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# Stability analysis of ginger (*Zingiber officinale* Rosc.) genotypes

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## Abstract

Ten genotypes of ginger (*Zingiber officinale*) were subjected to stability analysis based on their evaluation for 6 years at Regional Agricultural Research Station, Ambalavayal (Kerala, India). All the genotypes differed significantly for tiller number, leaf number and yield. Stability analysis revealed the superiority of Ernadan and Kuruppampady as they expressed high mean yield, non significant $S^2di$ values and a regression nearing unity.

**Key words** : ginger, stability analysis, *Zingiber officinale.*

Ginger (*Zingiber officinale* Rosc.) is grown on a wide range of climatic conditions in Kerala. Though propagated exclusively through vegetative means (rhizomes), the present day cultivars popular among the farmers, have been evolved through introduction and selection. Environmental factors significantly influence the productivity of the crop and hence a genotype with high yield potential and stability is essential for cultivation. In recent years, much emphasis has been laid on the nature of genotype x environment interaction and also the techniques used for analysing such interactions. However, no information is available on the stability of promising genotypes in ginger. The present investigation is aimed at testing the stability of promising ginger genotypes.

Ten varieties of ginger namely, Awacho, Dharja, Ernadan, Himachal, Jorhat, Kuruppampady, Maran, Rio-de-Janeiro, $V_2E_{5-2}$ and Wyanad Mananthavady were evaluated at Regional Agricultural Research Station, Ambalavayal (Kerala, India) for 6 years during 1993–99. The experiment was laid out in a Randomized Block Design with three replications. All the genotypes received the cultivation practices recommended by the Kerala Agricultural University (KAU 1991). The data on plant height, number of leaves, tillers per plant and yield per hectare were recorded. The stability parameters were estimated following Eberhart & Russell (1966).

The analysis of variance for stability in respect of four characters revealed significant differences between genotypes for number of tillers, leaves per plant and yield (Table 1). The linear component was significant for tiller number, plant height and yield, while the non-linear component was significant for plant height indicating the contribution of non-linear component to the interaction effect in respect of plant height.

The linear regression analysis facilitates identification of genotypes having wider adaptability over a range of environment. According to Eberhart & Russell (1966), a genotype with high mean yield, unit regression coefficient (bi = 1) and least deviation from regression ($S^2di=0$) are considered as an ideal, widely adapted and stable genotype. However, Breese (1969) and Paroda *et al.* (1973) opined that regression coefficient is a measure of response to varying environments and the mean square deviation from linear regression is the true measure of stability, the genotypes with the least deviation being the most stable.

All the genotypes except Himachal exhibited significant response with respect to tiller number in different years and non significant mean square deviation from regression suggesting the stability of this character in ginger (Table 2). The variety $V_2E_{5-2}$ and Rio-de-Janeiro expressed the highest tiller number with non significant $S^2di$ value

**Table 1.** Analysis of variance for biometric characters and yield in ginger (1993–99)

| Source | df | Mean sum of square | | | |
|---|---|---|---|---|---|
| | | No. of tillers/ plant | Plant height | No. of leaves/plant | Yield |
| Genotype | 9 | 9.610** | 18.020 | 459.97** | 148.91** |
| Environment (g x e) | 50 | 3.410 | 16.980 | 46.82 | 203.35 |
| Environment (linear) | 1 | 151.27 | 287.130** | 311.85** | 9091.84** |
| Genotype x Environment (linear) | 9 | 0.784* | 35.680** | 21.39 | 76.84** |
| Pooled derivatives | 40 | 0.312 | 6.024* | 45.92 | 9.60 |
| Pooled error | 108 | 1.110 | 11.100 | 66.59 | 26.40 |

** Significant at 1% level; * Significant at 5% level

which might have contributed to the high yield of these varieties. All the genotypes except Dharja exhibited average response and non significant mean square deviation from regression for plant height. The stability of this character is reflected in the unit regression values. All the 10 genotypes were stable for leaf number, as they exhibited average response and non significant deviation from regression.

All the genotypes showed significant regression values for yield (Table 2). The highest yield was expressed by $V_2E_{5-2}$, followed by Ernadan. However, the significant regression value and mean square deviation from regression suggest the unpredictable performance of $V_2E_{5-2}$ in different years. The high regression value (bi=1.62) indicated the suitability of this genotype in a favourable environment. Among the varieties, Awacho,

**Table 2.** Mean regression coefficient and mean square deviations from regression of biometric characters and yield of ginger

| Variety | No. of tillers/ plant | bi | $S^2di$ | Plant height (cm) | Bi | $S^2di$ | No. of leaves/ plant | Bi | $S^2di$ | Yield (t/ha) | bi | $S^2di$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Awacho | 7.73 | 0.82** | -0.09 | 69.79 | 1.43 | 1.60 | 65.06 | 1.25 | -14.95 | 27.79 | 1.05** | -0.62 |
| Dharja | 7.89 | 1.17** | -0.30 | 66.87 | -1.64 | 20.77** | 76.59 | 2.27 | 45.88 | 28.29 | 0.75** | -6.23* |
| Ernadan | 9.36 | 1.27** | -0.13 | 70.81 | 0.08 | -0.88 | 80.53 | 0.82 | -11.22 | 37.00 | 0.88** | 4.54 |
| Himachal | 8.24 | 0.60** | -0.19* | 72.01 | 1.96 | -3.77 | 75.51 | 1.16 | -16.21 | 27.90 | 1.16** | 1.29 |
| Jorhat | 6.94 | 0.77** | -0.15 | 71.90 | 1.90 | 4.26 | 60.76 | 1.94 | 37.97 | 23.44 | 0.77** | 2.96* |
| Kuruppampady | 8.76 | 1.09** | -0.18 | 68.48 | 1.13 | 4.09 | 74.12 | 0.92 | -13.57 | 32.44 | 0.81** | 6.48 |
| Maran | 9.52 | 1.14** | 0.03 | 70.25 | 1.44 | -2.38 | 80.87 | 0.36 | 4.33 | 30.61 | 0.70** | -4.76* |
| Rio-de-Janeiro | 10.68 | 1.10** | 0.28 | 71.49 | 1.53 | -2.02 | 70.89 | -0.57 | 98.03 | 27.59 | 1.30** | -0.77* |
| $V_2E_{5-2}$ | 10.84 | 1.23** | -0.21 | 72.37 | 0.41 | -0.15 | 88.84 | 0.35 | 88.39 | 40.38 | 1.62** | 1.32** |
| Wyanad Mananthavady | 8.40 | 0.82** | 0.35 | 71.10 | 1.78 | 1.29 | 63.66 | 1.51 | 18.59 | 28.75 | 0.95** | 3.76 |
| Grand Mean | 8.83 | | | 70.57 | | | 73.68 | | | 30.42 | | |

** Significant at 1% level; * Significant at 5% level

Ernadan, Himachal, Kuruppampady and Wyanad Mananthavady, expressed non significant mean square deviation from regression, a trait appreciated in stability analysis (Breese 1969). Ernadan and Kuruppampady are promising genotypes as they expressed high mean yield. The variety Ernadan is the most promising as it exhibited high mean yield (37 t/ha) with non significant $S^2di$ value and a regression value nearing unity.

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