ESTABLISHMENT OF A BAMBOO STAND FOR CONSERVATION AND SUSTAINABLE UTILIZATION OF (ARAYAMBU) *PSEUDOXYTENANTHERA BOURDILLONII* (GAMBLE) NAITHANI

(Final Report of the Research Project No. 362/2000)

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PROJECT PROPOSAL

Project code : KFRI 362/2000

Project Title : **Establishment of a Bamboo stand for conservation and sustainable utilization of *Arayambu* (*Pseudoxytenanthera bourdillonii* (Gamble) Naithani**

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Objectives

1. Establishment of a bamboo stand of this rare endemic bamboo (Arayambu) for commercial exploitation.
2. To standardize the vegetative propagation methods for establishing plantations.
3. Adopt simple macro-propagation techniques for large-scale multiplication of this species.

Project period : June 2000 - May 2003

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ABSTRACT

Pseudoxytenanthera bourdillonii popularly known as *Arayambu* or *ponmungil* is a rare endemic bamboo of Kerala part of the Western Ghats. Over exploitation, flowering at very long intervals and death of clump after flowering have led to dwindling the population in its natural habitat. Rooting response was very poor in culm cuttings in all the treatments. No rooting was found in branch cuttings. Of the 11 treatments including GRS and control over three seasons using cuttings from three different parts rooting was observed only in four treatments. Although there is an indication that with IBA treatments during February-May rooting is possible, the current success rate of 10-15 percentage is not promising. Observations made show that offset planting alone is successful. Success rate, although very low in current experiments, there is an indication that rooting of culm cuttings is possible in this species. The present population is restricted to a few clumps in restricted localities. The natural habitat where the species is distributed need to be protected as far as possible from biotic factors. For ex situ conservation, plots need to be established in other agro-climatic regions similar to its natural distribution.

INTRODUCTION

Pseudoxytenanthera bourdillonii (Gamble) Naithani, popularly known as *Arayambu* or *ponmungil* is a rare endemic bamboo of Kerala part of the Western Ghats. Over exploitation, flowering at very long intervals and death of clump after flowering have led to dwindling the population in its natural habitat. Earlier report of flowering was recorded in 1889 (Blatter 1929). In 1982, KFRI tried to propagate this species vegetatively using the clump cuttings collected from Sholayar. Rooting was observed in cuttings but the rooted cuttings flowered along with the mother clump in 1983 and died. There was no sign of any seed set and further work could not be done. After a period of 8 years about 26 clumps appeared near the old mother clump in Sholayar. From the information available it appears that the flowering interval of the species is very long. Plantation of such species will be readily profitable since harvesting can be done for a long period (until next flowering).

Recently it has been estimated that only about 64 clumps are naturally distributed which is spread over five Districts in Kerala State (Table 1).

Table 1. Endemic to Kerala part of the Western Ghats

Locality	District	No. of clumps
New Amarambalam (Meenmutty, Anian mala)	Malappuram	26
Chalakkudy (Vazhachal, Sholayar)	Thrissur	6
Parambikulam (Karimala)	Palakkad	6
Nelliampathy (Seethakundu)	Palakkad	10
Attappady (Mukkali)	Palakkad	6
Periyar (Kumali. Kurisumala)	Idukki	10
Total		**64**

For establishing germplasm collections and plantations of any species for conservation and commercial utilization, proper propagation techniques for production of planting stock is inevitable. Observation of the *Arayambu* populations in their natural stands showed no flowering or fruit production. Hence conventional vegetative propagation methods like offset planting and rooting of culm and branch cuttings were attempted.

A brief description of the plant, its distribution and uses is given below.

Pseudoxytenanthera bourdillonii (Gamble) H.B. Naithani, J. Bombay Nat. Hist. Soc. 87: 440. 1990.

Synonym: *Oxytenanthera bourdillonii* Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 76, t. 67. 1896.

This is a straggling bamboo 10-15 m tall. **Culm** with long internodes covered with white powdery mass. **Culm-leaves** striate, ligule faintly serrate, blade triangular fused with auricle. **Leaves** broad, linear, lanceolate, sheath striate, ending in a pair of shining calluses with a depression, ligule long. **Inflorescence** a large panicle of spicate branchlets. **Caryopsis** linear oblong.

Distribution: This species is endemic to Kerala part of the Western Ghats. Distributed in Nilambur (Malappuram Dt.), Mukkali, Nelliampathy, Parambikulam (Palakkad Dt.), Vazhachal (Thrissur Dt.) and Kumali (Idukki Dt.).

Uses: This species has been exploited for the manufacture of high quality tooth picks and combs and the young shoots are edible. Since the internodes are long and culms are thin walled the species can be used for basketry, mat weaving and handicrafts.

MATERIALS AND METHODS

Earlier reports indicate that conventional propagation techniques are promising for a large number of bamboo species (Banik, 1980; Surendran and Seethalakshmi, 1985; KFRI, 1990; Banik, 1994). Different materials like offset, culm and branch cuttings were collected for propagation from four populations. Initially an area was selected at Nelliampathy, Nemmara Forest Division for planting, but the area could not be protected from damages due to elephant and other animals. Detailed work for standardization of a protocol for rooting of culm cuttings was carried out with one population. Planting stock produced from these populations was field planted in the germplasm at FRC, Veluppadam.

Collection of material:

Offset, culms and branches were collected from different populations as shown below (Table 2).

Table 2. Materials collected for propagation from different populations

Locality	Types of Propagules
Sholayar, Chalakkudy Forest Division, Thrissur Dt.	Offset
Victoria, Nelliampathy, Nemmara Forest Division, Palakkad Dt.	Offset; culm and branch cuttings
Meenmutty, Nilambur South Forest Division, Malappuram Dt.	Offset; culm cuttings
Kuttikkanam, Kottayam Forest Division, Idukki Dt.	Offset; culm cuttings

Processing of materials

Offsets: Healthy one-year old culms were selected from the clump and top portion was removed at about 1 m height from ground level (leaving about 3-4 nodes above). The soil was excavated till the rhizome neck was exposed. The rhizome with the top part of the culm was separated by cutting with a sharp billhook at the neck region along with the roots. The part consisting of rhizome and roots was wrapped in moist medium like gunny bags along with soil and transported to the nursery site. After transferring to bags containing soil, sand and cow dung (3:1:1) the cut end of the culm was sealed with a polythene strip to prevent water entry and decaying.

Culm cuttings: One- to three year-old culms were collected from three populations for induction of rooting. Detailed experiments to study the effect of position, growth regulating substances (GRS) and season were carried out on cuttings collected from Nelliampathy. Culms were cut at the basal end and the number of nodes was counted. Total number of nodes was divided into three parts viz., base, middle and top. Two noded cuttings were prepared from each part separately.

Branch cuttings: For this species, branches were available only from the top part of the culm and branches were slender. Prominent branches were selected and three-four nodes from the part attached to the culm were separated. Two-noded cuttings were used from these branches.

Treatment with GRS: Two GRS viz. NAA and IBA (naphthyl acetic acid and indole butyric acid), which are known to induce rooting in several bamboo species (Surendran and Seethalakshmi, 1985), were tried. Five concentrations (100, 200, 300, 400 and 500 ppm) along with a control with no GRS were tested for the efficacy on root formation (A stock solution of 1000 ppm was prepared by dissolving 1g of GRS in 50 ml of ethyl alcohol and made up to 1000 ml by adding water.). Treatment for culms was given by cavity method and for branches the basal portion was dipped in the solution overnight (Surendran and Seethalakshmi, 1985). Three replicates of 10 and 20

nodes each were given per treatment for culm and branch respectively.

Planting and nursery care: Raised nursery beds (12 m x 1.2 m raised to 30 cm) filled with garden soil, sand and cow dung (3:1:1) were prepared. Prophylactic treatment with chlorpyriphos 20 EC (60 ml/10 litre) and bavistin (1g/l) was given to prevent termite and fungal attack. Treated culm and branch cuttings were planted horizontally in the nursery beds and covered with a thin layer of soil. Watering was done twice daily and temporary thatch was provided to give 50 per cent shade during the summer months.

Field Planting: Establishment of a germplasm adjacent to the bambusetum at KFRI-FRC, Veluppadam, with planting stock produced during propagation experiments was initiated. Spacing of 6 m x 6 m was provided.

RESULTS

Sprouting and rooting response

Offsets: Although limited number of offsets was taken from phenotypically selected superior clump, 100 per cent establishment was observed in offsets.

The details of sprouting are given in Table 3. Treatments in which rooting occurred are given in bold letters.

Table 3. Sprouting and rooting of culm cuttings in different seasons

Season/Treatment/ Month of observation	Base			Middle			Top		
	M1	M2	M3	M1	M2	M3	M1	M2	M3
S1 – Control	0	1	0	0	1	0	0	0	0
S2 – Control	4	0	0	2	0	0	2	0	0
S3 - Control	1.3	0.7	0	1.3	0	0	0.3	0	0
S1 – NAA 100	9	4	0	3	1	0	7	1	0
S2 – NAA 100	2	0	0	4	0	0	3	0	0
S3 – NAA 100	2	1.3	0	1	0.7	0	0.3	0.3	0
S1 – NAA 200	6	2	0	4	0	0	1	0	0
S2 – NAA 200	0	0	0	2	0	0	5	0	0
S3 – NAA 200	0.7	0	0	4	0	0	3	0	0
S1 – NAA 300	4	2	0	4	2	0	4	0	0
S2 – NAA 300	1	0	0	2	0	0	1	0	0
S3 – NAA 300	0.7	0.3	0	1	0	0	1	0	0
S1 – NAA 400	1	2	0	5	0	0	0	0	0
S2 – NAA 400	1	0	0	1	0	0	2	0	0
S3 – NAA 400	0.7	1	**0.3**	0.3	0	0	0.3	0	0
S1 – NAA 500	6	0	0	10	0	0	2	0	0
S2 – NAA 400	0	0	0	2	0	0	2	0	0
S3 – NAA 400	1	0.7	**0.3**	0.3	0	0	0.3	0	0
S1 – IBA 100	6	4	0	3	0	0	4	0	0
S2 – IBA 100	0	0	0	4	0	0	3	0	0
S3 – IBA 100	0.7	0.3	0	1	0.3	**0.3**	0.3	0	0
S1 – IBA 200	3	2	0	8	5	0	6	0	0
S2 – IBA 200	2	0	0	3	0	0	1	0	0
S3 – IBA 200	1.3	0.7	0	1	0.3	0	0.7	0.7	**0.7**
S1 – IBA 300	5	1	0	4	1	0	4	1	0
S2 – IBA 300	0	0	0	2	0	0	1	0	0
S3 – IBA 300	2.3	1.3	0	0.7	0.3	0	0	0	0
S1 – IBA 400	5	4	0	4	2	0	3	0	0
S2 – IBA 400	0	0	0	1	0	0	0	0	0
S3 – IBA 400	0.3	0	0	0	0.3	0	0	0	0
S1 – IBA 500	3	0	0	3	1	0	2	0	0
S2 – IBA 500	1	0	0	3	0	0	0	0	0
S3 – IBA 500	0.3	0.3	**0.3**	0	0	0	0	0	0

S1 June –Sept S2 Oct – Jan S3 Feb – May

M1 – First; M2- second and M3- third month after planting

Culm and branch cuttings: Rooting response was very poor in culm cuttings in all the treatments. No rooting was found in branch cuttings. Of the 11 treatments including GRS and control over three seasons using cuttings from three different parts rooting was observed only in four treatments. This include basal cuttings treated with NAA 400 ppm (10%), top part treated with IBA 200 ppm, middle part with IBA 100ppm and base part with IBA 500 ppm all treated during February-May. Data on sprouting response shows that sprouting is induced in all seasons. A careful observation on the sprouting response of cuttings shows that sprouting occurs in most of the treatments in all seasons and enhanced by GRS treatments. But majority of the sprouts dried within two months.

Field Planting: The rooted cuttings and offsets were kept for one year in the nursery. Eight plants belonging to four populations have been planted out in the germplasm in May 2004. Long-term observations are required for monitoring the growth.

DISCUSSION

In this present investigation it was found that among the three methods used, offset planting was successful. Rooting of culm cuttings showed limited success. Although there is an indication that with IBA treatments during February-May rooting is possible, the

current success rate of 10-15 percentage is not promising. Branch cuttings did not show sprouting or rooting response. Detailed studies using different populations, different GRS combinations and rooting media are required for standardizing a protocol for vegetative propagation of this species.

Pseudoxytenanthera bourdillonii has good potential as a commercial species. The erect culms with medium thick wall diffuse clump forming nature, branching only from top parts and its typical characteristics makes it suitable for commercial plantation. The culms are ideal for stick industries as seen from tests conducted by toothpick industries in Kerala. The shoots are edible and highly favoured by the tribals due to its taste. The present population is restricted to a few clumps in restricted localities. Wild elephants are very fond of this species. Considerable amount of damage was observed in the natural habitat due to elephants.

Observations made show that offset planting alone is successful. Success rate, although very low in current experiments, there is an indication that rooting of culm cuttings is possible in this species.

With regard to conservation and commercial exploitation *P. bourdillonii* requires special attention. The natural habitat where the species is distributed need to be protected as far as possible from biotic factors. For *ex situ* conservation, plots need to be established in other agro-climatic regions similar to its natural distribution. Agro-silvi practices can be developed for this species and domestication can be attempted.

A cost effective propagation methods including micro propagation techniques need to be developed. In the context of forthcoming plans for integrated development for the bamboo sector in India and continuous search for potential species this species can be one of the promising ones.

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