

Effect of Hemicellulose Retention on Pulp Properties

S. R. D. Guha
J. S. Negi
Jiya Nand

Introduction

It is well known fact that hemicelluloses have favourable effect on pulp quality when present in reasonable amounts. Extreme acidity and alkalinity during pulping render them soluble, either by acid hydrolysis into component sugars or by alkaline degradation into small D. P. fragments. To avoid the solubilization of hemicellulose by acidic or alkaline pulping reagent, neutral sulphite semi-chemical process was developed. Because of the neutral cooking conditions, the acid or alkali susceptible hemicelluloses are retained.

In the present investigation, an attempt has been made to produce pulps from sabai grass (*Eulaliopsis binata*) by neutral sulphite semi-chemical process using varying amounts of chemicals so as to retain different amounts of hemicellulose. The strength properties of each pulps were compared and correlated with the amount of hemicellulose present.

Experimental

Raw material:—Sabai grass (*Eulaliopsis binata*) used in this investigation was collected from Dehra Dun forest (Western Circle). The grass was cut into 4 cms. lengths for the pulping. The moisture content of the grass was 12.5%.

S.R.D. Guha, J.S. Negi & Jiya Nand,
Cellulose and Paper Branch, Forest
Research Institute, Dehra Dun.

Sabai grass (Eulaliopsis binata) was pulped by neutral sulphite semi-chemical process using varying concentration of chemicals to produce pulps of varying hemicellulose content (estimated as pentosans). It was found that pulps having pentosan content from 10.5 to 12.5 per cent possess maximum strength.

Pulping:—Pulping was carried out in a stainless steel stationary digester of 3-litre capacity. Heating was done by Bunsen burners. The amount of grass taken at a time was 200 g. (oven-dry basis). The partially cooked pulps were then defibrized in a laboratory 12" Sprout-Waldron disc refiner giving two passes at 15 mm and zero mm.

Analysis of the pulps: The unbleached pulps were analysed for pentosan content.

Preparation of standard sheet: Standard sheets of 60 g.s.m. were prepared by first beating the pulps to 250 ml. C.S.F. (at 20°C) in a Lamphen mill at 4% consistency. The beaten pulp was then diluted to 0.3

per cent consistency. The sheets were made on a British standard sheet making machine. The sheets were then pressed and air dried.

Testing of standard sheets:—The sheets were tested for tensile strength, bursting strength, tearing strength and folding endurance at 65 R. H. and 27°C.

Results and Discussion

The cooking conditions and yields of NSSC pulps are given in Table-I and the pentosan content and strength properties in Table-II. From these tables it is clear that strength properties are optimum at a yield of 65% corresponding to a pentosan content of 11.0%.

Table-I
Cooking conditions and yields of N.S.S.C. pulps of sabai grass

Sl.No.	Total chemicals* %	Na ₂ CO ₃ : Na ₂ SO ₃	Bath ratio	pH value of liquor		Yield* %
				Before cooking	After cooking	
1.	10	4:1	7:1	10.0	7.5	78
2.	12	4:1	7:1	10.0	7.0	73
3.	14	4:1	7:1	10.5	8.0	65
4.	16	4:1	7:1	10.0	7.5	63
5.	18	4:1	7:1	10.0	7.0	60
6.	20	4:1	7:1	10.0	7.0	55

*Percentage expressed on oven-dry weight of original wood.

Table—II

Pentosan content and strength properties of N.S.S.C. pulps of sabai grass
(Serial Nos. in Table II correspond to those in Table-1)

Sl. No.	Percentage* of Pentosan	Burst factor	Tear factor	Breaking length (metres)	Folding' endurance (double folds)
1.	13.8	26.1	90	3870	28
2.	12.5	42.5	114	5600	65
3.	11.3	46.2	144	6625	105
4.	11.0	48.6	175	6740	225
5.	10.5	40.0	117	5400	150
6.	9.8	39.0	113	5320	120

* % based on oven dry weight of pulp.