The environmental variation of traits for interpreting genotypic characterization in broad-adapted populations of tamarind (*Tamarindus indica* L.)

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Objectives

We argue that the differential responses of trait variation related to genotypes.

We hypothesize that the frequency of genotype and environment type of variance for a set of trials will be differ.

Materials and Methods

Seeds were collected from three provenances from Asia, Africa and Central America.

The genotype heritability (h^2) was estimated for these traits following Hallauer et al. (2010):

$$h^2 = \frac{4\delta^2 f/m}{\left(\frac{\delta^2 e}{r}\right) + 4\delta^2 f/m}$$

Where $4\delta^2 f/m$, $\delta^2 e$ *and* r are the variance component of groups within family, the variance component of error and the number replications per trial.

Table 1. Location names and geographical coordinates of the population of Tamarind

Population		Mean annual precipitation	Altitude (meters)	Latitude N	Longitude W
Mali	**Faragouaran**	**1130**	**366**	**11°19'**	**07°47'**
Cuba	**Granma**	**1200**	**37**	**20°27'**	**76°32'**
Thailand	**Unknown**	**-**	**-**	**-**	**-**

Results

The environment variance in total plant mass contained variation where plants were not effectively influenced by environment such as climate and/or seed mass during growth periods.

Our results have shown that the environmental variance was characterized leaf mass and leaf carotenoid concentration by around the same value compared to genetic characterization in the phenotypic variance.

Table 2: Individual broad-sense heritability estimates of Tamarind. Estimates of variance components (δ^2_p = the phenotypic variance, δ^2_g = genotypic variance and δ^2_e = environment variance) are given for each component for populations (Hallauer et al., 2010).

Source	TFM	LM	SM	RM	TDM	Hyp	EP	RGR	Ch a	Ch b	Ch c
S^2 S(P)	3.336	0.0333	0.575	0.531	1.131	2.010	15.441	0. 000004	0.286	0.013	0.020
S^2 E	45.988	12.610	5.908	8.11	9.580	20.917	79.073	0. 00004	3.527	0.390	1.129
δ^2_p	18.492	2.735	2.958	3.025	5.587	10.362	0.169	0. 000019	1.667	0.111	0.249
δ^2_g	13.383	1.334	2.301	2.124	4.523	8.039	0.137	0. 000015	1.142	0.053	0.081
δ^2_e	5.110	1.401	0.656	0.902	1.064	2.324	0.032	0. 000004	0.524	0.058	0.168
h^2_b%	72.37	48.77	77.80	70.02	80.71	77.75	81.01	78.67	68.55	47.83	32.54

Seed weight (SW), total plant fresh mass (TFM), leaf fresh mass (LM), stem fresh mass (SM), root fresh mass (RM), total plant dry mass (TDM) hypocotyl (Hyp), epicotyl (Ep), relative growth rate (RGR), chlorophyll a (Ch a), chlorophyll b (Ch b), carotenoid (Ch c).

Conclusions

Our results showed significant level of genetic variance in plant mass, stem mass and root mass, which were associated with a high heritability.

Some parameters such as leaf mass and leaf carotenoid concentration represented high environmental variance.

The genotypic performance of traits is more predictable in next generation by genetic characterization of parents.