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Short Communication

Stability analysis for grain yield in bread wheat (*Triticum aestivum* L.) for irrigated ecosystems

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Abstract

In bread wheat eight advance lines and four check varieties *viz.,* GW 322, GW 366, GW 496 and LOK-1 were evaluated at three locations to estimate stability parameters for seed yield. Both linear and non-linear (pooled deviation) components of G x E variance were significant; however, linear component was of greater magnitude. The genotype, GW-411 had mean value (2910.22 kg/ha) higher than general mean (2817.35 kg/ha), regression coefficient around unity and minimum deviation from regression, thereby it was identified as stable genotype across the environments.

Key words: G x E interaction, Stability, Seed yield and Bread wheat.

1. Introduction

The adaptability of a variety over diverse environments is usually tested by the degree of its interaction with different environments under which it is grown. A variety or genotype is considered to be more adaptive or stable one, if it has a high mean yield but low degree of fluctuation in yielding ability, when grown over diverse environments. According to Eberhart and Russell (1966) a stable variety should have around unit regression coefficient over environments ($b_i \approx 1$) and minimum deviation from the regression ($S^2d_i = 0$) in addition to higher seed yield than population mean.

The stability parameters studied by Yue *et al.* (1990) revealed that wheat crop in general was more stable in yield than maize and sorghum. However, yield of durum wheat also fluctuates in the rainfed areas of Gujarat. In middle Gujarat bread wheat is cultivated as irrigated crop in different cropping pattern. It is being cultivated as *rabi* crop after harvest of short duration *kharif* pulses, maize and bajra as timely sown irrigated crop. It is being also cultivated after harvest of transplanted medium duration paddy crop as late sown irrigated crop. For timely sown crop the soils are light with medium fertility, while for late sown crop the soils are medium black paddy crop soil with high fertility. The variation for sowing period, physical structures of soil and fertility status of soils largely influence the yield of wheat crop. Therefore the present investigation was planned to evaluate promising twelve genotypes of bread wheat for their yield stability under three different environments of irrigated condition.

2. Materials and methods

Total 12 genotypes representing 8 advanced lines/ candidate varieties and 4 checks, *viz.,* GW 322, GW 366, GW 496 and LOK-1 of bread wheat were evaluated at three locations *viz.,* Anand, Thasra and Derol of middle Gujarat during *Rabi* season of the year 2009-10. The physical properties of the soils of each location were varied as Anand representing sandy loam soil, Thasra representing medium black soil of paddy land and Derol representing loamy soil of maize cultivated region. The advance lines were promising lines of various regions/ research stations of the state. The genotypes were evaluated in Randomized Complete Block Design with three replications at each location. An experimental unit was consisted of six rows of six meter length with 22 x 10 cm plant geometry. The wheat crop is being shown by drill, it is drilled crop, but as per recommendation for middle Gujarat intra row distance is likely to be maintained as 10 cm. Stability parameters for grain yield was worked out as per procedure suggested by Eberhart and Russell (1966).

3. Results and discussion

The pooled analysis across the location revealed significant differences among environments and genotypes for grain yield (Table 1); accordingly variance due to G x E interaction was significant. The variance

due to genotypes X environments (G X E) interaction was further partitioned into linear and non-linear (pooled deviation) components. Mean square value for both these components were found significant; however, linear component was of greater magnitude than its counter parts pooled deviation; which revealed that there were genetic differences among genotypes for their regression on the environmental index, and performance of genotypes would be predicted for an individual environment.

Table 1. Pooled analysis of variance of grain yield (kg/ha) in 12 wheat genotypes

Source	DF	MS
Genotypes	11	94157.204**
Environment + (G x E)	24	940532.383**
Environment (linear)	1	19733326.191**
G x E (linear)	11	159318.518**
Pooled deviation	12	90578.941**
Pooled error	66	20690.246

*** Significant at the 1 % level*

The simultaneous consideration of three parameters of stability (Table 2) for an individual genotype revealed that the genotypes "GW-411 and Lok-1" showed the regression coefficient value statistically closer to unity along with minimum deviation from linear regression and higher seed yield than average of all the genotypes.

Table 2. Stability parameters of 12 wheat genotypes grown in three environments

Sr. No.	Genotypes	Mean	Regression co-efficient (b_i)	Deviation from regression (s^2d_i)
1	GW-391	2852.111	1.408**	421654.477**
2	GW-396	2677.222	1.253**++	-15790.406
3	GW-400	2906.111	0.774*	127725.921**
4	GW-406	2601.778	0.72**++	-18823.181
5	GW-407	2743.111	0.449+	82042.691*
6	GW-410	2528.444	0.612**++	-6542.079
7	GW-411	2910.222	1.111**	43062.42
8	VA-2007-13	2954.444	1.126**	94760.95*
9	GW-322	3181.667	0.884**	6723.038
10	GW-366	2839.667	1.403**++	-18734.078
11	GW-496	2706.222	1.212**	76956.065*
12	LOK-1	2907.222	1.049**	45628.528
Average		2817.352	1.00	69888.695

*** Deviation from zero; ++ Deviation from one*

The genotype GE 366 numerically surpassed the average seed yield, showed minimum deviation from linear regression, but its regression coefficient was above one. Therefore it would be well adapted to better environment. Genotype GW 391 could not fulfilled the basic assumption/ requirement for predicting the performance of genotype as it significantly deviated from linear regression.

The genotype GW-322 yielded the highest grain yield followed by GW-411 and Lok-1, all these genotypes showed minimum deviation from linear regression. Among these, genotype GW 322 registered below unity regression coefficient, thereby it was well adapted to poor environment and it has above average stability; while genotypes GW 411 and Lok-1 had unit regression coefficient, and both were well adapted to all the environments.

The results are in accordance with the findings of by Fatih (1987), Rajput and Ziauddin (1992), Mahal *et al.*(1998), Amin *et al.* (2005), Banerjee *et al.* (2006) and

Yadav *et al.* (2009). All these scientists were found G X E interaction and both G X E linear and pooled deviation were significant, indicating that both predictable and unpredictable components shared G X E interaction; however, linear component was larger than pooled deviation suggesting that performance of the genotypes could be predicted for different environments.

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