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Review of the Plant: Solanum Melongena

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ABSTRACT: Solanum melongena (egg plant) is the herbaceous vegetable crop belonging to Solanaceae family primarily grown worldwide for food and is one of the best dietary sources of biologically active polyphenolic compounds, vitamins, antioxidants and medicinal needs. The plant is perennial but is often cultivated as an annual. Its morphology includes broad leaves, spiny stems, and purple or white flowers, with fruits that vary in size, shape, and color. Eggplants thrive in well-drained, loamy soils with ample sunlight and moderate water supply. Their growth is temperature-sensitive, making them susceptible to frost and extreme heat. It has coarsely lobed leaves, white to purple flowers and berries as its fruit. Breeders are becoming more concerned with the nutritional and health benefits of crops, and metabolic profiling are valuable tools for evaluating the chemical makeup of plants. Solanum melongena is significant in agriculture due to its versatility, ease of growth and resilience. Solanum melongena is rich in fiber, vitamins and minerals, egg plant also contains antioxidants like nasunin, which is beneficial for health. They are low in calories, making them valuable in a balanced diet. Research often focuses on pest resistance, genetic diversity, and adaptation to various growing conditions. Breeding programs aim to improve yield, quality and resistance to common diseases. Analgesic, antipyretic, anti-inflammatory, antiasthmatic, hypolipidemic, hypotensive, antiplatelet and anaphylactic reaction inhibitory properties are stated for the plant.

KEYWORDS: Herbal medicine, Anti-pyretic activity, Analgesic activity, Hyperlipidemic activity, Anti-asthmatic activity.

I. INTRODUCTION

Herbal medicine is becoming more and more popular worldwide in both developing and developed countries because of its lower side effects. Medicinal herbs are the source of many traditional treatments. Solanum melongena also referred to as brinjal, aubergine, or guinea squash, is a crop of economic significance in tropical and subtropical areas. The genus name, Solanum, is from the Latin word solamen, which means "comforting or soothing." The species name, melongena, references the fruit's melon shape. Another source states that the species name, melongena, has origins from the Italian name "melanzane," which is derived from "mela insana" or "mad apple." The forms, sizes, and colors of the fruits produced by different eggplant varieties vary. Solanum melongena (egg plant), a member of the Solanaceae family, has been traditionally used for its medicinal properties. Improved eggplant cultivators are required for climate change adaptation and sustained output. Compared to other vegetable crops, egg plant is more susceptible to a wide variety of plant diseases, pests, nematodes and weeds due to its comparatively long growing phase. Nutritionally, eggplants are low in calories but high in fiber, vitamins, and antioxidants, particularly anthocyanins, which contribute to their purple hue and provide health benefits. These antioxidants help reduce oxidative stress and inflammation, which may protect against chronic diseases like heart disease and cancer.

II. PLANT PROFILE

- **Synonym of the plant:** aubergine, guinea squash or brinjal
- **Local names of the plant:**
 - Sanskrit: vartaku
 - English: Brinjal
 - Assamese: Bengena
 - Marathi: Vangi
 - Bengali: Begun

Malayalam: Kathrikka

Kannada: Badane

Telugu: Vankaya

Tamil: Kathirikka

- **Botanical sources:** The botanical source of Solanum melongena, is the Solanaceae family, which includes over 2000 species and 75 genera which is known for its spiny plants.

- **Taxonomical classification:**

Kingdom: Plantae

Subkingdom: Viridaplantae

Infrakingdom: Streptophyta

Division: Trachephyta

Subdivision: Spermatophytina

Infradivision: Angiospermae

Class: Magnoliopsida

Subclass: Asteridae

Family: Solanaceae

Species: Solanum melongena

- **Geographical source:**

Egg plant is majorly being grown in India, China, Egypt, Iran and Turkey etc. Brinjal or egg plant (Solanum melongena) is an important solanaceous crop of sub-tropics and tropics. In India, it is one of the most common, popular and principal vegetable crops grown through out the country except in higher altitudes.

- **Habitat and Ecology:**

Eggplant prefers well- drained soil, moderate humidity, and full sun to partial shade. It's commonly found in forests, grasslands, and disturbed areas. As for its ecological adaptations, egg plant has developed drought tolerance through its deep root system and heat tolerance through its pubescent leaves and stems. Eggplant propagates vegetatively through stem cuttings

As a food source, eggplant attracts pollinators like bees and butterflies, as well as herbivores additionally eggplant contributes to soil health through nitrogen-fixing bacteria in its root nodules.

III. CULTIVATION

- **Cultivation of the plant:**

In tropical and subtropical climates Egg plant can be shown in the garden. Egg plant grown in temperature climates fares better when transplanted into the garden after all danger of frost has passed. Egg plant prefers hot weather, and when grown in cold climates or in areas with low humidity. Seeds are typically started 8 to 10 weeks prior to the anticipated frost-free date. Mulching helps conserve moisture and prevents weeds and fungal diseases. Hand pollination by shaking the flowers improves the set of first blossoms. Flowers are complete, containing both female and male structures, and may be self -or cross-pollinated.

→Cultivation of eggplant requires specific conditions to thrive, these are some following considerations

1. Climate and soil: Eggplants grow best in full sun with fertile soil and well-drained and a PH between 5.5 and 6.8.
2. Temperature: It is sensitive to cold temperatures and grows fastest in temperatures between 70°F and 85°F.
3. Propagation: Eggplant is typically propagated through seeds, which germinate in 8 to 12 days.
4. Growth Habit: The plant grows 2-4 feet tall and is multi-branched.
5. Fruit Harvest: Fruits are ready to harvest in about 105-133 days.

IV. DESCRIPTION

The Solanum melongena is called as an egg plant because some of its white varieties resemble chicken eggs in shape. The eggplant grown in soils that are moist, well-drained, fertile, sandy or loamy and have a pH of 5.5 to 6.8. It is propagated through seeds, and germination takes 8-12 days. The fruits can be harvested in approximately 105-133 days. The plants blossoms attract bumblebees. The leaves and stems are covered in star-shaped hairs and occasionally prickles. The flowers are solitary, star-shaped, and typically violet in colour. The fruit is a huge fleshy, smooth berry. The fruit colour varies according on the cultivator, ranging from white, green, purple and black. The fruit contains many pale brown kidney-shaped seeds.



V. MORPHOLOGY

The plant is herbaceous annual with erect or semi-spreading habits. It develops into bushy plant with large leaves that grow to a height of 60-120 cm

Leaves: The leaf pattern is opposite, large, single lobed and underside most cultivars, is cover with dense wool-like hair. The leaves may be with or without spines at the middle portion.

Flower: The flower is complete, actinomorphic and hermaphrodite. Calyx- five lobed; Corolla- five lobed; gamopetalous with margins of lobes incurved. The Basic flower type is 5-merous (5 sepals 5 petals 5 stamens) 6,7 and 8 merous flowers are commonly found in globose and round fruited types. *Solanum melongena* is generally considered to be an autogamous species; however, in open fields and warm conditions, flowers are visited by insects.



Fruit: The fruit is fleshy berry borne singly or in clusters. The shape of the fruit varies from ovoid, oblong, obovoid or cylindrical. The colour of the fruit is purple, purple black, yellowish, white, green variegated type of purple with white stripes, green with light green/white stripes or even combination of three colours. Anthocyanins, hairness on vegetative

parts vary quantitatively. The fruits are berries of highly variable shape and size. The absence or presence as well as the distribution pattern of two kinds of pigments, chlorophylls and anthocyanins, control a wide diversity of fruit colors. **Stem:** The plant is woody and develops several branches according to a roughly dichotomic ramification pattern.

VI. MICROSCOPIC CHARACTERISATION OF SOLANUM MELONGENA

| Characters | Solanum melongena |
|----------------|--|
| Epidermis | Single layered with cuticle |
| Hypodermis | Absent |
| Cortex | Collenchymatous followed by parenchymatous, with microsphenoidal crystals of calcium oxalate |
| Endodermis | Absent |
| Pericycle | Discontinuous |
| Medullary rays | Uni to biseriate |
| Pith | Parenchymatous with microsphenoidal crystals |

VII. CHEMICAL CONSTITUENTS

Anthocyanins, an important group of naturally occurring pigments of red and purple colored fruits, are the main phenolic compounds in egg plant peel. Chemical detection showed the presence of alkaloids, flavonoids, tannins, steroids and glycosides.

tryptophan, etc. Leaves contain chlorogenic, hydro caffeic and protocatechuic acids melongena. Twenty-one varieties of Egg plant, on the average the long-type varieties were rich in dry matter, crude protein, phenolics and glycoalkaloid contents, while the oblong type were rich in total water- soluble sugars.

VIII. CHEMICAL TEST

→**Chemical tests for Alkaloids:**

- Mayer’s test
- Dragendorff’s test

→**Chemical test for Saponins:**

- Foam test

→**Chemical test for Glycosides:**

- Bontrager’s test

→**Chemical test for Flavonoids:**

- Shinoda test

→**Chemical test for Phenolic compounds:**

- Ferric chloride test



IX. THERAPEUTIC USES

The *Solanum melongena* is traditionally used for the treatment of various diseases, including rheumatism, beriberi, itching, toothache, bleeding, asthma, bronchitis, cholera, neuralgia, and haemorrhoids.

- It is used to treat various inflammatory conditions.
- It is as an anti-oxidant agent.
- It is used to elevate lower body temperature (anti-pyretic).
- It is used to maintain blood glucose levels in the body (anti-diabetic).
- The plant has been used to treat Cardiac debility.
- The plant extracts exhibit hypolipidemic activity
- It is also used as an antibacterial agent.
- It is used as Anti- asthmatic agents.

Pharmacological activities of *Solanum melongena*

1. Anti-pyretic activity:

The antipyretic properties of *Solanum melongena* leaves given yeast induced pyrexia, it was discovered to have a dose-dependent, considerable anti-pyretic effect.

Mutalik et al., 2003 evaluated the anti-pyretic effect of leaves of *Solanum melongena* at doses of 100mg, 250 mg and 500mg/kg body weight. It was found to produce significant antipyretic effect in a dose-dependent manner in yeast induced pyrexia in albino rats.

2. Analgesic activity:

Alkaloids are for the Analgesic activity. The impact of crude alkaloidal fraction extracted from *Solanum melongena* leaves on the central nervous system was investigated by Vohora et al. It is demonstrated a notable analgesic effect. In 2003, Mutalik and colleagues assessed the analgesic properties of *S. melongena* leaves in albino mice. Oral dosage of 1g/kg body weight, SMWE effectively reduced the immunological anaphylactic reaction caused by sensitizing the skin with anti-dinitrophenol IgE.

3. Hyperlipidemic activity:

Hyper lipidemic activity is characterised by usually high blood levels of lipids; such as fat; cholesterol and trans fats. It is well recognised as the primary risk factor for cardiovascular disease and is one of the major global causes of death. Rich in dietary fibre, egg plant has the potential positively alter a number of lipid profiles, including total cholesterol (TC), apolipoprotein (Apo)A and B, low density lipoprotein cholesterol (LDL-C), very low-density lipoprotein cholesterol (VLDL-C) and total triglycerides. In a clinical trial, 19 healthy participants with a mean age 26 years had their lipid profile monitored for three weeks.

4. Anti-inflammatory activity:

Inflammation is normal, protective response to tissue injury caused by physical trauma, noxious chemicals or microbiologic agent. Inflammation is the body's effort to inactivate or destroy the invading organism, remove irritants and set the range for tissue repair. When healing is complete, the inflammatory process usually subsides. Over inflammation leads to tissue damage. Proinflammatory cytokines like TNF- α , IL-6 are produced in large quantities during inflammation by macrophages and monocytes that stimulate the response.

As a natural defence mechanism against tissue damage brought on by harmful substances, microbiological organisms or physical trauma, inflammation occurs. Usually the inflammatory process ends when healing is finished. Adequate or prolonged inflammation results in tissue damage.

5. Anti-Asthmatic Activity:

Fresh leaves *Solanum melongena* L, were extracted with methanol, and their potential mechanisms of actions as well as their ability to modify the tone of isolated, precontracted guinea pig tracheal chains were assessed. The extracts from *Solanum melongena*, most likely via, muscarinic receptor, had a Broncho spasmogenic rather than a Broncho spasmolytic action.

A randomised, double-blind, placebo-controlled clinical trial using *Solanum melongena* fruit at a dose of 89 ± 0.6 g of fruit/day in patients with moderate to severe asthma was conducted by Bello et al. in 2004. The fruit of

Solanum melongena was proven to dramatically reduce asthma symptoms and signs as well as the illness severity score following two weeks of regular consumption. There was a salbutamol sparing effect discovered.

6. Anti-hypertensive activity:

High blood pressure is a common chronic condition characterised by high force of blood against artery walls and vascular dysfunction, which indirectly increase the risk of cardio vascular disease and type 2 diabetes. The RAS plays a crucial role in physiological conditions, the kidneys produce renin into the bloodstream and convert angiotensinogen I. Then, angiotensin 1 is transformed into angiotensin 2 by ACE, which binds to the endothelium. Angiotensin II is a vasoconstrictor that regulates blood pressure. Additionally, ACE can metabolize bradykinin and control blood pressure. As a result, ACE inhibitors can affectively manage excessive blood pressure by blocking RAS.

Eggplant decreased the high BP probably via decreasing the cardiac output and myocardial contractility. Also, egg plant has exerted an antihypertensive effect via ACE inhibitory activity. Therefore, eggplant has been suggested as useful food for the management of hypertension and its complications in daily life.

7. Anti-Diabetic activity:

Solanum melongena found that the root extracts of Solanum melongena contained steroids, alkaloids, tannins, flavonoids, and saponins, glycosides. Antimicrobial, cytotoxic, and antidiabetic properties are widely present in the roots, leaves, stem, and flowers. Alkaloids, flavonoids, cardiac glycosides, tannins, saponins, volatile oil, and terpenoids were found in the plant's root extract after a preliminary phytochemical screening. These phytoconstituents may be the cause of the observed anti-diabetic effect. It can be inferred from the experimental findings that the root extract of Solanum melongena exhibited notable, dose-dependent anti-diabetic properties. There have been several studies reporting that eggplant has antidiabetic properties because of its anti-oxidant effects and lowering the absorption of glucose in the digestive organs via inhibiting α -glucosidase and α -amylase activity.

8. Anti-Microbial activity:

The benefits of the purple variety are widely recognized since the peel is full of anthocyanins, such as delphinidin and nasunin, which are antimicrobials, as well as chlorogenic acids. In varying amounts, these compounds can also be found in the fruit's pulp. All of these, however, are recommended to prevent mild gastrointestinal tract infections. Additionally, it has been claimed that these egg plants contain organic acids such as oxalate, which can be a serious worry for those with renal and gall bladder diseases when combined with soluble calcium in bodily fluids. Solanine is another extremely powerful glycoalkaloid that is present in fruits and vegetables that are members of the Solanaceae family. This also has antibacterial properties against a variety of bacteria and fungi.

9. Anti-Oxidant activity:

Basic plant functions do not require secondary metabolites. However, both conventional and contemporary medicine depend on these bioactive substances, which are a valuable source of medications and treatments due to their antioxidant qualities. Antioxidant content in food can be significantly impacted by cooking and storage temperatures. During the first three days of storage at 0°C, the antioxidant content of egg plant fruit increased before declining. On the other hand, a steady and slow buildup was noted at 10°C

When compared to raw egg plant, heat treatment, such as frying, increases the plant's total phenolic content and antioxidant capability. When egg plants were responsibly grilled below 65°C, their antioxidant activity dropped; but, when they were grilled at higher degrees, up to 95°C, their antioxidant activity rose. But not every cooking technique boosts the egg plant's antioxidant capacity. Edible oils are treated with synthetic antioxidants, including butylated hydroxy anisol, to increase their oxidative stability, but these substances can be harmful and cause cancer. However, heating can help shield the oil from lipid oxidation by releasing natural antioxidants. Therefore, in order to improve the usability of frying oil, egg plants have been studied as a natural antioxidant source.

10. Anti-Amnesic Activity :

The brain's intricate process of memory involves gathering information from the environment. Through a variety of neurotransmitters, the central cholinergic system plays a significant role in the processes of learning and memory.

The egg plant, Solanum melongena, contains neuroprotective and antioxidant compounds that are used to cure amnesia. A number of phytoconstituents found in Solanum melongena, primarily flavonoids and polyphenols, may be in charge of preventing amnesia. Scopolamine, which causes amnesia, is beneficially affected by Solanum melongena.

X. CONCLUSION

Solanum melongena's versatility, from culinary delight to medicinal treasure, underscores the importance of preserving and exploring traditional knowledge. Overall, Solanum melongena stands out not only as a dietary staple but also as a promising natural resource for preventive healthcare. With growing scientific evidence supporting its medicinal uses, eggplant offers a valuable contribution to modern health practices, merging the benefits of nutrition and natural medicine. Historically, eggplant has been valued in traditional medicine systems, including Ayurveda and Chinese medicine, for treating ailments such as asthma, arthritis, and digestive issues. Its potential neuroprotective and detoxifying effects further emphasize its role in promoting holistic well-being. Solanum melongena, a plant species with a rich history of traditional use, has demonstrated significant pharmacological potential. Its spasmogenic activity, antioxidant properties, and antimicrobial properties.

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