BAMBOOS FOR NORTHERN GARDENS

Lest the title of this paper be misunderstood, it must be explained at the start that although nearly all the hardier bamboos retain their leaves in fresh, green condition through the winter in regions having a suitably mild winter climate, the leaves of even the hardiest species are injured or killed at temperatures around zero. At lower temperatures the branches and, finally, the culms (main stems) are killed. Since the culms and branches normally live for several to many years where injurious winter temperatures do not occur, and the wood of the culm does not reach its full hardness and durability until the end of the third season in the life of the culm, it will be evident that with killing back every year or two no culms can ever fully mature their wood. Nor can the development of culms of full size take place, except possibly in some of the very small, grasslike species of bamboo. These circumstances preclude the production of culms suitable for industrial purposes in these colder localities.

Even when the branches and culms are killed to the ground in winter, however, the hardier bamboos often can be grown as ornamentals with a measure of satisfaction, provided the ground be well mulched to prevent cold injury to the more shallow-growing rhizomes (underground stems) and roots. Rhizomes in soil only moderately mulched have survived when the minimum air temperatures were somewhat lower than \(-20^\circ\) F., though the rhizomes at the surface of the ground were largely killed. The degrees of temperature at which cold injury to the leaves and to the woody parts of a given bamboo occurs cannot be stated with any exactness, since they are determined in part by the exposure of the plants to sunlight at the time of low temperature and to cold winds. It occasionally happens that the degree of cold that kills the leaves of a bamboo is not quite sufficient to damage the culms or kill the branches. The killing of the leaves alone is not too serious a matter, for new leaves always appear in the spring; they are borne on new twigs arising from the older ones just below the leaves of the preceding year, and the old leaves gradually fall.
The bamboos constitute a fairly large and very diverse group—of the grass family. They are woody perennials and range in their maximum heights from 6 or 8 inches to 120 feet, with basal diameters of from 1/16 inch to about 1 foot. The largest are tropical species, though two or three giants of the temperate zone reach heights of 70 to 80 feet. The leaves of all the species may easily be distinguished from those of almost all other members of the grass family by the narrowing of the blade into a short but definite petiole at the base; the petiole is joined to the sheath that encircles the culm, branch, or twig (branchlet) on which the leaf may be borne. Except in the very dwarf bamboos and at the tips of the culms in others, the true leaves are always borne on branches or twigs rather than directly on the culm as in the ordinary grasses. Below the leaves gathered at or near the tip of the culm, the "leaves" on the culm itself become "culm sheaths," modified in character until they cease to function even temporarily as true leaves. In many bamboos, including those of the genus Phyllostachys among the hardier kinds, the culm sheaths are early deciduous; in Semiarundinaria they are tardily deciduous while in Arundinaria, Sasa and some other genera they are more or less persistent. Flowering is exceedingly variable among bamboos. In a few species it may occur at intervals of only a few years and without resulting death of the plants—unless seed production is profuse, which often it is not.

The Hardy Running Bamboos

The hardy bamboos are of running habit as contrasted with most of those adapted to warmer climates, which usually grow in close clumps. The rhizomes in general run horizontally underground for a greater or less distance and only rarely turn upward at the tip to form a culm. They are all jointed, consisting of nodes and internodes, much like the culms, but with internodes shorter and much thicker walled—sometimes solid. From lateral buds at certain nodes arise the culms, which form gradually—sometimes rather rapidly—an extended thicket. The true roots, woody in character, develop in a whorl from each node of a rhizome and from the underground nodes of the culm base.

To summarize what has already been said in more detail, the distinctly hardy bamboos, with a number of which we shall be concerned here, are mostly evergreen at temperatures down to about 5° F., but at about zero the leaves of all but the hardest are killed, and at a few degrees lower the stems are partially or completely killed. Notwithstanding this, as was stated in the beginning, it is often possible by maintaining a good winter mulch among the culms to grow many of the hardy bamboos rather satisfactorily as ornamentals even where the tops ordinarily are killed in winter. The culms normally live for several years and when all are killed, by cold or other means, the size of those produced in the succeeding season will be much smaller. The hardy bamboos send up their new shoots in the early weeks of really warm weather in spring, provided the ground is reasonably moist. A shoot develops into a culm of full size in 5 to 8 weeks.
The wood is at first very soft, however, and in all except perhaps the smallest species, only attains its maximum density and strength gradually during the first three years of its life. These hardier bamboos are mostly native to China and Japan. At least two species, however, of the very wide spread and diverse genus *Arundinaria* are endemic in our southern states. They are not very ornamental and will not be mentioned further.

Other genera of hardy bamboos besides *Arundinaria* of which representative species are now in cultivation in the United States are *Phyllostachys*, *Pseudosasa*, *Sasa*, *Semiarundinaria* and *Shibataea*. However, with the exception of *Phyllostachys* and *Shibataea*, generic lines in this large group are not too clearly drawn, and for this and other reasons there has been and doubtless will be further considerable transfer of species by botanists from one genus to another. The genus *Pleioblastus*, erected in 1925, is at present considered by some authorities to be of doubtful validity and in this paper it is recognized only in synonymy. Attention will be given here to a number of species of the hardy bamboos, mostly small or medium sized, of the genera previously mentioned. They will be treated, as far as practicable, in order of size, the smaller being considered first.

The photograph on page 31 shows a small part of a collection of hardy oriental bamboos, grown in circular "tanks" 5 feet in diameter—filled with soil and without bottoms—at the United States Plant Introduction Garden, Glenn Dale, Maryland. The tanks are for the purpose of keeping the running rhizomes from spreading into adjacent areas. They are formed from galvanized iron sheets 26 inches wide and are sunk that distance into the ground. Running bamboos with their rhizomes thus confined grow in an artificial clump form and should be clearly distinguished from those that grow naturally in compact clumps. These plantings were about five years old when the photograph was taken. Incidentally, the temperature at Glenn Dale in some winters falls to between −10° and −15° F., and rarely as low as −28°. In light soils the rhizomes of some of these bamboos may grow under such a barrier and come up on the outside, and there is always the probability that those of all the running species will come to the surface and go "over the top" into the soil outside and continue to spread, unless watched and cut off when they start to go over.

1. *Arundinaria graminea* (Plate II) 3½ feet high here is reported to reach 9 to 16 feet in localities with a less rigorous winter climate. The leaves of *A. graminea* are distinctly grasslike—4 to 10 inches long and from less than a quarter to scarcely a half inch wide. Botanical synonyms for this species are *A. hindsii* var. *graminea* and *Pleioblastus gramineus*. The plant is a native of Japan but was introduced into this country from a European source, as have been most of our other oriental bamboos of small and medium size.

2. *Sasa chrysantha* (*Arundinaria chrysantha*) (Plate II), a larger-leaved species
has grown to nearly 5 feet in height. Its maximum is probably a little taller. Branches arise from the upper nodes of the culm, bearing 5-7 oblong-lanceolate leaves, 3-7 inches long and up to $\frac{3}{4}$ inch wide.

3. *Sasa pumila* (Plate II, III) is dwarf, growing about 2 feet in cool climates or in partial shade in warmer ones. It branches rather freely from the upper nodes of the culm and each branch bears 4-7 oblong-lanceolate leaves 1½-8½ inches long and $\frac{1}{4}$ to nearly $\frac{3}{8}$ inch wide, gathered near the tips of culms and branches. The leaves tend to curl, or roll up, in dry and sunny situations in summer. Because of its small size and rampant rhizomes, *S. pumila* may easily become a weed; it is very difficult to eradicate when it escapes into a garden and especially when it invades a lawn.

4. *Shibataea kumasaca* (Plate II, IV) is a broad-leaved bamboo 3 to 6 feet high. Other names, but without botanical standing, that have been used in the literature for this species are: *Shibataea kumasasa* (variant of *kumasaca*), *S. ruscifolia*, and *Bambusa viminalis*. This bamboo is a native of Japan. There are usually 8 to 10 dark-green, ovate-lanceolate leaves at each of the upper nodes of the slender culm; they are 1½-3 inches long and are usually terminal on very short branches—which commonly range from $\frac{1}{2}$ to $\frac{3}{8}$ inch in length but rarely considerably longer. The leaves suffer more or less injury at temperatures below $10^\circ$ F.

5. *Sasa variegata* (Plate IV) a handsome Japanese bamboo has leaves conspicuously striped with white or creamy white. *S. variegata* has been reported to grow only 1½ to 2 feet high, but the culms of the plant grown at Glenn Dale have attained slightly over 3 feet in height. The white-striped, oblong-lanceolate leaves, well rounded at the base, are finely pubescent beneath; they are 5 to 10 in number, usually gathered near the culm tip and the tips of the branches and are from 2 to 6 inches long. The plant is a little more cold-resistant than the preceding. Although the identity of our present plant has not been questioned until recently, it now seems to me possible that an apparently similar species described under the name *S. argenteo-striata* may be involved. Since the true identity of the plant is in some doubt, synonyms for the name *S. variegata* cannot well be given.

6. *Sasa veitchii* (Plate V) is a dwarf broad-leaved bamboo from Japan, with leaves roughly resembling those of *S. palmata* but much smaller and quite distinct in detailed characters. The little culm sheaths are at first densely white-hairy, which serve to help in identification. The leaves, dark green above and glaucous beneath, are usually oblong, 2 to 7 inches long and $\frac{3}{8}$ to 1½ inches wide, broadly tapering or rounded at the base. There is a tendency for the leaves to decay on the margins and turn brown to whitish in the late autumn or winter. This is very striking and characteristic in some situations, and when the first description was
published the plant was given the varietal name *albo-marginata*, under a different genus and species. The plants in the photograph are 15 inches high and represent average growth, though it is reported in England culms have sometimes attained heights of 3 to 4 feet. *S. veitchii* was first described as *Bambusa veitchii* and later was for some time known as *Arundinaria veitchii*. Still later it was called *Sasa albo-marginata*, a name shown by Mr. Alfred Rehder to be invalid. A small variety of *S. veitchii* was described from Japan many years ago as *forma minor* and it is possible that our present plant represents this rather than the larger, typical form.

7. *Sasa tessellata* (Plate III) a large-leaved, low-growing, species from China, has the distinction of bearing probably the largest leaves of all known bamboos. Its height is only $2\frac{1}{2}$ to 3 feet, but the leaves have measured from about 10 to as much as 28 inches in length and from $1\frac{1}{2}$ to $3\frac{1}{2}$ inches wide, at Glenn Dale, Md. In shape the leaves are oblong, tapering broadly at the base and rather narrowly to a sharp point at the apex. They are medium green above, glaucous beneath, and are regularly 2 in number at tip of the culm the first year, there being no branches developed that year; the midrib is conspicuously yellowish. The culm is rather short-jointed. The plant is interesting in a collection of bamboos but cannot be rated as very ornamental under ordinary conditions. It was introduced into Europe before 1845. Synonyms of *S. tessellata* are *Bambusa tessellata*, *Arundinaria tessellata* and *A. ragamowskii*.

8. *Sasa palmata* (Plate VI) is the accepted name for this handsome large-leaved bamboo. For some time we had supposed it to be *S. senanensis* (Fr. & Sav.) Rehder, but the misidentification has recently been discovered. The latter species has not yet been introduced into this country so far as known. *S. palmata* is one of the most striking of the medium-low bamboos. The culms, curving upward from the base, often grow 5 to 6 feet tall and in very favorable situations will reach 7 or 8 feet. Branches arise singly from some of the middle and upper nodes of the culm. The leaves, bright green above and glaucous beneath, are borne in palmate clusters of 3 to 9 at the apex of the culm and the tips of the branches. They are among the largest in bamboos, measuring up to 15 inches long by $3\frac{1}{2}$ inches wide and being exceeded in length, I believe, only by the leaves of *S. tessellata*. This bamboo is generally neat in habit and makes an exceedingly attractive appearance where mass effect is desired and where the winter climate is not too severe; it is but little injured at temperatures of $5^\circ$ F. Besides the misidentification of our plant as *S. senanensis*, it has been known at various times, in Europe or in Japan, under the synonyms *Bambusa palmata*, *Arundinaria palmata*, *A. paniculata* forma *chimaki-zasa*, *Sasa paniculata*, and *S. australis*.

9. *Pseudosasa japonica* (Plate II) still widely known as *Arundinaria japonica*, is
believed to be the earliest of the hardy oriental bamboos to be introduced into the United States. It came, of course, by way of Europe, sometime after 1850, and it probably is still the best known and most widely grown species in decorative plantings, especially in the more northern areas in which bamboos thrive. An attractive group of plants that grew in the old U.S. Botanical Garden shortly before it was moved to its present site is shown on page 31. Besides the rather handsome leaves, evergreen down to about 7° F., and the ease of growing the plant, the comparatively slow spreading of the rhizomes is a characteristic by which this bamboo doubtless has largely earned its popularity. It more nearly "stays put" than almost any other hardy bamboo that might otherwise have competed with it. The erect culms commonly grow from 6 to 10 feet high, even where they are killed by cold every few years, and in warmer localities they sometimes reach 16 feet or more. Semi-erect branches grow singly from some of the upper nodes, and these, with the apical section of the culm, bear clusters of 4 to 11 narrow-oblong leaves 5 to 13 inches long, wedge-shaped at the base; they are glossy dark green above and somewhat glaucous beneath. Other synonyms of Pseudosasa japonica are Bambusa metake, Arundinaria metake, and Sasa japonica. The accepted Japanese common name for our present plant is Yadake, though it presumably at one time also was called Metake, by which name we recognize it in this country.

10. Arundinaria simoni a variable bamboo from Japan, represents one of the several forms the species assumes, supposedly by way of its seedlings. This one, being grown at the U.S. Barbour Lathrop Plant Introduction Garden, near Savannah, Georgia, came originally from a European source. It is a form of medium stature, the tallest culms being about 8 feet. Although A. simoni is not a spectacular bamboo, the absence of any strong tendency to run and the consequent forming of a fairly dense clump are points in its favor. The leaves of A. simoni are narrow-oblong, sometimes almost linear, from 3 to 12 inches long and from \( \frac{1}{3} \) to about 1\( \frac{1}{2} \) inches wide at most. Occasionally a white stripe appears. The Japanese name for A. simoni is Yadake (which should never be confused with Madake, Phyllostachys bambusoides, or with Metake, Pseudosasa japonica).

11. Semiarundinaria fastuosa is the stateliest, if not the handsomest, of the hardy bamboos. Narihiraikes, the Japanese name for it, has allusion to the general appearance of the plant, as does also the Latin specific name, fastuosa. Narihira is said to have been a sort of legendary Beau Brummel. We may call the plant the Narihira bamboo. The culms grow ultimately to heights up to 25 feet or more in a mild climate. The rhizomes are less active than those of most running bamboos, which results in slow spreading. The smaller culms are generally densely clothed for almost their entire length by the rich dark-green, oblong to oblong-lanceolate leaves, which are from 4 to 7 inches long and are borne on
short, rather upright, branches. The smooth straw-colored culm sheaths often hang on in a semi-detached state for a number of weeks after the new culms have completed their growth and are quite characteristic during that period. The species fortunately is one of the hardiest and withstands temperatures down to zero F. with little injury. There are many other things that might be said concerning this splendid bamboo but space does not permit. The synonyms are Bambusa fastuosa, Arundinaria fastuosa, A. narihira.

Hardy Bamboos of the Genus Phyllostachys

The species of Phyllostachys have an open branching habit, quite different from that of any of the members of Arundinaria, Sasa, or other genera previously mentioned. The internodes of the culms of Phyllostachys are grooved or flattened on one side, above the branches, and the branches themselves are similarly somewhat flattened. The grooved strip is called the "sulcus." The branches are paired and are unequal in size, the smaller one arising, in fact, from an almost suppressed basal internode of the larger. The nodes of the culms and branches are much more prominent than in any of the other genera of bamboos that we have considered. The leaves of none of the species of Phyllostachys are large, and all those on adult culms are small as compared with the size of the plants. This is easily apparent in P. nigra var. henonis. In other general habits of growth, such as running rhizomes and the spring growth of the new culms, these bamboos are much like those of the other genera discussed. Each species has its own time for sprouting in any given environment—usually in May in the north—but the exact time is always dependent upon heat and the moisture supply. However, this is also true of all types of bamboo.

Besides Phyllostachys nigra var. henonis, another variety of P. nigra and three other species of the genus will be discussed briefly. A number of other species and varieties, probably not less well adapted for growing in the North for their decorative effects, could have been included but their characteristics are much the same in general and space does not permit.*

12. Phyllostachys viridi-glaucescens is a native of China and is one of the smaller of the species of the genus so far introduced into the United States. It was first brought to this country from Europe by the Biltmore Nurseries, about 1895. At Glenn Dale, Maryland, because of being frequently frozen back it has not exceeded about 12 feet in height but at the U. S. Barbour Lathrop Plant Introduction Garden, near Savannah, Ga., it has grown to twice that height. From its

*For any reader who may be interested in a somewhat more detailed treatment of the foregoing and other species of the hardy bamboos, there is a series of three articles by the author in the National Horticultural Magazine in the issues for July and October, 1945, and January, 1946.
specific name one might expect it to be strikingly distinctive in its greenness or in the glaucous character of the under surface of the leaves as compared with other species of *Phyllostachys*. The foliage does not, however, differ greatly in either of these respects from that of most others. The leaves, 2 or 3 to 5 on a twig are $\frac{2}{3}$–$\frac{6}{4}$ inches long. The dry culm sheaths are dull straw color, lightly spotted and blotched with brown, and have a characteristic roughness on the upper part of the outer surface due to scattered minute projections from some of the veins. The maximum height recorded at Savannah for *P. viridi-glaucescens* is about 24 feet—a third taller than that attained at Biltmore, where minimum winter temperatures sometimes are injurious.

13. *Phyllostachys nigra* f. *muchisa* is one of several black-stemmed variants of *P. nigra* and is grown somewhat widely in Japan and in Formosa (Taiwan). The country of origin is said by Dr. T. Nakai to be in doubt. It was introduced into Europe many years ago from a source not now known and was imported into the United States by the Department of Agriculture in 1928. Culms up to 24 feet in height have been produced near Savannah, Georgia.

14. *Phyllostachys aureosulcata* (Plate VI) is a medium-sized Chinese bamboo, known to reach heights of at least 30 feet in favorable environments in the South. The plant was originally collected as an unidentified species in Chekiang Province, China. The specific name alludes to the pale-golden or yellowish color of the sulcus (the flattened or grooved area of the internodes of the culm and branches) that is present during the first year. In the second year, as the green of the rounded part of the culm or branch becomes paler, the yellowish color of the sulcus becomes gradually less apparent and by the third year is practically indistinguishable from the faded green of the rounded part. During the first season at least, the pale-golden sulcus constitutes an infallible means of identification of this bamboo. Another useful character is a faint roughness of the culm and branches that can be felt when the fingers are moved gently upward over the surface of a new culm. This roughness also becomes less perceptible with time. The light-green culm sheaths, with their whitish threadlike stripes and the prominent, bristled auricles at the apex, are likewise very characteristic during the period of development of the new culms. The leaves, 2–5 inches long, are borne 3–5 on a twig. The new shoots, when of sufficiently large diameter to be useful for food, are reported to be of very good quality.

*Phyllostachys aureosulcata* was for a time placed under *P. nevinii* and was sent out widely under that name. After discovery of the error (1933) plants were sent out by the Department of Agriculture simply as "*Phyllostachys* sp., P. I. No. 55713" until the species was described under the new name in 1945. The fact of the extensive distribution of this bamboo made by the Department of Agriculture, in the North as well as in the South, is one of the reasons for including it
in this paper, though its attractiveness and vigor of growth well justify mention of it.

15. Phyllostachys aurea (Plate III, V) may be the first species of this genus successfully introduced into the United States. Culms up to 30 feet in height have been produced near Savannah, Georgia, and there are unverified reports from other localities of greater heights. Although the species has the creeping rhizomes of all its relatives, it spreads much less rapidly than many. It is not difficult to confine it to a satisfactory clump form, for a number of years at least, by cutting any culms that may come up beyond the limits desired. The leaves of P. aurea are mostly small but they range up to 5 inches long; there are usually only 2 or 3 on a twig. The species has flowered oftener than any other of the introduced bamboos but little seed has been produced. An outstanding characteristic of this bamboo is a type of distortion of many of the culms by which a varying number of the lower internodes are shortened, in a very irregular manner; the nodes occasionally are inclined at an oblique angle, and there appears to be a form in which this pattern is commonly carried out in such a way as to give a tortoise-shell effect. This crowding of the nodes makes such culms very attractive for distinctive fishing poles and walking sticks, especially in view of the fact that the wood of this species is generally rated high in strength. The mature culms of this species may be considered as of high quality generally for all purposes to which bamboo of its size range may be adapted. The specific name aurea, which would seem to imply a distinctly golden or yellow coloration, is to that extent a misnomer. The culm is green at first and becomes no more golden with age than do the culms of numerous related species when grown under similar light conditions; and it does not at any time compare with the brilliant yellow culms of two other members of the genus, P. bambusoides var. castilloni and P. sulphurea.

16. Phyllostachys nigra var. henonis (Plate II~ has produced culms more than 50 feet in height in the Gulf region but, although it is considered one of the most cold-resistant bamboos, it is so often killed back in winter at Glenn Dale that no culm has exceeded 15 feet. It is a handsome bamboo and is well worthy of trial, especially where subzero temperatures are not an annual occurrence. Synonyms are P. henonis, P. puberla.

Robert A. Young

Division of Plant Exploration and Introduction
Bureau of Plant Industry, Soils, and Agricultural Engineering
Agricultural Research Administration
U. S. Department of Agriculture
EXPLANATION OF THE ILLUSTRATIONS

Plate II. (Left). A group of six species of running bamboos grown in "clumps," with roots confined, at U.S. Plant Introduction Garden, Glenn Dale, Maryland. Foreground: Arundinaria graminea. Center: Sasa chrysantha (left); S. pumila (right). Background: Pseudosasa japonica (left); Phyllostachys nigra var. henonis (center); Shibataea kumasaca (right).

(Right). Pseudosasa japonica, the well-known Metake, at the old U.S. Botanical Garden, Washington, D.C. Plants up to 7 feet tall.

Plate III. (Top, left). Sasa pumila, a dwarf running bamboo, with roots confined.

(Bottom, left). Sasa tessellata, one of the largest-leaved of all bamboos but of low stature, rarely taller than 3 feet. (Roots confined.)

(Right). Basal sections of selected culms of Phyllostachys aurea, showing the characteristic distortion of nodes and internodes of some of the culms that makes them attractive for walking sticks, etc.; no two culms are exactly alike but some are very similar. The base of nearly one-half of the culms may exhibit these irregularities of structure. Photograph by Robert L. Taylor.

Plate IV. (Left). Shibataea kumasaca, a unique broad-leaved bamboo—roots confined—with ovate-lanceolate leaves. The new culms, with leaves not yet fully expanded, dominate the center and right side of the clump.

(Right). Sasa variegata, a dwarf bamboo—roots confined—with white-striped leaves. (Plants 2 feet high. Phyllostachys viridi-glaucescens in background.)

Plate V. (Left). Sasa veitchii, a dwarf broad-leaved running bamboo, growing usually to only 15 inches or less in height.

(Right). Phyllostachys aurea, kept in artificial clump form by cutting all culms that come up on the outside. This clump, growing in 1933 at the U.S. Plant Introduction Garden, Glenn Dale, Md., had a diameter of 6 feet at the base.

Plate VI. (Left). Sasa palmata, one of the larger-leaved bamboos, growing here to about 5 feet high. Old U.S. Botanical Garden, Washington, D.C.


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