.50	4.00	22.11	18.00	46.00	52.70	33.00	23.74	12.50
3	BRW 3806 × FLW- 15	78.00	126.00	83.00	22.10	6.00	21.20	18.00	48.00	74.25	31.00	30.20	22.43
4	KHTW- 01 × HD2967	80.00	126.00	66.00	21.60	5.17	19.60	11.67	38.34	68.83	35.56	28.91	19.90
5	KHTW- 01 × KRL- 1-4	78.00	128.00	74.70	25.00	3.90	21.00	20.50	58.90	57.27	31.33	27.38	15.67
6	KHTW- 01 × FLW- 15	73.00	128.00	72.00	19.70	3.00	22.60	16.00	42.00	58.70	29.00	27.25	16.00
7	DWAP 1608 × HD2967	72.00	127.00	85.00	25.50	7.00	22.60	16.00	45.33	55.80	28.64	25.10	14.00
8	DWAP 1608 × KRL-1-4	80.00	131.00	81.00	20.47	5.33	23.27	16.00	44.00	47.80	28.00	25.83	12.33
9	DWAP 1608 × FLW-15	76.00	121.00	96.00	24.80	4.00	23.70	19.00	47.00	62.20	31.00	28.41	17.67
10	DWAP 1925 × HD2967	81.00	121.00	87.00	20.60	5.34	25.70	21.00	46.67	49.60	29.75	32.26	16.00
11	DWAP 1925 × KRL-1-4	76.67	117.00	84.00	22.27	6.00	21.93	15.67	40.00	51.70	30.00	30.28	15.67
12	DWAP 1925 × FLW-15	82.00	132.00	88.00	26.70	6.00	24.60	21.00	58.00	47.60	33.00	34.29	16.33
13	DBW-278 × HD2967	79.00	128.00	68.00	19.40	6.00	19.83	23.00	52.00	64.50	38.00	26.37	17.00
14	DBW-278 × KRL- 1-4	73.33	119.00	89.00	23.73	3.67	24.40	18.66	46.00	56.76	36.00	25.57	14.52
15	DBW-278 × FLW- 15	84.00	117.00	82.00	28.90	5.00	22.50	23.00	51.00	61.80	33.00	27.18	16.79

Continue…

16	GW 477 × HD2967	78.00	122.00	91.00	23.80	5.00	24.70	22.10	51.00	68.40	39.00	25.86	17.67
17	GW 477 × KRL- 1-4	79.00	118.00	75.00	20.80	5.00	20.80	18.00	55.00	67.80	39.00	23.03	15.61
18	GW 477 × FLW- 15	76.00	119.00	76.00	21.20	4.00	19.60	21.00	53.00	73.20	34.00	23.25	17.00

19	WH 1252 × HD2967	76.00	120.00	93.00	25.87	8.00	22.54	21.00	55.67	72.30	34.00	25.88	18.66
20	WH 1252 × KRL- 1-4	71.00	131.00	78.13	22.63	7.00	22.13	23.03	55.60	61.00	31.67	25.69	15.67
21	WH 1252 × FLW- 15	71.00	126.00	91.00	23.80	3.00	22.70	21.66	56.00	68.20	38.00	27.86	19.00
22	RWP-2019/41 × HD2967	77.00	118.00	78.00	20.40	4.00	20.90	22.70	63.33	71.14	31.00	31.43	22.33
23	RWP-2019/41 × KRL-1-4	75.00	132.00	85.67	25.13	6.00	23.90	19.34	41.33	71.74	35.00	32.58	23.37
24	RWP-2019/41 × FLW-15	78.00	128.00	92.00	26.70	7.00	24.60	19.00	49.00	64.70	29.00	23.18	15.00
25	RWP-2019/38 × HD2967	75.00	125.00	62.00	24.50	5.00	21.30	10.00	38.00	64.10	32.00	27.75	17.79
26	RWP-2019/38 × KRL-1-4	74.00	125.00	78.33	23.03	4.00	19.60	16.00	56.90	73.10	36.00	21.89	16.00
27	RWP-2019/38 × FLW-15	75.00	118.00	76.00	20.90	4.00	22.84	17.00	39.00	58.90	31.00	27.74	16.33
28	RWP-2019/32 × HD2967	80.00	119.00	81.00	24.40	7.00	24.70	16.00	52.00	53.80	29.00	29.74	16.00
29	RWP-2019/32 × KRL-1-4	75.34	128.00	83.33	19.50	5.00	23.60	24.00	52.00	65.20	31.00	27.62	18.00
30	RWP-2019/32 × FLW-15	80.00	123.00	81.00	21.90	3.00	23.60	22.00	48.00	64.80	34.00	23.15	15.00

Cont….

31	WSM-138 × HD2967	73.00	117.00	84.00	28.47	8.00	27.70	17.00	42.00	63.80	35.00	17.23	11.00
32	WSM-138 × KRL-1-4	78.00	126.00	92.00	26.80	3.00	24.70	22.00	56.00	52.80	29.00	29.69	15.66
33	WSM-138 × FLW-15	72.00	126.00	73.00	19.10	7.00	26.90	23.00	55.00	70.10	36.00	24.27	17.00
34	AKAW-4 × HD2967	76.00	124.00	72.00	27.03	5.00	19.03	15.67	44.00	74.30	32.08	17.51	13.00
35	AKAW-4 × KRL- 1-4	72.00	117.67	96.00	24.40	7.00	25.60	13.00	38.00	56.50	38.00	30.08	17.00
36	AKAW-4 × FLW- 15	70.00	131.00	87.00	21.73	5.00	19.70	22.93	55.60	49.70	33.33	26.16	13.00
	Mean	76.26	123.91	81.10	23.36	5.18	22.60	18.94	48.94	61.97	32.99	26.67	16.42
	Min	70.00	117.00	62.00	19.10	3.00	17.50	10.00	38.00	47.60	28.00	17.23	11.00
	Max	84.00	132.00	96.00	28.90	8.00	27.70	24.00	63.33	74.30	39.00	34.29	23.37
Check													
1	PBW757	80.00	109.67	81.33	22.00	5.00	20.67	17.00	52.00	53.34	35.00	20.82	11.11
2	DBW187	76.00	118.00	93.33	20.00	4.00	23.33	18.00	43.00	56.11	39.00	20.22	11.30
3	RAJ3777	78.00	109.33	83.00	24.00	7.00	23.33	16.00	49.00	53.45	40.00	23.61	12.61
	Mean	76.94	123.56	80.15	22.43	5.48	22.68	18.53	48.36	59.79	33.03	26.55	15.68
	Min	70.00	109.33	60.38	16.50	3.00	17.50	10.00	38.00	42.96	24.80	17.23	9.00
	Max	85.00	132.00	96.00	28.90	9.12	32.60	24.00	63.33	75.50	40.00	37.66	23.37
	SE(d)	1.75	2.58	1.91	0.85	0.33	0.90	0.92	1.18	1.32	0.82	1.39	0.72
	C.D. at 5%	3.47	5.12	3.79	1.68	0.66	1.79	1.83	2.34	2.61	1.64	2.76	1.43
	C.V. (%)	2.79	2.55	2.91	4.61	7.50	4.89	6.09	2.99	2.69	3.05	6.44	5.62

Table 3. Mean performance for 12 quantitative characters of 12 parental lines and 36 hybrids of wheat in late sown (E2) conditions

SN	Characters	Days to 50% flowering	Days to maturity	Plant Height (cm)	Flag Leaf Area (cm^2)	Tiller per plant	Panicle length (cm)	No. of spikeletes per spike	Grain per spike	Biological yield (g)	1000 grain weight (gm)	Harvest index (%)	Grain yield per plant (g)
	Line												
1	BRW 3806	72.48	112.32	59.85	17.56	3.32	15.49	13.20	34.31	38.96	24.50	18.48	7.20
2	KHTW- 01	73.57	117.30	61.10	18.09	5.72	18.38	15.19	38.58	43.17	25.47	23.75	10.25
3	DWAP 1608	72.13	119.96	60.63	21.09	4.34	16.86	16.98	46.65	44.83	24.63	23.44	10.50
4	DWAP 1925	76.80	120.06	65.28	17.49	5.35	14.85	18.17	40.65	45.83	32.70	27.54	12.60
5	DBW-278	71.43	123.59	71.77	20.09	5.29	16.89	17.07	52.99	44.80	26.47	25.96	11.60
6	GW 477	71.38	121.51	75.40	19.35	7.95	21.98	15.62	55.69	46.70	24.63	23.86	11.14
7	WH 1252	77.59	118.71	84.41	20.39	3.49	15.76	14.83	45.06	44.35	32.70	27.23	12.07
8	RWP-2019/41	75.26	123.02	84.08	21.45	5.67	17.72	17.56	40.65	42.20	33.03	36.51	15.40
9	RWP-2019/38	74.30	122.47	91.01	19.70	7.40	19.96	19.02	42.16	60.33	32.37	25.87	15.60
10	RWP-2019/32	79.26	117.99	82.33	18.79	6.44	18.08	19.90	48.79	47.30	34.90	27.23	12.84
11	WSM-138	82.39	121.76	85.82	18.38	4.37	14.92	14.93	36.98	61.23	30.53	21.09	12.90
12	AKAW-4	73.49	122.92	68.73	20.42	6.30	22.56	14.17	40.84	49.94	25.37	30.30	15.13
	Tester												
1	HD2967	73.49	122.33	94.66	20.55	4.00	25.71	18.67	41.99	50.90	39.46	33.84	17.17
2	KRL-1-4	77.00	128.34	93.41	15.09	2.76	30.60	14.87	42.26	53.53	34.97	28.45	15.20
3	FLW-15	69.85	121.33	86.47	18.19	4.67	27.89	16.17	47.04	58.37	31.57	26.22	15.30

	Mean	**74.70**	**120.91**	**77.66**	**19.11**	**5.14**	**19.84**	**16.42**	**43.64**	**48.83**	**30.22**	**26.65**	**12.99**
	Min	69.85	112.32	59.85	15.09	2.76	14.85	13.20	34.31	38.96	24.50	18.48	7.20
	Max	82.39	128.34	94.66	21.45	7.95	30.60	19.90	55.69	61.23	39.46	36.51	17.17

Conti…….

	Hybrids												
1	BRW 3806 × HD2967	72.89	115.00	70.15	18.99	2.77	14.36	15.67	39.33	53.70	30.18	23.09	12.40
2	BRW 3806 × KRL-1-4	68.86	116.00	65.49	21.39	4.00	18.50	16.00	41.59	52.41	31.32	22.61	11.82
3	BRW 3806 × FLW- 15	73.88	121.00	84.36	19.49	5.00	17.79	16.00	45.68	71.80	26.90	29.11	20.90
4	KHTW- 01 ×HD2967	76.89	121.00	64.11	19.46	4.50	17.14	9.34	34.80	53.06	31.90	35.09	18.60
5	KHTW- 01 × KRL- 1-4	75.59	118.00	73.82	22.86	3.90	17.89	18.50	55.36	54.27	28.33	25.21	13.67
6	KHTW- 01 × FLW-15	68.39	123.00	72.61	17.59	2.00	19.19	14.00	38.35	55.70	26.00	25.13	14.00
7	DWAP 1608 × HD2967	65.89	122.00	84.51	21.35	5.66	19.15	13.67	42.67	53.80	25.64	22.32	12.00
8	DWAP 1608 ×KRL-1-4	74.86	121.00	79.65	19.47	5.33	19.86	14.00	40.36	44.80	25.00	20.43	9.15
9	DWAP 1608 × FLW-15	70.75	116.00	97.41	24.55	3.00	20.05	17.00	42.85	59.20	28.00	26.47	15.67
10	DWAP 1925 ×HD2967	75.89	116.00	82.55	19.27	4.67	22.26	18.67	42.16	47.60	26.75	29.42	14.00
11	DWAP 1925 × KRL-1-4	72.52	107.00	82.15	20.86	6.00	17.78	13.67	34.74	48.70	27.00	28.75	14.00
12	DWAP 1925 ×FLW-15	79.39	127.00	86.41	25.09	5.00	22.46	19.00	54.46	44.60	30.00	32.86	14.66
13	DBW-278 × HD2967	75.39	123.00	68.14	17.40	4.67	18.17	20.67	48.34	62.50	35.00	25.07	15.67
14	DBW-278 × KRL-1-4	68.67	109.00	88.15	19.58	3.68	22.73	17.29	41.49	53.76	33.00	23.21	12.48
15	DBW-278 × FLW- 15	77.86	112.00	82.66	23.79	4.00	20.76	21.00	46.75	64.80	35.00	26.25	17.00

Conti….

16	GW 477 × HD2967	73.89	117.00	90.14	21.19	3.67	23.04	19.77	46.79	66.40	36.00	24.72	16.42
17	GW 477 × KRL-1-4	73.76	108.00	71.00	16.29	5.00	19.13	16.00	50.78	46.40	36.00	32.33	15.00
18	GW 477 × FLW-15	72.79	114.00	75.61	16.59	3.00	17.86	19.00	48.35	70.67	37.00	25.48	18.00
19	WH 1252 × HD2967	71.45	116.67	92.11	21.21	6.67	20.40	18.66	51.02	70.30	31.00	23.77	16.66
20	WH 1252 × KRL-1- 4	67.39	121.00	76.74	20.12	7.00	19.97	21.03	51.09	58.00	28.67	23.40	13.57
21	WH 1252 × FLW-15	67.55	121.00	89.74	22.29	2.00	20.59	19.66	52.89	65.20	35.00	26.08	17.00
22	RWP-2019/41 × HD2967	73.39	113.00	75.44	17.99	3.00	18.76	20.37	61.19	70.20	28.00	29.03	20.33
23	RWP-2019/41 × KRL-1-4	70.49	122.00	82.08	22.47	6.00	21.25	17.34	39.69	70.60	32.00	32.31	22.80
24	RWP-2019/41 × FLW-15	74.34	123.00	91.60	25.09	6.00	22.94	17.00	46.96	61.70	26.00	23.24	14.33
25	RWP-2019/38 × HD2967	71.26	120.00	58.74	23.09	3.67	19.30	7.67	36.26	71.00	36.00	22.99	16.33
26	RWP-2019/38 × KRL-1-4	70.89	115.00	78.47	21.48	4.00	18.05	14.00	54.79	70.10	33.00	19.98	14.00
27	RWP-2019/38 ×FLW-15	70.35	113.00	77.15	19.29	3.00	21.84	15.00	34.49	55.90	28.00	25.65	14.33
28	RWP-2019/32 × HD2967	78.39	114.00	80.66	22.89	6.00	24.46	13.67	48.85	51.80	26.00	27.03	14.00
29	RWP-2019/32 ×KRL-1-4	72.70	118.00	83.45	14.94	5.00	21.99	22.00	47.84	62.20	28.00	25.74	16.00
30	RWP-2019/32 × FLW-15	74.59	118.00	80.14	19.26	2.00	22.05	20.00	43.89	61.80	31.00	21.04	13.00

Conti…..

31	WSM-138 × HD2967	67.86	112.00	82.11	25.36	7.00	25.09	14.67	39.39	61.80	32.00	14.59	9.00
32	WSM-138 × KRL-1-4	74.39	116.00	91.14	23.39	3.00	20.19	20.00	54.26	49.80	26.00	27.47	13.66
33	WSM-138 × FLW-15	68.00	121.00	72.75	16.96	6.00	23.79	21.00	53.35	67.10	33.00	22.37	15.00
34	AKAW-4 × HD2967	71.49	119.00	68.55	24.88	4.00	16.62	13.33	42.23	72.30	29.08	15.24	11.00
35	AKAW-4 × KRL- 1-4	65.89	107.67	92.61	22.76	7.00	22.96	11.00	35.86	44.80	35.00	33.51	15.00
36	AKAW-4 × FLW-15	65.02	126.00	88.65	20.07	4.00	17.04	20.93	52.79	46.70	30.33	23.55	11.00
	Mean	**72.04**	**117.29**	**80.03**	**20.80**	**4.48**	**20.15**	**16.85**	**45.60**	**58.76**	**30.48**	**25.40**	**14.79**
	Min	65.02	107.00	58.74	14.94	2.00	14.36	7.67	34.49	44.60	25.00	14.59	9.00
	Max	79.39	127.00	97.41	25.36	7.00	25.09	22.00	61.19	72.30	37.00	35.09	22.80
	Check												
1	PBW757	78.33	105.67	78.33	20.00	4.00	17.67	15.00	49.00	51.23	28.49	18.27	9.33
2	DBW187	74.34	114.00	90.33	18.00	3.00	20.33	16.00	40.00	55.56	30.75	18.02	10.00
3	RAJ3777	76.34	105.33	80.00	22.00	6.00	20.33	14.00	46.00	58.80	30.00	20.37	11.98
	Mean	**73.02**	**117.80**	**79.53**	**20.28**	**4.65**	**20.03**	**16.63**	**45.03**	**55.81**	**30.36**	**25.39**	**14.05**
	Min	65.02	105.33	58.74	14.94	2.00	14.36	7.67	34.31	38.96	24.50	14.59	7.20
	Max	82.39	128.34	97.41	25.36	7.95	30.60	22.00	61.19	72.30	39.46	36.51	22.80
	SE(d)	1.45	2.73	1.59	0.39	0.24	0.49	0.86	0.70	1.49	0.96	1.24	0.56
	C.D. at 5%	2.88	5.43	3.15	0.76	0.47	0.96	1.72	1.39	2.96	1.91	2.47	1.12
	C.V. (%)	2.43	2.84	2.45	2.32	6.25	2.97	6.36	1.90	3.27	3.88	6.00	4.90

Table 4. Estimates of range, heritability, genetic advance and genetic advance in per cent of mean for 12 characters in wheat

Characters	Y	Mean	Min	Max	Heritability (%)	GA% mean
Days to 50% flowering	E1	76.82	70.00	85.00	60.92	4.30
	E2	73.02	65.02	82.39	75.70	5.62
Days to maturity	E1	123.55	109.33	132.00	64.54	7.05
	E2	117.80	105.33	128.34	62.90	7.12
Plant Height (cm)	E1	80.35	60.38	96.00	92.32	16.05
	E2	79.53	58.74	97.41	95.05	17.12
Flag Leaf Area (cm^2)	E1	22.55	16.50	28.90	82.30	4.19
	E2	20.28	14.94	25.36	95.55	4.40
Tiller/Plant	E1	5.45	3.00	9.12	91.59	2.66
	E2	4.65	2.00	7.95	95.01	2.55
Panicle length (cm)	E1	22.60	17.50	32.60	86.29	5.30
	E2	20.03	14.36	30.60	95.67	5.63
No. of spikeletes per spike	E1	18.55	10.00	24.00	84.86	5.08
	E2	16.63	7.67	22.00	85.80	4.96
Grain per spike	E1	48.37	38.00	63.33	93.44	10.85
	E2	45.03	34.31	61.19	97.72	11.39
Biological yield (g)	E1	59.88	42.96	75.50	95.91	15.74
	E2	55.81	38.96	72.30	95.07	16.08
1000 Grain Weight (gm)	E1	33.07	24.80	40.00	90.63	6.16
	E2	30.36	24.50	39.46	88.30	6.27
Harvest index (%)	E1	26.50	17.23	37.66	80.82	6.48
	E2	25.39	14.59	36.51	87.33	7.70
Grain yield per plant (g)	E1	15.74	9.00	23.37	88.45	4.74
	E2	14.05	7.20	22.80	93.48	5.19

CONCLUSION

The grain yield per plant (g) among parents it ranged from 9.00 g (BRW 3806) to 19.96 g (WH 1252) in timely shown (E1). The grand mean (15.68±0.72) was more than the parents (14.91) and less than crosses (16.42). Among the crosses, it ranged from 11.00 g (WSM-138 × HD2967) to 23.37 g (RWP-2019/41 × KRL-1-4) in E1. Best five crosses have been recorded higher grain yield per plant (g) in E1 - RWP-2019/41 × KRL-1-4 (23.37 g), BRW-3806x FLW-15(22.43 g), RWP-2019/41 x HD-2967 (22.33), KHTW-1 x HD-2967 (19.90), WH-1252 x FLW-15 (19.00) and HS-645 x NW-5054 (23.10). And grain yield per plant (g) among parents it ranged from 7.20 g (BRW 3806) to 15.60 g (RWP-2019/38) in late shown (E2). Whereas, the grand mean value (14.06±0.56) was more than the parents (12.99) and less than crosses (14.79) in E2. Among the crosses, it ranged from 9.00 g (WSM-138 × HD2967) to 22.80 g (RWP-2019/41 × KRL-1-4) in E2. Best five crosses have been recorded higher grain yield per plant (g) under sodic soil in E2 condition- RWP-2019/41 × KRL-1-4 (22.80 g), RWP-2019/41 × HD2967 (20.33), BRW 3806 × FLW-15 (20.90 g), KHTW- 01 × HD2967 (18.60) and GW 477 × FLW-15 (18.00) are the crosses may be used soil tolerant genotype because their performance are higher and stable in both environmental conditions. the high estimate of heritability in broad sense (>60%) was recorded for all characters like- biological yield per plant (g), grain per spike, plant height (cm), number of tillers per plant, 1000-grain weight (g), grain yield per plant (g), panicle length (cm), number of spikelet's per spike, flag leaf area (cm^2) And the high estimate of heritability in a broad sense (>60%) in late sown (E2). all characters like- biological yield per plant (g), Number of tillers per plant, Grain yield per plant (g), Grain per spike, Plant height (cm) The high estimates of Genetic Advance as per cent of Mean (>15%) were found in these characters- plant height (cm) and biological yield per plant (g), in

timely sown (E1). High heritability coupled with high genetic advance in per cent of mean was recorded under sodic soil for plant height (cm), biological yield per plant (g), grain per spike, harvest index (%), number of tillers per plant, number of spikelet's per spike, panicle length (cm), and grain yield per plant (g) in both timely sown (E1) and late sown (E2) under sodic soil condition.

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