TARC Notes

Host species of two hymenopterous parasites to rice gall midge observed in Thailand

In the process of the field census carried out to study population dynamics of rice gall midge, *Orseolia oryzae* (Wood-Mason), the parasitic activities of two hymenopterous parasites, *Neanastatus grallaria* (Masi) and *Obtusiclava oryzae* Subba Rao, were observed in a field of wild rice, *Oryza perennis* Moench, which was transplanted in a lowland rice field in July, 1975, although these parasites were found to be very few in experimental paddy fields, where cultivated rice was grown, over the observation period of three years from 1973 to 1975. Therefore the authors carried out a continuous observation on host species and their stages parasitized by these parasites of immature stages in the wild rice field from July 1975 to December 1976.

Neanastatus grallaria (Masi) has been reported as a parasite to rice gall midge Hidaka et al., Yasumatsu et al., 1975) and *Obtusiclava oryzae* Subba Rao has also been described as a parasite to rice gall midge (Subba Rao, 1973).

Host species of *Neanastatus grallaria* are given in Table 1, which shows that out of the total number of 120 of the parasite at the larval and pupal stages observed on host insects, 67% was found on larvae and pupae of the rice gall midge, 27% on the larvae of rice gall midge, which were already parasitized by *Platygaster oryzae* (Cameron), a major hymenopterous parasite of the rice gall midge, and the mummies of rice gall midge in which the pupae of *Platygaster oryzae* were contained, and 7% on the larvae and pupae of *Obtusiclava oryzae*. It can be considered from this result that *Neanastatus grallaria* (Masi) is external, larva-pupal parasite of the rice gall midge but not host-specific in its parasitic behavior, because of its occasional attacks on the mummies of the rice gall midge or the pupae of *Obtusiclava oryzae*, as the secondary or tertiary parasite.

A result of observation on *Obtusiclava*

Table 1. Host species of *Neanastatus grallaria* (Masi), a hymenopterous parasite, observed in wild rice field

Total No. of *N. grallaria*	Parasitized host species and their stages								
	Orseolia oryzae			*Platygaster oryzae*			*Obtusiclava oryzae*		
	Larva	Pupa	Total	Larva*	Mummy**	Total	Larva	Pupa	Total
120 (100%)	7	73	80 (66.6%)	7	25	32 (26.6%)	2	6	8 (6.6%)

* The third instar larva of rice gall midge parasitized by *Platygaster oryzae*.
** Mummy of rice gall midge which contains pupa of *Platygaster oryzae*.

Table 2. Host species of *Obtusiclava oryzae* Subba Rao, a hymenopterous parasite, observed in wild rice field

Total No. of *O. oryzae*	Parasitized host species and their stages						
	Platygaster oryzae			*Orseolia oryzae*			
	Larva*	Mummy**	Total	Larva	Prepupa	Pupa	Total
137	14	112	126 (91.9%)	2	2	7	11 (8.0%)

* The third instar larva of rice gall midge parasitized by *Platygaster oryzae*.
** Mummy of rice gall midge which contains pupa of *Platygaster oryzae*.

oryzae is shown in Table 2. Of 137 parasite larvae and pupae observed on host insects, about 90% was found on the mummies of the rice gall midge in which the pupae of *Platygaster oryzae* were contained, and only 8% was found on the larvae or pupae of the rice gall midge. The result suggests that *Obtusiclava oryzae* Subba Rao is rather regarded as a secondary parasite which parasitizes the pupae of *Platygaster oryzae* (Cameron), although it parasitizes rice gall midge to some extent.

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These investigations were conducted at the Phan Rice Experiment Station, Phan, Chiang Rai, Thailand.

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Masahiro KOBAYASHI *Tropical Agriculture Research Center, Japan.*
Present Address: *Kyushu National Agricultural Experiment Station, Japan.*
Sawan KADKAO *Department of Agriculture, Ministry of Agriculture and Cooperatives, Thailand*

Expansion and growth of tropical bamboo by culm cutting

More than 1,200 species of bamboo are growing over a total of 14 million hectars of land throughout the world, and about 80% of that area is distributed in the Southeast Asian tropical region.

Bamboo species can be divided basically into two groups by the type of their propagation performance (Fig. 1). This classification is very useful for bamboo cultivation. The first group is a non-clump forming type, and it includes *Phyllostachys* and *Semiarundinaria* genera which grow mainly in temperate and subtropical regions such as Japan, Korea, the middle part of continental China and some places in Taiwan. This type of bamboo is characterized by monopodial rhizomes and culms; some buds of nodes of the rhizome protrude through the earth to become the culm every year, but the other buds at the apex of rhizome become new rhizome creeping under ground, so that bamboo culms emerge sporadically being widely spaced each other. Many bamboo species of this type sprout in April to May in Japan.

The sprouting period is generally less than 50 days, i.e., most of shoots sprout out within that limited period. However, about 50% of shoots are usually left undeveloped because of insufficient nutrients. Another group is a clump forming type. Bamboo species like *Bambusa, Dendrocalamus* and *Schizostachyum* genera which grow in the tropical regions belong to this type. Characteristics of this type of bamboo is that the bigger buds at the lower portion of culm locating under the ground surface sprout directly above ground and grow into culms (the tillering), forming a clump of culms with short rhizomes. The sprouting period of this type is much longer than that of the non-clump forming type: shoots emerge one after another for a period of many months. Accordingly, most of the shoots can grow and mature.

Rhizome cutting or so-called offset is widely used in propagating bamboo of non-clump forming type because rooting is not expected by culm cutting, while culm cutting is used in propagating bamboo of clump forming type because the rooting rate of this type of bamboo is higher in culm cutting than in offset.

Expansion of rhizome system and regeneration of culms of tropical bamboo by culm cutting are briefly described below.

Culm cutting was conducted in April, 1975, with *Bambusa vulgaris Schrad. ex Wendl.* The material was cut at midsection of two internodes with one node at the center and planted in a provisional nursety at Forest Products Research and Industries Development Commission (FORPRIDECOM), College,

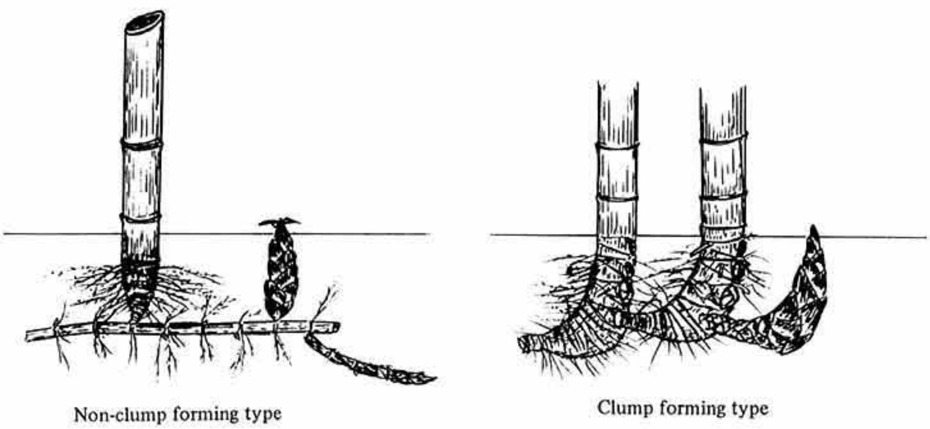

Fig. 1. Two different types of propagation characteristics of rhizome

Table 1. Growth of culms, branches and leaves of *Bambusa vulgaris* propagated by cutting

Characteristics		Stage of culm development						
		First year				Second year		
		1	2	3	4	5	6	7
Culms:								
No. of culms observed	(pc)	1	2	2	3	3	5	2
Length	(m)	1.20	2.43	4.26	5.43	6.28	8.44	8.85
Diameter*	(cm)	0.95	1.15	2.02	3.01	4.10	4.89	4.88
Green weight	(gm)	10.5	69.6	445.0	1522.2	2651.0	5650.1	5414.9
Moisture content	(%)	10.15	10.29	32.21	41.47	43.66	45.46	51.27
No. of node	(pc)	8	12	21	30	33	38	35
Branches: **								
Maximum length	(m)	—	0.91	1.49	2.45	2.53	3.45	3.93
Green weight	(gm)	—	54.7	360.6	1300.5	1743.2	3923.6	3805.7
Moisture content	(%)	—	9.44	34.10	48.40	50.62	54.00	60.00
Leaves: **								
No. of leaves	(pc)	—	—	306	2281	3566	6442	4753
Green weight	(gm)	—	—	29.5	354.6	693.9	2135.9	1623.1

* Diameter measured at 30 cm above the ground level.
** No data available at the initial stages of elongation in the first year of observation.

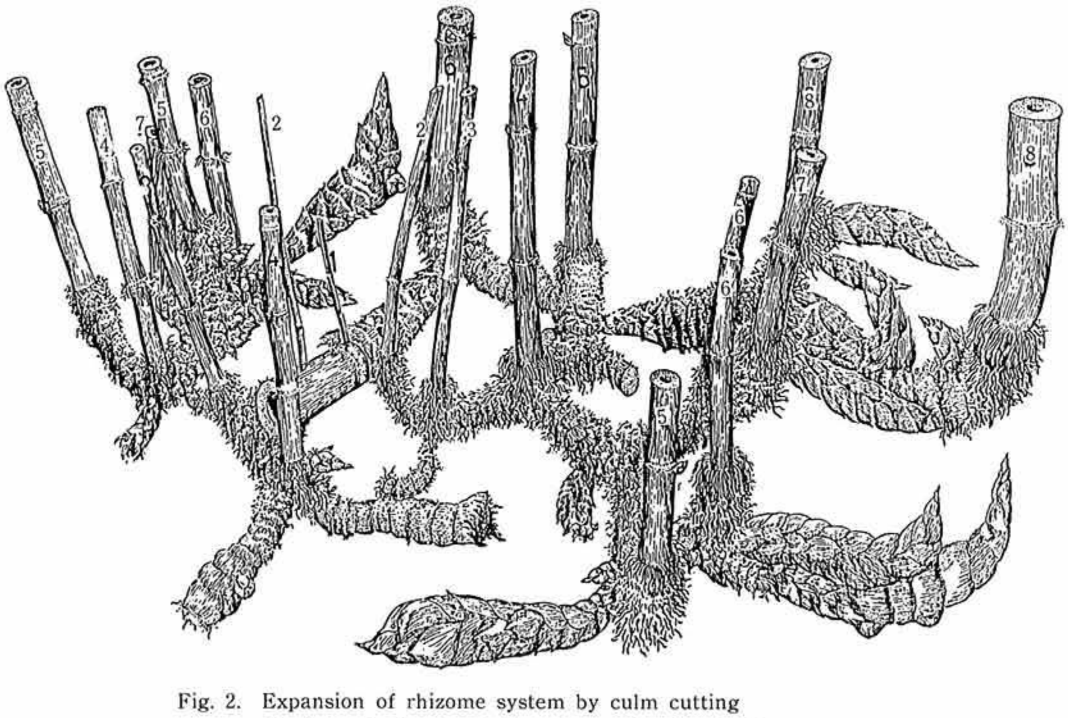

Fig. 2. Expansion of rhizome system by culm cutting
Numbers 1~7 refer to the stages of culm development indicated in Table 1.

Laguna, the Philippines. Observations were made for a period of two years to give an enough time for growth before the clump was dug up.

The results are given in Table 1 and Fig. 2. As shown in the Table, two weeks after planting, a new sprout protruded and new leaves developed (1st stage) while leaves from the old branches were shed off at this stage. One month later the culm length doubled and diameter increased considerable (2nd stage). Two month later the culm length increased to 3.5 times while the diameter doubled (3rd stage). At this stage, the buds of the rhizomes developed into new culms, resulting in an increased number of culms and hence the expansion of the clump. The 4th stage is the last stage observed in the first year and this was about two months after the stage 3. At this stage, more culms were developed through rhizome branching. However, a culm which developed during the first stage died due to exhaustion of nutrients resulting from successive production of culms and branching of rhizomes toward the 4th stage. In the first year of observation, no shoots appeared during the dry season.

In the second year, the development of new shoots occurred when the rainy season commenced in April to May (5th stage), and after that the same process of development as observed during the first year was repeated up to the 7th stage of the second year.

By this time, the maximum culm diameter has attained about 5 times that of the stage 1, and culm length about 7 times that of the stage 1, while the leaves of stage 2 already dropped, and culms of stage 3 started to decay.

At the start of the 3rd year, a clump was dug. Shoots were observed to have developed. The diameter (about 5.75 cm) of the shoots were found to be same as the mother culm. The length and weight of branches, number and weight of leaves, and their moisture contents increased progressively from the first stage up to the 7th at the second year of observation.

Three years after cutting, culms completely developed. An estimation of culm production suggests that the yearly economical harvesting of culms can be started in the 5th year after planting.

Based on the above result, it is concluded that the regeneration of tropical bamboo by the use of culm cutting is not only easy and speedy, but also offers high productivity, and therefore recommendable to tropical bamboo plantations.

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Etsuzo UCHIMURA *Kansai Branch, Forestry and Forest Products Research Institute, Japan.*