

Lignin from Soda Liquor and Soda Anthraquinone Liquor of *Ipomoea Carnea* Jacq

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Abstract: Non wood plant are more common as raw material where wood is scarce. *Ipomoea carnea* Jacq has not enjoyed much favor for pulp and paper making as compared to wheat straw, rice straw etc. Structural determination studies has been carried out on the soda lignin of *Ipomoea carnea* Jacq prepared from soda spent liquor and soda anthraquinone spent liquor. Lignin of the non wood species investigated was found to have certain chemical groups such as carbonyl, methoxyl, total hydroxyl and phenolic hydroxyl groups. On comparing the results, the reactive groups were found to be same to that of *Boswellia Serrata*. Determination of groups is of importance in the study of the reactive lignin form paper making point of view. It was found that *Ipomoea Carnea* is having paper making properties.

Key words: *Ipomoea carnea* Jacq, lignin, soda spent liquor, soda anthraquinone spent liquor,

INTRODUCTION

The last three decades have witnessed a tremendous increase in the exploitation of available non wood resources for pulp and paper making, in order to meet the raw material demand to substitute pulp wood, which is becoming scarce. The multiple uses of timber in the forest product industries has further substantiated the need for the pulp and paper industries to seek other cellulose raw material which are available in sufficient quantities. To conserve wood resource non wood fiber plants can be substituted for wood pulping. Among various sources, the non wood lignocelluloses raw material is gaining importance in supplementing the requirement of renewable fibrous resources for the production of paper. Wheat straws, rice straw are the most abundant cellulose source used in paper industry. Keeping in view to the new potential resource, *Ipomoea carnea* Jacq has been found as a new resource for paper making.

Ipomoea carnea Jacq is a common weed which is locally known as 'Beshram'. Due to its high adaptability and resistance towards adverse climatic condition it may grow in all types of climate and soils, marshy as well as dry. A large diffuse or straggling shrub with milky juice, a native of South America. This plant is used for making fence for the road side, but due to its massive growth and rapid propagation it is growing rapidly in barren waste lands². Plantation of *Ipomoea carnea* Jacq may be undertaken in the month of June, July with the onsets of monsoon shoots are fast growing and attaining optimum size in about a year time.

Non wood is an essential composite of two types of polymeric compounds namely (i) carbohydrate –which can be further divide into cellulose and hemicelluloses (ii) lignin –isolation of lignin by the use of solvents involves use of inorganic chemicals which are employed to dissolve lignin and separate the fibers from wood to paper. Alkaline process is commercially used for the production of pulp and paper; lignin is obtained as a byproduct which is known as spent liquor. The lignin from spent liquor of acid process is ligno-sulphonate whereas the lignin from alkaline processes is known as soda lignin. Soda lignin has been put to research Lignin is essentially a three dimensional branched network polymer made up of carbon, hydrogen and oxygen. The constitutional model of lignin is composed of many groups such as ether, primary and secondary alcoholic hydroxyl groups, and carbonyl groups.

MATERIAL AND METHODS

500 g of *Ipomoea carnea* Jacq was pulped by soda pulping and soda anthraquinone pulping in a 20L capacity stainless steel rotatory digester unit, with 16.8% NaOH (cooking liquor) for 150 min at 160°C and pressure of 10 psi. The cooking liquor to *Ipomoea carnea* Jacq was 5:1 by weight for soda anthraquinone pulping. 0.1% anthraquinone was added to the soda pulping system.

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Soda lignin and soda anthraquinone lignin were dissolved in dioxin to give about 10% solution. This solution was filtered through G3 crucible. The residue left over G₃ crucible was rejected. The filtrate was added drop wise from the separating funnel to anhydrous solvent ether with stirring. The purified lignin was precipitated with solvent ether which was later decanted off. The precipitate was washed twice with benzene and twice with low boiling petroleum ether. The purified lignin was kept in petroleum ether overnight in vacuum at room temperature. A series of experiment was carried out to study the chemical constituent of *Ipomoea carnea* Jacq, which includes elemental chemical analysis, determination of carbonyl groups, methoxyl groups, total hydroxyl groups and furfural contents. All the determination was carried according to the TAPPI standards method of analysis.

Table 1: elemental composition and c₉ formula of ipomoea carnea jacq

Species	Carbon	Hydrogen	Oxygen	Methoxy	C ₉ Formula	Formula weight
<i>Ipomoea carnea</i> Jacq	53	4.6	42.3	21	C ₉ H _{6.2} O _{4.72} (OCH ₃) _{1.63}	240.56
Formula = C ₉ H _{6.2} O _{4.72} (OCH ₃) _{1.63}						
Formula weight = 240.56						

Table 2: Reactive group of lignin of ipomoea carnea Jacq

Unit	OCH ₃ per C ₉ unit	CO per C ₉ unit	Total OH per C ₉ unit	Phenolic OH per C ₉ unit	Furfural
%	21	0.24	10.7	0.42	nil

Table 3: Composition of c₉ formula of mild wood lignin of some other hardwood

S.No	Species	%Carbon	%Hydrogen	%Oxygen	C ₉ Formula	Formula weight
1	<i>Termanalia tomentosa</i>	56.4	5.6	38	C ₉ H _{7.75} O _{2.32} (OCH ₃) _{1.64}	203.71
2	<i>Bossewelia serrata</i>	57.1	5.8	33.1	C ₉ H _{8.97} O _{3.06} (OCH ₃) _{1.49}	211.59
3	<i>Xylixylocarpa</i>	60.7	6.3	33	C ₉ H _{8.76} O _{2.56} (OCH ₃) _{1.37}	205.06
4	<i>Pterocarpus</i>	58.2	5.8	36	C ₉ H _{8.12} O _{2.56} (OCH ₃) _{1.37}	212.97
5	Beech	60.3	6.3	33.4	C ₉ H _{8.79} O _{2.9} (OCH ₃) _{1.44}	207.83
6	Aspen	60.4	6.2	33	C ₉ H _{8.79} O _{2.86} (OCH ₃) _{1.99}	206.99
7	Maple	60.3	5.68	33.9	C ₉ H _{7.64} O _{3.01} (OCH ₃) _{1.34}	205.48

Table 4: Reactive groups of mild wood lignins of tropical hardwood

S.No.	Species	OCH ₃ per C ₉ unit	CO per C ₉ unit	Total OH per C ₉ unit	Phenolic OH per C ₉ unit
1	<i>Termanalia tomentosa</i>	22.5	0.21	13.76	0.34
2	<i>Bossewelia serrata</i>	21	0.24	10.70	0.42
3	<i>Xylixylocarpa</i>	20.8	0.24	12	0.42
4	<i>Pterocarpus</i>	19.7	0.22	11.60	0.35

RESULT AND DISCUSSION

Elemental composition of soda lignin of *Ipomoea carnea* Jacq investigated upon in this study is depicted in Table I. Lignin macromolecule is a three dimensional polymer made up of phenyl propane unit and therefore empirically it can be best represented by C₆-C₃ or C₉ formula. It is a principle carrier of methoxyl group in its aromatic structure. Representation of methoxyl group is also included in C₉ formula. C₉ formula of *Ipomoea carnea* was found to be C₉H_{6.2}O_{4.72} (OCH₃)_{1.63}, with the formula weight of 240.56. The constitutional model of lignin is composed of many reactive groups such as methoxyl, carbonyl, hydroxyl and furfural. Table II shows the result of the group determined in *Ipomoea carnea*. The methoxyl content per C₉ unit in the lignin was 25% carbonyl groups per c9 unit is found to be 0.24%, total phenolic hydroxyl groups per c9 unit was found to be nil On comparing the results the reactive groups in *Ipomoea carnea* Jacq was similar to those of bossewelia Table III and Table IV revealed the elemental composition, C₉ formula and the methoxyl content and phenolic hydroxyl carbonyl groups of some of the wood lignin of hard wood species On comparison with all other species it was found that the C₉ formula of *Ipomoea carnea* Jacq was similar to that of *Bossewelia serrata*.

Conclusion

The reactive group of the lignin of *Ipomoea carnea* Jacq upon investigation was found to be almost similar to other species, evidence that it may be employed for paper making. The amount of lignin varies from wood to wood and non wood to non wood species. Lignin is characterized by considerable amount of methoxy group and a part of phenolic groups in nature. It can be concluded from the study that the lignin prepared from soda spent liquor and soda anthraquinone liquor of the non wood species contains carbon 53.01%, hydrogen 4.62%, oxygen 42.3% and methoxyl groups 21% Lignin is an aromatic amorphous material which forms a part of the cell wall and the middle lamella in the wood thus it can be concluded that the lignin of *Ipomoea carnea* Jacq contains all those features of other hard wood and soft wood lignin for paper making process.

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