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Determination of Condensed Tannin Content in Neem Bark.

by

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"The work described in this thesis was carried out by me under the supervision of Prof. Mahinda Wickramrathne and a report on this has not been submitted in whole or in part to any university or any other institution for another Degree/Diploma."

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ABSTRACT

Tannin, a natural polymer belong to the polyphenolic group of compounds, is widely used in the leather industry. Specially as tanning agent for the conversion of putescible collagen fibers into leather matrix during the leather-manufacturing process.

In this project we measured the condensed tannin content in Neem bark to find out whether it is possible to use Neem Bark as a source of Tannin.

Tannin extracts of Neem Bark were obtained by reacting with Caustic Soda (NaOH), Distilled water, Methanol, and 70% aqueous Acetone.

A Stiasny Method determined the Condence Tannin contents of the extracts. By determining the Stiasny value it is expressed the content of Phenolic material able to react with an aldehyde.

72% of the tannin extract of the Neem Bark was reacted with the Formaldehyde. There for Neem Bark can use as a tanning agent in the small leather making process.

1. Introduction

1.1 Tannin

Plants accumulate a wide variety of "secondary" compounds, including alkaloids, terpenes and phenolics. Although these compounds apparently do not function in "primary" metabolism such as biosynthesis, biodegradation and other energy conversions of intermediary metabolism, they do have diverse biological activities ranging from toxicity to hormonal mimicry, and may play a role in protecting plants from herbivore and disease.

Phenolic metabolism in plants is complex, and yields a wide array of compounds ranging from the familiar flower pigments (anthocynidins) to the complex phenolics of the plant cell wall (lignin). However, the group of phenolic compounds known as tannins is clearly distinguished from other plant secondary phenolics in their chemical reactivities and biological activities.

Tradition use of tannins as against for converting animal hides to leather ("tanning") is one manifestation of the most obvious activity of the tannins: their ability to interact with and precipitate proteins, including the proteins found in animal skin. The term "tannin" comes from the ancient Celtic word for Oak, a typical source for tannins for leather making.

Bate-Smith defined tannins as "water soluble phenolic compound having molecular weights between 500 and 3000.... (Giving) the usual phenolic reactions... (and having) special properties such as the ability to precipitate alkoloids, gelatin and other proteins".

Haslam has more recently substituted the term "polyphenol" for "tannin", in an attempt to emphasize the multiplicity of phenolic groups1` characteristic of these compounds. He notes that molecular weights as high as 20,000 have been reported, and that tannin complex not only with proteins and alkoloids but also with certain polysaccharides. He prefers to use the term tannin, which emphasizes the character, which sets tannins apart from all other phenolics: the ability to precipitate proteins.

1.2 Structural Chemistry of Condensed Tannin

Proanthocynidins (condensed tannins) are polymeric flavanoids. The flevanoids are a diverse group of metabolites based on a heterocyclic ring system derived from phenylalanine (B) and polyketide biosynthesis (A). The flevanoid skeleton, the standard letters to identify the rings and the numbering system are shown here.

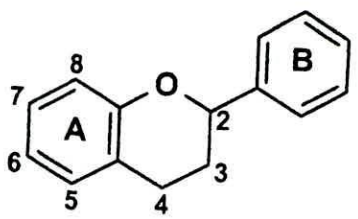
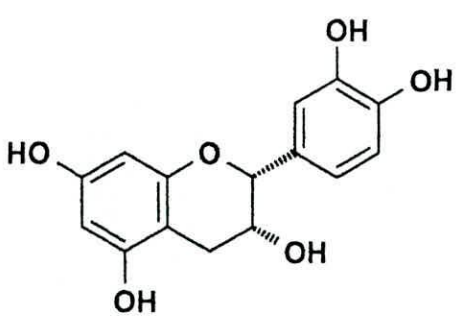
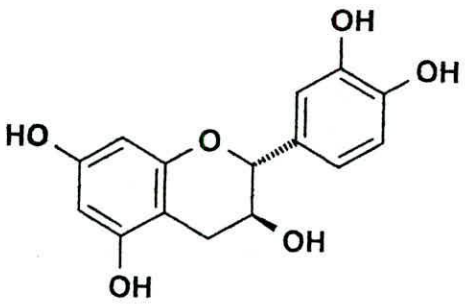


Fig. i Flavanoid Skeleton

The most widely studied condensed tannins are based on the flavan-3-ols (-)-epicatechin and (+)-catechin.



epicatechin



catechin

Fig. ii Flavan-3-ols

Addition of a third phenolic group on the B ring yields epigallocatechin and gallocatechin. Much less common are flavan-3-ols with only a single phenolic group on the B ring, para to C-2 (epiafzelechin, afezelechin with stereochemistry corresponding to epicatachin, catechin respectively).

The best characterized condensed tannins are linked via a carbon-carbon bond between C-8 of the terminal unit and C-4 of the extender. The four common modes of coupling are illustrated by the dimmers isolated by Haslam, and original named B-1, B-2, B-3, and B-4. The more complete names specify the position and stereochemistry of the interflavan bond completely. In addition to these dimmers, related dimmers linked by C-6 of the terminal unit and C-4 of the extender have been isolated.