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# STABILITY ANALYSIS OF SESAME VARIETIES DURING EARLY *KHARIF*

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## ABSTRACT

**Fifty genotypes were evaluated in different locations of the eastern dry zone of Karnataka through participatory plant breeding approach. The experiment was conducted in two research stations (ZARS, UAS, Bangalore and ARS, Balajigapade) and farmers' fields in three villages (Nittur, MN halli and Sathnur). Stability of the genotypes across the different locations of this zone was worked out for seed yield. Eberhart and Russell model of stability was used for analysis. Significant differences were observed for seed yield. Genotypes were identified as promising in different locations based on actual seed yield. Among fifty entries only three entries Kanakapura local, ST-3 and ST-16 showed stability for seed yield.**

**Key words :** Sesame, stability, seed yield.

## INTRODUCTION

Sesame is an important dryland oilseed crop of Eastern dry zone of Karnataka. It is sown as early as April / May utilizing the pre-monsoon showers and after its harvest, the main *kharif* (south-West monsoon) crop is taken. Thus farmers treat it as a bonus crop. But the average yield of the crop in farmer's fields was very low because of lack of suitable varieties with high yielding potential. The phenotypic performance of a genotype differs in different environments, seasons and locations. The G X E interaction has assumed greater importance in plant breeding, as they affect stability of varieties under diverse environments. So participatory approach was carried out to select varieties which are high yielding and also an attempt was made to study the stability of these varieties of sesame during early *kharif* in this zone.

## MATERIALS AND METHODS

The experiment was conducted in two research stations (Zonal Agricultural Research Station, GKVK Campus of University of Agricultural Sciences, Bangalore and Agricultural Research Station, Balajigapade) and in three farmers' fields one each at Nittur, Melina Nayakana halli (MNH) and Sathnur which comes under Eastern Dry Zone of Karnataka during early *kharif*, 2005. Fifty sesame varieties (Table 1) were evaluated in this experiment, which was laid out in an augmented design. The plot size being 2.5 x 0.9 m and the spacing followed was 30 x 10 cm. Sowing was carried out during April – May in the above locations. Inter cultivation was carried out twice, one at 15 DAS and another at 30 DAS. No plant protection measures were taken up.

Observations were made on days to maturity at the time of harvest, plant height (cm),

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**Table 1 :** List of genotypes studied along with description.

| Genotype | Variety/ local colletion / Important features /Areas recommended for cultivation |
|---|---|
| Dhavari | White, Variety |
| E-8 | White, Bold seed, variety recommended for Northern Karnataka |
| Kanakapura local | Black, local variety collected from Kanakapura. |
| Magadi local | local variety collected from Magadi Taluk |
| TMV-3 | Profusely branched, bushy type, variety recommended for Karnataka, and Tamilnadu. |
| Ajjampur local | Local variety collected from Ajjampur village. |
| Belgaum Black | Local variety collected from Belgaum district |
| Belgaum white | Local variety collected from Belgaum district |
| CGW local | Local variety collected from ChikkaGanganawadi village |
| Chandana | Variety released |
| Channapatna local | Local variety collected from Channapatna taluk |
| Dinnur local | Local variety collected from Dinnur village. |
| DS-1 | Variety released for Karnataka |
| Gouri | Brown seed variety recommended for Coastal districts of Andhra Pradesh as *kharif* and rabi crop and Assam |
| Kunigal local | Local variety collected from Kunigal taluk |
| Madhavi | Light Brown seed, variety recommended for Coastal districts of Andhra Pradesh as *kharif* and rabi crop, Assam |
| Malavalli local | Local variety collected from Malavalli Taluk |
| Marupalli local | Local variety collected from Marupalli village. |
| Rajeshwari | White bold seed, Variety recommended for Andhra Pradesh (late *kharif* and rabi) |
| Rama | Reddish brown seed, variety recommended for Madhya Pradesh, West Bengal. |
| Ranebennur local | Local variety collected from Ranebennur taluk |
| Savanur local (1) | Local variety collected from Savanur village |
| Savanur local (2) | Local variety collected from Savanur village |
| ST-1 | Germplasms collected from Research stations. |
| ST-2 | —— do——- |
| ST-3 | —— do——- |
| ST-4 | —— do——- |
| ST-5 | —— do——- |
| ST-6 | —— do——- |
| ST-7 | —— do——- |
| ST-8 | —— do——- |
| ST-9(1) | —— do——- |
| ST-9(2) | —— do——- |
| ST-11 | —— do——- |
| ST-12 | —— do——- |
| ST-13 | —— do——- |
| ST-14 | —— do——- |
| ST-15 | —— do——- |
| ST-16 | —— do——- |
| Swetha till | Variety released for cultivation. |
| Thalli local | Local variety collected from Thalli village |
| Thilak | Variety released for cultivation |
| TKG-1 | Variety released for cultivation |
| Turuvekere local black | Local variety collected from Turuvekere village |
| Turuvekere local white | Local variety collected from Turuvekere village |
| Uma | Non-shuttering, synchronous in maturity, Variety released for Assam, Bihar, M.P., Eastern U.P., W. Bengal, Orissa and N-E states, Andaman and Nicobar islands. |
| Yadgiri local | Local variety collected from Yadgiri district. |
| YLM-11 | Germplasms collected from Research stations. |
| YLM-17 | —— do——- |
| YLM-57 | —— do——- |

plant height up to first branch (cm), number of primary branches, number of nodes up to first branch, number of capsules / plant, capsule length, capsule width, 1000 seed weight, seed yield per plant, oil content in percentage, oil yield per plant.

Stability analysis for yield was carried out by following the method of Eberhart and Russel (1966) who suggested three stability parameters *viz.*, mean performance ($\mu$), regression of means on environmental index ($b_i$) a predictable response of a genotype to either good or poor environment, deviation from regression ($S^2d_i$) which is a measure of genotype x environment interaction of unpredictable type. Depending on the character, a genotype with high or low mean, unit regression coefficient and non significant deviation from regression was considered as ideal, widely adaptable and stable genotype.

## RESULTS AND DISCUSSION

Analysis of variance for stability revealed significant differences among genotypes in individual as well as pooled environments for seed yield (Table 2). This indicated that the genotypes differed for seed yield. From, pooled analysis of variance, it was seen that environment effect was highly significant indicating the differential effect of each environment. The G x E interaction was also significant for seed yield, indicating the differential response of the genotypes for different environments and the relative merits of different genotypes changed with environments. Such results were obtained for seed yield by Anuradha and Reddy (2005), Kumaresan and Nadarajan (2005), Manivannan and Ganesan (2001), and Raghuwanshi *et al.* (2003).

The data were subjected to stability analysis. The model used was Eberhart and Russell (1966). This model assumes that the G x E interaction is predominantly linear in function of the environmental mean. They defined both linear and non linear function of the G x E interaction in which G X E sum of squares is partitioned into (i) linear components of environment (ii) linear components of G X E interaction and (iii) deviation from regression.

In the present investigation, there was presence of significance for linearity for environment. This implies that the assumption for the differences among the linear response to environment is valid. However, the pooled deviation from regression was also significant when tested against the pooled error, there by indicating the presence of non-linearity for seed yield. When the variance of the G X E (linear) and the pooled deviations were compared, it was observed that the magnitude of the pooled deviations was more than the G X E (linear) variance for seed yield. Anuradha and Reddy (2005) and Raghuwanshi *et al.* (2003) reported preponderance of linear components for seed yield. But Kumaresan and Nadarajan (2005) reported that both linear and nonlinear components were significant for seed yield.

In interpreting the results of the present investigation, $S^2d_i$ was considered as the measure of stability. Once the genotype was found to be stable based on non-significant deviation from regression ($S^2d_i = 0$), then the type of stability (measure of response or sensitivity to environmental changes) was decided based on the regression coefficient ($b_i$) and mean values. If bi is equal to unity, a genotype

**Table 2 :** Anova for stability analysis for seed yield (g) per plant.

| Source | DF | MSS |
|---|---|---|
| Genotype (G) | 49 | 3.5087* |
| Environment (E) | 4 | 180.271** |
| G X E interaction | 196 | 2.2479** |
| Total | 249 | |
| Pooled Error | 245 | 0.1387 |
| E + (G X E) | 200 | 5.8084** |
| E (linear) | 1 | 721.082** |
| G X E (linear) | 49 | 1.5671 |
| Pooled deviation | 150 | 2.4253** |
| Pooled error | 250 | 0.06934 |

* Significant at 0.05 and ** significant at 0.01 probability level.

**Table 3 :** Stability parameters for seed yield in sesame (Early *kharif*, 2005).

| Genotype | Mean | Bi value | Mean square deviation |
|---|---|---|---|
| Dhavari | 3.67 | 1.49 | 1.87* |
| E-8 | 3.73 | 0.89 | 0.29* |
| Kanakapura local | 3.64 | 1.03 | 0.07 |
| Magadi local | 4.35 | 1.08 | 2.38* |
| TMV-3 | 3.55 | 1.26 | 0.25* |
| Ajjampur local | 3.21 | 1.10 | 1.38* |
| Belgaum Black | 3.22 | 0.84 | 1.88* |
| Belgaum white | 4.49 | 1.02 | 3.50* |
| CGW local | 4.21 | 1.28 | 0.53* |
| Chandana | 5.55 | 0.65 | 0.95* |
| Channapatna local | 5.39 | 0.83 | 3.28* |
| Dinnur local | 5.04 | 1.27 | 8.70* |
| DS-1 | 3.34 | 1.08 | 0.83* |
| Gouri | 4.35 | 0.41 | 1.62* |
| Kunigal local | 5.19 | 1.08 | 3.27* |
| Madhavi | 3.94 | 1.06 | 1.15* |
| Malavalli local | 4.25 | 0.91 | 2.30* |
| Marupalli local | 3.18 | 0.58 | 3.30* |
| Rajeshwari | 5.51 | 0.63 | 0.72* |
| Rama | 2.11 | 0.56 | 2.30* |
| Ranebennur local | 3.46 | 0.76 | 2.37* |
| Savanur local (1) | 4.01 | 1.16 | 0.60* |
| Savanur local (2) | 3.56 | 1.35 | 0.71* |
| ST-1 | 3.54 | 1.26 | 0.62* |
| ST-2 | 3.56 | 1.23 | 0.65* |
| ST-3 | 3.67 | 0.99 | -0.05 |
| ST-4 | 3.33 | 1.13 | 0.56* |
| ST-5 | 3.57 | 1.10 | 1.52* |
| ST-6 | 3.24 | 0.43 | 4.73* |
| ST-7 | 3.02 | 0.99 | 0.58* |
| ST-8 | 4.44 | 1.03 | 0.53* |
| ST-9(1) | 4.53 | 0.64 | 4.94* |
| ST-9(2) | 4.51 | 0.55 | 6.62* |
| ST-11 | 3.25 | 0.87 | 2.00* |
| ST-12 | 3.08 | 0.89 | 2.72* |
| ST-13 | 3.46 | 1.46 | 1.09* |
| ST-14 | 4.33 | 0.83 | 2.84* |
| ST-15 | 3.92 | 1.09 | 0.88* |
| ST-16 | 2.13 | 0.62 | -0.04 |
| Swetha til | 3.63 | 1.44 | 1.38* |
| Thalli local | 4.06 | 0.95 | 1.12* |
| Thilak | 4.90 | 1.19 | 2.85* |
| TKG-1 | 3.94 | 0.41 | 3.56* |
| Turuvekere local black | 1.52 | 0.62 | 1.46* |
| Turuvekere local white | 2.71 | 1.23 | 0.85* |
| Uma | 4.60 | 1.85 | 11.26* |
| Yadgiri local | 2.77 | 1.15 | 0.45* |
| YLM-11 | 3.64 | 1.25 | 7.32* |
| YLM-17 | 4.15 | 1.81 | 1.41* |
| YLM-57 | 4.05 | 0.67 | 11.70* |

is considered to have average stability, if bi is more than unity, it is suggested to have less than average stability and if bi is less than unity, it is reported to have more than above average stability. Hence, the genotype with a high (desirable) mean and a bi equal to 1.00 or less than 1.00 was considered as suitable for the whole area under consideration, a genotype with high (desirable) mean and more than 1.00 was considered as suitable for highly favorable conditions, while a genotype with the moderate mean and a bi less than 1.00 was considered as suitable for poor environmental conditions.

Based on actual yield, the genotypes were identified as promising viz., Gouri, YLM-57, Chandana, ST-6, Rajeshwari at GKVK, YLM-57, ST-13, Kunigal local, ST-1, Ajjampur local at location ARS, Balajigapade, Dinnur local, Chandana, ST-9(1), Channapatna local at Nittur, YLM-57 YLM-11, Thilak at sathnur and Channapatna local, ST-14, Kunigal local, ST 9(1) at MN Halli.

Considering the actual stability parameters estimated through stability analysis, among the entries identified as promising for early *kharif* based on actual yield, none showed stability for yield as indicated by the stability parameters $S^2d_i$ (deviation from regression of the experimental mean on environmental index) which was significantly away from zero. However, among the genotypes, three entries Kanakapura local, ST-3 and ST-16 appeared to have stability for yield as revealed by the $S^2d_i$ values, which were not significantly away from zero. The $b_i$ (regression of means of a genotypes in different environments on the environmental indices of the environments) was not significantly away from unity for these two entries ( Kanakapura local and ST-13), which means that they had average stability and bi was less than unity for the entry ST-16 which indicates that this genotype has more than above average stability. Similarly Anuradha and Reddy (2005), Kumar *et al* (2006), Kumar *et al* (2008), Kumaresan and Nadarajan (2005), Manivannan and Ganesan (2001), and Raghuwanshi *et al.* (2003) and Velu and Shunmugavalli (2005) identified stable genotypes for seed yield among the genotypes studied.

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