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Phenotypic stability of yield and its contributing characters in bread wheat (*Triticum aestivum* L. emend Thell)

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Abstract: Fifty genotypes of bread wheat were evaluated under three simulated environments for stability parameters with respect to grain yield and its component traits. Genotype x environment interaction was significant for all the characters. Both linear and non-linear components of G x E interaction were significant for grain yield per plant, number of spikelets per spike, number of grains per main spike and 1000-grain weight. Whereas, for number of effective tillers per plant only linear component was significant. Only one genotype JAB-95-7 showed stability for all characters. Genotypes, JAB-95-16, JAB-95-23, JAB-95-27, JAB-95-31 and JAB-95-33 were also high yielders and stable for grain yield. Effective number of tillers per plant, number of spikelets per spike, number of grains per main spike, and 1000grain weight, the major components of yield varied in compensatory fashion to impart stability to the final and complex character, yield. *(Key words: Bread wheat; Yield and stability)*

The potentials of genotypes and stability of their performance can be judged by multi-environment testing. The larger the genotype x environment interaction, the lesser are the chances of progress under selection. In the present study, an attempt has been made to identify high yielding stable genotypes in bread wheat.

Materials and Methods

Forty-four advanced generation bulks with six released varieties of wheat were grown in randomized block design with three replications in three environments created by sowing the material on different times, *viz.* early (October 29), timely (November 15) and late (December 2), during rabi 1994-95 at the Wheat Research Station, Gujarat Agricultural University, Junagadh. Each genotype was randomly alloted to plot of 1.5 meters long row keeping a distance of 22.5 cm apart between rows, and 10 cm within rows. All other cultural practices were followed uniformly to raise the good crop. Observations on five random competitive plants, leaving border ones, of each genotype were recorded. The linear (b) and non-linear (S^2d) components of genotype x environment interaction and stability parameters of fifty genotypes over environments were computed following Eberhart and Russell (1966) model.

Results and Discussion

The analysis of variance for different characters (Table-1) in individual environments as well as pooled over environments showed significant variation among genotypes included in the present study. The environments and genotype x environment interactions were significant in pooled analysis for all the characters. The linear and non-linear components of

Table 1. Analysis of variance for stability in bread wheat

Source	d.f.	Mean squares				
		Grain yield/ plant (g)	Number of effective tillers/ plant	Number of spikelets/ spike	Number of grains/ main spike	1000-grain weight (g)
Genotypes	49	2.397**	1.074**	4.968**	86.345**	56.253**
Environments	2	62.641**	22.785**	43.735**	442.416**	632.922**
G x E	98	1.037**	0.343**	0.471**	11.031*	4.795**
Environment (linear)	1	125.281**	45.570**	87.477**	884.777**	1265.729**
G x E	49	1.032**	0.368*	0.462**	12.402**	6.080**
Pooled deviation	50	1.022**	0.312	0.471	9.467**	3.443**
Pooled error	294	0.632	0.231	0.194	3.453	1.767

*, ** Significant at 5 and 1 per cent levels respectively.

Table 2. Stability parameters of promising genotypes for yield and yield contributing characters in bread wheat

Genotypes	Grain yield / plant (g)			Number of effective tiller / plant			Number of spikelets/ spike			Number of grain/main spike			1000-grain weight (g)		
	Mean	bi	S²di	Mean	bi	S²di	Mean	bi	S²di	Mean	bi	S²di	Mean	bi	S²di
JAB-95-7	7.36	0.77	0.23	4.56	1.11	0.26	14.20	0.95	0.49	45.51	2.14	3.79	42.57	0.98	0.26
JAB-95-8	7.16	1.68	0.76	4.91	2.20	0.27	15.27	0.74**	-0.19	42.62	0.86	-2.13	40.76	0.45**	-1.59
JAB-95-10	7.76	1.74	0.27	4.36	1.36*	-0.21	15.31	0.86	1.24**	46.58	1.02	-1.99	45.23	0.91	-1.00
JAB-95-15	7.09	-0.86**	-0.60	4.42	-0.88**	-0.17	15.49	0.55	0.18	38.76	0.32	-0.09	45.05	0.81	2.71
JAB-95-16	9.91	2.36**	-0.63	5.82	2.22**	-0.22	18.09	-0.20*	0.33	48.62	0.53	39.67**	44.02	0.45	9.27*
JAB-95-18	7.49	0.96	-0.51-	3.98	1.42	-0.21	16.51	2.04**	0.06	50.64	2.87**	-2.14	50.90	1.28	1.39
JAB-95-21	7.44	1.55	-0.30	4.38	1.16	0.12	16.02	0.34**	-0.17	45.00	0.34	26.89**	43.14	1.09	-1.51
JAB-95-23	8.18	1.31	0.84	4.56	0.97	0.03	18.00	0.15*	0.11	55.40	0.27	23.76-	44.67	0.11*	3.06
JAB-95-26	7.24	1.24	-0.27	3.84	1.29	-0.09	15.40	1.58	0.16	49.98	2.43	16.67*	42.96	0.67**	-1.66
JAB-95-27	8.00	1.79*	-0.30	3.78	1.51**	-0.22	16.42	0.75	1.18*	54.04	0.14	2.75*	49.06	0.59	1.37
JAB-95-31	8.89	1.10	-0.62	4.93	1.01	-0.17	16.07	0.72	-0.01	52.22	1.99**	-2.63	41.57	1.07	0.39
JAB-95-33	8.84	2.69**	-0.01	5.40	2.61	-0.23	17.49	1.04	0.22	49.98	0.75	-0.57	42.36	0.76**	-1.57
JAB-95-34	7.20	1.69	0.55	4.82	1.65	0.17	15.49	0.65	0.99*	47.91	0.60*	-8.06	38.39	0.49**	-1.74
JAB-95-35	7.91	-0.06**	-0.55	4.53	-0.09*	-0.02	15.29	0.69	1.08*	36.44	0.99	1.74	52.58	1.07	5.91
JAB-95-41	7.47	1.50	1.74	4.80	130	0.53	15.31	1.42	0.02	44.82	2.10	3.20	42.02	1.29**	1.65
JAB-95-42	7.33	0.73	-0.53	4.69	0.19**	-0.22	16.20	1.23**	-0.18	47.40	0.32**	-3.07	40.02	0.91**	-1.76
Lok-1	7.27	1.10	0.87	5.84	0.26	0.79*	13.36	0.86	0.58*	33.96	0.26**	-3.06	51.27	2.90	35.33**
GW-496	7.26	1.92**	-0.57	5.40	1.59-	-0.22	14.69	0.85	0.28	44.80	0.83	-2.21	40.08	1.06	3.83
GW-190	7.11	0.49	1.01	4.11	0.58	-0.04	17.93	1.26	0.03	56.49	0.69	-1.77	39.62	0.65**	-1.36
DL-803-3	7.16	0.75	-0.56	4.47	1.03	-0.22	15.84	1.17	-0.11	51.56	-0.11**	-3.44	38.08	0.25**	-1.49
Mean	7.036			4.42			15.482			45.214			42.378		

*, ** Significant at 5 and 1 per cent levels respectively.

bi, Tested against individual SEbi

G x E interaction were significant for grain yield per plant, number of spikelets per spike, number of grains per main spike and 1000-grain weight. These findings are in accordance with the findings of Jatasra and Paroda (1980), Bhullar *et al.* (1983) and Patil *et al.* (1992). In case number of effective tillers per plant, only linear component was significant as observed by Kindarkhedia and Jadon (1990).

The genotype JAB-95-16 was the highest yielding followed by JAB-95-31, JAB-95-33, JAB-95-23 and JAB-95-27 of which only JAB-95-23 and JAB-95-31 were average stable and responsive to all the three sowing dates, while, JAB-95-16, JAB-95-27 and JAB-95-33 were stable and responsive under favourable environmental conditions.

Grain yield is a complex character. The analysis of individual yield components can lead to simplification in explaining stability for grain yield. JAB-95-7 was the only genotype which showed average stability for grain yield and all its components (Table 2). The high grain yield in this genotype was resulted from high mean values for number of effective tillers per plant, number of grains per main spike and 1000-grain weight. Responsiveness of highest yielding genotype, JAB-95-16 in the favourable environment for grain yield per plant was accompained by high b value (2.22) for number of effective tillers per plant and stable performance of JAB-95-31 and JAB-95-33 was resulted by high mean values for number of effective tillers per plant, number of spikelets per spike and grains per main spike. The genotype JAB-95-23 had all four yield components with high mean values but contribution of number of grains per main spike was difficult to predict as it had significant deviation from regression. The high 1000-grain weight resulted into high grain yield per plant in JAB-95-27.

The study revealed that out of twenty high yielding stable genotypes, 12 for number of effective tillers per plant, 10 for number of spikelets per spike, 9 for number of grains per main spike and 9 for 1000-grain weight were stable and superior. Considering grain yield and stability of these five traints the genotypes, JAB-95-7, JAB-95-16, JAB-95-23, JAB-95-27, JAB-95-31 and JAB-95-33 were found very promising. In the present study, it seems that the stability of number of effective tillers per plant, spikelets per spike, grains per main spike and 1000-grain weight varies in compensating manner in different genotypes in imparting them yield stability.

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