

Soda and Kraft Pulping of Ipomea Fistulosa

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ABSTRACT

Soda pulping of *Ipomea Fistulosa* at 15% active alkali (as Na_2O) affords pulp of Kappa No. 45 at H Factor 1119. Kraft pulping at the same H Factor at 24% active alkali (as Na_2O) and 19% sulphidity affords pulp of Kappa No. 27. Strength properties of sheets made from these pulps show that these pulps can be used as supplementary to bamboo and Mixed Hard wood pulps. Toxicity studies of *Ipomea Fistulosa* show that stems are not toxic. Even the ether extract of leaves is not toxic. Water extract shows some toxic effect only at higher doses. Thus material is safe for handling.

Ipomea Fistulosa, locally known as besharam grows wild in all types of climate and soils-marshy as well as dry. It is native to south America and was introduced in India as an ornamental plant. It is widely used as fencing for fields. Its leaves are not eaten by cattle. It is draught resistant and can be raised both under rain fed and irrigated conditions¹. Plantation of *Ipomea Fistulosa* may be undertaken in the month of June-July with the on set of monsoon. Once it is planted in particular area, there is no need of replantation because it remains overgreen until it is uprooted. Culting is effected from the bottom of the stems leaving the un-matured stalks on the plants. Under rain fed conditions a border crop, one mile in length gave, in six cuttings 75000 lbs of green matter in one year. Under irrigated conditions the yield was nearly double^{1,2}. As per our observation one bush of *I. Fistulosa* consisting of approximately 20-25 stalks gives 2.8 kgs of air dry pulpable material excluding leaves which may be cut thrice a year and can be used for green manuring. Based on this estimation one acre of plantation (with each plant occupying 9 sq ft.) will yield 13.5 Tons of dry pulpable material per year.

RESULTS AND DISCUSSION :

Proximate analysis and physical data is given in Table—1. Holocellulose, Lignin and ash content of *I. Fistulosa* is comparable to Bamboo and hard Woods, lignin being slightly higher. Its density however is much lower than bamboo and mixed hard woods. Therefore

higher bath ratio is maintained. Pulping data is presented in Table—2.

The unscreened pulp yield by soda pulping at 1120 H Factor is 49%. Bamboo and mixed hardwoods under similar conditions give 43-45% yield. Total solid content of black liquor is 16 g.p.l., which may be due to pith and higher lignin content. At this solid content residual alkali content of black liquor is 3.2 g.p.l. Kraft pulping at the same H factor gives a pulp of Kappa No. 27 at 45% yield. Strength properties of standard sheets are given in Table—3. It is observed that except Kappa No. and Tear factor, other properties are not improved by kraft pulping. Toxicity test³ results show that ineffective dose is 2320 mg/kg for ether extract of stems; 1660 mg/kg for ether extract of leaves; 1300mg/kg for water extract of stems and LD50 of water extracts of leaves is 231 mg/kg. Thus only water extract of leaves appears to be lethal. Taking average weight of man as 50 kg; ineffective dose as well as lethal dose for human body becomes much higher. Under normal working conditions that much quantity of extract is not likely to be absorbed by human body and therefore the material is safe for handling.

EXPERIMENTAL :

For physical and chemical data stems from different bushes were cut and air dried. For chemical

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TABLE—1
Physical Data and Proximate Analysis of I—Fistulosa

Sl. No.	Physical data	Sl. No.	Proximate Analysis
1.	Average height of stalks, cms. 142	1.	Ash, 4.9
2.	Average diameter of stalks, cms. 1.1	2.	Solubility in, % (i) Alcohol-Benzene 4.21 (ii) Hot water 15.12 (iii) 1% NaOH 25.8
3.	% of leaves on freshly cut stalks 30	3.	Holocellulose, % 67.2
4.	Basic density of chips, kg/M ³ 270	4.	Lignin, 25.1

TABLE—2
Pulping Data of I. Fistulosa

Sl. No.	Particulars	Soda Pulping	Kraft Pulping
1.	Active alkali (as Na ₂ O) %	20	24
2.	Chip to liquor ratio	1:10	1:10
3.	Sulphidity %	—	19.76
4.	Time to 115°C, min.	45	30
5.	Time from 115° to 163°, min.	15	30
6.	Time at 163°C, min.	120	120
7.	H factor	1120	1120
8.	Unscreened pulp yield, %	49	45
9.	Kappa No. of unbleached pulp	45	27
10.	Black liquor :		
	(i) pH	10.6	11.2
	(ii) Total solids gpl.	16	37
	(iii) Residual alkali (as Na ₂ O) gpl.	3.2	7.2

TABLE 3
Strength Properties of Unbleached Pulp

Sl. No.	Particulars	Soda pulping	Kraft pulping
1.	Freeness °SR	45	45
2.	G. S. M.	60	60
3.	Bulk	1.46	1.45
4.	Breaking length, Meters	6447	4453
5.	Burst factor	26	25
6.	Tear factor	26	36
7.	Double fold	42	26

analysis oven dried stems were ground in grinder to 40 mesh. Proximate analysis is carried out as per TAPPI standards.

Pulping : Air dried stems of *I. Fistulosa* were chipped manually. Average size of chips was 3/4" to 1". No depithing was carried out. Pulping was carried out in electrically heated stainless steel stationary digester of 15 litres capacity. Temperature of digester was controlled by dimmerstat. After the completion of cooking cycle, pulp was washed on flat screen. Analysis of Black liquor was carried out as per TAPPI standards T-625.

Pulp evaluation : Pulp was beaten in laboratory beater under standard conditions and sheets were made on standard sheet making machine as per TAPPI standard T-205 and physical testing of pulp hand sheets was done as per standards S-220.

Toxicity : Toxicity of the material was determined as per standard procedure. Ether and water extracts of leaves and stems used for determining the LD₅₀ test which determines lethal dose in mgs/kg at which 50% animals are dead.

CONCLUSION : With 15% chemical at 165°C for 2 hours, unbleached pulp with Kappa No. 45 can be prepared at 49% yield. Strength properties of this paper are suitable for producing unbleached wrapping paper *I. Fistulosais* not toxic as far as handling is concerned. This material may prove as supplementary material to bamboo and mixed hard woods for producing unbleached Kraft paper.

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