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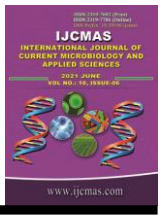

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Medicinal and Traditional Utilization of African Ebony (*Diospyros mespiliformi)*: A Review

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A B S T R A C T

Diospyros mespiliformis is the largest genus in Ebenaceae that has more than 500 species with remarkable economical values, especially *Diospyros kaki Thunb* which has traditionally been used as an important food resource in China, Korea, and Japan. The tree has multipurpose uses including timber, edible fruits, and traditional uses. The tree is used for both traditional and popular medicine in various traditions. It has antioxidant, Anti-inflammatory, therapy for insomnia, antihemintic and enzyme-inhibitory. The tree is a native to Africa, Asia and some part of Europe. Leaves are usually simple, alternate, and coriaceous. In most African countries, fruits from the tree are normally consumed as fruits and also as antibiotic; the leaves are feed by animals especially camels. In Nigeria, the genus is mostly found in the extreme northern part of the country. The people in the rural area collect this fruits and sell them make their source of livelihood. The aim of this review is to search and itemize the recent findings pertaining to the medicinal and traditional value of this genus. In addition, the review also attempts to identify some local utilization of this genus with the aim of creating further awareness on the important of this genus to mankind.

Introduction

Trees remain the most important source of traditional medicines due to their intrinsic advantages over other plant forms, which often have limited availability throughout the year (Brendler *et al.*, 2010; Moyo *et al.*, 2015). Traditional medicinal is becoming more attractive to the world due to its effectiveness in curing almost all ailments across the globe. Most of these trees cure many ailments without any site effects.

Furthermore, many trees are known to bear edible fruits that are valued for their therapeutic potential, with the dual benefit of providing nutritional and medicinal effects (Leakey, 1999; Stadlmayr *et al.,* 2013; Awodoyin *et al.,* 2015; Maroyi, 2016; Bvenura and Sivakumar 2017; Hassanin *et al.,* 2019). Recent renewed interest in traditional medicine has increased the number of efficacy-based studies to substantiate the uses of fruit trees in local and popular medicine (Kamatou *et al.,* 2011). *Diospyros* species have been ubiquitous to ethnic medication throughout the tropical regions. Leaves, barks, fruits, hard wood, and roots have been used as tonic, powder, and poultice to heal a wide range of illnesses such as asthma, dermatitis, hypertension, atherosclerosis, lumbago, hemorrhage, insomnia, biliousness, among others. Common usage includes febrifuge, carminative, astringent, sedative, anti-hypertensive, vermifuge, constipation, and antidiuretic (Xie *et al.,* 2015). Ethnobotanical, food, socio-cultural, economic and pharmacological aspects of wild edible forest tree (WEFT) species have been widely documented in Africa (Kebu and Fassil, 2006; Racquel, 2014). Health-promoting results associated with consumption of edible fruits and vegetables are attributed to the presence of bioactive components in them. A number of plant species belonging to diverse plant families have been validated to have some sort of biological activity. Among these, Diospyros, from family Ebenaceae is a genus with emerging health benefit.

Diospyros mespiliformis is the largest genus in Ebenaceae that has more than 500 species with remarkable economical values, especially *Diospyros kaki* Thunb which has traditionally been used as an important food resource in China, Korea, and Japan (Guo, and Luo, 2011). The tree is a native to Africa, Asia and some part of Europe. Leaves are usually simple, alternate, and coriaceous. The inflorescence is cymes, flowers are actinomorphic, and calyx is gamosepalous and persistent. Diospyros species are deciduous and evergreen shrubs and trees. The verified biological effects of members of Diospyros genus include antioxidant, hepatoprotective, anti-inflammatory, analgesic, antipyretic, antihypertensive, antidiabetic, neuro-protective, antimicrobial, anti-protozoal, fungicidal, anthelmintic, insecticidal, molluscicidal, cytotoxicity, anti-tumor, multidrug resistance (MDR) reversal, and sedative (Abdur Raufa *et al.,* 2017). The crude n-hexane fraction of the dry stem of D. variegata Kruz demonstrated significant antinociceptive effect in acetic acid and tail immersion models (Trongsakul, 2003). This review is intended to summarize the current knowledge on ecological, ethnobotanical, and phytochemicals present in these plants, their uses in the treatment of different diseases and disorders. In this context, recent references have been obtained from databases such as Science direct, NCBI, Google Scholar, and SciFinder. We hope this review will be a valuable addition to the field of the ethno botanical study and will be a great help for patient and researchers.

Origin and Geographical Distribution of *Diospyros mespiliformis*

The Ebenaceae (ebony family) are pan tropical in distribution and encompass the genera Diospyros and Euclea with ca. 500 - 600 species. Only a few of them extend into temperate zones. Main centres of diversity are in SE-Asia, Madagascar, tropical Africa, and South America The last comprehensive revision of the family dates back to the 19th century (Hiern, 1873).

Diospyros is a large pan tropical genus of about 500 species; in mainland tropical Africa about 90 species occur and several produce valuable timber or edible fruits. The species is

extremely widespread, occurring from Senegal east to Eritrea, Ethiopia and Kenya, and south to Namibia, northern South Africa and Swaziland, but it is nearly absent in the more humid forest zones of West and Central Africa. It is also found in Yemen. Trial plantings for fruit production exist in Israel, and *Diospyros mespiliformis* has also been planted in the southern parts of the United States (Orwa *et al.*, 2009).

Ecology of *Diospyros mespiliformis*

Diospyros species are important and conspicuous trees in many of their native ecosystems, such as lowland and dry forests. The species occurs in woodlands, savannahs and along riverbanks. It prefers areas with permanent water that helps in natural regeneration, and it grows faster in frost-free areas. *D. mespiliformis* occurs naturally from Ethiopia in the north to Swaziland in the south (Orwa *et al.*, 2009).

Diospyros mespiliformis occurs in woodland and wooded savanna, sometimes also in fringes of more humid forest, up to 1350 m altitude, rarely up to 2000 m. In many drier regions it is commonly found in riparian forest. The mean annual rainfall in the area of distribution is 300–2000 mm, with a dry season of up to 8 months. *Diospyros mespiliformis* is usually found on more fertile, deep soils, often on alluvial soils and termite mounds, but it are occasionally found on rocky hill slopes. Young trees have been recorded to be sensitive to fire (Orwa *et al.*, 2009).

Botanical Description and Cultivation

Diospyros mespiliformis (Ebanaceae) is one of the most widely distributed African trees and it grows in Nigeria under wider range of conditions than any other, this specie is widespread from north up to Sahara (National Research Council, 2008). It is commonly called Jackal-berry or African ebony. It is found in Savannah and Northern low land forest. It is an ever green tree of 12-15 m height but sometimes reaching up to 20 m or more in the rain forest (Aliyu, 2006)

Mature trees have dark gray fissured bark. An adult tree reaches an average of 4 to 6 metres in height, though occasionally trees reach 25 metres. The foliage is dense and dark green with elliptical leaves, which are often eaten by grazing animals such as elephants and buffalo. The tree flowers in the rainy season; the flowers are imperfect, with genders on separate trees, and are cream-colored. The female tree bears fruit in the dry season and these are eaten by many wild animals; they are oval-shaped, yellow or purple when ripe and about 20–30 mm in diameter. The fruit remain embedded in the persistent calyx lobes. Like the marula, the tree is favoured by the Bantu, who will leave them growing in their cultivated lands in order to harvest the fruit (Hyde, *et al.*, 2018).

Diospyros mespiliformis is a densely crowned evergreen tree, attaining heights of 15-50 m. The stem is rounded, buttressed, and has grey-black or black bark (Palgrave, 1981). The bark is smooth in young trees, but rough with regular scales in older trees. The leaves are alternate, oblong to elliptical in shape, 4-7cm long and 1.5-5.5cm wide, shiny above, paler beneath, and hairy when young (Janick & Paull, 2008). The white flowers are fragrant. Dioecious in nature, pollination is by bees. In Southern Africa, the tree flowers during the rainy season (October to November) and fruit matures during the April to September dry season (Palgrave, 1981; Janick & Paull, 2008). Its globose, fleshy fruit is about 3cm in diameter, greenish and pubescent when young, yellowish to orange when ripe, and with an enlarged calyx. The tree is easily propagated from seed (their dormancy is broken by

soaking the seeds in hot water for a few minutes), coppice cuttings, seedlings, and root suckers (Janick & Paull, 2008). *Diospyros mespiliformis* is a tree of the dry to moist tropics, where it is found at elevations up to 1,300 metres. It grows best in areas where annual daytime temperatures are within the range 16 - 27°C, but can tolerate 12 – 34°C. It prefers a mean annual rainfall in the range 500 - 1,300mm, but tolerates 400 - 1,500mm but prefers a sunny position. Prefers heavy soils and rocky soils along seasonal water courses and swamps.

Ethnobotanical uses

The leaves, bark and roots of the tree contain tannin, which can be used as a styptic to staunch bleeding. The roots are consumed to purge parasites and are thought to be a remedy for leprosy (Hyde, *et al.,* 2018). The bark and leaves were the most involved in traditional medicine. Examples of diseases treated include anaemia, diarrhoea, cough, ulcers, and stomach aches, blood evacuation after childbirth, and fortification of mothers and new-borns. Often, the plant part used was boiled as an infusion or soaked in boiled water as an infusion, and drinking the infusion as a liquid was the most common form of use (Gnonlonfin *et al.,* 2018)

Uses in local and popular medicine

Different societies in the world have different forms of use of *D.mespiliformis.* The study conducted by Gnonlonfin *et al.,* 2018 indicated that The different forms of use of *D. mespiliformis* in Northern Benin were decoction, maceration, filtration, powder, boiled pulp, ash, vegetable brush (toothpick), direct consumption, pounding, small cushion (leaves of *D. mespiliformis* rolled as a cushion), chewing, consumption after transforming on wine. Vegetable brush (toothpick), powder, ash, consumption after cooking on embers and soap. Gnonlonfin *et al.,* 2018 deduced that ethnobotanical consensus values for decoction, maceration, filtration, pounding and direct consumption use forms were high for Hausa, Yoruba, Adja, Batonu, Ditamari, and Berba but could be low for other ethnic groups. Mabogo (1990) reports that *Diospyros mespiliformis* is used to treat a number of ailments: the bark, leaves and roots help stop bleeding, heal wounds and treat ring worm infestation, dysentery and fever; they are also used as a remedy for leprosy; and the crushed fruit is applied to treat fungal infection of the scalp. Cheikhyoussef *et al.,* (2011) reported that the plant is used to treat male erectile dysfunction. The bark or leaves are steamed to treat malaria (Chinsembu and Hedimbi, 2010). Adzu and co-workers studied, the antipyretic, analgesic, and anti-inflammatory effects of the methanol extract of *D. mespiliformis* in rats and mice in an effort to verify the use of this plant in folk medicine to relieve pain and fever. Results revealed that the extract at doses of 50 and 100 mg/ kg i.p. exhibit significant antipyretic effect (Thomford, *et al.,* 2015).

The leaves, roots, bark and fruits contain antibiotic qualities and have many medicinal uses in West Africa. Roots and bark are used to stop purging and to enhance fertility, while the leaf decoction is used as remedy for fever, otitis and wound dressing. Bark and roots for infections such as pneumonia, malaria, syphilis, leprosy, dermatomycoses, as an anthelmintic and to facilitate child birth. Different parts used to cure toothache diarrhoea, headache, and as a psycho-pharmacological drug (Orwa *et al.,* 2009). An infusion of the bark is used to treat stomach ache. Bark and roots are also used for infections such as malaria, pneumonia, syphilis, leprosy, dermatomycoses, as an anthelmintic and to facilitate childbirth (Abba *et al.,* 2016). Barks and roots are used as psycho-pharmacological drug and to treat

tumour (Mohamed, 2009). Fruits decoction or infusions are taken to treat dysentery, diarrhea, and menorrhagia. Fruit ash is applied to fungal skin infections and fruit powder to ulcers, whereas seed decoctions are administered against headache. Twigs are chewed to clean teeth (El-Kamali, 2011). Its seeds are also known to have nutraceutical value in managing high cholesterol, reducing risk of type-2 diabetes, and for weight control (Preedy *et al.,* 2011). The Leaves Used as astringent, febrifuge, mildly laxative, stimulant and vermifuge. Infusion of the leaves is used in treatment of fevers, pneumonia, syphilis, leprosy and yaws (NRC, 2008).

A traditional food plant in Africa, this fruit has potential to improve nutrition, boost food security, foster rural development and support sustainable land care (Shaanika and Helvy, 2012). The fruit is edible for humans; its flavour has been described as lemon-like, with a chalky consistency. They are sometimes preserved, can be dried and ground into a flour, and are often used for brewing beer and brandy. The Ovambo people call the fruit of the Jackal berry eenyandi and use it to distill Ombike, their traditional liquor (NRC, 2008).

Nutritional value of the Species

A traditional food plant in Africa, this fruit has potential to improve nutrition, boost food security, and foster rural development and support sustainable land care. Fruit - raw, cooked, dried or made into beverages by fermentation. The seed have high contain of carbohydrate which make the seed a potential source of Dietary energy in human. The rural people used it as source food during drought days when the conventional crops fail. The diversity of the fatty acid profile lends the oil to potential exploitation in human nutrition and health, chiefly as a source of essential fatty acids (EFAs) and as a raw material for synthesis of other critical lipids vital for supporting key physiological process in the body (Chivandi, *et al.,* 2011). The fruit is edible for humans; its flavour has been described as lemon-like, with a chalky consistency. They are sometimes preserved, can be dried and ground into a flour, and are often used for brewing beer and brandy (Shaanika and Helvy, 2012). The Ovambo people call the fruit of the Jackal berry eenyandi and use it to distil Ombike, their traditional liquor. The seed oil has the potential to be exploited as a source of metabolic raw material for both DHA and EPA in the form of ALA. In the DSM seed oil, ALA could be used as a dietary supplement to arrest the development and progression of DHA-deficiency triggered depression and other physiological conditions associated with decreased concentration of omega-3s in the body (Chivandi, *et al.,* 2011).

Non timber forest products are among the most important natural products that are obtained from the wild. These products play a vital role in the livelihood of rural and even the urban dweller.

Diospyros mespiliformis as a wide range of medicinal and traditional value. According to this review, it serves as a potential source of source of human nutrition. The seed have high contain of carbohydrate which make the seed a potential source of Dietary energy in human.

The rural communities used it as a source of livelihood especially when the conventional crops fail. The *Diospyros mespiliformis* has a wide range of medicinal and traditional uses. According to the literatures, the specie is a good source of antioxidant, anti-inflammatory, anticancer, analgesic, Antiplasmodial hypoglycemic, and antioxidant. The various medicinal and Ethno-medicinal properties found in various findings might be useful in development of new drugs and food recipes.

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