

Thalia Dealbata Biological Habits, Planting Management and Protection

Technology and its Application in Environmental Protection

* Luojun Gong^{1, a*}, Xing Kong^{2, b}, Guilin Li^{3, c}, Cong Xu^{4, d}, Honghui Wang^{5, e},
Xinli Liang^{6, f}

¹ Hubei Provincial Fishery Technical Extension Center, Wuhan, China, 430070

^{2, 3, 4, 5, 6} Hubei Environmental Technology Co., Ltd. Wuhan, China, 430070

^agongluojun@sina.com

Keywords: Thalia dealbata; Planting management; Planting protection; Environmental protection

Abstract: Thalia dealbata not only has the power to spend adaptable, easy to grow, high ornamental value of aquatic plants, but also has strong decontamination capability, so that it can be used with one other aquatic plants, as an artificial wetland sewage treatment system an important selection of plants. Not only beautify the environment, but also purify water.

Thalia dealbata biological habits

Thalia dealbata is a perennial emergent plants, is a very high value ornamental water flowers, to commemorate the German botanist Johnny • Purcell derived from the name.

Taxonomic status. Thalia dealbata scientific name Thalia dealbata. Alias arrowroot water, Thalia. Belonging to Dong leaves Branch / Marantaceae, Thalia genera.

Morphological characteristics. Thalia dealbata with complex spikes, born peduncle from the inside out of the top of the sheath; bracts numerous, half closed, shedding flowers; purple flowers, 2-3 florets coated by two small bracts close was born rachis; Bracteoles long 0.8-1.5cm, concave, leathery, abaxially glabrous, with a waxy surface layer mask white belly pubescence; Sepals 1.5-2.5mm, purple; lateral staminodes petal-shaped, base white to lavender, dark purple tip and edges, long 1.2-1.5cm, width 0.6cm; Corolla tube short column, lilac, lip-shaped pocket, dark purple upper and lower lavender. Plant height 100-250cm, plant foliage height 60-150cm. Peduncle slender, often above the foliage 50-100cm; basal leaves, 4-6 tablets; petiole longer, about 40-80cm, the lower part of the sheath-like, slightly swollen base, top and base of the petiole reddish brown or light brown; leaf to ovate-lanceolate to oblong, long 20-50cm, width 10-20cm, hard paper, gray-green, purple edge, entire; dorsal surface is white powder, leaf belly mask sparse pubescence; leaf base blunt, sharp pointed leaves; outfeed parallel veins. Capsule spherical or near spherical obovate, length, width axis about 0.9-1.2cm and 0.8-1.1cm, peel light green when ripe top cracking; mature seeds brown, rough surface, arillate, hilum more apparent. The flowers with massive roots, rhizomes sprout growth of ramets; especially developed roots, rhizomes clouds on adventitious roots, the roots can grow 10cm 70-90 bars of the students, adventitious root length 50-90cm, there is lateral, upper lateral root root especially developed. Thalia dealbata underground roots and rhizomes huge volume of space, and aboveground fairly.

Geographical Distribution. Thalia dealbata native to the southern United States and Mexico, tropical plants, perennial aquatic herb, grown mainly in southern China and Taiwan, Hong Kong and Macau.

Growth habit. Love warm wet, sunny climate, not cold, gradually withered after the winter aboveground. With roots in the mud in the winter. Slightly alkaline soil to grow well.

Thalia dealbata suitable climatic zone is characterized by indicators of Health: daily average temperature ≥ 10 °C by the number of days is greater than 180d; the coldest month average temperature higher than -5 °C; annual extreme minimum temperature of not less than -15 °C; then force China spent the suitable range of Shenyang - Beijing - Taiyuan - Chengdu - Lijiang area bounded by the east line [1]. Safe winter, and exhibit regional evergreen or semi-evergreen properties [2] in Dianchi Lake Basin. Shenzhen *Thalia dealbata* year-round growth, but the impact of environmental factors such as growing season by a very significant [3]. Xixi National Wetland Park has more than 100 species of aquatic plants, and then as one of the dominant species flower power [4]. Relative conductivity and semi-lethal temperature measurements show that *Lythrum* and then spend the cold strong force, barracuda grass and aquatic *Canna*'s cold worse [5].

Environmental Stress. Under drought stress, wetland plants as the pressure increased, decreased chlorophyll content, cell membrane permeability increasing, peroxidase activity first increased and then decreased. Its drought resistance order of aquatic *Canna*, *Shuicong*, *Thalia dealbata*, dry grass and barracuda grass umbrella [6].

Polluted water stress, barracuda grass, *Thalia dealbata*, aquatic *Canna* showed leaf cell membrane permeability increased, the increase of malondialdehyde (MDA) content, chlorophyll content decreased, and the harm different in different stress the plant suffered significant anti-strong inverse stress plants suffer relatively minor injuries. Fuzzy comprehensive evaluation of the membership function method showed resilience *Thalia dealbata* stronger than barracuda grass and aquatic *Canna*, and to sewage treatment capacity of the strongest, followed by urban sewage treatment, industrial wastewater treatment weakest [7].

Thalia dealbata, taro and other wetland plants under flooded conditions, the system leaves the destruction of the cell membrane, membrane permeability increased, leading to increased electrical conductivity, but with the increase in water and plant life time, but decreased conductivity . Plant chlorophyll content with prolonged flooding time exhibit a downward trend [8].

***Thalia dealbata* planting Maintenance Technology**

Reproduction. *Thalia dealbata* propagation speed, there are two kinds of sexual reproduction and asexual reproduction.

seed propagation and harvest ripe seeds and sowing. Generally the main spring. Moist after sowing, germination optimum temperature 16-21 °C, 15 days to germinate.

Division propagation division propagation mode is the main mode of reproduction. Early spring, cut off from the mother plant with 1-2 buds roots, planted into the basin, enough base fertilizer, into the pool maintenance. Grow new plants to be transplanted in the pool to grow. A bud a year will be able to issue 10 buds.

Industrial production also take tissue culture methods.

Cultivation and Management Technology. Land Production

Reproduction of the Southern Region Division propagation carried out before and after the festival. Generally speaking, each vegetative propagules with 2-3 buds want to ensure seedling survival rate.

Soil requirements

Thalia dealbata on soil adaptability, could grow both in clay, loam, or sandy soil. Also less demanding on soil fertility in barren soil can grow, but it is best to choose fertile, loose, organic-rich soil planted.

Thalia dealbata can handle high concentrations of wastewater in sand culture artificial wetland system [9]. Sewage can be treated at a small gravel-bed wetland ecosystems and soilless cultivation conditions [10]. In wetland gravel bed planted *Thalia dealbata*, has good impact load capacity and significantly decontamination effect [11].

Dianshanhu floating bed planting canna and *Thalia dealbata*, nylon mesh upper and lower fixed planting fast way beneficial to the growth and reproduction, the survival rate were 83.33%, higher than the loosestrife and yellow irises [12].

Planting density

Nursery production of planting density spacing of 1m × 1m. Ornamental planting density spacing of approximately 0.6m × 0.6m, in order to facilitate fast into the scene.

Planting depth

Thalia dealbata underground stem, a year underground plant stem diameter up to 3-4cm, planting depth of up to 10cm.

The main management after planting

1) After the land in the spring tiller, due to low temperatures, generally required to maintain shallow water or just keep the soil moist, to raise the soil temperature to facilitate germination.

2) *Thalia dealbata* growing season absorb nutrients and consume more, in addition to planting Shizujifei, the dressing is a very important job. Daily with NPK fertilizer mainly, but also of organic fertilizer. Fertilization principle is "thin manure handling facilities." To grasp the principles of irrigation "shallow - shallow - deep". That spring, shallow, deep summer, autumn light, in order to facilitate plant growth.

3) *Thalia dealbata* plants are waxy, strong resistance, pests and diseases rarely occur.

Production Facilities

Production facility due to its production environment can be artificially controlled, sub-planted *Thalia dealbata* time from the usual spring (before and after the festival) has continued to fall. Specific methods of operation with the basic production land.

The application then force spent on environmental protection

Water Purification. the effect of nitrogen:

Xin Guo et al [13] with seven kinds of aquatic research subsurface flow constructed wetland treatment of rural sewage nitrogen removal. The results showed that: Plants in nitrogen 20mg ·L-1 grow best in water, morphological index of each plant with increasing ammonia concentration decreasing; plant nitrogen removal increased with decreasing concentration of ammonia. Nitrogen is better *Thalia dealbata*, Oriental cattails and windmill grass. Jiaorong Ting [14] brewery wastewater treatment plant tailrace planting a variety of aquatic plants, canna flower ammonia removal and re-power the highest, reaching 98.92% and 98.20%; CODcr removal rate was above 87%. *Thalia dealbata* which effect is particularly prominent. Canna and then spent force different acidity of water purification have shown a good ability. The higher the pH, ammonia removal, the better. When the pH = 9, the Canna and *Thalia dealbata* of ammonia nitrogen removal rate. pH is too high or too low will inhibit nitrogen removal effect. Canna differences and *Thalia dealbata* different forms of nitrogen for maximum absorption rate and affinity. When low concentrations of ammonium nitrogen wastewater treatment, and then spend the more power the better Canna, with higher Vmax and lower Km, can adapt to a wide range of concentrations of nitrate. TN wastewater treatment pond

aquaculture artificial wetland system, CODMn, ammonia nitrogen and chlorophyll a, the effect is obvious [15].

the effect of phosphorus

Yongrong Jiang et al [16] in three series in South horizontal subsurface flow wetland sewage treatment system sewage in winter, for COD, BOD5, TP and coliform removal is still a good effect on the TN removal efficiency is poor. Which, CODcr and BOD5 degradation occurs mainly in the first stage of the biological bed, TP and TN degradation occurs mainly in the third stage of biological bed. Three-bed biological purification plants with better results are: first-class aquatic plant canna, *Thalia dealbata* planted the second stage, the third stage planted iris. *Thalia dealbata* and elephant grass on CODcr and BOD5 and PO4³⁻ - P removal is better, but the removal of NH₃-N is poor [17]. Jiaorong Ting [14] and then get canna flower power over 72% of the total phosphorus removal results. At pH = 6-7, they are the removal of phosphorus also reached the highest value. pH is too high or too low phosphorus removal effect will inhibit the inhibitory effect of higher pH values, significantly greater than the effect of a low pH value. Canna differences and *Thalia dealbata* of different forms of phosphorus maximum absorption rate and affinity. *Thalia dealbata* Canna more suitable than the high phosphorus concentrations. Treated with surface flow and horizontal subsurface flow constructed wetland system for aquaculture pond water TP and chlorophyll a, with good results [15].

the absorption of heavy metals

Thalia dealbata can absorb Cd and Zn, and the main enrichment plant roots. Higher enrichment of Cd Zn [9]. Mosaic *Arundo donax*, *Thalia dealbata* and water *Wolffia* on Mg absorption ability [8].

comprehensive capacity

According to the comprehensive evaluation of potential purification system, the cluster analysis, [18] and canna, reed, windmill grass, water onion, then force canna, reed, *Thalia dealbata*, Canna and other flowers and *Lythrum* [19] have strong purification ability.

Other. release rate:

The results showed that rot, and then force flowers and reeds TN, TP and CODcr strength is weak, such as the release of [20].

Floating Island test

Floating island planting flowers and other aquatic plants and then force for the growth of microorganisms have a role in promoting. Emergent plants - microbial systems to remove pollutants in the water body has a certain effect. Water temperature is controlled floating island each index factor [21].

secrete oxygen

YunShuang Fan [20] The use of sedimentation tank - biological oxidation pond - a sheet flow wetland - two tables flow wetland treatment Mi straight river found a total of six kinds of emergent plants secrete oxygen concentration size: Ling Bai > reed > barracuda grass > *Thalia dealbata* > Canna > Shuicong; for TN, TP, and ammonia removal CODcr more obvious, the removal of total phosphorus is play a supporting role.

nutrient content

Thalia dealbata in vivo distribution of nitrogen and phosphorus content in leaves > roots, stems and roots *Thalia dealbata* unit dry mass of nitrogen and phosphorus ratios were 1.59 and 1.08 [12].

The amount of the same species of plants and COD_{Cr}, BOD₅ and TN was significantly positively correlated with TP correlation is not strong; different species of plant biomass annual rate of removal of various pollutants were significantly correlated [22].

mowing

Dianshanhu floating beds planted *Thalia dealbata*, harvest time in November, it reached 78 tillers. *Thalia dealbata* strong ability to absorb nitrogen, nitrogen obtained harvest amounted to 457.11g / m²; *Thalia dealbata* leaf nitrogen and phosphorus uptake roots were 1.73 times and 1.17 times [12]. Biomass plant stems and leaves greatly influenced by harvest and cycle range of biomass and the root zone of plants harvested roots with cyclical changes [22]. Artificial wetland system mowing *Thalia dealbata*, can remove nitrogen, phosphorus, which then forces spent the best [15].

Conclusion

In summary, then not only has the power to spend adaptable, easy to grow, high ornamental value of aquatic plants, but also has strong decontamination capability, so that it can be used with one other aquatic plants, as an artificial wetland sewage treatment system an important selection of plants. Not only beautify the environment, but also purify water [7,9-10,18-20].

References

- [1] Mou Lihua, Chen Yuchu, Shi Feng, Wang Yingying, wetland exotic plant invasion risk *Thalia dealbata* Preliminary study [J], wetland science, 2010,8 (4): 395-400
- [2] Deng Fu Tang, Li Qiang, Deng Fu providers, Dianchi Lake Basin wetland plants artificial breeding research [J], Chinese gardens, 2007 (2): 90-93
- [3] Lei Shi, Bao-zhen, Cao Xiangdong, Wang Jin, Liu should, Lvbing Nan, research *Shatin* wetland plant growth characteristics and decontamination capabilities [J], Agro-Environment Science, 2005,24 (1): 98-103
- [4] Xu Liping, Liu Huichun, Xixi National Wetland Park Aquatic Resources Survey [J], Zhejiang Agricultural Science, 2008 (5): 555-557
- [5] have Aiping, see Liu, Xu Xiaowei, ETHNIC, cold waters of several eco-modified plants [J], Agricultural Science and Technology Bulletin, 2008 (11): 155-156
- [6] OF FORESTRY, Lu Weimin, Cai Jianguo, Forest with a preliminary study of five kinds of wetland plants drought resistance [J], Jiangsu Agricultural Sciences, 2008 (3): 266-268
- Songchun Chun study [D] [7], eutrophic water three kinds of physiological and biochemical characteristics of aquatic plants, Zhejiang Forestry University master's degree thesis, 2010
- [8] Cai Jianguo, Hangzhou Wetland Landscape Design Study Habits and [D], Beijing Forestry University doctoral dissertation, 2006
- [9] Bong small worries, pollution and the effect of screening tests wetland plant research [D], Hunan Agricultural University, a master's degree thesis, 2010
- [10] screening Chen Zhicheng, Guo Dangui, Xiong Minghui, Luo Shuhua, forest dragons, Guogui Sheng, domestic sewage treatment plant varieties [J], environmental pollution control technology and equipment, 2006, 7 (4): 90-93

- [11] Zhu Baoyu, lychee Lake Comprehensive Management Practice Research [D], Guangdong University of Technology Master of Engineering Thesis, 2007
- [12] Wu Jianqiang, Wang Min, Wu Jian, Jiang Yue, Sun army, Cao Yong, four kinds of floating bed capacity of plants to absorb nitrogen and phosphorus in water bodies experimental study [J], Environmental Science, 2011,32 (4): 995-999
- Guo Xin Zhang Yu seats Compass Liu Xiaoguang column, under high ammonia concentrations and wetland plants filter removal effect [13],,, [J], Agro-Environment Science, 2011,30 (5): 993-1000
- [14] Jiaorong Ting, aquatic plants for brewery wastewater treatment plant tail water purification effect study [D], Zhejiang University, a master's degree thesis, 2007
- [15] Zhuxue Sheng, Wang Liqing, Xu Houtao, Qiu Xue Mei, Li, Ji Gao Hua, Xie Ping, the use of constructed wetlands wastewater treatment ponds effectiveness analysis [J], fisheries modernization, 2009,36 (4): 8-12
- [16] Jiangyong Rong, Maude clear, Duan Jun Yuan, Tianmao Long, Zhang Lianhai, Chen Qin, different plant configuration wetlands winter sewage purification effect is [J], water resource protection, 2009,25 (3): 25-28
- [17] MO Feng Luan, efficient vertical flow wetland sewage treatment system practical research [D], Central South Forestry University master's degree thesis, 2004
- [18] Chen Yonghua, Wu Xiao-fu, JIANG Li Juan, Chen Mingli, Zeng Min, lightning, Jenny Zhang, Yang quartz, screening and treatment of domestic sewage purification potential wetland plants evaluation [J], Environmental Science, 2008,28 (8) : 1549-1554
- [19] Zouyi Xiong, wetland plants to nitrogen and phosphorus screening and winter capacity and pilot study [D], Central South University of Forestry and Technology master's degree thesis, 2008
- [20] Van cloud cool, composite constructed wetland treatment plants pollute rivers and wetlands screening study [D], Kunming University master's degree thesis, 2010
- [21] LI Xian will, aquatic plants - Purification of water quality effects of microbial systems [D], Jiangnan University, a master's degree thesis, 2008
- [22] Shi Lei, Yang Xuan study, the amount of wetland plants and their impact on the purifying effect of [J], Eco Environment, 2010,19 (1): 28-33