The Importance of Debarking and Use of Some Hardwoods for the Indian Pulp and Paper Industry

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SUMMARY

The author has described his experience on the use of some species of tropical hardwoods in laboratory, and of mill scale production. Pulping and bleaching of *Eucalyptus grandis* with and without bark have also been described. The author experience shows that debarking must be done.

INTRODUCTION

The future development of Pulp and Paper Industry in India depends upon the use of hardwoods as raw material, in view of the impending shortage of bamboo. During the last few years a number of paper mills in India have started using mixed hardwoods in big way. The use of hardwoods is increasing steadily. With modern technique of beating and pulping hardwoods are used in the manufacture of various grades of paper.

In Japan even the hardwood chips are imported for manufacturing quality paper for home consumption and export. The experience of the author of the use of some species of hardwoods either in the laboratory or in mill trials is narrated below :—

CASUARINA SP.

This wood is found to be very suitable for pulp. This wood is grown in the coastal regions of South India and Eastern India. This is a quick growing hardwood, and according to V. Seth, "with irrigation and use of fertilizers it should be possible to obtain 100 m^3 or more yield of per hectare of this wood over a ten years cutting cycle". At present this wood is used as firewood, give support to the roof. There is one disadvantage that this wood should be chipped when it is fresh. If the wood is stored for a long time and it loses moisture and become very hard it is difficult to chip the dry wood.

BOSWELLIA SERRATA (SALAI)

This wood is used in large quantity in Pulp and Paper Mills and is found in Bihar, Uttar Pradesh and Madhya Pradesh Forests. It is suitable for pulping. The major defect in the use of this wood is that on storing it is eaten away by borer and gets attacked by fungus. This wood can be chipped easily.

EUCALYPTUS HYBRID AND E. GRANDIS

A large scale plantation of Eucalyptus has been done in Uttar Pradesh, Mysore and Kerala. This wood offers no difficulty in chipping, pulping and bleaching. The experiment carried out at F.R.I. Dehradun shows that young wood of 6 to 7 years could be pulped with bark for the production of

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TABLE—II

COOKING CONDITIONS OF SODA PULPING OF EUCALYPTUS GRANDIS

Chips Liquor ratio	—	1 : 3.5
Time taken to raise at cooking temperature	—	1 hour 45 minutes
Cooking temperature	—	165 °C
Sulphidity	—	20%
Cooking time	—	2 hours

Sl. No.	Cook No.	Alkali taken on B.D. Chips as NaOH %	Alkali Consumed %	Screened Pulp Yield %	Reject %	Permangnate No. of pulp
1.	1A Debarked wood	22	20.26	42.7	0.2	17.0
2.	2A „	18	17.65	44.9	3.6	19.8
3.	3A „	14	13.93	55.7*	—	35.0
4.	4A Wood along with bark	22	20.67	41.8	0.2	18.3
5.	5A „	18	17.65	43.0	3.5	20.3
6.	6A „	14	13.95	52.0*	—	36.0
7.	7A Bark only	22	21.2	38.8	2.8	—
8.	8A „	18	17.7	36.0	6.8	—

* Cooked chips were refined through Sprout Waldron disc refiner.

TABLE—III

BLEACHING DATA

Chlorination Time	—	45 minutes
Chlorination Temp.	—	22°C.
Final pH at Chlorination stage	—	2.0
Alkali Extraction Time	—	90 minutes
Temperature	—	45°C
1st Hypo Stage		
pH	—	9.0
Temperature	—	40°C.
Time	—	180 minutes
2nd Hypo Stage		
Temperature	—	30°C
Time	—	180 minutes

Sl. No	Cook No.	**Chlorination** % Cl_2 added on B.D. Pulp	**Alkali Extraction** % Alkali	**1st stage Hypo** % available Chlorine consumed on B.D. Pulp	**2nd stage Hypo** % available Chlorine consumed on B.D. Pulp.	Brightness of final Bleached Pulp
1.	1A	5.1	2.0	2.8	—	78
2.	2A	5.7	2.0	3.6	—	76
3.	3A	12.0	2.5	5.0	2.1	—
4.	4A	5.1	2.0	3.65	—	76 a few fines specks
5.	5A	5.8	2.0	4.05	—	73
6.	6A	12.0	2.5	5.4	2.3	—

TABLE—IV

PHYSICAL STRENGTH PROPERTIES OF UNBLEACHED PULPS

Sl. No.	1	2	3	4	5	6	7	8
Cook No.	1A	2A	3A	4A	5A	6A	7A	8A
Freeness of pulp beaten in Lampen mill, °S R,	39	41	40	42	39	40	39	39
G.S.M.	62	61.5	62	62	61	58.5	62	62
Caliper, m.m.	0.105	0.09	0.095	0.098	0.09	0.094	0.12	0.13
Bursting Strength, kg/cm²	1.75	1.85	2.4	1.4	1.6	1.75	Below scale	
Burst factor	28	30	39	23	26	30	—	—
Breaking length, kilo metres	5.70	5.75	5.6	3.9	4.5	4.5	0.84	0.67
Tear factor	66	84	72	52	72	59	26	19
Double fold	78	84	130	24	80	85	2	2

TABLE—V

PHYSICAL STRENGTH PROPERTIES OF BLEACHED PULPS

Sl. No.	1	2	3	4
Cook No.	1A	2A	4A	5A
Freeness of Pulp beaten in Lampen mill, °SR	38	39	42	43
G.S.M.	62	61	62	62.5
Caliper, m.m.	0.092	0.092	0.094	0.09
Bursting Strength, kg/cm²	1.24	1.34	1.24	1.30
Burst Factor	20	22	20	21
Breaking length, kilo metres	3.8	4.9	3.7	4.02
Tear Factor	46	52	40	50
Double fold.	8	18	8	25

various grades of paper. The author collected a tree of *Eucalyptus grandis* freshly cut which was eight years old and found that the bark present was 15.64% on gross basis and 14.49% on oven dry basis. It is not difficult to remove the bark as it can be peeled off easily. Experiments were conducted on laboratory scale on *Euclyptus grandis*, eight years old with and without bark. It was found that *Eucalyptus grandis* with bark gives rise to specks in pulp bleached in conventional three stages bleachings i.e. chlorination, alkali and calcium hypochlorite. The pulp obtained by cooking the bark only is full of specks and could not be bleached to high degree of brightness inspite of using excessive bleach liquor. *Eucalyptus grandis* and *hybrid* with bark can be used for wrapping paper. The detail of experiment conducted on *E. grandis* 8 year old, are given in Tables–I, II, III and IV.

BUTEA MONOSPERMA (PALAS)

It is available in large quantity in West Bengal. It is said that local people do not like to use this wood as fire wood. This wood is full of knots and gives pulp of poor strength, which is easily bleachable. This wood should be discarded for pulping.

SHOREA ROBUSTA (SAL)

A large percentage of Sal wood is present in saw mills waste, avaialable to the paper mills. No difficulty has been experienced by using a small quantity of wood along with Salai. The wood is suitable for pulping.

SESBANIA GRANDIFLORA

The Sesbania species are ready for pulping in 3-4 years. The young tree does not require debarking. It can be easily chipped and is found suitable for pulping and the pulp is easily bleachable.

TABLE—I

CLASSIFICATION OF CHIPS USED

Screen size (")	Eucalyptus without bark (%)	Eucalyptus with bark (%)
1¼	12.6	21.6
1	12.9	13.8
¾	30.4	25.4
½	26.1	22.7
¼	18.0	16.5

CONCLUSIONS

The above conducted experiments show that it is essential to remove the bark from Eucalyptus grandis to make bleachable pulp for the following reasons:

(1) There is slightly more consumption of alkali in cooking of wood with bark than debarked wood. (Table–II)

(2) The yield of screened unbleached pulp is slightly more in case of debarked wood. (Table–II)

(3) The unbleached pulp obtained from wood with bark consumes more bleaching chemicals (Table–III)

(4) The bleached pulp of wood with bark has a few fine specks while the pulp obtained from debarked wood gives a few degrees of higher brightness and is free from fine specks as compared to bleached pulp obtained under similar conditions from wood with bark. (Table–III)

Even in case of unbleached pulp, the pulp obtained from debarked wood is having higher tear factor (Table–IV) and higher percentage of long fibres than that obtained from wood containing bark.

In India barking is done in the forest itself in the primitive manual way. The bark is thus wasted and left in the forest itself. A proper debarking equipment should be installed in the paper mill, where hardwood is going to be used in large quantities. The bark is utilised in a better way. It can be used as fuel for boilers.

Hardwoods are going to play a major role in the development of Pulp and Paper Industry of INDIA. We must start thinking of utilising every part i.e. the lop and top, bark etc. of hardwood, so as to conserve the wealth of the forest in the country, as ninetythree percent of these forests consist of tropical broad leaved hardwoods.

TABLE—VI

FIBRE CLASSIFICATION OF UNBLEADHED PULP

Retained on	Bamboo	Eucalyptus grandis debarked	Eucalyptus grandis with bark
	%	%	%
20 mesh	41	1	1
35 mesh	22	36	27
100 mesh	11	40	46
Passing through 100 mesh	26	28	27