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Phenotypic Stability Analysis in Niger (Guizotiaabyssinica Cass)

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Abstract – **Eight elite genotypes with two checks varieties of Niger were evaluated for their yield performance over five locations. Stability parameters were worked out for seed yield. The sum of square due to genotypes and environment were significant, indicating presence of substantial genetic variability among the genotypes and seasons. The GxE interaction was observed to be significant. On partition of the same into linear and non-linear components both were found significant, suggesting their importance in the expression of seed yield in Niger. However, linear component was larger in magnitude, indicating that the prediction of performance across the environment is possible. This also confirm from overall ANOVA, where Linear is more than thrice over nonlinear. On examination of individual parameters, the genotypes IGPN 8007, IGPN 08-66 and PhuleKarala were observed to be responsive and stable. Simultaneously the genotypes IGPN 8004 and IGPN 9001was found to be suitable for poor environment conditions (below average stability). However, the genotypes IGPN 08-21, IGPN 08-26,IGPN 08-33 and IGP 76 suitable under rich environmental conditions (above average stability). It is therefore worth to utilize these genotypes in the Niger improvement program to converage the stability characteristics of seed yield. The stability parameters appeared to be governed by different gene or genes in combination in Niger.**

Keywords – **Phenotypic, Stability, Gxe, Niger.**

I. Introduction

Adaptation of agricultural crops to various environments has been a key factor to enhance the seed yield, which have occurred since the spread of crop to the new environment (Evan 1980). The process of adapting the crop to gradually changing agronomic conditions has become more efficient through the use of systematic breeding program and selection by breeders for high yield potential with wide adaptation. It has been estimated that the spectacular yield increase of crops during the second part of the 20th century have to be attributed in almost equal measure to breeding and use of inputs.

Niger (*Guizotiaabyssinica* Cass) is a hundred percent cross- pollinated crop with presence of sporophytic protandrous self- incompatibility mechanism and hence homozygosity confers the adaptability to Niger genotypes. However, consistency in performance of such genotypes across diverse environments is lacking. Under such circumstances it is necessary to identify newly developed genotypes, before their release for cultivation for high yield potentiality coupled with stability of performance over various environments. Otherwise, specific genotypes can be suggested and recommended for specific environment. So as to overcome total failure of the crop. Keeping this view in mind the present investigation was carried out.

II. Materials and Methods

Eight genotypes along with two checks were evaluated at five locations viz. ZARS, Igatpuri, ARS, Dhule, KVK, Nandurbar, MPKV Rahuri and ZARS, Kolhapur during Kharif season of 2012 under rain fed condition in randomized block design with three replications in plot size of 4.00 x 3.00 m^2 at spacing 30 x 10 cm^2.The recommended package of practices were followed to raise good and healthy crop stand. The observations were recorded per plot basis and converted into seed yield kg/ha. The data were subjected to analysis of stability as per the method outlined by Eberhart and Russel (1966).

III. Results and Discussion

The analysis of variance for stability (Table-I showed that mean difference significances between genotypes and environments were highly significant indicating presence of considerable variability among genotypes and environments. The significance of mean square due to GxE interaction indicates that the genotypes interacted considerably with the prevailing environmental condition. Similar type of results have also been reported by Upadhyaya (1993), Kumar et al. (1993), Hegde et al. (1999), Patil and Purkar (2000), Patil (2001), Duhoon and Patil (2003) and Patil (2008). The GxE interaction was further portioned into linear and nonlinear components. Since both the components were significant, the practical usefulness of prediction would depend on relative magnitude of two variance. In the present study the linear component was in larger (more than thrice larger) magnitude than nonlinear components, suggesting that the prediction of performance of a genotype can be possible across the environments. In prediction of performance, the nonlinear component may have its role, since it is also significant, Only Joshi and Patil (1982) have reported importance of nonlinear component in the expression of seed yield in Niger.

Table I. Anova for seed yield stability in Niger Genotypes.

Source	d.f.	Mean sum of square
Genotypes	09	5.8017**
Environments	04	18.0895**
G x E	36	00.6667**
Environment + (G x E)	40	02.1547**
Environment Linear	01	113.8756**
G x E Linear	09	01.9486**
Pooled Deviation	30	00.2798*
Pooled Error	100	00.0041

*Significant at P=0.05 and **Significant at P=0.01.

Different measures of stability have been used by various workers. Earlier, Finley and Wilkinson (1963) considered linear regression slope as a measure of stability. Further Eberhart and Russel (1966) emphasized the need of considering both linear and nonlinear component of G x E interaction in judging the stability of a genotype. In the present study three stability parameters i.e. mean performance (X), regression coefficient (bi) and deviation from regression (S^2di). Considering these three stability parameters, the stability of elite Niger genotypes are accessed and promising ones will be promoted in further improvement programme.

Table-II: Seed yield stability in Niger genotypes.

Sr. No.	Genotypes	Mean Performance (kg/ha)	Regression Coefficient (b_i)	Deviation from Regression (S^2d_i)
1	IGPN 8004	414	1.5721*	0.0171**
2	IGPN 8007	331	1.0079	0.0000
3	IGPN 08-16	372	1.1973	0.0072**
4	IGPN 08-21	266	0.6260	0.0131**
5	IGPN 08-26	235	0.4710	0.0023**
6	IGPN 08-33	277	0.5042	0.0030**
7	IGPN 08-66	322	1.1531	0.0016
8	IGPN 9001	418	1.5397*	0.0056**
9	IGP 76(c)	278	0.6401	0.0066**
10	Phulekarala (c)	339	1.1339	0.0000
	Mean	325	0.9845	
	SE±	40.15	0.3924	

All the genotypes except IGPN 8007, IGPN 08-66 and PhuleKarala were significant for their non-linear component (S^2di). This mean that only the genotypes IGPN 8007, IGPN 08-66 and PhuleKarala was stable (average stability) for seed yield(Table II), which having high mean performance, unit regression coefficient, and least or zero of deviation from regression. Besides IGPN 8004 and IGPN 9001 have shown regression coefficient more than unity indicating their suitability for poor environmental conditions (below average stability). However, the genotypes IGPN 08-21, IGPN 08-26,IGPN 08-33 and IGP 76 have shown regression coefficient less than unity, indicating its suitability under rich environmental conditions (Above average stability).

It is , therefore concluded that these genotypes may be included in Niger improvement programme to converage the stability characteristics of seed yield for development of stable variety adapted to wide range of environments and to achieve quantum jump in Niger production and productivity. Ultimately, which will help in boosting the economy of tribal farmers and to increase the share of Niger among all oilseed crops in the oilseed scenario of the country.

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