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A REVIEW ON VARIOUS PARTS OF HERBARIUM SYZYGIUM AQUEUM

[1]Rajshree R. Darade, [2]Mrs. Nishigandha N. Dhokale, [3]Nisha Purkar, [4]Pranita Kankariya, [5]Pankaj Gunjal

[1] Student, [2]Assistant Professor, [3]Student, [4]Student, [5]Student

[1]Depatment of Pharmaceutics,

[1]Matoshri College of Pharmacy, Eklahare, Nashik, India.

ABSTRACT

In recent decades, the area of herbal medicine has grown at an exponential rate. Herbal remedies have been used to treat and cure a variety of diseases and physiological states in traditional practices such as Ayurveda, Unani, and Siddha. Watery rose apple, scientifically known as *Syzygium aquem* (Burm Alston), thrives in tropical areas. We utilize monographs to research the current state and standards of herbal plants, such as synonyms, biological sources, families, chemical contents, medicinal uses, and pharmacological effects. *Syzygium aqueum*, sometimes known as "water apple," is a tropical, evergreen, low-growing little tree from the Myrtaceae family. *Syzygium aqueum*, which has a variety of fruit hues, is one of the plants used in traditional medicine. The current review attempts to emphasize the many ethanobotanical and traditional uses, as well as taxonomy, distribution, active ingredients, medicinal uses, health advantages, and other reports on *Syzygium aqueum.*

KEYWORDS: *Syzygium aqueum*, Water apple, Active constituents, Nutrients composition, Medicinal uses, etc.

1. INTRODUCTION

Medicinal plants are regarded as valuable sources of components that can be used in the manufacture of pharmacopoeial, nonpharmacopoeial, or synthetic medications. Aside from that, these plants play an important role in the evolution of human cultures around the world. Furthermore, several plants are considered vital sources of nutrition and are therefore suggested for their medicinal properties. The growing interest in the usage and significance of medicinal plants in various nations has resulted in increased efforts to document ethnomedicinal facts about medicinal plants.[1] S. Aqueum, often known as water apple, is one of the most useful medicinal plant species in the Myetaceae. In Ayurveda, plant extracts have been shown to have pharmacological properties such as antihyperglycemic action, antiinflammatory activity, antioxidant activity, and so on. The therapeutic effects of this genus are so potent that a broader range of research is required to determine the overall pharmacological role in diverse diseases. Syzygium aquem (Burm Alston) belongs to the Myrtaceae family (Morton 1987) [2] with common names Malabar plum, plum rose, water apple, rose apple in English, and "Gulaabijiamikaayalu" in Telugu. It is one of the underutilized fruits, with no acknowledged orcharding, use, or value addition. Watery rose apple reaches a height of 6-10 meters. The leaves are opposite, subsessile, oblong to lanceolate. Fruits are white, pink to crimson in hue, luscious, spongy, rose-scented, and contain 2-6 seeds (Radha and Mathew (2007) [3]; Wong, (1996) [4]. The fruit is delicate and can be consumed alongside its crispy flesh and skin (Bolarin et al., 2016) [5]. The flowering season lasts from February to March, and the fruits mature in May and June. Fruiting occurs seasonally, however there may be two or three crops per year. A single tree produces 18-21 kg of fruit (Whistler and Elevitch, 2006) [6].

Figure No.1: Leaves of *Syzygium aqueum*

Figure No.2: Flowers of *Syzygium aqueum*

Figure No.3: Fruits of *Syzygium aqueum*

2. TAXONOMY

Table No.1: Taxonomic Position of *Syzygium aquem*

DOMAIN	Eukaryota
KINGDOM	Plantae
PHYLUM	Spermatophyte
SUBPHYLUM	Angiospermae
CLASS	Dicotyledonae
ORDER	Myrtales
FAMILY	Myrtaceae
GENUS	Syzygium
SPECIES	Syzygium aquem

3. VERNACULAR NAMES [7]

Table No.2: Vernacular names of *syzygium aqueum*

SR. NO.	NAME	LANGUAGE
1.	Wax jambu, java apple, Bellfruit, Water-apple, Watery rose-apple	English
2.	Jambu semarang, Jambu klampok	Indonesian
3.	Jambu air mawar	Malay
4.	Makopa	Filipino
5.	Chomphu-kaemmaem, chomphu-khieo	Thai
6.	Roi	Vietnamese
7.	Bellfruit	Taiwan
8.	Thabyuthabye	Burmese
9.	Pu tao	Chinese
10.	Sitzigiui dzhamboza	Russian
11.	Pomarrosa pomo	Dominican Republic
12.	Futo momo	Japanese

4. ORIGIN AND DISTRIBUTION OF *SYZYGIUM AQUEUM*

Syzygium aqueum is primarily widespread in Sri Lanka, Pakistan, and Malaysia. In India, it is more likely to be found in moist deciduous woods up to 1500 m height. It thrives in warmer regions such as Andhra Pradesh, Assam, Karnataka, Kerala, Orissa, Maharashtra, West Bengal, Punjab, Rajasthan, and Tamil Nadu. (Figure No.4).

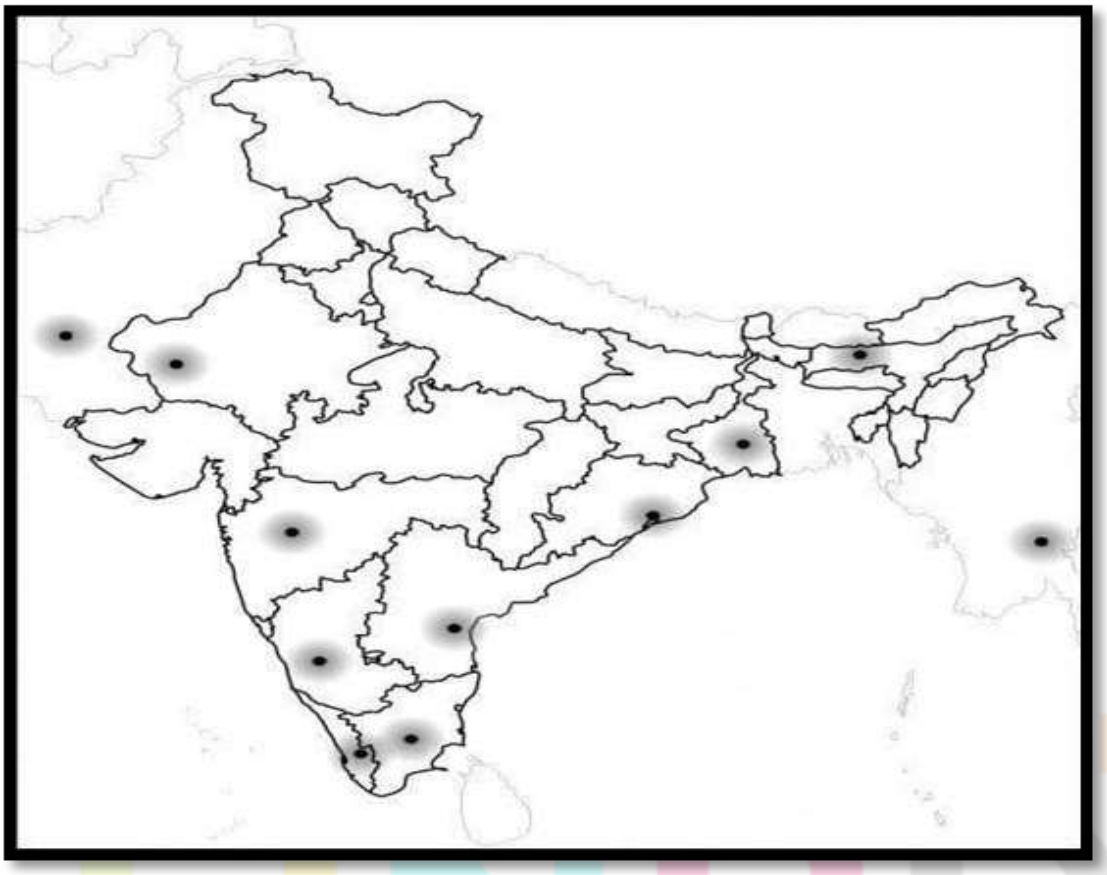

Figure No.4: Geographical distribution of Syzygiumaqueumin several places of Indian subcontinent

5. COMPOSITION OF NUTRITION

Watery rose apple is known as a low-calorie fruit due to its high-water content of roughly 90%. According to Monisha et al. (2018)[22], the average chemical composition is calcium (29 mg), potassium (123 mg), and sulfur (13 mg).

Vitamin C (24.78 mg); total fat (0.86 mg); iron (0.88 mg); and phosphorus (1.14 mg). Rose apples have a high fiber content (9.34 g per 100 gm), as well as fats (4.51 g), carbohydrates (59.25 g), and protein (8.62 gm). They also provide 312.07 kcal of calories, 292.59 mg of vitamin C, and 300.54 mg of anthocyanins. Augusta *et al.*

(2010)[23]; Costa *et al.*(2006)[24].

According to Nallakurumban et al. (2015)[25], watery rose apples have the following nutritious composition.

Table No.3: The following table describes the nutrient composition of watery rose apple as reported by Nallakurumban *et al*. 2015 [20].

S. NO	CONSTITUENTS	RANGE
1.	Total phenolic contents (mg/100g)	28.80-30.70
2.	Total flavonoids (µg/g)	62.03-62.07
3.	Antioxidant activity (µg/g)	138.4-144.50
4.	Beta carotene(µg/g)	37.21-37.28
5.	Ascorbic acid /vitamin C contents (mg/100g)	13.06-13.08
6.	Moisture (g %)	91.70
7.	Protein	0.31
8.	Fat (g %)	0.29
9.	Ash (g %)	1.24
10.	Crude fibre (g %)	1.37
11.	Acidity (g %)	0.07
12.	TSS (bx)	5.4
13.	pH	4.14
14.	Calcium (mg)	0.64

6. MEDICINAL USES

Various parts of this plant are utilized in traditional medicine, including the leaves, which have been demonstrated to have antibacterial properties and to relieve childbirth pain. The dried leaves in powdered form have been used to treat mouth ulcers, while a root preparation has been used to ease irritation and swelling. Thrush is treated using a decoction of Syzygium aqueum, an astringent bark. The leaf extract has also been shown to have cosmeceutical characteristics, including anti-tyrosinase, anticellulite, and lypolitic

Health Benefits of Water Apple [8]

Fights Free Radical Damage: Rose apples are high in vitamin C. It protects against free radicals, pollution, and harmful substances, which cause health problems like heart disease, cancer, and arthritis. Free radicals are produced in the body when exposed to radiation, nicotine or smoking, or during the breakdown of food. Vitamin C increases the synthesis of white blood cells and helps them function properly. Vitamin C, as an antioxidant, reduces oxidative damage and promotes smooth functioning. Vitamin C is also thought to enhance the immune system, helping it fight off colds.

Reduced Risk of Stroke: The presence of Vitamin C in rose apples reduces the risk of stroke and other health problems such as inflammation, oxidative damage, cardiac health, atherosclerosis, blood pressure, and endothelial function. Vitamin C can help prevent strokes and heart attacks by reducing plaque buildup in the body.

Boost good HDL Cholesterol: Rose apples contain niacin, which is used to increase cholesterol. Niacin raises HDL cholesterol levels while lowering triglycerides and LDL cholesterol.

Prevent Diabetes: According to the research, Rose Apple lowers blood glucose levels by increasing the activity of carbohydrate metabolic enzymes such as glucose-6-phosphate dehydrogenase, hexokinase, and glucose-6-phosphatase.

Prevent Constipation: Dietary fiber in Rose Apple aids the digestive system in material movement and stimulates stool, which is beneficial to those who have irregular stools or constipation. It promotes healthy weight and lowers the risk of heart disease and diabetes.

Prevent muscle cramping: Rose Apple contains a suitable amount of potassium. It increases muscle strength and relieves muscle cramps caused by low potassium levels.

Skin Health: Rose Apple contains enough Vitamin A and C to protect against oxidative stress caused by poor diet, stress, and pollution. It also relieves dryness and wrinkles.

7. PHYTOCHEMISTRY

The plant contains many functional groups such as flavonoids,[9] anthocyanidins,[10] phenolic chemicals, and terpenoids [11,12]. The brief is shown in the table below.

Table No.4: Different active components of *Syzygium aqueum*

ACTIVE COMPONENTS		PARTS
Proanthocyanidins	Samarangenins A and B	**Leaves**
Flavonoids	4-hydroxybenzaldehyde, myricetin-3-O-rhamnoside, europetin-3-Orhamnoside, phloretin, myrigalone-G myrigalone-B	**Leaves**
Terpenoids	α-Selinene (13.85%), β- caryophyllene (12.72%)	**Leaves**
Terpenoids	γ-terpinene	**Fruits**

Chemical Tests to be used for Detection of Metabolites:

1. Flavonoids

- Shinoda test
- Alkaline reagent test
- Zinc hydrochloride test

2. Tannins

- Goldbeater's skin test:
- Ferric chloride test
- Phenazone test

3. Terpenoids

- Libermann-Burchard test
- Salkowski test
- Sulfur powder test

4. Proteins

- Warming test
- Test with trichloroacetic acid
- Biuret test [20]

8. PHARMACOLOGICAL ACTIONS

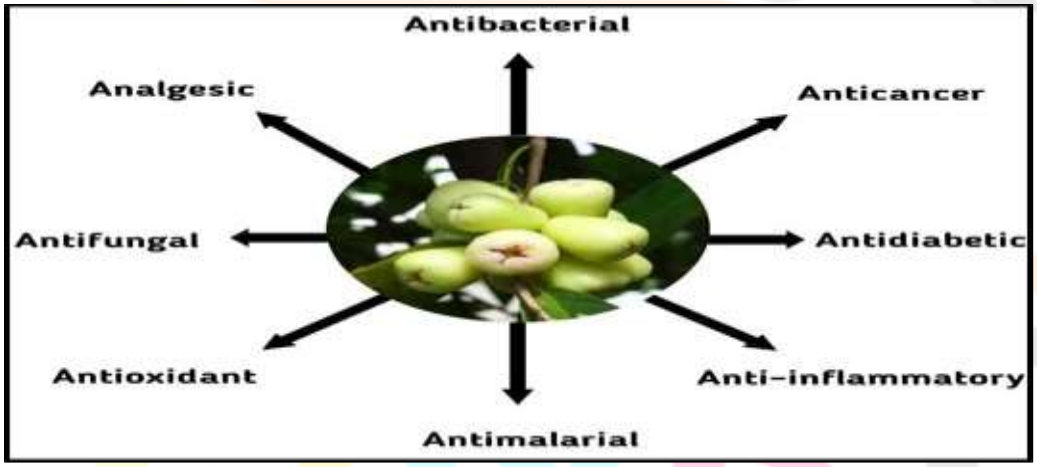

Figure No. 5: Uses of

1. **Antibacterial Activity:** Rose apple extracts have been shown to have antibacterial properties against diverse bacterial strains. These effects may be due to the presence of bioactive chemicals such as flavonoids, tannins, and phenolic compounds. [13]
2. **Anticancer:** Investigation suggests possible applications in cancer prevention and treatment. According to certain studies, chemicals obtained from rose apples may suppress tumor growth or metastasis**.** **[14]**
3. **Antidiabetic:** Rose apples (Syzygium aqueum) may have antidiabetic benefits due to bioactive chemicals found in them [15]

4. **Antimalarial:** While there is limited direct evidence on the antimalarial activities of rose apples (Syzygium aqueum), certain research have looked into the potential of specific chemicals found in rose apples against malaria parasites.
5. **Phytochemical Composition:** Rose apples contain biologically active compounds such as flavonoids, tannins, and polyphenols that may have antiparasitic properties. However, their direct effect on malaria parasites warrants additional exploration.
6. **Antioxidant Effects**: Antioxidants found in rose apples may help to reduce the oxidative stress linked with diabetes.[16]
7. **Antifungal:** Rose apples (Syzygium aqueum) have potential antifungal capabilities due to bioactive components. Here are some features of their antifungal potential. According to the review, rose apple extracts may limit the growth or viability of fungus such as Candida species, Aspergillum species, and others [17].
8. **Anti-inflammatory:** Rose apples include flavonoids, phenolic compounds, tannins, and other bioactive chemicals known to have anti-inflammatory properties [18].
9. **Analgesic:** There is limited direct proof of rose apples' analgesic effects (Syzygium aqueum). However, some studies have revealed that there may be pain-relieving effects. More thorough research, including clinical trials, is required to investigate and confirm the analgesic capabilities of rose apples, identify the chemical substances responsible for these effects, and comprehend their mechanisms of action in treating pain in people. Always seek the advice of a healthcare practitioner before using pain management tactics or therapies[19].

Table No. 5: Pharmacological actions of *syzygium aqueum*[21]

PHARMACOLOGICAL ACTION	PLANT PART
Antibacterial	Leaves, Fruits
Anticancer	Fruit, Leaves, Seeds
Antidiabitic	Seeds
Anti-inflammatory	Fruit, Leaves
Antimalarial	Leaves, Bark

Antioxidant	Leaves, Fruit
Antifungal	Leaves, Fruit
Analgesic	Leaves

9. CONCLUSION:

Syzygium aqueum has been used in traditional medicine around the world. Studies have shown a variety of pharmacological actions and the presence of several bioactive chemicals, albeit many of these have yet to be measured. Considering its phytotherapeutical value, study into the identification of numerous new secondary metabolites is required since the plant has enormous promise as a long-time medicinal plant that has yet to be fully realized. *Syzygium aqueum* is widely discussed, although clinical trials have yet to be conducted. As a result, in the near future, clinical evaluation should serve as a baseline for this species' safe medicinal applications. This review has discussed the general features, key chemical ingredients, and traditional uses, as well as the broad range of pharmacological activity.

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