BRIEF COMMUNICATION

Search for lectins in seeds of tropical trees of Kerala, India

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Tissue specific plant lectins were searched in the seeds of 44 tropical trees of Kerala, India. Seeds of only 12 plant species showed lectin activity. N-acetyl-D-galactosamine was the best inhibitor of lectin activity for the majority of the seeds. Lectin activity in the seeds of 4 species were not inhibited by any of the mono- or polysaccharides used.

Additional key words: erythroagglutinins, haemagglutinins, inhibition by saccharides.

Lectins are a group of proteins or glycoproteins having the capacity to combine with specific saccharides on cell surfaces. They have the rare capability of recognizing the saccharide structures in glycoproteins and glycolipids of the cell membrane. Thus the lectins are widely used as reagents in cell pathology. Occurrence of lectins in the seeds of many plants and their important biological activities have been reported. Similarly, the occurrence of these saccharide binding proteins have been reported in animals and microorganisms.

No serious study aiming on screening seeds of tropical plants in India for lectin activity has so far been reported. Kerala, the southern part of India, enjoys tropical climate with rich biodiversity. Hence screening of the seeds of some tropical trees for their lectin activity was performed.

Seeds were randomly collected from 44 different tropical trees of Kerala belonging to the forests of Thekkady and Wayanadu. A systematic classification was made as described by Bentham and Hooker (1979) (Table 1). The collected seeds

Received 24 January 1997, accepted 10 April 1997.

Acknowledgement: The financial assistance given by The Royal Society of Chemistry, London is gratefully acknowledged. The help rendered by Prof. N. Ravi and Mrs. Rasiya Beegum of TBGRI, Trivandrum is also acknowledged.

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Table 1. Taxonomic classification of trees. All plants except *Areca catechu* are dicots.

Name	Family	Order
<i>Dalbergia latifolia</i>	<i>Fabaceae</i>	<i>Rosales</i>
<i>Cassia fistula</i>	<i>Caesalpiniaceae</i>	<i>Rosales</i>
<i>Cassia siamea</i>	<i>Caesalpiniaceae</i>	<i>Rosales</i>
<i>Acacia arabica</i>	<i>Mimosaceae</i>	<i>Rosales</i>
<i>Acacia catechu</i>	<i>Mimosaceae</i>	<i>Rosales</i>
<i>Terminalia catappa</i>	<i>Combretaceae</i>	<i>Myrtales</i>
<i>Terminalia arjuna</i>	<i>Combretaceae</i>	<i>Myrtales</i>
<i>Terminalia belirica</i>	<i>Combretaceae</i>	<i>Myrtales</i>
<i>Terminalia chebula</i>	<i>Combretaceae</i>	<i>Myrtales</i>
<i>Terminalia paniculata</i>	<i>Combretaceae</i>	<i>Myrtales</i>
<i>Psidium guajava</i>	<i>Myrtaceae</i>	<i>Myrtales</i>
<i>Syzygium cumini</i>	<i>Myrtaceae</i>	<i>Myrtales</i>
<i>Phyllanthus emblica</i>	<i>Euphorbiaceae</i>	*
<i>Putranjiva roxburghii</i>	<i>Euphorbiaceae</i>	*
<i>Ficus glomerata</i>	<i>Moraceae</i>	*
<i>Ficus hispida</i>	<i>Moraceae</i>	*
<i>Ficus religiosa</i>	<i>Moraceae</i>	*
<i>Anona squamosa</i>	<i>Anonaceae</i>	<i>Ranales</i>
<i>Citrus aurantium</i>	<i>Rutaceae</i>	<i>Geraniales</i>
<i>Citrus maxima</i>	<i>Rutaceae</i>	<i>Geraniales</i>
<i>Azadirachta indica</i>	<i>Meliaceae</i>	<i>Geraniales</i>
<i>Swietenia mahagony</i>	<i>Meliaceae</i>	<i>Geraniales</i>
<i>Tectona grandis</i>	<i>Verbenaceae</i>	<i>Lamiales</i>
<i>Vitex altissima</i>	<i>Verbenaceae</i>	<i>Lamiales</i>
<i>Strychnos nux-vomica</i>	<i>Loganiaceae</i>	<i>Gentianales</i>
<i>Areca catechu</i>	<i>Arecaceae</i>	*
<i>Santalum album</i>	<i>Santalaceae</i>	*
<i>Plumeria rubra</i>	<i>Apocynaceae</i>	<i>Gentianales</i>
<i>Lagerstroemia reginae</i>	<i>Lythraceae</i>	<i>Myrtales</i>
<i>Butia monosperma</i>	<i>Fabaceae</i>	<i>Rosales</i>
<i>Ficus bengalensis</i>	<i>Moraceae</i>	*
<i>Polyalthia longifolia</i>	<i>Anonaceae</i>	<i>Ranales</i>
<i>Casuarina equisetifolia</i>	<i>Casuarinaceae</i>	*
<i>Mimusops elengi</i>	<i>Sapotaceae</i>	<i>Ebenales</i>
<i>Michelia chempaka</i>	<i>Magnoliaceae</i>	<i>Ranales</i>
<i>Thespesia populneoide</i>	<i>Malvaceae</i>	<i>Malvales</i>
<i>Sterculia alata</i>	<i>Sterculiaceae</i>	<i>Malvales</i>
<i>Erythrina aborescens</i>	<i>Fabaceae</i>	<i>Rosales</i>
<i>Erythrina stricta</i>	<i>Fabaceae</i>	<i>Rosales</i>
<i>Bauhinia variegata</i>	<i>Caesalpiniaceae</i>	<i>Rosales</i>
<i>Adenanthera pavonina</i>	<i>Mimosaceae</i>	<i>Rosales</i>
<i>Vallaris</i> sp.	<i>Apocynaceae</i>	<i>Gentianales</i>
<i>Cinnamomum camphora</i>	<i>Lauraceae</i>	*
<i>Artocarpus hirsuta</i>	<i>Moraceae</i>	*

* - in Bentham and Hooker classification, for plants belonging to the families *Euphorbiaceae*, *Arecaceae* (of Monocots), *Santalaceae*, *Casuarinaceae* (of *Monochlamydeae*), there is no separate order.

were properly dried, deskinmed, pulverised and defatted using petroleum ether (60 - 80 °C). Defatted seed material (10 g) after soaking in 100 cm³ phosphate buffered saline (pH 7.4, 0.01 M) was homogenized and kept at for 24 h with constant stirring. The supernatant solution was centrifuged at 4 °C for 30 min at 20000 g. The haemagglutination and saccharide inhibition assay was carried out as described by Peuppke (1979). The saccharide specificity of the lectin was determined by inhibition of haemagglutination activity of lectins by mono-, di- and polysaccharides and their derivatives. For studying the haemagglutination assay, native erythrocytes of human ('O' phenotype), rabbit, rat and sheep as well as neuraminidase treated erythrocytes were used.

Seeds of 44 tree species belonging to 21 families were screened for the lectin activity. Among these, 12 species belonging to 10 families showed maximum lectin activity when tested against a spectrum of erythrocytes. Among the identified 12 trees, the lectin activity of *Artocarpus hirsuta* (Moraceae) was very strong against all kinds of erythrocytes. The activity was followed by the seed extracts of *Cinnamomum camphora* (Lauraceae) *Vallaris* sp. (Apocynaceae) and *Erythrina aborescens* (Fabaceae) (Table 2).

Table 2. Haemagglutination and haemagglutination assays of the seed extracts. NI - no inhibition, + - agglutinates native red cells, (+) - agglutinates neuraminidase treated red cells, - - no agglutination, Hu - human, Rb - rabbit, Rt - rat, Sh - sheep, Gal N Ac - N-acetyl-D-galactosamine.

Name of plant	Haemagglutination				Best inhibitory sugar
	Hu	Rb	Rt	Sh	
<i>Butia monosperma</i>	+	+	+	+	Gal N Ac
<i>Erythrina arborescens</i>	+	+	+	(+)	Gal N Ac
<i>Bauhinia variegata</i>	+	+	+	(+)	Gal N Ac
<i>Artocarpus hirsuta</i>	+	+	+	+	Gal N Ac
<i>Cinnamomum camphora</i>	+	-	+	-	NI
<i>Erythrina stricta</i>	+	(+)	(+)	(+)	Gal N Ac
<i>Michelia chempaka</i>	-	+	(+)	-	Fetuin
<i>Thespesia populneoide</i>	-	-	-	(+)	NI
<i>Sterculia alata</i>	-	+	-	(+)	NI
<i>Adenanthera pavonina</i>	-	+	-	(+)	Fetuin
<i>Vallaris</i> sp.	-	+	+	-	NI
<i>Polyalthia longifolia</i>	-	+	-	(+)	Gal N Ac

Galactose and galactose derivatives were found to inhibit the lectin activity of the majority of seed extracts. N-acetyl-D-galactosamine was found to be the best inhibitory saccharide in 6 types of seeds.

Though the floristic diversity of the tropical part of India is very high, studies relating to the seed lectin activity are limited. In the present study, the seeds of 44 locally available trees were screened for lectin activity. Twelve species have shown a positive lectin activity, with similarities and differences in the agglutinating property to both human and animal erythrocytes. The two species of *Erythrina*, *Butia monosperma* and *Artocarpus hirsuta* showed maximum agglutination with the six

different types of erythrocytes. The general agglutinating ability to different erythrocytes showed a maximum with rabbit and guinea pig erythrocytes. All these results support that these lectins may serve as new kind of probe for cell surfaces.

The former report dealing with 20 different plant lectins showed lectin like property in only 2 of them (*Magnifera* and *Avocado* sp.) (Beevi *et al.* 1989). Though no lectin activity was reported in *Bauhinia acuminata* by Beevi *et al.* 1989, the present study reports positive activity with *Bauhinia variegata*.

Among other tropical trees with lectin activity, we may mention *Artocarpus integrifolia*. Similarly, in the present study, activity to *Artocarpus hirsuta* has been reported. The lectins from the seeds of *Artocarpus integrifolia* were extensively investigated by Vijayakumar and Forrester (1986) and Pillai *et al.* (1994).

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