www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(1): 228-230

www.thepharmajournal.com
Received: 04-11-2021
Accepted: 06-12-2021

Sampada S Bhopale
Agricultural Botany Section, College of Agriculture, Kolhapur, Maharashtra, India

Adhir R Aher
Agricultural Botany Section, College of Agriculture, Kolhapur, Maharashtra, India

Bhagyashri R Bhosale
Agricultural Botany Section, College of Agriculture, Kolhapur, Maharashtra, India

Yogesh V Lokhande
Agricultural Botany Section, College of Agriculture, Kolhapur, Maharashtra, India

Mayuri V Pawar
Agricultural Botany Section, College of Agriculture, Kolhapur, Maharashtra, India

Corresponding Author:
Sampada S Bhopale
Agricultural Botany Section, College of Agriculture, Kolhapur, Maharashtra, India

Estimation of hybrid vigour for grain quality characters in Hexaploid wheat (*Triticum aestivum* L.)

Sampada S Bhopale, Adhir R Aher, Bhagyashri R Bhosale, Yogesh V Lokhande and Mayuri V Pawar

Abstract
The present investigation was undertaken with the objectives, to assess genetic variation in gluten, minerals and antinutrients contents in grain of parents and F_1, to estimate the heterosis (Relative heterosis, Heterobeltosis, Standard heterosis) for grain quality characters. The average mean performance of F_1 was higher than parents in desired direction for many of the characters suggesting existence of heterotic effects. The genotype CNM 15.2 was dwarfish among the genotypes. The genotype DBW 39 showed maximum tillers per plant and maximum number of spikes per plant. The genotype K 1314 showed maximum spike length and length of grain. The genotypes DBW 93, SRRSN 6070, SAWYT.HT.74, SAWSN 3266 showed maximum number of grains per spike, breadth of grain. 1000 grain weight and grain yield per plant respectively. The analysis of variance revealed that the mean square value due to genotype were highly significant for all characters indicating presence of sufficient genetic variability in the experimental material. The results revealed that there was significant difference among genotypes as mean square value found to be significant for all traits.

Keywords: heterosis, heterobelteosis, mean performance

Introduction
Wheat species of the genus *Triticum* L. are members of the *Triticeae* Dum. tribe of the Poaceae Barn. family and represent the world's most important monocotyledenous cereals (Anon., 2015) [2]. Wheat provides nearly 55% of carbohydrates and 20% of food calories. It contains carbohydrate 78.10%, protein 14.70%, fat 2.10%, minerals 2.10% and considerable proportions of vitamins (thiamine and vitamin B) and minerals (zinc, iron). Wheat is also good source of traces minerals like selenium and magnesium, nutrients essential for good health (Adams *et al.* 2002; Fraley 2003; Shewry *et al.* 2006; Topping 2007) [1, 4, 7, 8]. Heterosis breeding has proved to be a potential method of increasing yield in the self as well as cross fertilizing crops (Barot *et al.*, 2014) [3]. Heterosis term describes the improved ability as compared to their parents, increase in growth, yield and other plant traits is known as heterosis.

Material and Methods
The field experiment related to the present investigation was carried out during *Rabi*, 2019 at Post Graduate Research Farm Agricultural Botany Division, Rajarshee Chhatrapati Shahu Maharaj College of Agriculture, Kolhapur. The experimental material for the present investigation consists of 33 genotypes ($13F_1$+19 Parent+1 Check) of bread wheat. The experiment was laid out in randomized block design with three replications. 32 genotypes (13 F_1 and 19 parents) along with one check were randomly planted in three replications. Each entry was represented by one row 5m length spaced at 22.5cm between rows and 10cm within plant. The observations were recorded on five randomly selected plants for seven characters namely gluten %, calcium mg/100gm, magnesium mg/100gm, zinc mg/100gm, copper mg/100gm, iron mg/100gm, phytic acid mg/gm. The analysis of variance was done as suggested by Panse and Sukhatme (1985) [5]. The relative heterosis over mid-parent, heterobeltosis over better parent and standard heterosis over commercial hybrid/variety and calculated as per Rai (1979) [6].

Results and Discussion
For grain quality characters the genotype DBW 93 recorded lowest gluten per cent and the genotype HI 1618 showed lowest phytic acid content. The genotypes DBW 39 and K 1314 showed highest zinc content.

The genotypes HD 3043, NIAW 301, SAWYT.HT.74, K 1314 showed highest calcium, magnesium, copper and iron content respectively.

The cross SAWYT.HT.74 x SRRSN 6070 recorded lowest gluten per cent and the cross SAWYT.HT.74 x K 1314 showed lowest phytic acid content. The crosses SAWYT.HT.74 x SRRSN 6070, NIAW 301 x KRL 370 and SAWYT.HT.74 x CNM 15.2 showed highest copper content, the crosses NIAW 301 x KRL 370, SAWYT.HT.74 x CNM 15.2, K 1314 x SRRSN 6070, HI 1618 x DBW 93 showed highest calcium, magnesium, zinc and iron content respectively.

The extent and magnitude of various heterotic effects in percentage over mid parent (RH) better parent (HB) and over check (SH) varied with cross to cross and character to character.

1. **Relative Heterosis:** For grain quality character the cross Raj 4513 x HI 1618 were the best hybrid performed for copper and iron content, the crosses NIAW 301 x KRL 370, Raj 4513 x SAWSN 3266, HI 1618 x GW 2016-750, NIAW 34 x SBWYT.HT.74, SAWYT.HT.74 x K 1314 were the best hybrid performed for gluten, calcium, magnesium, zinc, phytic acid content respectively.
2. **Heterobeltosis:** For grain quality character the crosses DBW 93 x DBW 93, SAWYT.HT.74 x SRRSN 6070, HI 1618 x GW 2016-750, NIAW 34 x SBWYT.HT.74, SAWYT.HT.74 x K 1314 were the best hybrid performed for gluten, calcium, magnesium, zinc and phytic acid content respectively. The cross Raj 4513 x HI 1618 was desirable for iron and copper content.
3. **Standard heterosis:** For grain quality character the crosses SAWYT.HT.74 x SRRSN 6070, NIAW 301 x KRL 370, K 1314 x SRRSN 6070, HI 1618 x DBW 93, SAWYT.HT.74 x K 1314 were the best hybrids performed for gluten, calcium, zinc, iron and phytic acid content respectively. The cross SAWYT.HT.74 x CNM 15.2 were the best hybrids performed for magnesium and copper content.

Table 1: Estimates of relative heterosis, heterobeltiosis and standard heterosis for 7 grain quality characters in wheat.

Sr. No.	Crosses	Gluten			Calcium			Magnesium		
		Heterosis over			Heterosis over			Heterosis over		
		RH	HB	SH	RH	HB	SH	RH	HB	SH
1	DBW 39 x DBW 93	10.17	0.15[1]	3.53	12.30	3.87	3.93	1.75	1.52	1.94
2	HI 1618 x DBW 93	13.44	8.88	0.13	9.20	4.75	-3.01	4.91	1.54	1.49
3	Raj 4513 x SAWSN 3266	2.71[2]	0.84[2]	0.71	19.01[1]	8.34[2]	7.41[3]	3.81	1.90	-3.57
4	K 1314 x SRRSN 6070	5.67	1.65	5.61	15.29[3]	4.55	4.62	5.18	1.30	2.24
5	Raj 4513 x HI 1618	3.97[3]	3.09	-0.77[3]	13.04	6.94	-2.42	4.46	2.35	-2.84
6	SAWYT.HT.74 x SRRSN 6070	4.82	2.76	-1.33[1]	12.96	11.15[1]	-6.50	3.56	2.84	-2.50
7	SAWYT.HT.74 x K 1314	7.08	4.36	1.45	14.87	6.19	5.18	3.79	0.76	1.43
8	NIAW 301 x KRL 370	1.65[1]	1.49	5.57	10.59	5.34	8.63[1]	2.05	0.24	1.19
9	SAWYT.HT.74 x CNM 15.2	4.98	2.68	-0.90[2]	15.82[2]	6.97	6.17	6.70[2]	3.62[3]	4.26[1]
10	NIAW 34 x CNM 15.2	8.34	3.42	-0.19	8.02	3.76	2.98	2.76	1.37	1.99
11	HI 1618 x GW 2016-750	7.10	2.01	3.66	7.97	4.57	-3.18	6.98[1]	4.62[1]	2.38[2]
12	NIAW 34 x SBWYT.HT.74	12.17	8.78	1.58	9.61	7.97[3]	1.73	6.41[3]	4.47[2]	2.26[3]
13	SAWYT.HT.74 x HD 3043	5.56	1.45[3]	3.24	13.70	1.75	8.33[2]	4.28	1.13	2.03
Minimum		1.65	0.15	-1.33	7.97	1.75	-6.50	1.75	0.24	-3.57
Maximum		13.44	8.88	5.61	19.01	11.15	8.63	6.98	4.62	4.26

Sr. No.	Crosses	Zinc			Copper		
		Heterosis over			Heterosis over		
		RH	HB	SH	RH	HB	SH
1	DBW 39 x DBW 93	5.82	0.87	6.15	-2.12	-1.32	-11.50
2	HI 1618 x DBW 93	16.60	8.36[2]	3.69	19.56[3]	10.00	5.76
3	Raj 4513 x SAWSN 3266	8.11	8.10[3]	-26.20	13.72	11.53	11.54
4	K 1314 x SRRSN 6070	32.96[2]	6.14	11.69[1]	11.11	9.09	15.36
5	Raj 4513 x HI 1618	21.78	7.19	-3.69	22.44[1]	20.00[1]	15.38
6	SAWYT.HT.74 x SRRSN 6070	32.94[3]	6.84	10.46[2]	10.90	7.01	17.29[2]
7	SAWYT.HT.74 x K 1314	23.92	3.27	6.76	11.13	5.26	15.39
8	NIAW 301 x KRL 370	19.46	4.39	9.53	15.09	8.92	17.27[3]
9	SAWYT.HT.74 x CNM 15.2	8.72	3.86	7.38	17.30	7.01	17.31[1]
10	NIAW 34 x CNM 15.2	6.14	5.12	0.92	15.21	12.76[3]	1.92
11	HI 1618 x GW 2016-750	13.79	5.43	1.53	19.55	10.00	5.76
12	NIAW 34 x SBWYT.HT.74	62.72[1]	14.74[1]	10.15[3]	20.83[2]	13.72[2]	11.54
13	SAWYT.HT.74 x HD 3043	9.40	3.86	7.38	11.32	3.50	13.46
Minimum		5.82	0.87	-26.20	-2.12	-1.32	-11.50
Maximum		62.72	14.74	11.69	22.44	20.00	17.31

Sr. No.	Crosses	Iron			Phytic acid		
		Heterosis over			Heterosis over		
		RH	HB	SH	RH	HB	SH
1	DBW 39 x DBW 93	13.04	12.01	15.69[2]	-17.93	-20.8	-14.35
2	HI 1618 x DBW 93	15.27	12.92	16.63[1]	-14.81	-18.78	-12.17
3	Raj 4513 x SAWSN 3266	14.06	13.17[3]	2.57	-12.86	-13.4	-4.36
4	K 1314 x SRRSN 6070	7.69	1.53	8.19	-10.61	-11.25	-14.93

5	Raj 4513 x HI 1618	20.29[1]	13.81[1]	13.81[3]	-24.26[2]	-32.14[2]	-25.83[2]
6	SAWYT.HT.74 x SRRSN 6070	12.72	9.92	3.74	-18.49[3]	-24.27[3]	-15.50[3]
7	SAWYT.HT.74 x K 1314	7.57	7.29	-3.51	-27.48[1]	-34.56[1]	-26.98[1]
8	NIAW 301 x KRL 370	18.18[2]	11.08	12.64	-14.53	-15.49	-14.24
9	SAWYT.HT.74 x CNM 15.2	12.69	13.28[2]	1.87	-12.40	-15.02	-5.16
10	NIAW 34 x CNM 15.2	17.47[3]	11.26	13.32	-5.53	-7.97	1.95
11	HI 1618 x GW 2016-750	10.94	2.83	2.10	-11.16	-11.77	-4.13
12	NIAW 34 x SBWYT.HT.74	16.34	11.26	13.34	-10.69	-11.7	-4.11
13	SAWYT.HT.74 x HD 3043	7.88	5.21	-0.70	-17.48	-23.76	-4.09
Minimum		7.57	1.53	-3.51	-27.48	-34.56	-26.98
Maximum		20.29	13.81	16.63	-5.53	-7.97	1.95

References

1. Adams ML, Lombi E, Zhao FJ, McGrath SP. Evidence of low selenium concentrations in UK bread-making wheat grain. Journal of the Science of Food and Agriculture. 2002;82:1160–1165.
2. Anonymous. Annual report (2014-15), Directorate of Economics and Statistics, Department of Agriculture, Co-operation and Farmers Welfare, 2015 GOI.
3. Barot HG, Patel MS, Sheikh WA, Patel LP, Allam CR. Heterosis and combining ability analysis for yield and its component traits in wheat (*Triticum aestivum* L.). Electronic Journal of Plant Breeding. 2014;5(3):350-359.
4. Fraley RT. Improving the nutritional quality of plants. In: Vasil IK (ed) Plant biotechnology 2002 and beyond. Kluwer, Dordrecht, 2003, 61–67.
5. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research Publication, 1985, 87-89.
6. Rai B. Heterosis breeding. Agrobiological publications, Delhi-I 1005 1, India, 1979.
7. Shewry PR, Powers S, Field JM, Fido RJ, Jones HD, Arnold GM, *et al*. Comparative field performance over three years and two sites of transgenic wheat lines expressing HMW subunit transgenes. Theoretical and Applied Genetics. 2006;113:128–136.
8. Topping D. Cereal complex carbohydrates and their contribution to human health. Journal of Cereal Science. 2007;46:220-229.