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The First English farm journal from the house of Kerala Karshakan

Hydrangea

*A Magical
Spectacular
Flower*



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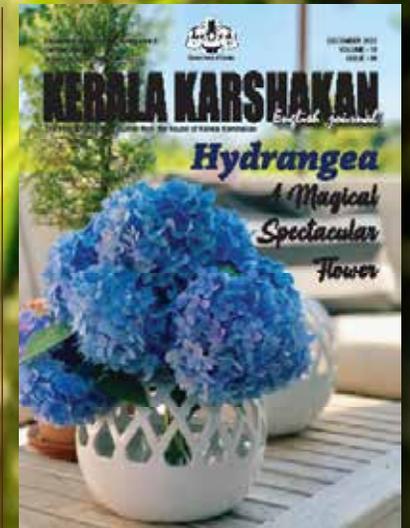


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Hydrangea

A Magical Spectacular Flower

What Are Hydrangeas?

Also commonly called hortensia, hydrangea make up a genus of more than 75 species of flowering shrubs. The name “hydrangea” is derived from the Greek word *hydria*, meaning “water vessel.” Although widely grown in the American Southeast, these plants are native to both Asia and North America. They can be either deciduous or evergreen and grow as climbing vines, trees, or—most commonly—shrubs.

- Hydrangea are one of the showiest and most spectacular flowering woody plants in the landscape, and are commonly grown successfully in many climates.
- This plant also has the added feature of being one of very few flowers that can be manipulated culturally to produce different color blooms.

History

- Originated in Japan
- In the 18th century, Hydrangeas were brought to England and they quickly became very popular flower throughout Europe
- Native Americans used the root as a diuretic and detoxifier. The bark of the hydrangea was used to ease muscle sprains and burns and is still used today



Bigleaf hydrangeas

as a tonic herb to treat bladder problems and kidney stones.

- Faial Island is an island of Portugal and is commonly called the “blue island” due to its abundance of native hydrangeas

Species of Hydrangeas:

Known for their beautiful blooms and soft, leafy foliage, hydrangeas range in size from one-foot-tall shrubs to 100-foot climbing vines. The size, shape, and color of hydrangeas vary among species:

1. Bigleaf hydrangeas (*Hydrangea macrophylla*): Known as Bigleaf, Florist, Garden, House, French or Japanese Hydrangea. There are over 500 named cultivars reported in existence. The coloring of *Hydrangea macrophylla* flowers depends on soil type. They have the ability to change bloom color based on soil pH. There are also a few white-flowered cultivars whose flowers may turn very pale pink or blue as they age. These are grown as both garden and pot plants.

These hydrangeas have two flower types: mopheads, which are notable for their large globe-shaped flower heads, and lacecaps, which have flattened heads of small flowers surrounded by a ring of large flowers. Bigleaf hydrangeas bloom on old wood in the spring, and they thrive



Smooth hydrangeas



Panicle hydrangeas

in shade.

2. Smooth hydrangeas (*H. arborescens*):

Smooth hydrangeas do well in spaces that receive morning sun and afternoon shade and require consistently moist soil. They bloom in the summer with flower colors that range from white to pink. Other than their smoothly textured leaves and shorter height, the *Hydrangea arborescens* is similar in appearance to bigleaf hydrangea shrubs.

3. Panicle hydrangeas

(*H. paniculata*): Panicle hydrangeas bloom in late summer and do well in colder climates. If you do not prune them, these deciduous hydrangeas can grow up to 15 feet tall. The *Hydrangea paniculata* thrives in direct sunlight and forms cone-shaped flower heads. Cultivars include Grandiflora, Tardiva, White Moth, and Limelight.

4. Oakleaf hydrangeas

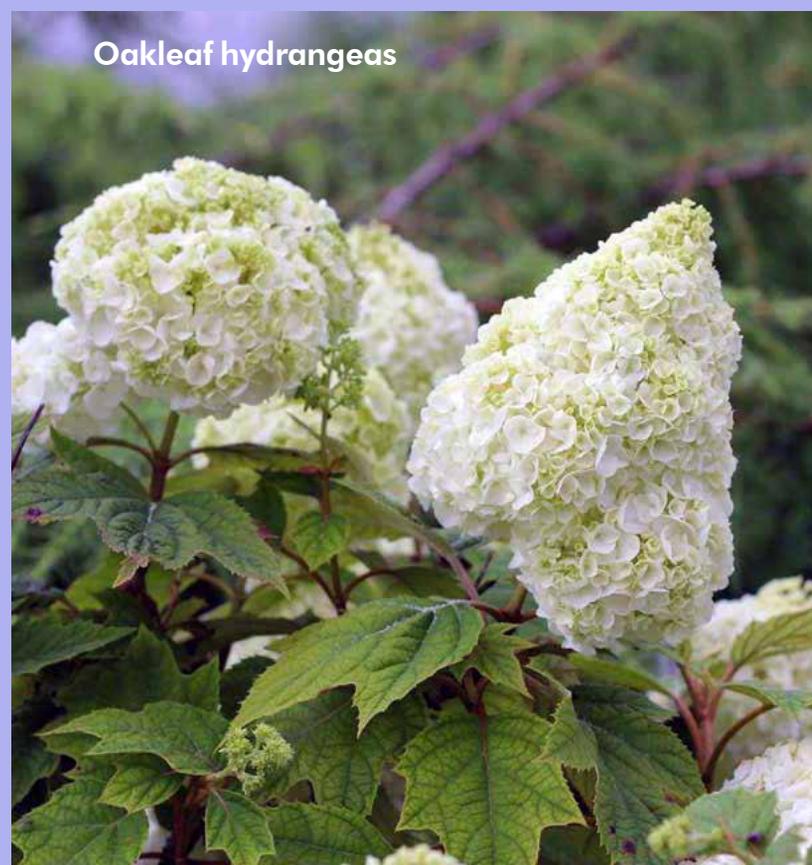
(*H. quercifolia*): Oakleaf hydrangeas flourish in full sunlight and grow in the woodlands of America's Southeast. Their color ranges from white to purple, and their large, lobed leaves are similar in appearance to oak leaves. They generally bloom early spring to mid-summer.

5. Climbing hydrangeas

(*H. anomalopetolaris*): These are vine plants that can grow up to 50 feet long or sprawl across 200 square feet of earth if grown without a structure to climb. They do well in part- to full-shade environments and their white flowers bloom in early summer.

6. Mountain hydrangeas (*H. serrata*):

Mountain hydrangeas bloom pink or blue flowers from June to August. They are similar in



Oakleaf hydrangeas

appearance to lacecap bigleaf hydrangeas, though their leaves and flowers are smaller. They grow best in part shade and range in height from two to five feet.

Flower colour

The color of big-leaf hydrangea flowers is dependent on a variety of chemical factors, and can range from blue to pink, with the possibility of all shades in between. There are white varieties of *H. macrophylla*, but changing the color of white varieties is not possible.

The true cause of color variation in hydrangea blooms is the amount of aluminum found in the flower tissue. This element binds with certain pigment complexes, causing them to appear blue in the presence of aluminum, and pink in its absence. Changing bloom color is not as simple as adding aluminum to the soil, because the plant's ability to take up aluminum is largely dependent upon the soil pH, and to a lesser extent dependent upon the presence of phosphorous.

Blue flowers- Hydrangea blooms will be blue under most natural conditions due to the fact that most soils have some aluminum present, and have the appropriate pH for uptake of that element. The ideal pH for blue flowers is in the range of 4.5 to about 5.5 because this is the ideal range for aluminum uptake. The presence of phosphorous can bind aluminum making it unavailable for uptake, and therefore prevent blue color even when ample aluminum is present in the soil. This should be a consideration when choosing fertilizer formulations. If a soil test shows that pH is in the correct range but aluminum is lacking, it can be added to the soil in the form of dissolved aluminum sulfate. This will add aluminum and acidify the soil, but care must be taken because aluminum can become toxic at high levels. Also, direct contact of this solution with foliage will cause burn.

Pink flowers- In order to produce pink blooms on hydrangea, it is necessary to inhibit the

Climbing hydrangeas





Mountain hydrangeas

uptake of aluminum. This can be achieved by raising pH to levels where uptake is inhibited, normally in the range of 5.7-6.2. Exact pH levels will vary and intermediate colors will result from pH levels in the middle of these ranges. Soil pH can be raised using lime, but care must again be taken to avoid direct contact with foliage. Raising the pH too high will lead to iron deficiency because uptake of this element is reduced under basic conditions. Exact rates of aluminum sulfate or hydrated lime will vary depending on existing pH, aluminum levels, and the buffering capacity of the soil. The only way to determine the pH, aluminum level, and nutrient needs of a soil is to submit a sample for a laboratory analysis. Soil nutrient analyses must be conducted before soil amendment takes place.

Hydrangeas are shrubs that come in a variety of types and a range of striking colors. They are relatively low-maintenance, flourish in shade or sun, and add elegance to any garden.

Types of Hydrangeas for Home Gardens

Within the six species of hydrangeas are numerous varieties, which provide nearly endless possibilities for sprucing up the

garden.

1. Limelight hydrangeas: Popular for its pale green flowers that bloom on new growth, the Limelight hydrangea is a great choice for colder environments. It grows relatively quickly and can reach up to 10 feet in height.

2. Cityline Mars hydrangea: The Cityline Mars is a bigleaf hydrangea featuring flowers



Limelight hydrangeas

with bold colors and patterns that are dependent on the pH of the soil in which it grows. It is native to Japan and grows one to three feet, and does best in direct sunlight.

3. Nikko Blue hydrangea: A mophead hydrangea, the Nikko Blue is native to Japan and thrives in partial shade. The vibrancy of its shade of blue depends on whether or not it is planted in acidic soil, and it ranges in height from four to six feet.

4. Incrediball hydrangea: The flowers of Incrediball hydrangea bloom in white, densely packed clusters that are supported on sturdy stems. They are native to the eastern United States and thrive in bright sunlight.

5. Zinfin Doll hydrangea: Known for attracting butterflies, this native of China and Japan grows best in full sun. Its flowers are mophead in shape and range in color from white to pink.

6. Gatsby Pink hydrangea: The Gatsby Pink prefers warm environments with partial shade. Its unusually shaped flowers bloom in white



Nikko Blue hydrangea

before cycling to pink, and it can grow as tall as eight feet.

7. Annabelle hydrangea: The deciduous Annabelle hydrangea is notable for its large, pure white flowers that can grow up to 12 inches across. It blooms in late spring to summer and often continues into the fall.

8. Invincibelle hydrangea: The Invincibelle is a smooth-leaf hydrangea that is valued for its hardiness. Its flowers are large—though not as large as the Annabelle hydrangea—pink, and

Cityline Mars hydrangea





Incrediball hydrangea

bloom on new wood in the summer and fall.

Growing conditions

Hydrangea plants grow best in well-drained soil that is high in organic matter. The plant requires a good deal of moisture; however, it is subject to root rots and other problems if the soil stays saturated for

extended periods. Hydrangea will thrive in full-sun when it is well established, but can also do well in partial shade.

Hydrangeas generally prefer slightly acidic soils in the pH range of 4.5-6.5, and manipulation of the soil pH is one key factor in controlling bloom color.

Propagation – Hydrangeas root fairly easily, and can even be started in water. Hydrangea species are relatively easy to propagate by seed, although seeds can be exceptionally small, or sexually. Stem cuttings and tissue culture (micropropagation) are the most common methods of commercially propagating hydrangea.

Hydrangea macrophylla and its cultivars are propagated as rooted cuttings. Softwood cuttings root easily using 1000 ppm IBA.

Pruning

Hydrangea is a plant that produces blooms on one year old growth, and this must be kept in mind when pruning the plants. The best time to prune is just after blooms fade in mid-

Zinfin Doll hydrangea





Gatsby Pink hydrangea



Invincibelle hydrangea

July to August, depending upon the location. This allows the plant to produce some new vegetative growth before winter dormancy, and it will be on this growth that flower buds are produced. Pruning too late in the season will cause the new vegetative growth to be susceptible to winter injury, and waiting until the spring to prune will remove the flower buds that were produced on last year's growth. On older plants, about one third of the oldest woody stems should be pruned to ground level in order to encourage the growth of new vegetative sprouts which will

bloom more prolifically than woody growth. 'Deadheading' or removing faded flowers will promote production of foliage.

Harvesting

Hydrangeas are commonly sold when they are 2-4 feet tall. Hydrangeas are generally a 3 year crop; depending on species, soil type, fertility, moisture, growth rate, pruning, etc; with harvesting occurring the last year or two.

Disease and Insect Concerns

The main disease concerns of hydrangea are fungal leaf spots that will develop if the foliage remains moist for extended periods, especially overnight when the temperature cools down.

Common foliar diseases include Botrytis blight (*Botrytis cinerea*), Cercospora leaf spot (*Cercospora spp.*), and powdery mildew (*Erysiphe polygoni*). All of these diseases can be reduced through cultural methods and controlled with various chemical options.

Hydrangea is also susceptible to root rot caused by a fungus-like organism, *Phytophthora nicotianae*. This is most common in container grown plants and is only a problem in the landscape on overwatered and poorly drained sites.



Annabelle hydrangea

INTRODUCTION

Pontederia crassipes (formerly *Eichhornia crassipes*), commonly known as common water hyacinth is an free-floating perennial aquatic plant (or hydrophyte) belongs to family Pontederiaceae consisting of about five species, native to tropical and sub-tropical South America. It is the sole species of the subgenus *Oshunae* within the genus *Pontederia*. It is known as “million dollar weed”, “Florida Devil” in South Africa, the “Terror of Bengal” in India and the “Japanese Trouble” in Sri Lanka, due

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“WATER HYCINTH AN INVASIVE AQUATIC PLANT”





A bowl of duckweed and water hyacinth

to its invasive growth tendencies. In China, the plant is called as “fengyanlian,” meaning the “lotus of phoenix’s eyes,” as the patterns on petals resemble the beautiful eye of the phoenix.

INDIAN AND GLOBAL SCENARIO

In India, water hyacinth growing potential states are Delhi, Uttar Pradesh, Bihar, West Bengal, Orissa, Andhra Pradesh, Tamil Nadu and Gujarat. It has been widely introduced in North America, Asia, Australia, Africa and New Zealand. They are found in large water areas such as Louisiana, or in the Kerala backwaters in India.

HABITAT AND DISTRIBUTION

Water hyacinth habitat ranges from tropical desert to subtropical or warm temperate desert to rainforest zones. It thrives in a wide range of fresh water habitats (shallow ponds, marshes, small streams, lakes and river). The most favourable growing temperatures ranges from 14 to 29°C, water pH about 7, low salinity, rich in N, P, K. Under such conditions, water hyacinth readily establishes and forms dense mats due to its efficient vegetative reproduction.

MORPHOLOGY

Water hyacinth grows in all types of freshwaters environments. It is found at the surface of rivers, lakes,



canals and ponds and may root in the mud of shallow waters. This plant varies in size from a few inches to over three feet tall. Water hyacinth is a rhizomatous and stoloniferous plant with long, pendant and adventitious roots.

Leaves: It has dark thick, glossy green ovate leaves in rosettes form with distinctive, swollen, bladder-like petioles. The leaves are 10–20 cm (4–8 inches) across on a stem, 5–10 cm in diameter, which is floating by means of buoyant bulb-like nodules at its base above the water surface. They have long, spongy and bulbous stalks. Leafstalk that is filled with spongy tissue and curved inward at the edges. *E. crassipes* leaves show anatomical characteristics of C_3 plants but the photosynthetic process shows some characteristics of the more productive C_4 plants.

Flower: flowers are mostly funnel-shaped, born on upright spikes with lavender to pink colour flowers with six petals (the upper petal with a prominent dark blue, yellow-centred patch). An erect stalk supports a single spike of 8–15 conspicuously attractive flowers. These flowers are 4–7 cm long and 4–6 cm wide, pollinated by long-tongued bees and they can reproduce both sexually and clonally. Flowers bloom from November to April. Water hyacinth has three flower morphs and is termed “tristylos”. The flower morphs are named for the length of their pistil: long, medium and short. The flower stalk is pubescent with two bracts; the lower bract forms a blade. The perianth tube is 15 to 20 mm long. The six

stamens have curved filaments and glandular hairs.

Fruit: Fruit is 3-celled capsules are 10–15 mm long, contain up to 300 seeds.

Seeds: Seeds are egg-shaped, oval at the base with a tapering apex measuring about 0.5–1.5 mm long. Each plant can produce thousands of seeds each year, and these seeds can remain viable for more than 28 years.

Root: Roots are fibrous, dark purple/black, and hang beneath the rosette. One of the fastest growing plants known, water hyacinth reproduces primarily by way of runners or stolons, which eventually form daughter plants anchored in mud or sediment in shallow water.

COMPOSITION OF WATER HYACINTH

Fresh water hyacinth is generally composed of 90 and 95 % of water. In India, one tonne (1.1 short tons) of dried water hyacinth yields about 50 liters of ethanol and 200 kg residual fiber (7,700 Btu).

REPRODUCTION

Water hyacinth reproduces by seeds, budding, fragmentation and stolon production. Daughter plants sprout from the stolons and doubling times have been reported of 6–18 days.

Life cycle

- Grows slowly during cooler winter months, starts rapid growth once temperatures rises.
- Flowering can begin as early as October and continue through the summer months. Each of the flowers on a stalk remains open for one to two days before beginning to

withier. When all the flowers on a plant have withered, the stalk gradually bends into the water and after about 18 days, seeds are released from capsules at the base of each dead flower. In warm climates, vegetative reproduction is rapid and enables the formation of large, dense rafts of plants within a short time.

USES:

Bioenergy: Bengali farmers collect and pile up these plants to dry at the onset of the cold season; they then use the dry water hyacinths as fuel. The ashes are used as fertilizer. One hectare (2.5 acres) of standing crop thus produces more than 70,000 m³/ha (1,000,000 cu ft/acre) of biogas (70% CH₄, 30% CO₂).

Waste water treatment: Water hyacinth removes arsenic from arsenic-contaminated drinking water. The plant is extremely tolerant and has a high capacity for, the uptake of heavy metals, including cadmium, chromium, cobalt, nickel, lead, and mercury, which could make it suitable for the biocleaning of industrial wastewater. The roots of *Pontederia crassipes* naturally absorb some organic compounds believed to be carcinogenic. In addition to heavy metals, *Pontederia crassipes* can also remove other toxins, such as cyanide, which is environmentally beneficial in areas that have endured gold-mining operations.

Agriculture

- Used as a source of organic matter for composting in organic farming. It is used internationally for fertilizer

Leaves



Fruit



Flower



Root



Seeds





and as animal feed and silage for cattle, sheep, geese, pigs, and other livestock. Water hyacinth is usually chopped and fed directly to animals and as green manure crop.

- In Bengal, the *kachuri-pana* has been used primarily for fertilizer, compost or mulch, and secondarily as fodder for livestock and fish. In Bangladesh, farmers in the southwestern region cultivate vegetables on “floating gardens” usually with a bamboo-built frame base, with dried mass of water hyacinth covered in soil as bedding. The method of this agriculture is known by many names including *dhap chash* and *vasoman chash*.
- Used for mushroom production.
- Used for compost and vermicompost making
- Water hyacinth leaf extract has been used as Bio-herbicide, shown to exhibit phytotoxicity against another invasive weed *Mimosa pigra*. The extract inhibited the germination of *Mimosa pigra* seeds in addition to suppressing the root growth of the seedlings.

Edibility: The plant is used as a carotene-rich table vegetable in Taiwan. Japanese cook and eat the green parts and inflorescence. Vietnamese also cook the plant and sometimes add its young leaves and flower to their salads. Fried hyacinth beans can actually make digestion smoother. The old Chinese medicine uses *Eichhornia* beans to keep the spleen healthy. The herb is also known to treat nausea, upset stomach, intestines, diarrhoea,

worms, etc.

Health benefits: Many skincare products contain hyacinth. The use of water hyacinth and its antimicrobial, antifungal, antibacterial properties make it a perfect choice for treating many skin related problems. In Kenya, some women use this water Hyacinth plant to promote lactation. A new mother can consume boiled hyacinth to get the most out of it. On the other hand, its flowers can help women suffering from irregular periods

Other uses

In various places in the world, the plant is used for making furniture, handbags, baskets, rope, mat, carpet, soap, paper and household goods/interior products (lampshades, picture frames). Broadly, leaves, stems, and roots of hyacinth are composed of cellulose, hemicellulose, and lignin. By adding water hyacinth pulp to the raw material of bamboo pulp for anti-grease paper can increase the physical strength of paper.

Impact

- It forms dense, impenetrable mats which clog waterways, making boating, fishing and almost all other water activities, impossible. Water hyacinth mats also degrade water quality by blocking the air-water interface and greatly reducing oxygen levels in the water, eliminating underwater animals such as fish.
- Destroys native wetlands and waterways, killing native fish and other wildlife and causes imbalance in the aquatic micro-ecosystem.

- Provides breeding ground for mosquitoes.

CONTROL:

Cultural/Physical: Very small infestations of water hyacinth may be controlled by handpulling. Water hyacinth thrives in nutrient-rich waters, so reducing nutrient concentrations in impacted waters, may decrease the vigorous growth of this plant.

Mechanical: Mechanical harvestors and chopping machines can be used to remove water hyacinth from the water and transport it to disposal on shore.

Chemical: Herbicides, such as glyphosate, diquat and 2,4/D amine have been used worldwide to reduce water hyacinth populations. 2,4/D leads to the death of water hyacinth through inhibition of cell growth of new tissue and cellular apoptosis.

Biological control: Biological control options for water hyacinth include various insect species, introduced plant pathogens and allelopathic plants.

- The 2 weevil species *Neochetina eichhorniae* and *Neochetina bruchi*, and the 2 moth species *Niphograpta albiguttalis* and *Xubida infusella* - These will eat stem tissue, which results in a loss of buoyancy for the plant which will eventually sink.
- Bacteria- A nitrogen fixing bacteria is concentrated around the bases of the petioles, but the bacteria do not fix nitrogen unless the plant is suffering extreme N-deficiency.
- Hippopotamus- Water hyacinth is a good food source of hippopotamus.

Since ancient times, the particular grass family known as bamboo has been closely entwined with culture and even

survival. This plant can be used for many different things, such as making furniture, handicrafts, musical instruments, cutlery, and building materials, among many others. Bamboo is currently very sought-after for its aesthetic qualities. Because of its decorative appeal and function as a visual and acoustic barrier, it is much

Bamboo

*a new member of
homegardens*



Ornamental Bamboos Budha Belly Bamboo

sought after for landscaping residential gardens and urban parks. Live fences, hedges, windbreaks, and other structures are also made of it. Because of this, diverse ornamental bamboo is becoming a popular addition to backyard landscaping and city parks.

Uses

Bamboo is used as hedges along pathways, or as partitions. These hedges are maintained by pruning the leaves at the end of the summer when the leaves tend to become brown. This will rejuvenate the

foliage and create a uniform growth habit. Bamboos are planted as live fences to hide unsightly views and to block out the noise. Maintenance includes yearly top pruning and removal of unwanted old clumps every two-to-three years. Tall bamboo is planted in a single line to form a fence with a spacing of about 3m x 3m. Besides serving as a windbreak, thorny bamboos give protection from other intruders. Medium-sized bamboos are the best planting material to grow as house plants or for decorating outdoors. To

maintain proper drainage and avoid water logging, pebbles are to be placed at the bottom of the pots.

Species and Site Selection

When a bamboo clump is fully developed, the type of rhizome, whether sympodial (climbing) or monopodial, determines the growth habit and overall look of the clump (running). Rhizomes spread out and flow in all directions in culm-forming bamboo, but they are ubiquitous in monopodial bamboo. The best soil for growing them in is one that is

well-drained, light, friable, and rich in organic matter.

Ornamental Bamboos
Budha Belly Bamboo
(*Bambusa ventricosa*)

Ornamental evergreen bamboo known as “Buddha belly bamboo” has swelling or bulging internodes that resemble the chubby belly of the Buddha. When planted in warm temperate settings as an attractive container plant, this tropical bamboo makes an amazing privacy screen. To create swelling internodes, the plant must be under-potted, let to dry out, or given insufficient fertilisation. It is mainly chosen for bonsai. It can reach heights of up to 40–55 feet in its natural habitat and 5-8 feet in containers. It prefers full sun to partial shade and does well in moist but well-drained soil. Bamboos are a better option for pots, screens, and hedges. Aphids, cottony scales, and bamboo borers are some of its main pests. Propagation can be done either using division or cuttings of sections of young rhizomes in spring.

Wamin Bamboo (*Bambusa vulgaris cv. Wamin*)

Wamin bamboo, also known as dwarf Buddha belly bamboo, is a small-sized evergreen bamboo with dark lustrous green canes that are ornamented with short internodes that resemble a Buddha’s fat belly. The cane supports up to 30 cm of skinny branches with long, green leaves. Up to 15 feet, it



Wamin Bamboo



**Hedge Bamboo /
Chinese Dwarf Bamboo**

can grow. Tall plants are great for containers and make good privacy screens. Handicrafts are frequently made from its culms. Cuttings or division are used in the propagation process.

**Hedge Bamboo /
Chinese Dwarf Bamboo
(*Bambusa multiplex*)**

A medium-sized evergreen bamboo known as “Alphonse Karr” has tall, erect, vivid golden-yellow canes with green stripes and panels. The culm’s golden hue changes from golden to orange-red in direct sunlight and deepens to golden-yellow with age. This

non-invasive bamboo is a great option for a private screen and makes a fantastic container plant. It can reach heights of 10 to 30 feet. It prefers full sun to partial shade and is useful for containers, screens, and hedges. In the spring, weak, dead, injured, or spindly stems are removed, and the plant is thinned to best display the stems. You can remove flowering shoots to stop more from growing.

**Variegated Bamboo
(*Bambusa multiplex f. variegata*)**

A sympodial bamboo is one that is densely tufted and

variegated. The culms have tips that arch and are erect. When young, internodes are green, smooth, and white waxy, and nodes are not enlarged. Although less so on culms and branches, this plant bears white stripes on its leaves. If well-maintained, these hedges, which grow to a height of 2.5-7 m, make excellent windbreaks. Clump division and culm cuttings are used to spread it. Because of the white stripes on its culms, branches, and leaves, it is often grown for decorative purposes.

Ivory Bamboo (*Bambusa vulgaris var. striata*)

Bambusa vulgaris, a sizable evergreen bamboo with arching golden-yellow canes, is one of the most commonly grown decorative bamboos. Green stripes, both wide and narrow, are randomly applied on canes. It will be 5 to 10 cm in diameter and up to 9.3 m high. When young, the culm sheath has a few yellow-green stripes and ranges in colour from orange to light green. It is a highly sought-after ornamental species for park landscaping because of its smooth, lustrous, golden-yellow culms that are striped with irregularly spaced, vertical green stripes. It is utilised as privacy screens and on banks, slopes, and hedges. It works well to control erosion, but once in place, it can be challenging to get rid of.

**Golden Bamboo
(*Phyllostachys aurea*)**

Golden bamboo has

edible shoots loaded with vitamins C and E, potassium, and alkaloids. Its stems, leaves, and roots have a medicinal purpose. They are considered antiseptic and antiulcer. It can also alleviate illnesses such as acne, ulcers, arthritis, and more. It is a running type of bamboo whose canes are generally green but they will become yellow when fully grown. With the help of sunlight, it develops a golden-yellow color. Other than being an ornamental plant, it is also used to build furniture, fences, scaffolding floors, and musical instruments. It also acts as a visual and noise barrier. Propagation is mainly through rhizomes

Planting and Propagation

The beginning of the rainy season is the optimum time to plant bamboo since it gives the plant a better opportunity of becoming well-established. Planting clumps that are two to three years old and cultivated in containers is the best strategy. Compared to planting stock that is recently split from the mother clump, these have a higher rate of survival.

You should dig the planting hole a day in advance. It is ideal to plant bamboo propagules in a hole that is 1 m x 1 m x 1 m in size. Before taking the plant out of the pot, soak it for 15 to 20 minutes. Plant the bamboo with the root ball intact and at soil level by using a shovel to loosen the dirt at the side of the pot. Runners or



Variegated Bamboo

monopodial have to be confined with plastic material to prevent them from invading other parts of the landscape.

Bamboo can be propagated vegetatively or by seeds, though the latter method is rarely utilised because few seeds are produced. Therefore, the vegetative method is being used. The ideal form of replication, nevertheless, is from seeds if they are available because they can be used when the clump's age is unknown.

The offset method, two-node cutting method, one-node split-culm method, and whole-culm method are all examples of vegetative propagation. The rhizome and bottom portion of a single culm (one to two years old) are divided into portions with 3-5 nodes when using the offset method. The culm is chopped at an angle, and the end will eventually be sealed with clay or dirt. A healthy mother clump's rhizome will be cut off at the rhizome neck. After the offset

has been removed, the rhizome section needs to be wrapped in damp sacks or banana leaves to keep it from drying out.

In a two-node cutting method, culm cuttings with two nodes, one full internode, and an open internode are used. 1.5-2-year-old culm should be taken with an open internode kept long as possible by cutting the next upper internode close to the third node. The basal portion of branches is pruned to about 10-30 cm. In the end, wax



Ivory Bamboo



Golden Bamboo

should be applied at both ends or wrap it with moist saw-dust/ coconut husk.

By making one-node cuttings from the chosen culm that has recently produced branches attached to the nodes, the one-node split-culm method can be used on 1.5–2 year old plants.

The poly bag's size is then decreased by cutting this in half. The node should have 1-2 branches that have been cut to a height of 10 to 30 cm.

With branches pruned and culms buried and raised in nursery beds, the whole-culm approach uses a culm that is between two and three years old. Unsegmented culms are pre-rooted, and rooted nodes are segmented. After that, the rooted nodes are removed from the unsegmented culms and placed in polybags.

Maintenance and Protection

The plant should be watered during the summer

when leaves begin to wilt.. Other maintenance includes thinning or removal of defective culm that may hamper the growth. The plant should be protected from animals, insects, rodents, and termites.

With varying uses and applications, bamboo has shown its presence besides humans since time immemorial. Ornamentation with bamboo can create a new resting area in our home gardens thereby beautifying them even more.

SPICE SPENT

*no more
a waste !*



Introduction

Spice oils and oleoresins are the major processed products obtained from spices and have huge demand in industry. There is a tremendous increase in the production and export of spice oils and oleoresins. Indian spice oil and oleoresin export has increased from 11,635 t in the year 2015-16 to 16450 tons in 2020-21 [DASD, 2021]. At present, spice spent obtained after oil and oleoresin extraction does not have any commercial utility. 80-90% of the bulk spice is left over as residue which do not find any commercial use or application and create disposal problem. Ayurvedic industry also generates large amount of residues, left

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Black pepper spent

over after extraction from spices during the preparation of various medicines. The meaningful utilization of spent waste from spice processing industry will reduce waste generation and increase resource recovery.

Scope and utilization of spent residues from spices

Spice spent is defined as repurposed waste biomass, or in other words, they are spice industry by-products, which is a source of bioactive compounds and functional ingredients like dietary fiber, mineral, and protein (Sowbhagya, 2019). It contains polyphenols & vital minerals like calcium, iron, magnesium and zinc. The dietary fiber content of the spice spent is much higher than that of many fruits and vegetables. Spice spents could be utilized for the formulation of functional foods, isolation of bioactive compounds, production of

bioactive films, nanofibers, synthesis of bioethanol and adsorption of dyes. It can also be used as starch source, component in composites for the improvement of tensile strength and thermal stability, as organic fertilizer and nematicide.

Black pepper spent

The fruits of black pepper have been widely used since time immemorial in the cooking practices and also in traditional ayurvedic medicines. Characterisation of spent residue from black pepper revealed that it has a total dietary fibre content of 51% and protein content of 14%. It was also a source of minerals. Spent pepper generated from processing industries could be utilized for extraction of oil, oleoresin and piperine and in formulation of nutraceuticals, as it retains 60% of valuable compounds even after industrial processing

(Prabhuet al., 2015). Results obtained from high performance liquid chromatography (HPLC) clearly suggested that purity of piperine from raw and spent peppers were close to that of a standard piperine. Hence, spent pepper generated from ayurvedic industries could be utilized for value addition by development of high value oleoresin and nutraceuticals for healthcare application.

Turmeric spent residue

Turmeric, the golden spice is primarily consumed in the form of powdered rhizomes for colouring and flavouring foods. Annually, 18000 t of spent residue are produced by the turmeric oil and oleoresin industry. This spent is not being utilized commercially at present. However, this spent waste can be utilized in several ways to produce value added products. Turmeric spent residue has





Ginger spent residue

potential application as a source of starch, phytochemicals and is utilized in food preparations. The partial replacement of rice flour with turmeric spent flour in foods, improved colour and overall nutritional status in terms of essential minerals and functional compounds such as curcuminoids. Turmeric spent oleoresin, left after separation of curcuminoids have presence of non-curcuminoids and bioactive components with impressive antioxidative activity and antimicrobial property which in turn indicates its utility in food, nutraceutical, cosmetic and pharmaceutical industries. Turmeric spent can be considered as an inclusion diet for the amelioration of diabetic status (Kumar and Salimath, 2014). Spent turmeric being

rich in starch can also be used for preparation of bioactive films and bionanocomposites, which showcases enormous potential as packing materials for food products. Nanofibers were successfully obtained from turmeric spent through acid hydrolysis accompanied with high pressure homogenization. This showed pronounced antimicrobial activity and good antioxidant activity that can be potentially applied in different fields, including preparation of bionanocomposites. A phytogetic feed additive formulation for broilers was prepared by incorporating bioactive compounds in nanofiber isolated from turmeric spent. Turmeric spent can also be used for manufacturing of ecopots which repels storage

pests.

Ginger spent residue

Ginger spent is a source of minerals, especially phosphorous (85.5 mg). Starch isolated from ginger spent had high gelatinization property and suitability for use in frozen foods. A potent antioxidant namely 3,5-diacetoxy-7-(3,4-dihydroxy phenyl) heptanes (Diarylheptanoid) was obtained from spent ginger, which could be made use of in food formulations. Incorporation of ginger spent into diet of rabbits resulted in improved growth performance and stimulates hypolipidemic and hypocholesterolemic effects, thereby increasing the safety margin of rabbit meat (Omageet al., 2007). Spent ginger is a rich source of carbohydrates and fermentation of carbohydrates

by *Saccharo myces cerevisiae* can result in production of bio-ethanol. An integrated biorefinery approach using spent industrial ginger waste for resource recovery is reported by Gao et al. (2021). Valuable products including ginger oil, starch, microfibrillated cellulose, bio-oil and hydrochar were obtained from spent ginger waste. Ginger nanofiber obtained from ginger spent was reinforced into different matrices like chitosan and polyvinyl alcohol by solvent cast method to get bionanocomposites. Due to the high durability and good antibacterial activity,

these composites can be used to make packing materials, organ retrieval bags, medical disposables and breathable wound dressing. Magnetic ginger nanofiber reinforced composite films were synthesized from spent ginger waste and these magnetic composites were explored as an adsorbent for removing copper (II) ions from aqueous solution.

Chilli spent residue

Chilli, a commercially important spice crop is valued both for its colour and pungency. The spent residue from chilli obtained after the oleoresin extraction, does not find any commercial value except around

1 % use in veterinary feeds. The chilli spent residue was found to be a good source of calcium, an essential mineral for bone health. The minerals such as magnesium, iron and zinc vital for tissue metabolism are also present in the spent waste. Addition of 10% chilli spent residue to bread, significantly increased the protein content and almost doubled the content of dietary fiber and minerals in the bread (Sowbhagyaet al., 2015). Addition of chilli spent in diet of white leghorn up to 5% improved egg-yolk colour without affecting feed intake, egg weight, hatchability and



quality of eggs (Yamiet al., 2002).

Coriander spent

Coriander spent after removal of oil and oleoresin was found to contain significantly high levels of total dietary fibre of 51.7% and high levels of minerals like calcium, potassium, iron, zinc and manganese. Coriander spent rich in dietary fiber and minerals was incorporated in the flour at 10% for the preparation of bread. The loaf volume, flavour, crumb grain, and shape of the bread were not affected by the replacement of bread flour by coriander spent (10%) (Chien and Potty, 1996). Coriander seed spent can also be used as a ready-to-use biosorbent for the removal of dyes from water and textile industrial effluent.

Spent cumin residue

Spent residue from cumin, obtained after volatile oil and

resin extraction by solvents, is not commercially exploited for food application at present except in veterinary feeds, that too, only to a small extent. Spent cumin residue have dietary fiber content much higher than that of many fruits and vegetables and is a rich source of protein, iron, zinc and other vitamins. Spent cumin when incorporated into foods, can modify the products texture, stabilize emulsions and improve shelf life. Hence it can be utilized as a basic ingredient for various food formulations and can find application in therapeutic foods. Soluble dietary fibre from spent cumin exhibited better prebiotic activity than that of prebiotic oligosaccharide inulin. Ramadevi et al. (2017) reported that broilers fed with feed containing 10 per cent spent cumin seeds showed increased high-density lipoprotein (HDL) cholesterol

level. Presence of niacin at 2.7 mg per 100g in cumin seeds can be a possible reason for elevating HDL levels. Cumin seed residue from ayurvedic industries could be utilized for the recovery of essential oil, oleoresin, and antioxidant dietary fiber. Spent cumin retained almost 80% of cuminaldehyde and compounds such as p-coumaric acid, cinnamic acid, and quercetin, which are of high biological significance especially in the prevention and management of many of chronic diseases (Arunet al., 2017).

Fenugreek, fennel and mustard seed spent residue

Fenugreek seed spent, a low-cost by-product of nutraceutical industry, is used as a new and efficient bio sorbent for the removal of Azo dyes (acid blue 113), triarylmethane dyes





(crystal violet) and malachite green dye from aqueous media and textile industrial effluent. Fennel seed spent was explored as potential adsorbent for removal of ethidium bromide (EtBr), a potent mutagen causing health hazards, and congo red dye, from aqueous solution (Sulthana et al., 2018). Mustard meal is a high quality nutrient

source and can be used as organic fertilizer. Application of mustard seed meals would give complete suppression of root knot nematode, *Meloidogyne incognita* in pepper.

Conclusion

Spice spent, a spice industry by-product, is a source of bioactive compounds and functional ingredients and has

versatile applications in many fields. The development of spice processing industries has made it necessary to look into the utilization of the by-products generated, to add value to the produce. Since India is one of the major producers of spices and spice products, there is a lot of potential for the usage of spice spent effectively. Thus, value addition and utilization of spent spices is important in terms of economic benefit and environmental safety.

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FINGER MILLET

AND ITS
AMAZING
HEALTH
BENEFITS

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Millets also known as nutriceals are small seeded cereals which are widely grown as cereal crops or grains for fodder and human food. In view of increase in public awareness on nutritional and health benefits of millets and its suitability to be cultivated under adverse conditions, the United Nations (U.N) has declared 2023 as the "International Year of Millets".

The word millet is derived from the French word "mille" meaning thousand. Finger millet locally known as "Ragi" or "Madua" (*Eleusine coracana* (L.) is the most important among small millets and has the potentialities to be exploited to meet the needs of dry land farmers. It is a self pollinated, allopolyploid crop, native to Africa with chromosome number $2n=4x=36$. The grain belongs to family Poaceae and the sub-family Chloridodeae and is originated in Ethiopia (Ramashia et al., 2018). Different

cultivars of finger millet grain exist with brown, light brown and white grain colour which can be used as distinct means of cultivar differentiation (Devi et al., 2014; Kumar et al., 2016). The white cultivars have been developed mainly for the baking industry and the brown and light brown types are mainly used for porridge (Sood et al., 2017).

Finger millet is hardy in nature and can be grown in poor soils with low moisture and nutrients. It is well suited to upland farming ecosystems because of



Popularization of Finger millet



its faster growing habit, early maturity and better performance under adverse conditions. Ragi is a climate resilient crop that can withstand drought and even salinity and water logging to some extent. Wider adaptability and higher nutritional quality, higher multiplication rate and longer shelf life under ambient conditions makes finger millet an ideal crop for use as a staple food and famine reserve

Area and production

In India finger millet occupies an area of 10.16 lakh hectares with a production of 13.85 lakh tonnes and a productivity of 1363 kg ha⁻¹. Among the major finger millet growing states in India, Karnataka is the leading state in

area and production (Agricultural Statistics at a glance 2017-18). Apart from India being its largest producer, finger millet is the oldest cultivated cereal crop in India and is referred to as “nrttakondaka”, although also named “rajika” or “markataka” which means dancing grain (Shobana et al., 2013).

Health and Nutritional Benefits

Finger millet is an important crop in terms of its nutritional and pharmaceutical attributes. It can be used as an essential protein supplement in order to overcome malnutrition in children and lactating women all over the world. Calcium which is predominantly present in finger millet, plays an essential role in

growing children, pregnant women, the elderly as well as in people suffering from obesity, diabetes and malnutrition. In addition to that, calcium aids in maintaining bone strength and teeth health in adults. Finger millet has a low glycemic index hence it can keep blood sugar level in control. Dietary fibres in ragi support gut health and decreases the risk of colon cancer. Finger millet is also a rich source of micronutrients such as iron which prevents anaemia, zinc that boosts immunity, copper which helps in sustaining energy levels and manganese that is essential in formation of connective tissue. Polyphenols are regarded as major antioxidants that plays an

important role in maintaining the body immune system. Phenolic acids and tannins are considered as main polyphenols present in finger millet, while flavonoids are reported to be available in small amounts.. Tannins in the outer layer of the grain, serves as a physical barrier to fungal invasion and plays an important role in the biological function of plants and humans (Devi et al., 2014). Tannins which were once considered as antinutrients, are now considered as nutraceuticals as they can contribute to antioxidant activity which is an important factor in healthy aging and prevention of metabolic diseases (Shibairo et al. (2014)).

Constraints in finger millet production

In spite of its nutritional and therapeutical attributes, there are several constraints in finger millet production in India. Major constraints are limited exploration and utilization of the germplasm, lack of high yielding improved cultivars for the different finger millet production agro-ecologies, absence of production support when compared to the support enjoyed by other cereals, lack of appropriate post-harvest processing technologies, lack of remunerative price in market that has led to farmers shifting from finger millet to high value crops. Change in lifestyle and food habits has led to less preference for consumption

in many areas due to black or brown colour of the finger millet. Land degradation due to soil erosion, improper usage of fertilizers, insects, disease especially blast disease caused by *Pyricularia grisea* and rat damage are other hindrance in ragi cultivation.

Popularization of Finger millet

Karnataka government has started an initiative to popularize finger millet by developing products as well as by branding of Karnataka ragi. Much of the efforts till date have been to increase millet productivity at the farm level. Additional effort are needed to develop the consumer interest in the cereal.

According to ICRISAT, developing appropriate consumer products is a key component to change the image of millets and to make them more modern. Development of appropriate processing technologies are essential to make finger millet popular among consumers. Verma and Patel (2017) has discussed examples of value added products and possibilities of utilizing finger millet as one of the basic ingredients. The products discussed includes multi grain flour, papad, puffed finger millet mix, noodles, ragi soup, raipakora and ragivada.

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A *llium* L., one of the largest genera in the family Alliaceae, has about 1,100 species distributed world-wide. The genus *Allium* naturally occurs in dry seasons in the northern hemisphere and South Africa. The primary centre of evolution for the genus extends across the Irano-Turanian bio-geographical region, and the Mediterranean basin and western North America are considered as the secondary centres of diversity. The genus is

characterized by bulbs that are enclosed within the membranous or fibrous tunics, free tepals and well-known characteristic plant odour and taste due to the presence of cysteine sulphoxides. The Indian *Allium* includes over 10 subgenera, 22 sections and 35–40 taxa excluding cultivated species distributed in different eco-geographical areas of the temperate and alpine regions of Himalayas sharing many taxa of Chinese origin. Indian Himalayan region has two distinct centres of diversity, the western Himalaya (over 85

per cent of total diversity) and the eastern Himalaya (6 per cent), covering the alpine-sub temperate region (2500–4500 m msl). *Allium negianum* is an onion species that is discovered from Himalayan region of Uttarkhand at 2019.

Habitat

Slopes, sandy soils along rivers and streams along the alpine meadows (altitude 3000–4800 m msl) in Sumna valley (villages Gamsali, Niti, Tolma, Kailashpur and Farkya) in Chamoli district near Malari glacier of India.

Allium Negianum

R E C E N T L Y D I S C O V E R E D

Onion

SPECIES IN UTTARKHAND

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Etymology

The specific epithet, “negianum”, is named in honour of Late Dr. Kuldeep Singh Negi, an eminent explorer who has dedicated his life in collection of indigenous *Allium* species germplasm. He was also instrumental in establishing the *Allium* Field Gene Bank (FGB) at the Regional Station, Bhowali, Uttarakhand.

Vernacular/local name

Pharan, Phran, Jambu, Sakua, Sungdung, Kacho

Taxonomy

Globally *Allium* subgenus

Rhizirideum has 37 taxa that are included in four sections distributed mainly in Europe-East Asia, in China and also in Russia, Mongolia and Kazakstan. The section *Eduardia* of the subgenus *Rhizirideum* is mainly distributed in the western Himalaya with Pakistan on the west and Nepal and Tibet in the centre, and southwest China on the eastern side. The subgenus *Rhizirideum* is the smallest subgenus of *Allium* as per the flora of India, and it is represented only by the section *Eduardia*. The taxa under subgenus *Rhizirideum* are

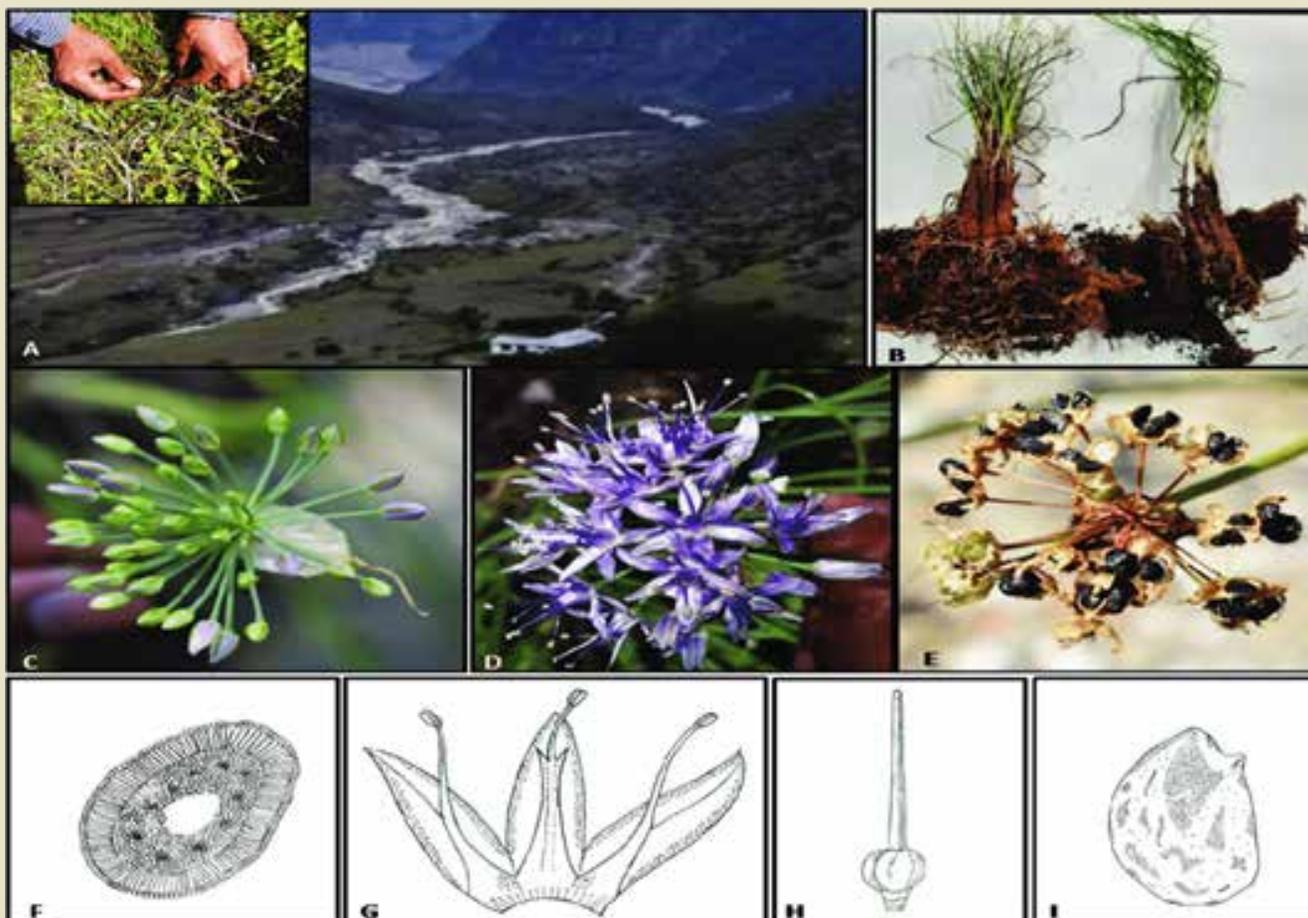
characterized by the presence of several narrowly ovoid-cylindric bulbs, which borne on creeping rhizome usually covered with a common reticulate membrane, leaves shorter than scape, long beak, nearly 2 to 3 times longer than the base and hemispherical umbel.

Distribution and ecology

The section *Eduardia* of the subgenus *Rhizirideum* is distributed in the southern most range of the Himalayan region of India extending to China which is the centre of diversification. *Allium negianum* is a species







A) general habitat B) bulb covered with reticulate fiber on bulbs of *A. przewalskianum* (orange-red) and *A. negianum* (red-brown) C) inflorescence and spathe with a very long beak, persistent D) inflorescence E) capsule with mature seeds F) line-illustrations of transverse section of leaf showing hollow channel G) longitudinal section of flower with stamen with two sharp teeth H) ovary I) seed with prominent beak

recorded from the southernmost transitional zone between India and China.

The distribution of *A. negianum* is restricted to the phytogeographical region of western Himalaya from Sumna valley, Malari, Chamoli district of Uttarakhand, in western Himalaya, India where it commonly occurs along the open grassy meadows, sandy soils along rivers and streams occurring in the snow pasture lands along the alpine meadows in synanthropic habitats. Indiscriminate harvest of leaves and bulbs used for 'seasoning' purposes has threatened its wild population. The first report on large scale cultivation of this

taxon in Niti valley, Uttarakhand, as 'seasoning allium spice' called 'jambu' and 'phran'.

Botany

Plant: Herbs, hermaphrodite, 27–50 cm tall. Rhizome condensed, 6.5–8.5 mm long, oblique.

Bulb: Clustered, cylindrical to narrowly ovoid, 0.8–1.2 cm in diameter, 6.8–12 cm long, outer tunic finely reticulate, reddish-dark brown, inner membranous, light-brick red.

Leaves: 4–6, slightly shorter than scape, 12–40 cm × 1.0–3.2 mm, erect, to semi-terete to terete, dark green; base slightly bulbous. Scape terete, semi-erect, covered with leaf sheaths at base only, stout, solid in cross-

section (hollow in mature), 15–30 cm × 3.5–5.5 mm. Spathe 1-valved, persistent, beak very narrow-long, 2.5–4 mm.

Inflorescence: Umbellate, hemispheric, 30–40 lax flowered. Peduncle subequal, 16–18 × 2–3 mm, without bulbils.

Flowers: Bisexual, perigone campanulate, tepals dark purple with distinct green mid-line; inner tepals slightly longer than outer ones, oblong-lanceolate, apex acute, 6–8 × 3–4 mm; outer segments ovate to narrowly so, 5.5–6 × 2.5–3 mm.

Stamens: Anthers oblong, yellow-purplish (on maturity), 2.3–2.6 mm long; filaments subequal, 6.8–8.5 mm, purple, slightly exerted, connate at

Character	<i>A. przewalskianum</i>	<i>A. negianum</i>
Habitat	Carbonaceous slates-gravel; 3300–5200 m	Grassy meadows, open sandy slopes, along rivers/ streams; 3000–4800 m
Plant habit	Erect	Semi-erect
Plant growth	Robust, shorter	Taller
Plant height (cm)	20 – 45	27 – 50
Bulbs no. in cluster	2– 4	2 – 7
Bulb no., shape	Cluster 3–4; cylindrical-narrowly ovoid	Cluster 4–8; cylindrical-narrowly ovoid
Bulb length (cm)	10.2–12.5	6.8–12
Bulb diameter (cm)	0.6–0.7	0.8–1.2
Tunic outer	Finely reticulate; reddish- orange-brown	Finely reticulate; reddish-dark brown
Tunic inner	Membranous, brown-red	Membranous, orange-red
Rhizome type; size (mm)	Vertical, short; 3–5	Oblique; 7–12
Leaf no., colour	3–5, lighter brown-green	4–6, dark green
Leaf length (cm)	15–30	12–40
Leaf width (mm)	2.0–2.5	1–3.2
Leaf erectness	Erect	Erect-semierect
Leaf waxiness	Non-waxy	Waxy
Umbel flower opening pattern	Synchronous (80 per cent)	Asynchronous(30–40 per cent)
Umbel shape	Spherical-hemispherical, densely flowered, compact	Hemispherical, lax, loosely flowered
Flower color	Pale red-purple pink (variable)	Dark purple
Perigonium shape and color	Campanulate, pink-dark purple, tepal wide open	Campanulate, lilac, light to dark purple, tepal partly opened
Seed color	Dull black	Shiny black
1000 seed wt (g)	2.12	2.73
Odour when crushed	Strong onion-light garlic	Strong onion-garlic

base and adnate to perigone segments; outer ones subulate; inner ones broadened for 1/2–1/4 to their length, one sharp toothed on each side.

Ovary: sub-globose, purple-tinged, 3.6–4.8 × 1.8–3.5 mm. Style: terete, exerted, stigma smooth, acute-acuminate, ovules 2 per locule.

Seed: Capsules trigonous, 5–5.5 × 5.8–7.2 mm; seeds obovate with a prominent notch

on one side, 3.2–4.0 × 1.9–1.9 mm, testa deep black. Plant has strong onion-garlic type aroma.

Phenology

Flowering and fruiting is from June to middle September (altitude 3000 – 4800 m msl)

Closest relatives

It is distinct from its closest relative, *A. przewalskianum* Regel, the only taxon of subgenus *Rhizirideum*, section *Eduardia* in India.

A. negianum is clearly distinguished from *A. przewalskianum* particularly characters of the bulb tunic color when fresh, umbel, teeth in filament. *Allium negianum* is diploid ($2n = 2x = 16$) whereas *A. przewalskianum* is reported to be tetraploid ($2n = 4x = 32$) as well as diploid. Major morphological characters of *Allium negianum* in comparison with *A. przewalskianum*.

Fresh Flower Arrangement

A Traditional
Decoration Method

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Flower arrangement is a tribute to nature and profound creation which is attempted to establish a communion with nature by capturing some of splendor and framing it in a conceived design. Two types of flower arrangement commonly employed viz., Fresh flower arrangement and Dry flower arrangement. Fresh flower arrangements were commercially exploited in wedding decoration, spiritual places, public official function etc.,. whereas dry flower products were produced in a

separate manufacturing unit and a standard export market was established in our country. One of the greatest advantages of flower arranging is that we can produce as attractive effects with the humblest of materials, like a twisted branch picked up during the morning walk, and just a few blooms gathered from your garden. In our culture, flowers were used in daily basis, most of the ornamentals which remains fresh and attractive can be utilized in creating a wonderful fresh flower arrangement.

Different forms such as bouquets, wall hangings, arrangement of flowers in spiritual places, garland making forms a variable flower arrangement

Types of fresh flower arrangement

- Western style
- Eastern or Japanese style
- Free style

Western style

Mass arrangement of fresh flowers in symmetrical pattern in which more number of flowers included. In European countries, this style was primarily used to decorate palaces, mansions and churches.

Traditionally, triangular, round or oval shapes were created, but after the Second World War, more designs like the L-Shape, Crescent and S-Shape were also introduced. A vase for a western arrangement requires to be fitted with a pin holder as well as a wire-netting. It also make use of an 'oasis' or a block of plastic foam which is very light but becomes solid and heavy when it is immersed in water for approximately twenty minutes. The block can be conveniently cut with a knife and is fitted to fill the entire diameter of the vase. It is easy to simply push in the flowers in this sponge-like substance, but being damp, once the stems are fixed, it is advisable not to remove them as the oasis starts to crumble. As it retains water, flowers last in an oasis just as they would in a vase, but a fresh oasis has to be used each time for an arrangement. Cut flowers like rose, gerbera, gladiolus, chrysanthemum, liliun etc., were used in creation of standing bouquets.

Eastern or Ikebana style

Ikebana is the Japanese tradition of flower arrangement,

also known as kado, the "way of flowers". More than simply putting flowers in a container, Ikebana is a disciplined art form in which nature and humanity are brought together. Contrary to the idea of floral arrangement as a collection of particolored or multicolored arrangement of blooms, Ikebana often emphasizes other areas of the plant, such as its stems and leaves, and draws emphasis towards shape, line, form. Though ikebana is a creative expression, it has certain rules governing its form. The main rule is that all the elements used in construction must be organic/natural such as branches, leaves, grasses, or flowers. The artist's intention behind each arrangement is shown through a piece's color combinations, natural shapes, graceful lines, and the usually implied meaning of the arrangement. The structure of a Japanese flower arrangement is based on a scalene triangle delineated by three main points, usually twigs, considered in some schools to symbolize heaven, earth, and man and in others sun, moon,

Flower Rangoli



love and earth. The container is also a key element of the composition, and various styles of pottery may be used in their construction.

Free style

Combination of western and eastern style. According to the need, decoration method varies. Mass appearance of flower arrangement is recommended in flower vases at official environment. Eastern style mixed western style arrangements used in marriage functions with cut flowers like gerbera, carnation, rose, gladiolus, orchids,



lilies etc., Line arrangement on stages and podium were widely commercialized. In south Indian tradition, Rangoli (Floor decoration) is popular in Kerala and Tamil Nadu during onam festival. Commercial loose flowers like marigold, chrysanthemum, Nerium, cock's comb, Pinwheel jasmine (Nanthiyavattai), Temple tree flowers and also some of



Free style

Foliage/filler (Green coloured) supplements were given by Casuarina and Thuja.

Flower Rangoli

A traditional flower rangoli making involves the following steps

- Collection of loose flowers and foliage preferably in the morning
- Formation of one layer of sand on the floor and sprinkling of water above the sand

- Drawing the design of interest (Outline) using fingers or small wooden sticks which make sure the border between the arrangement of two different flowers
- Filling of suitable and contrast flowers as per the design
- All the three classified style of flower arrangements were traditional in nature in which eastern style is attached with Chinese and Japanese culture whereas mixed style/

free style widely adopted in Indian tradition.

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