

Research on the Bamboo in Korea(Part 10)

On the Bending Test of *Phyllostachys reticulata*

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韓國産의 竹類에 關한 研究(第10報)

—Phyllostachys reticulata의 屈曲試驗에 對하여—

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**SUMMARY**

The bamboo is a plant whose culm grows straight up. This growing characteristics has been widely utilized in industry and craft. But the developments of handcraft making and horticultural techniques in recent years become to demand the bent bamboo culms. This study has been conducted at the experimental grove located at Hyunnae Ri, Okkye Myun, Myungju Gun, Kangwon Do since 1960.

Although it has been known that the secret for which bamboo shoots complete growth within 40 odd days lies in their rhizomes, this writer felt the bamboo culm sheath might be another factor in addition. Hence some were stripped of sheath in this bending study as the following:

1. Time of sheath stripping.
2. Direction of sheath stripped for arbitrary bending.
3. Accuracy of bending following the size (growth) of bamboo shoots.

The following results were obtained:

1. Bamboo shoots begin to appear in April. But the bamboo shot up in June showed the best bending result with 68% of bending efficiency.
2. Bending of the culm was facilitated by stripping off the sheath located on the side of the direction toward which bending was desired. By doing this, the culm could be bent as much as 90 degrees. But the culm totally stripped of sheath could be bent in any direction.
3. In order to determine the accuracy of bending of bamboo shoots growing, sheath were stripped off the shoots of which height ranged from 10 centimeter to 150 centimeters. The shoots with height of 110 centimeters showed the best result with 90%.

**INTRODUCTION**

The bamboo, one of staples of South-East Asia, has 1,250 species in 46 genus throughout the world. South-East Asia, its main habitat, has 1,180 species, whole of its production in Asia are Korea, Southern China, Japan, Malay, Ceylon, Formosa, and Philippines.

In Korea, Kyongsang Nam Do and Cholla Nam Do are known as its home, occupying 80 percent of the total area of bamboo production in this country. Kyongsang Puk Do, Cholla Puk Do, Chungchong Nam Do, and Kangwon Do are also known as its minor production.

I undertook the task of investigating the bamboo in this country, primarily concerned in its kind and distribution, and could draw the following conclusions as the first phase of my investigation:

- 1) At a mountain peak in Kunoe Myon, Wando Gun, Cholla Nam Do, I found out a new species (*Sasamorpha chiisanensis Nakai Forma Wandonia H.P. Chong*).
- 2) The kinds of the autogenous wild bamboo in this country are as follows:
  - a) 8 kinds in *Phyllostachys*(5 Sp.; 2 For.; 1 Var.)
  - b) 1 kind in *Pleioplastus*(1 Sp.)
  - c) 2 kinds in *Pseudosasa*(1 Sp.; 1 Var.)
  - d) 4 kinds in *Sasamorpha*(2 Sp.; 1 For.; 1 Var.)
  - e) 4 kinds in *Sasa*(4 Sp.)

In total there are kinds of autogenous wild bamboo in this country. When adding to this species which the Japanese has transplanted in Kyongsang Nam Do Forest Experimental Station, there are in all 54 species in this country.

Having found out the distribution of bamboos in Korea as above, the writer undertook a series of research in order to promote their production as follows, and the results were already published.

- 1) Study on the rhizome of bamboo
- 2) A trial method of judging the age of *Phyllostachys reticulata*.
- 3) On propagation of the up-land bamboos.
- 4) On the fertilizer application test of *Sasamorpha purpurascens var. borealis*.
- 5) On the effectiveness of fertilizers by kind upon the new and old bamboos.
- 6) On the growth of diameter at eye height after the fertilizer application.

This time an experiment of bending of *phyllostachys* was conducted and the result is given here.

Bamboos are a group of plant whose culm grows straight up. The straight culmed bamboos have been widely utilized for various purposes, but today there are certain demands for bent-culmed bamboos for handcrafting in accordance with development of horticultural techniques. If the culm should be bent as desired, the handcraft industry could be certainly helped.

## MATERIAL AND METHOD

The materials were obtained from the bamboo grove located at Hyonnae Ri, Okkye Myun, Myongju Gun, Kangwon Do, the site of the previous study by the writer; and they were *Phyllostachys reticulata* with an average diameter at eye height of 2.8cm. This study was conducted from March 20, 1960 to September 10, 1961.

In 1960, the bending was tested following the timing and the size (length) of the shoots; and in the second year the items selected from the results of the first year were tested.

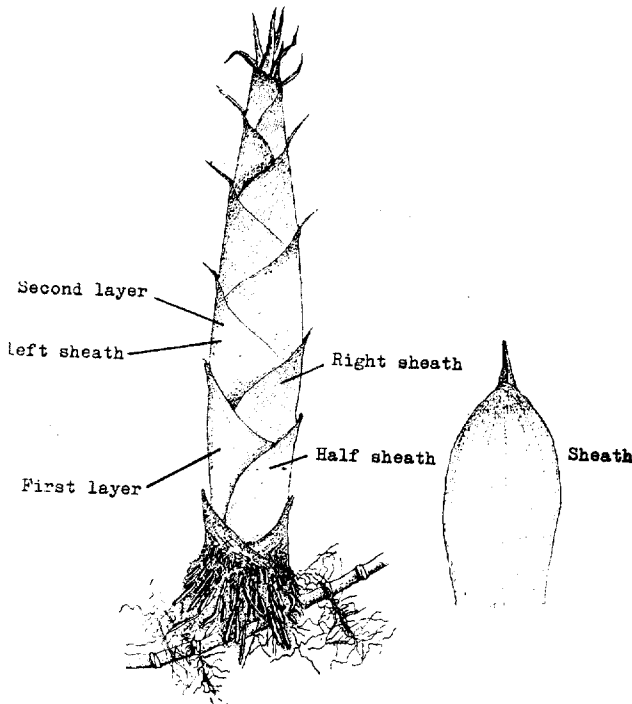
### 1. Time of sheath-removal

The time of emergence of bamboo shoots varies somewhat with climatic conditions. During the period from April when the shooting-up is completed, right sheath of two layers were removed on April 18, May 20, June 18, and July 10 in order to determine the best time for sheath removal.

### 2. Sheath-removal at different points of the shoots.

In order to determine the best size of the bamboo shoots for bending, five individuals whose heights ranged from 30cm to 200cm were selected at an interval of 10cm and these were removed of right sheaths. The position of removal was the mid-part of shoots.

Since the divergence of bamboo leaves is 180 degrees (cf. Fig. 1), five individuals each were removed of one right sheath and one leaf sheath respectively; 10 individuals removed of right and left sheaths together; 10



**Fig. 1. Morphology at bamboo shoot and the names for bamboo sheath**

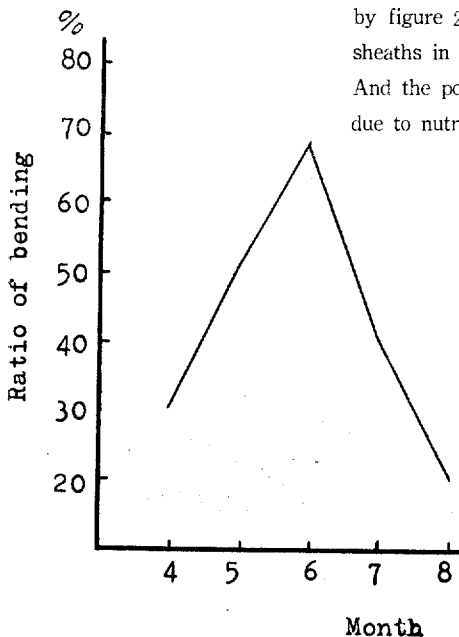
individuals removed of 4 left and right sheaths around the shoots: 10 individuals removed of halves of left and right sheath; 10 removed of 4 sheaths of two layers; 10 removed of right 2 layers and additionally removed of left 2 layers 50cm away up from the point of the former removal for testing arbitrary bending; and 10 each removed of 5 right sheaths and 5 left sheaths respectively. In total these numbered 80.

## RESULTS AND DISCUSSION

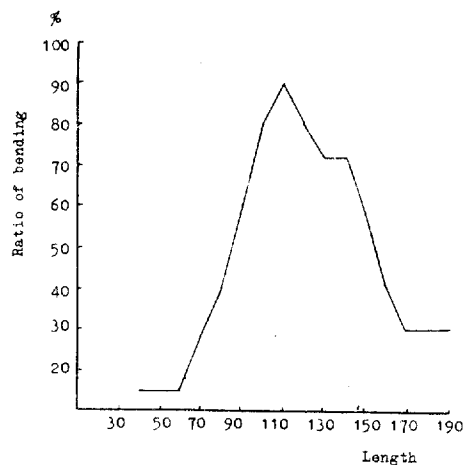
Completion of bamboo shoot growth within a 46-day period reaching up to 20-odd meter in height has been reported and its secret lies in the rhizomes. But sheaths in addition are assumed to be attributable for the fast growth.

### 1. Bending percentage following the time of sheath removal

Investigating the individuals which bent more than 3%, the best result was shown by the individuals whose sheaths were removed in June with 68% and the second best shown by the May-removed with 50% as shown by figure 2. The bending shown by the individuals which were removed of sheaths in April and May when the growth was most rapid was not good. And the poor result shown by the July and August removal was assumed to be due to nutrient deficiency and hardening of culm.



**Fig. 2. Ratio of bending accuracy by month**



**Fig. 3. Ratio of bending accuracy by length of bamboo shoots**

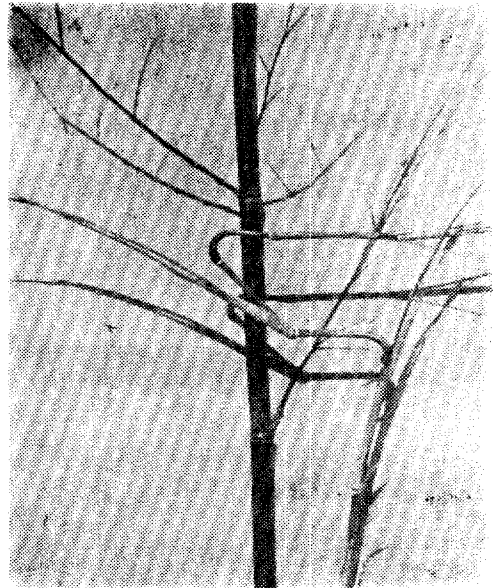
Because, in shorter shoots, the sheaths were closely attached to culm and the growth was very fast, the result was judged to be poor. The longer ones tend to harden quickly so that the bending could not have been good.

**2. Comprehensive bending test**

For an arbitrary bending, a test was conducted. The shoots removed of only one sheath showed 10% bending ratio whereas the shoots removed of 2 sheaths showed more than 70%. On the other hand, the individuals removed of more than 2 layers also showed poor result as well as poor height growth due to growth suppression.



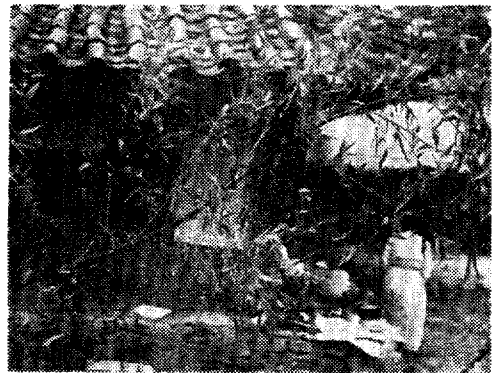
**Photo 1. Bent bamboo caused by the one-sided sheath removal**



**Photo 2. Arbitrary bending caused by left and right sheaths removal**



**Fig. 4 Number of sheaths removed and the bending direction**



In case where halves of sheaths were cut and removed, even 2 layers of them were removed, the bending ratio was only about 30%. Removal of 2 layers did not disturb growth and showed best bending ratio of over 80%, and this seemed to be the best measure for arbitrary bending. Removal of half of a sheath did not show good result, probably because of the residual growth element in the remaining half.

## 摘 要

竹類는 原來 竹幹이 곧게 자라는 植物이므로 現在 까지는 이와같이 곧게 자라는 性質을 利用하여 多角 度로 使用하여 왔으나 近日 竹工藝品製作의 趨勢는 屈曲된 竹幹의 必要性이 增加됨에 따라 著者는 韓國 產竹類의 屈曲生長에 關한 試驗을 行하고져 江原道 溟州郡 玉浚面 縣內里의 試驗林에서 1960년부터 試驗을 施行하였다.

竹筍이 40餘日 間에 完全成長하는 秘密이 主로 地下莖에 있다고 하나 竹筍의 竹皮에도 그 要因이 있을 것이라고 生覺하고 竹皮의 脫皮와 竹의 屈曲에 對한 試驗을 다음과 같이 行하였다.

### 1. 脫皮의 時期

2. 任意屈曲을 爲한 竹皮의 脫皮方向

3. 竹筍의 크기(生長)에 따르는 屈曲의 正確性

以上과 같은 試驗으로 다음과 같은 結果를 얻었다.

1. 本試驗地에서는 竹筍의 發筍이 大概 4月頃부터 始作되나 時期別로 屈曲의 難易를 觀察한 結果는 이 屈曲의 効率이 68%로서 가장 좋은 成績을 나타 냈다.

2. 曲度を 任意로 하고져 할 때에는 구부리고져 하는 方向의 竹皮를 脫皮하면 그 方向으로 구부러지며 90度의 角度까지 屈曲될 수 있음을 알았다. 但 둘레 全體를 베끼면 自由型으로 구부러 진다.

3. 어느 程度 生長한 竹筍이 屈曲도가 正確한가를 알기 爲하여 30cm부터 10cm의 間隔을 두고 150cm까지의 길이에 對하여 竹筍을 脫皮試驗해본 結果 110cm 크기의 것이 90%로서 좋은 成績을 나타내고 있음을 알 수 있었다.

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