Prospects of lantana unifora as a source of pulp

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ABSTRACT

The species Lantana is rated as one of the world s ten worst weeds (1) Various control methods have been successful only to a limited extent. Utilisation of the weed as a source of paper making fibre would not only help in weed contest but also alleviate the high demand for Pulp. Aspects considered are the pulping of the weed, fibre characteristics of the resulting pulp and the physical prOperties of the paper. A preliminary investigation has shown the possibility of producing acceptable paper making fibre in satisfactory yield.

With increasing demand for Cellulose pulp" various fibrous paper making raw material other than wood are being used to produce pulp. They are termed as non-woody plants. The list of these non-woody plants is increasing steadily as more and more plants are being investigated for their potential as a source of pulp. In the present investigation a common weed, Lantana Unifora, has been studied for its pulping characteristics. The plant is commonly known as "Putus". Various species of lantana are recorded as growing wild in East Africa and are considered as noxious weeds[3]. They are herbaceaus shrubs about 9 ft. tall and grow at an altitude of 10 ft. to 6000 ft. and in coastal areas. The plant is found in wastelands and also invade pastures. The plant adopts very easily to change in environmental conditions and take very short time to mature, its life span being 2–3 years. Various control measures like the use of herbicides and the introduction of the bug "Teleonemia Scrupulosa"[4] have been successful only to a limited extent, and have their own side effects on the ecosystem. If the weed can be used to produce pulp it would not only help in supplementing the demand for pulp but also help in weed control with minimum adverse effects[2,5].

EXPERIMENTAL METHODS AND RESULTS

Harvesting and Chipping : 20 Kg of mature stems of the plant Lantana Unifora were collected from around the Moi University campus. They were air dried for 6 days. The air dry material was cut into approximately 1–2 cm pieces manually using a hammer and hand knife. Seives of different mesh size were used to separate the most uniform chips from fines and the thin layer of bark.

Removal of Extractives : 500 gms of chips were boiled with water for 3 hr. and washed. The process was repeated twice to eliminate the water soluble extractives.

Cooking Procedure : The cooks were made in a 10 litre flask at the final liquor material ratio of 8 : 1. The cooking liquor had 30g/l NaOH and 8g/l Na_2S. The final sulfidity was 20%. The cooking was carried out at atmospheric pressure and temperature of 100°C for 10 hours. Stirring was done manually and small amount of water added to compensate for loss due to evaporation. Unscreened yield was determined by weighing the total unscreened pulp in the basket immediately after removal from the digestor and determinihg the solid content of small aliquot sample. The total wet weight was then corrected to oven dry basis for yield determination. An unscreened yield of 45% was obtained.

Determination of Properties :

Lignin content, moisture content, ash content and

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TABLE—1

Properties and Fibre Dimension of Lantana Unifora

Sample	Moisture content %	Ash content %	Lignin content %	Extra-ctives %	Fibre length mm	Dimension width μ	Kappa number
Chips before pulping	23.1	1.38	25	6.5	—	—	—
Unbleached unbeaten pulp	5.0	0.92	1.72	—	1.8	25	22 4

TABLE—2

Paper Properties of bleached Lantana Unifora Pulp at various Beating Times Brightness 80%

Time Min.	Freeness CSF ml	Basic weight g/m²	Tear Factor	Burst Factor	Fold MIT	Breaking Length (m)
15	695	57.8	72.2	2.62	2	1504
30	630	62 0	92.9	4.03	3	1563
45	520	66.0	91.1	4.93	3	1899
60	440	68 2	73.3	9 52	4	2 94
75	340	61.2	81.8	11.52	5	3064
90	250	62 0	80.7	16.55	5	3396
105	200	58.7	82 4	11.48	6	3549

kappa number were determined before and after pulping by appropriate TAPPI standard test methods Numerical average fibre length was determined by microscopic method and fibre diameter from scanning electron micrographs of unbeaten pulp The resuls are summarised in Table 1.

Bleaching : The Pulp were bleached using standard sequence CEHD[9].

Determination of Paper Making Strength Properties : The Properties recorded in Table–2 were determined on handsheets prepared after disintegration and beating of bleached pulp. Appropriate TAPPI standards methods were employed for disintegration, beating preparation of handsheets and testing. Deionized water was used to charge the beater and to dilute the interval samples and freeness test po.tions[9].

DISCUSSION :

By strict technical definition the Lantana plants are shrubs and have well developed stem & pith and are woody plants with 25% lignin content, but the conventional practice in pulp and paper science has been to consider all material other than soft wood and hardwood as non-woody materials hence the lantana unifora is non-woody plant. Improved methods of both, extractive removal and pulping are necessary to avoid foaming during pulping and obtain higher yield. In the present investigation cooking under high pressure was not possible due to lack of facilities and cooking had to be carried out for about 10 hours. Cooking using standard digestor would result in better yield, lesser cooking time and lesser consumption of chemicals. A high kappa number of 22.4 for unbleached pulp indicates the precsence of residual lignin is evident from

Table 1. Most unbleached non-woody fibres have-kappa-number range 8 to 12 and can be bleached by CEH bleaching sequence i.e. Chlorination, extraction and hypochlorite. The Lantana requires further bleaching of D stage (Chlorine dioxide) similar to wood pulp to reach a brightness of 80%. The fibre dimension in Table 1 and strength properties of bleached handsheets at various beating times in Table 2 indicates that the pulp is comparable to commercial hard wood pulp and require a beating time of 90 min. Hence if produced on a large scale this pulp can be used in those grades of paper or board which use hard wood pulp like wrapping paper corrugating medium, tube and core stock.

CONCLUSION .

The properties of the fibres obtained from Lantana Unifora are very close to those of the hardwood fibres. These plants should no longer be regarded as a weed "a plant out of place" but as a potential source of raw material for manufacture of pulp. These plants adapt very easily to change in environmental condition and can be grown in unproductive areas, like arid lands. This will also control soil erosion and prevent desertification. With improved methods of pulping the plant can be used on a commercial scale to produce cellulose pulp.

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