Indian J. Pl. Genet. Resources 7(2): 151-155, 1994; Special Issue

COLLECTING CEARA RUBBER (*MANIHOT GLAZIOVII* Muell) Arg. GERMPLASM

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The restricted cultivation of *Hevea brasiliensis* in the tropical zones due to its agroclimatic preference, necessitates an alternative source of natural rubber for the semi-arid marginal lands. Preliminary studies showed that *Manihot glaziovii* known as ceara rubber, is a potential plant for such semi-arid marginal lands. The plant was introduced to India in 1902 during the regime of the British. it is well adapted to the dry granitic highlands with scanty rainfall. Under such stress affected conditions, the unselected wild plants yield an appreciable quantity of latex containing more than 80% rubber. Since there is no organised cultivation of *M. glaziovii* in India, genetic materials are not commonly available. An exploration to the semi-arid hill tracts of Tamil Nadu resulted in the collection of a large semi-wild seedling population. Mature trees were tapped at random and on the basis of the preliminary observations on the bark characteristics, Latex flow pattern and morphological variation in germplasm were also observed.

Key words : Ceara rubber, *Manihot glaziovii*, exploration/collextion

For every crop, an alternative source or life support species is highly necessary. Moreover, it is today's need to cultivate the marginal lands and upgrade the poor soil with species adapted to the extreme hostile environment (Randhawa, 1987; Paroda, 1987; Smith, 1987). The major rubber yielding crop *Hevea* is under a potential threat due to South American Leaf Blight (SALB) caused by *Microcyclus ulei* (Thomson, 1986; National Acad. Sci., 1977). The increasing demand for natural rubber and paucity of suitable areas, warrants the identification of a suitable stress tolerant species adapted to the drought prone semi-arid marginal lands (Menon, 1983). Under the circumstances, *Manihot glaziovii* (ceara rubber) was examined as the potential alternative rubber yielding plant with certain extent of drought tolerance. *M. glaziovii* was one of the source of natural rubber in the early part of the century (Seeligman, 1910; Polhamus, 1962). It is a native of the central regions of NE Brazil and introduced in India in 1902 (Serrier, 1988).

There are reports on the occurrence of few trees of *M. glaziovii* in different parts of South India (Singh, 1983). It is also grown in the Central Tuber Crops Research Institute, Thiruvananthapuram (Kerala) for cassava breeding purpose. Two other species viz., *M. dichotoma* Ule and *M. piauhyensis* Ule are also

reported to be available in the Botanical Gardens at Calcutta and Bangalore (Wlth India , 1962).

EXPLORATION AND COLLECTION

A large seedling population of *M. glazlovii* growlng in a semi-arid condition, varying from huge trees to small seedlings were explored in the Mettur hills of Tamil Nadu. This hill station is situated about 60 km. from Salem District ad is continuation of the Yercaud-Shevroy hill tract. Fifty seedling trees were identified and a preliminary screening were conducted. Out of these, 10 genotypes were tentatively selected on the basis of certain attributes. Accessions collected included IC 101, 102, 103, 104, 105, 106, 107, 108, 109, 110.

EXTENT OF GENETIC DIVERSITY

M. glaziovii - a quick growing tree, belongs to the family Euphorbiaceae. It thrives well in areas where soil is degraded and rocky. Adversities like low rainfall, low humidity, drought and other stress environments seldom affect the survival of the plant. It can grow well at high attitutde up to 1800 m. The tree grows to a height of 8-12 m with ramified trichotomous branches and canopy. Girthing of the trunk is fast that it attains 40-50 cm at 4th year. It can be propagated by seeds as well as through vegetative cuttings. Wintering starts from January to April and flowering follows after refoliation. Flowering is noticed usually in March-April (Ramrao, 1914), but off season flowering has also been observed (George, 1993). The trunk of the trees is almost straight, covered by a leathery, peelable rhytidome under which the smooth bark is visible with numerous lenticels. Leaves are alternate, oblong- oval and palmately lobed. Leaf lobes vary from 2-7. Flowers are monoceious and unisexual. Male flowers are seen at the top of the panicles. Female flowers are located at the lower pedicels. Flower colour varies from white to violet. Flowering starts at the age of 18 months. Fruit is a capsule with three locules. Seeds are small, plano-convex with mottled tough integument. Each seed weighs about 0.58 gm. The endosperm contains about 40-99 per cent oil (George, 1993). Bark of *M. glaziovii* is smooth and soft beneath the rhytidome. Bark colour varies from white to green. The green bark contains chlorophyll. Bark retains moisture during frought season.

The laticifers in *M. glaziovii* are compound, articulated and anastomosing as in *Hevea*. The inter-connected latex tubes are sandwiched with secondary phloem elements (Scoor, 1884; George, 1993). Table 1 depicts the variation in the girth, bark thickness and bark anatomical traits of samples collected from Mettur hills. The trees can be tapped for latex collection, when they attain a girth of 40-50 cm at a height of 100 cm from ground level. The rhytidome has to be removed prior to tapping from the portion of the trunk marked

for opening the channel. The tapping channel may be opened at a slope of 30°, using a Jebong knife. Half spiral cut and 'V' shaped cuts also can be tried. During every latex collection operation, the channels are to be reopened by shaving off a thin layer of bark. Tapping may be done on alternate days. The latex thus oozing out, will be directed through a spout to the collection cups.

Table 1. Variation in the girth, bark thickness and anatomical traits

Tree No.	Girth (cm)	Bark thickness (mm)	No. of latex vessel rows	Density of latex vessel/mm circumference of the plant	Diameter (m)
1	112	15	19.7	34.0	17.39
2	107	16	29.7	36.0	16.45
3	130	18	10.0	35.4	18.36
4	112	16	25.5	32.6	13.79
5	115	16	11.6	36.0	14.04
6	142	15	24.5	47.4	14.40
7	140	16	8.0	39.4	16.20

The wild population of *M. glaziovii* showed wide variation in their various characteristics like bark colour, latex flow duration, volume of latex, rubber content etc. Dry rubber yield varies from 4.6 g to 10 g per tree per tap. The estimated potential yield is 276 to 600 kg.hectare per year. Latex is milky white and thick. Unlike in *Hevea*, the latex flow is affected by spontaneous coagulation. Preliminary studies showed that low latex vessel turgor and high plugging index (PI) are certain prominent adverse characters present in the specie (Table 2).

Table 2. Latex flow characteristics of *M. glaziovii*

Tree	Initial vol. of latex ml (5 mts)	Total vol. of latex (m)	Plugging index (PI)	Dry rubber
1	7	15	9.33	7.97
2	22	32	13 .75	9.04
3	23	47	9.78	10.55
4	11	22	10.00	7.81
5	11	30	7.33	7.37
6	24	33	14.55	6.92
7	20	34	11.76	7.78

It has also been observed that upon dilution with water viscosity of latex increases significantly eventually resultant in coagulation.

Properties of air dried sheet prepared from *Manihot* latex have been assessed in comparison with that of *Hevea* latex. The appearance of sheet rubber is similar to that of *Hevea*. However, ash content (1.18%) and nitrogen content (0.99%) of *Manihot* rubber are higher than that of *Hevea* rubber. Acetone extract is significantly higher (5.64%) in the case of the former indicating a higher concentration of resins.

M. glaziovii can be listed as a potential alternative source of natural rubber. Ceara rubber plantation will be a solution for the afforestation of marginal with degraded soil unsuitable for other crops. The drawbacks experienced in latex production can be eleminated through breeding and selection. No crop improvement attempt has so far been made with a view to increasing rubber production in *M. glaziovii*. Genetic resources available at stray locations have to be collected and conserved before they are destroyed. Breeding cycle and selection constraints can be reduced considerably due to the early flowering habit and vegetative propagation facilities. Important technological properties of *Manihot* rubber is comparable with that of *Hevea* rubber. In addition to rubber, the tree yields wood and seed oil. Ceara rubber Garden is the most ideal place for bee-keeping (Nehru *et al.*, 1989).

REFERENCES

Wlth India. 1962. Manihot *In* : Wealth of India - Raw Materials. Vol. VI. Publications and Information Directorate, CSIR, New Delhi.

George, P.J. 1993. Studies on *Manihot glaziovii*, Mell. Arg. with special reference to its potentiality as an alternative source of Natural Rubber. Ph.D. Thesis. Mahatma Gandhi University, Kerala.

Menon, K.K.G. 1983. Plantation opportunities - Need for long term planning. *In* : Plantation Crops - Opportunities and constraints. Vol. I. Oxford & IBH. New Delhi.

National Academy of Science. 1977. Guayule - An alternative Source of Natural Rubber. National Academy of Sciences, Washington. D.C.

Nehru, C.R., S. Thankamony, K. Jayaratnam and P.M.L. Joseph. 1989. Nector and pollen plants for extending the flow period in rubber growing areas of India. Bee World. Cardiff. International Bee Research Association. Vol. 70

Paroda, R.S., P. Kapoor, R.K. Arora and Bhag Mal. 1988. Life Support Species: An Indian Perspective. Proc. CSC/ICAR. International workshop. NBPGR, New Delhi.

Polhamus, L.G. 1914. Rubber - Leonard Hill Books, Ltd. London.

Rama Rao, M. 1914. Flowering Plants of Travancore. Dehradun.

Randhawa, N.S. 1987. Concept of Life Support Species for emergency and extreme environemtal conditions. *In*: Life Support Plant Species: Diversity and Conservation. NBPGR, New Delhi.

Scoot, D.H. 1984. On the Laticiferous tissue of *Manihot glaziovii*. (The Ceara Rubber. O.J. Micros). *Science* **24** : 193-203.

Seelingman, T., L. Torrilhon and H. Falconnet. 1910. Indian Rubber and Guttapercha. Scott, Green wood and Sons - London.

Serier, J.B. 1988. Le Manicoba: historie, biologie, culture interest economique. Caou ate houses et Plastiques n 677. p117- 122.

Smith, R.W. 1987. The place of Life Support Species in hostile or risk-prone environemtns: An overview. *In* : Life Support Plant Species. Diversity and Conservation. NBPGR, New Delhi.

Thomson. T. Edathil. 1986. South American Leaf blight - A potential threat to the Natural rubber industry in Asia and Africa.

Singh, Umrao, A.M. Wadhwani and B.M. Johri. 1983. Dictionary of Economic Plants in India. 2nd ed. ICAR, New Delhi.