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A Detailed Review On Taxonomy And Propagation Of Moringa Oleifera With Some Phytochemical Properties.

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Abstract

Moringa oleifera, also known as the “tree of life” or “miracle tree,”or the never die tree, and the ben oil tree is classified as an important herbal plant due to its immense medicinal and non-medicinal benefits. Traditionally, the plant is used to cure wounds, pain, ulcers, liver disease, heart disease, cancer, and inflammation. This review focuses on Taxonomy, propagation and phytochemical properties of Moringa oleifera with a motive to help further research. So far, more than one hundred compounds from different parts of Moringa oleifera have been characterized. The plant also has potent antioxidant, anticancer, antihypertensive, hepatoprotective, and nutritional effects. Therefore, further studies are proposed to explore the plant to identify and isolate compounds along with its therapeutic potential.

Keywords: Moringa oleifera, traditional medicinal uses, pharmacological activity, phytochemistry,

INTRODUCTION

Moringa species are all native to Asia, from where they have been propagated across many parts of the world especially more seen in warm countries, such as Malaysia and other tropical countries. Moringa is known by various names in different languages in Kannada- Nugge Sanskrit Shobhanjana ,Tamil Murungai, Telegu Munaga, Tellamunaga ,Urdu Sahajna Konkani Maissang, Moxing ,Punjabi -Sainjna Marathi ,Achajhada, Shevgi ;Hindi saijna, shajna English . This tree can tolerate temperatures from 19oC to 28oC, and has height from 5 to 10 m and can be cultured throughout the plains(chuang et.al, anwar et.al2007). Each part of the Moringa tree (fruits, seeds, leaves,flowers, bark and roots) is associated with the presence of at least one, or

more benefits. M. oleifera is one of the world's mostly used plants(bijina et.al 2011,moyo et.al 2012). All parts of the species are traditionally used for different purposes, but leaves are generally the most used all over the world. moringa is known for its fast growth, higher nutritional attributes, and utilization as a livestock fodder crop.

Plant taxonomy

Moringa oleifera Lam is among the major plants in the Moringaceae family. The taxonomic classification of Moriga is given in Table 1. Moringa oleifera, also,known as drum stick, is regarded as miracle tree (Fig. 1). Its each and every part is used for one or another purpose and has medicinal importance.

Range and growing condition of M. oleifera-

M. oleifera is a widespread multipurpose tree reported to have nutritional, therapeutic and prophylactic properties with several industrial applications. It is well known to the ancient world, It is a fast growing, a perennial tree which can reach a maximum height of 7 to 12 m up to the crown and also found growing naturally at elevations of up to 1000 m above sea level. It can grow well on hillsides, but is more frequently found growing on pasture land or in river basins as a non-cultivated plant. M. oleifera belongs to the monogeneric family of shrubs and tree Moringaceae, considered to have its origin in Agra and Oudh, in the northwest region of India and south of the Himalayan Mountains. It is now cultivated throughout the Middle East, almost the whole tropical belt and it was introduced in Eastern Africa from India at the beginning of 20th century. About 33 species have been reported in the family Moringaceae . Among those, thirteen species namely, M. arborea, M. borziana, M. concanensis, M. drouhardi, M. hildebrandtii, M. longituba, M. oleifera, M. ovalifolia, M. peregrina, M. pygmaea, M. rivae, M. ruspoliana, M. stenopetala are well known and found worldwide. It is an excellent source of nutrients and bioactive compounds [udikala etal 2017]. In India and Africa, it is extensively grown in tropical or arid regions.. Various Moringa plant parts including leaves, roots, seeds, and green pods were found useful in medicinal preparations. Moringa oleifera plants have also been identified as a rich source of bioactive compounds, phenols, glucosinolates, tocopherols, carotenoids, ascorbic acid, minerals, and polyunsaturated fatty acids and essential phytochemicals like tannins, alkaloids, steroids, and reducing sugars [moyo et.al 2012)]. The extracted oil of Moringa seed is referred to as Ben oil due to high monounsaturated fatty acids content in oleic acid .It is traditionally used to treat ulcer, wound healing, cancer, obesity, anemia, and liver disease as a folk medicine [nouman2012]. Moringa is also regarded as essential due to the high resistance of its tuberous roots to drought and arid conditions .

Table 1 Taxonomic classification of Moriga oleifera

Taxonomic	classification
Kingdom	Plantae
Subkingdom	Tracheobionta
Super division	Supermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Dilleniidae
Order	Capparales
Family	Moringaceae
Genus	Moringa
Species	oleifera

Figure 1 . Moringa oleifera plant

Figure 2 flowers of Moringa

M. oleifera is a short, slender, deciduous, perennial tree that grows to about 10 m tall, slender with drooping branches; branches and stem are brittle, with corky bark(fig1).Leaf Arrangement is Alternate-spiral. Leaf Type is Tri-pinnate.Shape of leaf is Ovate or elliptic,apex and leaf base is rounded with entire margin.Leaves are feathery, pale green, compound, tripinnate, (30–60 cm long), with many small leaflets, 1.3–2 cm long, 0.6–0.3 cm wide, lateral ones slightly elliptic, terminal ones obovate, and slightly larger (Figure 1). The feathery leaves of the tripinnate complex have green curved leaflets that are 1–4 cm long . Because of its leaves, the tree is frequently mistaken for a leguminous plant. The alternate twice or thrice pinnate leaves appear at the branch tips in most cases. They have a long petiole with 8–10 pairs of pinnae, each bearing two sets of inverse elliptic leaflets and one at the apex and are 20–70 cm long when young.Flowers are fragrant, white, or creamy-white, 2.5 cm in diameter, and are borne on inflorescences 15–25 cm long. in sprays(fig2). They bloom profusely in auxiliary, dropping panicles that are 10–25 cm long.The direct lanceolate sepals are five-reflexed.

The five petals are rumored to be thin. Except for the lowest stamen, they are reflexed and consist of five stamens and five staminodes .The stamens are yellow, and the pods are pendulous, brown, triangular, splitting lengthwise into three parts when dry, and containing about 20 seeds embedded in the pith.

Fruits are elongate, torulose capsule, angled, longitudinally 3-valve.It is many seeded tree, 3 angled, 3 winged. Fruiting is found throughout the year.The pod has nine ribs on both ends and the seeds are dark brown with three papery wing. The seeds have three papery wings and are oval with a tannish semi-permeable seed

arrangement . Their arrangements are mostly brown to dark brown but can be white if portions are of low viability. It almost within a week, viable seeds sprout. The body has three white wings that run at 130 intervals from start to finish .

Propagation of Moringa-

Moringa can be propagated by direct seed planting, seedling transplanting and mature stem cuttings. Direct seeding is preferable when the germination rate is high. Seeds must be sown at a maximum depth of 2 cm as deeper seeding might reduce the germination rate. There are around 4000 Moringa seeds (with their shell) in a kilo with the germination percentage of 78-94%. Moringa seeds germinate 5 to 12 days after seeding .Seedlings are grown in polythene bags or sacks prefilled with topsoil by sowing seeds at 2 cm depth and watering once in every 2-3 days. After showing they have to be placed in a slightly shaded area and also protect from heavy rains. The young Moringa plants must be nursed for 4 weeks before transplanting for better survival rate when they are about 30 cm high. Remove the polythene bag when transplanting ensuring that the roots of the plant are not damaged. Hardwood cuttings of 40 cm long and 4 to 5 cm in diameter, can also be used for propagation by burying one-third of the stem in the soil. Plants produced with cuttings will not have a deep root system will be more sensitive to wind drought and termite attacks.

Phytochemical properties

Moringa species contain various phytoconstituents such as alkaloids, saponins, tannins, steroids, phenolic acids, glucosinolates, flavonoids, and terpenes. The diversity of these phytochemicals in the genus contributes to its numerous pharmacological uses.

Regardless of the high phytochemical contents of the genus, the constituents of only specific species had been explored, namely M. concanensis, M. peregrina, M. stenopetala, and M. oleifera, and most of the studies focused on the leaves of the plants.

Flavonoids

The Moringa genus has high antioxidant activity mainly due to its high content of flavonoids. Most of the flavonoids present in the genus are in the flavanol and glycoside form. The most common flavonoids of the genus are rutin , quercetin, rhamnetin , kaempferol , apigenin, and myricetin (wasif et.al2014).

Glucosinolate

Moringa species contain abundant glucosinolates such as 4-O-(α-L-rhamnopyranosyloxy)-benzyl glucosinolate, also known as glucomoringin (GMG) depending on the maturity and physiological properties of the leaves

Phenolic Acid

M. oleifera leaves contain gallic acid as their major phenolic acid. Ellagic acid ,ferulic acid , caffeic acid , o-coumaric acid , and chlorogenic acid , are also found in the leaves and gentisic acid , syringic acid, ρ-coumaric acid , and sinapic acid were detected in trace amounts.

Terpenes

There are reports of presence of lutein as major carotenoid in M. oleifera leaves such as -E-luteoxanthin ,13-Z-lutein ,, 15-Z-β-carotene ,and all-E-zeaxanthin . Lupeol acetate, β-amyrin and α-amyrin(9)

Alkaloids

Two new pyrrole alkaloid glycosides present in M. oleifera leaves, include marumoside A and marumoside B(wasif et.al 2014).

Conclusion

Numerous studies have been conducted on different parts of M. oleifera, but there is a direct need to isolate and identify compounds associated with biotechnological applications. Nevertheless, it is woμth mentioning that endogenous roles of these compounds are still poorly understood. Since this plant has been proposed as a crop, it is planted around the world, which implies it needs to grow under different environmental conditions. Thereafter, it is expected that there will be some variation in the presence or concentration of certain metabolites in different parts of the tree. Despite it is a studied plant, changes in the general physiology and biochemical composition among populations adapted to particular environmental conditions are not known. Here, the presence of some compounds considered as defensive elements has been shown, and their distribution in vegetative plant parts has been established. However, detailed studies for examining the endogenous roles of the study compounds are yet required.

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