INOSITOLS: A COMMERCIALLY IMPORTANT SUGAR ALCOHOL FROM NATURAL RUBBER LATEX

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Besides rubber (*cis*-1, 4-poly isoprene), latex from *Hevea brasiliensis* is a rich repository of several important secondary metabolites. Among these inositols, particularly L- quebrachitol is the major group of sugar alcohol which has wide applications in pharmaceutical and medical research. In the present study, total inositol content in thirteen *Hevea* clones was determined. Inositol content was comparatively high in the clones RRII 105, RRII 5 and RRIM 703. The possibility of commercial exploitation of this high value secondary metabolite is being explored.

Key words: Inositols, L- quebrachitol, Natural rubber latex, Secondary metabolites.

The rubber tree (*Hevea brasiliensis*) is the main commercial source of natural rubber for the rubber industry. Rubber latex is a specialized form of cytoplasm containing suspension of rubber particles and non-rubber components in an aqueous medium. Latex contains 30 to 40 per cent rubber, and the remaining are non-rubber components, which are discarded as waste. The non-rubber components include water, carbohydrates, proteins, inorganic acids, lipids *etc.* (Smith, 1954; Lowe, 1961). Among the carbohydrates inositols, especially quebrachitol form a rich group of sugar alcohol.

Quebrachitol is the most abundant inositol present in rubber latex, which is a high value compound with several commercial applications (Anderson, 1972; d'Auzac *et al.*, 1989; Bealing, 1969). Quebrachitol is a substituted inositol with optical activity. The optical property enables it to be readily converted into various inositol derivatives of biological importance. Inositol and its derivatives have potential applications in pharmaceutical and medical research. With suitable chemical modifications, they are used in formulations of anti-cancer drugs, antibiotics and secondary messengers (Lau, 1993; 1996).

A chromatographic protocol was developed for L-quebrachitol isolation from the latex of *H. brasiliensis* (Jayasree *et al.*, 2007). As there is large extent of rubber plantation in South and South East Asia, the raw material for isolation of quebrachitol is abundantly available. In this study the total inositol in the latex of thirteen *H. brasiliensis* clones over three seasons was

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quantified to understand their potential for exploiting them at commercial level.

Fresh latex samples were collected from thirteen *H. brasiliensis* clones *viz.*, RRII 105, RRII 208, RRII 118, RRII 5, RRII 300, RRII 308, RRIM 600, RRIM 703, SCATC 93/114, SCATC 88/13, PR 255, PR 261 and Haiken 1 planted in the Farm of the Rubber Research Institute of India. The trees were 8 years old and the latex was harvested adopting ½ S d/3 system of tapping without stimulation from five replications of each clone with three trees per clone.

Approximately, 1g of latex sample was mixed with 80% alcohol and the serum was separated after removing the rubber particles from the coagulated latex. The residue was re-extracted with 80% alcohol after boiling for 30 minutes. The ethanol extracts were pooled and used for the estimation of total inositol content by the method of Bernad *et al.* (1958) as modified by Low (1978).

About 0.1 ml of ethanol extract was evaporated to dryness and made up to 0.1 ml with distilled water. To this 2.5 ml of 1 M sodium acetate buffer was added followed by 0.3 ml of 0.01 M sodium metaperiodate and the absorbance was read at 260 nm using a spectrophotometer (Shimadzu, Japan). This reaction mixture was then heated at 65°C for 2 hours cooled to room temperature and the absorbance was again read. The difference in optical densities before and after heating the reaction mixture was due to the oxidation of inositol to formaldehyde. A standard curve was made using pure myo-inositol and used to compare the inositol content in each sample and it was expressed as mg/tree/tap. The analysis of inositol content in the latex samples was carried out at specific intervals representing three seasons, *viz.*, monsoon (June to September), post-monsoon (October to January) and summer (February to May).

The inositol content in the latex of different *H. brasiliensis* clones showed significant variations. The highest inositol content was found for RRII 105, RRII 5, RRIM 703 followed by SCATC 88/13, RRIM 600, RRII 208 and the lowest levels for Haiken 1, RRII 300 and SCATC 93/114 clones (Fig. 1). The latex from

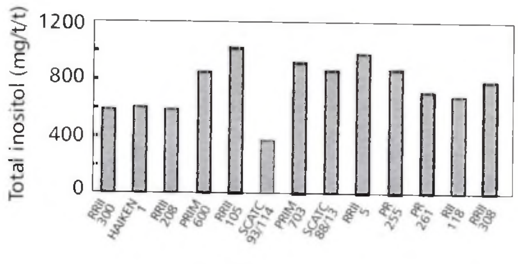

Fig. 1. Total inositol content in different *H. brasiliensis* clones

Table 1. **Clonal and seasonal variation in the content of inositol in different *H.brasiliensis* clones**

Clone	Inositol content (mg/t/t)		
	Monsoon	Post-monsoon	Summer
RRII 300	867.79	446.38	405.88
Haiken 1	693.38	583.58	419.04
RRII 208	1310.57	706.15	497.06
RRIM 600	1211.16	688.77	599.49
SCATC 93/114	569.20	227.60	271.53
RRII 105	1496.18	783.92	615.61
RRIM 703	1384.51	740.01	549.86
SCATC 88/13	1333.88	658.15	574.52
RRII 5	1311.65	1024.04	476.69
PR 255	1163.17	678.96	705.14
PR 261	1135.35	487.17	452.57
RRII 118	975.28	554.77	448.82
RRII 308	1103.70	626.90	583.21
F	4.65	5.79	2.05
CD ($P \leq 0.01$)	363.1	222.9	223.9

metabolically more active clones generally showed higher content of inositol. These clones are the high yielders of latex as well.

Apart from the clonal difference, there was seasonal variation in the levels of inositols in the latex. During monsoon season the inositol content was highest for latex from RRII 105 followed by RRII 703, SCATC 88/13 and the lowest for Haiken 1 and SCATC 93/114. The maximum inositol content was observed during post-monsoon in the latex of clones RRII 5, RRII 105 and minimum in SCATC 93/114. During summer season a higher content was noticed in latex from PR 255, RRII 105 and lowest in SCATC 93/114 (Table 1). Latex of RRII 118 and SCATC 93/114 showed a stable ranking with respect to the inositol content.

Total inositol content showed significant variation with respect to seasons. In all the clones, higher inositol content in the latex was noticed during monsoon season, the level decreased during post-monsoon period and the lower level was recorded during summer (Table 1). This

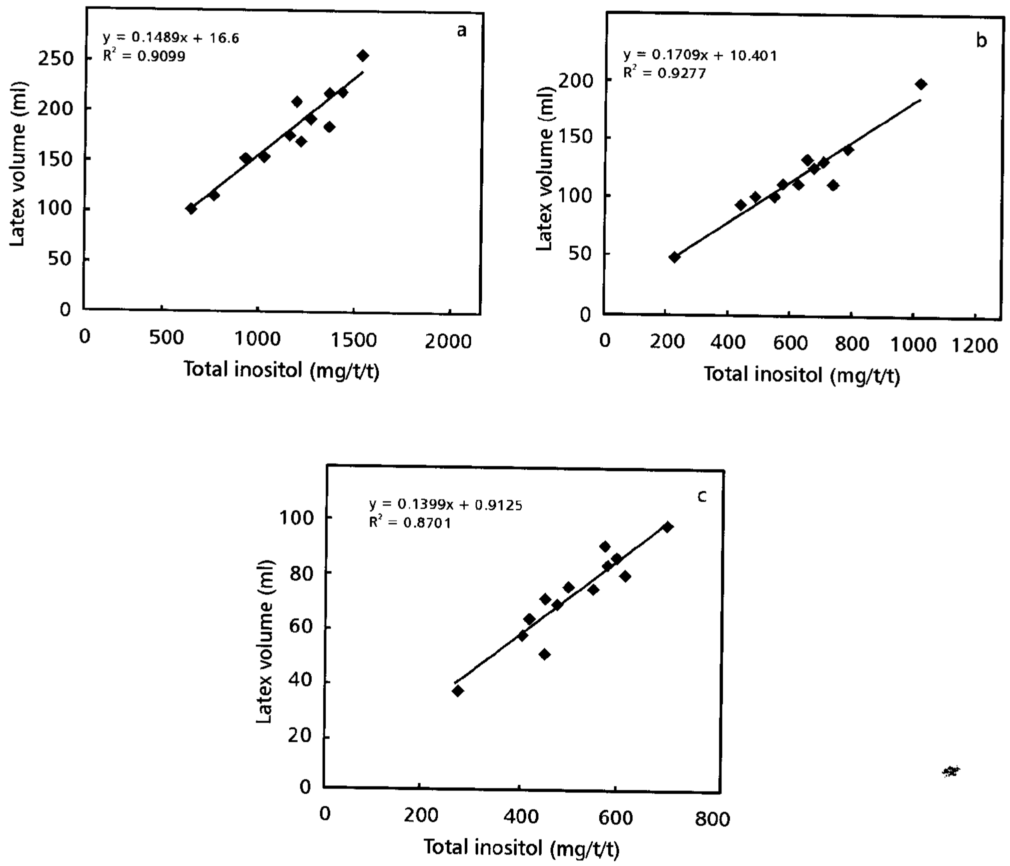

Fig. 2. Correlation of total inositol content with latex yield during different seasons.
(a) monsoon (b) post-monsoon (c) summer.

seasonal variations noticed in the total inositol content in the latex was closely related to the total latex produced by the tree during the different seasons (Fig. 2 a, b and c). Hence, the availability of inositols from the latex will be high from June to January in the traditional rubber growing belt.

Among the *H. brasiliensis* clones, RRII 105, RRII 5, RRIM 703, SCATC 88/13, RRII 208, PR 255 and RRIM 600 showed considerably high quantities of inositol in the latex across the seasons. RRII 105 is the most popular clone occupying more than 80 per cent of the cultivated area in India. Therefore, there is high potential for exploiting inositols from the latex of this clone.

Considerable quantities of inositols available in the latex of *H. brasiliensis* now remains unutilized and is discarded as waste material after processing the rubber. As the latex of popular clones are rich in inositol content the availability of the raw material for large scale production of inositol from latex exists in the rubber growing regions. This potential if exploited would be an additional source of income for rubber growers.

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