Comparative Suitability Evaluation of Maharashtra Hardwoods for Paper Making

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Comparative suitability evaluation of seven hardwoods growing in Maharashtra state for writing and printing papers as well as for wrapping papers. has been worked under standard conditions.

INTRODUCTION

In the state of Maharashtra there is only one big mill namely Ballarpur Paper & Straw Boards Mills Ltd. having the capacity of 69,000 tonnes per annum, and producing 65,000 tonnes per annum. There are other 15 small paper mills. There is scope of setting up some more units based on the tropical hardwoods and bamboo growing in the Maharashtra Region. With this end in view, comparative suitability evaluation of seven hardwoods namely *Albizia odoratissima, Anogeissus latifolia, Chloroxylon swietenia, Emblica officinalis, Pterocarpus marsupium, Terminalia bellirica, Xylia xylocarpa* sent by Deputy Director, Forest Development Corporation, west Chanda Unit, Chanderpur have been investigated for the production of wrapping paper as well as writing and printing paper by the kraft process. This method has been adopted because complete evaluation of raw material for the various grades of pulps and papers is very laborious and time consuming. It is also yet premature to say that a method based on morphology of fibres is workable. The wood characteristic which influence pulping are species age, density, extractive content, silica content of wood and wet web strength of pulp from these species. The importance of each of these has been discussed in the earlier paper[1]

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The method of evaluating comparative suitability of hardwoods by determining suitability index, is described briefly. Suitability factor of cost of pulp production (Sc) has been considered as the principal basic property while all other pulp characteristics like physical properties are considered as auxiliary property. The suitability figure is given by

$$S_f = \frac{P_o W_o + \sum_{x=i}^{x=n} P_x F_x W_x}{W_o + W_1 + W_2 + \cdots W_x}$$

Where

P_o=Principal basic factor
W_o=Weightage factor of P_o
P_x=Auxiliary basic property
W_x=Weightage factor of P_x
F_x=Adjusting factor of P_x

The comparative suitability index is given by

$$I = \frac{S_F}{S'_F} \times 100$$

Where S'_F is the suitability figure of a standard raw material, Bamboo (*Dendrocalamus strictus*) has been chosen as a standard raw material for comparison pf chemical pulps i.e. writing, printing and wrapping papers.

Suitability factor of cost of pulp production i.e. S_c has been defined as follows :—

For Writing and Printing Paper

$$S_{c_1} \propto \frac{\text{Unbleached pulp yield\%}}{\text{Total chemicals, \%}}$$

For Wrapping Papers

$S_{c_2} \propto$ Unbleahed pulp yield, %

Raw Material

Five kg of each of the following woods were received from Deputy Director, Forest Development Corporation, West Chanda Unit, Chanderpur.

1. *Albizia odoratissima*
2. *Anogeissus latifolia*
3. *Chloroxylon swietenia*
4. *Emblica officinalis*

Table—II.

Comparative suitability Indices of Hardwoods for writing and Printing papers.

Sl. No.	Species	$Sc_1 \alpha \frac{\text{Unbleached pulp yield\%}}{\text{Total chemicals. \%}}$	Strength properties of unbleached sheets.			Camparative suitability Index SF/S'F × 100	Remarks
			Breaking length(m)	Burst factor	Tear factor		
	Weightage factor	2	2	1	1	—	Standard
	Adjusting factor	1.000.	0.000323	0.0468	0.0164	—	raw
	Dendrocalamus strictuss	410/20.0	6340	43.8	125.0	100.00	material.
1.	*Albizia odoratissima*	46.0/25	5390	33.3	73.3	96.06	
2.	*Anogissus latifolia*	41.4/28	5040	35.0	73.3	88.36	
3.	*Chloroxylon swistenia*	44.4/23	5390	25.0	66.7	74.93	
4.	*Emblica officinalis*	36.3/26	5640	23.3	73.3	85.19	
5.	*Pterocarpus marsupium*	49.0/17	6510	43.3	86.7	111.45	
6.	*Terminalia bellirica*	43.4/23	5340	26.7	73.3	94.42	
7.	*Xylia xylocarpa*	40.7/28	5640	30.0	73.3	89.37	

Table—III

Comparative suitability Indices of Hardwoods for wrapping papers.

Sl. No.	Species	$Sc_2 \alpha$ Unbleached pulp yield%	Strength properties of sheets			Comparative suitability Index SF/S'F × 100	Remarks
			Breaking length meters (m)	Burst factor	Tear factor		
	Weightage factor	2	1	2	1	—	Standard
	Adjusting factor	1,000	0.000763	1.278	0.469	—	raw
	Dendrocalamus strictus	50.0	6550	39.1	106.6	100	material
1.	*Albizia odoratissim*	54.5	5270	29.5	73.3	86.32	
2.	*Anogeissus latifolia*	58.7	6910	46.1	108.8	116.68	
3.	*Chloroxylon swistenia*	55.0	5010	32.5	86.6	92.66	
4.	*Emblica officinalis*	39.3	4330	27.3	66.6	70.88	
5.	*Pterocarpus marsupium*	39.8	4000	36.0	70.0	90.35	
6.	*Terminalia bellirica*	49.0	6090	28.3	106.3	89.40	
7.	*Xylia xylocarpa*	54.4	4290	21.7	53.3	73.72	

5. *Pterocarpus marsupium*
6. *Terminalia bellirica*
7. *Xylia xylocarpa*

These woods were chipped in the factory chipper. Screened chips were used for carrying out these experiments.

Experimental and Results

For the production of writing and printing papers, the woods were cooked to pulps having kappa number of 25. These pulps can be bleached to a satisfactory brightness for writing and printing papers. For the production of wrapping paper, the wood is cooked with minimum amount of chemicals with shortest possible time and pressure to obtain high yields. The standard pulping conditions of cooking are given in Table I.

Table—1.

Standard conditions of cooking for Chemical pulps.

Cooking conditions	For writing & printing papers.	For wrapping papers.
Total Chemicals, %	To be adjusted	14
Kappa number	25±1	—
Digestion pressure, Kg/cm²	5.6	4 2
Digestion period*, hrs	4.0	4.0
Sulphidity, %	25	25
Bath ratio	1:4	1:4

*Digestion period includes 1.5 hours to raise the temperature of raw material in the digester to maximum temperature

The unbleached pulps so obtained were beaten in Lampen Mil to 300 ml. (C.S.F) freeness. Standard sheets of 60 g.s.m. were made to find the physical strength properties at 65 % RH and 25°C.

The results of unbleached pulp yield suitable for writing and printing and wrapping papers with total amounts of chemicals used and physical strength properties are recorded in Table II and III. The comparative suitability indices for these woods were calculated and have been given in Table II & III.

Disscusion

It is seen from Table II that excepting for *Chloroxylon swistenia* all other spaces have comparative suitability index of 100 ± 15 for writing and printing papers and they could be cooked in mixture.

It is observed from Table III that except for *Xylia xylocarpa* and *Emblica officinalis*, all other species have comparative suitability index of 100 ± 15 for wrapping paper and they could be cooked in mixture giving a yield of over 50%.

Acknowledgement

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References

1. Man Mohan Singh and P. P. Bhola :
"Comparative suitability evaluation of hardwoods for paper making". Holz-Forschung and Holzverwortung, 28, Heft 6 (1976).