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BAMBOO FLOWERING AND ITS MONITORING IN ARUNACHAL PRADESH (Year-2004 to 2009)



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Bamboo Flowering and its monitoring in Arunachal Pradesh

Bamboo is a shrub belonging to family Poaceae (gramineae) of monocot. It is a monocarpic plant which generally flower and die after attaining certain age of 15 to 120 years or above. The gregarious flowering of bamboo leads to damage of whole clump affecting entire distribution in an area. Till today bamboo flowering is believed to be the natural cycle of dying and regeneration phenomenon governed by age, environmental and edaphic factors. The exact cause of the flowering is still not known. Majority of the bamboo species flowers after certain period of time and it again regenerates from seeds but some bamboo do not produce good seeds like *Bambusa pallida*, *Schizostachyum polymorphum*, etc. though they flower. Bamboos like *Melocana baccifera*, and *Ochlandra travencoria* produce very big size fruit and bamboos like *Dendrocalamus strictus*, *D. hamiltonii*, *Schizostachyum pergacile*, *Bambusa bamboos*, *Oxythenanthera parviflora*, etc. produce grain size seeds. Some bamboos like *Schizostachyum capitatum* and *Schizostachyum fuchsinum* produce medium size seed and are very delicious food for the tribal people. Bamboos like *Schizostachyum polymorphum* produce sparse and round seeds. Some *Phyllostachys* and *Chinnobambusa* spp. do not even produce seed though it bears flowers like pod. Almost all the genera are reported to flower. However, there is a difference in flowering cycle period of different bamboo species as follows:

- **Annual or continuous flowering:**
The species which flower every year and do not die.
- **Gregarious or periodic flowering:**
The whole clump flowers in an extensive area

and dies after seed setting. The flowering may continue for two to three years in an area or in the same clump.

• **Sporadic or irregular flowering:** Occurs in isolated clumps (in one or two in an area) or in parts of one clump (in one or two clump).

Impact of Bamboo Flowering

Bamboo flowering occurs after 15-135 years approximately depending upon the species. The flowering of the bamboos produces seeds in large quantity. The ripening and falling of seeds attract the rodents especially the rats. Gregarious flowering of the bamboo produces large number of seeds, which increases the availability of food for the rodents. The availability of sufficient food is due to increase in seed production which leads to the increase in exponential reproductive rate and survivability of the rodent population or 'r' strategy pattern. The increase in rodent population leads to increases in predator's population like snake, etc. The food chain comprising of bamboo seeds, rodents and snakes is observed conspicuously. In association with the availability of primary producer (bamboo seeds) there is enhancement of first and second order consumer's population. It can be said that, the law of nature of ecological balance is to protect the population of the rodents and other consumers associated with it.

The rats eat the fruit which increases their growth and fertility rate. The maturity and falling of bamboo seeds coincide with the paddy, corn and other grains. Once the rats have finished eating the bamboo seeds, they migrate to other fields, devouring grain, corn and rice thus causing

destruction of the crops and subsequently to a year-long famine, termed as "rat famine".

Once the flowering is over, the plant gradually dies. The death of the plant and deteriorating culms, branches, leaves and roots invariably increases the population of insects and other pests. The deteriorating root results in loosening of the soil binding capacity, thus flowering leads to landslide in various places. Water contamination, water borne disease etc. are the ultimate consequences of landslide.

The State Forest Research Institute, Department of Environment and Forests, Government of Arunachal Pradesh is regularly monitoring and developing database on bamboo flowering in the state.

Some of the bamboos flowering recorded in the state during the last few years are as follows:

YEAR 2004-05

1. *Dendrocalamus hamiltonii*, Nees and Am. ex Munro. (Fig.1),
2. *Dendrocalamus spp.*, Nees (cv. Halap) (Fig.2),
3. *Schizostachyum spp.* (cv. Tador), (Munro) Majumdar in Karthikeyan et al., (Fig.3), and
4. *Chimonobambusa callosa* (cv. Rejii), Munro. (Fig. 4)

The gregarious flowering of above bamboo was recorded in Pipu-Dipu, Chayang Tajo and Sewa Lada road in Seppa, East kameng district covering an approximate area of 10 sq.km (Fig. 1-4)



Fig.1. *Dendrocalamus hamiltonii* (hatae) (2004-2005)



Fig.2. *Dendrocalamus* spp. (halap)



Fig.3. *Schizostachyum* spp. (cv. Tudor)



Fig.4. *Chimonobambusa callosa* (cv. Reji)

YEAR-2005-06

1. *Schizostachyum capitatum*, (Munro) Majumdar var. *capitatum* (Gamble) Majumdar in Karthikeyan et al. Fl. India Enum., Monocot 281.1989. (LN: Tolum).

This bamboo species was recorded gregariously flowering from Zero-point Tinali, Bhalukpong area in West Kameng district, to Seppa in East Kameng district

The seeds of this bamboo species are most liked by rats and leads to severe rat's famine. (Fig.5). The approximate area assessed was about 5 sq. km in stretches.



Fig.5. *Schizostachyum capitatum* (Tolum)

2. *Yushania maling* (LN : Yal-Yana)

Formerly *Arundinaria maling* Munro

This bamboo species was recorded gregariously flowering at Jang, Tawang, Zemithang and Bumla in Tawang district and Tale valley in Ziro, Lower Subansiri and Mayodia in Lower Dibang valley districts with a total estimated area of 50 sq. km. (Fig-6)



Fig. 6. *Yushania maling* (yal-yana)

3. *Thamnocalamus spathiflorus* Munro, Trans. Linn. Soc. London 26:34.1868.

Recorded gregariously flowering from 5th mile to Dirang in West Kameng district covering an area of about 3 sq. km. (Fig.7).



Fig.7. *Thamnocalamus spathiflorus*.

4. *Drepanostachyum annulatum*. Keng f.

Observed gregarious flowering near Muna camp, Dirang in West Kameng district with an approximate area of 1 sq.km. The distribution and flowering of this bamboo species is reported first time from the state (Fig-8).



Fig.8. *Drepanostachyum annulatum*

Year-2006-07

1. *Melocana baccifera*. (Roxb.) Kurz. Prelim.Report Fl.Pegu, Append. B. 94. 1875. (CN : Muli).

This amphipodial bamboo species was observed gregariously flowering at Doimukh, Hoj, Sagalee, Hajuringpa, Chessa in Papum Pare district and Seppa in East Kameng district with a total approximate area of 20 sq.km (fig-9).



Fig.9. *Melocana baccifera* (Muli)

2. *Bambusa bamboos*. Voss in Vilmorin, Blumengartneri 1:1189. 1896. (Eng-Thorny bamboo).

This bamboo species was reported gregariously flowering by associate worker Dr. G. Murtem, SFRI from Dollungmukh area of Lower Subansiri district. The approximate area was not known (Fig-10).



Fig.10. *Bambusa bamboos*

YEAR-2008-09

1. *Neomicrocalamus franii* Keng f.

This climbing bamboo was observed gregariously flowering at Hyauliang to Hawaii by SFRI team comprising of Shri J.Dopum, Dr. L.R. Bhuyan, Dr. G. Murtem and R.K.Taj in Oct, 2008 (fig.11 A). The flowering was also observed in Dibang Valley district in the month of April'2009 from Mayodia to Anini with an approximate area of 60 Sq.km.(fig.11.B). This bamboo species is very limited in its distribution in Arunachal Pradesh covering few pockets in sub tropical to mild temperate belt from 1500 M to 2500m (MSL). This bamboo is likely to be extinct. The approximate area covered is 100 km which stretches from Mayodia to Mechuka and Hayuliang to Hawaii. The flowering of this bamboo species is reported first time from the state.



Fig.11 (A). *Neomicrocalamus franii* (2008)



Fig. 11. (B) *Neomicrocalamus franii* (2009)



3. *Dendrocalamus hamiltonii*, Nees and Arn. ex Murno, Trans. Linn. Soc. London 26: 151. 1868.

This species was observed gregariously flowering at few pockets particularly between Ziro to Boa Simla road, Basar to Daporijo road Upper Subansiri district and smaller patches at Koloriang in Kurung Kumey district and Along to Yingkiong road in Upper Siang district (Fig. 12):



Fig.12. *Dendrocalamus hamiltonii*

4. *Drepanostachyum khasianum* Stapleton, Bamboos of Bhutan, Pp T49.1994.

The gregarious flowering of this species was observed on 25th May' 2009 near Sangesar (Madhuri) lake to T-Gumpa road in Tawang district. The distribution of this bamboo species is very limited to particular area. The total area assessed was 0.05 sq.km. The distribution and flowering of this bamboo species is reported first time from the state (Fig. 13).



Fig.13. *Drepanostachyum khasianum*

5. *Thamnocalamus spathiflorus* (Trin.) Munro.

This species was observed gregariously flowering in Bomdila and Tawang district from Sange area to Jashwant Garh and also on the Tawang-Bumla road. The flowering was recorded on 25th May 2009. The approximate area under flowering was 12 sq.km. (Fig. 14)

6. *Dendrocalamus giganteus*, Munro.

This bamboo species was found gregariously flowering in New Changlang village, Changlang district during the visit on the month of 6th June 2009. The area under flowering was negligible (Fig. 15).



Fig.14. *Thamonocalamus spathiflorus*



Fig. 15. *Dendrocalamus giganteus*

7. *Arundinaria racemosa* Mich.

The species was observed gregariously flowering at Bomdila, West Kameng and Tawang districts during the month of April 2009. The flowering was mostly concentrated at Sange to Sela pass area. The flowering of this bamboo species is reported first time from the state (Fig. 16).



Fig.16. *Arundinaria racemosa*

8. *Chimonobambusa callosa*, Munro. (cv. Tapo)

The species was observed gregariously flowering at Chayang Tajo, East Kameng district during the month of May 2009. The extent of flowering area was not assessed (Fig.17).



Fig. 17. *Chimonobambusa callosa*

9. *Schizostachyum polymorphum* Munro.

Recorded flowering in Changlang district during the visit on 5th June 2009 under NBM R&D project work. The area under flowering is negligible (Fig. 18).



Fig.18. *Schizostachyum polymorphum*

10. *Dendrocalamus* spp. (cv.Halap)

This species was observed gregariously flowering in few patches at Gumto (Doimuk) and Sagalee in Papum Pare district and Palin area in Kurung Kumey district (Fig.19). The species was observed flowering during the month of July 2009.



Fig.19. *Dendrocalamus* spp.(halap)

11. *Schizostachyum arunachalensis*

Nithanii Indian For. 118:230. 1992; Tewari, Monogr.Bamboo 130.192.

This species was observed gregariously flowering during the month July, 2009 at Liroko area under Likabali circle of West Siang district. The area under flowering is approximately 100 hectares. The flowering of this bamboo spp. is reported for the first time from the state (Fig.20).



Fig. 20. *Schizostachyum arunachalensis*

12. *Bambusa balcoa*, Voss in Vilmorin, Blumengartnerii 1: 1189.1896

This species is observed gregariously flowering at few pockets of Papum Pare district particularly in Chessa area during the month of July, 2009. The area under flowering is negligible (Fig 21).



Fig.21. *Bambusa balcoa*

ACTION PLAN SUGGESTED FOR FLOWERING MANAGEMENT

- ↪ *Artificial regeneration / Plantation programme.*
- ↪ *Marketing/Disposal of affected bamboos.*
- ↪ *Providing/Raising / Cultivation of vegetable / Catch crops.*
- ↪ *Public awareness campaign.*
- ↪ *Supply of food items to the affected area.*
- ↪ *Containing the rodent population.*
- ↪ *Soil conservation in highly concentrated bamboo areas.*