

Isolation and Extraction of Medicinally Useful Dye from the Heartwood of *Caesalpinia sappan* Linn. using Different Solvents

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Heartwood of *Caesalpinia sappan*, an indigenous tree, is a source of medicinally useful dye. It serves the dual purpose—colouring matter and treatment of certain ailments as well. Using the various solvents for extraction, viz., water, methanol, ethanol and aqueous caustic soda, the dark brown solid (aqueous solution orange), dark orange-red viscous liquid, reddish brown semi-solid (orange-red solution), and dark brown semisolid (red-violet solution) respectively are obtained, expected to have varied medicinal value as well.

INTRODUCTION

Recent years have seen regulations banning the use of synthetic dyes in food and medicines because of their side effects. To find a much better alternative, we have isolated certain natural dyes from the tree *Caesalpinia sappan*. These are not only the good dyes but have altogether certain medicinal value also, instead of the harmful side effects of synthetic dyes. Using the different solvents for extraction, the shade and the nature of the dye changes.

Caesalpinia sappan is an indigenous small tree (family Caesalpiniceae). The plant was first systematically screened for its usefulness in 1949.¹ The heartwood, which provides the actual medicinal dye, is considered² a valuable astringent, alternative tonic, blood purifier and is said to be useful in diarrhoea, specially of the children.³ Hikino *et al.*⁴ have determined the clinical application of its active ingredient *brazilin* in certain inflammatory disorders. Recently Yamasaki *et al.*⁵ have concluded the inhibiting effect of xylem of heartwood of *Caesalpinia sappan* on D-Glucose uptake by Ehrlich ascites tumour cells.

EXPERIMENTAL

Authentic heartwood of *Caesalpinia sappan* was procured from Yogi Pharmacy, Harwar. Wood was made into small chips.

Extraction in water: 10 g of the heartwood chips were boiled with distilled water for 1 h. Orange coloured extract was separated and the solid material boiled again and again and the extract separated each time until the colour became light.

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All the collected solutions were mixed and then evaporated to dryness to obtain the dye.

Extraction in Methanol (a) in cold: 10 g of the chips were kept in sufficient methanol in soxhlet extractor for 48 h Orange-red extract was collected and fresh methanol added again and kept for 48 h. The procedure was repeated till colour of the extract became light. All solutions were mixed and methanol was separated by vacuum distillation.

(b) *By refluxing:* 10 g of the chips were refluxed with sufficient methanol for 5 h. Orange-red extract separated. Process repeated till light colour. Solutions mixed and methanol was separated by distillation over a water bath.

Extraction in ethanol: Similar procedure, as in the case of methanol (a) above, was adopted.

Extraction in aqueous NaOH: 10 g of the chips were kept in separating funnel with sufficient aqueous decimolar NaOH solution for 24 h. Red-violet solution was separated. Procedure repeated till light colour. Alkaline solid dye is obtained by evaporation of the solution.

RESULTS AND DISCUSSION

The physical appearance and yields of the medicinal dyes obtained by various solvents are given in Table-1.

TABLE- 1
PHYSICAL APPEARANCE AND YIELDS OF MEDICINAL DYE
Heartwood = 10 g

S. No.	Solvent	Yield (g)	Colour and state	Colour of decoction
1.	Water	1.274	dark brown solid	orange
2.	Methanol (cold)	2.450	dark orange-red viscous liquid	orange-red
3.	Methanol (reflux)	1.204	dark orange-red semi-solid	orange-red
4.	Ethanol	0.838	red-brown semi-solid	orange-red with brownish tinge
5.	Aq. NaOH	5.025	dark brown semi- solid	red-violet

A look at the physical appearance of the obtained samples points towards their different natures. Mehrotra and Sharma² carried out the soxlet extraction in hexane and subsequently in benzene, chloroform, alcohol, and water successively and obtained the colour of the samples in almost similar range. Nigam *et al.*⁶ have isolated the material in ethanol and obtained a semi-solid mass, though they did not mention its colour. However they obtained a yellowish coloured solid⁷ through exhaustive soxhlet extraction in petroleum ether. The dyes isolated by us are likely to have different medicinal properties is verified by their different nature, which points out towards the different components in them, the work on which is in progress. Moreover, the yield in water is low while that in methanol is high. It is because of water-insoluble but methanol-soluble portion in the dye of heartwood

of *Caesalpinia sappan*. Same conclusion is drawn from other yields as well. Moreover, the dye isolated in water was found to be partly soluble in ether and gave different colour. This, too, confirms the conclusion drawn by us.

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