

Water Spinach (*Ipomoea aquatica*): The Forgotten Leafy Green with a Big Future

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Few vegetables lead as double a life as water spinach. In the kitchens of Southeast Asia, South Asia, and southern China, it is a beloved, rapidly growing green — stir-fried with garlic, tossed into sour soups, or pickled for the market stall. In Florida and other parts of the southern United States, the very same plant is illegal to possess without a special permit, listed as a noxious weed capable of choking canals and drainage systems. This article describes *Ipomoea aquatica*, known to hundreds of millions of people by names as varied as kangkong, kalmi sag, rau muống, and pak bung — and known to Florida wildlife officials simply as "the weed to watch."



Freshly harvested water spinach bundles at market

What is Water Spinach?

Although its common name suggests otherwise, water spinach has no botanical relationship to true spinach. It is a member of the Convolvulaceae, or morning-glory family, and is in fact a closely related species of the sweet potato. Its scientific name, *Ipomoea aquatica*, reflects its watery habitat: this is a herbaceous, semi-aquatic, often perennial vine with long, hollow, jointed stems that let it float on water or creep across mud. Wherever a stem node touches water or moist soil, it puts down roots, which is one reason the plant spreads so readily — both as a crop and, where unwanted, as a weed. The leaves are typically arrowhead- or heart-shaped, alternating along the stem, and range from narrow, pointed forms to broader ones, generally somewhere between 15 and 30 cm long. The flowers are unmistakably "morning glory" in form — funnel-shaped, white through pale pink to lilac, usually blooming singly or in small clusters at the leaf axils. When the stems are cut or broken, they release a milky sap. The fruit is a small, woody capsule holding one to four grayish seeds that are buoyant enough to float and disperse on water for long periods, a trait shared with several of its water-dispersed relatives in the morning-glory family.



The trumpet-shaped, "morning-glory" flower of *Ipomoea aquatica*

Two broad cultivar types are cultivated commercially. One — sometimes called "green stem" or Ching Quat — has narrow, pointed leaves and white flowers and is suited to moist-soil beds. The other — "white stem," Pak Quat, or "water ipomoea" — has broader, arrowhead leaves and pink flowers and is cultivated in fully aquatic, paddy-like conditions. Growers in China have also traditionally distinguished plants by stem colour, with white-stemmed forms generally considered more tender and better flavoured than green-stemmed ones.

A Vegetable with Hundreds of Names

Perhaps no detail illustrates water spinach's deep and ancient relationship with people better than the sheer number of names it carries. Ethnobotanist Daniel Austin's 2007 survey in Ethnobotany Research & Applications catalogued names in dozens of languages across five language families — Austro-Asiatic, Austronesian, Dravidian, Indo-European, and Sino-Tibetan, among others. In Sanskrit it was kalamba, a name thought to be at least 2,200 years old that left descendants in Bengali, Hindi, Nepali, Tamil, and other South Asian languages. In Chinese it appears in documents from around A.D. 300 as wéng cài literally "buried propagule potherb," a reference to the traditional planting method. The most geographically widespread name, Nevertheless, is kangkong — a Malay word carried by traders across Malaysia, Indonesia, the Philippines, and the western Pacific, eventually loaned into languages as far-flung as Chamorro and Palauan. Other regional names include rau muống in Vietnam, pak bung in Thailand, trâm kũn in Cambodia, kalmi sag across much of northern India, and "ong choy" or "water convolvulus" in English-language markets. This linguistic diversity is itself evidence for the plant's antiquity in Southeast Asia: the fact that Burma, Cambodia, Laos, Thailand, and Vietnam each use entirely unrelated, home-cultivated names — rather than a shared loanword — suggests the vegetable has been locally known and used in each of these places for a very long time.

Origins: A Long-Running Botanical Debate

Where water spinach was first brought into cultivation is still debated among botanists. The two leading theories point to China and to India, and the evidence — historical texts, patterns of cultivation, medicinal use, plant pathogens specific to the species, and the linguistic record — leans toward an origin somewhere in southeastern Asia, without settling definitively on one country. The oldest clear Chinese reference dates to around A.D. 304, when the writer Ji Han described it as "a strange vegetable of the south" unfamiliar to people in northern China. The Sanskrit name kalamba, meanwhile, may be even older, potentially dating to before 200 B.C., which has led some researchers to argue for an Indian origin instead. There is also a long history of plant exchange between India and China by both overland and maritime routes, so the two regions' claims are not necessarily exclusive of one another. This plant's introduction to Africa appears to be comparatively recent and is plausibly linked to the seven great naval expeditions of the Chinese admiral Zheng He (Cheng Ho) in the early 1400s, whose ships are recorded as having carried wéng cài as a shipboard vegetable — cultivated in tubs of earth on deck so fresh greens would be available throughout long voyages. From Asia, European traders, colonists, and later Asian diaspora communities carried the plant and its uses to the Pacific Islands, Africa, Australia, and eventually the Americas.

How Water Spinach is Grown

Cultivation guides from sources as varied as the FAO's Myanmar-focused smallholder leaflet, an Australian government agriculture note, and Indian horticultural references describe broadly similar practices, adapted to whether the crop is cultivated in moist soil or fully flooded, aquatic conditions.

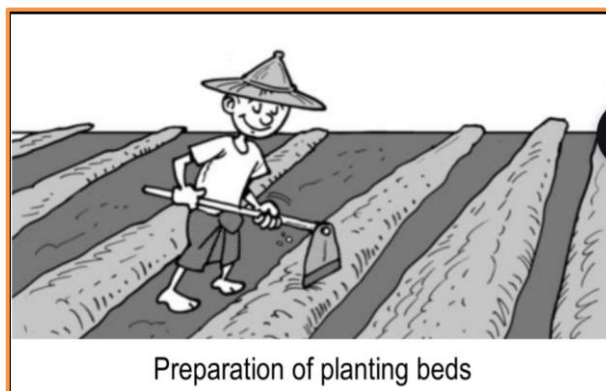
Climate and soil

Water spinach thrives in warm, humid conditions, generally between 20°C and 30°C, and stops growing well below about 10°C. It is cultivated year-round in the tropics but behaves as an annual in cooler climates. It tolerates heavy rain and even flooding — unsurprising for a

semi-aquatic plant — but not frost, and it should be sheltered from strong winds. Fertile soil rich in organic matter, with a pH between 5.5 and 7.0, gives the best results.

Land preparation and planting

For moist-soil culture, raised beds roughly 60–100 cm wide (or, in smallholder terms, about half a foot high and three feet wide) are prepared with furrows for drainage. Because the plant tolerates flooding well, beds don't need to be built especially high. Direct seeding is the most common method. Seed should be no more than about two years old and is often soaked for 24 hours beforehand to improve germination. Seeds



Preparation of planting beds

are sown roughly 1–1.5 cm deep, with two or three seeds per hole, and lightly covered with compost; after seedlings develop two or three true leaves, they are thinned to stand about 10–15 cm apart. Typical spacing recommendations range from about 15×15 cm to 20×15 cm depending on the source, and rows are commonly set 20–30 cm apart. Water spinach can also be propagated vegetatively from 30–40 cm stem cuttings taken from young growth just below a node, or, for aquatic culture, by transplanting cuttings into puddled soil much as rice seedlings are transplanted into a paddy.

Fertilizing and irrigation

Organic matter — cow dung compost or farmyard manure — is typically worked in at bed preparation to improve soil structure and water-holding capacity. A basal dose of balanced compound fertilizer is applied at planting, followed by several split top-dressings of nitrogen at roughly 10-day intervals during growth. Because the plant responds strongly to nitrogen, over-fertilizing is a real risk: excess nitrogen boosts leafy growth but can push nitrate concentrations in the leaves and stems to undesirable levels while reducing dry matter content. Water spinach needs consistently moist conditions and wilts quickly in a dry spell owing to its succulent tissue. Light irrigation immediately after sowing helps establishment, and fields are typically furrow-irrigated as needed. In fully aquatic culture, the field is flooded to a shallow depth after planting and the water level is gradually raised as the crop develops, with water kept moving rather than stagnant.



A furrow-irrigated water spinach field in active growth

Weeding, pests, and disease

Because the crop is usually direct-seeded, weed control in the early stages is important; organic mulches such as rice straw can be applied once seedlings reach 10–15 cm. Reported disease problems include damping-off, leaf spot, root-knot nematodes, and fungal stem and root rots, while common insect pests include aphids, leaf beetles, and various caterpillars, including "armyworm" species in the genus *Spodoptera*. A specialist white rust pathogen, *Albugo ipomoeae-aquaticae*, is largely confined to this species and occurs across southern and southeastern Asia.

Harvest

Water spinach should be harvested before it flowers, both for quality and to keep the crop producing new shoots. In semi-aquatic systems, the first harvest generally comes 30–60 days after sowing (accounts vary somewhat by climate and cultivar), either by pulling whole plants or, more commonly, by cutting shoots 15–25 cm long close to the ground on a roughly weekly basis, which encourages secondary shoots to regrow from the nodes left behind. In

fully aquatic culture, the top 30 cm or so of the main shoot is cut a few centimetres above the water line, which stimulates vigorous horizontal regrowth; subsequent cuttings can be taken every few weeks. With repeated cutting, total yields of 35–40 tonnes of fresh greens per hectare over a season are commonly reported. Because the plant wilts rapidly once cut, harvesting is best done during the cooler part of the day, followed promptly by a cold-water rinse and shaded, wind-protected storage; for market, the greens are usually bundled in roughly 500 g bunches.



A dense, ready-to-harvest planting of water spinach

In the Kitchen and the Medicine Cabinet

Water spinach is eaten across an extraordinary range of cuisines, almost always as a cooked vegetable, though the tender young shoot tips can also go into salads. Stir-frying — often with garlic, chili, ginger, or shrimp paste — is probably the single most common preparation, epitomised by Cantonese wéng cài dishes and Thai pak bung fai daeng. In Vietnam it is used as a garnish with noodle soups; in the Philippines it appears in the pork or chicken dish adobong kangkong and in the sour stew sinigang; in South India it is sliced into thin strips and cooked into soups with tomatoes; and in West Bengal, the dish kolmishak stir-fries the leaves on their own. Beyond human food, the coarser stems and leaves are widely used as fodder — for pigs, cattle, and fish in aquaculture ponds — though only in modest quantities, since the plant has a mild laxative effect. Nutritionally, the leaves are a good source of vitamins A, C, and several B vitamins, along with iron, calcium, potassium, and phosphorus, and contain a modest amount of protein. This nutrient profile underlies water spinach's long history as a folk medicine across Asia and Africa: it has traditionally been used as a mild laxative and digestive aid, a treatment for haemorrhoids, a poultice for fevers and boils, and — in Burma, India, and Indonesia — as an emetic for various forms of poisoning. In parts of Africa and Sri Lanka it has been used to help manage diabetes symptoms, and some modern studies have looked at its cholesterol-lowering and antioxidant properties. Its iron content in particular has made it a recommended food for anaemia and during pregnancy in several traditional medicine systems. As with many plants used both as food and folk medicine, these traditional uses are worth noting as cultural context rather than as clinical guidance.

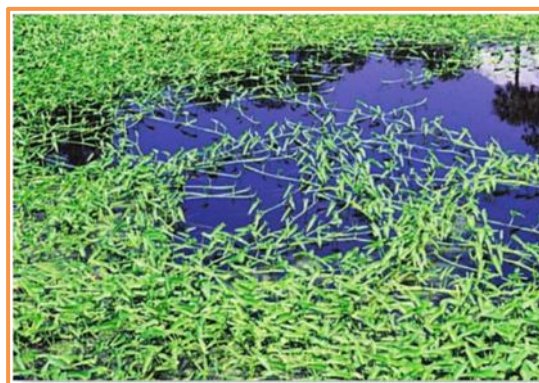


Freshly cut water spinach shoots and leaves ready for cooking

The Other Side of the Story: An Aggressive Invasive Weed

The same traits that make water spinach such a productive, low-input crop — its tolerance for flooding, its ability to root from almost any stem fragment, and its remarkably fast growth — also make it one of the world's more troublesome aquatic weeds once it escapes cultivation. A single plant can branch profusely and produce stems more than 20 metres (70 feet) long, growing at a rate of roughly 10 cm (4 inches) per day under good conditions. Research cited in the ethnobotanical literature puts potential biomass production as high as 190,000 kg of fresh weight per hectare in nine months, and a single plant can produce well over a hundred fruit capsules, each with several buoyant, water-dispersed seeds. In Florida, where the plant has been introduced repeatedly since before the 1950s, it has escaped cultivation and established wild populations in canals, lakes, rivers, and the Everglades. According to

Florida's Fish and Wildlife Conservation Commission, dense mats of water spinach obstruct water flow in drainage and flood-control canals, displace native shoreline vegetation important to fish and wildlife, and form impenetrable canopies over ponds and retention basins that create stagnant water — ideal breeding habitat for mosquitoes. Because of this, water spinach has been prohibited in Florida since 1973, and possession without a special permit remains illegal there; by 2003 it had been listed as a noxious weed in 35 U.S. states, and international conservation bodies have included it among the "100 of the worst" invasive plants worldwide. Despite the ban, Asian communities in Florida have continued growing it, sometimes illegally, reflecting how deeply the plant is embedded in food culture even where it is legally restricted.



A dense water-spinach mat choking a Florida waterway

“Because of its aggressive growth rate, never plant water-spinach in Florida’s ponds, lakes, rivers and canals. The possession of water-spinach is prohibited without a special permit.”

— Florida Fish and Wildlife Conservation Commission

Identifying water spinach in the wild is straightforward once you know the signs: a vine trailing at or near the water's edge, with arrowhead-shaped leaves and funnel-shaped "morning glory" flowers in white, pale pink, or lilac. Interestingly, even in parts of its native range, such as Orissa in India and the Philippines, researchers have studied it as an agricultural weed problem, trying to find vulnerable points in its lifecycle for control — a reminder that "crop" and "weed" are less fixed botanical categories than they are judgments about context and location.

A Plant of Two Reputations

Water spinach's story is ultimately one of context. In the wetlands and paddies of tropical and subtropical Asia, and increasingly in home gardens and small farms worldwide, it is a fast, forgiving, highly nutritious crop that can be harvested repeatedly from a single planting and thrives with minimal input, particularly in flood-prone land poorly suited to other vegetables. In the drainage canals and lakes of Florida and other warm regions where it has escaped cultivation without the natural checks of its native range, it is exactly the kind of aggressive, water-dispersed, fragment-propagating plant that ecologists dread. Growing it responsibly — in contained beds or ponds, away from natural waterways, and only where locally legal — allows people to enjoy one of the world's most versatile leafy greens without repeating the mistakes that turned it into a regulated invader in the first place.

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