

A Systemic Review of Treatment of Rheumatoid Arthritis Using Herbal Plants

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ABSTRACT

Rheumatoid Arthritis (RA) is a chronic autoimmune disease of unknown aetiology that affects 0.5% of the population and can result in disability owing to joint destruction, characterized by joint synovial inflammation and progressive cartilage and bone destruction resulting in gradual immobility. Rheumatoid arthritis risk factors include genetic, hormonal, environmental and nutritional, and socio-economic factors, age and sex, ethnicity, smoking, infections, and so on. Treatment of inflammatory diseases, such as rheumatoid arthritis is practiced based on traditional medicine in many countries. The greatest disadvantage in the presently available potent synthetic drugs lies in their toxicity and reappearance of symptoms after Discontinuation. With limitations of existing drug molecules herbal drugs are gaining interest among RA Patients. Medicinal plants are plants containing inherent active ingredients used to cure disease or relieve symptoms of arthritis. The present review also focuses on the medicinal plants that interact with the mediators of inflammation and are used in the treatment of rheumatoid arthritis (RA).

Keywords: Rheumatoid Arthritis, RA, Herbal Plants, Rheumatoid Arthritis herbal Plant treatment

INTRODUCTION

Rheumatoid arthritis (RA) is a debilitating autoimmune disorder characterized by chronic inflammation of the Synovial joints, leading to pain, swelling, and joint deformities with stiffness, it can also damage both joints and extra-articular organs, including the heart, lung, digestive system, eye, skin and nervous system. Rheumatoid arthritis (RA) is a chronic inflammatory, systemic, progressive, autoimmune disease in which the body's immune system whose major role is to protect the health by attacking foreign bacteria and viruses are mistakenly, attacking the joints resulting in thickened synovium, pannus formation & destruction of bone, cartilage(1). Many complications can follow such as permanent joint damage requiring arthroplasty, rheumatoid vasculitis and elty's syndrome requiring splenectomy if it remains unaddressed. Still now researchers are unable to know the exact cause of this disease. However, it is believed that age, gender, genetics and environmental exposure (cigarette smoking, air pollutants and occupational) play a role in development of RA. As there is no cure for RA, the

treatment goals are to reduce the pain and stop/slow the further damage. RA aspects between 0.5 And 1% of adults in the developed world with between 5 and 50 per 100,000 people newly developing the condition each year. In autoimmune diseases normally the immune system displays self-tolerance and does not attack the body's own components. HLs self-tolerance Breaks down and leads to an autoimmune disorder. The pathophysiology of RA involves chronic inflammation of the Synovial membrane, which can destroy articular cartilage and juxtaarticular bone. Arthritis is a very common health problem which is cause activity of daily living (ADL)–Related and instrumental activity of daily living (IADL)–related functional disability, Restriction of work and social participation, and fulfilling their life roles. Over 200 diseases may cause arthritis including rheumatoid arthritis, Osteoarthritis, gout, tuberculosis & other infection(2). Most Common types of arthritis are Ankylosing spondylitis, Gout, Juvenile idiopathic arthritis, Osteoarthritis, Psoriatic arthritis, Reactive arthritis,

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Rheumatoid arthritis, Septic arthritis, Calcium pyrophosphate deposition disease, Crystal arthritis, Bacterial infections, Systemic lupus erythematosus (SLE), Reactive arthritis, Chronic Childhood Arthritis, Fibromyalgia, Lupus, Scleroderma, Post-traumatic arthritis, Hemochromatosis arthritis, Enteropathic arthritis, Vasculitic arthritis, Giant Cell Arteritis, Behçet's Disease, Relapsing Polychondritis, Gonococcal Arthritis, Pseudogout and Relapsing Polychondritis(3).

Pathophysiology

Rheumatoid arthritis - T lymphocytes (T-cells) binding to antigen and t-cell activation. B cell activation leading to formation of IgM antibody. Antigen-antibody reaction is produce. Formation of Immune complex. The release of Inflammatory chemicals (e.g., IL, NF etc) from inflammatory cells. Inflammatory damage to synovial cavity. Destruction (erosion) of cartilage. Inflammation leads to swelling in synovial membrane and pain around joints(4).

Diagnostic treatment ⁽⁵⁾

Medical history

A doctor will ask about your symptoms, any other medical conditions you or your family have, and any medications you are taking.

- Physical exam: A doctor will check your general health, reflexes, and problem joints.
- Imaging tests
- X-rays

- Ultrasound
- Magnetic resonance imaging (MRI)
- Computed tomography (CT)
- Blood tests
- Antinuclear antibody (ANA) test
- Complete blood count (CBC)
- Creatinine
- Sedimentation rate
- Rheumatoid factor (RF) and cyclic citrullinated peptide (CCP) antibody tests
- White blood cell count
- Uric acid
- Surgery: Synovectomy is a procedure that removes damaged connective tissue lining a joint cavity.
- Disease-modifying antirheumatic drugs (DMARDs) can help with symptom remission if started early

Plants Used For Treatment Of Rheumatoid Arthritis

❖ Ginger ^(6, 7)

- Synonym: Gingerin, Rhizoma zingiberis, Zingibere, Zingiber, and Zingiberis.
- Biological source: Ginger comes from the rhizome, or underground stem, of the Zingiber officinale plant.
- Family: Zingiberaceae
- Chemical constituents:

Chemical Components	R. Time (min)	Concentration % DMT	Concentration % WLD
Bisacurone epoxide	1.773	16.35215	-
2-Heptanone	5.809	0.36243	-
Heptan-2-ol	6.015	2.31573	-
Alpha-pinene	6.928	5.47721	4.20737
Camphene	7.321	16.93417	0.08067
Beta-Pinene	8.055	0.99324	17.20679
Myrcene	8.359	4.07577	0.49867
Octanal	8.663	0.42944	-
Alpha-Phellandrene	8.781	0.79561	-
Beta- Phellandrene	9.504	11.60409	72.72907
Eucalyptol	9.561	14.99832	0.40929
Butyl 2- methylvalerate	9.76	0.74342	-
Caryophyllene	10.937		0.49867
Isocugenol	11.276		3.98642
Linalool	11.503	0.7712	-
Citronellal	13.084	0.79028	-
Neral	15.717	2.87096	-

Geranial	16.564	4.13926	-
2-Undecanone	17.198	0.3768	-
Copaene	19.716	0.43628	-
Germacrene D	22.591	0.59153	-
Fenchyl acetate	22.624	7.16701	0.61332
2-Farnesene	23.077	2.81488	-

- Cultivation: Grow ginger in tropical climates (25-35°C) with fertile, well-drained soil (pH 5.5-6.5). Plant rhizomes 5-7.5 cm deep, spaced 20-30 cm apart. Keep soil moist, fertilize regularly, control weeds and pests, and harvest in 8-10 months when leaves yellow. Dry and store in a cool, dry place.
- Types:
 - Thai Ginger (Galanga)
 - Blue Ginger (Zingiber zerumbet)
 - Baby Ginger
 - Black Ginger (Kra-Chai)
 - Wild Ginger (Asarum)
 - Jamaican Ginger
 - Finger Ginger
 - Chinese Ginger
 - Australian Ginger
 - White Ginger
 - Red Ginger
 - Sand Ginger
 - Korean Ginger
 - Indonesian Ginger
 - Indian Ginger
 - Spiked Ginger Lily
 - Nepalese Ginger
 - Tumeric Ginger (*Curcuma longa*)
 - Butterfly Ginger
- Dose:
 - ✓ Here are some common forms of ginger and their corresponding doses:
 - ✓ Fresh ginger: 1–2 teaspoons of grated fresh ginger (about 2–5 grams) daily.
 - ✓ Ginger powder: 1–3 grams per day, usually divided into smaller doses.
 - ✓ Ginger extract: 100–200 milligrams of ginger extract, typically standardized to contain 5% gingerols, taken two or three times per day.
- Forms:
 - Fresh Ginger
 - Ginger Powder
 - Ginger Extract
 - Ginger Tea
 - Ginger Oil
 - Ginger Supplements
 - Ginger Juice
- Environmental adaptability:
 - a. Climate: Warm and humid tropical/subtropical climates (22°C–30°C).
 - b. Humidity: Requires 70–90% relative humidity.
 - c. Frost Sensitivity: Cannot tolerate frost; suitable for frost-free regions.
 - d. Soil: Well-drained loamy or sandy soil rich in organic matter.
 - e. pH: Prefers slightly acidic to neutral soil (pH 5.5–7.0).
- Commercial products: Ginger Root, Dramamine Non-Drowsy Naturals, Hofels Ginger One A Day, Zingiber, Focalgin-B.
- Contraindications: Pregnant or breastfeeding women, people with heart conditions, and people with diabetes should not take ginger without talking to their doctors.
- Clinical evidence: Nausea and vomiting, Bloating and gas, Cancer, Inflammation, Swallowing function,
- Synergistic combination: Ginger and Barley, ginger and Pomegranate, ginger and Licorice, ginger and Turmeric, Ginger and Ashwagandha and Amla, Ginger and synthetic CBD, Ginger and nifedipine.
- Analytical methods: Differential Scanning Calorimetry (DSC): Measures the heat flow associated with thermal transitions in ginger, providing information on stability and shelf life. Thermogravimetric Analysis (TGA): Monitors weight changes as a function of temperature, useful for studying moisture content and thermal decomposition. Liquid Chromatography-Mass Spectrometry (LC-MS): Combines liquid chromatography with mass spectrometry for detailed analysis of ginger's bioactive compounds. Supercritical Fluid Chromatography (SFC): Utilizes supercritical fluids for the separation of non-volatile and thermally labile

compounds in ginger. Direct Analysis in Real-Time Mass Spectrometry (DART-MS): Allows for the direct analysis of ginger samples without extensive preparation.

- Common uses: Digestion, Blood sugar control, Weight loss, Milk secretion, Anti-inflammatory, Pregnancy, Cardiovascular health
- Precautions:
 1. Limit to 4g/day to avoid side effects.
 2. Consult if pregnant or on blood thinners.
 3. Stop 2 weeks before surgery.
 4. Avoid with gallstones or allergies.
 5. Can cause stomach upset in excess.

❖ **Tumeric** (8, 9)

- Synonyms: Curcuma, Curcuma aromatica, Curcuma domestica, Indian saffron, Haldi, Haridra, Pian jiang huang, Racine de curcuma, Radix curcumae, and Yu jin
- Biological source: Turmeric is the dried rhizome of *Curcuma longa* Linn. (syn. *C. domestica* Valetton).
- Family: Zingiberaceae
- Chemical constituents: Curcuminoids (5%): Curcumin I (60%), Curcumin II & III, Dihydrocurcumin. Essential Oil (6%), Major Terpenes: Zingiberene (25%), α -phellandrene, turmerones, ar-turmerone, Other Compounds: Linalool, cineole, camphor, eugenol, curdione, curzerenone., Choloretic Agent: β -tolylmethyl carbinol.
- Identification test: Water test, Image processing, Ultraviolet-visible (UV-Vis) spectroscopy, Principal component analysis (PCA) and soft independent modeling class analogy (SIMCA).
- Cultivation: Ginger grows in warm, humid climates (25–30°C) with well-drained, loamy soil (pH 5.5–6.5). Plant rhizomes in spring, and harvest 8–10 months later when leaves yellow.
- Dose: For arthritis, a typical dose of turmeric (curcumin) is about 500–2,000 mg per day, often in divided doses. It's best taken with black pepper (which enhances absorption) or fat for better bioavailability.
- Analytical method: HPLC: Widely used for the accurate quantification of curcuminoids and other polyphenols, Thin Layer Chromatography (TLC): For preliminary qualitative analysis, Supercritical Fluid Chromatography (SFC): Effective for

separating and analyzing non-volatile compounds, UV-Vis Spectroscopy: Used to measure the absorbance of curcuminoids, Fourier-transform Infrared (FTIR) Spectroscopy: For identifying functional groups in turmeric compounds.

- Precautions:
 - ✓ Pregnancy
 - ✓ Blood Thinning
 - ✓ Gastrointestinal Issue
 - ✓ Diabetes
 - ✓ Gallstones
 - ✓ Medication Interactions
 - ✓ Allergy
- Contraindications: Liver disease, Bleeding problems, Diabetes, Infertility, Iron-deficiency anaemia, Surgery, Gastroesophageal reflux disease, Heart
- Synergistic combination: Turmeric with ginger, turmeric with chitson, tumeric with citrus fruit, Turmeric and Black pepper, Turmeric and Ginger, Turmeric and Omega-3 Fatty Acids, Turmeric and Boswellia (Frankincense), Turmeric and Green Tea, Turmeric and Vitamin D, Turmeric and Bromelain.
- Clinical evidence: Pain and inflammation, Heart health, Cancer, chronic diseases, including cardiovascular, metabolic, neurological, skin, hepatic, and infectious disorders.
- Form of us: A spice, in tea, or as a supplement, Paste1. Turmeric Powder, Turmeric Capsules/Softgels, Turmeric Extract (Curcumin), Turmeric Tea, Turmeric Oil (for topical use, Turmeric Paste, Turmeric Liquid/Tinctur
- Types of drugs: Herbal tea, Dietary supplements, Common Turmeric (*Curcuma longa*), Wild Turmeric (*Curcuma aromatica*), Black Turmeric (*Curcuma caesia*), Jiang Huang (Chinese Turmeric, White Turmeric (*Curcuma zedoaria*), Yellow Turmeric, Mango Ginger (*Curcuma amada*)
- Commercial products: Curcumin C3 Complex, Turmeric with Black Pepper Extract (BioPerine), TURMERIC-PLUS by Nature's Nutrition, TURMERIC Curcumin with Ginger by Oregon's Wild Harvest, Joint Support Turmeric by Solgar, Arthri-D by Luminology, Curcumin with Boswellia by Doctor's Best, Turmeric Curcumin Extra Strength by Nature's Bounty, TURMERIC

95% Curcuminoids by Gaia Herbs, Turmeric Joint Support by Instaflex.

- Environmental adaptability: Temperature: 20°C – 30°C, Rainfall: 1500-2500 mm, Soil: Loamy, pH 4.5-7, Sunlight: Partial to full, Altitude: Low to moderate, Humidity: 60-80%, Cold Sensitivity: Frost-sensitive
- ❖ **Cat Claw** (10, 11)
 - Synonyms: black bead. N. Feline claw., Kitty claw., Cat's-claw. N, Pithecelloidium unguis-cati. N., Cat's nail., Claw of a cat., Felis claw
 - Biological source: Biological source of cat's claw is the bark and root of the *Uncaria tomentosa* and *Uncaria guianensis* vines, which are native to the Amazon rainforest and other tropical areas of Central and South America.
 - Family: Madder
 - Chemical constituents: Rynchophylline, Isorynchophylline, Cat's Claw Glycosides, Quercetin, Oleanolic Acid, Beta-sitosterol, Polyphenols
 - Identification method: Mayer's Reagent Test, Shinoda Test, Ferric Chloride Test Salkowski Test, Lead Acetate Test, Dragendorff's Reagent Test, Wagner's Reagent Test, Borträger's Test, Foam Test, Chromatographic Techniques (TLC, HPLC)
 - Cultivation:
 1. Climate: Tropical, 20°C – 30°C
 2. Soil: Loamy, pH 5.5-5
 3. Planting: Seeds, cuttings, rootstocks
 4. Spacing: 1.5-2 meters
 5. Watering: Regular, avoid waterlogging
 6. Sunlight: Partial shade
 7. Fertilization: Organic compost
 8. Pruning: For growth control
 9. Pests: Aphids, fungal issues
 10. Harvesting: After 2-4 years
 - Dose:
 - ✓ Powder: 1 to 2 grams per day
 - ✓ Capsules/Tablets: 250 to 500 mg, 1 to 3 times per day.
 - ✓ Tincture: 30 to 60 drops, 2 to 3 times per day.
 - ✓ Tea: 1 to 2 teaspoons of dried root, steeped in hot water, 1 to 3 times per day.
 - Common uses: Anti-inflammatory, Immune System Support, Digestive Health, Pain Relief, Antiviral, Anticancer, Detoxification, Cardiovascular Health
 - Analytical methods: HPLC: Commonly used for the separation and quantification of alkaloids, phenolic compounds, and other bioactive substances. Thin Layer Chromatography (TLC): Utilized for preliminary identification and separation of compounds. UV-Vis Spectroscopy: Measures absorbance for quantifying certain phenolic compounds. Fourier-transform Infrared (FTIR) Spectroscopy: Identifies functional groups present in the bioactive components.
 - Precautions:
 - ✓ Pregnancy and Breastfeeding
 - ✓ Autoimmune Disorders
 - ✓ Blood Pressure
 - ✓ Blood Thinning
 - ✓ Organ Transplants
 - ✓ Allergic Reactions
 - ✓ Medication Interactions
 - ✓ Surgical Considerations
 - Contraindications:
 - ✓ Pregnancy and Breastfeeding
 - ✓ Autoimmune Disorder
 - ✓ Hypotension (Low Blood Pressure)
 - ✓ Bleeding Disorders
 - ✓ Organ Transplants (Immunosuppressive drugs)
 - ✓ Allergic Reactions to Cat's Claw
 - ✓ Pre-surgery (due to bleeding risk)
 - ✓ Use with Blood Thinners
 - Synergistic combination:
 - ✓ Cat's Claw and Turmeric
 - ✓ Cat's Claw and Boswellia
 - ✓ Cat's Claw and Ginger
 - ✓ Cat's Claw and Omega-3 Fatty Acids
 - ✓ Cat's Claw and Green Tea
 - ✓ Cat's Claw and Vitamin C
 - ✓ Cat's Claw and Echinacea
 - ✓ Cat's Claw and Ashwagandha
 - ✓ Cat's Claw and Milk Thistle
 - ✓ Cat's Claw and Probiotics
 - ✓ Cat's Claw and Garlic
 - ✓ Cat's Claw and Rhodiola
 - ✓ Cat's Claw and Licorice Root
 - ✓ Cat's Claw and Spirulina
 - ✓ Cat's Claw and Aloe Vera
 - Clinical evidence:
 - ✓ Anti-inflammatory Effects

- ✓ Immune System Support
- ✓ Antiviral Properties
- ✓ Cancer Support
- ✓ Antioxidant Effects
- ✓ Digestive Health
- ✓ Pain Relief
- ✓ Blood Pressure Regulation
- ✓ Anti-aging Effects
- ✓ Wound Healing
- ✓ Cognitive Function Support
- ✓ Liver Protection
- ✓ Antibacterial Properties
- ✓ Reduction in Blood Sugar
- ✓ Improved Circulation
- Forms:
 - ✓ Capsules/Soft gels
 - ✓ Powder
 - ✓ Tincture
 - ✓ Tea
 - ✓ Extract
 - ✓ Liquid Form
 - ✓ Topical Cream/Ointment
 - ✓ Tablets
- Types:
 - ✓ *Uncaria tomentosa* (Common Cat's Claw)
 - ✓ *Uncaria guianensis* (Wild Cat's Claw)
 - ✓ Black Cat's Claw (*Curcuma caesia*)
 - ✓ Red Cat's Claw (*Uncaria africana*)
 - ✓ White Cat's Claw (*Curcuma zedoaria*)
 - ✓ Jiang Huang (Chinese Cat's Claw)
 - ✓ Mango Ginger (*Curcuma amada*)
- Commercial products:
 - ✓ Arthri-D by Luminology
 - ✓ Turmeric and Cat's Claw by Nature's Way
 - ✓ Joint Support by Nature's Sunshine (with Cat's Claw)
 - ✓ Curcumin and Cat's Claw by Doctor's Best
 - ✓ Cat's Claw Extract by Herb Pharm
 - ✓ JointFlex by BioSource Naturals (with Cat's Claw)
 - ✓ Cat's Claw Complex by Gaia Herbs
 - ✓ Nature's Answer Cat's Claw
 - ✓ Flexi-Cat by Herbal Medicine (with Cat's Claw)
 - ✓ Cat's Claw with Boswellia by Solgar
- Environmental adaptability: Cat's Claw thrives in tropical and subtropical climates, prefers well-drained, fertile soils, requires regular watering, and can tolerate moderate drought, growing well up to 2,000 meters in altitude.
- ❖ **Willow Bark** (12, 13)
 - Synonyms: white willow bark, brittle willow, and simply willow. Crack willow (*Salix fragilis*), purple willow (*Salix purpurea*), and weeping willow (*Salix babylonica*).
 - Biological source: Willow bark is obtained from the dried bark of *Salix* species, mainly *Salix alba*, *Salix purpurea*, and *Salix fragilis* (family Salicaceae). It is a natural source of salicin.
 - Chemical constituents: Salicin, Flavonoids (e.g., quercetin, kaempferol, catechins, naringenin), Polyphenols (e.g., tannins, cinnamic acid derivatives), Phenolic glycosides (e.g., salicortin, fragilin), Tannins, Alkaloids, Essential oils
 - Identification method:
 - ✓ Ferric Chloride Test
 - ✓ Borntrager's Test
 - ✓ Shinoda Test
 - ✓ Lead Acetate Test
 - ✓ Gelatin Test
 - ✓ Bromine Water Test
 - ✓ Folin-Ciocalteu Test
 - ✓ Dragendorff's Test
 - ✓ Wagner's Test
 - ✓ Keller-Kiliani Test
 - Cultivation: Willows are typically cultivated in temperate climates with cool to mild conditions, preferring moist, well-drained, fertile soils. They are propagated mainly through dormant hardwood cuttings, planted in late winter or early spring, and require consistent moisture throughout the growing season. Willows thrive in full sun to partial shade and should be spaced 1–3 meters apart, depending on the species. Regular pruning helps maintain their shape and promotes healthy growth, with harvesting of the bark ideally occurring in spring when the sap is rising.
 - Dose:

The typical dosage of willow bark is:

 1. Extract: 60-120 mg of salicin per day for adults.
 2. Tea: 1-2 teaspoons of dried bark, 2-3 times a day.
 3. Powder: 1-2 grams per day for adults.
 - Common uses: Back pain, osteoarthritis, fever, flu, muscle pain, and many other conditions, upset

stomach, digestive disorders and as a mild laxative, used for making dye, furniture, mats, baskets, drums, stirrups, tipi pegs and pins, fox and fish traps, hunting lodge poles, and meat-drying racks.

- Analytical methods: High-Performance Liquid Chromatography (HPLC): Used to quantify salicylates, particularly salicin. UV-Vis Spectroscopy: Sometimes used after derivatization to enhance detection. HPLC: Preferred for accurate and precise quantification of salicylates and polyphenols. Gas Chromatography (GC): Used for volatile components analysis after derivatization. Fourier-transform Infrared (FTIR) Spectroscopy: Identifies functional groups present in the bark's bioactive compounds.
 - Precautions:
 - ✓ Consult a doctor before use, especially if pregnant, nursing, or on medication.
 - ✓ Avoid if allergic to aspirin or salicylates.
 - ✓ Do not give to children/teens with flu symptoms (risk of Reye's syndrome).
 - ✓ Monitor dosage to avoid side effects like stomach issues or tinnitus.
 - ✓ Avoid if you have ulcers, asthma, bleeding disorders, or kidney issues.
 - ✓ Be cautious with drug interactions (blood thinners, NSAIDs).
 - ✓ Use high-quality products and stop if side effects occur.
 - Contraindications: People with asthma, diabetes, gout, gastritis, hemophilia, stomach ulcers, or with kidney or liver issues should also avoid willow bark. People who are allergic or sensitive to salicylates (such as aspirin) should not use willow bark.
 - Synergistic combination:
 - ✓ Turmeric: Enhances anti-inflammatory effects.
 - ✓ Devil's Claw: Boosts pain relief. Boswellia: Supports joint health.
 - ✓ Ginger: Eases inflammation and protects the stomach.
 - ✓ Magnesium: Relaxes muscles for pain relief.
 - ✓ Feverfew: Helps with migraines.
 - ✓ Valerian Root: Reduces stress-related pain
 - Clinical evidence:
 - ✓ Osteoarthritis: 240 mg salicin reduced pain significantly
 - ✓ Back Pain: Effective for chronic low back pain, higher doses (240 mg) were more effective (Phytotherapy Research, 2000).
 - ✓ Anti-Inflammatory: Comparable to aspirin in reducing inflammation.
 - ✓ Headaches: May help with tension headaches, but more research is needed.
 - Form of use: Tea, Capsules/Tablets, Tincture, Powder, Topical Application, Liquid Extract, Standardized Extract, Willow Bark Oil, Extract in Ointments or Creams, Willow Bark Bath (soak), Willow Bark Lozenges
 - Types: White willow, *Salix fragilis*, Bay willow, *Salix daphnoides*, Black willow, *Salix purpurea*, European Willow
 - Commercial products:
 - ✓ Nature's Way Willow Bark
 - ✓ Traditional Medicinals Willow Bark Tea
 - ✓ Swanson Willow Bark Extract
 - ✓ Herb Pharm Willow Bark Extract
 - ✓ Gaia Herbs Willow Bark Extract
 - ✓ Burt's Bees Muscle Rub
 - ✓ Arthritis Strength by Osteo Bi-Flex (contains willow bark)
 - ✓ Pain Relief by Nature's Way.
 - Environmental adaptability: Shatavari thrives in tropical and subtropical climates, prefers well-drained soils, requires moderate rainfall, and can tolerate drought once established, growing well up to 1,500 meters in altitude.
- ❖ **Shatavari** (14, 15)
- Synonyms: Satavari, Satawar, Satmuli, Shatamuli, Bahusuta, Abhiru, Indivari, Vari, Rishyaprokta, and Abhirupattri., Asparagus-fern, Indian Asparagus, Sataver White, Sparrow Grass, Buttermilk Root, Water Root, Climbing Asparagus, Sataver Yellow, Wild Asparagus, and Wild Carrot.
 - Biological source: It consists of Dried roots and leaves of plant *Asparagus racemosus*
 - Family: Liliaceae
 - Chemical constituents: Steroidal saponins: Known as Shatvarins, these are the primary chemical constituents of Shatavari. Shatvarins I to VI are present in the plant, with Shatvarin I being the major glycoside. Isoflavones: The plant

contains 8-methoxy-5, 6, 4-trihydroxy isoflavone-7-O-beta-D-glucopyranoside.

Polycyclic alkaloid: The plant contains asparagine A, a cage-type pyrrolizidine alkaloid. **Flavonoids:** The plant contains glycosides of quercetin, rutin, and hyperoside in its flowers and fruits. **Vitamins:** The plant contains vitamins A, B1, B2, C, and E. **Minerals:** The plant contains trace minerals such as zinc, manganese, copper, cobalt, calcium, magnesium, and potassium. **Other compounds:** The plant also contains oligospirostanoside, racemosol, dihydrophenantherene, racemofuran, carbohydrates, mucilage, essential fatty acids, gamma linoleinic acids, folic acid, diosgenin, quercetin 3-glucourbnides, arginine, tyrosine, tannin, and resin.

- **Identification method:** Dragendroff's test, Wagner's test, Hager's test, Mayer's test, Preliminary Phytochemical Screening, Saponin Content Test, Fluorescence Test.
- **Cultivation:** Sow seeds in June or July, 2 cm deep and 10 cm apart, covering with a thin layer of fine sand. Soak seeds in water or cow urine to improve germination. Transplant seedlings when they reach about 45 cm in height. Plant seedlings in 45 x 45 x 45 cm pits, spaced 1 meter apart, and provide support for the plants to twine. Water immediately after planting, then every 4–6 days for the first month, and weekly thereafter. Weed frequently during the early growth stage. Harvest the roots 12–14 months after planting, with each plant yielding 500–600 g of fresh roots.
- **Dose:**
 - ✓ **Seeds:** Sow 2 cm deep, 10 cm apart.
 - ✓ **Soak:** Seeds in water or cow urine for a few hours.
 - ✓ **Watering:** Every 4–6 days for the first month, then weekly.
 - ✓ **Weeding:** Regularly, especially in early growth.
- **Common uses:** Reproductive Health, Lactation Support, Digestive Health, Immune Boosting, Stress Relief, Skin Health, Antioxidant Properties, General Vitality.
- **Analytical methods:** High-Performance Liquid Chromatography (HPLC): Widely used for the quantification of shatavarins, particularly shatavarin IV. UV-Vis Spectroscopy: Used after

suitable derivatization to measure saponins. **HPLC:** The most common method for the precise quantification of shatavarins, flavonoids, and other bioactive compounds. **Gas Chromatography (GC):** Used for volatile compounds analysis, often coupled with mass spectrometry. **UV-Vis Spectroscopy:** For the estimation of phenolic and flavonoid contents. **Fourier-transform Infrared (FTIR) Spectroscopy:** Identifies functional groups in bioactive compounds.

- **Precautions:**
 - ✓ **Pregnancy/Breastfeeding:** Consult a doctor before use.
 - ✓ **Allergic Reactions:** Discontinue if any occur.
 - ✓ **Hormone-Sensitive Conditions:** Use under medical supervision.
 - ✓ **Drug Interactions:** Be cautious with hormone treatments or sedatives.
 - ✓ **Dosage:** Follow recommended amounts.
 - ✓ **Children:** Avoid for those under 12 without doctor advice.
 - ✓ **Health Issues:** Consult a doctor if you have kidney or liver problems.
- **Contraindications:**
 - ✓ **Hormone-Sensitive Conditions:** Avoid in breast or ovarian cancer.
 - ✓ **Pregnancy:** Use cautiously, especially in the first trimester.
 - ✓ **Liver/Kidney Disorders:** Consult a doctor before use.
 - ✓ **Allergy:** Avoid if allergic to Shatavari or related plants.
- **Synergistic combination:**
 - ✓ **Ashwagandha:** Enhances stress relief and improves vitality.
 - ✓ **Turmeric:** Boosts anti-inflammatory and antioxidant effects.
 - ✓ **Ginger:** Improves digestion and enhances absorption of Shatavari's nutrients.
 - ✓ **Triphala:** Supports digestive health and detoxification.
 - ✓ **Guduchi:** Enhances immunity and reduces inflammation.
 - ✓ **Fenugreek:** Supports lactation and hormonal balance.
- **Clinical evidence:**
 - ✓ **Reproductive Health:** Improves fertility and hormone regulation

- ✓ Lactation: Increases breast milk production
- ✓ Stress Relief: Reduces stress and anxiety
- ✓ Immune Support: Enhances immune response and reduces inflammation
- ✓ Gastrointestinal Health: Improves digestion and relieves gastric ulcers
- Forms:
 - ✓ Capsules/Tablets
 - ✓ Powder
 - ✓ Liquid Extract/Tincture
 - ✓ Tea
 - ✓ Topical Cream/Ointment
 - ✓ Paste
 - ✓ Syrup
 - ✓ Soft gel Capsules
 - ✓ Herbal Formulations (blended with other herbs like Ashwagandha or Triphala)
 - ✓ Infused Oil
 - ✓ Churna (powdered blend, often mixed with ghee or honey)
 - ✓ Lozenges
- Types:
 - ✓ Pure Shatavari
 - ✓ Shatavari with Ashwagandha
 - ✓ Shatavari with Triphala
 - ✓ Shatavari with Turmeric
 - ✓ Shatavari Syrup
 - ✓ Shatavari Capsules
 - ✓ Shatavari Tea
 - ✓ Shatavari Powder
 - ✓ Shatavari Tablets
 - ✓ Shatavari Churna
- Commercial products:
 - ✓ Himalaya Shatavari
 - ✓ Organic India Shatavari
 - ✓ Baidyanath Shatavari
 - ✓ Dabur Shatavari
 - ✓ Planet Ayurveda Shatavari
 - ✓ Kama Ayurveda Shatavari
 - ✓ Patanjali Shatavari
 - ✓ Herbal Hills Shatavari
 - ✓ Zandu Shatavari
 - ✓ Moringa Shatavari by Nature's Way
- Environmental adaptability: Shatavari thrives in tropical and subtropical climates, prefers well-drained, loamy soils, requires moderate rainfall, and can tolerate drought once established. It grows well up to 1,500 meters above sea level.
- Synonyms: Imli (Hindi), Tamarindo (Spanish), Tamarind Tree, Indian Date, Sour Date, Tamarindus (scientific genus name), Meethi Imli (Sweet Tamarind), Black Tamarind.
- Biological source: Tamarind consists of dried ripe fruits (freed from the brittle epicarp) of *Tamarindus indica* Linn., belonging to family Leguminosae.
- Chemical constituents: Tartaric acid, reducing sugar, pectin, proteins, fibre, cellulose, pyrazines, organic acids like acetic, citric, mallic acid and succinic acid, Amino acids like alanine, leucine, phenylalanine, proline and serine, trans-2-hexenal and thiazoles.
- Identification method: Ninhydrin test, Millon's test, Biuret test, Carbohydrates test, Glycosides test, Tannins test.
- Cultivation: Tamarind thrives in tropical climates with well-drained soil, is propagated by seeds or grafting, planted during monsoons, requires minimal irrigation and annual fertilization, and starts yielding fruit in 7-10 years.
- Dose:
 - ✓ Pulp: 5-10 g of tamarind pulp daily as part of meals or diluted in water.
 - ✓ Juice: 100-200 ml of tamarind juice may help reduce inflammation.
 - ✓ Tea: Tamarind leaves or pulp can be boiled in water and consumed 1-2 times a day.
- Uses: Tamarind is used in many dishes as a flavoring, including sauces, marinades, chutneys, drinks, and desserts. To treat a variety of conditions, including: Diarrhoea, constipation, fever, and malaria, Liver and gallbladder problem, Stomach disorders, Pregnancy-related nausea, Intestinal worms.
- Analytical methods :
 - ✓ Volumetric neutralization: Determines titratable acidity
 - ✓ Potentiometry: Determines pH
 - ✓ Refractometry: Determines soluble solids
 - ✓ Oven: Determines moisture
 - ✓ Muffle furnace: Determines ash
 - ✓ Micro-Kjeldhal method: Determines protein
 - ✓ Gravimetric non-enzymatic method: Determines total dietary fiber
 - ✓ Soxhlet extractor: Determines lipids
 - ✓ HPLC-DAD: Analyzes vitamin C and carotenoids

❖ **Tamarind** (16, 17)



- ✓ HPLC with fluorescence detection: Analyzes vitamin E and folates
 - Precautions: Avoid tamarind if allergic, monitor blood sugar levels, and beware of interactions with blood thinners. Excess can cause stomach upset or tooth enamel erosion. Consult a doctor if pregnant or breastfeeding.
 - Contraindications:
 - ✓ Allergic Reactions: Do not consume if allergic to tamarind.
 - ✓ Low Blood Pressure: Tamarind may lower blood pressure further, avoid if you have hypotension.
 - ✓ Bleeding Disorders: Avoid use if you have bleeding disorders or are on blood-thinning medications.
 - ✓ Diabetes: Use cautiously, as tamarind can affect blood sugar levels.
 - Synergistic combination:
 - ✓ Tamarind and Ginger
 - ✓ Tamarind and Turmeric
 - ✓ Tamarind and Honey
 - ✓ Tamarind and Aloe Vera
 - ✓ Tamarind and Garlic
 - ✓ Tamarind and Lemon
 - ✓ Tamarind and Mint
 - ✓ Tamarind and Black Pepper
 - ✓ Tamarind and Cumin
 - ✓ Tamarind and Cinnamon
 - ✓ Tamarind and Clove
 - ✓ Tamarind and Fennel
 - ✓ Tamarind and Cardamom
 - ✓ Tamarind and Coriander
 - Clinical evidence: Clinical evidence on tamarind suggests it may have anti-inflammatory, antioxidant, and cholesterol-lowering effects, as well as potential benefits for managing blood sugar and digestive health. However, more research is needed to confirm these findings. Always consult a healthcare provider before use.
 - Form:
 - ✓ Tamarind pulp (fresh or dried)
 - ✓ Tamarind paste
 - ✓ Tamarind juice
 - ✓ Tamarind powder
 - ✓ Tamarind tablets or capsules (for supplements)
 - ✓ Tamarind oil (for topical use)
 - ✓ Tamarind tea (made from pulp or leaves)
 - Types: Sweet Tamarind, Sour Tamarind, Indian Tamarind, Thai Tamarind, African Tamarind, Mexican Tamarind
 - Commercial products :
 - ✓ Tamarind Concentrate (Chili's, Patak's)
 - ✓ Tamarind Paste (Tamarind Tiger, Swad)
 - ✓ Tamarind Candy (Laila, Bamba)
 - ✓ Tamarind Juice (Tropicana, Maaza)
 - ✓ Tamarind Sauce (Kikkoman, Thai Kitchen)
 - ✓ Tamarind Extract (Nature's Way, Herbal Secrets)
 - ✓ Tamarind Tablets (Tamarind Supplement by Herbal Hills)
 - ✓ Tamarind Syrup (F&N, Goya)
 - ✓ Tamarind Jam (Mother's Recipe, Kesar)
 - ✓ Tamarind Powder (Aachi, Everest)
 - Environmental adaptability: Tamarind thrives in tropical and subtropical climates, tolerates drought, and grows in well-drained, slightly acidic to neutral soils. It requires moderate rainfall and can adapt to altitudes up to 1,000 meters.
- ❖ **Moringa** (18, 19)
- Synonyms: Drumstick tree, Horseradish tree, Ben oil tree, Benzoil tree, Miracle tree, Tree of life, Malunggay (commonly used in the Philippines), Shajan (used in India and Pakistan), Nuggekai (used in South India, especially in Kannada), Sajna (used in Hindi and Bengali).
 - Biological source: The biological source of moringa is the plant *Moringa oleifera*, which belongs to the family Moringaceae.
 - Chemical constituents: Alkaloids, Moringinine, Quercetin, Kaempferol, Chlorogenic acid, Vitamin A (Beta-carotene), Vitamin C (Ascorbic acid), Vitamin E (Tocopherol), B-complex vitamins (e.g., B1, B2, B3, B6, B12), Minerals: Calcium, Potassium, Iron, Zinc, Magnesium, Proteins and Amino Acids High content of essential amino acids (e.g., leucine, isoleucine, valine), Glucosinolates: Fatty Acids, Oleic acid (from seeds), Linoleic acid, Palmitic acid, Antioxidants, Flavonoids (e.g., myricetin, rhamnetin), Polyphenols, Other Bioactive Compounds: Saponins, Tannins, Terpenoids, Isothiocyanates
 - Analytical methods:

- ✓ HPLC: Used for detailed profiling and quantification of vitamins, phenolic compounds, and flavonoids.
- ✓ Gas Chromatography-Mass Spectrometry (GC-MS): Utilized for analyzing fatty acids and volatile compounds.
- ✓ Thin Layer Chromatography (TLC): Employed for qualitative analysis of certain bioactive compounds.
- ✓ Fourier-transform Infrared (FTIR) Spectroscopy: Identifies functional groups in bioactive components.
- ✓ Nuclear Magnetic Resonance (NMR) Spectroscopy: Provides detailed structural information on specific compounds.
- Identification test: Dragendorff's Test (for alkaloids), Shinoda Test (for flavonoids), Froth Test (for saponins), Ferric Chloride Test (for tannins and phenols), Biuret Test (for proteins), Molisch's Test (for carbohydrates), Libermann-Burchard Test (for steroids), Sulfur Test (for sulfur-containing compounds)
- Dose:
 - ✓ Moringa Leaf Powder:
 - Adult Dose: 2–6 grams per day (start with a lower dose and increase gradually).
 - ✓ Moringa Capsules/Tablets
 - Dose: 500 mg to 1,000 mg, 1–2 times daily.
 - ✓ Moringa Leaf Tea
 - Dose: 1–2 teaspoons of dried leaves per cup of water, 1–3 times daily.
 - ✓ Moringa Oil
 - Topical Use: As required for skin or hair application.
 - Oral Use: 1–3 teaspoons per day (consult a physician).
 - ✓ Fresh Leaves or Pods:
 - Fresh Leaves: 50–100 grams per day (as food).
 - Pods (Drumsticks): 1–2 pods daily as part of a meal.
 - ✓ Moringa Seed Extract
 - Dose: 250–500 mg per day (in divided doses).
- Common uses: Nutritional Supplement, Antioxidant, Anti-inflammatory, Diabetes Management, Heart Health Support, Immunity Booster, Wound Healing, Skin Care, Hair Care, Water Purification, Cosmetic Uses, Biofuel Production, Animal Feed, Fertilizer
- Synergistic combination:
 - ✓ Moringa and Turmeric
 - ✓ Moringa and Ginger
 - ✓ Moringa and Lemon
 - ✓ Moringa and Ashwagandha
 - ✓ Moringa and Garlic
 - ✓ Moringa and Honey
 - ✓ Moringa and Black Pepper
 - ✓ Moringa and Aloe Vera
 - ✓ Moringa and Green Tea
 - ✓ Moringa and Lemon Balm
- Cultivation: *Moringa oleifera* thrives in tropical or subtropical climates with well-drained soil, requiring moderate watering, full sunlight, and spacing of 2–3 meters between plants, while being propagated through seeds or cuttings, and harvested for leaves in 3–4 months and pods in 6–8 months.
- Precautions:
 - ✓ Pregnancy: Avoid root, bark, and flowers.
 - ✓ High Dosage: Can cause digestive issues.
 - ✓ Blood Pressure: Use cautiously if on antihypertensive meds.
 - ✓ Blood Sugar: Monitor closely if diabetic.
 - ✓ Liver Issues: Avoid root and seeds in liver problems.
 - ✓ Allergic Reactions: Test for skin allergies.
 - ✓ Children: Use cautiously in young children.
- Contraindications:
 - ✓ Pregnancy: Avoid root, bark, and flowers.
 - ✓ Low Blood Pressure: May worsen hypotension.
 - ✓ Liver Disease: Avoid root and seeds.
 - ✓ Diabetes: Monitor blood sugar closely.
- Clinical evidence : Clinical evidence for *Moringa oleifera* includes:
 - ✓ Antioxidant/Anti-inflammatory: Reduces oxidative stress and inflammation.
 - ✓ Blood Sugar Control: Helps lower blood glucose levels.
 - ✓ Cholesterol Reduction: Lowers total cholesterol and triglycerides.
 - ✓ Antimicrobial: Effective against bacteria, fungi, and viruses.
 - ✓ Liver Protection: Helps prevent liver damage.
 - ✓ Anticancer: Potential in inhibiting cancer cell growth.
 - ✓ Weight Management: Aids in reducing fat and improving metabolism.

- ✓ Neuroprotective: Supports brain health and cognitive function.
- Form:
 - ✓ Fresh Leaves
 - ✓ Dried Leaf Powder
 - ✓ Capsules/Tablets
 - ✓ Moringa Oil
 - ✓ Tea
 - ✓ Moringa Seed Oil
 - ✓ Moringa Seeds
 - ✓ Moringa Extracts
 - ✓ Moringa Powdered Supplement
 - ✓ Moringa Juice
 - ✓ Moringa Paste
 - ✓ Moringa Protein
 - ✓ Moringa Tablet
 - ✓ Moringa Soap
 - ✓ Moringa Cream
 - ✓ Moringa Lotion
 - ✓ Moringa Balm
 - ✓ Moringa Capsules
- Types: Moringa oleifera, Moringa stenopetal, Moringa peregrina, Moringa concanensis.
- Commercial products : MoringaLife Moringa Powder, Kuli Kuli Moringa Energy Bars, MoringaPure Organic Moringa Capsules, Organic India Moringa Tea, Moringa Source Moringa Oil, Moringa Green Tea, The Moringa Company Moringa Powder, Terry Naturally Moringa 500 mg Capsules, Banyan Botanicals Moringa Tablets, Miracle Moringa Soap, Moringa Farms Moringa Supplements, Moringa Wellness Moringa Powdered Drink.
- Environmental adaptability: Moringa oleifera is adaptable to tropical and subtropical climates, well-drained soils with pH 6–7.5, and full sunlight. It is drought-resistant, sensitive to frost, and grows at altitudes up to 2,100 meters. Moringa thrives in heat but requires moderate watering and cannot tolerate waterlogging or extreme cold.
- ❖ **Rosemary (20, 21)**
- Synonyms: Rosmarinus officinalis (scientific name), Compass plant, Incensier, Anthos, Mary's her, Old Man, Romero (Spanish), Garrigue rosemary
- Biological source: The biological source of rosemary is the leaves and young stems of the plant Rosmarinus officinalis, a woody, aromatic herb from the Lamiaceae (mint) family.
- Chemical constituents: Essential Oils: Cineole (Eucalyptol), Camphor, Alpha-pinene, Beta-pinene, Borneol, Verbenone, Flavonoids: Rosmarinic Acid, Luteolin, Apigenin, Quercetin, Phenolic Compounds: Caffeic Acid, Chlorogenic Acid, Triterpenes: Ursolic Acid, Oleanolic Acid, Tannins, Alkaloids, Resins
- Identification method: Foam Test (for saponins), Ferric Chloride Test (for phenolic compounds), Shinoda Test (for flavonoids), Lead Acetate Test (for tannins), Borntrager's Test (for anthraquinones), Fehling's Test (for reducing sugars), Liebermann-Burchard Test (for steroids), Dragendorff's Test (for alkaloids), Gelatin Test (for proteins), Thin Layer Chromatography (TLC) (for essential oil analysis).
- Dose:
 - ✓ Fresh Rosemary: 1–2 teaspoons, 1–3 times a day.
 - ✓ Dried Rosemary: 1–2 grams per day.
 - ✓ Rosemary Tea: 1–2 teaspoons, 2–3 times a day.
 - ✓ Rosemary Oil: 2–3 drops in a carrier oil for topical use.
 - ✓ Rosemary Extract: 100–500 mg per day.
- Precautions:
 - ✓ Pregnancy: Avoid high doses.
 - ✓ Breastfeeding: Use cautiously.
 - ✓ Allergies: Test for skin reactions.
 - ✓ Blood Pressure: Use cautiously with antihypertensive meds.
 - ✓ Surgery: Discontinue 2 weeks before surgery.
- Contraindications:
 - Pregnancy: Avoid large doses.
 - High Blood Pressure: Avoid in hypertension
 - Epilepsy: Avoid in epileptic individuals.
- Analytical methods:
 - ✓ HPLC: Commonly used for the separation and quantification of polyphenols, flavonoids, and diterpenes in rosemary.
 - ✓ Thin Layer Chromatography (TLC): Used for preliminary screening of phenolic compounds and essential oils.

- ✓ Fourier-transform Infrared (FTIR) Spectroscopy: Identifies functional groups in bioactive compounds.
 - ✓ Nuclear Magnetic Resonance (NMR) Spectroscopy: Provides structural details of isolated compounds.
 - ✓ LC-MS (Liquid Chromatography-Mass Spectrometry): Used for detailed analysis of phenolic acids, flavonoids, and other bioactives.
 - Cultivation: Rosemary cultivation:
 - 1) Climate: Mediterranean.
 - 2) Soil: Well-drained, pH 6–7.
 - 3) Propagation: Seeds, cuttings.
 - 4) Spacing: 18–24 inches.
 - 5) Watering: Moderate, drought-tolerant.
 - 6) Sunlight: Full sun.
 - 7) Temperature: 15°C–25°C.
 - 8) Pruning: Regular.
 - 9) Harvesting: Leaves anytime.
 - Clinical evidence: Clinical evidence for rosemary includes:
 - ✓ Cognitive Boost: Enhances memory and concentration.
 - ✓ Antioxidant: Protects cells from oxidative stress.
 - ✓ Anti-inflammatory: Reduces inflammation and pain.
 - ✓ Digestive Health: Eases indigestion and bloating.
 - ✓ Antimicrobial: Effective against bacteria and fungi.
 - ✓ Anxiety Relief: Reduces anxiety and stress.
 - ✓ Blood Sugar: May help manage blood sugar levels.
 - Common uses: Culinary: Flavoring for dishes, Medicinal: Treats digestion, headaches, inflammation, Aromatherapy: Enhances memory, reduces stress, Skincare: Anti-aging, promotes skin health, Haircare: Boosts hair growth, reduces dandruff, Antimicrobial: Natural disinfectant, Antioxidant: In dietary supplements.
 - Forms of rosemary:
 - ✓ Fresh Leaves
 - ✓ Dried Leaves
 - ✓ Essential Oil
 - ✓ Tea
 - ✓ Powder
 - ✓ Extracts
 - ✓ Capsules/Tablets
 - ✓ Creams/Lotion
 - ✓ Hair Oils
 - Synergistic combination :Rosemary and Lavender, Rosemary and Peppermint, Rosemary and Ginger, Rosemary and Eucalyptus, Rosemary and Turmeric, Rosemary and Lemon, Rosemary and Sage.
 - Types: Rosmarinus officinalis (most common variety), Rosmarinus officinalis ‘Prostratus’ (trailing variety), Rosmarinus officinalis ‘Arp’ (cold-hardy variety), Rosmarinus officinalis ‘Tuscan Blue’ (strong aromatic variety).
 - Commercial products: Kirk’s Rosemary Soap, Now Foods Rosemary Oil, Aromatica Rosemary Essential Oil, Rosemary Mint Shampoo by Aveda, Terry Naturally Rosemary Extract, Garden of Life Rosemary Capsules, The Body Shop Rosemary Hair Oil, Aura Cacia Rosemary Essential Oil, Herb Pharm Rosemary Extract, young Living Rosemary Essential Oil.
 - Environmental adaptability: Rosemary thrives in Mediterranean climates with full sun, well-drained soil (pH 6–7.5), and temperatures of 15°C–25°C. It is drought-tolerant, but sensitive to frost and waterlogging.
- ❖ **Yucca** (22, 23)
- Synonyms: Yucca gloriosa, Adam's Needle, Spanish Bayonet, Bear Grass, Lord's Candle, Tree of Life, Mango Lily.
 - Biological source: The biological source of yucca is the leaves and roots of plants from the Yucca genus, which belong to the Asparagaceae family. The most commonly used species include Yucca filamentosa and Yucca glauca.
 - Chemical constituents: Saponins – Yucca saponin, Steroidal Saponins – Yucca saponin A, Resins – Yucca resin, Tannins – Yucca tannins, Flavonoids – Quercetin, Alkaloids – Yucca alkaloid, Vitamins – Vitamin C, Minerals – Calcium, Potassium
 - Identification test: Foam Test, Borntrager’s Test, Flavonoid Test, Tannins Test, Alkaloid Test, Saponin Test, Steroid Test (Liebermann-Burchard Test), Ferric Chloride Test – For phenolic compounds. Shinoda Test – For flavonoids, Lead Acetate Test – For tannins, Molisch’s Test – For carbohydrates, Keller-

- Killiani Test – For cardiac glycosides., Fehling’s Test – For reducing sugars, Barfoed’s Test – For monosaccharides., Libermann’s Test – For steroids and triterpenoids.
- Dose:
 - ✓ Extract: 100–500 mg/day
 - ✓ Powder: 1–2 g/day
 - ✓ Tea: 1–2 cups/day
 - Common uses: Anti-inflammatory, Pain relief, Antioxidant, Improved mobility, 5. Reduction of swelling, Support for joint health, Improved cartilage function, Detoxification (removal of joint toxins), Support for connective tissues.
 - Precautions:
 - ✓ Check for allergies.
 - ✓ May cause stomach upset in high doses.
 - ✓ Consult during pregnancy or breastfeeding.
 - ✓ Caution with medications (e.g., blood thinners).
 - ✓ Avoid in liver or kidney issues.
 - Contraindications: Allergic reactions, Severe digestive disorders, Pregnancy (large doses), Liver or kidney diseases.
 - Clinical evidence: Arthritis Relief: Reduces joint pain and inflammation, Antioxidant: Protects cells from oxidative stress, Anti-inflammatory: Lowers inflammation markers, Digestive Health: Supports gut health, Cholesterol: Reduces cholesterol levels, Skin Health: Aids wound healing, Detoxification: Reduces digestive toxins.
 - Synergistic combination: Yucca and Turmeric, Yucca and Ginger, Yucca and Boswellia, Yucca and Ashwagandha, Yucca and Devil’s Claw, Yucca and Moringa.
 - Analytical methods:
 - ✓ UV-Vis Spectroscopy: For polyphenols and flavonoids.
 - ✓ FTIR (Fourier Transform Infrared Spectroscopy): For functional group analysis.
 - ✓ NMR (Nuclear Magnetic Resonance): For detailed molecular structure analysis.
 - ✓ DNA Extraction and Sequencing: For genetic studies and identification.
 - ✓ RT-PCR (Real-Time PCR): For gene expression analysis.
 - ✓ Gel Electrophoresis: For DNA, RNA, or protein analysis. Plate Count Method: For total viable count.
 - ✓ PCR (Polymerase Chain Reaction): For identifying specific microbial strains
 - Cultivation: Yucca thrives in warm, sunny, and dry climates. It prefers well-drained, sandy or loamy soil with a pH between 6 and 8. The optimal temperature range for growth is 20°C to 30°C (68°F to 86°F). It requires moderate watering and is drought-tolerant once established. Full sun exposure is ideal for yucca. Propagation is typically done through seeds, offsets, or root cuttings, and plants should be spaced 2 to 3 feet apart. During the growing season, a balanced fertilizer can be applied. Yucca roots are ready for harvesting after 2 to 3 years, or flowers can be harvested after blooming. While generally pest-resistant, yucca plants may occasionally be affected by aphids or scale insects.
 - Form: Fresh Root, Dried Root, Yucca Powder, Yucca Extract, Yucca Capsules/Tablets, Yucca Tea, Yucca Essential Oil, Topical Creams/Lotions, Yucca Powder for Animal Feed.
 - Types:
 - ✓ Yucca filamentosa (Adam’s Needle)
 - ✓ Yucca glauca (Small Soapweed)
 - ✓ Yucca brevifolia (Joshua Tree)
 - ✓ Yucca schidigera (Mojave Yucca)
 - ✓ Yucca elata (Soaptree Yucca)
 - ✓ Yucca whipplei (Our Lord’s Candle)
 - ✓ Yucca arkansana (Arkansas Yucca)
 - ✓ Yucca rostrata (Beaked Yucca)
 - Commercial products:
 - ✓ Nature’s Way Yucca Root
 - ✓ Yucca Root Powder by Bulk Natural Food
 - ✓ Jason Yucca & Aloe Shampoo
 - ✓ Yucca Root Capsules by Solaray
 - ✓ Traditional Medicinals Yucca Root Tea
 - ✓ Rocky Mountain Oils Yucca Oil
 - ✓ Green Leaf Naturals Yucca Skin Cream
 - ✓ Yucca Schidigera Extract in Pet Food
 - ✓ Vet’s Best Yucca & Aloe Dog Shampoo
 - Environmental adaptability: Yucca thrives in warm, dry climates with full sun exposure. It prefers well-drained, sandy or loamy soil with a pH of 6 to 8. The plant is best suited for temperatures between 20°C and 30°C (68°F to 86°F) and is sensitive to frost. Once established, yucca is drought-tolerant and requires moderate watering. Full sun is essential for its optimal growth. It grows well at low to moderate altitudes

and can tolerate wind, though it may need protection in extreme storms.

❖ **Red Clover** (24, 25)

- Synonyms: Wild Clover, Purple Clover, Meadow Clover, Cow Clover, Beebread, Trefoil, Peavine Clover
- Biological source: The biological source of Red Clover is the dried flowers and aerial parts of the plant *Trifolium pratense*, belonging to the Fabaceae family.
- Identification method: Chemical Tests for Red Clover:
 - ✓ Shinoda Test: For flavonoids.
 - ✓ Ferric Chloride Test: For phenolic compounds.
 - ✓ Saponin Foam Test: For saponins.
 - ✓ Borntrager's Test: For anthraquinones.
 - ✓ Liebermann-Burchard Test: For steroids and triterpenoids.
 - ✓ Alkaloid Test: Using Dragendorff's reagent.
- Cultivation: Red clover grows best in temperate regions with cool, moist climates. It prefers well-drained, loamy soil with a pH range of 6.0 to 7.5. The plant thrives in temperatures between 10°C and 24°C (50°F to 75°F). It requires moderate watering but is drought-tolerant once established. Red clover needs full sun or partial shade for optimal growth. Propagation is primarily done through seeds, and planting is ideally carried out in early spring or late summer. The flowers are harvested at full bloom for maximum potency.
- Dose:
 - ✓ Capsules/Tablets: 40–80 mg isoflavones daily
 - ✓ Tea: 1–3 cups daily
 - ✓ Tincture: 1–3 ml, three times daily
- Common uses: Menopause symptoms, Bone health, Cardiovascular health, Skin conditions, Respiratory issues, Detoxification, Arthritis management.
- Analytical methods :
 - ✓ High-Performance Liquid Chromatography (HPLC): For the quantification of isoflavones and flavonoids
 - ✓ .Gas Chromatography-Mass Spectrometry (GC-MS): For the analysis of volatile compounds.
- ✓ UV-Vis Spectrophotometry: For measuring total phenolic and flavonoid content.
- ✓ Thin Layer Chromatography (TLC): For qualitative analysis of phytochemicals.
- ✓ Atomic Absorption Spectroscopy (AAS): For analyzing individual minerals.
- ✓ Inductively Coupled Plasma Mass Spectrometry (ICP-MS): For comprehensive mineral profiling.
- ✓ Gel Electrophoresis: For the analysis of nucleic acids or proteins.
- Precautions:
 - ✓ Hormone-sensitive conditions (e.g., breast cancer)
 - ✓ Pregnancy and breastfeeding
 - ✓ Bleeding disorders
 - ✓ Before surgery
 - ✓ Possible allergic reactions
- Contraindications
 - ✓ Hormone replacement therapy (HRT)
 - ✓ Anticoagulants/antiplatelets (e.g., warfarin)
 - ✓ Liver conditions
 - ✓ Children
 - ✓ Consult a healthcare provider before use.
- Clinical evidence
 - ✓ Menopause Symptoms: Some studies show red clover may reduce hot flashes, though results vary.
 - ✓ Bone Health: May support bone density in postmenopausal women, but evidence is inconclusive.
 - ✓ Cardiovascular Health: May help lower LDL cholesterol in some studies.
 - ✓ Anti-inflammatory Effects: Shows potential to reduce inflammation, especially for arthritis.
 - ✓ Cancer Risk: Limited evidence, with concerns about estrogenic effects.
- Synergistic combination: Red Clover and Turmeric (Curcumin), Red Clover and Ginger, Red Clover and Boswellia, Red Clover and Willow Bark, Red Clover and Devil's Claw.
- Form: Capsules/Tablets, Tea, Tincture, Powder, Topical Cream/Ointment, Extract.
- Types: *Trifolium pratense* (Common Red Clover), Wild Red Clover, Sweet Clover, White Clover, Red Clover (various cultivated varieties), Prairie Clover (*Dalea* spp.), Hairy Vetch (*Vicia villosa*), Alpine Clover (*Trifolium alpinum*).

- Commercial products : Promensil, . Red Clover Blossom, Nature’s Way Red Clover, Solgar Red Clover, Herb Pharm Red Clover Extract, Puritan’s Pride Red Clover, Swanson Red Clover Extract, Traditional Medicinals Organic Red Clover Tea
- Environmental adaptability: Red clover is environmentally adaptable, thriving in temperate climates, well-drained soils, and areas with moderate rainfall. It tolerates both acidic and alkaline soils and is commonly found in meadows, fields, and roadsides. It is also drought-tolerant once established.
- ❖ **Valerian Roots (26-28)**
 - Synonyms: Valeriana officinalis, Garden Heliotrope, All-heal, Setwall, Cat’s Valerian, Phu, Aman tilla, Baldrianwurzel (German)
 - Biological source:
 - ✓ Botanical Name: Valeriana officinalis
 - ✓ Family: Valerianaceae
 - ✓ Part Used: Roots and rhizomes
 - ✓ Geographical Sources: Native to Europe and Asia, also cultivated in North America.
 - Identification method: Ferric Chloride Test, Saponification Test, Odor Test, Liebermann-Burchard Test, Dragendorff’s Test, Phloroglucin Phloroglucinol Test, Fluorescence Test.
 - Cultivation: Valerian root is cultivated in temperate regions with cool summers. It thrives in moist, well-drained loamy soil with a pH between 6.0 and 7.5. The plant is typically propagated through seeds or root divisions. Seeds should be sown in spring or fall at shallow depths. Valerian requires consistent watering, especially during the growing season. Organic compost or nitrogen-rich fertilizers help enhance growth. The roots are harvested in autumn, typically after two years of growth, when the plant reaches maturity. After harvesting, the roots are cleaned, dried, and stored in a cool, dry environment to maintain their medicinal properties.
 - Dose:
 - ✓ Capsules/Tablets: 300–600 mg, before bed.
 - ✓ Tincture: 2–4 ml, 2–3 times daily.
 - ✓ Tea: 1–2 teaspoons, 1–3 times daily.
 - ✓ Extract: 1–2 ml, 1–3 times daily.
 - Common uses: Sleep disorders, Anxiety and stress, Menopause symptoms, Muscle spasms, Pain relief, Digestive issues, Reduces joint inflammation, Eases joint pain, Improves mobility and flexibility, Supports overall relaxation and reduces stress related to arthritis.
- Analytical method:
 - ✓ High-Performance Liquid Chromatography (HPLC): Separates and quantifies bioactive compounds like isoflavones. Uses a liquid mobile phase and a solid stationary phase.
 - ✓ Gas Chromatography-Mass Spectrometry (GC-MS): Analyzes volatile compounds such as essential oils Separates compounds by volatility and identifies them by mass.
 - ✓ Thin Layer Chromatography (TLC): Qualitatively analyzes phytochemicals. Compounds are separated on a coated plate using a solvent.
 - ✓ UV-Vis Spectrophotometry: Measures absorbance of UV/visible light to quantify phenolics and flavonoids.
 - ✓ Fourier Transform Infrared Spectroscopy (FTIR): Identifies functional groups by measuring infrared light absorption.
 - ✓ Atomic Absorption Spectroscopy (AAS): Quantifies minerals by measuring absorption of light by atoms.
- Precautions:
 - ✓ Pregnancy and breastfeeding: Avoid use, as safety is not established.
 - ✓ Sedative medications: May enhance the effects of sedatives and cause excessive drowsiness.
 - ✓ Alcohol: Avoid combining with alcohol as it can increase drowsiness.
 - ✓ Liver conditions: Use cautiously in people with liver disorders.
 - ✓ Surgery: Stop use at least two weeks before surgery to avoid interference with anesthesia.
- Contraindications
 - ✓ Allergic reactions: Do not use if allergic to valerian.
 - ✓ Pregnancy and breastfeeding: Contraindicated due to lack of safety data.
 - ✓ Antidepressants: Avoid in combination with antidepressants due to the risk of excessive sedation.
 - ✓ Anticonvulsants: May interfere with seizure medications.

- Clinical evidence : Sleep Disorders: Improves sleep quality and reduces sleep onset time, Anxiety and Stress: Helps reduce anxiety and promote relaxation, Menopause Symptoms: Reduces hot flashes and other symptoms., Muscle Relaxation and Pain Relief: Eases muscle spasms and mild pain, Safety: Generally safe for short-term use, with minor side effects like drowsiness.
 - Synergistic combination Valerian and Turmeric, Valerian and Ginger, Valerian and Boswellia, Valerian and Willow Bark, Valerian and Devil's Claw, 6. Valerian and Cat's Claw, Valerian and Ashwagandha, Valerian and Frankincense, Valerian and Lavender, Valerian and Chondroitin
 - Form : Capsules/Tablets, Tincture, Tea, Powder, Topical Cream/Ointment, Extract.
 - Types: Valeriana officinalis (Common Valerian), Valeriana wallichii (Indian Valerian), Valeriana edulis (Mexican Valerian), Valeriana fauriei (Japanese Valerian), Valeriana glechomifolia (Brazilian Valerian).
 - Commercial products:Valerian Root by Nature's Way, Sleepology by Valerian Root, Valerian Root by Solgar, Herb Pharm Valerian Extract, Traditional Medicinals Valerian Root Tea, Nature's Bounty Valerian Root, Swanson Valerian Root Extract, NOW Foods Valerian Root, Puritan's Pride Valerian Root, Gaia Herbs Valerian Root.
 - Environmental adaptability: Valerian root is adaptable to temperate climates with cool summers, thriving in well-drained, moist, and slightly acidic to neutral soils. It can grow in both sunny and partially shaded areas, though it prefers full sun for optimal growth. Valerian is resistant to drought once established and can tolerate a range of soil types, making it a hardy plant in diverse environments.
- ❖ **Horsetail (29-31)**
- Synonyms: Equisetum arvense, Field Horsetail, common Horsetail, Shave Grass, Scouring Rush, Pine Horse Tail,Dutch Rush.
 - Biological source:The biological source of Horsetail is:
 - ✓ Botanical Name: Equisetum arvense
 - ✓ Family: Equisetaceae
 - ✓ Part Used: Aerial parts (stems)
 - ✓ Geographical Distribution: Native to temperate regions of Europe, Asia, and North America.
 - Cultivation: Horsetail (*Equisetum arvense*) is best cultivated in temperate climates with cool, moist conditions. It grows well in moist, slightly acidic to neutral soil, though it is tolerant of a variety of soil types. The plant is typically propagated through spores or by dividing rhizomes in early spring. Horsetail requires regular watering to maintain moisture, as it naturally thrives in wetlands and along riverbanks. While it can tolerate partial shade, it prefers full sun for optimal growth. Once established, horsetail is relatively low-maintenance but can become invasive, so control measures may be necessary in gardens. The aerial parts of the plant are harvested during the growing season, particularly in early summer, for medicinal use.
 - Identification method: Silica Content Test, Flavonoid Detection Test, Alkaloid Test (Dragendorff's Reagent), Tannins Test (Ferric Chloride Test), Liebermann-Burchard Test.
 - Dose:
 - ✓ Capsules/Tablets: 300–500 mg, 2–3 times daily.
 - ✓ Tincture: 2–4 ml, 2–3 times daily.
 - ✓ Tea: 1–2 teaspoons of dried horsetail per cup of water, 1–3 times daily.
 - ✓ Extract: 1–2 ml, 1–3 times daily.
 - Common uses: Hair Growth, Urinary Health, Wound Healing, Skin Health, Osteoporosis Prevention, Reduces joint inflammation, Alleviates pain and discomfort, Improves joint flexibility, Supports bone health, Acts as a natural diuretic to reduce swelling.
 - Analytical method:
 - ✓ High-Performance Liquid Chromatography (HPLC): Quantification and separation of active compounds like flavonoids and phenolic acids.
 - ✓ Gas Chromatography-Mass Spectrometry (GC-MS): Identification of volatile compounds and essential oils.
 - ✓ Thin Layer Chromatography (TLC):Qualitative identification of phytochemicals.
 - ✓ UV-Vis Spectrophotometry:Determining the presence and concentration of polyphenols,

- ✓ flavonoids, and other compounds.
 - ✓ Fourier Transform Infrared Spectroscopy (FTIR): Characterizing functional groups in chemical structures.
 - Precautions:
 - ✓ Pregnancy and breastfeeding: Not recommended during pregnancy or breastfeeding due to insufficient safety data.
 - ✓ Kidney conditions: Use cautiously in individuals with kidney disease, as horsetail acts as a diuretic.
 - ✓ Allergic reactions: People with allergies to plants in the Equisetaceae family should avoid horsetail.
 - ✓ Diuretics: May enhance the effect of diuretic medications, leading to dehydration or electrolyte imbalances.
 - ✓ Surgery: Discontinue use at least two weeks before surgery due to its diuretic effect
 - Contraindications:
 - ✓ Pregnancy and breastfeeding: Contraindicated due to lack of safety data.
 - ✓ Severe kidney or liver disease: Should be avoided in individuals with significant kidney or liver impairment.
 - ✓ Heart conditions: Avoid use in people with heart conditions as it may cause an imbalance in potassium levels.
 - Synergistic combination : Horsetail and Turmeric, Horsetail and Ginger, Horsetail and Boswellia, Horsetail and Devil’s Claw, Horsetail and Willow Bark, Horsetail and Nettle, Horsetail and Frankincense, Horsetail and Ashwagandha.
 - Clinical evidence : Improves bone density and prevents osteoporosis, Promotes hair growth and reduces hair loss, Reduces joint pain and inflammation in arthritis, Acts as a diuretic for urinary health, Enhances wound healing, Improves skin elasticity and reduces acne.
 - Form: Capsules/Tablets, Tea, Tincture, Extract, Powder, Topical Cream/Ointment, Decoction
 - Types: Equisetum arvense (Common Horsetail), Equisetum hyemale (Scouring Rush), Equisetum telmateia (Giant Horsetail), Equisetum palustre (Marsh Horsetail), Equisetum fluviatile (Water Horsetail), Equisetum sylvaticum (Woodland Horsetail), Equisetum pratense (Meadow Horsetail), Equisetum variegatum (Variegated Horsetail).
 - Commercial products: NOW Foods Horsetail Extract, Gaia Herbs Horsetail Powder, Piping Rock Horsetail Capsules, Organic Veda Horsetail Tea, NutriGold Horsetail Extract, Nature’s Bounty Horsetail Supplement, Banyan Botanicals Horsetail Capsules, Planetary Herbals Horsetail Extract, Nature’s Way Horsetail Capsule,.
 - Environmental adaptability: Horsetail (Equisetum arvense) is highly adaptable to various environmental conditions, thriving in moist, well-drained, slightly acidic to neutral soils, often found in wetlands, riverbanks, and marshy areas. It is well-suited to temperate climates, though it can tolerate a range of temperatures, from cool to moderately warm regions. Horsetail can grow in full sun to partial shade, but it flourishes best in areas with consistent moisture. This plant is resilient and capable of surviving in nutrient-poor soils, and once established, it can withstand periods of drought. Its invasive growth habit allows it to spread in disturbed or altered environments, making it both hardy and adaptable.
- ❖ **Peppermint (32-34)**
- Synonyms: Mentha piperita, Peppermint herb, Mojito mint, Field mint, Bald mint, Brandy mint, Mentha balsamea, Black mint.
 - Biological source:
 - ✓ Botanical Name: Mentha piperita
 - ✓ Family: Lamiaceae
 - ✓ Part Used: Leaves and flowering tops
 - ✓ Geographical Distribution: Native to Europe and Asia, now cultivated worldwide.
 - Cultivation: Peppermint thrives in temperate climates, prefers moist, well-drained soil, and is propagated through cuttings. It requires consistent moisture, full sun or partial shade, and should be harvested before flowering for optimal oil content.
 - Identification method: Essential oil content test, alkaloids test, acid value determination.
 - Chemical constituents: Menthol, Menthone, Pulegone, Menthyl acetate, Iso-menthone, Flavonoids (e.g., luteolin, apigenin), Tannins, Rosmarinic acid, Carvone, Caffeic acid.
 - Dose:
 - ✓ Peppermint Tea: 1–2 teaspoons, 2–3 times daily.

- ✓ Peppermint Oil: 0.2–0.4 ml, 2–3 times daily.
- ✓ Tincture: 2–3 ml, 2–3 times daily.
- ✓ Dried Herb: 2–4 grams per day.
- ✓ Topical: 1–2 drops of essential oil as needed.
- Common uses:
 - ✓ Digestive Health: Relieves indigestion, bloating, and irritable bowel syndrome (IBS).
 - ✓ Respiratory Support: Eases symptoms of colds, coughs, and congestion.
 - ✓ Headache Relief: Reduces tension headaches when applied topically.
 - ✓ Pain Relief: Soothes muscle aches and joint pain.
 - ✓ Oral Health: Freshens breath and helps in gum care.
 - ✓ Stress Reduction: Provides calming effects and reduces anxiety.
 - ✓ Skin Health: Treats acne, itching, and inflammation.
 - ✓ Antimicrobial: Prevents bacterial and fungal infections.
- Synergistic combination: Peppermint and Ginger, Peppermint and Chamomile, Peppermint and Eucalyptus, Peppermint and Lavender, Peppermint and Lemon Balm, Peppermint and Licorice Root, Peppermint and Rosemary, Peppermint and Tea Tree Oil.
- Precautions: Use diluted peppermint oil to avoid skin irritation. Avoid direct application to broken skin or sensitive areas. May cause heartburn in individuals with gastroesophageal reflux diseases (GERD). Avoid inhalation in children under two years due to potential respiratory issues. Use cautiously during pregnancy and breastfeeding.
- Contraindications : Peppermint is contraindicated in GERD, hiatal hernia, gallbladder issues, allergies, children under 6, pregnancy, breastfeeding, and severe kidney or liver disease. Use caution and consult a healthcare provider.
- Clinical evidence:
 - ✓ Irritable Bowel Syndrome (IBS): Peppermint oil improves symptoms like pain and bloating.
 - ✓ Digestive Health: Alleviates indigestion, bloating, and nausea.
 - ✓ Headache Relief: Topical peppermint oil reduces tension headaches.
 - ✓ Pain Relief: Used in topical creams for muscle and joint pain.
 - ✓ Antimicrobial Effects: Effective against bacteria like *E. coli*.
 - ✓ Respiratory Relief: Menthol in peppermint helps relieve congestion.
- Analytical methods: UV-Vis Spectroscopy, IR Spectroscopy, NMR Spectroscopy, Atomic Absorption Spectroscopy (AAS), Fluorescence Spectroscopy, Gas Chromatography (GC), High-Performance Liquid Chromatography (HPLC), Thin-Layer Chromatography (TLC), Size-Exclusion Chromatography (SEC), Mass Spectrometry (MS), Potentiometry, Voltammetry, Conductometry, Acid-Base Titration, Redox Titration, Complexometric Titration, Differential Scanning Calorimetry (DSC), Thermogravimetric Analysis (TGA), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), X-Ray Diffraction (XRD), X-Ray Fluorescence (XRF), ELISA, GC-MS, LC-MS.
- Form: Fresh leaves, Dried leaves, Peppermint oil, Peppermint capsules, Peppermint tea, Topical creams, Balms, Lozenges, Inhalers, Mouthwash
- Types: Black Peppermint (*Mentha × piperita* var. *vulgaris*), White Peppermint (*Mentha × piperita* var. *officinalis*), Chocolate Peppermint (*Mentha × piperita* ‘Chocolate’), Peppermint Menthol (*Mentha × piperita* ‘Menthol’), Lavender Peppermint (*Mentha × piperita* ‘Lavendula’), Ginger Peppermint (*Mentha × piperita* ‘Ginger’), Variegated Peppermint (*Mentha × piperita* ‘Variegata’), Orange Peppermint (*Mentha × piperita* ‘Orange’).
- Commercial products:
 - ✓ Biofreeze Pain Relief Gel (contains menthol derived from peppermint)
 - ✓ Tiger Balm Arthritis Rub (includes menthol and essential oils)
 - ✓ Bengay Menthol Pain Relieving Cream
 - ✓ Salonpas Pain Relieving Patch (menthol-based)
 - ✓ Icy Hot Menthol Cream
 - ✓ TheraBreath Pain Relief Roll-On (contains peppermint oil)
 - ✓ Dr. Bronner’s Peppermint Oil Rub
 - ✓ PainBloc24 Arthritis Relief Cream
 - ✓ Mentholatum Deep Heat Rub

- ✓ Sombra Warm Therapy Gel
- Environmental adaptability: Peppermint is adaptable to temperate climates, grows best in moist, fertile, well-drained soils, and can tolerate partial sun to full sunlight. It is frost-tolerant and spreads through runners, making it resilient but potentially invasive.
- ❖ **Curry Leaves (35-37)**
 - Synonyms : Katta Patta, Karivepaku (in Telugu), Karipatta (in Hindi), Sweet Neem Leaves, Murraya Leave, Curry Patta, Bay Leaves.
 - Biological source : The biological source of curry leaves is *Murraya koenigii*, a plant belonging to the Rutaceae family. The leaves of this plant are commonly used in cooking and traditional medicine.
 - Chemical constituents:
 - ✓ Alkaloids: Murrayanine, Murranyne, Koenigine
 - ✓ Flavonoids: Quercetin, Kaempferol, Isoquercitrin
 - ✓ Essential Oils: Linalool, A-Pinene, B-Caryophyllene, Γ -Terpinene, Camphor
 - ✓ Carbohydrates: Glucose, Fructose
 - ✓ Phenolic Compounds: Tannins, Flavonoids
 - ✓ Vitamins: Vitamin A, Vitamin C, B-vitamins (like B1, B2, B3, and B6)
 - ✓ Minerals: Calcium, Iron, Phosphorus
 - ✓ Proteins and Amino Acids: Aspartic acid, Glutamic acid, Serine
 - Cultivation: Curry leaves (*Murraya koenigii*) are cultivated in tropical and subtropical climates with warm temperatures (25°C–35°C). They prefer well-drained, loamy soil with a slightly acidic to neutral pH. Propagation is through seeds or cuttings, with spacing of 60–90 cm. The plant needs moderate watering, ensuring the soil remains moist but not waterlogged. Curry leaves thrive in full sunlight.
 - Identification method: Alkaloid Test, Flavonoid Test, Tannin Test, Essential Oil Test, Phenolic Compounds Test, Vitamin C Test (Ascorbic Acid).
 - Analytical methods:
 - ✓ High-Performance Liquid Chromatography (HPLC): To separate, identify, and quantify bioactive compounds such as alkaloids, flavonoids, and essential oils.
 - ✓ Gas Chromatography-Mass Spectrometry (GC-MS): To identify and analyze volatile compounds, essential oils, and fatty acids present in curry leaves.
 - ✓ UV-Vis Spectrophotometry: To determine the concentration of phenolic compounds and flavonoids in curry leaves.
 - ✓ Fourier Transform Infrared Spectroscopy (FTIR): To characterize functional groups and the overall chemical structure of curry leaf compounds.
 - ✓ Inductively Coupled Plasma Mass Spectrometry (ICP-MS): To analyze trace minerals and elements such as copper, manganese, and potassium in curry leaves.
 - Dose:
 - ✓ Fresh Leaves: 5-10 leaves daily
 - ✓ Powder: 1-2 teaspoons per day
 - ✓ Capsules: 1-2 (500 mg) daily
 - ✓ Oil: 1-2 drops topically
 - ✓ Tea: 1-2 cups daily
 - Common uses: Topical Application: Curry Leaf Oil (e.g., using a curry leaf-infused oil for massage), Oral Consumption: Curry Leaf Powder (e.g., 1-2 teaspoons daily), Curry Leaf Tea: Drinking 1-2 cups daily for anti-inflammatory benefits, Digestive Health, Hair Care, Diabetes Management, Antioxidant, Skin Care, Anti-Microbial, Liver Health, . Weight Loss.
 - Precautions:
 - ✓ Pregnancy: Avoid excessive consumption.
 - ✓ Diabetes: Monitor blood sugar levels, as curry leaves may lower them.
 - ✓ Liver Disease: Use with caution if you have liver problems.
 - ✓ Allergic Reactions: Discontinue use if you experience any allergic reactions.
 - ✓ Blood Pressure: Caution if you have low blood pressure.
 - ✓ Breastfeeding: Consult a healthcare provider before use.
 - Contraindications: Pregnancy: Avoid excess use, Diabetes: Monitor blood sugar levels, Liver Disease: Avoid in severe cases, Allergy: Avoid if allergic to Rutaceae family, Low Blood Pressure: Use cautiously.
 - Clinical evidence: Antioxidant: Protects against cellular damage, Blood Sugar: Helps lower blood sugar levels, Anti-Inflammatory: Reduces

inflammation, useful in arthritis, Cholesterol: Helps lower cholesterol levels, Liver Health: Supports liver detoxification, Hair Growth: Promotes hair growth and prevents hair loss.

- Synergistic combination: Curry Leaves and Turmeric, Curry Leaves and Ginger, Curry Leaves and Fenugreek, Curry Leaves and Black Pepper, Curry Leaves and Ashwagandha, curry leaves with honey, curry leaves with lemon
- Form: Fresh Leaves, Dried Leaves, Powder, Oil, Capsules, Tea, Extract
- Types: Regular Curry Leaves, Dwarf Curry Leaves, Variegated Curry Leaves
- Commercial products: Flexura, JointFlex, Curry Leaf Joint Pain Relief Cream, CurryLeaf Oil, Curcumin & Curry Leaf Capsules.
- Environmental adaptability: Curry leaves thrive in tropical and subtropical climates, prefer well-drained, loamy soil, and require moderate watering and full sunlight. They are sensitive to frost and grow well at lower to mid-altitudes.

❖ Chamomile (38-41)

- Synonyms: German Chamomile, Roman Chamomile, Manzanilla, Wild Chamomile, Scented Mmayweed.
- Biological source : The biological source of chamomile is primarily *Matricaria chamomilla* (German chamomile) and *Chamaemelum nobile* (Roman chamomile), both belonging to the Asteraceae family. The flowers of these plants are used for medicinal purposes.
- Chemicals constituents :
 - ✓ Flavonoids: Apigenin, Luteolin, Quercetin
 - ✓ Essential Oils: Chamazulene, A-Bisabolol, Farnesene
 - ✓ Terpenoids: Bisabolol oxides A and B, Matricin
 - ✓ Coumarins: Umbelliferone
 - ✓ Tannins: Catechin, Epicatechins
 - ✓ Amino Acids: Glycine, Glutamine
 - ✓ Polysaccharides: Inulin
- Dose:
 - ✓ Chamomile Tea: 1-2 cups per day.
 - ✓ Chamomile Capsules: 300-400 mg, 1-2 times per day.
 - ✓ Chamomile Extract: 1-2 ml, 2-3 times per day.
 - ✓ Chamomile Oil (Topical): A few drops, applied to affected areas as needed.

- Common uses:
 - ✓ Chamomile Tea: 1-2 cups daily for pain relief.
 - ✓ Chamomile Oil: Applied topically to affected joints.
 - ✓ Chamomile Compress: A warm compress for joint pain and stiffness.
- Identification method: Flavonoid Test, Essential Oil Test, Tannin Test, Terpenoid Test, Alkaloid Test, Coumarin Test, Polysaccharide Test, Amino Acid Test.
- Analytical methods:
 - ✓ High-Performance Liquid Chromatography (HPLC): To separate, identify, and quantify bioactive compounds such as flavonoids (e.g., apigenin, luteolin), coumarins, and essential oils in chamomile.
 - ✓ Gas Chromatography-Mass Spectrometry (GC-MS): To analyze volatile compounds and essential oils, identifying terpenoids like chamazulene and bisabolol.
 - ✓ UV-Vis Spectrophotometry: To determine the concentration of flavonoids, particularly apigenin and luteolin, and other phenolic compounds in chamomile.
 - ✓ Fourier Transform Infrared Spectroscopy (FTIR): To identify functional groups in the chemical structure of chamomile compounds, such as alcohols, esters, and terpenes.
 - ✓ Atomic Absorption Spectroscopy (AAS): To quantify mineral content (e.g., calcium, potassium, magnesium) in chamomile.
- Precautions:
 - ✓ Pregnancy: Avoid excessive use.
 - ✓ Allergy: Avoid if allergic to Asteraceae plants.
 - ✓ Blood Thinners: May enhance effects of blood thinners.
 - ✓ Sedatives: Use cautiously with sedative medications.
 - ✓ Breastfeeding: Consult a healthcare provider.
 - ✓ Diabetes: Monitor blood sugar levels.
- Contraindications:
 - ✓ Pregnancy: Avoid excessive use.
 - ✓ Allergy: Contraindicated for Asteraceae allergies.
 - ✓ Blood Thinners: Avoid with blood-thinning medications.

- ✓ Sedatives: Avoid with sedative drugs.
 - ✓ Children: Use cautiously.
 - Clinical evidence:
 - ✓ Anti-inflammatory: Studies show chamomile helps reduce inflammation, beneficial in conditions like arthritis.
 - ✓ Anxiety Relief: Clinical trials suggest chamomile reduces symptoms of generalized anxiety disorder (GAD).
 - ✓ Sleep Aid: Research supports chamomile's effectiveness in promoting sleep and treating insomnia.
 - ✓ Digestive Health: Chamomile has been shown to relieve digestive discomfort, such as bloating and indigestion.
 - ✓ Skin Health: Evidence indicates chamomile's role in treating skin conditions like eczema and dermatitis.
 - Cultivation Chamomile thrives in temperate climates with cool temperatures ranging from 18°C to 24°C. It prefers well-drained, sandy loam soil with a pH between 6.0 and 7.5. Full sunlight is essential for its growth, and it requires moderate watering, ensuring the soil is moist but not waterlogged. Seeds are typically sown in early spring or autumn, spaced 15-30 cm apart. Flowers are harvested when fully bloomed, usually 60-90 days after planting. Chamomile can be propagated from seeds or by dividing mature plants.
 - Form: Dried Flowers, Chamomile Tea, Essential Oil, Capsules/Tablets, Tincture, Creams/Ointments
 - Types: German Chamomile (*Matricaria chamomilla*), Roman Chamomile (*Chamaemelum nobile*), Wild Chamomile, Creeping Chamomile (*Chamaemelum nobile*, used for ground cover), Egyptian Chamomile
 - Commercial products: ArthriCare, Chamomile Joint Cream, Soothe and Relief, Chamomile Muscle Rub, JointEase Chamomile Balm
 - Environmental adaptability: Chamomile thrives in temperate climates, prefers well-drained, sandy loam soil, and requires full sunlight. It needs moderate watering and does not tolerate waterlogging. Chamomile grows well at low to moderate altitudes and is sensitive to frost.
- ❖ **Guggulu (42-45)**
- Synonyms: Commiphora wightii, Indian Myrrh, Guggul, Gugulipid, Gum Guggul
 - Biological source: The biological source of Guggulu is the resin obtained from the tree Commiphora wightii, which belongs to the Burseraceae family. This tree is native to India and parts of the Middle East.
 - Chemical constituents:
 - ✓ Guggulsterones: Z-guggulsterone, E-guggulsterone
 - ✓ Guggulipid: A mixture of various sterols, including sitosterol and stigmaterol.
 - ✓ Essential Oils: Caryophyllene, Humulene
 - ✓ Resins: Guggul resin, which contains complex hydrocarbons.
 - ✓ Flavonoids: Quercetin, Kaempferol
 - ✓ Triterpenoids: Friedelin, Betulinic acid
 - Dose:
 - ✓ Capsules/Tablets: 500-1,000 mg, 1-2 times daily.
 - ✓ Powder: 1-2 grams, 1-2 times daily.
 - ✓ Resin: 1-2 grams, 1-2 times daily.
 - ✓ Tincture: 1-2 ml, 2-3 times daily.
 - Identification method: Alcohol Test, Salkowski Test, Liebermann-Burchard Test, Ferric Chloride Test, Steam Distillation, Froth Test
 - Analytical methods:
 - ✓ High-Performance Liquid Chromatography (HPLC): To separate, identify, and quantify bioactive compounds like guggulsterones.
 - ✓ Gas Chromatography-Mass Spectrometry (GC-MS): To analyze volatile compounds and essential oils.
 - ✓ Thin Layer Chromatography (TLC): For qualitative analysis of phytochemicals such as steroids and triterpenoids.
 - ✓ UV-Vis Spectrophotometry: To determine the concentration of phenolic compounds and flavonoids.
 - ✓ Fourier Transform Infrared Spectroscopy (FTIR): To identify functional groups in guggul's chemical structure.
 - ✓ Nuclear Magnetic Resonance (NMR) Spectroscopy: To analyze the molecular structure of compounds like guggulsterones.
 - ✓ Uses: Reduce Joint Pain, Improve Mobility, Lower Cholesterol, Anti-inflammatory Effect, Support Detoxification, Promote

Weight Loss, Skin Health, Improve Metabolism, Boost Immunity.

- Cultivation: Guggulu thrives in hot, dry climates with temperatures between 25°C and 40°C. It prefers well-drained, sandy or loamy soil with a pH of 6.0–7.5 and requires full sun for optimal growth. The plant is drought-tolerant once established and needs minimal water. Guggulu can be propagated through seeds or root cuttings and typically matures in 6–8 years before resin harvesting. It grows best at altitudes ranging from 300 to 1,200 meters above sea level.
 - Precautions: Avoid during pregnancy, Consult a doctor while breastfeeding, Caution in low blood pressure or antihypertensive use, Avoid if allergic to Commiphora plants., Discontinue use 2 weeks before surgery, May interact with cholesterol-lowering medications.
 - Contraindications:
 - ✓ Pregnancy: Contraindicated due to potential uterine stimulation.
 - ✓ Breastfeeding: Not recommended without medical supervision.. Hypotension: Avoid if you have low blood pressure or are on antihypertensive medications.
 - ✓ Active Inflammatory Conditions: Contraindicated in cases of acute inflammation or fever.
 - ✓ Surgery: Avoid use 2 weeks prior to surgery due to blood-thinning effects.
 - Synergistic combination: Guggulu and Turmeric, Guggulu and Boswellia, Guggulu and Ginger, Guggulu and Ashwagandha, Guggulu and Devil's Claw
 - Clinical evidence: Lowers cholesterol and improves lipid profiles, Reduces inflammation in conditions like arthritis, Aids in weight loss by boosting metabolism, Exhibits antioxidant properties, Supports skin health, useful for acne and psoriasis.
 - Form: Resin, Capsules/Tablets, Powder, Tincture, Ointments/Topical Creams.
 - Types: Indian Guggulu (*Commiphora wightii*), African Guggulu (*Commiphora africana*), Gugulipid (Standardized extract form).
 - Commercial products: Guggulactone, Gugguliplex, Guggul Powder Capsules, Joint Health Guggulu, Guggulu Plus.
 - Environmental adaptability: Guggulu thrives in hot, dry climates with full sunlight, well-drained sandy or loamy soil, and minimal watering. It grows at altitudes of 300-1,200 meters and is sensitive to frost.
- ❖ **Sage (46-48)**
- Synonyms: Salvia, Common Sage, Garden Sage, True Sage, Meadow Sage
 - Biological source: The biological source of Sage is the dried leaves of *Salvia officinalis*, belonging to the Lamiaceae family.
 - Chemical constituents :
 - ✓ Volatile Oils: Thujone, Camphor, Cineole
 - ✓ Flavonoids: Apigenin, Luteolin
 - ✓ Tannins: Rosmarinic Acid
 - ✓ Phenolic Acids: Caffeic Acid, Chlorogenic Acid
 - ✓ Diterpenes: Carnosic Acid, Carnosol
 - ✓ Vitamins: Vitamin K, Vitamin A
 - ✓ Minerals: Calcium, Magnesium
 - Cultivation: Sage thrives in temperate climates (15°C–25°C), well-drained loamy or sandy soil (pH 6.0–7.0), and full sunlight. It requires moderate watering and is drought-tolerant but sensitive to waterlogging.
 - Dose:
 - ✓ Dried Leaves: 1-3 grams daily, often used in tea.
 - ✓ Tincture: 1-3 ml, 2-3 times daily.. Capsules: 300-600 mg, 1-2 times daily.
 - ✓ Essential Oil: 2-5 drops diluted in a carrier oil for topical use.
 - ✓ Infusion/Tea: 1-2 teaspoons of dried leaves per cup, taken 2-3 times daily.
 - Uses:
 - ✓ Anti-inflammatory: Reduces joint inflammation.
 - ✓ Pain Relief: Eases pain associated with arthritis. Antioxidant: Protects joints from oxidative damage.
 - ✓ Improves Mobility: Reduces stiffness and enhances joint flexibility.
 - ✓ Topical Use: Sage oil or compresses can be applied to swollen joints for relief.
 - Precautions: Avoid during pregnancy and breastfeeding in large amounts, Use cautiously in low blood pressure or liver disease., Discontinue use before surgery.

- Synergistic combination: Sage and Turmeric, Sage and Boswellia, Sage and Ginger, Sage and Devil's Claw, Sage and Willow Bark, Sage and Garlic, Sage and Black Pepper, Sage and Ashwagandha, Sage and Frankincense, Sage and Green Tea.
- Identification method: Fluorescence Analysis, Qualitative Test for Flavonoids, Test for Tannins, phytochemical screening.
- Analytical methods:
 - ✓ High-Performance Liquid Chromatography (HPLC): To separate, identify, and quantify bioactive compounds such as phenolic acids, flavonoids, and terpenoids in sage.
 - ✓ Gas Chromatography-Mass Spectrometry (GC-MS): To analyze volatile compounds, including essential oils like camphor, thujone, and cineole.
 - ✓ Thin Layer Chromatography (TLC): For qualitative analysis and quick screening of phytochemicals like flavonoids and phenolic acids.
 - ✓ UV-Vis Spectrophotometry: To determine the concentration of phenolic and flavonoid compounds in sage.
 - ✓ Fourier Transform Infrared Spectroscopy (FTIR): To identify functional groups and characterize the chemical structure of sage compounds.
- Contraindications: Not recommended during pregnancy or breastfeeding., Avoid in hormone-sensitive conditions and severe allergies to Lamiaceae plants.
- Clinical evidence: Improves memory and cognitive function, Reduces inflammation, especially in arthritis, Exhibits strong antioxidant properties, Helps alleviate digestive issues, Reduces hot flashes and night sweats in menopause.
- Form: Dried Leaves, . Capsules/Tablets, Tincture, Essential Oil, Tea/Infusion, Topical Cream/Ointment.
- Types: Common Sage (*Salvia officinalis*), Purple Sage (*Salvia officinalis* 'Purpurascens'), White Sage (*Salvia apiana*), Spanish Sage (*Salvia lavandulifolia*), Pineapple Sage (*Salvia elegans*), Clary Sage (*Salvia sclarea*), Golden Sage (*Salvia officinalis* 'Icterina')
- Commercial products: Sage Joint Support, Sage Arthritis Relief Capsules, Sage Pain Relief Cream, Sage & Boswellia Joint Formula, SageFlex, JointEase with Sage, Sage Arthritis Oil.
- Environmental adaptability: Sage thrives in mild, temperate climates with full sun, well-drained soil, and moderate watering. It is drought-tolerant but sensitive to frost and cold temperatures.
- ❖ **See Buckthorn** (49-52)
 - Synonyms: Hippophae rhamnoides, Sea Berry, Sandthorn, Sallowthorn, Obligato
 - Biological source: The biological source of Sea Buckthorn is the fruit and leaves of Hippophae rhamnoides, a deciduous shrub belonging to the Elaeagnaceae family.
 - Chemical constituents:
 - ✓ Fatty Acids: Omega-7 (palmitoleic acid), Omega-3 (alpha-linolenic acid), Omega-6 (linoleic acid), Omega-9 (oleic acid).
 - ✓ Vitamins: Vitamin C, Vitamin E, Vitamin A (beta-carotene), Vitamin K
 - ✓ Flavonoids: Quercetin, Kaempferol
 - ✓ Phenolic Compounds: Gallic acid, Ellagic acid
 - ✓ Carotenoids: Beta-carotene, Lycopene
 - ✓ Tannins
 - ✓ Amino Acids: Glutamic acid, Aspartic acid
 - ✓ Sterols: Beta-sitosterol
 - ✓ Sugars: Glucose, Fructose
 - Cultivation: Sea buckthorn thrives in cold, temperate climates with full sunlight, well-drained sandy or loamy soil, and regular watering. It is drought-tolerant and can be propagated by seeds, cuttings, or suckers.
 - Dose:
 - ✓ Sea Buckthorn Oil: 1-2 teaspoons (5-10 ml) per day.
 - ✓ Sea Buckthorn Capsules: 500-1,000 mg, 1-2 times daily.
 - ✓ Sea Buckthorn Juice: 30-60 ml, 1-2 times daily.
 - ✓ Sea Buckthorn Extract: 1-2 ml, 1-2 times daily.
 - Uses: Reduces inflammation in joints, Relieves pain associated with arthritis, Improves joint lubrication, Promotes tissue repair and regeneration, Protects joints from oxidative

stress, Supports immune function, Improves skin health and healing, Boosts energy levels, Reduces cholesterol levels, Enhances digestive health, . Supports cardiovascular health, Promotes wound healing, Improves liver function.

➤ Identification method: Acid Value Test, Saponification Value, Phytochemical Screening

➤ Analytical methods:

✓ High-Performance Liquid Chromatography (HPLC): To separate, identify, and quantify bioactive compounds such as flavonoids, carotenoids, vitamins (e.g., vitamin C, E), and phenolic acids in sea buckthorn.

✓ Gas Chromatography-Mass Spectrometry (GC-MS): To analyze volatile compounds, fatty acids, and essential oils in sea buckthorn oil.

✓ UV-Vis Spectrophotometry: To determine the concentration of carotenoids, flavonoids, and phenolic compounds in sea buckthorn.

✓ Fourier Transform Infrared Spectroscopy (FTIR): To identify functional groups and characterize the chemical structure of sea buckthorn components.

➤ Dose:

✓ Sea Buckthorn Oil: 1-2 teaspoons (5-10 ml) per day.

✓ Sea Buckthorn Capsules: 500-1,000 mg, 1-2 times daily.

✓ . Sea Buckthorn Juice: 30-60 ml, 1-2 times daily.

✓ Sea Buckthorn Extract: 1-2 ml, 1-2 times daily.

➤ Uses: Sea buckthorn reduces inflammation, relieves pain, improves joint mobility, promotes healing, and provides antioxidant protection in arthritis, Supports immune function, Enhances skin healing and reduces dryness, Promotes cardiovascular health, Improves digestion, Reduces cholesterol levels, Boosts energy and vitality, Supports liver health.

➤ Precautions: Avoid during pregnancy and breastfeeding in large amounts; use cautiously with low blood pressure and liver disease.

➤ Contraindications: Not recommended for pregnant or breastfeeding women in high doses, or for those with low blood pressure or liver disease.

➤ Clinical evidence: Sea buckthorn has clinical evidence supporting its anti-inflammatory effects, skin healing properties, cardiovascular benefits, immune support, and liver protection.

➤ Forms: Sea Buckthorn Oil, Tea Buckthorn Capsules/Tablet, Sea Buckthorn Juice, Sea Buckthorn Extract, Sea Buckthorn Cream/Ointment, Sea Buckthorn Powder

➤ Types: Hippophae rhamnoides (Common Sea Buckthorn), Hippophae salicifolia (Willow-leaved Sea Buckthorn), Hippophae tibetana (Tibetan Sea Buckthorn), Hippophae neurocarpa (Black Sea Buckthorn), Hippophae litangensis (Litang Sea Buckthorn)

➤ Commercial products: Sea Buckthorn Joint Support Capsules, ArthriFlex Sea Buckthorn Oil, Sea Buckthorn Pain Relief Cream, Omega-7 Sea Buckthorn Capsules, Sea Buckthorn Arthritis Relief Gel, Sea Buckthorn Joint Care Supplements, Sea Buckthorn Extract for Inflammation

➤ Environmental adaptability: Sea buckthorn thrives in cold climates, well-drained soil, full sunlight, and is drought-tolerant. It grows well in altitudes up to 2,500 meters and is frost-tolerant.

➤ Synergistic combination: Sea Buckthorn and Turmeric. Sea Buckthorn and Boswellia, Sea Buckthorn and Ginger, Sea Buckthorn and Willow Bark, Sea Buckthorn and Devil's Claw, Sea Buckthorn and Black Pepper

❖ **Ginger Lily (27, 53, 54)**

➤ Synonyms: Hedychium, Gingerflower, Butterfly Ginger, Garland Lily, White Ginger

➤ Biological source: The biological source of Ginger Lily is the rhizome and flowers of plants in the Hedychium genus, which belongs to the Zingiberaceae family.

➤ Chemical constituents:

✓ Essential Oils: Contain components like zingiberene, terpinolene, and camphene.

✓ Flavonoids: Includes compounds like quercetin and kaempferol.

✓ Phenolic Acids: Such as ferulic acid and caffeic acid.

✓ Gingerol Derivatives: Similar to those found in ginger, contributing to its pungency.

✓ Starch: Present in the rhizome.

- ✓ Saponins: Bioactive compounds with potential medicinal properties.
 - ✓ Alkaloids: Compounds with possible therapeutic effects.
 - Cultivation: Ginger lilies thrive in tropical and subtropical climates with warm temperatures, high humidity, and well-drained, fertile soil. They require partial shade to full sunlight, consistent moisture, and should be spaced 2-3 feet apart. Propagation is done through rhizomes, planted 2-4 inches deep. Regular fertilization supports healthy growth.
 - Dose: General Guidelines (when using extracts or supplements):
 - ✓ Ginger Lily Extract: 300-500 mg per day, taken in divided doses.
 - ✓ Ginger Lily Essential Oil: 2-3 drops, diluted in a carrier oil for topical use.
 - Use: Ginger lily helps reduce inflammation, relieve pain, improve mobility, protect against oxidative damage, and relax muscles in arthritis, Reduces joint swelling, Alleviates discomfort from rheumatoid arthritis, Supports tissue regeneration in joints, Enhances circulation to affected areas, May improve flexibility and reduce stiffness.
 - Identification test: Solubility Test, Sulfuric Acid Test, Ferric Chloride Test, Thin-Layer Chromatography (TLC), Vanillin-Sulfuric Acid Test.
 - Analytical method:
 - ✓ High-Performance Liquid Chromatography (HPLC) : To separate, identify, and quantify bioactive compounds such as flavonoids, phenolic acids, and alkaloids in ginger lily.
 - ✓ Gas Chromatography-Mass Spectrometry (GC-MS): To analyze volatile compounds, essential oils, and fatty acids in ginger lily.
 - ✓ Thin Layer Chromatography (TLC): For qualitative analysis of phytochemicals like flavonoids, saponins, and terpenoids.
 - Clinical evidence: Reducing nausea (e.g., pregnancy, chemotherapy), Alleviating pain and inflammation (e.g., osteoarthritis), Improving digestion and reducing bloating, Enhancing metabolic health (e.g., insulin sensitivity, weight management), Supporting cardiovascular health (e.g., lowering blood pressure, cholesterol), Providing antioxidant effects.
 - Synergistic combination: Ginger and Turmeric (Curcumin), Ginger and Boswellia (Frankincense), Ginger and Green Tea, Ginger and Devil's Claw, Ginger and Omega-3 Fatty Acids (Fish Oil).
 - Form: Essential Oils, perfume, extract, shampoo, tablets, capsules, powder, liquid extract, topical creams / ointment, tea, tincture, soft gels capsules.
 - Types: *Hedychium coronarium* (White Ginger Lily), *Hedychium gardnerianum* (Kahili Ginger), *Hedychium flavescens* (Yellow Ginger Lily), *Hedychium coccineum* (Scarlet Ginger Lily), *Hedychium greenii* (Red Ginger Lily), *Hedychium spicatum* (Spiked Ginger Lily), *Hedychium yunnanense* (Yunnan Ginger Lily)
 - Commercial products: Tumeric & Ginger by Nature's Way, Zingiber by Organic India, . GingerFlex by Now Foods, Thera-Gesic, Ginger-Plus by Nature's Answer, Arthri-D by Design for Health, Solgar 7 by Solgar
 - Environmental adaptability: Ginger lilies thrive in tropical and subtropical climates with warm temperatures, well-drained, fertile soil, partial to full shade, and regular moisture. They prefer high humidity and may struggle in dry or frosty conditions.
- ❖ **Bitter Gourd (55-57)**
- Synonyms: Bitter melon, Bitter squash, Balsam pear, Goya (in Japan), Karela (in India), Ampalaya (in the Philippines), *Momordica charantia*.
 - Biological source: The biological source of bitter gourd is *Momordica charantia*, a plant species belonging to the family Cucurbitaceae. It is widely cultivated in tropical and subtropical regions for its edible fruit, which is known for its bitter taste and various medicinal properties.
 - Chemical constituents:
 - ✓ Alkaloids: Momordicine
 - ✓ Saponins: Charantin (a mixture of steroidal saponins)
 - ✓ Glycosides: Momordicosides
 - ✓ Flavonoids: Quercetin, Kaempferol
 - ✓ Polypeptides: Polypeptide-p (an insulin-like peptide)
 - ✓ Vitamins: Vitamin C, Vitamin A, Vitamin B-complex

- ✓ Minerals: Calcium, Potassium, Magnesium, Iron, Phosphorus
 - ✓ Triterpenes: Cucurbitacin B
 - ✓ Sterols: Stigmasterol, β -sitosterol
 - Cultivation: Bitter gourd is cultivated in warm, humid climates with well-drained, sandy loam soil. It is propagated by seeds, typically sown directly in the field. The plant requires regular watering, supports for climbing, and a temperature range of 24°C to 30°C. It thrives best in soil with a pH of 6.0 to 7.0 and is harvested around 3-4 months after sowing.
 - Dose:
 - ✓ Fresh juice: 30-50 ml daily
 - ✓ Dried powder: 1-3 grams per day
 - ✓ Capsules/Tablets: 500-1000 mg per day
 - ✓ Decoction: 50-100 ml per day
 - Common use: Reduce inflammation in the joints, Relieve pain associated with arthritis, Improve joint mobility by reducing swelling, Support overall joint health, Blood sugar control (managing diabetes), Digestive health (relieving constipation), Weight loss, Antioxidant and anti-inflammatory effects, Liver detoxification, Skin health (treating acne), Immune support, Potential anti-cancer properties.
 - Precautions and Contraindications Avoid during pregnancy, Monitor blood sugar if diabetic, Use in moderation to prevent stomach issues, Check for allergies before topical use, Caution if you have liver problems, Discontinue 2 weeks before surgery.
 - Identification method: Alkaloids Test, Saponins Test, Flavonoids Test, Steroids and Terpenoids Test, Glycosides Test.
 - Analytical methods:
 - ✓ High-Performance Liquid Chromatography (HPLC): To separate, identify, and quantify bioactive compounds such as saponins, flavonoids, phenolic acids, and alkaloids in bitter gourd. Gas Chromatography-Mass Spectrometry (GC-MS): To analyze volatile compounds, fatty acids, and essential oils in bitter gourd.
 - ✓ Thin Layer Chromatography (TLC): For qualitative analysis and preliminary screening of
 - ✓ phytochemicals like flavonoids, alkaloids, and saponins.
 - ✓ UV-Vis Spectrophotometry: To determine the concentration of phenolic compounds, flavonoids, and other bioactive compounds in bitter gourd.
 - ✓ Fourier Transform Infrared Spectroscopy (FTIR): To identify functional groups and characterize the chemical structure of compounds in bitter gourd.
 - Clinical evidence:
 - ✓ Diabetes: Lowers blood sugar.
 - ✓ Weight Loss: Reduces fat and boosts metabolism.
 - ✓ Antioxidant: Supports immunity and reduces inflammation.
 - ✓ Liver Health: Improves liver function.
 - ✓ Cancer: May have anti-cancer effects.
 - ✓ Cholesterol: Reduces LDL and triglycerides.
 - ✓ Antimicrobial: Fights infections.
 - Synergistic combination: Bitter Gourd and Turmeric, Bitter Gourd and Ginger, Bitter Gourd and Garlic, Bitter Gourd and Holy Basil, Bitter Gourd and Fenugreek, Bitter Gourd and Ashwagandha, Bitter Gourd and Green Tea, Bitter Gourd and Celery, Bitter Gourd and Boswellia, Bitter Gourd and Devil's Claw
 - Form: Fresh Juice, Powder, Capsules/Tablets, Decoction, Extract, Tincture, Tea, Oil, Topical Paste, Dried Slices.
 - Types: Indian Bitter Gourd (*Momordica charantia* var. *charantia*), Chinese Bitter Gourd (*Momordica charantia* var. *abbreviata*), Thai Bitter Gourd (*Momordica charantia*), White Bitter Gourd (*Momordica charantia*), Bald or Smooth Bitter Gourd (*Momordica charantia*)
 - Commercial products: Herbal Hills Karela Powder, Basic Ayurveda Bitter Gourd Juice, Bitter Melon Extract Capsules, Bitter Melon Tea Bags, Bitter Gourd Seed Oil.
- Environmental adaptability: Bitter gourd thrives in warm, tropical or subtropical climates with temperatures between 25°C to 35°C, well-drained soil, full sunlight, and moderate watering. It prefers high humidity but can tolerate drier conditions when well-watered.

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