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Little Mallow: A review of botany, composition, uses and biological potentials

Hafiza Uroosa Rasheed[1], Haq Nawaz[1], Rafia Rehman[1], Ayesha Mushtaq[1]*, Sunil Khan[2] and Muhammad Waqar Azeem[1]

[1]Department of Chemistry, University of Agriculture, Faisalabad-38040 Pakistan and [2]Department of botany, Haripal Vivekananda College, Hooghly, India

Abstract

Little mallow (*Malva parviflora* L.) is a perennial herb that belongs to the malvaceae family. It is distributed throughout subtropical, tropical and temperate regions of Asia, Europe and Africa & it has medicinal and nutritive value. *Malva parviflora* mostly contains phenolics, flavonoids, flavonols & fatty acids. The extent of each of these chemical constituents varies depending on the type of species or cultivars as well as cultivation conditions such as soil type, weather, irrigation & other horticulture practices. It is an important medicinal plant which possesses several traditional medicinal activities and also known for its edible uses. More uses & applications of Malva parviflora by-products are continuously added. Further research on maximizing yield per hectare and optimum preservation methods are needed, particularly in the developing world where mallow harvesting & post-harvest processing methods are much traditional.

Key words: *Malva parviflora*, antidepressant, cardioprotective

Full length article **Corresponding Author*, e-mail: ayesha_mushtaq123@yahoo.com

1. Botany

1.1. Introduction

Little mallow (*Malva parviflora* L.) is an annual herb belonging to family *Malvaceae* and genus *Malva* bearing the common name 'mallow' which includes about 25 to 40 species of herbaceous, biennial, annual and perennial plants. This genus is widespread throughout the tropical, temperate and subtropical regions of Asia, Africa and Europe. *Gossypium* L. (cotton), *Hibiscus rosa-sinensis* (Hibiscus), and *Malva parviflora* (little mallow) are more prominent species of *Malva*. Many species of this genus are being used as medicine, tea and food, from millennia. Little mallow is one of them, but it has been mostly categorized as a useless weed in many regions of the world. *Malva parviflora* is known by different names depending where you are in the world. In English, it is commonly called as little mallow/cheesweed mallow/marshmallow/small flower mallow [1]. In Hindi it is known as mushk dana. In Urdu, it is known as sonchul. In Arabic, it is known as bamia [2-4].

1.2. History

Malva parviflora is native to Asia, Northern Africa and Europe. The word "*Malva"* is derived from Greek word, "malakos" (soft) and the word "*Parviflora"* is derived from Latin word "*parvus*" (small) and "floris" (flower). *Malva parviflora* is one of the earliest cited plants. Its first known reference was from Australia (1845), with the description of a species called *Malva preissiana*, but absence of this name in any literature source, suggests that this name has been replaced by *Malva parviflora*. It is believed that *Malva parviflora* was introduced intentionally as a garden plant as it was cultivated in Europe as a salad vegetable and a 'green manure'. In 1922, it was recorded as being present at high 'luxurious' densities in agricultural areas of New South Wales, where it was thought to have caused the potentially fatal 'staggers' syndrome in livestock. Now, it has been distributed throughout tropical, sub-tropical, and temperate regions of the world.

1.3. Demography/Location

Although *Malva parviflora* is grown in a variety of climatic conditions but plants growing in warmer areas have higher height and longer period of growth. Warmth, light and moisture are the key ecological requirements for its cultivation. This specie is not frost tender and is widely distributed in India, Pakistan, Saudi-Arabia, and Europe (southeast and southwest regions) [2]. In Pakistan, it is found in Azad Kashmir, Hazara, Rawalpindi, Murree, Swat and Margalla Hills [5]. *Malva parviflora* oil is not produced on industrial scale. Moreover, no statistics are known about its global production as well as import and export.

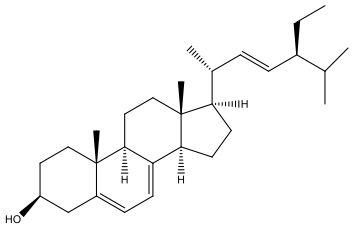
1.4. Botany, Morphology, Ecology

Malva parviflora is annual herb having height of 15 to 45 cm with round, erect or prostrate stems. Green branches are present along whole length of the stem. The leaves are alternate having stipules. Petiole: 40 to 150mm long, stiff due to presence of hairs on its upper surface. Blade: dull or dark green in color, round to kidney shape, 20 to 70 mm long, 40 to 120 mm wide, having 5 to 7 finger like lobes with even scalloped boundaries, possess radiating veins more prominent at lower surface. Moreover, few twin or star shaped or simple stiff hairs are also present on the stem as well as on the blade. Flowers: bisexual, 5 to 6 mm in diameter, solitary or in form of clusters of 2 to 4 flowers. Petals: white/pink/pale in color, having hairless claws. Calyx: cup-shaped, 3 to 3.5mm long. Ovary is 8 to 12 celled. Styles are separated into branches (thread-like), stigmatic from inner side. Tube of stamens is divided into several filaments. Inflorescence is axillary. Fruit is round or pumpkin like capsule and maybe it is hairless or covered with fine hairs. Capsules converts into fruitlets via breakdown and each fruitlet has one seed. Seeds are tiny, 1 to 2mm wide, red brown, and are kidney shaped. Seeds are usually encapsulated in seed coat which is brown in color. There are up to 5000seeds/plant. Single tap root is present.

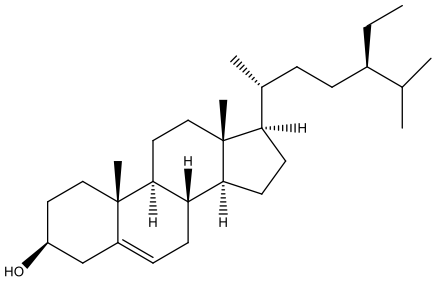
Little mallow is adaptable to areas having annual rainfall from 315 to 490mm. Plants thrive best in the temperature range of 9-27ºC [6]. It can grow in an extensive range of soils such as, sandy, loamy, clayey, and stony/rocky soils. Its long and single tap root helps in the survival during long drought periods. Optimum pH for seed germination is 4 to 10, however, however, germination stops at higher pH [7].

2. Chemistry

Malva parviflora contains substantial amounts of antioxidants including ascorbic acid, β-carotenes, α-tocopherols, and glutathione. It also contains minerals such as iron, copper, zinc, phosphorous, and manganese [8]. The key phytochemicals present in *Malva parviflora* include sterols, flavonoids, polyphenolic compounds, and terpenes. Figure 1 shows structures of important phytochemicals of *Malva parviflora*. In a study, phytochemicals including β-amyrin, α-amyrin, a mixture of β-sitosterol and stigmasterol, cholesterol, campasterol, ergosterol, and β-sitosterol-O-β-D-glucoside were isolated from petroleum fraction of *Malva parviflora*. Ethyl acetate fraction yielded kampeferol -3-(6''-p-coumaroyl-O-β-D-glucoside. Fourteen fatty acids were detected in the aerial parts of *M. Parviflora* L. (Table 1); constituting about 99.9 % of its fatty acids content, of which Palmitic, linoleic, and linolenic acid were more prominent [9]. GCMS analysis is usually used to find out the chemical profile of the essential oils [10-15].



Ergosterol



β-sitosterol

Figure 1. Structures of important phytochemicals of *Malva parviflora* L.

Table (1): Fatty acids composition of *Malva parviflora* [9]

Sr. No.	Fatty Acid	Percentage (%)
1	Capric acid	0.78
2	Lauric acid	0.59
3	Myristic acid	1.31
4	Palmitic acid	26.5
5	Palmitoleic acid	1.29
6	Stearic acid	3.83
7	Oleic acid	7.15
8	Linoleic acid	24.73
9	Linolenic acid	28.25
10	Arachidic acid	0.8
11	Arachidonic acid	1.45
12	Behenic acid	1.65
13	Erucic acid	0.83
14	Lignoceric acid	0.77

3. Postharvest technology

Harvesting of *Malva parviflora* leaves and flowers can be done in summer via picking off the stems at their base, or by using gardening scissors. Because of their high moisture content (>75 %), fresh mallow leaves are highly perishable. Process of drying can increase period of consumption of leaves, in the meanwhile, nutritional content is maintained by the moisture evaporation, from the product, up to a specific threshold level. Different methods are used for drying purpose. Convective air drying processes can result in adverse alterations in color, nutritional content and taste of dried product due to the long time application of high temperature. Microwave drying saves the product from the alteration in nutritional properties. Further, this drying method reduces the time of drying [16]. Another method, Infrared drying method can also be used to get food stuffs of high quality including grains, vegetables and fruits [17]. Infrared drying advantages include: high drying rate, saving and uniform distribution of energy and attaining better

quality dried products [18-19]. Dried leaves can be stored for long periods of time. The juice which can be added in green smoothie is prepared from its old leaves, while, young leaves, after chopping, are used in salads.

4. Value Addition

Mallow is commonly used as vegetable. Both the leaves and the immature fruit are edible. *Malva parviflora* does not have an especially strong or exciting taste, but does make a pleasant addition to salads and can be cooked as a green.

5. General Uses

Malva parviflora is used for the treatment of stomach irritation, throat infections, bronchial problems, cough and intestinal irritation. Leaves and flowers are emollient and used to soften skin's sensitive areas. It is used as poultice to decrease swelling and to remove toxins. Leaves have laxative properties and they relieve the gut irritation. Blend of *Malva parviflora* and Eucalyptus is a remedy for the treatment of chest infections including cough. *Malva parviflora* has been used to treat headache, sores, fever and different digestive problems. Roots or leaves decoction has been used to rinse hairs for the removal of dandruff and to soften hairs [20-23]. *Malva parviflora* is an essential ingredient of human diet for many underprivileged areas. It has also been used as food for poultry, carp fish, and grazing animals.

6. Pharmacological uses

6.1. Antibacterial, antifungal and irritant activities

Antibacterial, antifungal, and irritant potentials of *Malva parviflora* and *Malvastrum coromandelianum* extracts (ethanol, hexane, and chloroform) were evaluated against various bacterial (*Proteus vulgaris*, *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis*) and fungal (*Aspaergillus niger* and *Aspergillus oryzae*) strains. Extracts of both plants exhibited similar patterns of inhibition against *Escherichia coli*, but showed slightly different inhibitory response against other three bacterial strains. Moreover, the antibacterial potential of chloroform extract was higher than other two. Inhibitory effect of all extracts was almost same for both fungal strains. All the three extracts caused acute irritation, when applied on the inner side of ear of male albino rabbits [24].

6.2. Hepatoprotective activity

Malva parviflora has been used traditionally to cure liver disorders. In an experiment whole plant methanol extract was administrated at two different dose levels (0.25g/kg and 0.5g/kg), to evaluate its hepatoprotective effect against paracetamol induced hepatic damage, in mice. Standard drug was silymarin. Treatment significantly reduced the levels of ALT (alanine aminotransferase), AST (aspartate aminotransferase), ALP (alkaline phosphatase), and bilirubin in liver, in a dose dependent manner [25].

6.3. Anti-inflammatory and antioxidant activities

The anti-inflammatory property of extracts of *Malva parviflora* leaf was investigated using xylene intoxicated ear oedema assay. Indomethacin was used as standard drug. Oral administration of methanol and aqueous extract at doses of 0.5g/kg and 0.3g/kg, respectively, showed significant inhibitory effect, in mice. Results were comparable to standard drug. Antioxidant activity was evaluated using total antioxidant capacity assay, in mice. Daily administration of both extracts for three weeks showed dose dependent antioxidant activity [26]. Anti-inflammatory potential of *Malva parviflora* stem extract was examined using carrageenan and histamine induced paw oedema. Analgesic activity was assessed using acetic acid writhing assay. Significant inhibition of formation of oedema was shown by the extract at doses of 0.1 and 0.2 g/kg. Extract significantly reduced the number of writhes in a dose dependent manner. Results were comparable to standard drug (indomethacin) [27].

6.4. Anti-diabetic activity

In a study, Streptozotocin intoxicated diabetic rats were treated with varied doses of *Malva parviflora* leaf extracts (methanol, hexane, and chloroform) for 28 days. Results revealed that antidiabetic potential of hexane extract was higher than other extracts [28]. In another study, a new compound oleanic acid derivative (triterpene isolated from aerial parts of plant), showed significant antidiabetic and hypolipidemic potential against streptozotocin nicotinamide-induced type-2 diabetes, and streptozotocin induced type-1 diabetes, in mice [29].

6.5. Neuroprotective activity

Malva parviflora L. possess considerable neuroprotective potential. A study was performed to investigate the neuroprotective activity of *Malva parviflora* leaves extract (ethanolic) using Morris water maze assay, against Alzheimer's disease mediated by amyloid-β- (Aβ-), in mice. The extract improved the defected memory of model animals by restoring the levels of brain antioxidant enzymes including glutathione peroxidase, superoxide dismutase, glutathione reductase, and catalase. Extract also decreased the levels of lipid peroxidase to normal level [22].

6.6. Anticancer activity

In a study, anticancer potential of five different medicinal plants was assessed using lactate dehydrogenase and 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assays, against breast cancer cells (MDA-MB-231). Results revealed the promising cytotoxic potential of two (*Rumex vesicarius* and *Malva parviflora*) of five medicinal plants. Loss of cellular integrity, contraction of the protoplasm, and cell detachment were observed in the extract-treated MDA-MB-231 cells [30].

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