Biological Forum – An International Journal 14(4a): 161-164(2022)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Inbreeding Depression Study in F_2 and F_3 Segregating Generations of Bread Wheat (*Triticum aestivm* L.)

Aditi R. Rajane, N.R. Potdukhe, S.V. Sai Prasad, S.J. Gahukar, B.D. Gite and Pallavi R. Sasane*
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra), India.

(Corresponding author: Aditi R. Rajane)*
(Received 17 September 2022, Accepted 07 November, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: In order to study inbreeding depression for yield and some of its associated characters in bread wheat (*Triticum aestivum* L.), the present experiment was carried out performing diallel analysis following Griffing (1956) Approach. Twelve genetically diverse parents were selected and crossed in diallel fashion including reciprocals. These parents were evaluated along with their 132 F_2's and 132 F_3's in a Randomized Block Design (RBD) with 3 replications at the Wheat Research Unit, Dr. PDKV, Akola during Rabi 2019-20. Although not for all the characters, the direct cross AKAW-4627 × AKAW-4210-6 and reciprocal cross WB-2 × AKAW-4210-6 were found to have maximum negative significant inbreeding depression for the grain yield. The study reveals good scope for commercial exploitation among the progenies for improvement of yield levels in bread wheat in segregating generations.

Keywords: Inbreeding Depression, Bread Wheat, Diallel Analysis, Griffings Approach, RBD.

INTRODUCTION

Since prehistoric times, wheat has been cultivated in India and is the country's second-most significant cereal (Tandon, 2000; Kumar and Maloo 2011). Worldwide, hexaploid wheat [2n = 6x = 42 = AABBDD] is cultivated and consumed as a food crop. Wheat output and productivity have increased noticeably, but since it is a staple food for more than a billion people and the population is still growing, wheat yield and its quality still need to be increased significantly.

Any breeding program's success is largely dependent on the choice of parents, the mating system used, and, eventually, the breeder's acute judgment in choosing superior genotypes from more numerous and unattractive plants within the segregating populations. Inbreeding is a fundamental process for providing the base material for selection because it resulted in better segregants for the wheat crop (Gaur *et al.*, 2014; Kumar *et al*., 2016). In order to quantify the extent of inbreeding depression in bread wheat and identify superior parents and crosses that may be effectively applied in the future wheat improvement programmes, the current study was carried out.

MATERIALS AND METHODS

Twelve different wheat varieties were chosen for the experiment based on their genetic diversity and stability for several yield parameters. They were then diallel mated, including reciprocals. In three replications during Rabi 2019–20, twelve genotypes and their 132 F_2 and 132 F_3 progenies were evaluated at the wheat research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.

The observations were recorded randomly from the ten competitive plants in parents and 30 plants from F2 and F3 progenies for all the following traits *viz.* days to 50% flowering, days to maturity, plant height, effective tillers per plant, grains per earhead, grain weight per plant, 1000 grain weight, harvest index and grain weight per plot. Mean values over selected plants were used for statistical analysis. The mean values of different F_2s and F_3s for all characters were subjected for analysis of inbreeding depression as per cent increase or decrease in the mean value of F_3 over F_2.

The degree of inbreeding is measured by the inbreeding coefficient. Inbreeding depression was estimated when both F_2 and F_3 population of the same cross were available. It was measured as follows (Chavan *et al.*, 2018):

$$\text{ID in } F_3 = \frac{\overline{F_2} - \overline{F_3}}{\overline{F_2}}$$

Where,

F_2 and F_3 = means of F_2 and F_3 generations

RESULTS AND DISCUSSION

Normally inbreeding depression occurs in the F_2 generation and beyond because the benefits of dominance or dominance interaction fade in these generations due to diminished heterozygosity. Significant inbreeding depression for various characteristics was observed in the current experiment.

The crosses with estimates of inbreeding depression that are both negative and significant offer scope for selection in the F_2 generation and later. Similar results were reported by Bhatt (2008). None of the crosses showed consistency for every character, but each one showed considerable inbreeding depression for at least one or more traits. For example (Table 1), among 66 direct crosses, twenty six crosses recorded significant desirable negative inbreeding depression for grain yield per plot, and cross AKAW-4627 × AKAW-4210-6 (-12.82%) recorded maximum negative inbreeding depression followed by crosses AKAW-5017 × MACS-6222 (-11.36%), AKW-1071 × K-307 (-11.11%), MACS-6222 × WB-2 (-10.71%), and K-307 × WB-2 (-10.53%). In Addition to grain yield, the crosses AKAW-4627 × AKAW-4210-6 (-15.42%), AKW-1071 × K-307 (-14.27%) and K-307 × WB-2 (-19.17%) also showed significant inbreeding depression for the character grains per earhead. As regard 66 reciprocal crosses, eighteen crosses noted significant desirable negative inbreeding depression and cross WB-2 × AKAW-4210-6 (-20.00) recorded maximum inbreeding depression followed by the crosses AKAW-4210-6 × AKAW-4627 (-13.51%), GW-322 × HPBW-01(-13.51%), K-307 × AKAW-4925 (-12.82%), MACS-6222 × AKAW-5017 (-12.20%), and GW-322 × AKW-1071 (-11.63%). Out of above mentioned crosses, WB-2 × AKAW-4210-6 (-8.68%) and K-307 × AKAW-4925 (-7.36%) were also having significant inbreeding depression for the grains per earhead. Above direct and reciprocal crosses indicates that the concerned trait is controlled by non-additive gene action and can be improved through heterosis breeding. The direct cross AKAW-4627 × MACS-6222 have exhibited negative significant inbreeding depression for more than one characters *viz*., days to 50% flowering (-4.83%), days to maturity (-4.31%), plant height (-4.40%), effective tillers per plant (-10.51%), grains per earhead (-3.55%) and grain yield per plot (-7.69%). Whereas, reciprocal cross K-307 × AKAW-5017 was seen to have negative significant inbreeding depression for the characters like effective tillers per plant (-21.28%), grains per earhead (-14.56%), grain weight per plant (-24.76%) and 1000 seed weight (-7.09%) but without grain yield per plot.

The inconsistency of expression for different characters is in conformity with the findings of Khattab (2010); Zaazaa (2017) for harvest index, grain weight/spike and number of grains/spike; Hamam (2013) for number of grains/spike and grain yield/plant in F_2 and F_3 generations; Kumar *et al*. (2017) for grain yield per plant while and Nagar *et al*. (2019) found both positive and negative significance of inbreeding depression in F_1's and F_2's for grain yield per plant,1000 seed weight, and no. of grains per spike.

Table 1: Inbreeding Depression in F_3 population for different characters.

Sr. No.	Direct Crosses	Days to 50% flowering	Days to Maturity	Plant height (cm)	Effective tillers per plant	Grain per earhead	Grain yield perplant (g)	1000 grain weight (g)	Harvest index	Grain Yield per plot (kg)
1.	AKAW-5017 × AKAW-5014	-4.41**	-0.87	-0.29	17.12**	2.34	6.59	-1.86	-2.72	7.32*
2.	AKAW-5017 × AKAW-4924	-0.69	0.85	-7.50**	-10.03**	-3.78**	3.69	0.20	-1.02	0.00
3.	AKAW-5017 × AKAW-4925	4.83**	5.13**	-4.70**	7.64	0.33	3.25	0.29	4.48	0.00
4.	AKAW-5017 × AKAW-4627	3.55	-3.08**	-9.13**	12.85**	-0.84	9.30	-3.09	1.17	7.32*
5.	AKAW-5017 × AKAW-4210-6	-9.09**	2.20**	-0.81	8.89*	0.27	9.10	0.70	-0.10	-7.69**
6.	AKAW-5017 × AKW-1071	-7.91**	-0.88	-1.15	-4.21	-1.43	-25.54**	-3.79	-2.72	-4.35
7.	AKAW-5017 × MACS-6222	-3.65	-2.22**	1.75	-6.07	-7.18	3.01	0.06	1.86	-11.36**
8.	AKAW-5017 × GW-322	-3.45	-1.75**	-4.06**	4.91	-1.95	6.18	1.99	-0.16	-8.11**
9.	AKAW-5017 × K-307	6.29**	2.16**	-1.45	7.62	-1.48	6.37	-0.20	6.74	9.20**
10.	AKAW-5017 × HPBW-01	-2.82	-1.72**	-5.73**	5.95	-15.68**	1.70	5.78**	-1.39	4.76
11.	AKAW-5017 × WB-2	-2.07	-2.16**	10.45**	4.19	-3.75**	3.20	-4.10*	1.27	-7.69**
12.	AKAW-5014 × AKAW-4924	-2.90	-1.00	3.90**	26.84**	-4.89**	5.77	3.03	3.80	2.56
13.	AKAW-5014 × AKAW-4925	0.00	-2.22**	-1.42	20.08**	-9.31**	17.71**	1.05	-0.02	-10.34**
14.	AKAW-5014 × AKAW-4627	-1.37	-3.03**	6.01**	-13.81**	-0.81	6.31	-0.32	-0.06	-7.32*
15.	AKAW-5014 × AKAW-4210-6	-4.96**	-1.28	11.25**	2.66	-1.07	2.96	2.12	-6.39	3.03
16.	AKAW-5014 × AKW-1071	-0.66	-2.61**	-7.96**	9.14*	-3.90**	4.32	-6.61**	0.14	-5.75
17.	AKAW-5014 × MACS-6222	2.01	-3.45**	-5.58**	-11.73**	-5.46**	4.25	1.22	10.44**	0.00
18.	AKAW-5014 × GW-322	-5.33**	-0.43	-6.29**	3.26	0.24	-0.34	2.48	1.18	-10.00**
19.	AKAW-5014 ×X K-307	-0.67	-0.86	-10.58**	-4.53	-0.59	15.96**	2.48	2.38	2.70
20.	AKAW-5014 × HPBW-01	-2.01	-1.68	-7.16**	8.77*	-3.04**	5.08	0.98	0.20	25.00**
21.	AKAW-5014 × WB-2	2.04	-2.13**	-4.94**	6.28	-5.09**	13.08**	-0.82	-9.30	0.00
22.	AKAW-4924 × AKAW-4925	-7.48**	-1.71**	-4.05**	1.34	-0.38	0.40	4.04*	0.12	-7.69**
23.	AKAW-4924 × AKAW-4627	-2.78	-6.14**	15.35**	6.27	-1.37	12.07**	2.95	1.20	-7.69**
24.	AKAW-4924 × AKAW-4210-6	0.00	0.00	-1.60	8.31	1.21	7.08	1.38	2.08	-2.13
25.	AKAW-4924 × AKW-1071	-7.69**	1.74**	-3.86**	6.80	2.83**	17.30**	-0.32	11.10**	-3.23
26.	AKAW-4924 × MACS-6222	-2.74	2.11**	-1.67	4.30	1.58	9.07	1.75	3.09	2.04
27.	AKAW-4924 × GW-322	-7.14**	-4.72**	2.26	-3.75	3.37**	16.78**	-0.11	5.00	-2.56
28.	AKAW-4924 × K-307	-4.70**	-2.98**	2.33	-8.17	-0.76	-8.53	-0.76	2.44	0.00
29.	AKAW-4924 × HPBW-01	0.00	-5.73**	-2.57	4.28	0.24	9.38	2.89	7.44	-7.69**
30.	AKAW-4924 × WB-2	-0.69	-7.8988	-3.24**	2.58	-8.98**	15.88**	0.85	-2.91	-2.56
31.	AKAW-4925 × AKAW-4627	-1.43	-1.75**	-12.05**	1.73	0.87	-9.44	1.35	2.44	-10.00**
32.	AKAW-4925 × AKAW-4210-6	-2.78	-5.22**	-9.84**	8.33	2.01	12.02**	-1.35	6.02	-7.69**
33.	AKAW-4925 × AKW-1071	0.00	-2.11**	-6.71**	5.53	0.06	6.63	0.83	7.26	-8.11**

34.	AKAW-4925 × MACS-6222	-3.40	-1.27	-9.72**	13.15**	-2.04	10.66**	-1.15	-2.56	-3.23
35.	AKAW-4925 × GW-322	-1.33	1.68**	-5.16**	-2.75	-13.11**	-10.91**	3.01	2.68	-6.25
36.	AKAW-4925 × K-307	1.45	-7.96**	11.11**	-9.47**	-3.11**	-4.64	2.26	-9.25	16.13**
37.	AKAW-4925 × HPBW-01	-1.37	-1.27	-10.28**	-14.75**	-2.65*	15.41**	1.07	7.84	0.00
38.	AKAW-4925 × WB-2	-1.35	-4.24**	-24.20**	4.91	-3.04**	13.16**	3.00	4.69	0.00
39.	AKAW-4627 × AKAW-4210-6	-1.30	-0.43	-6.56**	4.84	-15.42**	9.28	1.81	-1.14	-12.82**
40.	AKAW-4627 × AKW-1071	-0.67	-2.15**	-0.37	8.24	-13.26**	9.43	3.72	3.72	-10.00**
41.	AKAW-4627 × MACS-6222	-4.83**	-4.31**	-4.40**	-10.51**	-3.55**	25.41**	1.39	-1.10	-7.69**
42.	AKAW-4627 × GW-322	0.68	-2.59**	6.50**	1.91	-3.93**	4.90	-1.49	-4.84	22.22**
43.	AKAW-4627 × K-307	-8.72**	2.59**	4.30**	-6.79	1.17	12.62**	2.18	6.26	-7.69**
44.	AKAW-4627 × HPBW-01	4.23**	-4.50**	-0.17	-15.38**	-1.99	13.24**	-2.69	1.41	-8.57**
45.	AKAW-4627 × WB-2	-1.37	-7.21**	5.33**	-3.08	-16.99**	-39.61**	-1.10	4.51	0.00
46.	AKAW-4210-6 × AKW-1071	-2.04	0.00	-0.97	-5.44	0.59	21.39**	0.37	0.01	11.11**
47.	AKAW-4210-6 × MACS-6222	-4.17**	-2.59**	3.38**	2.40	-18.96**	-7.65	6.49**	8.87	29.41**
48.	AKAW-4210-6 × GW-322	-4.89**	0.00	-0.03	9.98**	-4.22**	12.41**	3.05	-0.06	-8.57**
49.	AKAW-4210-6 × K-307	-6.67**	-3.93**	-1.38	-3.07	-1.56	-3.56	1.71	3.80	24.14**
50.	AKAW-4210-6 × HPBW-01	-4.41**	-1.30	-4.16**	-13.19**	-18.61**	11.80**	-0.50	1.31	8.11**
51.	AKAW-4210-6 × WB-2	-2.16	-1.72**	2.46	10.87**	-0.81	9.84*	-3.14	4.88	-7.69**
52.	AKW-1071 × MACS-6222	3.95*	-2.93**	2.94*	5.12	-2.85**	7.14	0.34	0.14	-9.09**
53.	AKW-1071 × GW-322	2.13	-5.31**	0.60	6.58	-10.89**	-13.43**	3.58	8.14	8.11**
54.	AKW-1071 × K-307	-3.18	-1.65**	-15.18**	-2.50	-14.27**	-8.76	2.17	6.05	-11.11**
55.	AKW-1071 × HPBW-01	6.33**	1.23	4.20**	10.40**	2.56**	3.49	-0.77	5.13	-9.52**
56.	AKW-1071 × WB-2	-1.99	-3.80**	0.90	4.76	1.54	9.74	-5.86	7.94	14.29**
57.	K-307 × MACS-6222	4.29**	-7.14**	-0.16	5.04	-7.16**	4.69	0.16	2.01	-5.56
58.	K-307 × GW-322	-2.74	-1.28	4.06**	-7.40	-2.98**	6.72	-2.92	6.32	8.11**
59.	K-307 × HPBW-01	-1.32	-2.11**	-2.18	3.41	-1.93	1.77	1.84	1.61	8.11**
60.	K-307 × WB-2	4.70**	-2.11**	3.98**	4.10	-19.17**	1.60	3.18	2.44	-10.53**
61.	MACS-6222 × GW-322	-0.66	2.56**	0.51	1.39	1.01	0.80	1.21	4.08	0.00
62.	MACS-6222 × HPBW-01	-6.04**	1.72**	-2.51	16.51**	2.02	-2.33	2.08	-2.34	1.89
63.	MACS-6222 × WB-2	2.01	2.13**	0.01	1.93	-1.17	-2.29	3.25	0.00	-10.71**
64.	HPBW-01 × GW-322	0.00	-7.96**	3.71**	7.60	-1.37	7.24	1.92	-2.82	-8.11**
65.	HPBW-01 × WB-2	-0.68	1.28	0.24	5.57	1.41	-41.08**	0.21	-0.97	-5.26
66.	WB-2 × GW-322	-3.45	-1.29	-1.53	7.65	-1.04	-22.80**	1.25	1.92	-3.45
67.	AKAW-5014 × AKAW-5017	6.21**	-7.89**	-4.10**	6.69	-0.54	-1.66	0.31	3.90	-7.69**
68.	AKAW-4924 × AKAW-5017	-0.68	0.43	-2.04	14.11**	2.32	-11.76**	2.25	-2.08	-6.67
69.	AKAW-4924 × AKAW-5014	2.63	0.41	6.07**	9.44**	1.04	9.01	0.25	3.86	7.69**
70.	AKAW-4925 × AKAW-5017	-2.74	0.00	-0.58	7.26	0.49	7.59	2.62	0.18	0.00
71.	AKAW-4925 × AKAW-5014	2.70	0.00	4.74**	0.96	-11.64**	18.31**	-0.43	1.55	-9.09**
72.	AKAW-4925 × AKAW-4924	4.35**	0.85	4.66**	10.97**	1.95	-0.52	1.05	1.63	26.32**
73.	AKAW-4627 × AKAW-5017	2.74	-2.44**	3.40**	5.34	-11.12**	-18.72**	2.86	0.00	3.23
74.	AKAW-4627 × AKAW-5014	1.45	0.87	2.39	10.51**	0.12	10.78**	2.15	7.32	0.00
75.	AKAW-4627 × AKAW-4924	7.48**	2.59**	5.07**	7.10	2.73**	-5.29	1.47	9.76	5.88
76.	AKAW-4627 × AKAW-4925	8.84**	-2.61**	6.20**	7.30	-3.72**	10.13*	3.38	2.61	21.21**
77.	AKAW-4210-6 × AKAW-5017	8.61**	-3.45**	-2.89*	-20.24**	3.97**	10.49**	12.61**	14.26**	18.75**
78.	AKAW-4210-6 × AKAW-5014	5.56**	-2.30**	3.69**	-4.97	1.02	15.85**	2.88	-2.44	11.11**
79.	AKAW-4210-6 × AKAW-4924	9.46**	3.00**	-3.04*	-24.58**	4.13**	6.66	1.39	8.09	5.26
80.	AKAW-4210-6 × AKAW-4925	14.08**	-1.74**	5.20**	-36.95**	-4.49**	-11.20**	-1.43	-1.40	25.00**
81.	AKAW-4210-6 × AKAW-4627	2.04	1.69**	11.41**	-1.34	7.72**	10.60**	-2.08	5.18	-13.51**
82.	AKW-1071 × AKAW-5017	2.82	-0.45	3.07*	-20.19**	0.08	0.95	0.98	1.55	-7.69**
83.	AKW-1071 × AKAW-5014	-2.90	2.56**	1.48	5.84	1.86	4.76	2.63	-7.87	8.11**
84.	AKW-1071 × AKAW-4924	-9.09**	-0.84	-6.32**	3.36	2.70**	12.39**	1.85	2.68	7.69**
85.	AKW-1071 × AKAW-4925	3.95*	-4.68**	-7.35**	2.73	-6.15**	8.74	2.85	-1.23	-10.53**
86.	AKW-1071 × AKAW-4627	6.04**	-3.03**	8.97**	-2.56	1.81	15.54**	0.54	-1.10	-7.69**
87.	AKW-1071 × AKAW-4210-6	-1.35	-3.48**	5.24**	-3.78	7.04**	13.73**	3.31	1.23	13.33**
88.	K-307 × AKAW-5017	4.05*	-2.54**	-7.36**	-21.28**	-14.56**	-24.76**	-7.09**	6.61	-2.86
89.	K-307 × AKAW-5014	6.21**	4.24**	9.65**	-15.01**	4.85**	6.87	2.14	-1.12	17.65**
90.	K-307 × AKAW-4924	4.64**	-7.89**	1.17	10.98**	2.74**	2.27	1.17	0.00	0.00
91.	K-307 × AKAW-4925	-2.56	1.63**	-1.54	-1.60	-7.36**	-3.26	-5.41	12.44**	-12.82**
92.	K-307 × AKAW-4627	6.76**	-4.24**	-6.14**	-2.76	7.87**	11.90**	-0.85	2.97	8.11**
93.	K-307 × AKAW-4210-6	-6.67**	-4.31**	1.09	2.68	2.37	-4.44	-1.56	-0.10	6.67
94.	K-307 × AKW-1071	-3.40	-0.42	-1.13	2.61	-0.67	-26.09**	-15.17**	-13.58**	26.32**
95.	MACS-6222 × AKAW-5017	-4.90**	-1.26	3.14**	8.19	1.48	12.68**	2.06	7.68	-12.20**
96.	MACS-6222 × AKAW-5014	-9.86**	-2.93**	1.14	0.52	2.47*	7.94	3.31	5.08	-10.53**
97.	MACS-6222 × AKAW-4924	1.96	-0.83	-9.17**	17.25**	-2.01	-12.48**	1.19	2.44	8.11**
98.	MACS-6222 × AKAW-4925	2.01	-4.24**	-9.12**	2.85	1.20	6.13	0.40	-2.89	7.69**
99.	MACS-6222 × AKAW-4627	2.74	-0.43	1.93	-11.48**	4.28**	6.89	2.37	3.16	-6.38
100.	MACS-6222 × AKAW-4210-6	2.04	1.69**	1.05	3.42	1.54	-5.30	3.89	-3.22	0.00
101.	MACS-6222 × AKW-1071	0.00	1.69**	0.61	2.60	1.88	6.94	-0.71	5.05	-8.00**
102.	MACS-6222 × K-307	-2.10	-0.43	-2.31	-9.49**	5.53**	8.16	-4.59**	4.35	0.00
103.	HPBW-01 × AKAW-5017	1.37	0.43	2.27	4.72	-1.32	12.09**	4.83**	-3.16	-4.35
104.	HPBW-01 × AKAW-5014	4.11*	-1.71**	1.50	3.58	2.01	11.25**	2.87	6.97	0.00
105.	HPBW-01 × AKAW-4924	-2.90	-2.54**	-5.34**	7.83	-1.60	-0.54	2.46	5.93	-6.25
106.	HPBW-01 × AKAW-4925	-2.19	-7.49**	4.31**	3.37	2.50*	2.02	3.55	3.90	-5.00
107.	HPBW-01 × AKAW-4627	0.00	2.61**	9.53**	3.11	2.73**	9.43	1.77	1.67	30.43**
108.	HPBW-01 × AKAW-4210-6	3.50	-1.71**	-9.16**	-6.46	0.99	9.32	1.76	3.80	8.11**
109.	HPBW-01 × AKW-1071	10.53**	-2.50**	5.49**	-11.51**	2.33	5.38	2.69	1.30	0.00
110.	HPBW-01 × K-307	7.38**	-1.71**	1.51	-17.46**	-3.63**	3.95	0.80	3.08	14.29**
111.	HPBW-01 × MACS-6222	5.96**	4.17**	-0.10	-12.52**	2.23	2.67	3.80	-4.44	36.36**

112.	WB-2 × AKAW-5017	6.21**	-1.71**	0.93	1.96	-0.35	14.76**	4.63**	1.23	-7.69**
113.	WB-2 × AKAW-5014	3.40	-1.27	-1.36	0.90	3.44**	13.43**	7.56**	-0.51	-10.34**
114.	WB-2 × AKAW-4924	5.41**	-2.54**	-0.09	2.21	-1.19	4.91	2.04	-1.14	-7.69**
115.	WB-2 × AKAW-4925	-8.57**	-2.95**	-0.03	4.19	-0.99	-1.01	1.46	1.21	11.11**
116.	WB-2 × AKAW-4627	-12.23**	-3.39**	-4.94**	2.86	-8.09**	4.97	-2.92	-2.80	42.86**
117.	WB-2 × AKAW-4210-6	6.85**	-3.90**	-11.53**	4.06	-8.68**	9.56	2.06	-5.97	-20.00**
118.	WB-2 × AKW-1071	-0.69	-2.11**	3.23**	-4.07	-4.49**	17.25**	3.55	-2.94	0.00
119.	WB-2 × K-307	5.48**	2.52**	-6.21**	-7.83	3.10**	7.39	1.96	7.47	-11.11**
120.	WB-2 × MACS-6222	-9.59**	4.56**	0.12	-6.24	-0.80	13.97**	2.30	4.67	26.32**
121.	WB-2 × HPBW-01	0.00	-3.03**	-2.67	-5.75	1.88	-5.16	4.31**	6.33	-5.00
122.	GW-322 × AKAW-5017	3.40	0.43	-5.83**	4.35	-5.38**	-10.42*	1.80	-1.24	-7.69**
123.	GW-322 × AKAW-5014	-5.41**	-3.80**	5.84**	4.07	-6.13**	12.74**	4.97**	5.08	5.88
124.	GW-322 × AKAW-4924	-3.55	-7.02**	7.26**	-13.76**	-0.51	9.29	2.67	3.70	-5.26
125.	GW-322 × AKAW-4925	4.00*	2.93**	-10.53**	1.76	3.43**	-1.35	2.00	3.09	-1.96
126.	GW-322 × AKAW-4627	-9.63**	-3.03**	1.06	2.78	2.95**	7.04	3.60	0.31	-2.70
127.	GW-322 × AKAW-4210-6	-2.13	5.49**	-11.48**	-8.07	0.92	9.30	2.92	-4.77	5.56
128.	GW-322 × AKW-1071	9.59**	5.44**	2.96*	-10.74**	-2.90**	18.60**	-2.05	3.23	-11.63**
129.	GW-322 × K-307	0.68	0.00	-12.59**	-9.27**	3.65**	11.22**	2.85	2.08	0.00
130.	GW-322 × MACS-6222	-0.67	-0.83	-2.20	10.18**	-4.10**	-6.65	0.83	1.63	15.38**
131.	GW-322 × HPBW-01	-2.10	0.42	-2.72	4.57	1.59	-6.01	-0.47	11.55**	-13.51**
132	GW-322 × WB-2	2.67	0.83	3.57**	3.01	1.00	3.29	2.73	2.97	-3.70
	Check	-2.98	-0.86	-1.74	7.04	1.45	7.95	3.52	9.30	5.00
	CD									
	1%	1.104	0.668	1.371	2.153	1.248	2.493	0.685	1.004	2.645
	5%	0.836	0.506	1.038	1.630	0.945	1.887	0.519	0.760	2.002

CONCLUSION

The population buffering benefit, which can happen in further generations due to gene segregation or occasionally because of the production of superior gene combinations, may lead to the negative inbreeding depression. Such a circumstance is advantageous in conventional breeding programmes. As an overview of all the results it is evident that, among 132 crosses, the direct cross AKAW-4627 × AKAW-4210-6 and reciprocal cross WB-2 × AKAW-4210-6 have maximum negative significant inbreeding depression for the grain yield which is more desirable. The direct cross AKAW-4627 × MACS-6222 and reciprocal cross K-307 × AKAW-5017 were seen to have negative desirable ID for most of the yield related traits but not grain yield. All the above crosses can be used in the wheat breeding programme based on the breeder's preference.

Acknowledgment. This research was a part of Ph.D. thesis and we are extremely grateful to Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola and Wheat Research Unit, Dr. PDKV, Akola for providing field and lab facilities for conducting this trail.

Conflict of Interest. None.

REFERENCES

Bhatt, A. (2008). Studies on heterosis and inbreeding depression in forage sorghum [*Sorghum bicolor* (L.) moench.]. *Agric. Sci. Digest., 28*(4), 258-261.

Chavan Tukaram, A., Wadikar, P. B. and Naik, G. H. (2018). Heterosis, Inbreeding Depression and Residual Heterosis Study in F_2 and F_3 Segregation Generation of Okra (*Abelmoschus esculentus* (L.) monench). *Int. J. Curr. Microbiol. App. Sci., 7*(9), 1681-1684.

Gaur, S. C., Singh, S. N., Tiwari, L. P. and Gaur, L. B. (2014). Heterosis and inbreeding depression in the inheritance of grain yield and it's components in wheat (*Triticum aestivum*). *Current Advances in Agricultural Sciences, 6*(2), 186-189.

Hamam, K. A. (2013). Estimation of genetic parameters using five populations model in three bread wheat crosses under normal irrigation and drought stress. *Egypt J. Plant Breed., 17*(2), 63-79.

Khattab, S. A. M., Esmail, R. M. and Al-Ansar, A. M. F. (2010). Genetical analysis of some quantitative traits in bread wheat (*Triticum aestivum* L). *New York Sci., J., 3*(11), 152-157.

Kumar, J., Singh, S. K., Singh, L., Kumar, M., Kumar, A., Kumar, S. and Yadav, R. K. (2016). Study of economic heterosis and inbreeding depression in bread wheat (*Triticum aestivum L.*) under late sown condition. *Res. Environ. Life Science, 9*(9), 1082-1086.

Kumar, S., Singh, S. K., Singh, L., Gupta, S. K., Yadav, V., Prashant, P. C. Yadav, Y. Pandey, Singh, L. and Kumar, S. (2017). Heterosis and inbreeding depression for grain yield and related morphophysiological characters in wheat (*Triticum aestivum* L.). *Int. J. Curr. Microbiol. App. Sci., 6*(10), 1352-1364.

Kumar, V. and Maloo, S. R. (2011). Heterosis and combining ability studies for yield components and grain protein content in bread wheat [*Triticum aestivum* (L.)]. *Indian Journal of Genetics and Plant Breeding, 71*, 363-366.

Nagar, S. S., Kumar, P., Singh, C., Gupta, V., Singh, G. and Tyagi, B. S. (2019). Assessment of heterosis and inbreeding depression for grain yield and contributing traits in bread wheat. *Journal of Cereal Research, 11*(2), 125-130.

Tandon, J. P. (2000). Wheat breeding in India during the twentieth century. *Crop Improvement, 27*, 1-18.

Zaazaa, E. I. (2017). Genetic Analysis of Yield and Its Components in Some Bread Wheat Crosses (*Triticum aestivum* L.) using Five Parameters Model. *J. Plant Production, Mansoura Univ., 8*(11), 1215-1220.

How to cite this article: Aditi R. Rajane, N.R. Potdukhe, S.V. Sai Prasad, S.J. Gahukar, B.D. Gite and Pallavi R. Sasane (2022). Inbreeding Depression Study in F_2 and F_3 Segregating Generations of Bread Wheat (*Triticum aestivm* L.). *Biological Forum – An International Journal, 14*(4a): 161-164.