

Linseed Stalks : Promising Raw Material for Paper Industry

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ABSTRACT

This paper gives the general situation of linseed crop in our country—its area under cultivation in different parts of India, total production of seed availability of linseed stalk, the commercial importance of linseed oil and the fibre "Flax". Various trials carried out for preparation of pulps from linseed stalk are also discussed. 16% kraft pulping has shown promising results indicating its suitability for wrapping, writing, and printing papers. Soda pulping of linseed stalk indicates the potential of this agriculture waste for the production of newsprint.

Introduction

Linseed (*Linum Usitalissimum L.*) belongs to the family Linaceae and the genus linum which has over 100 species. This crop has been grown from ancient times for its stem fibres known popularly as "Flax" and also for its seed which is rich in oil. The linseed oil finds extensive commercial applications in various fields like, in the manufacture of paints and varnishes, water proof fabrics, linoleum, core oil and tempering oil in hard board manufacturing, in the production of printing inks etc. The well-known textile fibres "Flax" is extracted from the stem of this plant. Because of its high strength this fibre finds specialised applications in different fields. It is worthwhile to note here that Rs. 30 crores worth of "Flax" fibre is presently imported to meet the defence requirements alone.

Linseed in India : Area and Distribution

India is one of the leading linseed producing countries ranking third in the world. The total area under the cultivation of this crop is around 1.9 million hectares, with a seed production of about 5 lakh tonnes. In India, Madhya Pradesh leads in the yield and the acreage, followed by Uttar Pradesh together contribute 70% of the nation's total production. Karnataka and West Bengal are the other important States which grow Linseed crop in large areas. The average yield of the

pure crop varies from 210 to 450 kg/ha of seed under rainfed cultivation. The irrigated crop may yield 1200-1500 kg/ha of seed.

Linseed Stalk as raw material for paper and pulp

It is reported that about 3.5 to 4 million tonnes of dry linseed stalk is produced annually in our country. The above figure is likely to increase in view of the present thrust to increase the production of oil seeds in general. The analysis of linseed stalk as shown in Table 1. indicate that in view of its high cellulose content these can meet the demand of cellulosic raw materials for our paper industries.

TABLE I
Analysis of Linseed Stalk

1) Ash	9.8%
2) (Alcohol + Benzene) Extract	12.5%
3) Hot water soluble	16.3%
4) Lignin	22.8%
5) Holocellulose	76.2%

Over the years in our country genotypes of linseed having branching habits have been developed to suit rainfed condition as on oil seed crop. However, in view

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of the present need to meet the country's demand for flax fibre as well as oil, our agricultural scientists have come out recently with a dual purpose linseed variety (LCK-152) suitable both for oil as well as fibre.

Exploitation of dry linseed stalk for the production of pulp for paper manufacturing

In view of the acute scarcity of conventional cellulosic raw materials like bamboo and soft wood, the paper industry is turning more and more towards the utilisation of non-conventional cellulosic raw materials for paper manufacturing. In this context the above dual purpose linseed variety which is available in abundance, holds a promising future for the paper industry.

In order to explore the above raw material, Cotton Technological Research Laboratory (ICAR), Bombay in collaboration with Parkhe Research Institute, Kohpoli made an attempt to produce various types of pulp and different grades of paper from linseed stalk.

Kraft Pulping

After optimising the chip size of the linseed stalk, kraft pulps were prepared using 14% to 20% kraft liquor (NaOH + Na₂S). It was observed that the 16% pulping process produced the best quality paper which could be used for wrapping, writing, printing etc. As the bamboo pulp is considered to be a superior pulp at present, it was considered worthwhile to compare the pulp made from bamboo as well as linseed stalk under similar conditions, as shown in Table II. It can be observed from pulping conditions that linseed stalk required lower cooking temperature and less cooking time (H-factor 995) than bamboo (H factor 1375) to get almost the same percentage of screened pulp yield and kappa number. It is also observed that the tear factor values for linseed pulp is considerably higher than bamboo pulp which is attributed to the longer fibre length. Even though the breaking length and burst factor values for unbleached pulp are half as compared with bamboo unbleached pulp, the values at the same time meet the normal requirements for the production of quality papers.

TABLE II

KRAFT PULPING OF LINSEED STALK		KRAFT PULPING OF BAMBOO	
Cooking Conditions			
Bath ratio	- 1:3	Bath ratio	- 1:2.5
Time to temp.	- 60min	Time to 105°C	- 45 min
Time at temp.	- 120min	Time at 105°C	- 45 ,,
Max temp.	- 160°C	Time to 165°C	- 90 ,,
		Time at 165°C	- 90 ,,
		Linseed Stalk	Bamboo
1) Chemical charge	16% Kraft	16% Kraft	
2) Total yield%(Unscreened)	46.4	50.6	
3) Screened yield %	45.8	49.8	
4) Rejects %	0.6	0.8	
Unbleached Pulp			
5) Initial Freeness, CSF	670	690	
6) Final freeness, CSF	251	250	
7) Bulk, CC/g	2.13	1.6	
8) Burst factor	19.25	49.0	
9) Tear factor	112.17	90.3	
10) Breaking Length (M)	3624	6820	

Soda pulping

Soda pulping was carried out using various concentrations of soda liquor (NaOH) ranging from 10% to 15% NaOH. Soda pulp though somewhat inferior in quality had the advantage in terms of yield and cost. The above study at the same time indicated the suitability of linseed stalks for the production of newsprint grade pulp for which work is in progress.

In the light of the above encouraging results of the preliminary trials it can be safely concluded that linseed stalk can offer itself as a very good cellulosic raw materials for our paper industry.

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