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Phenotypic stability for berry yield in black pepper (*Piper nigrum*)

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Black pepper (*Piper nigrum* L.) is an important perennial spice cultivated mainly in Kerala, Karnataka, Tamil Nadu and Andhra Pradesh in addition to limited extent in North-Eastern states. Year-to-year fluctuation in yield even within location is often encountered in black pepper (Pradeepkumar *et al.* 1999). An attempt was made to understand the stability parameter of 3 new lines (a selection and 2 hybrids) along with a released hybrid ('Panniyur 1') and 2 released selections of Karimunda ('KS 14' and 'KS 27'). The experiment, set to randomized block design with 4 replications, was conducted at Valparai (Tamil Nadu) for 7 years from 1995–96 to 2001–2002. Fresh yield/vine (weight of berries) was recorded every year on per plant basis. The stability parameters were worked out for berry ield (Eberhart and Russell 1996).

Pooled analysis of variance for berry yield revealed significant difference among the genotypes as well as environments (Table 1). Significant genotype × environment interaction indicates that the genotypes showed different reactions in different years. The results confirm the findings of Ibrahim *et al.* (1985) for spike weight in black pepper.

Both linear and non-linear components were important. Eberhart and Russell (1966) suggested that both linear and non-linear components of genotypes × environment interaction should be used in judging the stablity of different varieties. According to Eberhart and Russell (1966), the ideal variety is one which has high means yield (μ), unit regression coefficient (b=1.0) and the least deviation from regression ($S^2D=0$). The stability parameters of the black pepper genotypes are presented in Table 2. High mean yield/vine was recorded by the genotype 'HP 105', followed by 'Coll. 1041' and 'Panniyur 1'. The value of 'b' was different for different genotypes, indicating their differential response to changing environments. Regression coefficient was more or less 1 in 2 of the lines, 'HP 105' and 'HP 813'. 'Panniyur 1' and 'KS 14' showed the highest deviation from regression coefficient. The new lines 'Coll. 1041' revealed good yield and rather high regression slope coupled with significant deviation from regression, whereas 'HP 105' high mean yield, regression value near to 1 and significant deviation from regression. The third new line, 'HP 813' though had moderate mean yield and regression value more or less 1, showed significant deviation from regression.

Among the released lines, 'Panniyur 1' though had moderate mean yield, showed the highest regression slope and significant deviation from regression. The other 2 varieties, viz 'KS 14' and 'KS 27, had low mean yield and low values of b. However, 'KS 14' had non-significant deviation from regression.

Though, in general, the black pepper genotypes exhibited unpreditable behaviour by judging the regression slope and significant deviation from regression, the 2 new lines, viz 'HP 105' and 'Coll. 1041' should be regarded as superior to

Table 1 Pooled analysis of variance for berry yield of black pepper

Source	df	MSS
Total	41	6.283
Lines (G)	5	34.28**
Environment (E)	6	8.19**
G × E	30	1.23**
Environment + (G×E)	36	2.39*
Environment (Linear)	1	44.17**
Genotype × Environment (Linear)	5	2.39*
Pooled deviation	30	0.84**
Pooled error	126	0.0035

*P, 0.05; **P, 0.01

Table 2 Stability parameters for berry yield in black pepper

Line variety	Berry yield (kg/plant) (fresh)	bi (regression coefficient)	S^2d (deviation from regression)
'Coll. 1041'	5.21	1.59	1.38**
'HP 105'	6.14	0.92	1.96**
'HP 813'	2.78	1.05	0.76**
'Panniyur 1'	3.27	1.61	0.26**
'KS 14'	0.58	0.27	0.01 ns
'KS 27'	1.01	0.56	0.47**

**P-0.01

*Short note

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'Panniyur 1', 'KS 14' and 'KS 27' (the released varieties) since these 2 lines proved superior in the most important parameters of stability, viz yield. 'HP 105' will be more sutiable for high-yielding environment. 'HP 813' also had moderately good mean yield and regression coefficient near 1, making it more suited to low-yielding environments. Frey (1964) reported and good adaptable variety gives superior production over a wide range of environments. Bains and Gupta (1972) also suggested that the potential of genotype to express greater mean (for yield and or quality) over environments should be the most important parameter, since the other parameters may not be of any particular utility, if the genotype is potentially weak. Thus the new lines 'HP 105', 'Coll. 1041' and 'HP 813, fall very much in lines with these thinking and are thus superior to the released varieties.

'HP 813', though moderate in mean yield recorded about 12% oleoresin, 2.8% essential oil (quality parameters of black pepper) compared to 9.4% oleoresin and 2% essential oil in 'Panniyer 1'. Ibrahim *etal.* (1985) also reached similar conclusion while working with 5 black pepper genotypes including'Panniyur 1.'

SUMMARY

Three balck pepper lines along with 'Panniyur 1' (released hybrid) and 'KS 15' and 'KS 27' (released clones) were evaluated for berry yield for 7 years (1995–96 to 2001–2002) at Valparai, Tamil Nadu. Phenotypic stability for berry yield indicated that the new lines, viz 'Coll. 1041' and 'HP 105' were superior to the released hybrid and clones for the important parameters of stability, viz mean yield. The other new line 'HP 813', though at par with 'Panniyur 1' for mean yield, had the other stability parameter (bi) better than 'Panniyur 1'. 'HP 105' was found more suited to better environment, while 'HP 813' for marginal environment.

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