Indian J. Pl. Genet. Resources 7(2): 157-164, 1994; Special Issue

JUVENILE CHARACTERIZATION OF WILD HEVEA GERMPLASM

Saji T. Abraham, C.P. Reghu, A.O.N. Panikkar, S.N. Potty and P.J. George

Rubber Research Institute of India
Kottayam 686 009, (Kerala)

Certain vigorous clones of *Hevea brasiliensis* selected from the population representing the three provenances in Brazil i.e., Acre, Rondonia and Matto Grosso were morphologically characterised to define the juvenile plant type of the wild clones, at the age of one year after planting, in field conditions using the parameters, habit of the plant, nature of axillary buds and leaf scars, shape and appearance of leaf storey and leaf characters. Specific variations were noted for most of the characters between the wild clones belonging to the three provenances. The importance of characterization in maintaining the identity of the hitherto under scribed wild germplasm is emphasised.

Key words : *Hevea brasiliensis*, characterization, population

Germplasm collection, conservation and evaluation has assumed great significance in various crops, and is carefully pursued by many national and international agencies, on a priority basis. *Hevea brasiliensis*, the most important source of natural rubber (Family : Euphorbiaceae), is a native of Brazil. The resultant narrow genetic base of the crop, the potential threat from diseases and genetic erosion and the requirement for environment friendly clones highly demand the broadening of the genetic base and its conservation. Plant breeders in the field of rubber research has thus urged to take steps to replenish the breeder's stock by collecting new genotypes from the Amazonian rain forests. (Ahmed, 1986). The 1981 exploration conducted by International Rubber Research and Development Board (IRRDB) to the primary centre of origin of the Para rubber tree has resulted in a large collection of wild genotypes of *Hevea* which can be utilised in crop improvement by introgression of new genetic traits in the present cultivars expecially for disease resistance and cold and drought tolerance.

While the role of germplasm in the improvement of cultivated plants has been well recognized, the successful utilization of the genetic pool, particularly in the developing countries, is still only to a very limited extent.

(Holden and William, 1984; Gill, 1984). One of the serious constraints is the delay in characterisation and cataloguing. Until a particular collection is properly evaluated and its attributes made known to breeders, it is of little practical use. The process of evaluation begins with characterisation chosing proper descriptor list followed by recording of data for each accession. Standardised methods for observation and recording of these characters are essential to provide means for classifying germplasm and is necessary for studying the pattern of variability. The present work was undertaken to characterise the morphological traits of the wild *Hevea* germplasm at juvenile stage, as the first step in the cataloguing and evaluation of a large population. Only limited efforts have been reported in morphological characterisation of *Hevea* clones in general (Dijkman, 1951; Silvia and Satchuthananthavale, 1961; Jayasekara *et al.*, 1984 and Mercykutty *et al.*, 1991) and that of the wild genotypes in particular.

MATERIALS AND METHODS

Clonal population raised from 80 genotypes of *Hevea brasiliensis* (Willd. ex. Adr. de. Juss.) Muell. Arg., procured through 1991 IRRDB collection trip were chosen for the study. The genotypes represented three provenances (Acre, Matto Grosso, Rondonia) in more or less equal proportions. Budding was carried on to assorted seedling sticks and the successful budgrafts were raised in polybags. The budded plants raised in polybag were planted at the age of five months in a field trial in July 1992, adopting 2.5 × 2.5 m spacing with four replications of four plants each. Observations were taken for the qualitative characters at the age of thirteen months after planting. Leaf characters were recorded from the top most mature whorl. The characters observed were recorded in a format (Table 1) designed for the purpose.

RESULTS AND DISCUSSIONS

Of the 80 wild genotypes, 28 belonged to Matto Grosso, 25 to Acre and 27 to Rondonia. The genotypes showed considerable variation of the most of the characters described. Individual plants within a genotypes showed in general similar character expressions. There was no specific pattern in the expression of traits between the three provenances. The variation in the expression of the characters were thus distributed over the 80 genotypes. The genotypes showed variations for the characters such as habit, girth of the plant, leaf scar margin, seperation of the leaf storey, shape and size of petiole, petiolule orientation, petiolule size, prominance of extra floral nectary, leaf colour shape and size, leaf margin, cross sectional appearance of leaf blade, leaf tip, lateral appearance, leaflet arrangement and prominance of vein. Branching habit, nature of axillary buds and leaf scars leaf storey shape,

external appearance of the leaf whorls, prominance of pulvinus, petiole angle, luster and texture of leaves, leaf thickness, leaf vein colour and nature of dorsal surface of the leaf blade exhibited very little variation and more of a uniformity over the entire genotypes. The frequency of distribution of the genotypes in the different scores is given in Table 1.

The general habit of the plants showed that majority of Acre and Matto Grosso genotypes had a medium height and lean habit, while most of the Rondonian genotypes were tall and lean, with the remaining genotypes distributed over other classes. The vigour of the plants was found to be generally more for Rondonian genotypes as indicated by their girth, while the Acre and Matto Grosso genotypes followed with average girth for majority of them. Dijkman (1951) and Polhaums (1962) had reported the relevance of the axillary buds and leaf scars in identifying different clones. In this study, it was noticed that almost the entire sample population characterised, had normal axillary buds. Majority of the Acre genotypes showed prominant leaf scars with pronounced margin while the genotypes of the other two provinances had normal leaf scars. One of the most easily identified character in the genotypes studied was the shape of the first mature top most leafwhorl. This was also reported by Silva and Satchuthananthavale (1961) and Mercy Kutty *et al.* (1991). Here, the majority of the genotypes had hemispherical leaf whorls while a few genotypes from the three provenances had genotype specificity for this character with conical, truncate and bow shaped whorls. It was noted that in general, majority of the genotypes had well separated leaf whorls except for certain genotypes with intermediate separation and a few with closely placed whorls. In general, the genotypes expressed open whorls. In leaf characters, there were marked open whorls. In leaf characters, there were marked variation for the petiole shape and size where majority of the genotypes had concave and straight petioles. A few of the Rondonian genotypes had long 'S' shaped petiole and one genotypic from each of the provenance showed arched petioles. Considerable variation was noted in the petiole length. Majority of the plants had petioles with acute angle and only a few had wide angle of insertion. Petiolule orientation and its size were also found to be distributed over the entire class, with the majority of the genotype possessing upwardly oriented medium size petiolules. In a limited number of genotypes, leaflets were easily distinguishiable by specificity in the colour, luster, texture, size, shape, leaf margin, lateral appearance, leaflet arrangement, cross sectional appearance, leaf apex, nature and colour of vein and appearance of dorsal surface of leaflets. However majority of the genotypes were found to have green coloured leaves with dull luster, leathery texture, elliptic leaf shape, medium size, thin, apiculate leaf apex, flat lateral appearance, well separated leaflets, yellowish and less prominant veins and smooth leaf blades. The smooth and wavy nature of leaf margin was distributed over the two classes.

Table 1. The descriptors and frequency (no) of distribution of genotypes

Morphological Traits		Matto Grosso	Acre	Rondonia
1.	**Habit**			
	1.1 Tall and stout	1	4	4
	1.2 Tall and lean	10	4	18
	1.3 Medium stout	1	2	0
	1.4 Medium and lean	15	14	4
	1.5 Dwarf and stout	0	0	0
	1.6 Dwarf and lean			
2.	**Girth of the plant**			
	2.1 Above average	8	3	11
	2.2 Average	13	14	13
	2.3 Below average	7	8	3
3.	**Branching**			
	3.1 Early branching	0	0	0
	3.2 Late branching			
	3.3 No branching			
4.	**Nodes**			
	4.1 Axillary buds			
	4.1.1 Protuding	0	0	0
	4.1.2 Sunken	0	0	0
	4.1.3 Normal	28	25	27
	4.2 Leaf Scars			
	4.2.1 Pronounnced margin	8	20	12
	4.2.2 Normal margin	20	5	15
	4.3 Nature of leaf scars			
	4.3.1 Sunken	0	5	3
	4.3.2 Normal	28	20	24
5.	**Leaf storey**			
	5.1 Shape			
	5.1.1 Conical	0	0	1
	5.1.2 Truncate	2	1	1
	5.1.3 Bow shaped	1	1	1

(Continued on page 161)

Morphological Traits	Matto Grosso	Acre	Rondonia
5.1.4 Hemispherical	25	23	24
5.2 Separation			
5.2.1 Well separated	20	20	13
5.2.2 Not well separated	1	0	3
5.2.3 Intermediate	7	5	11
5.3 External appearance			
5.3.1 Open	28	25	25
5.3.2 Close	0	0	2
5.3.3 Intermediate	0	0	0
6. Leaves			
6.1 Pulvinus	MT	AC	RO
6.1.1 Swollen	25	24	26
6.1.2 Normal	3	1	1
6.2 Petiole			
6.2.1 Shape			
6.2.1.1 Arched			
6.2.1.2 Concave	8	17	18
6.2.1.3 Straight	19	7	4
6.2.1.4 'S' Shape	0	0	4
6.2.2 Size			
6.2.2.1 Long	1	4	5
6.2.2.2 Medium	20	17	16
6.2.2.3 Short	7	4	7
6.2.3 Angle			
6.2.3.1 Acute	27	22	24
6.2.3.2 Horizontal	1	3	3
6.2.3.3 Optuse	0	0	0
6.3 Petiolule			
6.3.1 Orientation			
6.3.1.1 Upward	16	14	17
6.3.1.2 Horizontal	7	2	3
6.3.1.3 Downward	5	9	7

(Continued on page 162)

Morphological Traits	Matto Grosso	Acre	Rondonia
6.3.2 Size			
6.3.2.1 Long	2	1	8
6.3.2.3 Medium	22	18	18
6.3.2.3 Short	4	6	1
6.3.3 Extra floral			
6.3.3.1 Prominent	21	14	10
6.3.3.2 Less prominent	7	11	17
6.4 Leaflets			
6.4.1 Colour			
6.4.1.1 Green	22	20	21
6.4.1.2 Dark green	6	5	6
6.4.1.3 Yellowish green	0	0	0
6.4.2 Luster			
6.4.2.1 Glossy	5	0	4
6.4.2.2 Dull	23	25	23
6.4.3 Texture			
6.4.3.1 Smooth	0	0	0
6.4.3.2 Leathery	28	25	27
6.4.4 Shape			
6.4.4.1 Elliptic	26	24	21
6.4.4.2 Lanceolate	0	0	0
6.4.4.3 Obovate	2	1	6
6.4.5 Size			
6.4.5.1 Large	2	11	11
6.4.5.2 Very large	0	1	
6.4.5.3 Medium	26	13	16
6.4.5.4 Small	0	0	
6.4.6 Thickness			
6.4.6.1 Thick	28	23	23
6.4.7 Margin			
6.4.7.1 Smooth	15	14	8
6.4.7.2 Wavy	13	11	19

(Continued on page 163)

Morphological Traits	Matto Grosso	Acre	Rondonia
6.4.8 Appearance (S.S)			
6.4.8.1 Straight	24	11	12
6.4.8.2 'V' shape	1	2	1
6.4.8.3 Boat shaped	3	11	14
6.4.9 Leaf Apex			
6.4.9.1 Aristate	0	1	0
6.4.9.2 Accuminate	5	2	2
6.4.9.3 Cuspidate	1	0	3
6.4.9.4 Apiculate	22	22	22
6.4.10 Lateral appearance			
6.4.10.1 Flat	21	16	15
6.4.10.2 Convex	0	1	0
6.4.10.3 'S' shape	7	8	12
6.4.11 Arrangement			
6.4.11.1 Margin toughing	7	4	6
6.4.11.2 Overlapping	1	0	4
6.4.11.3 Separated	20	21	17
6.4.12 Vein colour			
6.4.12.1 Yellow	28	23	25
6.4.12.2 Light green	0	2	2
6.4.13 Nature of vein			
6.4.13.1 Prominent	4	9	12
6.4.13.2 Not prominent	24	26	15
6.4.14 Leaf blade dorsa			
6.4.14.1 Smooth	22	25	25
6.4.14.2 Irregular	6	0	2

The observations thus reveal that there are variation in the genotypes studied for many of the characters and also that some of them like stature, leaf storey arrangement and petiolar architecture are of breeding value when hybridizations are programmed for specific non conventional objectives. The study also projects the need of a well defined set of descriptors for characterisation and cataloguing. However, more discriptors will have to be added based on the experience gained as well as the stage at which the parameters are recorded.

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