

Iris Pseudoacorus Biology Habit, Cultivation Technology and its Application in Environmental Protection

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Abstract. This article elaborate introduce iris pseudoacorus biology habit, cultivation technology, and its application in environmental protection. Beyond that it provides theoretical basis and technical support in the application of environmental protection in the plant as well as its facilities operation. Meanwhile, this article also gives some examples in the field of environmental protection.

Biology Habit

Categories. Iris pseudoacorus belong to freesia, IRIS. Another name is yellow flag.

Morphological Features. It has a strong stem, with slanting growth; its fibrous root is yellowish white, have pinched horizontal stripes. In addition to this, it has a large plant, fat thick rhizomes. Leaves Basal, where leaf blade with wide strip, apex acuminate. The length of it is 60 to 120 centimeters, there are exist 3 to 5 longitudinal veins not obvious. With conspicuous midrib and transverse netted veins. Hollow stem, where stems 8 to 12 centimeters. There have 1 to 2 stem leaf. It containing 2 flowers; Flower yellow, the diameter is 6 to 7 centimeters. Thin petal, the length is 3 to 11 centimeters, and the tube length of perianth is 0.5 to 1.2 centimeters. The outer perianth lobes obovate, equipped with puce stripes and spots, on both sides of edge with a maroon auricular lump. Inner perianth lobes oblanceolate, While flowers in full blooming, it forms outward tilt; There are 3 stamens. Anthers and filaments are nearly isometric; Style branches are dark yellow, apex lobes with thin teeth, ovary is green. Capsule elliptical cylinder, the length is 3 to 6 centimeters; diameter is reaching 2 centimeters, article 6 the rib, no beak. Seeds are brown color, flat, semicircle. Blooming periods is 5 to 6 months; fruiting time is 7 to 8 months.

Growth Habit. Iris pseudoacorus is well adaptable. During the temperature of 15 to 35 degrees centigrade it also can grow, when below the 10 degrees centigrade, the plant stop growing. It can tolerant to drought, wet, resistant high temperature, and cold. In Harbin sun island region it grows well [1]. The longest root length is 12.57 centimeters. Root volume is 4.70 cubic centimeters. Above ground biomass of per unit area is 0.78kg m⁻²[2] Iris pseudoacorus like light but resistant half shadow, it likes containing Calcareous weak alkaline soil, and it

resists hungry soil and extensive management. There is no special requirement for soil, clay, sand; loam all can grow [3].

Geographical Distribution. *Iris pseudoacorus* is widely distributed, such as Shanxi, Gansu, Hubei, Sichuan, Yunnan and other places have distribution. It grows grass slope, lin grass, as well as wetland. *Iris pseudoacorus* is good salt resistance. In the northern coast of china, it can be used as high salinity area brackish water plant of artificial wetland sewage treatment system [4].

Stress Resistance. Under the sewage treatment, *Iris pseudoacorus* has a hardy stress resistance. Compared with controls, the electrical conductivity and Malondialdehyde content changed little; meanwhile, in the initial experiment of *Iris pseudoacorus*, the free Pro content, POD, and CAT activity and root activity has increased [5].

Other. The leaf of *Iris pseudoacorus* is green, such as the sword. The design and color is gorgeous and large, extremely rich appeal. It can be decorated in the landscape pool, which near wet part of the river or in the shallow water. Not only can observe leaf, but also can appreciate the flowers. It's a high ornamental value of aquatic plant. If lay aside near the edge of rock and water stone, it will make people feel pure and fresh nature.

Iris Pseudoacorus Planting and Maintaining Technology

Seeding Breeding. There are two ways of breeding. One is seed propagation; the other is division propagation .

Seed Propagation.

Seed Harvested. *Iris pseudoacorus* shells moisture content is higher. Mature seed will germinate in fruit. Moreover, if come across dry climate, it will present partial flowering, and mature seed will owing to fruit cracking then natural scattered. Therefore, should be timely collecting seed.

Sowing with harvest at any times. Owing to its biological characteristics, *Iris pseudoacorus* should be sowing with harvested at any time. Thus, the percentage of seeding can be up to 80-90%. Due to the difference in flowering time, seed ripening time will suffer a big difference. *Iris pseudoacorus* seed maturity of the Yangtze River is 8 to 9 months.

Due to the hard seed, before sowing should use warm water soaked for half day. Remove the water, sowing in seedbed with cultivating soil or shallow bowl. After sowing to maintain high humidity and temperature, it will germinate approximately 20 days. One month later, it will become seeding. Cultivating soil is consist of humus soil and sand according to geometric collocation, with blending, and adds a small amount of vermiculite.

Preventing Pest. *Iris pseudoacorus* sowing and seeding almost occur at the season of summer and autumn. Beyond that, autumn is the high-occurrence season that diseases and pests happened. Inside of Seedbed, high humid environment is easy to bring to seeding diseases. Furthermore, soft seeding also becomes many pests' objective. For this reason, preventing pest control is extremely important.

Timely separating seeding and transplanting. When seeding has 2 to 3 pieces of euphylla can be transplanting. By doing this method, not only can reduce the density of seeding, ventilation pervious to light, but also improve the environment, thereby reducing seeding diseases.

Division Propagation. Ramet general occurs in spring and autumn season. Autumn in September is the most appropriate [1]. First, digging out the rhizome, and shaking off the soil, then, using knife to division. Each part of stem should have 2 to 3 buds are advisable. In case of water runoff need to cut off part of the blade. After doing these, it can directly on the basin or plant. During spring, planting for about 10 days after emergence, most of that year spring flowering. During autumn,

suffering from hibernation, the next year it will bloom. Generally 3 to 5 years of time doing these, it's beneficial to update plant growth and to expand reproduction [1-5].

Planting destiny and the method. Iris pseudoacorus is often used in landscape application by outdoor planting. General 2 to 3 buds plexus, 20 to 25 plexus per square meter. Plant spacing 30 centimes times 40 centimes, planting depth 6 to 10 centimeters. Firstly, applying fertilizer in pelvic floor before potting, then is loading the cultivating soil. Digging holes to plant in the middle of it, and plant after turns the soil, in addition to keep the soil moist or with a layer of shallow water.

The preparation of ploughing before planting [1].

Soil Preparation. Ploughing, finely clods, removing sundries and weeds. When it's necessary, we can exchange the soil partially.

Planting. After digging the planting hole, make the planting roots extend in the planting hole, doesn't make it bend, cover the soil. Then sprinkle profoundly water, after the water soaked into cover a layer of soil.

Watering. Early spring drought, pay attention to watering 2 times enough water, so as to facilitate the plant turn green, and germinate the seeding. Moreover, after planting seeding, need to watering 3 time in a row. Planting after the first 3days for 2 times, another 5 to 6 days watering for 3 times, each time should be drenched, and turns the soil in time.

The management of planting. After planting the Iris pseudoacorus, we need to deal well with managing weeds and turning over the seeds .

Managing the weeds. The season of planting and dividing the ramet of Iris pseudoacorus, is also a good timing of growing weeds. In order to avoiding the weeds compete with plantings for water, nutrients, and the space of growing, thus, need to do a good job of picking up weeds.

Flower and fruit management. Mature fruit cracking of fruits and seeds scattered everywhere affect the landscape effect. Besides, the aim of harvesting seeds, when the cluster drooping down, meanwhile the apex of fruit cracked, using the knife cut off it. By doing this method, it can improve the shape of plant, increasing the aesthetic, reducing the waste of plant nutrients.

Turn over the plant in time. Due to the Iris pseudoacorus has an ability of widely adaptable and growth fast. There is 30centimeters times 40centimeters row spacing planting, generally 3 years will form a giant group, 4 to 5 years will be crowded seriously, afterwards it will decline. At this moment, there is also a key link that cannot be ignored is to turning over the Iris pseudoacorus in the maintenance management process. At the same time, combined with the kinds of organic fertilizer, it also can supplement the soil fertility.

Pest Management. Iris pseudoacorus generally take place less plant diseases and insect pests. During the session of sowing seeding, seeding is susceptible to diseases and pests. In the course of growing, to prevent shoot dry ZuanXinChong (huanbanshiyee). Enter into the rainy season, under the condition of high temperature and high humidity, if the blade is turn into a dark green, from the surface to the underground part is presented the softening rancidness. When it present the leaf dry up with a purplish-brown, thus, need to deal with on plant root out quickly, and spray drug to prevent and control. Before winter is coming, need to cut off the residual leaves and burn around dry leaves.

The application of Iris pseudoacorus in environmental protection

Denitrogenate. Cattail, Canna, Iris pseudoacorus, Water bamboo and calamus for the handling of the sewage by construed wetland TN have a good effect [8-9]. Among them, Iris pseudoacorus

have a good effect on denitrification[4]. But the *Iris pseudoacorus* in $\text{NH}_4^{+}\text{-N}$ and concentration under the condition of more than 50mg L^{-1} can't grow, plant nitrogen effect decrease with the increased concentration of ammonia nitrogen [10]. The orthogonal experiment and the theory of quantification analysis for modular heavy bed best combination for water level is 0.50m; Ceramsite bed body; shale matrix; plants for foxtail algae, *Iris pseudoacorus* and the hybrid of sunshade grass of TN removal rate can reach 79%, the reliability is reach 95% [11].

Phosphorous removal. In the artificial wetland sewage treatment system, *Iris pseudoacorus* can effectively remove the sewage TP; it has a good effect [8-9, 12]. *Iris pseudoacorus* of TP removal rate is significantly higher than the reeds, water bamboo, and calamus, etc. [4, 12] For the TP removal, it will mainly in horizontal flow phase [9].

Water body remediation. Ma Mu Yuan use *Iris pseudoacorus* to control salt and high nitrogen and phosphorus eutrophication, he found that the TN, $\text{NO}_2\text{-N}$, and $\text{NO}_3\text{-N}$ nutrient has better removal effect. Water of $\text{NO}_3\text{-N}$ has a same change trend of DO, $\text{NH}_3\text{-N}$ has an opposite change trend to DO. *Iris pseudoacorus* can effectively control the water chlorophyll a; it can effectively inhibit the growth of algae breeding. At the same time, planting *Iris pseudoacorus* can inhibit the increase of water PH value, lower salinity, improving the transparency and water quality. For *Iris pseudoacorus* nutrient removal, mainly through the role of plant rhizosphere microorganisms reach the result.

Iris pseudoacorus have an obvious effect in the eutrophication of water bodies, and show a good effect of nitrogen and phosphorus removal. *Flagiris* is the best, yellow flag is take second place, but the growth condition of yellow flag is much better than *flagiris* and *Iris nertschinskiana*. Water removal rate of nitrogen and phosphorus have a high relevance on *Iris pseudoacorus* net biomass, and there is no correlation between plant nitrogen, phosphorus content, with the result that nitrogen and phosphorus uptake should be as an important indicator of aquatic plant selection [10].

Iris pseudoacorus etc 6 kinds of aquatic plants have an obvious removing effect on BOD₅, COD_{Cr}, TN, and TP. Among them, *acorus tatarinowii* schott and *Iris pseudoacorus* have the best treatment effect. With time changing, *Iris pseudoacorus* conductivity and malondialdehyde content gradually decreased, the free proline(Pro) of *Iris pseudoacorus*, *Pratia nummularia*, *Iris pseudoacorus*, *Calamus*, and *Alisma orientalis* root activity are all present a phenomenon of decrease first increase afterward.

Other. Plants such as *Iris pseudoacorus* have a good effect on artificial wetland processing sewage COD_{Cr} and turbidity. (LuMin, 2004). The vertical- horizontal flow artificial wetland system for treatment of sewage of removing COD and SS has an obvious removing effect. As for the removal rate of COD and SS, it mainly in the vertical flow phase. Among then, *Canna flaccida* have a slightly higher effect than the *Iris pseudoacorus* in the field of dealing with COD [7].

There have reached a very good effect on the landscape ecological, by planting *Iris pseudoacorus* to carry on the ecological water conservancy in Ningbo inland [11]. *Iris pseudoacorus* also have a good effect on river regulation and water pollution control in nanhui district of Shanghai.

Iris pseudoacorus is mainly use for water plants and revetment plants configuration.

The landscaping of dominant species are *Eichhornia Crassipes*, Water lily, *Iris pseudoacorus*, and Purple Loosestrife; the water quality improvement of dominant species are *Iris pseudoacorus*, reed, and Purple Loosestrife [12]. Between this two ecological waterscape configuration for wetland aquatic plants in the group, one is *arundo donax* var *versicolor*, *Iris pseudoacorus*, and jiao grass, among them, *arundo donax* var *versicolor* is act as dominant role, and others are associated with the dominant one. The other is *Iris pseudoacorus*, Cattail, Water lily, and *Villarisa nymphaeoides*,

among them, *Iris pseudoacorus* is act as dominant role, and others are associated with the dominant one.

Conclusion

Iris pseudoacorus not only can be used as an ornamental plant, but also have a good effect on nitrogen and phosphorus. It can be used as a good aquatic plants selecting objective in the artificial wetland swage treatment system [5, 12]; it can play a better role in the eutrophication of water body management ; it also can be applied in soil salinity in the north area .

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