PETIOLAR NECTARY MORPHOLOGY: A TOOL FOR CLONE IDENTIFICATION IN *HEVEA*

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Crop improvement programmes in different rubber growing countries have resulted in the availability of a large number of clones for commercial cultivation. Due to the narrow genetic base, the available morphological variation among the commercially cultivated *Hevea* clones is also low making clone identification a cumbersome process. The present study explores the utility of morphological features of petiolar nectaries for clone identification. Morphological features of petiolar nectaries were recorded from one to two year old plants of forty nine *Hevea* clones which included size of the cluster, number of glands, appearance and shape of the nectaries. Based on the descriptors, the clones could be grouped into different classes and it was found that the character was stable over different seasons in young plants. Hence, it can be used as a descriptor for clone identification along with other descriptors available for *Hevea*.

Keywords: Clone identification, Extrafloral, *Hevea*, Petiolar nectaries

Hevea brasiliensis is the major source of natural rubber in the world. For increasing the production of rubber, all the major rubber producing countries have crop improvement programmes which have resulted in the release of a large number of clones for commercial cultivation. Considering the narrow genetic base, the available variation in the morphology of different clones is also low making the identification of *Hevea* clones a difficult procedure. Attempts to identify *Hevea* clones started as early as 1915, when Spercher, used seed samples to determine the identity of mature buddings followed by the description of clones by Frey-Wyssling, Heusser and Ostendorf (Djikman, 1951). Earlier workers have identified several morphological features for clone identification like characters of leaf, leaf storey, petiole, branching pattern, seed characters, latex reaction etc. (Djikman, 1951; Mercykutty *et al*., 2002; Thomas *et al*., 2006). Although previous studies have mentioned the use of extrafloral nectaries in morphological description of clones, only two categories *viz*., prominent and non-prominent or less prominent were described (Mercykutty *et al*., 2002; Rao *et al*., 2005; Thomas *et al*., 2006). Thankamma and George (1968) have given a detailed account of the structure and functions of the extra-floral nectaries of *Hevea* earlier. The present study was undertaken to develop a detailed morphological description of petiolar nectaries of *Hevea* clones which will aid in

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the identification of the clones along with other known morphological descriptors.

The morphological features of petiolar nectaries of *Hevea* clones were observed from the clonal nursery trial planted at Research Farm of RRII at Taranagar in Agartala, Tripura ($22^0$56′-$24^0$32′N and $91^0$10′-$92^0$21′E) in June 2011 in a 7 x 7 lattice design with two replications, 12 plants per replication and a spacing of 2.5m x 2.5m. Observations were made in April (summer), September (post-monsoon), November (pre-winter) and March (post-winter) from the clones when the plants were one to two year old. Fully expanded healthy leaves of the topmost mature whorl were observed and the features were recorded as per the selected descriptors (Fig. 1) for each clone and compiled. A character was assigned to a clone if the same was expressed in more than 65 per cent of the samples and no other character was expressed in more than

Fig. 1. **Descriptors for petiolar nectaries in *Hevea***

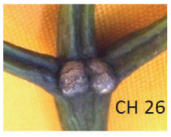
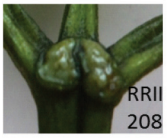
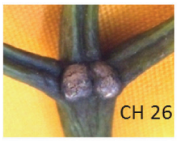
Sl. No.	Feature	Types			
1	Size	Small/undefined	Average	Big	Very big
					
2	Number	Low(<3)	Medium(3)	High(4-5)	Profuse(>5)
					
3	Margin	Definite	Indefinite		
					
4	Surface	Cup shaped	Flat	Raised	
					
5	Shape	Circular/oval	Reniform	Irregular	
					

Table 1. **Morphological description of petiolar nectaries of *Hevea* clones**

	Character	Clone
I.	Size	
	Small/undefined	FX 516, RRII 118
	Small-average	PB 217, PB 5/51, PR 107, RRII 308, RRII 417, RRII 429, RRII 5, RRIM 623, SCATC 93/114, Tjir 1
	Average	Ch 26, Gl 1, GT 1, IAN 45/873, Mil 3/2, PB 215, PB 235, PB 255, PB 28/59, PB 311, PB 314, PB 86, PR 255, PR 261, RRIC 100, RRIC 45, RRII 105, RRII 203, RRII 33, RRII 414, RRIM 600, RRIM 605, RRIM 703, SCATC 88/13, Yendayar
	Average-big	RRII 430, RRIC 102, RRII 208
	Average-very big	RRII 422
	Very big	RRIC 52
II.	Number	
	Low-medium	Ch 26
	Medium	FX 516, PB 235, RRII 208, RRII 33, RRIM 600
	Medium-high	Gl 1, LCB 1320, PB 217, PB 255, PB 311, PB 314, PB 5/51, PB 86, PR 107, PR 255, PR 261, RRIC 45, RRII 118, RRII 308, RRII 430, SCATC 93/114, Yendayar
	High	GT 1, Mil 3/2, PB 215, PB 28/59, RRIC 100, RRIC 102, RRII 203, RRIM 605, RRIM 703, SCATC 88/13
	High-profuse	IAN 45/873, RRIC 52, RRIM 623, RRII 414, RRII 417, RRII 429, Tjir 1
	Profuse	RRII 105, RRII 422
III.	Margin	
	Definite	Ch 26, FX 516, Gl 1, IAN 45/873, LCB 1320, Mil 3/2, PB 215, PB 217, PB 235, PB 255, PB 311, PB 314, PB 5/51, PB 86, PR 107, PR 255, PR 261, RRIC 100, RRIC 52, RRII 118, RRII 203, RRII 208, RRII 308, RRII 417, RRII 429, RRII 5, RRIM 600, RRIM 703, SCATC 88/13, SCATC 93/114, Yendayar
	Definite-indefinite	PB 28/59, RRIC 45, RRII 105, RRII 414, RRII 430, RRIM 605, RRIM 623, Tjir 1
	Indefinite	GT 1, RRIC 102, RRII 422
IV.	Surface	
	Cup shaped	PB 235
	Cup-flat	FX 516, Mil 3/2, RRII 203, RRII 118, PB 314
	Flat	GT 1, PB 215, PB 28/59, PB 311, PB 5/51, RRIC 100, RRII 105, RRII 208, RRII 33, RRII 429, RRIM 623, SCATC 88/13, SCATC 93/114
	Flat-raised	PB 217, PB 255, PR 107, PR 255, PR 261, RRIC 102, RRII 414, RRII 417, RRII 430, RRIM 605, RRIM 703
	Raised	Ch 26, Gl 1, IAN 45/873, LCB 1320, PB 86, RRIC 45, RRIC 52, RRII 308, RRII 422, RRII 5, RRIM 600, Tjir 1, Yendayar

	Character	Clone
V.	Shape	
	Reniform	Ch 26
	Circular/oval	FX 516, PB 215, PB 235, PB 5/51, RRIC 45, RRII 417, RRIM 600, LCB 1320
	Cicular-irregular	Gl 1, IAN 45/873, PB 217, PB 255, PB 311, PB 314, PR 107, PR 255, RRIC 100, RRII 118, RRII 203, RRII 414, RRII 429, RRIM 703, SCATC 93/114, Yendayar
	Irregular	GT 1, PB 28/59, PB 86, PR 261, RRIC 102, RRIC 52, RRII 105, RRII 208, RRII 308, RRII 33, RRII 422, RRII 430, RRII 5, RRIM 605, RRIM 623, SCATC 88/13, Tjir 1

25 per cent of the samples. In other cases a range of characters was assigned.

The features recorded from the clones which gave consistent results, included size of the cluster, number of glands, appearance and shape of the nectaries (Fig. 1). Majority of the clones had average sized nectaries (58%) but the character varied from very small or undefined nectaries (FX 516 and RRII 118) to very big nectaries (RRIC 52) (Table 1). Usually *Hevea* leaves have three petiolar nectaries, but the number of individual glands ranged from two to more than 5 in the clones tested. Thankamma and George (1968) have reported the presence of one to seven glands in *Hevea.* Clones RRIM 600, RRII 208, RRII 33, PB 235 and FX 516 had predominantly three nectaries, while in most other clones the number of nectaries varied from 3-5. Clones RRII 105 and RRII 422 predominantly had more than five nectaries, while clones RRII 414, RRII 417, RRII 429, RRIC 52, RRIM 623, IAN 45/873 and Tjir1 also had a tendency to have more than five nectaries. Majority of the clones had definite margins for the individual nectaries except RRII 422, RRIC 102 and GT1 which had nectaries with indefinite margins. A few clones like RRII 105, RRIM 623 and RRII 414 also had predominantly indefinite nectaries. Upper surface of the individual nectaries ranged from cup shaped (circular with a clear central depression) nectaries to raised or globular type of nectaries. Clone PB 235 was characterised by cup shaped nectaries, which was also predominant in clones like Mil3/2, FX 516 and RRII 203. Most of the clones had flat or raised upper surface or their intermediaries. Clones Gl 1, Ch 26, IAN 45/873, LCB 1320, PB 86, RRIC 52, RRII 308, RRII 5 and RRIM 600 were characterised by raised nectaries.

The present study shows that the morphology of petiolar nectaries varies in different clones and has fairly good stability in the young stages (1-2 year old plants). The stability of the character over different environments and age of the tree needs further investigation. It was observed that the petiolar nectary morphology can be utilised as a clone identification character along with other known descriptors in *Hevea*.

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REFERENCES

Djikman, M.J. (1951). *Hevea: Thirty Years of Research in the Far East*. University of Miami press, 329 p.

Mercykutty, V.C., Marattukulam, J.G., Saraswathyamma, C.K. and Meenakumari, T. (2002). *Identification of Hevea clones: A Manual*. Rubber Research Institute of India, Kottayam, 103 p.

Rao, G.P., Abraham, S.T., Reghu, C.P. and Varghese, Y.A. (2005). *Descriptors for Rubber (Hevea brasiliensis* Willd. Ex Adr. De Juss) Muell. Arg. Rubber Research Institute of India, Kottayam, 72 p.

Thankamma, L. and George, K.V. (1968). Extrafloral nectaries in *Hevea brasiliensis*. *Rubber Board Bulletin*, **9** (4): 41-46.

Thomas, V., Meenakumari, T., Gireesh, T. and Varghese, Y.A. (2006). *Identification of RRII 400 series clones of* Hevea *in the early growth phase: A Manual*. Rubber Research Institute of India, Kottayam, 51p.