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Patchouli (*Pogostemon cablin* Benth.): Botany, agrotechnology and biotechnological aspects

Mallappa Kumara Swamy*, Uma Rani Sinniah

Department of Crop Science, Faculty of Agriculture, University Putra Malaysia, Serdang, Selangor, Darul Ehsan 43400, Malaysia

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ABSTRACT

Patchouli (*Pogostemon cablin* Benth.) is an industrially valued aromatic medicinal plant currently having a huge demand for its essential oil. It is widely used in flavor and fragrance industries as well as in pharmaceuticals. Clonal propagation is therefore obligatory to obtain homogeneous patchouli plants from preferred germplasm in order to meet the global need. At present, farmers are showing keen interest towards its large scale cultivation mainly in the tropical and sub-tropical countries. Understanding the plant biology, chemistry and other uses allows better utilization of any industrial crops. Therefore, the present review discusses on the botany, agronomy and biotechnological aspects of patchouli. Also, the current market demand for patchouli raw material is being reviewed by highlighting the possible exploration of modern techniques in identifying the adulterants to authenticate this herb. This review provides a comprehensive information on both basic and applied aspects of patchouli crop cultivation and management. The applied aspect of patchouli biotechnology allows one to explore the newer potential for various industrial uses and improve the rural economy.

Contents

* Corresponding author. Present address: Department of Crop Science, Faculty of Agriculture, Universiti Purta Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
E-mail address: swamy.bio@gmail.com (M.K. Swamy).

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1. Introduction

Natural products obtained from plant sources are widely used as herbal medicine to treat various human health problems. Herbal medicines are widely consumed throughout the world and it is ever increasing. Some of the natural products obtained from plants include essential oils, coloring agents, dyes, cosmetics and pharmaceutical compounds. Presently, various medicinal and aromatic plant species are cultivated on a large scale to meet the industry requirement for plant metabolites. Though these industrial crops produce relatively lesser products, their trading assure a reasonably higher income to farmers (Lubbe and Verpoorte, 2011). Aromatic plants yielding essential oils exhibit various therapeutic properties and hence, they are widely used in food, fragrance and pharmaceutical industries. Flavor and fragrance industries consume almost 90% of essential oil to manufacture cosmetics, perfumes, food and other healthcare products.

Patchouli (*Pogostemon cablin* Benth.) plant is a perennial herb native to South and South East Asia (Maheshari et al., 1993). The leaves of the plant yield aromatic oil, which is highly valued in perfumery and aromatherapy because of its dominant aromatic spicy fragrance (Hasegawa et al., 1992). Patchouli oil acts as a strong base and provides permanent fixative properties to prevent evaporation and promote tenacity (Murugan and Livingstone, 2010). Therefore, it is broadly applied in fragrance industries to manufacture various healthcare products such as soaps, detergents, body lotions and perfumes (Swamy and Sinniah, 2015). Patchouli oil is broadly used in aromatherapy to improve sexual interest, mitigate depression, anxiety and to calm nerves. Previous review papers have highlighted the occurrence of various phytocompounds and their potential therapeutic properties including antimicrobial, analgesic, antiinflammatory, antioxidant, antiplatelet, aphrodisiac, antithrombotic, antidepressant, antimutagenic, fibrinolytic, antiemetic and cytotoxic activities (Chakrapani et al., 2013; Priya et al., 2014; Swamy and Sinniah, 2015). These characteristic features make a patchouli plant to be considered as a commercial crop with great industrial importance throughout the world for various applications (Vijayakumar, 2004; Xian et al., 2007). Patchouli is one of the top 20 essential oil yielding plants which are traded regularly in the world market and has a higher rank (CBI, 2009; Lubbe and Verpoorte, 2011; Singh et al., 2015). The largest quantity of patchouli oil is produced in Indonesia. However, it is also cultivated on a large scale in many countries, including India, Malaysia, China, Singapore, Vietnam and West Africa (Maheshari et al., 1993; Swamy et al., 2010a,b; Swamy et al., 2015). Even then, the global market demand for patchouli herb is not yet fulfilled. Hence, there is a need to increase the area of cultivation to meet the demand at both domestic as well as international market (Singh et al., 2015).

For a successful cultivation of industrial herbs, it is necessary to understand their botany, growth and developmental features, chemistry of metabolites and different ecological requirements. The growing interest among farmers is forcing the exploration of better technologies for developing high yielding patchouli plants and other cultivation practices in order to ensure profitable cultivation. Biotechnology offers the possibility of obtaining a consistent higher yield with superior plant quality, better management of plant nutrition, disease and pest problems. Patchouli herb was never domesticated in the early days and therefore, knowledge on its propagation is limited. Despite agronomic bottlenecks, crop improvement programs to develop elite genetically uniform superior planting materials are yet to be established globally. Considering the current scenario, this review was aimed at compiling the literature to explain the botany, agronomy, biotechnology, market demand, adulteration and authentication of patchouli herb. The review includes an updated research literatures surveyed using various search engines like Scopus, Google Scholar, ScienceDirect and PubMed etc.

2. Botanical description

2.1. Taxonomic position

Patchouli is a member of the mint family, Lamiaceae. The taxonomic position of this plant is as follows:

Kingdom—Planta
Division—Magnoliophyta
Class—Magnoliopsida
Order—Lamiales
Family—Lamiaceae (Labiatae)
Genus—*Pogostemon*
Species—*cablin*

Patchouli plant was first described by Pelletier-Sautelet in 1845 and was named as *Pogostemon patchouli*. In 1896, Holmes identified it as *P. cablin* and in Philippines, patchouli is locally called as 'cabalam' and hence the name *P. cablin* (Bhaskar and Vasantha Kumar, 2000). In India, there are about 25 different species of Pogostemon. Patchouli is called by different names such as patchouli or *tamala patra* (in Sanskrit), *patcholi* (in Hindi), *patche tene* (in Kannada), *pacchilai* (in Tamil), *patchilla* (in Malayalam), *patchapan* or *patcha* (in Marathi) and *guang hou xiang* (in Chinese), *nilam* (in Malaysia and Indonesia), *phimsen* (in Thailand) (Table 1).

Table 1
Vernacular names of *Pogostemon cablin*.

Country	Vernacular names (Language)
India	Tamala patra (Sanskrit), Patcholi (Hindi), Patche tene (Kannada), Pacchilai (Tamil), Patchilla or Kattam (Malayalam), Patchapan or Patcha (Marathi), Patchapat (Bengali)
Philippines	Kabling (Tagalog), Katluen (Bisaya)
Malaysia	Nilam or Dalum Wangi or Tilam Wangi (Malay)
China	Guang Hou Xiang or Huo hsiang (Chinese)
Indonesia	Nilam (Acheh), Singalon (Batak), Nilam wangi (General)
Thailand	Phimsen (Thai)
Korea	Hyangdukkaephul or Pachuri (Korean)
Vietnam	Hoac huong (Vietnamese)