

**PSEUDOSASA JAPONICA (SIEB. AND ZUCC. EX STEUD.)
AND ITS USE**

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Numerous introduced plants originating from eastern countries have adapted to the environmental conditions prevailing in our country. Such a species, the representative of bamboo group, is *Pseudosasa japonica* (Sieb. and Zucc. ex Steud.), the so-called sagittate bamboo, or small bamboo. This species is classified in the group of fast-growing bamboos. Taking into account the analysed characters of the species, its application can be wide. *Pseudosasa japonica*, sagittate bamboo can be used in landscaping, for gardens and parks, as a house plant, but also in the protection against soil erosion in urban and suburban spaces. The anatomic analysis of internode cross section was studied in the aim of comparison with the typical structure of monocotyledonous plants, which characterises the representatives of the family *Poaceae*.

Key words: bamboo, horticulture, landscape architecture, erosion regions, anatomy, *Pseudosasa japonica*

INTRODUCTION

Numerous introduced plants originating from eastern countries have adapted to the environmental conditions prevailing in Europe. According to some authors, the species *Fallopia japonica* (Japanese fallopia), *Heracleum*

mantegazzianum (hogweed) and *Impatiens glandulifera* (Himalayan balsam) find favourable sites along the canals, watercourses and rivers. In the conditions of floodwater habitats, the above plant species have an invasion potential throughout Great Britain (DAWSON and HOLAND, 1999).

The family *Poaceae* (grasses) consists of more than 10,000 species, i.e. more than 600 genera. Bamboos belong to one of the most significant families of plants, producing support and foodstuffs for humans and domestic animals. These monumental plants belong to the family *Poaceae*, subfamily *Bambusoideae*.

Bamboos and their cultivars have a large utilisation. In the world, there are about 1000 species of bamboo, i.e. about 90 genera. The majority of bamboo species originate from China, 37 genera with more than five hundred species, almost a half of the total number of bamboo species (XIA, *et al.*, 1999).

Bamboos are divided into two groups based on the method of development: fast-growing and clump-forming bamboos. The most widespread genera of clump-forming bamboos are: *Bambusa*, *Chusquea*, *Denrocalamus*, *Fargesia*, *Himalayacalamus*, *Otatea*, *Thamnocalamus*, *Thyrostachys*. The most widely distributed genera of fast-growing bamboos are: *Arundinaria*, *Chimonobamboo*, *Phyllostachys*, *Pleioblastus*, *Pseudosasa*, *Sasa*, *Sasaella*, *Semiarundinaria*.

The species *Pseudosasa japonica* (Sieb. and Zucc. ex Steud.) is a small bamboo which has already been applied in our country for some time.

MATERIAL AND METHOD

Based on the literature sources (ANDRE, 1998; BEZONA, 1996) and our own observations, morphological characteristics of the species have been described, as well as the potentials of application. The anatomic analysis was performed on the cross sections of the samples taken from the weekend settlement Lipovačka šuma in the vicinity of Belgrade (Figure 1a). The preparations cut with sliding microtome were prepared by standard procedures of microscopic preparations. Microphotographs were made by Digital Blue QX3 Computer Microscope system.

RESULTS AND DISCUSSION

In our country, bamboos can be applied in landscaping, for green spaces, gardens. In its application, special attention should be focused on the position, environmental conditions, composition, i.e. attention should be paid to the desirable effects which should be achieved.

The desirable effects are the attractive results which represent what we want to achieve by using the plants in our space. For instance, individual species of bamboo can be implemented in the prominent positions in front of high plant species or at open positions, then for hedges, in combination with other plants, as well as ground covers, in aquatic environments or in settlements. Bamboos can be planted in jardinières and flowerpots (Figure 1b). To this purpose, almost all bamboo species can be used, still the species in the genus *Phyllostachys* are recommended.

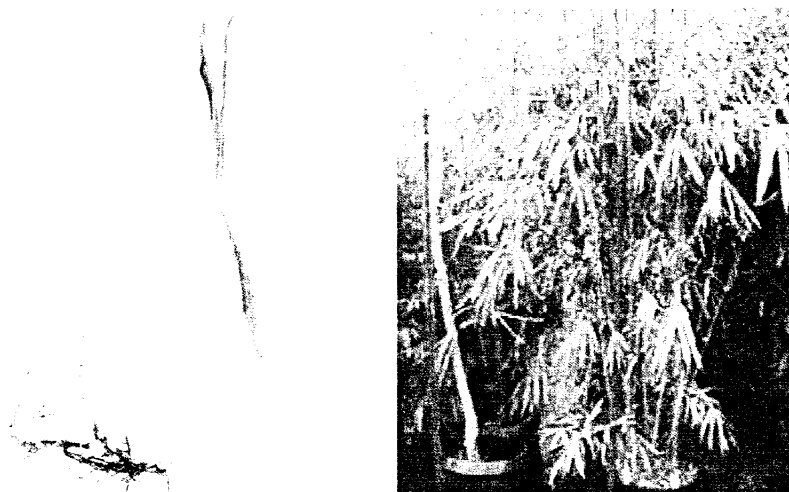


Figure 1. a) *Pseudosasa japonica* cultivated as pot plant, b) *Pseudosasa japonica*, sample from Lipovačka šuma

Species *Pseudosasa japonica* (Sieb. and Zucc. ex Steud.) small bamboo or sagittate bamboo (synonym *Arundinaria japonica* Sieb. & Zucc. ex Steud., *Sasa japonica* (Sieb. & Zucc. ex Steud.) Makino) originates from East Asia, more precisely from Japan. Small bamboo belongs to the group of fast-growing bamboos, it can reach the height of up to 5 m, rarely close to 6 metres, most commonly its height is about 3 metres. The stems of this species are in the lower parts covered with fine pale brown leaflets and in the higher parts with green leaflets (Figures 2a and 1b). They are distinguished by one or several branches on each internode and by wide leaves. The leaves of this species are green throughout the year, the flowers are hermaphrodite.

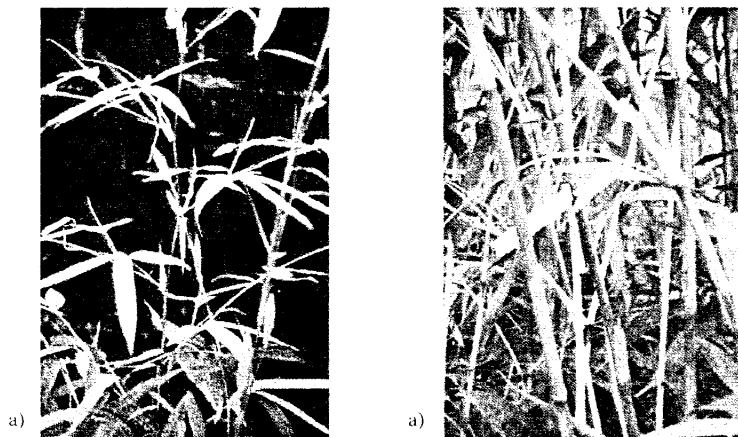


Fig. 2. a) The leaves of the species *Pseudosasa japonica*, b) Stems of small bamboo, *Pseudosasa japonica*

Sagittate bamboo grows on sandy, loamy and clayey substrates, optimally on well drained soils. It can also thrive well on the soil poor in nutrient substances. It tolerates acid, neutral and base soils. It grows well and develops in full shade, semi-shade and in open positions. It also thrives well on moist and arid localities.

Species *Pseudosasa japonica* is a plant which by its leaf mass stops the gusts of wind, its stems amortise windblasts, slow down the wind velocity and mitigate the turbulence, which reduces the transport of dust over the land.

ANATOMIC STRUCTURE

Anatomic structure of bamboo was described by ZEE 1974, YULONG and LIESE 1997, ANDRE 1998 and others. The analysis of leaf anatomic structure shows the distribution of cells in series of 3-5 on both leaf surfaces, which by their prosenchyma form, approach the oriza type, as well as the absence of macro, micro hairs and spines (SHARMA *et al.*, 1986). According to our analyses of the anatomic structure of internode cross section, nodal zone is from the anatomic aspect, more complex than the internodal part, inter alia also because of the presence of numerous cross connected bundles (ANDRE, 1998).

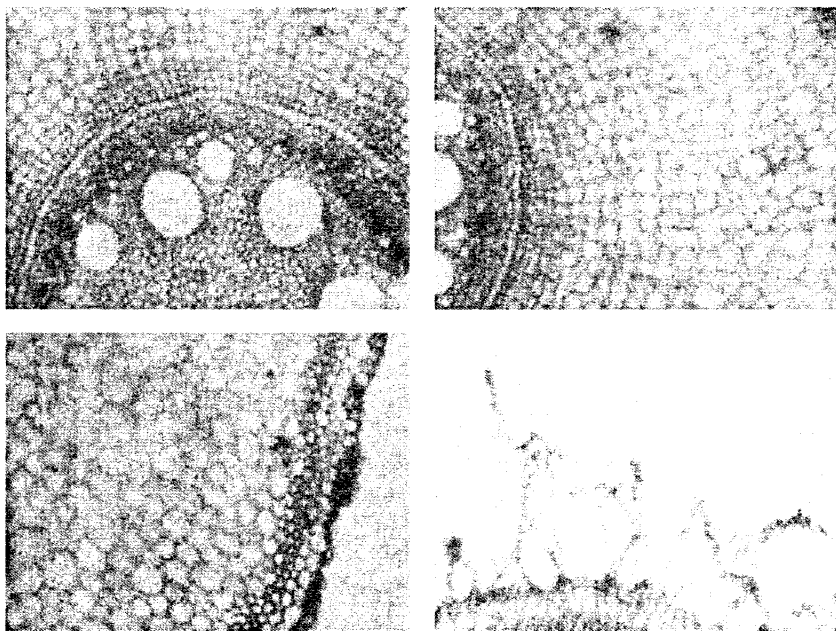


Figure 3. Cross section of internode

The analysis of prepared anatomic sections of internodes shows the palm type structure (KOJĆ *et al.*, 2001). On the surface, there is a single-layer epidermis with the cuticle, individual stomata and hairs (Figure 3). Primary bark is developed, visible and wider than the primary bark of monocotyledonous plants. It is clearly

separated from the central cylinder. In the peripheral part of the primary bark there is a developed sclerenchyma layer below which is a wider belt of parenchyma cells. Central cylinder starts with a mechanical ring of pericycle, by which the anatomic structure of this species is more similar to dicotyledonous plants. In the basic parenchyma cylinder, the closed collateral bundles are distributed in regular series. The number of vascular bundles is constant along the same internode, but it varies among them. It increases with the growth of the internode diameter (ANDRE, 1998). The central part of the internode is filled with pith cells.

VARIABILITY

The most significant varieties of the species *Pseudosasa japonica* differ by their leaf colour, branching and growth vigour.

Pseudosasa japonica Akebono-suji - similar to the species *Pseudosasa japonica*, with white strips on the green leaf background.

Pseudosasa japonica tsutsumiana, - similar to the above species, but with considerably slower growth and unusual internodes.

Pseudosasa japonica pleioblastoides - similar to the basic species, only with more branches from the base, so it has a more compact clump, rather fast growth. Of course, there are more varieties of this species, but their utilisation is considerably more uncommon.



a)



b)

Fig. 4. a) *Pseudosasa japonica* in the shade of high plants, b) a short hedge, *Pseudosasa japonica* on a prominent place in front of some high plant species

APPLICATION

The greatest numbers of bamboo representatives are very aggressive and expansive species. They occupy the terrain very fast and they spread very fast throughout the area where they are planted. Their rhizome develops very fast and occupies the soil, so that it expels and endangers the survival of other species occurring in its vicinity. Compared to the majority of representatives of the genus bamboo which are extremely aggressive, this species is harmless. During the second, i.e. the third year after planting, the plant starts to reproduce longer

rhizomes. For this reason, also for this species it is best to place the barriers for root development. Of course, for very aggressive species, the barriers should be more resistant, stronger and buried somewhat deeper in the ground.

Sagittate bamboo is applied both in the exterior and in the interior, it is a very ornamental plant in a closed space when planted in jardinières or flowerpots (ROBERDS, 1994).

Sagittate bamboo is suitable for forming hedges and for large spaces, because it forms wide, compact groups (Figure 4b). When it is used for hedges, it should be borne in mind that it is better for short hedges. When lengthy hedges are planned, it is best to place occasional groups mixed with other plant species.

It is effectively applied for short hedges. At places where a uniform hedge is not required it plays its part very successfully (Figure 4b). It can also be used as a solitary plant in the spaces which do not require very high plants (Figure 4a). Sagittate bamboo tolerates shade conditions. It thrives best in the conditions of low shade, still it also adapts to the conditions of more intense shade. The use of sagittate bamboo at shaded localities is therefore desirable.

Thanks to its characteristics, this species is able to fix the terrain which is situated in the shade. Consequently, its application in erosion control at shaded localities can be very effective, first of all on the slopes along the major roads passing through the towns, at the places in settlements which also require aesthetical effects and the solution of erosion risks in the conditions of shade from buildings, in factory yards, spoil banks, and the like. As it has already been pointed out, this species also tolerates the sunny locations and the soil poor in nutrients. Thanks to its characteristics, it holds and filters the wind, so we assume that it can be a potential material for the rehabilitation of cinder and slag dumps.

CONCLUSION

Pseudosasa japonica (Sieb. and Zucc. ex Steud.), the so-called sagittate bamboo, or small bamboo, is a plant that can have a considerably wider use in our country. The environmental conditions in our country do not disturb the growth and development of this plant, which tolerates the most extreme environmental conditions. It can be used both as interior and an exterior plant. It can be planted in flowerpots, jardinières or in open spaces. As opposed to the majority of bamboos, its planting in the open spaces does not require the strong barriers which prevent its further development and spreading. It is suitable for the establishment of hedges, as a solitary plant, in front of high plants or structures. It is extremely suitable for shaded places below high trees or buildings. It can fix the ground of the sloped sites, and as it tolerates the shade, it should be used for fixing the eroded areas in the shade. This characteristic makes it an extremely useful plant species for eroded terrains in the shade. In urban environments, there are many sites which require the solution of erosion problems in the shade. Also this plant species is a potential material for the prevention of wind erosion on spoil banks, cinder and slag dumps.

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**KARAKTERISTIKE VRSTE *PSEUDOSASA JAPONICA*
(SIEB. AND ZUCC. EX STEUD.) I NJENA UPOTREBA**

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I z v o d

Veliki broj introdukovanih biljaka poreklom iz istočnih zemalja prilagodile su se uslovima sredine koji vladaju kod nas. Jedna vrsta, predstavnik iz grupe bambusa jeste i vrsta *Pseudosasa japonica* (Sieb. and Zucc. ex Steud.), takozvani strelasti bambus, odnosno mali bambus. Ova vrsta spada u grupu brzorastućih bambusa. Imajući u vidu proučavane osobine navedene vrste njena primena je široka. *Pseudosasa japonica*, strelasti bambus se može koristiti u ozelenjavanju predela, vrtova, parkova, kao sobna biljka ali i u zaštiti erozionih terena urbanog i suburbanog prostora. Anatomska analiza poprečnog preseka internodija istraživana je sa ciljem da se uporedi sa tipičnom građom monokotiledonih biljaka koja je zastupljena kod predstavnika familije *Poaceae*.

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