



Cultivation and Utilization of *Glycyrrhiza glabra* (Licorice) in India: Propagation to Post-Harvest Management

(*Aruna Mehta¹, Neena Kumari¹, Kumari Bandana², Himani Sharma² and Kiran Thakur¹)

¹COHF Thunag, Dr.YSPUHF Nauni, Solan, Himachal Pradesh

²COHF Neri, Dr.YSPUHF Nauni, Solan, Himachal Pradesh

*Corresponding Author's email: arunauh2521@gmail.com

Glycyrrhiza glabra, commonly known as Mulethi or Licorice, has been an integral part of human civilization for centuries, celebrated for its diverse applications in medicine, cuisine, and cultural traditions. The name Licorice is derived from the ancient Greek words "glykos" (sweet) and "rhiza" (root), reflecting its incredibly sweet root. Native to the Mediterranean and parts of Asia, this perennial herbaceous plant continues to captivate contemporary society. The roots and rhizomes of Licorice store glycyrrhizin, a compound that is 50 times sweeter than sugar. Historically, Licorice has been significant in various ancient civilizations. In Ancient Egypt, it was used in a popular beverage called "Mai sus" and was found in King Tutankhamun's tomb. The Greeks and Romans valued Licorice for its medicinal properties, particularly for treating coughs and lung diseases. Traditional Chinese Medicine (TCM) has revered Licorice for over 4,000 years, often using it to harmonize herbal formulas, enhancing their effectiveness and reducing toxicity. In the culinary world, Licorice is a popular flavoring agent in candies and confections, especially in European and Middle Eastern cultures. Its distinctive taste is also used in beverages, baked goods, and savory dishes. Beyond food, Licorice extracts sweeten and flavor tobacco products, enhancing the sensory experience for consumers. Culturally, Licorice symbolizes longevity and strength in some traditions due to its robust root system and enduring nature. It has been used in rituals and ceremonies, highlighting its deep-rooted significance in human history. Today, the demand for Licorice continues to grow, driven by its versatile applications and health benefits. Ongoing research into its pharmacological properties explores its potential in modern medicine, including its role in combating viral infections and as a therapeutic agent in cancer treatment. The enduring legacy of Licorice attests to its remarkable versatility and lasting appeal across various facets of human life.

The Versatile Applications of Licorice

Licorice root, widely utilized in Ayurvedic and Unani medicinal practices, serves as a valuable component in numerous pharmaceutical formulations. Its properties as a demulcent and expectorant make it integral to bronchial tablets and cough mixtures, effectively treating respiratory conditions like bronchitis, allergies, colds, tuberculosis, and sore throats. With its demulcent attributes, it soothes and coats irritated tissues, offering relief from symptoms such as heartburn, gastritis, and inflammatory disorders. Licorice root also finds application in addressing liver issues, skin diseases, epilepsy, paralysis, rheumatism, hemorrhagic diseases, and diarrhea. Its multifaceted pharmacological profile includes roles as a laxative, emmenagogue, contraceptive, galactagogue, anti-asthmatic agent, and antiviral agent. Furthermore, licorice root exhibits a spectrum of medicinal properties, including antiulcer, diuretic, sedative, antipyretic, antimicrobial, anti-inflammatory, and antioxidant activities,

along with significant antitumor effects and memory enhancement capabilities. Its application extends to dermatological concerns, where it demonstrates skin whitening, depigmenting, anti-aging, and antierythemic properties, as well as serving as an emollient and offering chemopreventive and cardioprotective benefits. Notably, licorice root aids in restoring liver function in hepatitis C patients, possesses antidepressant qualities, and provides hepatoprotective and photoprotective effects. In the food industry, licorice root's inherent sweetness, devoid of bitterness, makes it a preferred choice for flavoring, sweetening, and preserving various food products. Additionally, licorice extract enhances the taste and aroma of beer. The residual roots, post-extraction of glycyrrhizin, are repurposed in the production of fire foam liquid for fire extinguishers, showcasing the resourcefulness of licorice derivatives in diverse application.

Morphology

Glycyrrhiza glabra is a herbaceous perennial plant characterized by its distinct morphology. It typically grows to a height of about 1 meter and features pinnate leaves, each measuring approximately 7-15 cm in length. These leaves are composed of 9-17 leaflets, giving them a feathery appearance. The flowers are relatively small, measuring between 0.8-1.2 cm in length. They range in color from purple to pale whitish blue and are arranged in a loose inflorescence. Following pollination, the plant produces oblong pods that are 2-3 cm long. These pods contain several seeds, contributing to the plant's reproductive cycle. The plant thrives in subtropical climates, particularly in regions with rich soil. Below the surface, the plant develops an extensive root system, consisting of a main taproot and numerous runners. The main taproot, which serves as the primary storage organ for the plant's nutrients, is harvested for its medicinal properties. It is characterized by its soft, fibrous texture and bright yellow interior.



Plant



Roots

Chemical constituents

The roots of *Glycyrrhiza glabra* are rich in triterpenoids and flavonoids. The primary active component is glycyrrhizin, a triterpenoid that contributes to the sweet taste of licorice root. Glycyrrhizin is present in concentrations ranging from 2% to 14% and is absent in the aerial parts of the plant. It is a white powder, highly soluble in water, and approximately 50 times sweeter than cane sugar. The sweetness of glycyrrhizin can be detected in water at a dilution of one part per 20,000. Flavonoid-rich fractions in licorice root include liquiritin, isoliquirtin, liquiritigenin, and rhamnoliquiritin. These flavonoids impart a yellowish color to the roots.

Additionally, the roots contain various other compounds: glucose (3-8%), sucrose (2.4-6.5%), mannitol, starch (30%), asparagine (a bitter principle), and resin (20-40%). A volatile oil is also present in trace amounts (0.03% to 0.035%). Licorice roots are a complex mixture of bioactive compounds, with glycyrrhizin and flavonoids being the most notable for their sweet taste and color properties

Propagation

In regions of India where seeds are scarce, *Glycyrrhiza glabra* is propagated using cuttings. These cuttings, typically 10-15 cm in length and containing 2-3 buds, are taken from freshly dug rootstock. For optimal results, cuttings should ideally be 25 cm long, enhancing shoot and root vigor.

Land Preparation

Given the long duration of the crop, preparing the field to a fine tilth and ensuring it is well-leveled to avoid water stagnation is crucial. Incorporating Farm Yard Manure (FYM) at a rate of 10 t/ha during field preparation significantly enhances the growth and development of the underground roots.

Planting

The ideal planting period is in March and early April. Cuttings of 15-25 cm with 2-3 buds are planted directly in the field at a depth of 6-8 cm, spaced 90x4 cm apart. When the plants reach a height of 20-30 cm, rows are raised to 45-60 cm to facilitate irrigation and root development. The root system grows horizontally and remains at a depth of 30 cm in the soil. Approximately 300 kg of stem cuttings are required per hectare. Cuttings typically sprout within 15-20 days post-planting. To promote faster root growth, cuttings can be dipped in Seradix-B before planting. Light irrigation is recommended immediately after planting, with sprouting rates ranging from 60-70%. Gap filling from the nursery is advisable after 40 days to ensure a uniform crop stand. Nursery beds can be prepared by planting cuttings and keeping them in moss for 8-10 days. Once buds sprout, the plants are transplanted to the main field.

Manures, Fertilizers, and Pesticides

Organic manures such as FYM (10-15 t/ha), vermicompost, and green manure are beneficial for the crop. The recommended N:P:K ratio is 40:40:20 kg/ha, with nitrogen applied in split doses during planting, six months later, and one year after planting. Given the crop's three-year duration, the same dose should be reapplied annually.

Irrigation

Regular irrigation is essential until the cuttings establish roots. Thereafter, irrigation is required every 8-10 days for the first 5-6 months and subsequently as needed. The crop is relatively drought-resistant once established, requiring approximately 7-8 irrigations annually. Avoiding water-logging is crucial to prevent root rot caused by soil-borne diseases.

Weeding and Intercropping

Periodic weeding is necessary to control weed growth. During the first two years, intercropping with carrots, potatoes, or cabbage is practiced to optimize land use and maintain weed control.

Pest and Disease Management

Pests

- Termites can cause significant damage during dry periods. Application of Aldrex at 25-30 kg/ha during the last ploughing is effective.
- Leaf ash weevil can be controlled with Metasystox (1.5 ml/l).

Diseases

- Root Rot: Affected roots become pulpy and soft. Control measures include Brassicol at 5 kg/ha.
- Wilt: Controlled with Bavistin at 0.05%.
- Leaf Spot: Treated with Bavistin (4 g/10 l of water).

Harvest Management

High yields are typically achieved from the third or fourth year of planting. Manual digging or using a disc harrow for root harvesting is effective. The crop is best harvested in winter (November or December) for roots with high glycyrrhizic acid content. Broken root parts left in the soil can be used for subsequent crops, with gap filling as necessary.

Post-Harvest Management

Post-harvest, roots are cleaned and cut into pieces 10-20 cm long and 1-2 cm in diameter. Initial drying is done in the sun for 2-3 days, followed by shade drying for 10-12 days until the moisture content is reduced to 10%. Dried roots are stored in polythene-lined bags, graded by thickness, and stored.

Conclusion

Licorice root, with its diverse medicinal properties, plays a vital role in traditional and modern medicine alike. From respiratory and gastrointestinal ailments to skincare and even fire extinguishing, its versatility knows no bounds. Understanding its cultivation process, from propagation to post-harvest management, highlights the meticulous care needed to yield potent roots. In essence, licorice root embodies the harmony between nature's gifts and human ingenuity, fostering holistic healing and sustainable practices.