Wild Vegetables: Morphology, Phytochemistry and Utility

Part 1

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Wild Vegetables: Morphology, Phytochemistry and Utility *(Part 1)*

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FOREWORD

Humans are dependent on plants for their food. Total 75% of the food supply to humans is drawn from just 12 crops and five livestock species. However, natural calamities, climate change, and other human activities pose a risk to the productivity of these species, with some potentially facing extinction. The ultimate goal of all scientists and policymakers is to see a hunger-free world. In this scenario, there is a need to expand the food base. Taking this into account, the book titled Wild Vegetables: Morphology, Phytochemistry and Utility by Dr. Ganesh Chandrakant Nikalje, Ms. Apurva Chonde, Dr. Sudhakar Srivastava, and Prof. Penna Suprasanna is a welcome step. In the global scene, there is a vogue to have plants as food from natural sources. I am happy to see the book with detailed information on the plants with their scientific name, names in different languages, their distribution, propagation and recipes. Many wild vegetables, especially leafy vegetables, have several essential elements like magnesium, calcium, sodium, etc. In villages and small towns like Anantapur, where I live, street vendors sell wild vegetables. The book gives detailed information on wild vegetables. The book also gives colour photographs for easy identification of wild vegetables. I am sure this book will be useful to both research scientists and laymen. This book will be a valuable resource for agriculturists and horticulturists to develop high-yielding varieties of these wild vegetables and for developing cultivation techniques. For nutritionists, it will be beneficial to fortify the human diet with vitamins and essential micronutrients.

I must congratulate all the four authors for this excellent book. I am sure this book will get a wider readership. This can be recommended to the students of Food Science and Nutrition.

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PREFACE

Biodiversity is an extremely important and balancing factor for the sustainable environment and ecosystems. Every single individual life form from the bacteria to higher evolved life forms is a component of Earth's ecosystem. Biodiversity refers to the relationship among various organisms and, encompasses diversity and ecosystem. Biodiversity constitutes the life support system for humankind for several needs including food, fodder, fuel, timber, pharmaceuticals and energy, and associated services (i.e. air and water, decomposition of wastes, recycling of carbon and nutrients, regulation of climate, regeneration of soil fertility, and maintenance of biodiversity).

Land use change, alterations in river flow, soil, water, and air contamination, misuse of marine resources, industrial activities, increasing population, and enhancing uniformity of food choices are the threats to biodiversity sustainability. The expansion of urban cities as well as rural agricultural activities has reduced the natural biodiversity-rich regions. The human's ability to adapt to environments and to interact with nature led to the use of wild plants and resources for their consumption in a sustainable manner. With the evolution of humans from the early hunter-gatherers to present times, and across unique variation ranges, plants have assumed extraordinary importance in human societies and, there is an interest in many wild species especially for meals and medicines. However, the increasingly prioritized choice for food sources (grains, fruits or vegetables) has promoted extensive cultivation of a few types of plants, while the rest of the plant types are becoming extinct or restricted.

Presently, nearly thirty domesticated crop species constitute a good-sized part of the dietary range and only three principal cereal grains (rice, wheat, and maize) make contributions to greater than half of the world's calorie consumption. While this is apparent, there are major cultivated vegetables, in which a number of 'fit to be eaten' species remained wild or semiwild, and had been left out during the process of domestication. However, these underutilized safe-to-eat elements have great potential to transform our food bowl in a more nutritious direction. The shift can enable the journey to a sustainable and climate change-resilient cultivation practice. The wild flora has played a very important role in contributing to the nutrition requirements of humankind all over the world and can continue to do so in the near future provided humans are aware of the potential accrued benefits.

Vegetables are consumed throughout the world for edible purposes. However, in the course of social and industrial evolution over the past few centuries, globalization has led to the homogenization of dietary habits. In the course of events, wild local relatives of a number of vegetables have been forgotten by the people and their consumption has decreased over the years. Such genetic resources of wild relatives of vegetables are decreasing and their cultivation is also getting reduced drastically. There is a need to impart knowledge to young students, researchers, and common people about the vast resources of wild relatives of vegetables in India.

This book focuses specifically on the Western Ghats, which is a huge reservoir of genetic reserve of a number of plants. The book provides ethnobotanical details, medicinal applications, phytochemical composition, and culinary notes of more than 120 wild vegetables belonging to 50 families. The information of wild vegetable plants is arranged alphabetically by family name, with each plant described in a consistent format. This book is divided in two volumes; the first volume consists of 23 families (Acanthaceae to

Euphorbiaceae) and the second volume contains 27 families (Fabaceae to Zygophyllaceae). The book shall act as a useful resource material for plant lovers, nature-enthusiasts, researchers and academicians, and those interested in food and nutrition.

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INTRODUCTION

The United Nations Development Programme (UNDP) Sustainable Development Goals aim "to end poverty, protect the planet, and ensure that by 2030, all people enjoy peace and prosperity." However, extreme hunger and malnutrition continue to hinder progress in many parts of the world. In 2022, approximately 9.2% of the global population faced hunger, which increased from 7.9% in 2019, and about 2.4 billion people experienced moderate or severe food insecurity (FAO, IFAD, UNICEF, WFP, and WHO, 2023). Throughout history, humans have utilized a significant number of plant species, estimated between 40,000 and 100,000, for various purposes (IPGRI, 2002). Of these, around 30,000 are considered edible, and approximately 7,000 have been cultivated or collected for food (Asfaw, 2001; Arora, 2014). However, with the Green Revolution, many traditional crops were replaced by high-yielding varieties developed through breeding techniques, jeopardizing the diversity of plant species used for food and other purposes (Ebert, 2014; Guzo *et al.*, 2023). This loss in diversity may contribute to increased hidden hunger and undernourishment (Nikalje *et al.*, 2023). To circumvent such difficulties, diversifying food sources by increasing the usage of wild vegetables offers a promising strategy. Wild vegetables are naturally occurring plants suitable for human consumption, providing unique flavors and valuable nutrients distinct from cultivated plants. Wild vegetables thrive in diverse environments, such as forests, meadows, coastal areas, and deserts, and are often more resilient to harsh conditions, growing at minimal cost (Duguma, 2020). Despite their potential, wild vegetables remain underutilized and unavailable to the public at large, and are often limited to rural areas where they are most abundant (Leakey *et al.*, 2022). Increasing awareness and research on their domestication could promote sustainable agriculture, food security, and economic growth in rural communities (Luo *et al.*, 2022).

Wild vegetables can supplement human diets with proteins, essential minerals, and micronutrients, contributing to nutritional quality (Ogle, 2001). They provide an affordable source of nutrients for rural and semi-urban societies (Ickowitz *et al.*, 2016; Jones, 2017). Diverse diets are crucial for optimal nutrition, health, and well-being (FAO, WFP, and IFAD 2012). However, many low-income families in low- and middle-income countries consume staple-centric diets that lack diversity (Jones, 2017). Including wild edible foods in these diets could improve nutrition in an affordable way (Ickowitz *et al.*, 2016).

For indigenous and non-indigenous populations, wild edible plants serve as staple or complementary foods (Ju *et al.*, 2013). In rural regions, especially in drylands, they play a vital role in food security by filling seasonal gaps and serving as emergency foods during famines (Soromessa and Demissew, 2002). Many indigenous communities believe wild foods better maintain health. During periods of scarcity, over 70% of wild edible plants are consumed as stored food resources dwindle (Teklehaymanot *et al.*, 2010). Raising awareness about these plants could encourage their more frequent inclusion in diets, and support the rural economy.

However, several challenges limit their broader acceptance. The lack of knowledge about their identification, nutritional benefits, and safe preparation can deter people from consuming them. Limited seasonal availability, labour- intensive foraging, and the risk of mistaking

edible plants for toxic look-alikes are additional barriers. Furthermore, some wild vegetables contain antinutritional compounds (*e.g.*, oxalates, tannins, and phytates) that can hinder nutrient absorption if not properly prepared (Ngurthankhumi *et al.*, 2024). Overharvesting can threaten their sustainability, and the absence of formal supply chains limits market availability. Finally, their strong or unfamiliar flavors may not align with consumer preferences, restricting their integration into modern diets.

The main intent of this book is to enhance efforts toward awareness and promote research on the domestication of wild vegetable plants. This could pave way for sustainable agriculture, food and nutritional security, and economic progression in rural areas.

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KEYWORDS

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CHAPTER 1

Wild Vegetables of the Family Acanthaceae

INTRODUCTION

The Acanthaceae, also known as the acanthus family, is a large and diverse group of flowering plants consisting of almost 250 genera and about 2,500 species. Some Acanthaceae plants are good sources of essential vitamins and minerals, including vitamins A, C, K, calcium, iron, and potassium. At the same time, some are good sources of essential fatty acids, including omega-3 and omega-6 fatty acids. However, the presence of Cystoliths (calcium carbonate crystals) is a characteristic feature of this family. At high concentrations, it can irritate the digestive system and potentially reduce nutrient absorption in high quantities. (Gabel *et al.*, 2020).

Hygrophila auriculata (Schumach.) Heine

Botanical name: *Hygrophila auriculata*

Family: Acanthaceae

Local name: Kolshinda

Vernacular name:

- **Bengali:** Shulamardan
- **Gujarati:** Ekharo, Kanta Sheriyo, Talimkhana
- **Hindi:** Bhankari, Gokshur, Kokil-ankh, Kshura, Tal Makhana, Trikat, Trivarnak
- **Kannada:** Gokantaka, Gokshura Kolavalike, Kolagulike, Kolavanke
- **Malayalam:** Vaya Schulli
- **Marathi:** Ekhara, Gokshura, Kolista, Kolsunda, Saranta, Talimkhana
- **Oriya:** Koilikhia
- **Punjabi:** Talmakhana
- **Sanskrit:** Kokilaksah
- **Tamil:** Nir-mulli
- **Telugu:** Enugu palleru, Kokilaksi, Vana-sringatamu

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Season: Flowering: October-April.

Parts used: Leaves, roots, and seeds.

Characteristics:

1. Growth Habit: *H. auriculata* is an herbaceous plant that typically grows as an aquatic or semi-aquatic perennial. It has a prostrate or ascending growth habit, with stems that can be either submerged or emergent depending on the water depth (Atal *et al.*, 1982).

2. Leaves: The leaves of *H. auriculata* are simple, opposite, and have distinct characteristics. They are lanceolate or elliptic in shape, about 5-15 centimeters long, and 2-5 centimeters wide. The leaf margins are serrated or toothed, and the upper leaf surface is usually green, while the lower surface can be reddish-purple (Atal *et al.*, 1982).

3. Flowers: The flowers of *H. auriculata* are small and typically arranged in clusters or spikes. They are bilaterally symmetrical and have a tubular shape with five petals. The flower color can vary, but it is commonly white or pale purple (Atal *et al.*, 1982 (Fig. **1.1**).

Fig. (1.1). flowering twig of *H. auriculata* (PC: Shrirang Bhutada).

4. Inflorescence: The inflorescence of *H. auriculata* is a spike-like or raceme-like structure that arises from the leaf axils or stem nodes. It consists of several flowers arranged in an elongated cluster (Atal *et al.*, 1982).

Distribution:

Native to the Indian subcontinent- India, Sri Lanka, Bangladesh, and Myanmar.

Propagation: Seed

Chemical constituents:

Alkaloids, Apigenin 7-O-glucuronide, Betulin, Butelin Fatty acids, Hentricontane, Leutolin, Luteolin-7-O-rutinoside, Lupeol, Lupeol Methyl 8--hexyltetracosanoate, Stigmasterol, Stigmasterol 25-oxo-hentriacontyl acetate (Bairaj *et al.*, 1982; Govindachari *et al.*, 1957; Misra *et al.*, 2001; Quasim *et al.*, 1967).

Recipe:

The young leaves are chopped and cooked either alone or in combination with other vegetables like peas or amaranth. Coconut milk or groundnut paste is then added, and the dish is served with a staple such as rice.

Uses:

1. Ayurvedic Medicine: In Ayurveda, the seeds, roots, and panchag (five parts of the plant, including the root, flowers, stem, fruits, and leaves, burnt together as ash) are used as medication. This plant possesses hepatoprotective and antioxidant properties, helping to reduce toxic accumulation from certain therapies.

2. Anti-inflammatory and pain relief: The plant is used traditionally to treat inflammation and pain (Hussain *et al.*, 2010).

3. Urinary tract infections: It is also used to treat urinary tract infections, edema, and gout, and as a diuretic (Neharkar *et al.*, 2015).

4. Blood sugar control: Studies suggest it may have hypoglycemic activity, potentially helpful in managing blood sugar levels (Hussain *et al.*, 2010).

5. Other potential benefits: Some research suggests it may have anticancer, aphrodisiac, antimicrobial, and wound healing properties (Neharkar *et al.*, 2015).

CHAPTER 2

Wild Vegetables of the Family Aizoaceae

INTRODUCTION

The Aizoaceae, also known as the fig-marigold family, is a large and diverse family of dicotyledonous flowering plants. It consists of about 135 genera and around 1,800 species. They are succulent plants, meaning their leaves and stems store water, which helps them survive in hot, dry climates. Some Aiozoaceae members are a good source of vitamins A and C, potassium and magnesium, omega-3 fatty acids, and dietary fibers. However, some members contain oxalic acid, which can interfere with the absorption of minerals like calcium and iron (Lokhande *et al.*, 2013).

***Sesuvium portulacastrum* (L.) L.**

Botanical name: *Sesuvium portulacastrum*

Family: Aizoaceae

Local name: Samudriya ghol

Vernacular name:

- **Common name:** Sea Purslane, Shore Purslane
- **Marathi:** Dhapa
- **Tamil:** Orputu, Vankaravacci
- **Telugu:** Vangaredukura
- **Bengali:** Jadu palang
- **Rajasthani:** Lunio

Season: Throughout the year

Parts used: Leaves

Characteristics:

1. Habitat: *S. portulacastrum* is primarily found in coastal regions, including sandy beaches, dunes, salt marshes, and mangrove swamps. It thrives in saline or brackish environments and can tolerate high levels of salt in the soil.

2. Plant Habit: *S. portulacastrum* is a low-growing, spreading, or prostrate succulent herb. It forms a dense mat or carpet-like growth close to the ground.

3. Leaves: The leaves of *S. portulacastrum* are fleshy, cylindrical, and succulent. They are arranged alternately along the stems and are generally small, about 1 to 2 centimeters in length. The leaves are green and have a cylindrical or linear shape.

4. Flowers: The plant produces small, inconspicuous flowers that are clustered at the tips of the stems. The flowers are typically pink or purplish in color, occasionally white. Each flower has five petals and a prominent yellow center. The flowers are self-fertile and can self-pollinate (Fig. **2.1**).

Fig. (2.1). Habitat of *S. portulacastrum* (PC: Jayant Kulkarni).

5. Stems: *S. portulacastrum* has reddish, fleshy stems that spread horizontally along the ground. The stems are smooth and succulent, and exhibit a branching pattern (Lokhande *et al.*, 2013).

Distribution:

Americas- United States, Mexico, the Caribbean islands, and various countries in South America, Africa- South Africa, Mozambique, Egypt, and Senegal, Europe- Mediterranean region and the Canary Islands, Asia- India, Pakistan, Iran, Saudi Arabia, the Persian Gulf, and Southeast Asia. Australia and Oceania- Australia, New Zealand, and various Pacific islands.

Propagation: Seed, and stem cuttings.

Chemical constituents:

Alkaloids, proline, glycine betaine, flavonoids, glycolipids, ecdysone, saponins, tannins, terpenoids, and steroids (Edeoga *et al.*, 2005; Nikalje *et al.*, 2018a).

Recipe:

Ingredients: 2 cups *S. portulacastrum* leaves, washed and chopped, 1 small red onion, thinly sliced, 1 tomato diced, 1 cucumber diced, Juice of 1 lemon, 2 tablespoons extra-virgin olive oil, salt and pepper to taste.

Methods: In a large bowl, combine the chopped *S. portulacastrum* leaves, sliced red onion, diced tomato, and diced cucumber. In a small bowl, whisk together the lemon juice, olive oil, salt, and pepper to make the dressing. Pour the dressing over the salad ingredients in the large bowl and toss gently to combine, ensuring all the ingredients are coated with the dressing. Let the salad sit for about 10 minutes to allow the flavors to meld together. Serve the *S. portulacastrum* salad as a refreshing side dish or as a light lunch. You can garnish it with additional herbs or seeds if desired.

Uses:

1. Edible Uses: The young leaves and tender shoots of *S. portulacastrum* are edible and can be consumed raw or cooked. They have a slightly salty and tangy taste. In some coastal communities, the plant is used as a culinary ingredient in salads, stir-fries, and pickles (Kathiresan *et al.*, 1997; Hammer, 2001).

2. Medicinal Uses: *S. portulacastrum* has been used in traditional medicine for various purposes. It possesses medicinal properties such as anti-inflammatory, diuretic, and wound-healing effects. It has been used to treat skin conditions, digestive disorders, and urinary tract infections (Rojas *et al.*, 1992, Lokhande *et al.*, 2013).

CHAPTER 3

Wild Vegetables of the Family Amaranthaceae

INTRODUCTION

The Amaranthaceae family comprises nearly 175 genera and more than 2,500 species. The plants are found nearly worldwide, with some species thriving in tropical regions and others adapted to cool temperate climates. Several species of this family are important food crops, including Amaranth, Quinoa, Beet, etc. and some species are ornamental including cocks comb, globe amaranth, etc. Amaranthaceae members are rich in nutrients, essential amino acids, dietary fibers, vitamins A, B complex (particularly B6), C, E, and minerals like calcium, iron, magnesium, phosphorus, and potassium. In addition, some members contain antinutritional compounds including, phytates, oxalates, and nitrates which may cause health issues in humans (Umar *et al.*, 2011).

Achyranthes aspera L.

Botanical name: *Achyranthes aspera*

Family: Amaranthaceae

Local name: Aaghada

Vernacular name:

- **Assamese:** Bonsoth
- **English:** Prickly Chaff Flower
- **Gujarati:** Agharo
- **Hindi:** Aghara, Chirchira
- **Irula:** Annaiidumudi
- **Kannada:** Uttaraani
- **Malayalam:** Katalaati
- **Manipuri:** Khujumpere
- **Sanskrit:** Akshara
- **Tamil:** Naagarkaaimullu

Season: Flowering and Fruiting time: September to April

Parts used: Leaves

Characteristics:

1. Plant Habit: It is a perennial herbaceous plant with an erect or spreading growth habit. It can reach a height of 30-120 cm (Srivastav, *et al.*, 2011) (Fig. **3.1**).

Fig. (3.1). ***A. aspera*** **plant** (PC: Apurva Shankar Chonde).

2. Stem: The stem of *A. aspera* is greenish to reddish-brown, robust, and usually covered with stiff hairs. It may have a woody base (Srivastav, *et al.*, 2011).

3. Leaves: The leaves are simple, opposite, and lanceolate to ovate in shape. They have a rough texture and are typically about 2-12 cm long. The leaf margins are often serrated or toothed (Srivastav *et al.*, 2011).

4. Flowers: *A. aspera* produces small, greenish-white flowers that are densely clustered in long, slender, spike-like inflorescences. The inflorescences can range from 5-30 cm in length (Srivastav *et al.*, 2011).

5. Fruits: After flowering, *A. aspera* develops small, brownish or blackish fruits. These fruits are rounded and have a hard, woody texture. Each fruit contains a single seed (Srivastav *et al.*, 2011).

6. Spines: One of the notable features of *A. aspera* is its presence of spines. The stem, branches, and leaf undersides may have sharp spines or thorns, which can vary in size and density (Srivastav *et al.*, 2011).

Distribution:

It is distributed throughout the regions with tropical weather regions, including many Pacific Islands environments. India: Maharashtra, Assam, Bihar, Gujarat, Karnataka, Madhya Pradesh, Odisha, Rajasthan, South India, Uttar Pradesh.

Propagation: Seeds

Chemical

It contains the following major classes of compounds: fatty acids, a number of oleic acids, bisdesmosidic, triterpenoid-based saponins, ecdysterone, n-hexaco--14- enoic, oleanolic acid, triacontanol, spinasterol, dihydroxy ketones, spathulenol, alkaloids, D-glucuronic, Betaine, Achyranthine and various amino acids (Praveen, 2014).

Recipe:

Ingredients: Lead leaves, garlic, onion, gram flour, oil, chili powder, and salt.

Method: Wash and chop the fresh leaves. Heat oil in a pan and fry crushed garlic cloves, followed by chopped vegetables, red chilies, and salt. Allow them to steam thoroughly. Once the vegetables are halfway cooked, gradually sprinkle the dal flour while stirring constantly. This will ensure even distribution. Continue cooking the vegetables on low heat.

Uses:

1. Anti-inflammatory and Analgesic Effects: It exhibits significant anti-inflammatory and analgesic properties, which can be attributed to the presence of bioactive compounds such as saponins and flavonoids. It has been used traditionally to alleviate pain and inflammation (Sutar *et al.*, 2008; Kumar *et al.*, 2009; Yadav *et al.*, 2016).

2. Antimicrobial Activity: It has demonstrated antimicrobial activity against various bacterial and fungal pathogens. It has been reported to inhibit the growth

CHAPTER 4

Wild Vegetables of the Family Anacardiaceae

INTRODUCTION

The Anacardiaceae family, also known as the cashew family, is a diverse group of flowering plants with over 80 genera and around 800 species. These family members are rich sources of essential vitamins and minerals, including vitamin C, vitamin K, potassium, phosphorus, and magnesium. In addition, some members are good sources of healthy fats *i.e.*, monounsaturated fats, and some members are rich in antioxidant compounds like carotenoids and phenolic acids. However, some members contain antinutritional compounds like Tannins, Urushiol, and anacardic acid, which can disturb human metabolism if ingested in high amounts (Mitchell *et al.*, 2022).

Mangifera indica L.

Botanical name: *Mangifera indica*

Family: Anacardiaceae

Local name: Mango

Vernacular name:

- **Hindi:** Aam
- **Gujarati:** Aambo
- **Manipuri:** Heinou
- **Tamil:** Ma
- **Telugu:** Mamidi
- **Malayalam:** Mangga
- **Kannada:** Maa, Maavu, Maavina mara
- **Marathi:** Amba
- **Konkani:** Ambo
- **Mizo:** Theihai
- **Angami:** Merosi

Season: Flowering: February - March; Fruit ripen: May - June.

Parts used: Fruits, Leaves, Bark, Flowers

Characteristics (Shah *et al.*, 2010):

1. Tree Size: *M. indica* is a large evergreen tree that can grow up to 30 meters in height.

2. Leaves: The leaves are alternate, simple, and usually spirally arranged. They are lanceolate or oblong in shape, ranging from 15 to 45 cm in length.

3. Flowers: The flowers are small, fragrant, and usually pale yellow to pinkish in color. They are borne in panicles, which are terminal and can be up to 30 cm long.

4. Inflorescence: The inflorescence is a panicle, and the flowers are polygamous (having both male and hermaphrodite flowers on the same tree).

5. Fruits: The fruit is a drupe, typically large and fleshy, with a single large seed (endocarp). The outer flesh is variable in color, ranging from green to yellow, orange, or red, depending on the cultivar (Fig. **4.1**).

Fig. (4.1). Fruits of *M. indica* (PC: Apurva Shankar Chonde).

6. Seed: The seed is large, flat, and covered by a woody endocarp.

Distribution: India and Burma, Assam, India and Myanmar, especially the Assam-Chittagong Hills. Introduced to Bangladesh; China; Indonesia; Malaysia; Myanmar; Philippines; Sri Lanka; Thailand.

Propagation: Seed

Chemical constituents:

Carotenoids- beta-carotene, lutein, and zeaxanthin; Flavonoids- Quercetin, isoquercitrin; Polyphenols- gallic acid, catechins, and mangiferin; Vitamins- Vitamin C and Vitamin A; Organic Acids- citric acid, mallic acid; amino acids, Carbohydrates-maclurin-mono-O-galloyl-glucose, maclurin-di-O-galloyl-glucose, iriflophenone di-O-galloyl-glucos; maclurin-mono-O-galloyl-glucose, maclurin-di-O-galloyl-glucose, iriflophenone di-O-galloyl-glucose, lipids, essential oils, and fiber **(**Berardini *et al.*, 2003; Schieber *et al.*, 2003; Celis *et al.*, 2019**)**.

Recipe:

Ingredients: Kairi (unripe/raw mango fruit) vegetable oil, mustard seeds, curry leaves, onions, tomato, jeera powder, haldi powder, chili powder, ginger-garlic paste, jaggery, water, and salt.

Method: Heat oil in a pan over medium heat. Add mustard seeds and curry leaves. Next, add the chopped onions and tomatoes, and lightly fry the mixture. Add all the dry masala powders and ginger-garlic paste; fry well for two minutes until a paste is formed. To this paste, add the small mango pieces, ensuring they are well-coated with the mixture. Then, add water, jaggery, and salt to taste. Cook on low flame for another 7-8 minutes until the mango pieces are tender. Serve the kairi bhaji either as a main dish on its own or with chapatis.

Uses:

1. Culinary:

- Fresh Consumption: The most common and widespread use of mangoes is as a fresh, delicious fruit consumed on its own.
- Food Products: Mangoes are used to make a variety of food products, including juices, jams, chutneys, pickles, and dried slices.
- Desserts: Mangoes are used in the preparation of desserts such as ice creams, sorbets, puddings, and cakes (Shaha *et al.*, 2010; Kulkarni *et al.*, 2014).

CHAPTER 5

Wild Vegetables of the Family Apiaceae

INTRODUCTION

The Apiaceae family, commonly known as the carrot or parsley family, is a large group of plants known for their hollow stems, compound umbel-shaped flower clusters, and often aromatic qualities. This family includes over 3,700 species across 434 genera, featuring many economically important plants like carrots, celery, coriander, and cumin. While these plants are rich in vitamins, minerals, and essential oils, some members of this family contain phototoxic or even poisonous compounds (Plunkett *et al.*, 2005).

***Carum copticum* (L.) Benth. & Hook.f. ex Hiern**

Botanical name: *Carum copticum*

Family: Apiaceae

Local name: Ajwain, Ova

Vernacular name:

- **Sanskrit**: Yamini,
- **Assamese**: Jain,
- **English**: Bishop's weed,
- **HindiL** Baluchi, Ajowan and Spirca,
- **Gujarati**: Ajmo, Canada: Oma,
- **Malaysia**: Oman,
- **Arabic**: Khella or khellin,
- **Persian**: Nankhah, Zenian, Khordaneh
- **South Khorasan**: Ajgho

Season: Flowering: April to June

Parts used: Leaves, Seeds, fruit.

Characteristics:

1. Plant Height: *C. copticum* is a small, herbaceous plant that typically grows up to a height of 30-60 centimeters.

2. Leaves: The leaves are compound and pinnately divided. They are feathery and have small leaflets that are linear or lanceolate in shape (Fig. **5.1**).

Fig. (5.1). Leaves and flowers of *C. copticum* (PC: Shivshankar Chapule).

3. Stem: The stem is erect, slender, and branched. It is typically green or slightly reddish in color.

4. Flowers: The flowers are small and white to pale pink in color. They are arranged in umbels, which are umbrella-shaped clusters that arise from the stem.

5. Fruits: The fruits are small, oval-shaped, and slightly curved. They are usually brown or grayish-brown in color. These fruits contain small, ridged seeds.

6. Aromatic Scent: The plant has a strong, aromatic scent that is similar to a combination of thyme and anise.

Distribution:

C. copticum is an Egyptian aborigine plant. This plant grows in arid and semiarid fields in different regions of central Europe, Asia, India (most crops are in the states of Rajasthan, Gujarat, and West Bengal), Iran (especially eastern regions of Baluchistan), Iraq, Afghanistan, and Pakistan (Zargari, 1996; Zahin *et al.*, 2010).

Propagation: Seed

Chemical constituents:

Carbohydrates, fats, proteins, fiber, tannins, glycosides, saponins, flavone, and mineral matter containing calcium, phosphorous, iron, cobalt, copper, iodine, manganese, thiamine, riboflavin, and nicotinic acid (Chauhan *et al.*, 2012).

Recipe:

Ingredients: Leaves, gram flour, green chilies, turmeric powder, mustard seed, salt, onion, garlic cloves, oil, *etc*.

Method: Wash and finely chop the leaves of ova. Chop the onion. Heat a pan with oil and add mustard seeds, garlic cloves, and chilies. Add the chopped onion and cook until it turns a yellowish-brown color. Then, add turmeric powder and the chopped ova leaves. After 5 minutes, add gram flour and salt. Cook for 8-10 minutes until well-cooked.

Uses:

1. Digestive Aid: Ajwain is commonly used as a digestive aid due to its carminative properties. It helps in relieving indigestion, bloating, and flatulence (Zarshenas *et al.*, 2013).

2. Respiratory Health: Ajwain is known for its expectorant properties, making it beneficial for respiratory conditions such as cough, bronchitis, and asthma. It helps in loosening mucus and clearing the airways (Boskabady *et al.*, 2014).

3. Pain Relief: Ajwain has analgesic properties and is used to alleviate various types of pain, including toothaches and joint pain (Zarshenas *et al.*, 2013).

4. Anti-inflammatory: Ajwain possesses anti-inflammatory properties and can help in reducing inflammation in the body (Boskabady *et al.*, 2014).

5. Antimicrobial: Ajwain has antimicrobial properties and is used to treat infections caused by bacteria and fungi (Zarshenas *et al.*, 2013).

6. Postpartum Care: Ajwain is traditionally used to aid in postpartum recovery. It helps in the contraction of the uterus and improves lactation.

7. Medicinal uses: The therapeutic effects of this plant in gastrointestinal disorders, such as reflux, cramps, abdominal tumors, abdominal pain, eye infection disorders, antiparasitic, antiplatelet-aggregatory, and antilithiasis as well as treating common cold and acute pharyngitis (Zarshenas *et al.*, 2013).

CHAPTER 6

Wild Vegetables of the Family Apocynaceae

INTRODUCTION

The Apocynaceae family, also known as the dogbane family, is a large and diverse group of flowering plants with over 4,000 species. They are found in tropical and subtropical regions around the world and come in a variety of shapes and sizes, including herbs, shrubs, vines, and even some trees. Most of the members contain milky latex, which can be irritating or even poisonous if ingested. Some members consist of macronutrients such as carbohydrates, fibers, and proteins and micronutrients such as iron, manganese, zinc, and copper (Maheshu *et al.*, 2014).

Caralluma adscendens (Roxb.) R.Br.

Botanical name: *Caralluma adscendens*

Family: Apocynaceae

Subfamily: Asclepiadoideae

Local name: Shengul, Makad Shing

Season: July-August

Parts used: Stem

Characteristics:

1. Stem: *C. adscendens* has a succulent, erect, and fleshy stem that can grow up to 30-60 cm in height. The stem is typically cylindrical or angular and may have prominent ridges or grooves (Fig. **6.1**).

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Fig. (6.1). Whole plant of *C. adscendens* (PC: A. Gaikwad).

2. Leaves: The leaves are small, reduced, and typically clustered along the stem. The leaves are usually triangular or lanceolate in shape, with a smooth margin. They are succulent and have a pale green to grayish-green color.

3. Flowers: The plant produces attractive flowers that emerge from the stem. The flowers are star-shaped, typically with five petals. The color of the flowers can vary, but they are commonly seen in shades of purple, pink, or yellow. The flowers have a strong, pleasant fragrance.

4. Inflorescence: The flowers are arranged in clusters or umbels at the tips of the stems. The inflorescence can be simple or branched, depending on the specific species or variety.

5. Fruits: After flowering, it develops small, fleshy fruits. The fruits are typically elongated and cylindrical, containing numerous seeds (Pardeshi *et al.*, 2023).

Distribution:

Tropical Africa - drier areas from Senegal and Mauritania to Somalia; through the Arabian Peninsula to India and Sri Lanka.

Propagation: Seed, and cuttings.

Chemical constituents:

Glycosides, flavonoids, and steroids are present in *C. adscendens*. The latex cells of the plant usually contain latex rich in triterpenes. Other constituents found in *C.*

adscendens include alkaloids of indole, phenanthrene, indolizidine, glycosides, saponins, and tannins (Deepak *et al.*, 1997).

Recipe:

This species has been used for centuries in India and is commonly consumed as a vegetable in semi-arid regions of the country. It can be eaten raw or cooked with spices, and it is also used in the preparation of chutneys and pickles.

Uses:

1. Appetite suppressant: Plant has been traditionally used as an appetite suppressant. It helps reduce food cravings and promote weight loss by suppressing appetite (Lawrence *et al.*, 2004).

2. Anti-obesity activity: *C. adscendens* has shown potential in managing obesity. It may help inhibit the activity of enzymes involved in fat synthesis and storage, thus contributing to weight management (Lawrence *et al.*, 2004).

3. Blood sugar regulation: *C. adscendens* may have a positive impact on blood sugar control. It may help regulate blood glucose levels and improve insulin sensitivity, potentially benefiting individuals with diabetes or pre-diabetic conditions (Maheshu *et al.*, 2014).

4. Antioxidant activity: It exhibits antioxidant properties, which can help protect the body against oxidative stress and damage caused by free radicals. This antioxidant activity may contribute to its potential health benefits (Maheshu *et al.*, 2014).

5. Nutritional value: *C. adscendens* is a rich source of dietary fiber, vitamins (such as vitamin C and vitamin E), minerals (including calcium and iron), and phytochemicals. These nutritional components contribute to its potential health-promoting properties (Maheshu *et al.*, 2014).

***Ceropegia bulbosa* Roxb.**

Botanical name: *Ceropegia bulbosa*

Family: Apocynaceae

Local name: Ankalodya, Gayala, Gayli

Vernacular name:

CHAPTER 7

Wild Vegetables of the Family Araceae

INTRODUCTION

The Araceae family, also known as the Arum family, is a large and diverse group of flowering plants comprising over 4,000 species found in tropical and subtropical regions worldwide. Members of the Araceae are renowned for their distinctive inflorescence, which features a fleshy stalk called a spadix, typically encircled by a modified leaf bract known as a spathe. Many species in this family are rich in carbohydrates and dietary fibers. However, Araceae plants also contain calcium oxalate crystals, called raphides, which can irritate the skin and mucous membranes if ingested (Almaaty *et al.*, 2022).

Amorphophallus commutatus L.

Botanical name: *Amorphophallus commutatus*

Family: Araceae

Local name: Shevale, mogari kanda and jungli suran

Vernacular name:

- **English:** Dragon Stalk Yam
- **Hindi:** Jangli Suran
- **Malayalam:** Kattuchena
- **Marathi:** Sherla
- **Other:** Dragon Stalk Yam

Season: Flowering: April-June; Fruiting: July-August

Parts used: Inflorescence

Characteristics:

1. Habit: It is a perennial herbaceous plant that grows from a tuberous underground stem.

2. Stem: The stem is usually short and erect, with a cylindrical shape.

3. Leaves: The leaves are large, palmately compound, and usually divided into several leaflets or lobes. Each leaflet has a pinnate venation pattern.

4. Inflorescence: The inflorescence consists of a single flower that arises from the center of a large, leaf-like structure called a spathe. The spathe is usually green with purple or maroon markings and may have a foul odour that attracts pollinating insects (Fig. **7.1**).

Fig. (7.1). Inflorescence of *A. commutatus* (PC: Apurva Shankar Chonde).

5. The flowers are unisexual, meaning that individual plants produce either male or female flowers.

6. Male flowers: The male flowers have a central column, known as the spadix, which is covered with small, tightly packed male flowers.

7. Female flowers: The female flowers are located at the base of the spadix and are usually surrounded by a ring of sterile flowers (Kavalan *et al.*, 2018).

Distribution: It is native to various countries in Southeast Asia, including India, Sri Lanka, Bangladesh, Myanmar, Thailand, and Malaysia (Krishna *et al.*, 2013).

Propagation: By corm

Chemical constituents: Alkaloids, amino acids, carbohydrates, phenols, terpenoids, glycosides, fixed oils and fats, proteins, flavonoids, anthraquinones, saponins, coumarin, Anthocyanin, Flavanones, tannins, quinones, and steroids (Arjun *et al.*, 2012).

Recipe:

Ingredients: Shevale, kakda, ginger garlic paste, cumin, red chili powder, garam masala, salt, kokum, coconut, *etc*.

Method: Heat oil in a pan. Add cumin and let it splutter. Then add ginger-garlic paste. Fry it and add salt and red chili powder. Cook it slightly. Next, add finely chopped shevelle and saute for 5-7 minutes. Add finely chopped kakda and cook for a few more minutes. Pour in coconut paste and let it cook. Finally, add kokum and garam masala. Adjust the salt to taste. Serve it with bhakri.

Uses:

1. Medicinal plant: It has physiologically active properties for the treatment of numerous ailments (Adebanjo *et al.*, 1983; Natarajan *et al.*, 2005).

2. Culinary Uses: The tubers are consumed as food after appropriate processing. It is cooked or boiled to remove the acrid taste and odour, and it can be used in traditional dishes such as curries, pickles, or stir-fries (Natarajan *et al.*, 2005).

3. Ornamental Plant: It is cultivated as an ornamental plant for its unique and attractive inflorescence. The large spathe and spadix make it visually appealing and it is often grown in gardens or as a potted plant (Natarajan *et al.*, 2005).

***Amorphophallus paeoniifolius* (Dennst.) Nicolson**

Botanical name: *Amorphophallus paeoniifolius*

Family: Araceae

Local name: Suran

Vernacular name:

- **Hindi:** Oal, Gandira, Jangli suran, Kanda, Madana masta
- **Kannada:** Gandira, Suvarna gadde, Soorana, Kandagaḍḍe, Choornagadde
- **Malayalam:** Cinapavu, Karunakarang, Kizhanna
- **Manipuri:** Haopan
- **Sanskrit:** Arsaghna, Arshoghna, Arsoghna, Bahukanda

CHAPTER 8

Wild Vegetables of the Family Asparagaceae

INTRODUCTION

The Asparagaceae family, also known as the Asparagus family, is a large and diverse group of flowering plants with 153 genera comprising 2,900 species worldwide (Stevens 2020). Generally, the flowers are showy and "lily-like" with six tepals. Many Asparagaceae members are good sources of essential vitamins, minerals such as folate, vitamin K, vitamin C, and potassium, vitamin B6, and fiber. Some members also contain prebiotic inulin fiber, which helps promote gut health. However, some members contain antinutritional compounds such as Fructans, Saponins, Oxalates, *etc.*

Asparagus officinalis L.

Botanical name: *Asparagus officinalis*

Family: Asparagaceae

Local name: Shatavari

Vernacular name:

- **Kannada:** Ashadi beru, Halavu makkala taayi beru
- **Hindi:** Shatamuli
- **Malayalam:** Sathavari
- **Tamil:** Tannir-vittan
- **Telugu:** Abiruvu, Cella
- **Marathi:** Shatamuli, Shatavari
- **Sanskrit:** Satamuli, Satavari
- **English:** Buttermilk root, Climbing asparagus, Water root, Wild asparagus, Wild carrot

Season: Summer

Parts used: Shoot, roots, leaves

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Characteristics (Grubben, 2004; Nature Gate, 2013; Al-Snafi, 2015):

1. Stem and Branches: It has tall, erect, and branching stems that can reach a height of 1 to 2 meters. The stems are light green in color, round, and typically covered in small scales or bracts. The branches are slender, feathery, and fern-like in appearance (Fig. **8.1**).

Fig. (8.1). Branches of *A. officinalis* (PC: Kailash Ugale).

2. Leaves: The leaves are modified into scale-like structures known as cladodes. The cladodes are small, triangular or lanceolate in shape, and closely arranged along the stems.

3. Flowers: It produces small, bell-shaped flowers that are either greenish-white or pink in color. The flowers are usually arranged in clusters or racemes and have six tepals (three inner petals and three outer sepals).

4. Roots: The roots of *A. officinalis* are fleshy and thickened, typically consisting of a central taproot and numerous lateral roots.

Distribution:

It is native to most of Europe, northern Africa and western Asia, India and is widely cultivated as a vegetable crop. Netherlands, Spain, France, Poland, Belgium, Germany, Austria, Italy and Switzerland.

Propagation: Seed

Chemical constituents:

α-D-fructofuranose-1,2′: 2,1′-β-D- fructofuranose dianhydride, 1,3-O-di- trans--coumaroylglycerol, tetracosanoic acid, 4′, 7-dimethyl kaempferol, rutin, quercetin, 5-hydroxymethyl-furaldehyde, L-asparagine, caffeic acid, ferulic acid, inosine, n-butyl-β-D-fructofuranoside, ethyl-β-D-fructo-pyranoside and sucrose (Huang *et al.*, 2006).

Recipe:

Ingredients: *Asparagus* shoots, oil, salt and pepper.

Method: Cut *Asparagus* shoots into 2-inch pieces. Saute the spears over high heat in a saute pan with oil or butter. Saute until lightly browned and tender, 3 to 5 minutes. Season with salt and pepper. The same method can be used in a wok to stir-fry the asparagus.

Uses:

1. Culinary Uses: It is widely consumed as a nutritious vegetable in various cuisines. The tender shoots of Asparagus are commonly steamed, boiled, grilled, or roasted and served as a side dish or incorporated into salads, stir-fries, pasta, and other savory dishes. *Asparagus* spears are known for their unique and delicate flavor, often described as slightly sweet and nutty (Khan, 2010; Al-Snafi, 2015).

2. Medicinal Uses: It has been used in traditional medicine for its potential diuretic, anti-inflammatory, and anti-cancer properties. The plant has been traditionally used as a natural remedy for urinary tract infections and to support kidney function (Winter, 2009; Al-Snafi, 2015; Negi *et al.*, 2010). Plant extract can be as a tonic for the prevention and cure of several ailments including those for the kidney, bladder, rheumatic, liver disease, asthma and cancer (Debuigne, 2009; Winter, 2009; Khan, 2010; Al-Snafi, 2015).

3. Nutritional Benefits: It is a nutrient-dense vegetable and a good source of vitamins (such as vitamin A, C, E, and K), folate, minerals (including potassium, phosphorus, and selenium), dietary fiber, and antioxidants. It is low in calories and fat and contains various phytochemicals that may contribute to its potential health benefits (Khan, 2010; Al-Snafi, 2015).

***Chlorophytum borivilianum* L.**

Botanical name: *Chlorophytum borivilianum*

CHAPTER 9

Wild Vegetables of the Family Asteraceae

INTRODUCTION

The Asteraceae family, also known as the sunflower family or daisy family, is the largest family of flowering plants with over 30,000 species found worldwide. The most distinctive feature is the inflorescence, called a capitulum or head. Many Asteraceae members are good sources of essential vitamins A, B, C, E, and K, folate, potassium, and healthy fats. They are also rich in antioxidants and prebiotics. However, some members also contain oxalates and Sesquiterpene lactones which can cause allergic reactions in some individuals (Song *et al.*, 2020).

Bidens biternata (Lour.) Merr. & Sherff.

Botanical name: *Bidens biternata*

Family: Asteraceae

Local name: Morshend

Vernacular name:

- **English:** Spanish Needles
- **Hindi:** Chirchitta
- **Malayalam:** Kandavarekuthi, Snehappullu
- **Other:** Beggar Ticks, Black Jack, Five Leaved Blackjack, Spanish Needles, Yellow Flowered Blackjack

Season: August to December

Parts used: Part used: leaves, roots

Characteristics (Zahara *et al.*, 2015):

1. Growth Habit: *B. biternata* is an annual or perennial herbaceous plant. It typically grows upright and can reach a height of 1 to 3 feet (30 to 90 cm).

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2. Leaves: The leaves are alternate and pinnately compound. Each leaf is divided into three leaflets. The leaflets are lanceolate to ovate in shape with serrated or toothed margins (Fig. **9.1**).

Fig. (9.1). Leaves of *B. biternata* (PC: Apurva Shankar Chonde).

3. Stems: The stems are slender, branched, and often reddish in color. They are typically hairy or rough to the touch.

4. Flowers: The flowers are small and yellow. They are borne in clusters at the tips of the stems or in the leaf axils. Each flower consists of disc florets surrounded by several outer ray florets.

5. Fruits: After flowering, *B. biternata* produces small fruits called achenes. These achenes are oblong or triangular in shape and have barbed or bristly projections that aid in dispersal.

Distribution: Central African Republic, Chad, China North-Central, China South-Central, China Southeast, Djibouti, Eritrea, Ethiopia, Free State, Ghana, Hainan, India, Ivory Coast, Japan, Jawa, Kenya, Korea, Myanmar, Namibia, Nansei-Shoto, Nepal, New Guinea, Northern Provinces, Northern Territory, Oman, Pakistan, Philippines.

Propagation: Seed

Chemical constituents:

Sesquiterpenes, germacrene-D, β-caryophyllene, β-carotene (Yuan *et al.*, 2008), alkaloids, flavonoids, phenols, and tannins (Zahara *et al.*, 2015).

Recipe:

Ingredients: Morshend leaves, soaked groundnut, oil, cumin, mustard, garlic, salt, *etc.*

Method: Peel a squash, grate it, and chop it finely. Heat oil in a pan and add cumin seeds, mustard seeds, and garlic. Then, add the chopped vegetables and sauté them. Next, add the soaked mung beans and salt to taste, and sauté again. Cover the pan and cook over low flame.

Uses:

1. Dietary Fiber: *B. biternata* contains dietary fiber, which is beneficial for digestive health and may help promote regular bowel movements (Panda, 2002; Zahara *et al.*, 2015).

2. Antioxidant Activity: *B. biternata* possess antioxidant properties, which can help protect against oxidative stress and damage caused by free radicals in the body (Panda, 2002; Zahara *et al.*, 2015).

3. Anti-inflammatory Potential: It may exhibit inhibitory effects on certain inflammatory markers, which could be beneficial in managing inflammatory conditions (Panda, 2002; Zahara *et al.*, 2015).

4. Antimicrobial Activity: Extracts from the plant have shown activity against certain bacteria, fungi, and parasites, indicating potential use in combating microbial infections (Panda, 2002).

5. Wound Healing: It has been traditionally used for wound healing purposes. It may have properties that promote the healing of wounds and provide relief from associated symptoms (Panda, 2002).

6. In China, the whole plant is used for detoxification, respiratory tract infections, blood stasis effect, acute appendicitis, sore throat, acute jaundice, hepatitis, gastroenteritis, malaria, rheumatoid joint pain, topical cure boils, traumatic swellings, snakebite, and pain (Shi *et al.*, 2007).

***Carthamus tinctorius* L.**

Botanical name: *Carthamus tinctorius* L.

CHAPTER 10

Wild Vegetables of the Family Basellaceae

INTRODUCTION

The Basellaceae family, also known as the Madeira vine family, is a small group of flowering plants with 4 genera and 19 species. *Basella* is a great choice for weight management or healthy eating plans. A 100-gram serving of raw *Basella* leaves contains only about 19 calories and negligible fat. The members are rich in beta-carotene, Vitamin C, iron, calcium, magnesium, potassium, manganese, folate, dietary fiber, and flavonoids. They also contain anti-nutritional compounds like oxalates and phytates (Kumar *et al.*, 2015).

Basella alba L.

Botanical name: *Basella alba*

Family: Basellaceae

Local name: Poi, Velbendi, Malabar spinach

Vernacular name:

- **Assamese:** Puroi khak
- **Bengali:** Pui Shaak
- **English:** Malabar Spinach
- **Gujarati:** Valchi Bhagi
- **Hindi:** Poi
- **Irula:** Paasakkeerai
- **Kannada:** Bansali
- **Malayalam:** Basala
- **Manipuri:** Urok Shumban
- **Sanskrit:** Upodika
- **Tamil:** Paasaangalli

Season: Flower from May to September, the seeds ripen from July to October

Parts used: All parts

Characteristics:

1. Leaves: The leaves are simple, succulent, and fleshy. They are typically dark green in color, ovate to heart-shaped, and have a glossy appearance. The leaves are alternate, meaning they are arranged singly along the stem (Fig. **10.1**).

Fig. (10.1). Leaves of *B. alba* (PC: Apurva Shankar Chonde).

2. Stem: The stem is succulent, twining, and often reddish or purplish in color. It is slender and can grow up to several meters in length, climbing or trailing along supports.

3. Flowers: The flowers are small and inconspicuous. They are borne in clusters or racemes and have a white or pinkish color. The flowers are bisexual, meaning they have both male and female reproductive organs.

4. Fruits: The fruits are small, fleshy, and berry-like structures. The fruit is usually dark purple when ripe and contains several seeds (Shantha *et al.*, 2016).

Distribution: It is native to the Indian subcontinent, Southeast Asia, and New Guinea. It is naturalized in China, tropical Africa, Brazil, Belize, Colombia, the West Indies, Fiji, and French Polynesia.

Propagation: Seed or stem cuttings.

Chemical constituents:

Flavonoids- kaempferol, quercetin, and myricetin, phenolic Compounds- gallic acid, caffeic acid, and chlorogenic acid, Carotenoids- beta-carotene, lutein, and zeaxanthin, vitamin C (ascorbic acid) (Ferreira Ozela *et al.*, 2007).

Recipe:

Ingredients: *Basella* leaves, onion, garlic, green chilies, ginger paste, mustard, cumin seeds, and dry masala, Oil, Salt, and kokum.

Method: First, clean and wash green leaves. Bhaji, drain out excess water and chop, keep aside. Heat oil in a pan add mustard and cumin seeds, after splutter add chopped onions and saute well until they become translucent, and then add chopped bhaji. Mix properly and add dry masala, salt, and kokum cooked with a cover for a few minutes. Ready to serve with Rotis or Bhakri, salad.

Uses:

1. Culinary: It is widely used as a leafy vegetable in various cuisines. The young leaves and tender shoots are commonly cooked and consumed as a nutritious green vegetable. They can be used in soups, stews, stir-fries, salads, and curries. The leaves have a mild and slightly sweet flavor (Kumar *et al.*, 2015).

2. Nutritional Benefits: It is rich in vitamins, minerals, and dietary fiber. It is a good source of vitamin A, vitamin C, iron, and calcium. Consuming *B. alba* can contribute to a balanced diet and provide essential nutrients (Kumar *et al.*, 2015).

3. Traditional Medicine: In traditional medicine systems, it has been used for various medicinal purposes. It shows antioxidant, anti-inflammatory, and antimicrobial properties (Krishna, 2012; Rodda *et al.*, 2012; Azad *et al.*, 2013).

4. Wound Healing: In some cultures, *B. alba* leaves have been traditionally used topically to promote wound healing. The leaves are sometimes crushed and applied to wounds or injuries to aid in the healing process (Mohammed *et al.*, 2012).

5. Ayurveda: In Ayurveda, the drug is used for various indications either alone or in combination for *mada* (intoxication), *anidrā* (insomnia), *paādadari* (cracked feet), *jvara* (fever), *pravaāhikaā* (dysentery), *arśhas* (haemorrhoids), *śiātapitta* (urticaria, *vranaśotha* (inflammatory), *arbuda* (tumours), *raktapitta* (bleeding disorders) (Misra, 2005; Acharya *et al.*, 2011).

CHAPTER 11

Wild Vegetables of the Family Bignoniaceae

INTRODUCTION

The Bignoniaceae family, also known as the trumpet vine or catalpa family, encompasses over 800 species across approximately 110 genera. Members are characterized by woody growth habits; many species are vines that climb using tendrils or twining. Their oppositely arranged, often compound leaves create a lush backdrop for their true stars: showy, bisexual flowers. These bell or funnel-shaped blooms, with five-lobed petals, come in a vibrant array of colors, making them popular ornamental plants. Some members contain flavonoids, alkaloids, fatty acids, steroids, *etc.* Some Bignoniaceae members contain iridoid glycosides and naphthoquinones, which may have beneficial properties but can also be toxic (Fischer *et al.*, 2004).

***Radermachera xylocarpa* (Roxb.) K. Schum.**

Botanical name: *Radermachera xylocarpa*

Family: Bignoniaceae

Local name: Kharshinga, khadshingi

Vernacular name:

- **Gujarati:** Khadsingi, Kharsing
- **Kannada:** Konana kombu, Ambaarihode, Udi
- **Konkani:** Genashingi, Kharsimgi
- **Malayalam:** Vetankurana
- **Marathi:** Khadshingi, Khurasinga
- **Tamil:** Patiri, Vetankuruni
- **Telugu:** Naguru, Naga-Dundilam
- **Oriya:** Khonda-partoll

Season: March-April.

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Parts used: Pod

Characteristics (Chatterjee 1948):

1. Tree Size: *R. xylocarpa* is a medium to large-sized tree that can reach heights of up to 30 meters (98 feet) tall. It has a well-developed trunk and a broad, spreading crown.

2. Leaves: The leaves of *R. xylocarpa* are compound and arranged in an opposite manner along the branches. Each leaf is composed of several pairs of leaflets, usually 6 to 12 pairs. The leaflets are elongated and lanceolate, with pointed tips and smooth edges. The leaf color is typically dark green.

3. Flowers: The flowers of *R. xylocarpa* are large and showy, arranged in terminal clusters or panicles. Each flower is trumpet-shaped, with a wide, flared mouth and a narrow tube. The color of the flowers can vary, but they are commonly seen in shades of white, pink, or purple (Fig. **11.1**).

Fig. (11.1). *R. xylocarpa* inflorescence (PC: Tukaram Kanoja).

4. Fruits: After the flowers, *R. xylocarpa* produces elongated, woody capsules as fruits. The capsules contain numerous small, flattened seeds. When ripe, the capsules split open to release the seeds (Fig. **11.1**).

5. Bark and Wood: The bark of *R. xylocarpa* is grayish-brown and has a rough, fissured texture. The wood is hard and durable, commonly used in construction and for making furniture.

Distribution:

Cambodia, Thailand, Laos, Vietnam, Myanmar, India.

Propagation: Seed

Chemical constituents:

Alkaloids, anthraquinones, cardiac glycosides, coumarins, emodins, fatty acids, flavanoids, glycosides, leucoanthocyanins, phlobatanins, phytosteroids, reducing sugars, saponins, tannins, terpenoids (Harborne, 1973).

Recipe:

Ingredients: pods, cumin, onion, tomato, ginger, garlic, salt, chili powder, asafoetida, garam masala, and coriander leaves.

Method: Rinse, peel, and chop the drumstick pods into 3- to 4-inch-long pieces. Heat oil in a pan and add cumin seeds, allowing them to crackle. Stir well and then add turmeric powder, red chili powder, and asafoetida. Next, add the ground paste made from onion, tomato, ginger, and garlic. Heat oil in another pan and crackle the cumin seeds. Then add the ground paste. Add the drumstick pods, pour water, and season with salt. Cover the pan and let the drumsticks cook until they become tender and well-cooked. Lastly, sprinkle garam masala and stir. Garnish the gravy as desired.

Uses:

1. Ornamental Plant: *R. xylocarpa* is often cultivated as an ornamental plant due to its attractive foliage, showy flowers, and overall aesthetic appeal. It is used in landscaping, gardens, and as a decorative plant in parks and public spaces (Sharma 2018).

2. Timber: The wood of *R. xylocarpa* is highly valued for its strength, durability, and resistance to decay. It is used in various construction and woodworking applications, such as for making furniture, cabinetry, flooring, and other structural components (Shetgiri *et al.*, 2001).

3. Traditional Medicine: In some traditional medicinal systems, various parts of *R. xylocarpa* are used for their potential therapeutic properties. The bark, leaves, and

CHAPTER 12

Wild Vegetables of the Family Burseraceae

INTRODUCTION

The Burseraceae family, also known as the torchwood or gumbo-limbo family, is composed of about 19 genera and 775–860 species of resinous trees and shrubs. These tropical trees and shrubs are native to Africa, Asia, and the Americas. Members are distinguished by their fragrant, resinous secretions and characteristic bark that flakes but remains smooth (Britannica 2022). Some members showed the presence of flavonoids, phenols, saponins, tannins, and triterpenoids.

***Garuga pinnata* Roxb.**

Botanical name: *Garuga pinnata*

Family: Burseraceae

Local name: Kakad

Vernacular name:

- **Hindi:** Kharpat
- **Tamil:** Arunelli, Karuvempu
- **Malayalam:** Annakaara, Kaattunelli
- **Telugu:** Garuga, Konda vepa
- **Kannada:** Aranelli, Biligadde, Kaashthanelli
- **Bengali:** Jum, Kapila
- **Oriya:** Kekadogatcho
- **Konkani:** Kudak
- **Assamese:** Pama
- **Gujarati:** Kaked, Khusimb
- **Mizo:** Bungbu Tuairam
- **Sanskrit:** Karnikarha, Kinikirath
- **Nepali:** Dabadabe, Ramasin

Season: Flowering and fruiting: January-August

Ganesh Chandrakant Nikalje, Apurva Chonde, Sudhakar Srivastava & Penna Suprasanna

Parts used: Fruit

Characteristics (Khan and Alam 1996):

1. Size and Growth Habit: *G. pinnata* is a medium-sized to large deciduous tree that can reach heights of up to 20-30 meters (65-98 feet). It has a straight trunk with a grayish-brown bark that becomes rough and fissured with age.

2. Leaves: The leaves of *G. pinnata* are alternate and pinnately compound. Each leaf consists of several leaflets arranged in pairs along a central axis, with a terminal leaflet at the end. The leaflets are lanceolate to elliptical in shape, with a pointed tip and serrated edges. The leaves are dark green and have a smooth texture.

3. Flowers: The flowers of *G. pinnata* are small and inconspicuous. They are typically greenish-yellow in color and arranged in clusters or panicles. The flowering season for *G. pinnata* varies depending on the region but generally occurs during the summer months.

4. Fruits: The fruits of *G. pinnata* are small drupes that are oval to spherical in shape. They are initially green and turn reddish-brown or black when mature. Each fruit contains a single seed. The fruits are edible and have a sour taste (Fig. **12.1**).

Fig. (12.1). Fruits of *G. pinnata* (PC: Apurva Shankar Chonde).

Distribution:

G. pinnata is commonly found in tropical and subtropical regions. It is native to various countries in Asia, including India, Myanmar, Sri Lanka, Thailand, and Vietnam. The tree prefers well-drained soil and can tolerate both dry and moist conditions.

Propagation: Seed, Cuttings root readily.

Chemical constituents:

21-hydroxydammar-5,24-diene-3-one, alkaloids, biphenyl ether and biphenyl types macrocyclic diarylheptanoids, flavonoids, phenols, saponins, tannins, triterpenoids, ubiquitous β-sitosterol (Shirwaikar *et al.*, 2007; Akacha *et al.*, 2016).

Recipe:

Fruit - raw, boiled or pickled

Pickle recipe: Kakad: 1 kg; Fenugreek seeds: 12 gm; Mustard seeds: 70 gm; Red chili powder: 40 gm, Salt: 150 gm, Asafoetida: 30 gm; Oil: 250 ml Turmeric powder: 20 gm Coarsely ground cloves, black pepper, fennel seeds: 20 gm.

Uses:

1. Traditional Medicine: Various parts of *G. pinnata*, including the bark, leaves, and fruits, are used in traditional medicine for their potential therapeutic properties. The tree shows anti-inflammatory, antimicrobial, and analgesic effects. It is used to treat ailments such as gastrointestinal disorders, skin infections, wounds, rheumatism, and respiratory conditions (Sethiya *et al.*, 2009; Zaman, 2016; Chavan *et al.*, 2021).

2. Resin: The tree is known for its resinous sap, which is extracted and used for various purposes. The resin is used as a natural adhesive, especially in woodworking and handicrafts. It is also employed in traditional incense making and may have aromatic and purifying properties (Khatun *et al.*, 2013).

3. Timber: The wood of *G. pinnata* is highly valued for its quality and durability. It is used in the construction of furniture, flooring, paneling, and other woodworking applications. The wood is known for its resistance to termite and fungal attacks, making it suitable for outdoor and marine applications as well (Singh *et al.*, 2018).

CHAPTER 13

Wild Vegetables of the Family Capparaceae

INTRODUCTION

The Capparaceae family, also known as the caper family, is a group of flowering plants with 33 genera and about 700 species. Some members are rich sources of vitamins, including vitamin A (in the form of beta-carotene), vitamin C, and vitamin K. They may also contain minerals like potassium, calcium, and iron. Some members may contain anti-nutritional compounds like Glucosinolates and tannins (Kamel *et al.*, 2009).

Capparis zeylanica L.

Botanical name: *Capparis zeylanica L.*

Family: Capparidaceae

Local name: Waghati

Vernacular name:

- **Common name:** Ceylon caper, Indian caper
- **Hindi:** Aradanda
- **Tamil:** Adondai
- **Konkani:** Govindphal
- **Marathi:** Govindi
- **Sanskrit:** Vyaghranakhi
- **Telugu:** Palaki
- **Gujarati:** Karrallura
- **Rajasthani:** Gitoran
- **Kannada:** Mullukattari
- **Nepali:** Ban Kera

Season: Flowering occurs in March and fruits ripen during October-November.

Parts used: All parts

Characteristics:

1. Habit: *C. zeylanica* is a shrub or small tree, typically growing up to 5 meters in height.

2. Leaves: The leaves are simple, alternate, and clustered towards the ends of branches. They are elliptical to obovate in shape, with a smooth margin and a prominent midrib. The leaves are usually dark green and have a leathery texture.

3. Flowers: The flowers are large, showy, and white in color. They have four petals that are arranged in a cruciform pattern, giving them a cross-like appearance. The flowers are borne on long stalks and have numerous stamens.

4. Fruits: The fruits are round or oval-shaped berries. They start off green and turn yellow when mature. The fruits contain numerous small, black seeds embedded in a juicy pulp (Fig. **13.1**).

Fig. (13.1). Fruits of *C. zeylanica* (PC: Apurva Shankar Chonde).

5. Bark: The bark is brownish-gray in color and has a rough texture (Padhan *et al.*, 2010).

Distribution:

East Asia - Southern China, India, Sri Lanka, Myanmar, Thailand, Cambodia, Laos, Vietnam, Malaysia, Indonesia, and Philippines.

Propagation: Seed

Chemical constituents:

Alkaloids- capparine, capparidine, and capparisine, Flavonoids- quercetin and kaempferol derivatives, Triterpenoids- ursolic acid and oleanolic acid, Glycosides- glucosinolates, and essential oils.

Recipe:

Ingredients: Finely chopped onions, crushed garlic cloves, turmeric, red chili powder, coriander powder, cumin seeds, mustard, asafoetida, curry leaves, oil, salt, and coriander leaves.

Method: First, wash the Vagheti fruits and remove the stalk. Finely chop the seeds. Heat oil in a pan and add curry leaves, cumin seeds, asafoetida, and mustard seeds. Sauté the onion and garlic in the oil until well cooked. Add turmeric powder, red chili powder, coriander powder, and fodi, and stir thoroughly. Cover and cook until the mixture becomes soft. Season with salt to taste. Finally, sprinkle finely chopped coriander over the vegetables.

Uses:

1. *C. zeylanica* is known for its edible fruits, which are often consumed in pickled or preserved forms. The pickled fruits, known as capers, are used as a condiment in various cuisines and can add a tangy flavor to dishes (Shivprasad *et al.*, 2016).

2. Anti-inflammatory and analgesic properties: Plant extracts have been studied for their potential anti-inflammatory and analgesic effects, which may be beneficial in managing pain and inflammation-related conditions (Sini *et al.*, 2011).

3. Antioxidant activity: The plant exhibits antioxidant properties, which can help protect the body against oxidative stress and cellular damage caused by free radicals (Amit *et al.*, 2010).

4. Diuretic effects: *C. zeylanica* has been traditionally used as a diuretic to promote urine production and excretion, which may be useful in conditions such as edema and urinary tract infections (Kirtikar and Basu 1987).

5. Wound healing: The plant has been used topically in traditional medicine for wound healing purposes. Its extracts may possess antimicrobial and tissue-regenerating properties that aid in the healing process (Chopra, 1984).

CHAPTER 14

Wild Vegetables of the Family Caricaceae

INTRODUCTION

The Caricaceae family, also known as the papaya family, is a small but economically important group of flowering plants with 6 genera and about 35 species. Caricaceae members are a good source of vitamins A (in the form of beta-carotene), C, E, and K. It also contains minerals like potassium, folate, and magnesium. However, some members may contain goitrogens, which can interfere with thyroid function in high amounts (Carvalho and Renner 2013).

Carica papaya L.

Botanical name: *Carica papaya* L.

Family: Caricaceae

Local name: Papaya

Vernacular name:

- **Common name:** Papaya, Melon tree, Pawpaw, Papaya, Tree melon
- **Hindi:** Papita
- **Manipuri:** Awathabi
- **Marathi:** Pappayi, Popay
- **Tamil:** Pappali
- **Bengali:** Papeya
- **Konkani:** Poppayi
- **Sanskrit:** Erand karkati
- **Mizo:** Thing-fanghma
- **Kannada:** Pappaaya, Pappaayi, Parangi

Season: October to December

Parts used: leaves, fruits

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Characteristics:

1. Tree: *C. papaya* is a small to medium-sized tree, typically reaching a height of 5-10 meters. It has a single, straight trunk with a smooth surface and a relatively thin diameter (Bruneton, 1999; Bhattacharjee, 2001).

2. Stem: The stem is smooth and cylindrical, with a greenish-gray color. It may have vertical striations or markings (The Wealth of India 1992; Bruneton, 1999; Bhattacharjee, 2001).

3. Leaves: The leaves are large, palmately lobed, and deeply divided into 5-7 lobes. They are arranged spirally at the top of the trunk and have long petioles (Bruneton, 1999; Bhattacharjee, 2001) (Fig. **14.1**).

Fig. (14.1). Aerial part of *C. papaya* (PC: Prajakta Nandgaonkar).

4. Flowers: The flowers are large and showy, with a fragrant aroma. They are unisexual and male and female reproductive parts are developed on different plants. The flowers are usually white to yellowish in color and are borne on long stalks (The Wealth of India, 1992; Bruneton, 1999; Bhattacharjee, 2001).

5. Fruits: The fruits are large and elongated, typically pear-shaped or oval. They can grow up to 20-30 cm in length. The skin of the fruit is thin and smooth when ripe, and it can vary in color from green to yellow-orange. The flesh inside is

orange or yellow, and it contains numerous small, black seeds surrounded by a gelatinous substance (Bruneton, 1999; Bhattacharjee, 2001).

6. Latex: When the stem or leaves are cut or injured, they exude a milky white latex. The latex is sticky and has a pungent odor.

Distribution:

Mexico, northern South America, Caribbean Islands, Florida, Texas, California, Hawaii, India, and other tropical and subtropical regions of the world.

Propagation: Seed

Chemical constituents:

Serine protease, alkaloids, glycosides, flavonoids, saponins, tannins, phenols and steroids, vitamins A, C, and E, B complex vitamins, such as pantothenic acid and folate, and minerals, benzyl isothiocyanate, glucosinolates, tocopherols (α and δ), β-cryptoxanthin, β-carotene and carotenoids (Roshan *et al.*, 2014).

Recipe:

Ingredients: Younger leaves, finely chopped onion, 5-6 garlic cloves, salt, green chilies, curry leaves, Asafoetida, grated coconut, mustard seeds, turmeric, gram dal, *etc.*

Method: Wash the leaves and chop them finely. Heat oil in a pan and fry asafoetida, mustard seeds, curry leaves, crushed garlic cloves, and finely chopped onion. Once the onion turns slightly yellow, add the chopped vegetables, chili, turmeric powder, soaked dal, and salt to taste. Lightly moisten with water, cover the pan, and cook over low flame. Once the vegetables are cooked, sprinkle wet coconut on top.

Uses:

1. Culinary: The ripe fruit of *C. papaya* is consumed as a refreshing and nutritious fruit. It can be eaten raw or used in various culinary preparations like salads, smoothies, juices, jams, and desserts (Tan *et al.*, 2020).

2. Medicinal: It has been traditionally used in folk medicine for its medicinal properties. It contains enzymes like papain and chymopapain, which have digestive and anti-inflammatory properties. The fruit and other parts of the plant are used in traditional medicine for treating digestive disorders, such as constipation and indigestion. Papaya leaves have been used for remedies against

CHAPTER 15

Wild Vegetables of the Family Cleomaceae

INTRODUCTION

The Cleomaceae family, which includes 2 genera and 220 species, is predominantly found in hot temperate, desert, and tropical regions (Chase *et al.*, 2016). This family members include species with various traditional uses, such as bioinsecticide, forage, ornamental plant, and for magical, religious, and medicinal purposes (Magalhaes *et al.*, 2023).

Cleome rutidosperma DC.

Botanical name: *Cleome rutidosperma*

Family: Cleomaceae

Local name: Nili tilwan

Vernacular name:

- **Common name:** Fringed Spider Flower
- **Marathi:** Nili tilwan
- **Bengali Name:** Nil Hurhure or Beguni Hurhure

Season: In India- May to November

Parts used: shoots, leaves

Characteristics:

1. Habit and Growth: *C. rutidosperma* is an annual herbaceous plant that typically grows erect, reaching heights of about 30-100 cm. It has a branching stem and can form dense stands.

2. Leaves: The leaves of *C. rutidosperma* are alternate, palmately compound, and usually have 3-5 leaflets. The leaflets are lanceolate to oblong in shape and have serrated or toothed margins. The leaves emit an unpleasant odor when crushed.

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3. Flowers: The flowers are typically white or pale pink in color. They are borne in terminal racemes and have four petals and six stamens. The flowers have a distinct aroma (Fig. **15.1**).

Fig. (15.1). Flowering twig of *C. rutidosperma* (PC: Apurva Shankar Chonde).

4. Fruits and Seeds: The plant produces elongated seed capsules that are about 1-2 cm in length. The capsules contain numerous small seeds (Okonwu *et al.*, 2017; Ghosh *et al.*, 2019).

Distribution:

Asia: Bangladesh, Malaysia, Maldives, Myanmar, Philippines, Sri Lanka, Thailand; Africa; North America; South America. India: Andaman & Nicobar Islands, Assam, Bihar, Gujarat, Karnataka, Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh, West Bengal.

Propagation: Seed

Chemical constituents:

Flavonoids- quercetin, kaempferol, and their glycosides, Triterpenoids- ursolic acid and oleanolic acid, Alkaloids- rutidospermine and rutidomine, Saponins, Phenolic compound- caffeic acid, coumaric acid, and their derivatives.

Recipe:

The leaves of *C. rutidosperma* are eaten as a cooked vegetable or added to soup.

Uses:

1. Medicinal: In traditional medicine, various parts of *C. rutidosperma*, including the leaves, flowers, and seeds, have been used to treat various ailments. It may have diuretic, antispasmodic, and emmenagogue properties. Ayurveda, Siddha, Yunani medical practitioners and rural people used the different parts of *C. rutidosperma* as leaves, roots, and seeds for anti-convulsant, anti-inflammatory, anti-stimulant, anti-scorbutic, rubefacient, anti-diarrheal, vesicant and carminative, *etc.* bioactivities (Kirtikar *et al.*, 1991; Waterhouse *et al.*, 1998; Pillai *et al.*, 2012).

2. Culinary: The young leaves and shoots of *C. rutidosperma* are edible and can be used in salads or cooked as a leafy vegetable. The seeds of the plant can also be ground into a powder and used as a spice or added to baked goods (Burkill, 2004; Edeoga *et al.*, 2005).

3. Phytoremediation potential: This plant is a hyperaccumulator of cadmium and lead (Bhattacharya *et al.*, 2022).

4. Ornamental Plant: *C. rutidosperma* is grown as an ornamental plant for its showy flowers. The attractive pink to purple flowers make it a popular choice for gardens and landscaping (Pillai *et al.*, 2012).

CHAPTER 16

Wild Vegetables of the Family Commelinaceae

INTRODUCTION

This family comprises approximately 41 genera and 731 species. In contrast to many flowering plants, Commelinaceae species feature a distinctive structure known as a spathe. This modified leaf serves as a protective sheath around the flower cluster (inflorescence) before it blooms. Some Commelinaceae species are excellent sources of vitamins, particularly A and C, and may also contain essential minerals such as calcium, potassium, and iron. However, certain Commelinaceae plants contain antinutritional compounds, including calcium oxalate crystals and saponins (Faden 1998).

Commelina benghalensis L.

Botanical name: *Commelina benghalensis*

Family: Commelinaceae

Local name: Kena

Vernacular name:

- **Bengali**: Kanshira/ Kanaibashi/ Dholpata
- **Hindi**: Kana/ Kankawa
- **Kannada**: Hittangani
- **Malayalam**: Kanankoai/ Kanchatam
- **Manipuri**: Wangdenkhoibi
- **Nepali**: Kane
- **Sanskrit**: Kanchata/ Kosapuspi
- **Telagu**: Neerukaassuvu

Season: May to December

Parts used: Leaves

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Characteristics:

1. Growth Habit: It is a prostrate or creeping herb that grows close to the ground. It has weak and slender stems that may sprawl or trail along the ground (Orni *et al.*, 2018).

2. Leaves: The leaves are alternate and simple, with long petioles (leaf stalks). The leaf blades are ovate to lanceolate in shape and have prominent parallel veins. They can range in size from 2 to 10 centimeters in length (Orni *et al.*, 2018).

3. Flowers: The flowers of *C. benghalensis* are small and arranged in clusters. Each flower has three petals: two large blue or purplish-blue upper petals and one smaller white or pale blue lower petal. The petals are delicate and ephemeral, lasting for only a short period (Hossain *et al.*, 2014; Orni *et al.*, 2018) (Fig. **16.1**).

Fig. (16.1). Flowering twig of *C. benghalensis* (PC: Apurva Shankar Chonde).

4. Inflorescence: The flowers are borne on slender, branched stalks that arise from the leaf axils or the stem nodes. The inflorescence can be a raceme or a panicle, depending on the growth stage of the plant (Orni *et al.*, 2018).

5. Fruits: After pollination, the flowers produce small capsules that contain seeds. The capsules are ovoid or ellipsoid in shape and usually have three chambers, each containing several seeds (Orni *et al.*, 2018).

6. Roots: *C. benghalensis* has fibrous roots that spread horizontally in the soil.

Distribution:

Native to tropical and subtropical regions in Africa, Asia, and the Pacific. African countries: Djibouti, Ethiopia, Somalia, Kenya, Cameroon, Congo, Rwanda, Benin, South Africa, Swaziland. Asian Countries: Arabia, China, Japan, Bhutan, India, Nepal, Pakistan, Sri Lanka, Indonesia.

Propagation: Seeds, Stem cuttings, Root cuttings

Chemical constituents:

Flavonoids- luteolin, apigenin, and kaempferol, alkaloids-commelinids and its derivatives, phenolic acids, and tannins, cyanogenic glycosides, sterols- β-sitosterol and stigmasterol.

Recipe:

Ingredients: Toovar daal, Kena leaves, Turmeric powder, Castor oil, ghee, Cumin seeds, Chopped shallots, red chili, sambar powder

Method: Boil toovar dhal along with a little turmeric powder and a bit of castor oil. Heat a teaspoon of ghee, and cumin seeds and add finely cut shallots and 1 red chili broken. Add 1/2 tea soon sambar powder and the cut kena leaves and fry till it wilts. Once wilted, add water, and salt and boil until fully done. Add the cooked daal and add little grated coconut before serving.

Uses:

1. The young leaves of *C. benghalensis* can be consumed as a leafy green vegetable. They are rich in various nutrients, including vitamins, minerals, and dietary fiber (Qaiser *et al.*, 1975).

2. Traditional medicine: In traditional systems of medicine, different parts of *C. benghalensis* are used to treat various ailments. It has been used to treat skin diseases, urinary tract disorders, digestive issues, respiratory problems, and as a diuretic and anti-inflammatory agent. It has been used for the treatment of pain, mouth thrush, epilepsy, constipation, headache, leprosy, fever, snake bite, and jaundice (Ssenyonga *et al.*, 1993; Kirtikar *et al.*, 1998; Ghani, 2003; Okello *et al.*, 2007; Hasan *et al.*, 2010).

3. Anti-inflammatory properties: Extracts from *C. benghalensis* have shown potential anti-inflammatory activity in laboratory studies. They may help reduce inflammation and alleviate related symptoms (Jayvir *et al.*, 2007).

CHAPTER 17

Wild Vegetables of the Family Convolvulaceae

INTRODUCTION

The Convolvulaceae family, commonly known as the morning glory family, boasts a vibrant display of flowering plants. The most interesting character is the flower's corolla, it is typically funnel-shaped, with five fused petals forming a trumpet-like structure. The family consists of 60 genera and 2000 species (Simoes *et al.*, 2022). Some members are a good source of vitamins like vitamin A, vitamin C, and B vitamin, dietary fibers, and essential minerals like potassium, magnesium, and iron.

Argyreia nervosa (Burm. f.) Bojer

Botanical name: *Argyreia nervosa*

Family: Convolvulaceae

Local name: Gogal, Samudrasoka

Vernacular name:

- **Assamese**: Bisadharaka lata, Hemalata, Sona parauraa lata
- **Bengali:** Abegi, Ayantri, Bijataraka, Chagalantrika, Dirgha baluka, Guguli, Husane lata, Jungaka, Kotarapuspi, Rsyagandha, Samudrasakha
- **Gujarati:** Samudrashok, Samudrashosh, Vardharo
- **Hindi:** Ghav bel, Samudrasokh, Samundar ka pat, Vidhara
- **Kachchhi:** Samadarsos, Vardharo
- **Kannada:** Chandrapada, Musute, Samudra balli, Samudrahaale, Samudrapala, Samudrasoge, Kadasige, Shringi
- **Konkani:** Samudra Somk
- **Malayalam:** Perunkurumpa, Samudra-tsjogam, Samudrappachcha
- **Manipuri:** Pungdingbi
- **Marathi:** Gugguli, Samudrashok, Varadhara, Vriddhadaru
- **Nepali:** Samudraphal
- **Odia:** Bruddhadaraka, Munda nai, Syama

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- **Sanskrit:** Antakotarapushpi, Bastantri, Bokadi, Chagalantrika, Jirnadaru, Junga, Kshatavidhvamsin, Murva, Rkshagandha, Samudra palaka, Sukshmapattra, Supushpi, Vriddha, Vriddhadaru, Vrshagandha
- **Tamil:** Akaya-p-puritam, Anpakar, Katar-palai, Mirutu, Pey-mucuttai, Pey-munnai, Samuttira-c-ceti, Samuttira-p-palai, Tokki, Vakul
- **Telugu:** Chandrapoda, Samudra-pachcha, Samudrapala
- **Tibetan:** Bhi tta dha ru, Bhra ddha dha ru
- **Tulu:** Malla adambu ballu

Season: December-June

Parts used: leaves, fruit, seeds and root

Characteristics (Galani *et al.*, 2010):

1. Habit: It is a perennial climbing vine that can reach heights of up to 10 meters.

2. Leaves: The leaves are large, heart-shaped or arrow-shaped, and alternate along the stem. They have a prominent central vein and are usually green with a smooth or slightly hairy texture (Fig. **17.1**).

Fig. (17.1). Flower of *A. nervosa* (PC: Tukaram Kanoja).

3. Flowers: The flowers are funnel-shaped and typically large, measuring 5-8 centimeters in diameter. They are usually white or pale pink with a darker pink or purple throat.

4. Fruit: The fruit is a capsule that contains seeds. The seeds are dark brown or black, rounded, and have a rough texture.

Distribution: It is native to tropical regions of Asia, including India, Sri Lanka, and Nepal. It has also been introduced to various other parts of the world, including Hawaii, where it has become naturalized.

Propagation: Seed, Softwood cuttings

Chemical constituents:

Alkaloids, carbohydrate, tannins, amber-colored resin, Sterols, Saponin, 1-triacontanol, ß-sitosterol, epifriedeline, Kaemperol-3-o-l-rhamnopyranoside, agroclavine, ergine, isoergine, isolysergic acid amide, pennidavine, caffeic acid, Et-caffeate, chanoclavine-I, chanoclavine-II, racemic chanoclavine-I, festuclavine, lysergine, lysergol, isolysergol, molliclavine, penniclavine, steoclavine, isosetoclavine, tetradecanyl pa lminate, 5, 8-oxidotetraco san-10-one, stig mast eryl p-hydroxycinnamate, n-triacontanol, β-sitosterol and p-hydroxy innamoyloctadecanolate (Kokate *et al.*, 2006; Ashutosh *et al.*, 2011; Singhal *et al.*, 2011).

Recipe:

Ingredients: Leaves, finely chopped onion, 5-6 garlic cloves, salt, green chilies, curry leaves, Asafoetida, grated coconut, mustard seeds, turmeric, gram dal, *etc.*

Method: Peel the stalks of the leaves, wash one judy leaf, and chop it finely. Heat oil in the pan and fry asafoetida, mustard seed, curry leaves, crushed garlic cloves, and finely chopped onion. When the onion turns slightly yellow, add the chopped vegetables, chili, and turmeric powder, add soaked dal, and salt to taste, lightly beat water and cover, and cook over low flame. Sprinkle-grated wet coconut over the cooked vegetable.

Uses:

1. *A. nervosa* is of great medicinal value. In traditional Indian medicine, the whole plant is prescribed for treating stomach complaints, sores on foot, smallpox, syphilis, dysentery and diarrhoeal, antifertility, anti-rheumatic, antifungal (Malahotra, 1996; Guhabaksh *et al.*, 1999).

CHAPTER 18

Wild Vegetables of the Family Cordiaceae

INTRODUCTION

The Cordiaceae family consists of a fascinating group of flowering plants native to tropical and subtropical regions around the world. Although they were once classified as a subfamily within the larger Boraginaceae family, recent phylogenetic studies have recognized them as a distinct family with unique characteristics. This family includes around 350 species, spread across two recognized genera: *Cordia* and *Varronia* (Miller and Gottschling 2007). Some members contain phenolic compounds, flavonoids, triterpenoids, alkaloids, and essential oils.

Cordia dichotoma G. Forst

Botanical name: *Cordia dichotoma*

Family: Boraginaceae

Local name: Bhokar

Vernacular name:

- **Assamese:** Goborsuta
- **Bengali:** Bahubara
- **Gujarati:** Vado gundo
- **Hindi:** Bahuar, Gunda, Lasora
- **Kannada:** Challe hannu
- **Malayalam:** Naruveeli, Virasam, Viri
- **Marathi:** bhokar, Gondani, Gondhan
- **Sanskrit:** Bahuka, Bahuvaraha, Uddalaka
- **Tamil:** Naru-valli, Viricu
- **Telugu:** Nekkara, Slesmatakamu, Virigi
- **Urdu:** Sipistan

Season: Flowering: March to May. Fruits are formed soon after flowering, develop quickly, and ripen from June to August.

Parts used: Leaves, fruit, seed

Characteristics:

1. Habitat: *C. dichotoma* is native to India and is commonly found in tropical and subtropical regions. It thrives in a variety of habitats, including dry forests, open woodlands, and scrublands. It can tolerate drought conditions and is often found growing in rocky or sandy soils.

2. Tree: *C. dichotoma* is a small to medium-sized deciduous tree that can reach a height of 10-15 meters. It has a well-developed trunk and branches that form a spreading crown (Patel *et al.*, 2011; Hussain *et al.*, 2013; Jamkhande *et al.*, 2013).

3. Leaves: The leaves of *C. dichotoma* are simple, alternate, and ovate or elliptical in shape. They are usually 5-12 cm long and 3-7 cm wide. The leaves have a smooth texture and a glossy appearance. The leaf margins are serrated or toothed (Patel *et al.*, 2011; Hussain *et al.*, 2013; Jamkhande *et al.*, 2013).

4. Flowers: The tree produces small, tubular-shaped flowers that are white or pale yellow in color. The flowers are borne in clusters or racemes and have a pleasant fragrance. They attract bees, butterflies, and other pollinators (Patel *et al.*, 2011; Hussain *et al.*, 2013; Jamkhande *et al.*, 2013).

5. Fruits: The fruits of *C. dichotoma* are small, round berries that resemble cherries. The fruits are initially green and turn yellow or orange when fully ripe. Each fruit contains a single hard seed surrounded by a fleshy pulp (Patel *et al.*, 2011; Hussain *et al.*, 2013; Jamkhande *et al.*, 2013) (Fig. **18.1**).

6. Bark: The bark of *C. dichotoma* is grayish-brown and smooth when young, but it becomes rough and fissured as the tree matures (Patel *et al.*, 2011; Hussain *et al.*, 2013; Jamkhande *et al.*, 2013).

Distribution:

It is widely distributed throughout various regions of India, including the northern, central, and western parts of the country and South Asia, including Pakistan, Nepal, and Bangladesh. It has also been introduced and naturalized in other parts of the world, including parts of Africa, the Middle East, and Southeast Asia.

Fig. (18.1). Fruits of *C. dichotoma* (PC: Suhas Kadu).

Propagation: Seed

Chemical constituents:

Phenolic compounds- ellagic acid, gallic acid, quercetin, and kaempferol, Flavonoids- quercetin, kaempferol, and rutin, Triterpenoids- lupeol and betulinic acid, Alkaloids- cordioside and cordiofolin, Essential oils- limonene, β-caryophyllene, and α-pinene.

Recipe:

Ingredients: Fruits of *C. dichotoma*, imli, onion & garlic paste, turmeric, sugar, salt, red chili powder, salt, coriander powder, and mustard oil.

Method: Prepare tamarind water by soaking tamarind pulp in warm water and straining it to remove any seeds or fibers. Keep the tamarind water aside. Deseed the fruits and boil them. Place the boiled fruits in the prepared tamarind water to prevent them from turning black. Keep the fruits soaked in the tamarind water. Keep a bowl of tamarind water nearby and dip your fingers in it to avoid the stickiness of the fruits. Heat around 1 and 1/2 cups of mustard oil in a cast iron kadai/wok, preferably an iron kadai. Add approximately 2 and 1/2 cups of onions and garlic paste to the hot oil and cook until it turns golden brown in color. Mix in 5 tablespoons of coriander powder, 2 tablespoons of turmeric powder, and 3

CHAPTER 19

Wild Vegetables of the Family Costaceae

INTRODUCTION

The Costaceae family, a vibrant group of flowering plants, stands out within the Zingiberales order for its unique characteristics. Often confused with their close relatives, the gingers (Zingiberaceae), The monostichous (one-sided) spiral phyllotaxy of shoot is the key character of this family, which encompasses around 7 genera and 143 species (Specht 2006). Some members are rich in essential oils, alkaloids, flavonoids, triterpenes, steroids, and phenolic compounds.

***Costus speciosus* (J. Koenig) C. Specht**

Botanical name: *Costus speciosus*

Family: Costaceae

Local name: Peva

Vernacular name:

- **Common Name:** Crepe Ginger, Setawar Tawar, Spiral Flag, Cane Reed, Malay Ginger, Wild Ginger, Spiral Ginger, White Costus
- **Assamese:** Devi tokon, Jam lakhuti
- **Malayalam:** Aanakoova, Aanappoo, Channa
- **Bodo:** Burhi thokon

Season: July-October

Parts used: leaves, rhizome, stem

Characteristics:

1. Height and Growth Habit: *C. speciosus* typically grows to a height of 1 to 3 meters (3 to 10 feet). It has a clump-forming growth habit with thick and erect stems (Gupta 2010).

2. Leaves: The leaves of *C. speciosus* are large and alternate. They are simple, entire (without toothed margins), and lance-shaped. The leaves have prominent parallel veins running along their length (Maji *et al.* 2020) (Fig. **19.1**).

Fig. (19.1). Whole plant of *C. speciosus* (PC: Apurva Shankar Chonde).

3. Inflorescence: The plant produces showy and colorful flowers arranged in a cone-shaped inflorescence at the top of the stems. The inflorescence is cylindrical and spirally arranged, giving it the name "Spiral Ginger." The flowers are usually red, pink, or orange, with a tubular shape and six petal-like lobes (Srivastava *et al.*, 2011; Mazumdar and Hussain 2021).

4. Bracts: Surrounding the flowers, there are large, brightly colored bracts that resemble petals. These bracts are often yellow, orange, or red and provide additional ornamental value to the plant.

5. Rhizomes: *C. speciosus* has thick, fleshy rhizomes that grow horizontally beneath the soil surface. These rhizomes serve as storage organs and help the plant survive adverse conditions.

6. Aromatic Scent: When the leaves or stems of *C. speciosus* are crushed, they emit a pleasant, aromatic scent.

Distribution: Indian Subcontinent- Western Ghats, Eastern Ghats, and parts of North India, also found in neighboring countries including Nepal, Bangladesh, and Sri Lanka. Southeast Asia- Thailand, Myanmar (Burma), Vietnam, Cambodia, and Indonesia, Africa- Nigeria, Ghana, Uganda, Kenya, Tanzania, and South Africa, Central and South America- Brazil, Mexico, Colombia, and Venezuela, Pacific Islands- Pacific Island countries, including Fiji, Samoa, and Hawaii.

Propagation: Seeds, Rhizome, Stem Cuttings

Chemical constituents:

Essential oils- α-pinene, β-pinene, limonene, camphene, and cineole, alkaloids- costunolide and dehydrocostuslactone, flavonoids- apigenin, kaempferol, quercetin, and rutin, triterpenes- lupeol and β-sitosterol, Steroids- stigmasterol and campesterol, phenolic compounds- caffeic acid, ferulic acid, and p-coumaric acid.

Recipe:

Food (Fruit & Vegetable): The edible part of *C. speciosus* is the starchy rhizome, which can be consumed as a food source. However, it is important to note that the rhizome is fibrous and has a watery taste with a hint of ginger, as it is closely related to ginger.

Uses:

1. Medicinal: *C. speciosus* has been traditionally used in Ayurvedic and traditional medicine systems for its medicinal properties. It shows anti-inflammatory, antimicrobial, and antioxidant properties (Karimi *et al.* 2013). It is used to treat various ailments such as skin diseases, digestive disorders, jaundice, flatulence, asthma, respiratory problems, inflammatory conditions (Nair *et al.* 2014; Maji *et al.* 2020), catarrhal fever, cold and cough, and also against snake bites (Nadkarni 2009).

2. Ornamental Plant: The attractive flowers of *C. speciosus* make it a popular choice as an ornamental plant in gardens and landscapes. The spiral-shaped inflorescence and vibrant colors add beauty and aesthetic appeal to outdoor spaces (Srivastava *et al.*, 2011; Mazumdar and Hussain 2021).

3. Culinary Purposes: While the rhizome of *C. speciosus* is fibrous and not commonly consumed as a primary food source, it is sometimes used as a flavoring agent in certain regional cuisines. It can add a mild gingery taste to dishes and beverages (Pawar *et al.*, 2014).

CHAPTER 20

Wild Vegetables of the Family Cucurbitaceae

INTRODUCTION

The Cucurbitaceae family, is commonly known as the gourd family or cucurbits. It is the second largest fruit and vegetable family. This family encompasses approximately 122 genera and 940 species. Cucurbits are rich in vitamins (Vit. A, C, E, and K), minerals (Potassium, Manganese, and Magnesium), antioxidants (flavonoids, carotenoids, *etc.*), and dietary fibers. However, they also contain some antinutritional compounds like cucurbitacins, oxalates, phytates, *etc.* (Schaefer and Renner 2011).

Benincasa hispida (Thunb.) Cogn.

Botanical name: *Benincasa hispida*

Family: Cucurbitaceae

Local name: Kohala

Vernacular name:

- **Hindi**: Petha, Pethakaddu
- **Manipuri**: Torobot
- **Tamil**: Neer poosanikai
- **Malayalam**: Kumbalanga
- **Telugu**: BooDida Gummadikaaya
- **Kannada**: Budekumbalakayi, Boodu Gumbala
- **Bengali**: Kumra, Chalkumra
- **Assamese**: Komora
- **Sanskrit**: Brihatphala, Ghrinavasa, Gramyakarkati, Karkaru
- **Nepali**: Kubindo
- **Tangkhul**: Katsenghei
- **Mizo**: Mai-pawl

Season: August to October

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Parts used: Fruit, seeds

Characteristics:

1. Vine-Like Habit: It is a vigorous, trailing or climbing vine with long, slender stems that can reach several meters in length. The plant typically grows on the ground or climbs over trellises and supports.

2. Large, Round Fruits: The fruits are the most distinctive feature of the plant. They are large, round, and can grow to considerable sizes, often reaching over 1 foot (30 cm) in diameter. The fruit's outer skin is smooth, waxy, and green when immature, turning pale yellow or white as it matures (Fig. **20.1**).

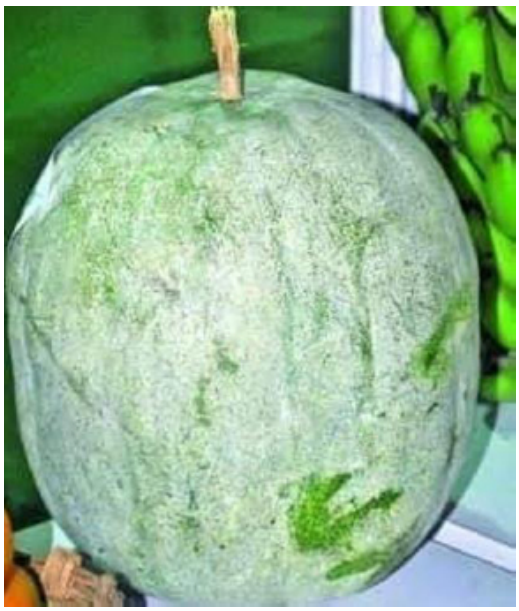

Fig. (20.1). Fruit of *B. hispida* (PC: Apurva Shankar Chonde).

3. Light Green Leaves: The leaves are large, alternate, and palmately lobed. They have a light green color and are often covered in fine hairs, especially on the underside.

4. Male and Female Flowers: It produces separate male and female flowers on the same plant. The flowers are typically large, yellow or white in color, and have a funnel-shaped structure. The male flowers usually appear in clusters, while the female flowers are solitary (Islam *et al.*, 2021).

Distribution:

Indo-China and India are the centers of greatest diversity, the wax gourd is now widely cultivated throughout tropical Asia and has been introduced to other tropical, subtropical, and warm temperate parts of the world.

Propagation: Seed

Chemical constituents:

The phytochemical analysis of fruits revealed the presence of volatile oils, flavonoids, glycosides, saccharides, proteins, carotenes, vitamins, minerals, ß-sitosterin, and uronic acid (Nimbal *et al.* 2011; Rana *et al.* 2012).

Recipe:

Ingredients: Kohala, oil, mustard seeds, cumin seeds, asafoetida, ginger and garlic paste, curry leaves and tomatoes, salt, *etc.*

Method: First of all, slice the kohala and remove its seeds. Wash the slices thoroughly. Heat oil in a pan and add mustard seeds, cumin seeds, asafoetida, and ginger-garlic paste. Let it cook until it turns a nice reddish brown. Then, add curry leaves and tomatoes. Pour the mixture into the pan along with the sliced kohala. Once the tomatoes and oil start to separate, add pumpkin seeds and salt. The pumpkin cooks quickly, so it would not take much time to cook.

Uses:

1. Culinary: It is widely used as a food source in various cuisines. The flesh of the fruit is commonly used in soups, stews, curries, and stir-fries. It has a mild, refreshing flavor and a crisp texture, making it suitable for both savory and sweet dishes (Ismal *et al.*, 2021).

2. Traditional Medicine: In traditional medicine systems, different parts of *B. hispida* have been used for their potential medicinal properties. The fruits, seeds, and leaves of the plant have been used in various formulations to treat conditions such as urinary disorders, digestive issues, respiratory ailments, and skin problems. Fruits are used as diuretic, tonic, aphrodisiac, cardiotonic, urinary calculi, for blood disease, insanity, epilepsy, schizophrenia and other psychologic disorders, such as jaundice, dyspepsia, fever, and menstrual disorders (Jayasree *et al.*, 2011).

3. Ayurveda: It is used in the treatment of epilepsy, cough, lung disease, hiccups, asthma, internal bleeding, and urinary retention (Grover *et al.*, 2001).

CHAPTER 21

Wild Vegetables of the Family Dilleniaceae

INTRODUCTION

The family Dilleniaceae consists of 10-14 genera and 500 species with four subfamilies (Lima *et al.*, 2014). The members are distributed in tropical and subtropical regions around the world including Australia. Some members are widely used in folk medicines to treat cough, fever, diabetes, diarrhea, and cancer and are also used as hair tonic (Sabandar *et al.*, 2017). Some members produce edible fruits and can be cultivated as ornamental plants.

Dillenia indica L.

Botanical name: *Dillenia indica*

Family: Dilleniaceae

Local name: Mothe Karmal, Elephant Apple, Karambel

Vernacular name:

- **Assamese:** Outenga
- **Hindi:** Chalta, Karambel
- **Kannada:** Kaltega, Mucchilu, Ganagalu
- **Manipuri:** Heigri
- **Mizo:** Kawrthindeng
- **Nepali:** Panch Phal, Raamphaal, Chaltaa, Paanch Kule, Thulo Taataree
- **Sanskrit:** Avartaki
- **Malayalam:** Pinnay, Punna

Season: Flowering- May-August, Fruiting: September-February.

Parts used: Fleshy sepals

Characteristics: (Nadkarni *et al.*, 1954; Khare *et al.*, 2007):

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1. Habitat: *D. indica* is native to South and Southeast Asia. It is commonly found in tropical and subtropical regions, growing in forests, savannahs, and riverbanks.

2. Tree Size: *D. indica* is a large tree that can grow up to 20 meters in height.

3. Bark: The bark of the tree is light grayish-brown in color and has a rough texture.

4. Leaves: The leaves are large, leathery, and oblong in shape. They are dark green on the upper surface and pale green on the lower surface. The leaf margins are serrated.

5. Flowers: The tree produces large, showy, solitary flowers. The flowers are white or cream-colored with numerous stamens and have a pleasant fragrance (Fig. **21.1**).

Fig. (21.1). Flower of *D. indica* (PC: Sunil Kadam).

6. Fruits: The fruits of *D. indica* are large, round, and resemble a green apple. They can reach a diameter of 5 to 10 centimeters. The outer skin of the fruit is thick and woody.

7. Seeds: Inside the fruit, there are numerous small, black seeds embedded in a pulpy mass.

Distribution:

E. Asia - China, India, Sri Lanka, Nepal, Bhutan, Myanmar, Thailand, Laos, Vietnam, Malaysia, Indonesia, Philippines.

Propagation: Seed, Semi-ripe cuttings

Chemical constituents:

Triterpenoids- betulinic acid, ursolic acid, and oleanolic acid, flavonoids- quercetin, kaempferol, and rutin, phenolic compounds- ellagic acid and gallic acid, essential oils- limonene, α-pinene, and β-pinene, tannins, carotenoids- β-carotene, vitamin C.

Recipe:

Ingredients: Raw green fruits of big karmal, oil, malvani bhajka masala, onion, turmeric, salt, wet coconuts.

Method: Remove the seeds from the Chirum fruits and then finely chop the fruits, and grate the wet coconuts for roasting. Chop the onion finely and when the onion turns yellow, roast the coconut in it and make it red. As soon as it cools down, divide it finely on a plate. Heat oil in a pan for frying. As soon as the oil is hot, add onion to the pan. As soon as the onion turns yellow, fry the finely chopped onion in it, add salt and turmeric powder to taste and fry the vegetable well and give it a little steam. After that, add Malvani Bhajaka masala and onion-coconut allotment to the bhaji. Add a little boiled water and cook the vegetables until tender.

Uses:

1. Culinary: The ripe fruits of *D. indica* are edible and often used in traditional cuisine. They can be consumed raw or cooked to make jams, jellies, chutneys, and beverages. The tangy flavor of the fruit adds a unique taste to various dishes (Bal *et al.*, 2012; Li *et al.*, 2013).

2. Medicinal: In traditional medicine, different parts of *D. indica* are used for their medicinal properties. The bark, leaves, and roots are known to possess antimicrobial, anti-inflammatory, and antioxidant properties. They are used in the treatment of various ailments, including respiratory disorders, digestive issues, skin diseases, rheumatism, fever, constipation, diarrhea, and stomach pain (Yeshwante *et al.*, 2009; Yazan *et al.*, 2014; Amritveer *et al.*, 2016).

3. Ornamental Plant: *D. indica* is valued for its attractive appearance and is cultivated as an ornamental plant in gardens and parks. The large, glossy leaves and beautiful white flowers with prominent yellow stamens make it an appealing choice for landscaping (Sabandar *et al.*, 2014).

CHAPTER 22

Wild Vegetables of the Family Dioscoreaceae

INTRODUCTION

The monocotyledonous family- Dioscoreaceae, also known as the yam family, is known for their starchy edible tubers. It consists of 9 genera and 750 known species (Xu and Chang 2017). The members are a valuable food source in tropical regions, rich in complex carbohydrates, fiber, B vitamins, and minerals such as potassium and manganese. Species contain diosgenin, a steroid saponin that can be toxic in high amounts (Xu and Chang 2017).

Dioscorea bulbifera L.

Botanical name: *Dioscorea bulbifera*

Family: Dioscoreaceae

Local name: Air potato, Air yam, Karande

Vernacular name:

- **English name:** Air potato, Potato yam.
- **Hindi name:** Suralu, Zami kanda, Gaithi, Genthi, Barahi khandh, Barahikhandha
- **Gujarati name:** Dukar kanda, Dukkar Kand, Suvariya, Dukkar Kand.
- **Kannada name:** Heggenasu, Kuntu genasu.
- **Malayalam name:** Kattu kachi, Kattu kachil.
- **Tamil name:** Pannu pilangu
- **Telugu name:** Nela dumpa
- **Bengali name:** Banalu, Pitalu.
- **Konkani name:** Karamdo.
- **Marathi name:** Gathalu, Manu kand, Gorkan, Kukar kand
- **Oriya name:** Pitalu.
- **Assamese name:** Kathalu, Mati alu.
- **Japanese name:** Benkei imo.
- **Chinese name:** T'u uh, Un kau tou.

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Season: June to October

Parts used: Corm, tuber

Characteristics: (Mahesh *et al.*, 2010; Behera *et al.*, 2010; Sakia *et al.*, 2011):

1. Vine-Like Growth: *D. bulbifera* is a perennial vine that climbs and twines around support structures or other plants. It can reach considerable lengths and form dense masses of foliage (Fig. **22.1**).

Fig. (22.1). Climber of *D. bulbifera* (PC: Apurva Shankar Chonde).

2. Heart-Shaped Leaves: The leaves of *D. bulbifera* are large, alternate, and heart-shaped. They have a prominent central vein and are usually green in color. The leaf size can vary, but they are generally quite broad.

3. Bulbils or Aerial Tubers: One of the distinct features of *D. bulbifera* is the presence of bulbils or aerial tubers. These are small, round structures that develop at the leaf axils along the vine. The bulbils are brown or reddish-brown in color and serve as a means of vegetative propagation.

4. Twining Stem: The stems of *D. bulbifera* are slender, and flexible, and tend to twine around nearby structures for support. They can coil and cling to other plants or objects as the vine grows.

5. Dioecious Flowers: *D. bulbifera* produces separate male and female flowers on different plants. The flowers are small, greenish-white, and arranged in clusters on long stalks. The male flowers have prominent stamens, while the female flowers have a three-lobed ovary.

Distribution: It is native to tropical and subtropical regions of Africa, Asia, and Australia. It has been introduced to various parts of the world, including the Americas, where it has become invasive in some areas. Africa- Nigeria, Ghana, Cameroon, and Madagascar, Asia- India, China, Thailand, Indonesia, and Malaysia, Australia- Queensland and the Northern Territory, Americas- Florida, Georgia, and Texas.

Propagation: By corm

Chemical constituents:

Diosgenin, Tannins, Flavonoids, furanoid norditerpenes, sinodiosgenin, diosgenin ß, epismilagenins, smilagenone, and stigmasterol; 2,3'-di-hydroxy-4'-5'-dimethoxybibenzyl, 5,3,4-trihydroxy-3,7-dimethoxyflavone, 7-bis--4-hydroxyphenyl) -4E, 6E-heptadien-3-one, adenosine, behenic acid, demethyl batatasin IV, diosbulbin B, diosbulbin D, docosyl ferulate, mono-arachidin, protocatechuic acid, stigmasterol, and Tristin (Gang *et al.*, 2009).

Recipe:

Ingredients: 1 air yam, 1 cup beef tallow, salt/garlic powder to taste *etc.*

Method: Wash the potatoes and start peeling them. Heat a pan and add oil. Keep stirring the potato pieces around, similar to frying potatoes, ensuring that they become brown evenly without burning. After about 10-15 minutes, you will have nicely cooked home fries. Sprinkle them with garlic powder and salt for added flavor.

Uses:

1. Food: The tubers of *D. bulbifera* are edible and can be used as a starchy vegetable. They are consumed in various ways, including boiling, roasting, or frying. In some cultures, they are used in traditional dishes and cuisines (Mishra *et al.*, 2008).

2. Traditional medicine: *D. bulbifera* has been used in traditional medicine systems for its potential medicinal properties. It possesses anti-inflammatory, antioxidant, and antimicrobial effects. It has been used to treat various ailments such as digestive disorders, respiratory issues, hemoptysis, goiter, skin infections,

CHAPTER 23

Wild Vegetables of the Family Euphorbiaceae

INTRODUCTION

The Euphorbiaceae, commonly known as the spurge family, is a large and diverse family of flowering plants. As the fifth-largest flowering plant family, it comprises approximately 7,500 species distributed across 300 genera (Kemboi *et al.*, 2020). The presence of milky latex is the characteristic feature of this family. Some members are rich in dietary proteins, carbohydrates, fats, oils, vitamins, and minerals. However, some members also contain antinutritional compounds such as triterpenoid saponins, phorbol esters, lectins, *etc.*

Euphorbia hirta L.

Botanical name: *Euphorbia hirta*

Family: Euphorbiaceae

Local name: Durduli

Vernacular name:

- **Assamese:** Gakhiroti bon
- **Bengali:** Barokarni
- **Hindi:** Dudhi, Bara Dudhi
- **Irula:** Pacchaikuthu chedi
- **Kannada:** Achchedida
- **Malayalam:** Kuzhinagappala
- **Manipuri:** Pakhamba Maton
- **Rajasthani:** Dhedhi-dudheli
- **Sanskrit:** Ksira, Nagari
- **Tamil:** Amman Pacharisi
- **Telugu:** Nanapala

Season: Flowering & Fruiting: November-April

Parts used: All parts

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Characteristics (Nadkarni 1976; Williamson, 2002; Prajapati *et al.*, 2003; Kirtikar *et al.*, 2003):

1. Plant Size: *E. hirta* typically grows up to a height of 10 to 40 centimeters (4 to 16 inches). It has a prostrate or ascending growth habit.

2. Leaves: The leaves of *E. hirta* are opposite and arranged in pairs along the stem. They are simple, narrow, and lanceolate in shape, with serrated or toothed edges. The leaves are usually hairy or pubescent, giving them a rough texture.

3. Inflorescence: *E. hirta* has a compact inflorescence, with clusters of flowers arranged in a head-like or cymose structure (Fig. **23.1**).

4. Flowers: The flowers of *E. hirta* are small and inconspicuous, usually greenish-yellow in color. They are arranged in clusters known as umbels, which are terminal or axillary in location. The presence of tiny, cup-like structures called cyathia is characteristic of the *Euphorbia* genus.

5. Capsules: After flowering, *E. hirta* produces small, three-lobed capsules that contain the plant's seeds. These capsules are typically green and have a distinct shape.

6. Latex: Like other members of the *Euphorbia* genus, *E. hirta* produces a milky white latex when its stems or leaves are cut or damaged.

Fig. (23.1). Inflorescence of *E. hirta* (PC: Apurva Shankar Chonde).

Distribution:

Bangladesh, China, Myanmar, Sri Lanka; India: Assam, Bihar, Gujarat, Maharashtra, Manipur, Madhya Pradesh, Tamil Nadu, Rajasthan, Uttar Pradesh; Tropical America.

Propagation: Seed

Chemical constituents:

Diterpenoids- Ingenol and its esters, flavonoids- quercetin, kaempferol, and their glycosides, tannins, alkaloids- ephedrine, vasicine, and vasicinone, phenolic compounds, essential oils containing- terpenes and sesquiterpenes.

Recipe:

Ingredients: Leaves, finely chopped onion, 5-6 garlic cloves, salt, green chilies, and curry leaves, Asafoetida, grated coconut, mustard seeds, turmeric, Jaggery, gram dal, *etc.*

Method: Peel the stalks of the leaves, wash them, and chop finely. Heat oil in a pan and fry asafoetida, mustard seeds, curry leaves, crushed garlic cloves, and finely chopped onion. When the onion turns slightly yellow, add the chopped vegetables, chili powder, turmeric powder, soaked dal, jaggery, and salt to taste. Lightly beat water and pour it in, then cover the pan and cook over a low flame. Once the vegetables are cooked, sprinkle wet coconut on top.

Uses:

1. Respiratory Conditions: *E. hirta* has been traditionally used to alleviate symptoms of respiratory conditions such as asthma, bronchitis, and cough. It shows bronchodilator and expectorant properties that may help in relieving respiratory congestion and improving breathing (Council of Industrial and Scientific Research; 2005; Kumar *et al.*, 2010).

2. Anti-inflammatory and Analgesic Effects: *E. hirta* has been used topically to reduce inflammation and relieve pain associated with conditions like arthritis, joint pain, and skin disorders. Some studies suggest that it may possess anti-inflammatory and analgesic properties (Lanhers *et al.*, 1991; Kumar *et al.*, 2010).

3. Antimicrobial Activity: *E. hirta* has been investigated for its potential antimicrobial activity against various bacteria, fungi, and parasites. It has shown inhibitory effects against certain pathogens, but further research is needed to dete-

CONCLUSION

Biodiversity is as important to the life on Earth as is the oxygen and water. This fact must be realized and spread to every corner of the society and to all the people. The present book explores the diversity of wild vegetables in India and presents a repertoire of resourceful information on "124 wild vegetables" belonging to 50 different families. The diversity of vegetables on our plate is diminishing with the 'same' vegetable being repeated on a regular basis. The book presents information lucidly on alternate potential vegetables that are available in nature. With a diverse group of vegetables on our plate, greater diversity in tastier food and enriched nutrition can be possible. Most importantly, the diversity brings in nutritional requirements more effectively as compared to the consumption of a few specific vegetables.

Nutritional deficiency, for example of minerals iron (Fe) and zinc (Zn) and vitamins like vitamin A, are common throughout the world. It is partly due to the inadequate quantity of food consumed and partly due to the consumption of very less variety of vegetables and, some specific common vegetables and fruits. The present book demonstrates the rich diversity of several vegetables, the "wild, edible plants" that can be easily adopted and consumed by the people. With the increase in modernization and globalization, there is a rapid disappearance of traditional things including local food and traditional delicacies. There are recipes known for the wild vegetables and this book has attempted to provide information on this culinary angle. The readers of the book shall become aware of the vast diversity of vegetables they can consume and can also gain benefit from known recipes. Obviously, there may be many more ways to consume such vegetables, such as soup, salad, or other delicacies.

Another important point to consider is the increasing ailments and mental and physical disorders in the present era of environmental pollution, contaminated food items, and unhealthy lifestyle. It is worth noting that wild vegetables also possess several medicinal properties and plenty of natural phytochemicals. It is a well-known fact that in earlier times, people used a number of plant-based traditional medicines throughout the world, and that knowledge is vastly respected even today. In fact, the knowledge of traditional medicine has paved the way for several drugs used in the present era. The presented data on wild vegetables also includes their usefulness in terms of medicinal value. The known uses of various wild vegetables for medicinal purposes are included in the book.

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In conclusion, the present book offers the readers a valuable resource on the wild vegetables' diversity of India along with their various uses. The book chapters include scientific to traditional information ranging from classification, chemical composition, and cooking instructions to medicinal applications.

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