Bamboo Flowering

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Introduction

Of the 550 or more species of Bamboo-the giant grass, nearly 120 species are found in India. Only about half a dozen of these are of importance to us. Generally Dendro Calamus Strictus & Bambusa Arundanecia are used for paper pulp. The abundance and the ease with which they can be propogated and cut, as well as short period in which they attain maturity makes them important in paper-pulp making. Every culm or stalk of bamboo has a life of 5 to 7 years according to the species, after which it dies. Even the dead bamboo can be used for pulp making, actually yielding a higher percentage of pulp though needing more drastic action (FRI Experiments).

Bamboo of the grass family is monocotiledanous and is not perpetual. Bamboo flowers and seeds both sporadically and gregariously Flowering and famine seasons synchronising, the seeding has mitigated the evils of famine. Even today streams of poor people from far and wide, can be seen converging into the forest district where the bamboo has flowered, in order to pick these edible seeds and take a subsistance.

Soon after flowering, the bamboo clump or culm dies cut; and it takes some years for the seeds to germinate and yield exploitable quantities of bamboo. With the result, in Paper Industry, it may be considered as a menace, to a certain extent. But fortunately, even if flowering is gregarious, it is not simultaneous in all districts and areas.

And some people consider the flowered bamboo is in itself not suitable for paper pulp making and have gone to the extent of carrying a tirade against it. They have even manipulated the pulp making conditions wittingly to prove this: and thus creating a panic in the minds of the less informed section of the public.

Mr. P.N. DEOGUN of Forest Research Institute, Dehra Dun, has observed in this connection, as long back as 1937 that:

**"Flowered culms are usually thin walled. Only a few small culms with flowers, which do not appear to be fertile, are solids. It is fortunate that flowered bamboo are quite suitable for making paper pulp even when they are cut a year or two after seed fall. Experiments conducted at the FRI showed that bamboo which has flowered four years previously was quite good for paper-pulp, and even gave a better yield of pulp per ton. The paper quality was as good as that from the living culms, although comparatively longer digestion was necessary. Total quantivity of chemicals used was the same."

It is happy to note that our own experiments conducted on a mill scale by the authors, have substantiated these observations of Mr. Deogun, flowered bamboo giving an appreciably higher yield of pulp with even lesser consumption of both White Liquor and Bleach.

Flowering And Seed of Bamboo

Bamboo is annually reproductive by the Rhizoms, shooting up from the root stalk. It has also unusual habit of flowering only at long intervals and the seeding cycle varies with species from 20-40 years.

Within the cycle, reproduction is only by Rhizoms and is limited by their food storage capacity. Rhizoms are large and bulbous and usually full of starch, governed by the starch forming capacity of the leaf area of the clump of bamboos. Starch is safely stored in granular form insoluble in cold water or sap.

In sporadic flowering only the culm or the stalk of bamboo that

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flowers, that dies and not the entire clump. Clums of any age may flower depending on other conditions. In gregarious flowering, with the death of the culm and the entire clump flowering, the Rhizoms from which they arise also die after the ripe seeds have fallen. As such, large areas of forests are found dry. This gregarious flowering, fortunately, takes some years to complete and progresses in a definite direction, rather like an epidemic wave in successive years, beginning at one undefined edge of an area. The wave period curiously corresponds very closely to the period of development of seedlings to full sized culms, which period is generally from 6-12 years according to the species. Flowering begins at the hill tops proceeding slowly down to the moist valley bottoms.

Some sporadic flowering of Dendrocalamus strictus takes place every year in partically all bamboo areas flowering from November to April. But gregarious flowering in one locality occurs only after a long period of years. The species is an irregular flowering species.

Life Cycle

The period between two gregarious flowerings over the same area is believed to be constant for a species; establishing its life cycle and this period is called its "Physiological Cycle".

Species	Locality	Flowring Cycle.	Remarks
1. Bambusa arundanecea	South-West & Central India	20-35 Years	
2. Dendrocalamus strictus	Throughout India	20-40 Year	Sporadically flowering patches of
3. Ochlandra	Kerala		culms may be found every year.

For Dendrocalamus strictus the cycle is more or less constant for a locality, but differs in localities remote from one another and with appreciable climate and soil difference.

Causes of flowering

It is difficult to say how gregarious flowering occurs. Bamboo before dying, makes an effort to precreate the species by flowering and fruiting.

The possible causes which bring about flowering can be :

1. Reproductive Age: Like animals, bamboo has a fixed reproductive age. This age may be affected by influences which hasten or retard it, most probably gets adopted to the locality and acquires a cycle which may differ from that in other localities. Variation in the same locality is presumably brought about by external causes affecting growth, again just as with animals.

2. Climatic Conditions: As stated already a number of famine years due to draught, coincide with flowering of bamboo. But flowering of bamboo is no indication or a omen for the coming famine. Bamboo flowers more in exposed situations than in sheltered and covered places. It has been noticed that no course grained dry soils, flowering is more sporadic than on moist soils where it occurs in large groups of hundreds of acres, but in abnormally dry years it is induced on all soils--all young and old clumps die.

3. Physicological Influences: Flowering primarily is determined by physiological causes inherent in the plant though to a slight extent influenced by climate or other causes. But this physiological cycle varies in different localities.

Before flowering certain chemicals changes, such as an accumulation of starch in the Rhizoms or a large reserve of sugar or other substances in the plant tissues, take place. These changes having taken place, even the cutting out of all the culms may act stop flowering Then the stool shoots flower and produce fertiles seeds.

Accumulation of such substances as starches, sugars or others reserves is influenced by soil and climatic conditions. Some flower in cold localities after long intervals but annually in warmer climates. High degree of moisture retards flower formation and flowering of gamboo on exposed sites is more common than on protected ones.

While systematic working of clumps may retard the formation of

reserves for flowering by directing the growth of the plant into vegetative channels, ill treatment or heavy working of lumps may stimulate flowering. Flowering is postponed by judicious working of bamboo—"Felling Cycle"; or proper working may result in sporadic flowering in place of gregarious flowering.

Reproduction of bamboo

Under natural conditions the seeds germinate and rood at the commencement of rainy season, and during the following monsoon throw up a scattered crop of meagre steams of 2 ft. height and ¼ in. diameter, to be followed successively and steadily by bigger and higher culms increasing with the enlarging or leaf area and food producing power and so year after year until eventually full sized culms are being produced and the clump habit is well established. This whole process varies from species to species from 6-12 years, Arundanasea having the longest period of 12 years. Then the clump will expand by peripheral production of young clums for some years longer, till it encroaches upon the soil area of surrounding clump and stop further progress.

Within the cycle period, annual culm production may be about 20% on an average over the total old culms in the clumps i.e., the annual sustained yield is about one-fifth of the whole standing crop. This production also varies from species to species according to the latest experiment. This productivity defines the felling cycle for the species generally.

To help restocking after a gregarious flowering it is necessary to:

(a) Close felling of the flowered bamboo till the seed has fallen.

(b) close the area for grazing for 3-4 years.

Perennial supply to a factory:

Yet the question of flowering of bamboo and its subsequent dying is the factor that gives rise to the fear of some that a factory entirely depending on Bamboo for its raw material, might be closed down for a long number of years because of interrupted supplies. But such a state of affairs need never occur for the following reasons—

1. Some species of bamboo and flower sporadically and not gregariously. They may be found flowering in patches every year. One of them Dendrocalomus strictus, is the most widely distributed of them all—with this question does not arise.

2. The slow spread of gregarious flowering period synchronises with the period of development from seeding to full sized culms. The earlier seedings are in full production before the latter occur.

3. In most areas two or more species occur, and no case is known of their cycles of flowering coinciding, so when the dominent species flowers the others will fill the gap temporarily created and as these will have a 30 to 60 years in which two recover, they can be ruthlessly cropped.

4. Rhizoms of different ages, can be brought from other localities and planted in the gregariously flowering area in advance, countering the effect of flowering on the supplies to the factory.

Conclusion:

There is no reason to be perturbed by the flowering of bamboo although flowering — sporadic or gregarious, which not only affects the availability of bamboo but also necessiate the exploitation of bamboo from a little distant areas, increasing the cost of transportation The solution is the systematic regeneration of bamboo from different flowering zones.

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References:

1. Rai H.W., The Digestion of Grasses and Bamboo for Paper Making.

2. Deogun P.N. Silviculture & Management of Bamboo D. Stricuts Indian Forest Records Vol. II, No. 4.

3. Pearson R.S. Note on the Utilisation of Bamboo for the manufacture of Paper Pulp, I.F.R. Vol. IV, Part V.

4. M.P.M. Chairman's Welcome address 17-12-1962.

5. "No basis for bamboo Flowering Havoc"—Indian Express 10-4-1963.

6. Raitt. W., Bamboo as Material for Paper-Pulp IFR III, No. III.