

Commonly Used Medicinal Plants for Effective Management of Gouty Arthritis

Saira Ashraf

Department of Eastern Medicine Government College University Faisalabad Pakistan

Farooq Bashir Butt

Associate Professor, Khaldunia College of Pharmacy, Lahore, Pakistan

Shahlla Umbreen

Department of Eastern Medicine, Qarshi University Lahore, Pakistan

Rizwan Rashid Bazmi

Department of Pharmaceutical Chemistry, Faculty of Pharmaceutical Sciences, Government College University Faisalabad, Pakistan

Muhammad Ishaque M R

Department of Eastern Medicine and Surgery, University of Sindh, Jamshoro, Pakistan

Muhammad Shoaib Sabir

Department of Eastern Medicine Government College University Faisalabad Pakistan

Maham Khan

Nuclear Institute of Agriculture and Biology (NIAZ-C), Faisalabad Pakistan

Fakhra Nazir

Center for Bio-Resource Research, Islamabad, Pakistan

Shafqat Rasool

School of Eastern Medicine Minhaj University Lahore, Pakistan

Syed Qaisar Zaheer

Department of Eastern Medicine Government College University Faisalabad Pakistan

Adan Aafreen

Department of Eastern Medicine Government College University Faisalabad Pakistan

Muhammad Akram*

Department of Eastern Medicine Government College University Faisalabad Pakistan.

Corresponding Author Email: muhammadakram@gcuf.edu.pk

ABSTRACT

Gouty arthritis is a painful inflammatory disorder characterized by elevated uric acid levels, leading to crystal deposition in joints. Several medicinal plants are traditionally used for their effective management due to their anti-inflammatory, analgesic, and uric acid-lowering properties. *Suranjan Shirin* (*Colchicum autumnale*) contains colchicine, which reduces inflammation and prevents crystal-induced damage. *Zingiber officinale* (*Zingiber officinale*) demonstrates potent anti-inflammatory and antioxidant properties that alleviate joint pain and swelling. *Post-Halela Zard* (*Terminalia chebula*) supports detoxification and helps regulate uric acid levels. *Elwa/SabarSaqootri* (*Aloe barbadensis*) contributes anti-inflammatory and soothing effects. Together, these plants offer promising natural support for the management of gouty arthritis.

Keywords: Gouty Arthritis; Medicinal Plants; Colchicum Autumnale; Zingiberofficinale; Anti-Inflammatory.

Introduction

The eminent ancient Greek physician and progenitor of medicine, Hippocrates (460-377 BC), characterizes gouty arthritis (*Naqras*) as a preeminent affliction, associating it with affluent individuals due to lifestyle factors such as a purine-rich diet (animal flesh) and excessive alcohol intake, along with comorbid conditions (hypertension, chronic kidney disease, obesity). Unani medicine describes Naqras as a joint condition caused by an imbalance of one of four humours (Akhlāt), usually phlegm. Gout is thought to be a male disease, and it becomes more common in women after menopause, because of estrogen.

Gouty Arthritis is widespread, affecting 5-10% of men over 50. Gouty Arthritis limits patient lifespan through triggering or escalating cardiac disease (CVD), and it is a hazardous problem for the progression of renal disease (CKD). The elevation in UA levels might be attributed to tissue hypoxia or increased oxygen radical generation. Because of its close association with CVD and renal diseases, most investigations have connected gout to poor clinical outcomes (Corry et al., 2008). Compared to patients with SUA <6.0, those with SUA ≥6.0 were more likely to be male, nonsmokers, and to have a history of peripheral artery disease, renal disease, coronary artery disease, MI, heart failure, hypertension, diabetes, and hyperlipidemia.

Compared to patients with SUA < 6.0 mg/dL, individuals with an increased baseline SUA level were also more likely to have a history of gout (Pagidipati et al., 2017).

Globally, by the end of 2020, the incidence of gouty arthritis had risen to 3.26 times the baseline, higher in males than in females, and increased with age. The expected prevalence of gouty arthritis will reach 95.8 million by the end of 2050, driven by population growth. Primary causes of impairment associated with gout included high body mass index and renal failure. In 2020, 55.8 million individuals worldwide were affected by gout, with an age-standardized prevalence of 659.3 (525.4–822.3) per 100,000, representing a 22.5% (20.9–24.2) increase since 1990. The overall population afflicted with gout doubled from 1990 to 2020, and the age-standardized prevalence rose by 22.5% since 1990, with increases observed in the majority of GBD-study areas (Cross et al., 2024).

The solubility of urate crystals is influenced by factors such as temperature, pH, cation concentration, and the presence of nucleating agents. According to an analysis of gouty arthritis patients, individuals with baseline (BL) blood urate levels of at least 6 mg/dL accounted for 95 percent of new gout flares. In contrast, those with levels close to 5 mg/dL accounted for 98 percent. Even after adjusting for sex, race, the presence of chronic renal illness, the use of diuretics, and the use of urate-lowering medications, the relationships remained. Nearly all acute flares occurred in those with BL urate levels exceeding 5 mg/dL or 6 mg/dL, according to the study, which also identified a strong correlation between the likelihood of recurrent gout flares and a single blood urate level assessment (McCormick et al., 2024).

The earliest known form of inflammatory arthritis is gout, which was first described in 2460 BC. Data collection from historical sources suggested that of the 264 Roman popes, 25 had gout (9.47%), and 12 of the 17 had renal disease (68%) as the primary cause of death. 5 of 25 patients had severe comorbidities, and 14 of 25 (58%) had additional risk factors. About 1% of the population resides in Italy and France, 2.5% in the UK, 3.9% in the USA, and 1% in China, all of whom have gouty arthritis. Portugal, Turkey, Malaysia, Japan, and the Republic of Korea are uncommon. The risk increases at 70 or 80 (Santo D.E. et al., 2021).

Gout can be acute or chronic, causing tissue damage and inflammation due to

the precipitation of monosodium urate (MSU) in joints, kidneys, and subcutaneous tissues. Inflammation-induced gout activation has been further elucidated in recent preclinical and clinical studies on gouty arthritis. Research has demonstrated that the inflammatory mechanism of monosodium urate accumulation consists of pro-inflammatory molecules, including interleukins IL-1 β , IL-8, and IL-17; the NLRP3 inflammasome; and tumour necrosis factor alpha (TNF- α), as well as anti-inflammatory molecules IL-10 and IL-37 (Yang et al., 2020).

Advancements in diagnostics and treatment aim to prevent inflammation, assess urate levels, and provide a comprehensive evaluation of gout. CT and ultrasound findings are also used in the evaluation and management of infection, with standard therapy available for patients whose disease is resistant to standard treatment (Parthasarathy et al., 2018). Gout, which affects 3.9% of adults in the US, is a prevalent condition of inflammatory arthritis. Advanced gout, tophi, persistent gouty arthritis, and joint degeneration can result from untreated gout. Acute inflammatory monoarthritis may need pathological examination of the affected tissue. The function of monosodium urate crystal deposition, typical patterns of involvement, and the tissue reaction to deposited crystals are the main topics of a thorough analysis of anatomical pathology in gout. Compared with other joint swelling conditions, MSU crystal gout is strongly associated with the tophus, an ordered, chronic, giant-cell granulomatous structure. The tophus, an organized chronic giant cell granulomatous structure, was described in various tissues (Towiwat et al., 2019).

However, in multivariate analyses, some factors were no longer significantly associated with gout, while 10 factors remained independently predictive. The data-derived prediction model had sensitivity and specificity less than 90%. The correlation of blood urate level with gout and non-gout fluctuates throughout time, and the probability of developing gout as opposed to non-gout rises gradually with the quartiles of the highest serum urate level ever measured. Serum urate levels should be included in future gout categorization criteria rather than relying solely on the presence or absence of a high serum urate level (Taylor et al., 2015).

Tophus and bone destruction in gout are strongly correlated, as shown by pathology investigations. Bone erosion is closely associated with the tophus, a structure made up

of urate crystals and chronic inflammatory tissue. With tophus visible in 80.2% of all joints, the soft tissue density and tophus urate are both directly and indirectly correlated with XR erosion scores (Sapsford et al., 2016). Acute gouty nephropathy is often secondary to tumor lysis syndrome or crush injury in 15-20% patients, resulting in severe hyperuricemia and kidney failure.

The net balance of renal and intestinal production, reabsorption, or secretion influences blood uric acid levels. Genome-wide association studies of hyperuricemia have recently contributed to a comprehensive understanding of epithelial absorption and uric acid as a byproduct. Additionally, new genetic networks showing the impact of uric acid homeostasis have emerged. Such advancements have the potential to yield new, targeted treatments for hyperuricemia, as well as a greater understanding of the illnesses linked to it (Mandal et al., 2015).

The Habb, often known as the pill, is an old dose type used in the Unani medical system. Habb is an Arabic term that means 'pill'; however, it is also used in several other contexts. This term is also applicable to seeds, but in the context of pharmaceuticals, it refers to a spherical solid (Suhail et al., 2017). The components of a pill may comprise one or two or more ingredients. Use of Hab-e-Suranjan reduces joint pain, swelling, and redness. The drug's composition, which is highly suited to the pathophysiology of hyperuricaemia and gouty arthritis, is mainly responsible for these clinical improvements. Suranjan (*Colchicum luteum*), Zanjbeel (*Zingiber officinale*), Sibraaqotri (*Aloe barbadensis*), senna leaf (*Cassia angustifolia*), and Post HalaileZard (*Terminalia chebula*) are some of the medications in our therapeutic combination.

The analgesic effects of Elva (*Aloe barbadensis*), Suranjan (*Colchicum luteum*), and Sedative (Musakkin activity of Halailezard) are responsible for the pain relief. The pain is alleviated by the analgesic properties of Elva (*Aloe barbadensis*), Suranjan (*Colchicum luteum*), and Sedative (Halailezard's Musakkin activity). Research claims that Elva's carbapaptidase significantly reduced pain and inhibited acetic acid-induced inflammation by preventing accelerated vascular permeability. The main anti-inflammatory component of aloe, carboxypeptidase, has been proposed, although other substances, such as salicylate, could be involved (Hilal et al., 2021).

The addition of Post HalailaZard (*Terminalia chebula*), which not only acts as an anti-inflammatory but also balances the effects of the aforementioned medications, ensures that the formulation is well-designed and least toxic, due to its Astringent actions as well as tonic action on the stomach and intestines (Parveen et al., 2020). Because of its excretory action on uric acid, Suranjan is beneficial in all inflammatory joint diseases and is mainly used for hyperuricaemia and gouty arthritis, whether chronic or acute. The medicine is remarkable for its purgative activity on the bowel and its astringent and resolvent action on joints, both key actions of Suranjan, but conflicting. As a result, uric acid is eliminated through the colon (Ali I., 2012).

Since *Naqras* is regarded as a condition characterized mainly through phlegmatic indulgence, our formulation is well-suited to eliminate abnormally enormous amounts of phlegm as well as the other humors that contribute to this pathognomonic condition. Serum uric acid level was the only objective parameter measured at the 15-day interval, demonstrating that the medicine had a very significant impact on lowering the level. The formulation particularly shows efficacy by alleviating urate crystals and uric acid through the gut due to Suranjan's well-known activity, which is the elimination of Monosodium urates from the blood and affected joints (Akhtar et al., 2019).

Suranjan's anti-inflammatory properties have a substantial impact on joint pain and joint mobility, in addition to reducing swelling and discomfort. They might also be at fault for how the patients behave. The Institutional Ethics Committee approved the recruitment of patients with joint pain from the general outpatient department of RRIUM, Chennai, who provided written informed consent for the research project. Ninety-seven individuals finished the research therapy. Individual indicators such as joint discomfort, oedema, soreness, and mobility limitations improved significantly after 14 days. Following therapy, 47.4% of patients experienced complete relief, 51.4% experienced partial relief, and 1.2% experienced no relief. According to laboratory tests, the combination of Habb-e-Suranjan and Raughan-e-Suranjan has strong analgesic properties, making it a potentially superior choice for people with joint discomfort (Kabiruddin et al., 2011).

Ingredients of Hab-e-Suranjan

- Suranjan Shirin (*Colchium Automnale*)
- Zanjbeel (*zinziber officinale*)
- Post HalelaZard (*Terminala chebula*)
- Elwa/ sabarsaqootri (*Aloe barbadensis*)

Suranjan Shirin (*Colchicum Autumnnale*)

Introduction

In the Unani school of Medicine, Suranjan (*Colchicum*) is among the principal medications utilized for arthritis. Suranjan (*Colchicum*) is a highly esteemed medication and is regarded as the primary treatment for arthritis by practitioners of Unani medicine. There are two types of Suranjan medication: SuranjanTalkh (*Colchicum luteum*) and SuranjanShirin (*Colchicum autumnnale*). According to Masihi and Hussain, the white variant (Shirin) is a superior drug for treating arthritis due to its lower toxicity compared to others (Rodnan et al., 1970). *Colchicum autumnnale* (Suranjanshirin) is used to cure gout (Naqras), rheumatism, gonorrhea dropsy, neurological disorders, including multiple sclerosis, and enlargement of the prostate.

Colchicine is a well-known medication that has been used in rheumatism clinics for centuries. *Colchicum autumnnale* has been listed in the first official Pharmacopoeia of the United States. Nowadays, *Colchicum autumnnale* (*Suranjanshiri*) is a primary source of colchicine, which is prescribed to patients with gouty arthritis. Colchicine has shown effectiveness in many animal models and in cell-level cardio protection tests. Colchicine's effects on acute myocardial infarction were initially investigated in preclinical models, and many in vitro and in vivo studies showed a reduction in inflammation (Akodad et al., 2020).

Botanical Description

Botanical name: *Colchicum autumnnale*; it belongs to the family Colchicaceae. "Autumn crocus" and "Meadow saffron" are other names for Suranjan Shirin. Its name is derived from Colchis, a historical Georgian kingdom and state on the eastern coast of the Black Sea, which has a wide variety of flora. This perennial herb grows to be approximately 0.3 meters tall, with pale purple blooms and a conical fleshy base. The herbaceous perennial has leaves that can reach 25 cm (10 in) long.

The blooms are solitary, measuring approximately 4-7 cm (2-3 in) in diameter.

They consist of six petals, six stamens with orange anthers, and three styles in white. In fall (autumn), the blooms protrude above the soil, with the blossom tube being long and the ovary remaining below ground. In spring, leaves develop, and the capsule is raised above ground as its stalk lengthens (Boboev et al., 2023). The corms of *C. autumnale* possess bulbous structures and are known to contain colchicine, a pharmacologically valuable substance characterized by a limited therapeutic range. In terms of macroscopic appearance, a fresh corm has a diameter of 2-3 cm; however, a dried corm is composed of transverse slices that are slightly reniform and occasionally more oval longitudinal slices that are between 2 and 5 mm thick. The epidermis is cinnamon-brown and has several wrinkles. Corm has a flavor that is either sweet or bland, or somewhat less bitter. Each grain has a diameter of 6-30 μm and a star- or triangle-shaped hilum (Akram et al., 2012).

Occurrence

It is widely distributed across Central Asia, the Mediterranean region, and Europe.

Colchicine

The presence of colchicines and related chemicals in *Colchicum autumnale* is responsible for its toxic properties. The alkaloid is thermally stable, rendering it resistant to deactivation at elevated temperatures. The plant colchicum, with several varieties, contains tropolone alkaloids used to manage cirrhosis, gout, Behcet's disease, psoriasis, myeloid leukaemia, Hodgkin's disease, and other cancers (Furqan et al., 2025).

Many individuals have found that long-term use and low dosage of colchicine (approx. 0.5 mg daily) effectively prevents cardiovascular events and gout flare-ups. However, when administered in individuals without severe liver or kidney disease or in conjunction with the majority of drugs, the therapeutic advantages obtained at modest doses are not sufficient to maintain serum levels over the upper limit of safety. According to studies over the past 50 years, the biological effects of long-term colchicine use do not increase the risk of myotoxicity, cytopenia, sepsis, or cancer (Robinson et al., 2022).

Colchicine possesses a physiological effect by preventing the NLRP3 inflammasome from being activated in response to inflammatory microcrystals

(Dalbeth et al., 2014). The accumulation of calcium, CPPD, or monosodium urates (MSU) in joints and periarticular tissues is associated with inflammatory reactions known as gout and pseudogout. These crystals trigger the NALP3 inflammasome, which activates caspase-1 and produces IL-18 and IL-1 β . Crystals impair macrophage IL-1 β activation in mice lacking components of the inflammasome. Mice lacking the inflammasome show reduced neutrophil influx. These discoveries provide light on the underlying inflammatory disorders and the function of the inflammasome in autoinflammatory illnesses (Martinon et al., 2006).

Zanjabeel (*Zingiber officinale* Roscoe)

It originated as zingiber, in Greek, and zinziberi in Latin. Ginger is produced across the humid tropics, with India as the largest producer. It is thought that Indians and Chinese have been using ginger as a tonic root for over 5000 years to treat a variety of illnesses (Ansari et al., 2021).

Ginger had been used as a flavouring since the earliest documented history. The pharmacological characteristics of ginger's compounds, such as gingerdiones and shogaols, have been shown to mirror the actions of non-steroidal anti-inflammatory medications NSAIDs in human leukocytes. Ginger has been shown to help people reduce nausea and vomiting after surgery without having a significant impact on gastric emptying. It has been demonstrated that several ginger extracts and fractions protect against chemical-induced tissue damage. According to the current investigation, serum markers of oxidative stress and inflammation are significantly influenced by ginger supplementation (Jalali et al., 2020). Ginger and its constituents are beneficial for coronary artery disease, peripheral artery disease, and vascular diseases (Li et al., 2021).

Botanical Description

Ginger (botanical name: *Zingiber officinale* Roscoe) belongs to the family *Zingiberaceae*. It comes from the English word *ginger*; in Urdu, it is known as Adrak; in Arabic, Zanjabeel Ratab; in Persian, Zanjabeel Taza; in English, ginger; and in Hindi, Adaraka. In Unani, it is known as Hutiyoon. The herb can grow up to 1.3 meters tall, with sessile, linear-lanceolate Berg leaves, a glabrous inflorescence on a pointed peduncle up to 25 cm, green bracts with a light border, yellow flowers with a

purple dotted labellum, and dark purple anthers. Rhizomes 2-4 inches in length; tubers branched, knotty, and somewhat compressed; lobed on one side; clavately branching without a corky, wrinkled epidermis; striate and buff in colour.

The term "Sonth/Sondh" refers to dried ginger. With 85 species, *Zingiber officinale*, also known as zanjbeel, is a commonly grown plant. The morphological and anatomical characterization of the leaf and rhizome provides a theoretical foundation for the medicinal exploration and utilization of ginger (Liu et al., 2020).

Occurrence

Ginger is widely cultivated in tropical Asia and is found worldwide. The major ginger-cultivating countries are India, Jamaica, Australia, Brazil, Bangladesh, Cameroon, China, Sri Lanka, Taiwan, Thailand, Indonesia, Trinidad, Uganda, Costa Rica, Fiji, Ghana, Guatemala, Nigeria, Philippines, and Sierra Leone.

Chemical Constituents

Phenolic compounds such as gingerols and shogaols, as well as terpenes, polysaccharides, lipids, organic acids, and raw fibres, are among its many chemical components (Mao et al., 2019). According to a study, 6-shogaol, a minor component of ginger with greater bioactivity than 6-gingerol, can be produced at higher levels by increasing drying and extraction temperatures. Compared with freezing and extraction at room temperature, the study found that the maximum output was obtained at 80°C extraction, resulting in a 7-fold increase in 6-shogaol content. The study also discovered that adding strong acid to the extraction solvent increases the synthesis of 6-shogaol. The pharmaceutical and food processing sectors may find this material beneficial (Ok et al., 2012).

A condensed extract of 160.5g was obtained from 600 grammes of dried, purified, and extracted rhizomes. N-hexane, ethyl acetate, and residual water were used to fractionate 50 grammes of ginger leaf extracts, yielding 8.44%, 11.01%, and 55%, respectively. Future studies could investigate pathology, dosage modifications, or the isolation of ginger compounds. In hyperuricemic white mice, the results of ginger fractionation at blood uric acid levels are being investigated after they receive chicken liver juice. According to the study, by preventing xanthine from being converted to uric acid, the ethyl acetate fraction, which contains a secondary

metabolite known as flavonoid, can reduce uric acid levels. This is because either excessive synthesis or insufficient renal excretion can result in elevated uric acid levels (Afriani et al., 2020).

Medicinal Use

Ginger is one of the herbs used in traditional medicine to treat gout. Ginger (*Zingiber officinale* Roscoe) ethanol extract can be a potential anti-hyperuricemia agent. Ginger is a medicinal herb used extensively in Chinese and Indian medicine because of its anti-inflammatory, anti-diabetic, antioxidant (Sang et al., 2009), antimicrobial, anti-emetic, immunomodulatory, relaxant, and anti-ulcer properties (Mahboubi et al., 2019). Its rhizome is frequently used to cure several conditions, including arthritis. The bioactive components in ginger essential oil extract prevent the generation of free radicals and oxidative stress, and can lower levels of inflammatory agents in the blood. According to recent research, ginger and its extract inhibit 5-lipoxygenase, thereby suppressing leukotriene formation. Studies conducted in vitro have demonstrated that ginger essential oil extract exhibits the highest levels of inhibition and protection (Mutthuraj et al., 2020).

Halelazard (*Terminalia chebula*)

The distinctive pharmacological characteristics of *T. chebula* are due to its high concentration of tannic acid, sitosterol, ascorbic acid, and garlic acid. Traditionally, this plant is used to manage a variety of ailments, including ulcers, gastro-enteritis, malabsorption syndrome, gout, rheumatoid arthritis, diabetes mellitus, and wound healing. Phytochemicals offer health benefits due to glycosides, alkaloids, polyphenols, terpenes, anthocyanins, and flavonoids (Khan et al., 2022).

Botanical Description

Halela, botanical name *Terminalia chebula*, belongs to the family *Combretaceae*, commonly known as “Harar” in Urdu and also called Black Chebulic Myrobalan in English. The trees are medium-sized, with spreading branches and a rounded crown, reaching 50 to 80 feet in height. The bark is dark brown and has longitudinal cracks. The elliptical, ovate leaves have two glands (Wadkar et al., 2023).

The flowers are hermaphrodite, 4 mm across, have a pungent smell, and are dull white to yellow, with 10 petals (Ashwini et al., 2011). The fruits have five lines or ribs on

the outside and measure between one and two inches. When mature, fruits have a yellowish-grey colour, but when unripe, they are green and fall as they ripen from March to November. The tree is up to 25 cm high, with simple, obtuse leaves 7-20 cm by 4-8 cm.

Terminalia chebula, a member of the Combretaceae family, is known for its Zard, a skin found in mature dried fruits. This tree, also known as myrobalan, belongs to around 250 species, mostly moderate to large trees—the term "Terminalia" is a Latin word meaning "terminus," referring to its terminal branches. The stems of this deciduous tree are woody and glabrous. It has oblong tips and simple, exstipulate, petiolate laminae. The fruit's tegument, testa, and epicarp are all present. Oil globules, rosette aggregate crystals, and aleurone grains are found in the folded cotyledon. Under a microscope, the plant's dark powder contains fibres (Basha et al., 2017).

Occurrence

Terminalia chebula is widely distributed in India, Sri Lanka, Burma, and Myanmar. *T. Chebula* is utilized not only in India but also distributed widely in other nations in Africa and Tropical Asia, including China and Tibet.

Medicinal Uses

TCHE significantly inhibited joint swelling in arthritis-induced models by lowering interleukins, such as IL-6 and IL-1 β , and blood TNF- α levels. TCHE, long-term usage has not resulted in any significant physiological effects. TCHE may have an anti-arthritic effect by modulating synovial inflammatory cytokines. The hydroalcoholic extract of *T. chebula* significantly reduced joint swelling in arthritis induced by formaldehyde and CFA. It significantly reduced TNF levels in blood, suggesting potential therapeutic effects in rheumatological diseases (Nair et al., 2010).

T. chebula fruits have various properties, including astringent, carminative, purgative, and stomachic properties (Kim et al., 2022). Fruit extracts from *T. chebula* that contain ethyl ester and gallic acid work well against MRSA and other bacteria. The aqueous extract decreased the urease activity of *H. pylori*. In addition, ethanol dioic acid inhibited *Clostridium perfringens* and other microorganisms. Research studies show that the extract also possesses antifungal activity in a paper disc method (Taiwana et al., 2024).

Fruits from *T. chebula* may be used to manage AIDS and sexually transmitted infections because they have been shown to have anti-HSV and anti-CMV properties (Kesharwani, 2017; Bag, 2013). *T. chebula*'s hot water extract shows anti-HSV and anti-CMV qualities, while the fruit's gallic acid and galloyl glucose prevent HIV-1 integrase 3' processing (Kolla et al., 2017). Excellent α -glucosidase inhibitory activities were demonstrated by 48 compounds, including three new compounds, which can potentially be used to treat type 2 diabetes and reduce postprandial hyperglycemia in patients (Lee et al., 2017).

Aloe vera (*Aloe Barbadensis* Miller).

Introduction

Aloe Barbadensis Miller, commonly known as Aloe Vera (AV), is well known for its exceptional qualities in supporting skin care, health, and therapeutic benefits. The words "Vera" and "Aloe" are Latin words meaning "true" and "Alloeh," referring to "shining bitter substance" in Arabic (Rahman et al., 2017). In the cosmetics business, aloe vera has long been used as a topical treatment for burns and abrasions as well as an emollient and moisturiser. *Aloe barbadensis* is utilized as an anti-inflammatory and cosmetic in different traditional medicines (Gupta et al., 2010). The fleshy leaves of *Aloe barbadensis* are used to make gel and latex products with potential biological and toxicological properties. Aloe vera has been identified as a glucose-lowering agent in diabetes therapy, with research demonstrating that it can reduce fasting blood glucose levels in diabetic rats while improving glucose tolerance.

Studies have shown gel can reduce total lipids, cholesterol, and triglycerides, and improve blood glucose levels (Boudreau et al., 2006). DSHEA, passed in 1994, is likely what has contributed to a surge in aloe vera's popularity over the last 10 years. Aloe vera has been shown to have anti-tumor, anti-arthritis, anti-rheumatoid, anti-cancer, and anti-diabetic medicinal properties. Aloe vera is also recommended for immune system weaknesses. According to the study, aloe vera, nux vomica, and colchicum extracts had more potent effects than diclofenac sodium, with the highest levels of inhibition and protection. A phytochemical screening revealed that these extracts could be used as alternative treatments for arthritic and inflammatory conditions (Farooq et al., 2022).

Botanical Description

Aloe Vera; botanical name as *Aloe Barbadensis* Miller, family *Asphodelaceae*(*Liliaceae*); known as Aloe Vera worldwide, mostly called as First Aid Plant or “Miracle Plant”. Aloe vera is a shrubby succulent that grows basal rosettes and dense leaves. It matures at 4 years old and has a lifespan of 12 years. The plant has 12-16 leaves. The leaves are bright green with irregular whitish spots, becoming spotless grey-green as they mature (Eshun et al., 2004).

AV is a short-stemmed plant with 12–20 fleshy, tapered, and spiny leaves. It reproduces via mobile pollinators and yields yellow to red tubular blooms in the spring. AV produces dark brown, winged seeds and short subterranean roots. It has an average lifespan of up to 25 years and may grow up to 160 cm. Its morphological and physiological characteristics can be influenced by variables such as nitrogen fertilisation, irrigation levels, and vermi compost composition.

Occurrence

Aloe Barbadensis is widely distributed in Asia, Europe, and the southern part of North America, with over 140 species, most of which are found in South Africa (Klopper et al., 2007). Aloe vera, indigenous to Egypt and Greece, has been utilised for the treatment of burns, wounds, and inflammatory scars for ages. Due to the high osmotic pressure of its gelatin extract, aloe is especially good for X-ray-damaged skin. The 'Antrokinon' compounds found in aloe vera have antiviral, antibacterial, and anti-cancer actions. The plant can thrive on salty soils and beaches and needs very little water. Mexico, India, Africa, Australia, the Caribbean, South and Central America, and Iran are among the places where it grows (SharrafMoghaddasi et al., 2011).

Chemical Constituents

Aloe vera contains up to 75 nutrients, including 200 active compounds such as lignin, anthraquinones, sugar, minerals, saponins, enzymes, vitamins, amino acids, and salicylic acid (Saleem, 2021). The primary secondary metabolites of *A. barbadensis* are phenolic compounds, such as pyrones, anthraquinones, and chromones (Dun et al., 2004). Three new chromones and eighteen recognised compounds were discovered in the 70% methanol extract of dried *A. barbadensis* powder. Based on inhibitory activity against PDE4D, *A. barbadensis* may have anti-inflammatory properties

(Zhong et al., 2013).

Medicinal Uses

Aloe vera, a medicinal herb that contains numerous pharmacologically active components, can help manage conditions such as diabetes, radiation burns, ulcers, gout, and ulcerative colitis. A mucilaginous gel derived from leaf parenchyma has also been used to treat a range of pathological conditions, including burns, peptic ulcers, gout, acne, and dermatitis. It helps mobilize the knee and other joints that have become stuck or lost lubrication due to gout inflammation. It also lessens inflammation in gouty arthritis. In actuality, this serves as the lubricant in gout. Additionally, Aloe barbadensis is used for wound healing. In a synovial model, aloe vera gel extract induced fibroblast proliferation. It also promoted fibroblast activity and collagen multiplication (Gothard, 2016).

Numerous clinical studies using animal models have been conducted with the entire gel extract. Proteins associated with cell migration, matrix formation, matrix breakdown, and growth factors have all been studied in relation to wound healing (Choi et al., 2003). According to research, aloe emodin induces apoptosis in bladder cancer cells, causes cell cycle arrest in leukaemia cells, and elevates cytosolic cytochrome C levels in lung cancer cells. In addition, it suppresses keratinocyte progression. However, the majority of the works are widely recognized and readily accessible in several locations (Avila et al., 1997).

Conclusion

Medicinal plants play a significant role in reducing pain, inflammation, and uric acid levels in gouty arthritis. Suranjan Shirin, Zanjabeel, Post HalelaZard, and Elwa provide adequate natural support. Their combined therapeutic actions offer a safe, holistic option for improving joint health and managing gout-related symptoms.

References

- Akhtar, P., Frynas, J. G., Mellahi, K., & Ullah, S. (2019). Big data-savvy teams' skills, big data-driven actions and business performance. *British Journal of Management*, 30(2), 252-271.
- Akram, N. A., Ashraf, M., & Al-Qurainy, F. (2012). Aminolevulinic acid-induced changes in some key physiological attributes and activities of antioxidant

- enzymes in sunflower (*Helianthus annuus* L.) plants under saline regimes. *Scientia Horticulturae*, 142, 143-148.
- Ali, I. (2012). New generation adsorbents for water treatment. *Chemical reviews*, 112(10), 5073-5091.
- Ansari, N. Y., Farrukh, M., & Raza, A. (2021). Green human resource management and employees pro-environmental behaviours: Examining the underlying mechanism. *Corporate Social Responsibility and Environmental Management*, 28(1), 229-238.
- Ashwini, K., Gaurav, K., Karthik, L., & Bhaskara Rao, K. V. (2011). Optimization, production and partial purification of extracellular α -amylase from *Bacillus* sp. marini. *Arch Appl Sci Res*, 3(1), 33-42.
- Avila, C. (2001). Distinguishing BIS-mediated and BAS-mediated disinhibition mechanisms: a comparison of disinhibition models of Gray (1981, 1987) and of Patterson and Newman (1993). *Journal of personality and social psychology*, 80(2), 311.
- Basha, G., Kishore, P., Ratnam, M. V., Jayaraman, A., Agha Kouchak, A., Ouarda, T. B., & Velicogna, I. (2017). Historical and projected surface temperature over India during the 20th and 21st century. *Scientific reports*, 7(1), 2987.
- Boboev, A. Y., Soliev, I. M., Yunusaliyev, N. Y., & Xotamov, M. M. (2025). Effect of Temperature on the Current-Voltage Characteristics of n GaAs p-(ZnSe) $1-x-y$ (Ge₂) x (GaAs_{1- δ Bi δ) y Heterostructures. *East European Journal of Physics*, (3), 408-412.}
- Boudreau, M. A. (2013). Diseases in intercropping systems. *Annual review of phytopathology*, 51(1), 499-519.
- Calderon, R., Lodha, K., Shafieloo, A., Linder, E., Sohn, W., de Mattia, A., ... & Zou, H. (2024). DESI 2024: reconstructing dark energy using crossing statistics with DESI DR1 BAO data. *Journal of Cosmology and Astroparticle Physics*, 2024(10), 048.
- Choi, I., Dalal, R., Kim-Prieto, C., & Park, H. (2003). Culture and judgement of causal relevance. *Journal of personality and social psychology*, 84(1), 46.
- Chang, G. C., Chiu, C. H., Yu, C. J., Chang, Y. C., Chang, Y. H., Hsu, K. H., ... &

- Yang, S. C. (2024). Low-dose CT screening among never-smokers with or without a family history of lung cancer in Taiwan: a prospective cohort study. *The lancet respiratory medicine*, 12(2), 141-152.
- Dalbeth, N., Aati, O., Gamble, G. D., Horne, A., House, M. E., Roger, M., ... & Reid, I. R. (2014). Zoledronate for prevention of bone erosion in tophaceous gout: a randomised, double-blind, placebo-controlled trial. *Annals of the rheumatic diseases*, 73(6), 1044-1051.
- Duker-Eshun, G., Jaroszewski, J. W., Asomaning, W. A., Oppong-Boachie, F., & Brøgger Christensen, S. (2004). Antiplasmodial constituents of *Cajanuscajan*. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives*, 18(2), 128-130.
- Farooq, S., Ozturk, I., Majeed, M. T., & Akram, R. (2022). Globalization and CO2 emissions in the presence of EKC: a global panel data analysis. *Gondwana Research*, 106, 367-378.
- Hayat, J., Akodad, M., Moumen, A., Baghour, M., Skalli, A., Ezrari, S., & Belmalha, S. (2020). Phytochemical screening, polyphenols, flavonoids and tannin content, antioxidant activities and FTIR characterization of *Marrubiumvulgare* L. from 2 different localities of Northeast of Morocco. *Heliyon*, 6(11).
- Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., ... & Cao, B. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The lancet*, 395(10223), 497-506.
- JALALI, S. M. R., & Doroudi, Z. (2020). Removal of reactive black 5 from waste waters by adsorption: a comprehensive review.
- Kabiruddin Ahmad, N., Ezhil, R., Anjum, N., & Khan, A. A. (2011). Evaluation of Analgesic Effect of Unani Pharmacopoeial Formulation Habb-E-Suranjan and Raughan-E-Suranjan in WajaulMafasil (Joints Pain) Patients: An Open Prospective Clinical Trial.
- Khan, D. A., Banerji, A., Blumenthal, K. G., Phillips, E. J., Solensky, R., White, A. A., ... & Contributors, W. (2022). Drug allergy: a 2022 practice parameter update. *Journal of Allergy and Clinical Immunology*, 150(6), 1333-1393.

- Kerje, S., Sharma, P., Gunnarsson, U., Kim, H., Bagchi, S., Fredriksson, R., ... & Andersson, L. (2004). The Dominant white, Dun and Smoky color variants in chicken are associated with insertion/deletion polymorphisms in the PMEL17 gene. *Genetics*, 168(3), 1507-1518.
- Kesharwani, A., Polachira, S. K., Nair, R., Agarwal, A., Mishra, N. N., & Gupta, S. K. (2017). Anti-HSV-2 activity of Terminalia chebula Retz extract and its constituents, chebulagic and chebulinic acids. *BMC complementary and alternative medicine*, 17(1), 110.
- Klopper, Rembrandt,* Lubbe, Sam** & Rugbeer, H. (2007). The matrix method of literature review. *Alternation*, 14(1), 262-276.
- Konda Gokuldoss, P., Kolla, S., & Eckert, J. (2017). Additive manufacturing processes: Selective laser melting, electron beam melting and binder jetting—Selection guidelines. *materials*, 10(6), 672.
- Li, P. K. T., Szeto, C. C., Piraino, B., Bernardini, J., Figueiredo, A. E., Gupta, A., ... & Struijk, D. G. (2010). Peritoneal dialysis-related infections recommendations: 2010 update. *Peritoneal dialysis international*, 30(4), 393-423.
- Li, Z., Hodgkinson, T., Gothard, E. J., Boroumand, S., Lamb, R., Cummins, I., ... & Ambler, C. A. (2016). Epidermal Notch1 recruits ROR γ ⁺ group 3 innate lymphoid cells to orchestrate normal skin repair. *Nature communications*, 7(1), 11394.
- Lee, K., & Malerba, F. (2017). Catch-up cycles and changes in industrial leadership: Windows of opportunity and responses of firms and countries in the evolution of sectoral systems. *Research Policy*, 46(2), 338-351.
- Mahboubi, M. (2019). Zingiberofficinale Rosc. essential oil, a review on its composition and bioactivity. *Clinical Phytoscience*, 5(1), 1-12.
- Martinon, F., Pétrilli, V., Mayor, A., Tardivel, A., & Tschopp, J. (2006). Gout-associated uric acid crystals activate the NALP3 inflammasome. *Nature*, 440(7081), 237-241.
- Mao, Q. Q., Xu, X. Y., Cao, S. Y., Gan, R. Y., Corke, H., Beta, T., & Li, H. B. (2019). Bioactive compounds and bioactivities of ginger (Zingiberofficinale Roscoe). *Foods*, 8(6), 185.

- Mahmood, H., & Furqan, M. (2025). Renewable energy transition, urbanization, and environment nexus in the Middle East and North Africa: Cross-sectional dependence analyses. *Environmental Economics*, 16(1), 89.
- Mandal, S., Van Treuren, W., White, R. A., Eggesbø, M., Knight, R., & Peddada, S. D. (2015). Analysis of composition of microbiomes: a novel method for studying microbial composition. *Microbial ecology in health and disease*, 26(1), 27663.
- McCormick, M. P., MacDowell, C., Weiland, C., Hsueh, J., Maier, M., Pralica, M., ... & Sachs, J. (2024). Instructional alignment is associated with PreK persistence: Evidence from the Boston Public Schools. *Early Childhood Research Quarterly*, 67, 89-100.
- Mutthuraj, D., Vinutha, T., Gopenath, T. S., Kaginelli, S. B., Karthikeyan, M., Ashok, G., ... & Basalingappa, K. M. (2020). Inhibition of Pro-Inflammatory Molecules by Ginger (*Zingiber officinale* Roscoe) and its Anti-Inflammatory Effects on Arthritis Patients. *Journal of Drug Delivery & Therapeutics*, 10.
- Nair, R., Varghese, S. H., Nair, B. G., Maekawa, T., Yoshida, Y., & Kumar, D. S. (2010). Nanoparticulate material delivery to plants. *Plant science*, 179(3), 154-163.
- Neogi, T., Jansen, T. L. T. A., Dalbeth, N., Fransen, J., Schumacher, H. R., Berendsen, D., ... & Taylor, W. J. (2015). 2015 gout classification criteria: an American College of Rheumatology/European League Against Rheumatism collaborative initiative. *Arthritis & rheumatology*, 67(10), 2557-2568.
- Nicotero, J. A., Scheib, E. T., Martinez, R., Rodnan, G. P., & Shapiro, A. P. (1970). Prevention of hyperuricemia by allopurinol in hypertensive patients treated with chlorothiazide. *New England Journal of Medicine*, 282(3), 133-135.
- Ok, E. A., Ortoleva, P., & Riella, G. (2012). Incomplete preferences under uncertainty: Indecisiveness in beliefs versus tastes. *Econometrica*, 80(4), 1791-1808.
- Pagidipati, N. J., Hellkamp, A., Thomas, L., Gulati, M., Peterson, E. D., & Wang, T. Y. (2017). Use of prescription smoking cessation medications after myocardial infarction among older patients in community practice. *JAMA cardiology*, 2(9), 1040-1042.
- Parveen, B., Parveen, A., Parveen, R., Ahmad, S., Ahmad, M., & Iqbal, M. (2020).

- Challenges and opportunities for traditional herbal medicine today, with special reference to its status in India. *Ann Phytomed*, 9(2), 97-112.
- Parthasarathy, A., Cross, P. J., Dobson, R. C., Adams, L. E., Savka, M. A., & Hudson, A. O. (2018). A three-ring circus: metabolism of the three proteogenic aromatic amino acids and their role in the health of plants and animals. *Frontiers in molecular biosciences*, 5, 29.
- Robinson, E., Sutin, A. R., Daly, M., & Jones, A. (2022). A systematic review and meta-analysis of longitudinal cohort studies comparing mental health before versus during the COVID-19 pandemic in 2020. *Journal of affective disorders*, 296, 567-576.
- Santo, D. E., & Hunter, J. (Eds.). (2021). *Mattering the Invisible: Technologies, Bodies, and the Realm of the Spectral*. Berghahn Books.
- Sang, S., Lee, J. D., & Lee, J. (2010). E-government adoption in Cambodia: a partial least squares approach. *Transforming Government: People, Process and Policy*, 4(2), 138-157.
- Saleem, F., Malik, M. I., & Qureshi, S. S. (2021). Work stress hampering employee performance during COVID-19: is safety culture needed?. *Frontiers in psychology*, 12, 655839.
- Sathiyamoorthi, P., & Kim, H. S. (2022). High-entropy alloys with heterogeneous microstructure: processing and mechanical properties. *Progress in Materials Science*, 123, 100709.
- Scott, D. J., Phillips, N. A., Sapsford, J. S., Deacy, A. C., Fuchter, M. J., & Ashley, A. E. (2016). Versatile catalytic hydrogenation using a simple tin (IV) Lewis acid. *Angewandte Chemie International Edition*, 55(47), 14738-14742.
- SharifMoghaddasi, M., & Res, M. (2011). Aloe vera their chemicals composition and applications: A review. *Int J Biol Med Res*, 2(1), 466-71.
- Suhail, M., Rosenholm, J. M., Minhas, M. U., Badshah, S. F., Naeem, A., Khan, K. U., & Fahad, M. (2019). Nanogels as drug-delivery systems: A comprehensive overview. *Therapeutic delivery*, 10(11), 697-717.
- Syawaluddin, A., AfrianiRachman, S., & Khaerunnisa. (2020). Developing snake ladder game learning media to increase students' interest and learning outcomes

- on social studies in elementary school. *Simulation & Gaming*, 51(4), 432-442.
- Towiwat, P., Chhana, A., & Dalbeth, N. (2019). The anatomical pathology of gout: a systematic literature review. *BMC musculoskeletal disorders*, 20(1), 140.
- Wadkar, H. S., & Pinjari, R. M. (2023). The morphology, extractions, chemical constituents and uses of *Terminalia chebula*: A review. *International Journal of Forest, Animal and Fisheries Research*, 6(29), 4772-5.
- Wang, C., Wang, Z., Wang, G., Lau, J. Y. N., Zhang, K., & Li, W. (2021). COVID-19 in early 2021: current status and looking forward. *Signal transduction and targeted therapy*, 6(1), 114.
- Weaver, N. A., Kuijf, H. J., Aben, H. P., Abrigo, J., Bae, H. J., Barbay, M., ... & Biessels, G. J. (2021). Strategic infarct locations for post-stroke cognitive impairment: a pooled analysis of individual patient data from 12 acute ischaemic stroke cohorts. *The Lancet Neurology*, 20(6), 448-459.
- Yang, Y., Lu, Q. B., Liu, M. J., Wang, Y. X., Zhang, A. R., Jalali, N., ... & Fang, L. Q. (2020). Epidemiological and clinical features of the 2019 novel coronavirus outbreak in China. *medrxiv*, 2020-02.
- Zhong, S., Fei, Z., Chen, Y. R., Zheng, Y., Huang, M., Vrebalov, J., ... & Giovannoni, J. J. (2013). Single-base resolution methylomes of tomato fruit development reveal epigenome modifications associated with ripening. *Nature biotechnology*, 31(2), 154-159.