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Indian J. Pl. Genet. Resources 8(1): 35-39, 1995; Special Issue (2)

EVALUATION OF *HEVEA* GERMPLASM: OBSERVATIONS ON CERTAIN PROMINANT TRAITS IN A CONSERVATORY

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A study was conducted in a source bush nursery of wild *Hevea* germplasm of 1981 IRRDB exploration during July-August, to identify the genotypes with superior performance. The genotypes represented Acre, Rondonia and Matto Grosso provenances of Brazil. Observations were made on girth, bark thickness, test tap yield, seed weight, length and broadth of the seeds and disease incidence. The general performance of MT genotypes with respect to vigour, yield and tolerance to *Phytopththora* was found to be superior. The genotypes exhibited wide variability for the characters studied. The single seed weight ranged from 1.1 – 3.75g, and the length and width of the seeds ranged from 1.9 – 2.75cm, and 1.3 –2.03cm respectively. The MT genotypes were found to be late flowering types compared to AC and RO genotypes.

Key words : *Hevea* germplasm, evaluation, elite genotypes

Entire rubber plantations in the East is largely based on a small population of seedlings collected by Wickham in 1876 from Boin near the Tapajos River in Brazil which has resulted in a very narrow genetic base of *Hevea*. Unidirectional selection over the years for yield and the absence of suitable varieties adapted to non-traditional rubber growing areas, have further worsened the situations arising from the threats of disease triangle and physiological disorders like Brown Bast etc. The only solution to overcome this dangerous situation is the conservation and utilization of genopool through collection of wild germplasm. The present study aims at evaluating the wild *Hevea* germplasm for various characters and identifying genotypes with superior performance for further crop improvement programmes.

MATERIALS AND METHODS

A germplasm conservatory comprising of around five hundred wild *Hevea* genotypes of 1981 IRRDB exploration was selected for the study, along with the control RRII 105. This conservatory was planted during 1989 at the Central Experimental Station of the Rubber Research Institute of India, Kottayam with

a spacing of 1 × 1m, and five trees per genotypes representatives of Acre, Rondonia and Matto Grosso provenances of Brazil were selected at the age of 4 years. The observations were made on girth of the plant at 30cm height above bud union (cm), bark thickness (mm) test tap yield (g), seed-weight (g) length (cm) and breadth (cm) and disease incidence during July-August, and the genotypes were compared for their performance.

RESULTS AND DISCUSSIONS

The genotypes exhibited wide variability for the characters studied. (Table 1). Girth of the plants ranged from 21.1 to 30.0cm, test tap yield from 0.19 to 1.604g, bark thickness from 2.7 to 5.5 mm, single seed weight from 1.3 to 2.03 cm. When the mean values were compared with the control RRII 105, the girth of the wild genotypes (26.10 cm) was more than the control (22.5 cm), indicative of the tendency for vigorous growth of the wild genotypes. For the remaining characters except for test tap yield, the performance of wild genotypes was more or less comparable to that of control. Wide variation observed in the germplasm genotypes in growth, vigour, bark structure, juvenile yield and morphological characters were in accordance with the general expectation that wild and primitive forms from the centre of origin exhibit much variability (Annamma *et al.*, 1986).

Table 1. Range of variation among genotypes for the characters studied

Traits	Wild Genotypes		General Mean	Control (RRII 105) Mean
	Maximum	Minimum		
Girth (cm)	30.0 (MT 1714)	21.1 (RO 1454)	26.10	22.5
Test Tap yield (g)	1.604 (MT 1707)	0.19 (RO 1549)	0.891	2.44
Bark thickness (mm)	5.5 (MT 2230)	2.7 (RO 1253)	4.12	5.0
Single seed wt. (g)	3.75 (RO 2013)	1.10 (RO 1542)	2.17	3.71
Seed length (cm)	2.57 (AC 1997)	1.9 (RO 1509)	2.15	2.5
Seed width (cm)	2.03 (AC 2013)	1.3 (RO 1509)	1.60	1.95

A provenance wise comparison of the performance of wild genotypes for the different characters studied is given in Table 2. The genotypes from Matto Grosso provenance were found to be superior for girth of the plant, test tap yield and bark thickness, compared to RO and AC genotypes and this is in confirmity with the general observations made by IRCA (Clement-Damange *et al.*, 1990) and Mercy *et al.*, 1992).

Table 2. Comparison of the mean values of the wild genotypes between the three provenances - RO, AC & MT

Traits	Mean values for the three states		
	RO	AC	MT
Girth (cm)	25.68	25.08	25.86
Test tap yield(g)	0.76	0.865	1.06
Bark thickness (mm)	3.67	4.27	4.53
Single seed wt. (g)	2.03	2.66	-
Seed length (cm)	2.12	2.34	-
Seed width (cm)	1.59	1.66	-

*Seeds of MT genotypes were not available

The list of genotypes showed vigorous growth and those which were not affected by *Phytophthora* is given in Table 3. Most of the genotypes represented the provenance Matto Grosso, indicating their inherent tolerance to *Phytophthora*, which can be utilised in a breeding programme to induce disease resistance. When the germplasm genotypes were observed for shoot rot disease by *Phytophthora*, the shoot tips of AC, RO and control RRII 105 exhibited Die back symptoms whereas the shoot type of MT genotypes did not show Die back symptoms, and were noticed to produced new sprouts at the shoot tip soon after the falling off the leaves. The general vigorous nature of the MT genotypes alongwith tolerance to *Phytophthora*, reveals the importance of this group of germplasm materials in the crop improvement programme.

Table 3. Genotypes with vigorous growth and not affected by *Phytophthora*

MT 1630	MT 1642	MT 1589	MT 1685	MT 1710	MT 1674
MT 1659	MT 1701	MT 1629	MT 1650	MT 1639	MT 1599
MT 2292	MT 1686	MT 1656	MT 1697	MT 1689	MT 1638
MT 1627	MT 1665	MT 1657	MT 1623	AC 1960	MT 1704
MT 1678	MT 1687	MT 1693	MT 1642	MT 1649	MT 1631
RO 1556	MT 1579	MT 1675	MT 1680	MT 1663	MT 1633
MT 1688	MT 1640	MT 1668	MT 1644		

When an observation was made of the occurrence of severe shoot rot (Table 4), most of the genotypes represented RO provenance indicating their poor tolerance to shoot rot. Other diseases noted in the conservatory were powdery mildew and pink disease (Table 5) and MT 2594 was severely affected

by powdery mildew and certain RO genotypes and AC genotypes were affected by pink disease.

Table 4. Genotypes affected by severe shoot rot

RO 1514	RO 1528	RO 1345	RO 1232	RO 1238
RO 1309	RO 1234	RO 1353	RO 1262	RO 1308
RO 1304	RO 1331	AC 1958	AC 1987	RO 1758
RO 2344	RO 1250	RO 1323	RO 1292	RO 1241
RO 2249	RO 1229	RO 1533	RO 2484	RO 1462
RO 2102	RO 1526	AC 1884	AC 3501	RO 1359
AC 1867	AC 1810	AC 2007	AC 1958	AC 1987
RO 1758	RO 2344	RO 3459		

Table 5. Genotypes affected by other diseases

Genotypes	Disease
MT 2954	Severe powdery mildew
RO 1558	Powdery mildew
RO 1454	Pink
RO 1334	Pink
RO 1260	Pink
RO 1341	Pink
AC 2028	Pink
AC 1961	Pink
AC 1901	Pink
AC 2456	Pink
AC 2342	Pink
AC 2439	Pink

Other general observations made in the conservatory:

Leaves: The genotypes exhibited wide variations in size, shape and orientation of the leaves.

Seed: There was clear difference in the colour, shape and mottling pattern of the seeds among the provenances AC & RO. The MT genotypes had not produced any seeds, indicating that they were late flowering types. The study reveals that, there exists wide variability among the genotypes which shows the possibility of broadening the genetic base of the cultivated rubber. The

superiority of MT genotypes for vigour, yield and tolerance to *Phytophthora* ranks it first for the inclusion in future breeding programmes of *Hevea*.

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