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Original Research Article

Velvet Tamarind (Dialium Guineense) : A Comprehensive Review of its Botany, Phytochemistry, Pharmacology, Nutritional Value, and Industrial Applications

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A B S T R A C T

Dialium guineense (African Velvet Tamarind) is an underutilized plant predominantly cultivated in West Africa especially in Nigeria. It contains tremendous amount of carbohydrate along with fiber, vitamin, minerals and a lesser amount of protein varying on the part of the tree. This study aims to review the nutritional composition, medicinal properties, antimicrobial activity, phytochemical and antioxidant of various parts (pulp, stem bark, seed and leaf) of the plant. The pulp is mainly ingested raw where it is believed to increase lactation among women and can be processed into juice. The stem bark along with it leaves is also used to treat cases of ailment where it also serves as treatment against bacterial infection and scavengers of free radicals. It is also used in the industry where it serves purpose in confectionery obtained from the pulp flour, as thickening agent in food, for making biodegradable packaging material, as animal feed and used in construction work. This review, carried out on Dialium therefore recognizes a need to make awareness on the lack of clinical trial on any therapeutic application of the plant even though laboratory examination has been conducted, in addition to fully study the bioavailability of the bioactive compounds and their by-product.

1. **Introduction**

Over the last few years, with an increasing awareness of global food security, environmental sustainability and the ever increasing prevalence of chronic diseases, significant efforts have been devoted to the search of alternative food resources exhibiting nutritional and therapeutic properties. As a result, there has been a growing focus on scientific research on underutilized indigenous plants with high nutritional and medicinal value, but not widely used in modern agriculture and food systems (Knez et al., 2024). It is to be noted that these plant species are variously described as ‘underutilized’, ‘orphan’, ‘neglected’ ‘indigenous’, ‘minor’ or ‘promising crops' due to their tremendous values but lacking research interest and commercial investment. Indigenous people have been relying on these plants as valuable sources of food, medicinal, fibre, edible oils, herbs and other products for centuries. But the lack of modernization, urbanization and the intensive cultivation of a few main commercial crops has led to significant reductions in cultivation, consumption and economic significance. Their underutilization is further exacerbated by inadequate post-harvest shelf life, seasonality, lack of nutritional characterization, limited processing technologies, weak market development and low awareness among consumers (Peduruhewa et al., 2021). However, their increasing awareness as a source of nutritive values and bioactive compounds has revived their recent scientific interest as sources of sustainable agriculture, functional foods, and public health.

The African velvet tamarind (Dialium guineense Willd.) is one of the less utilised natural resources of the area. It is a tropical fruit tree that belongs to the Fabaceae family and subfamily of Caesalpinioideae (Zacchaeus et al., 2021; Aburime et al., 2024). It is native to the humid tropical forests of West and Central Africa, where it occurs naturally in Nigeria, Ghana, Benin, Togo, Sierra Leone, Liberia, Côte d'Ivoire and Cameroon. Nigeria is one of the major producers and consumers of the species among these countries (Ehiem et al., 2025). All parts of the tree are nutritiously, medicinally or economically useful and this has made it a valuable tree in traditional African societies. Although Dialium guineense is abundant in many rural areas, it is not very cultivated and underutilized, with most of the fruits being collected from existing wild trees. Dialium guineense is a medium to large tree, which can reach a height of about 30 m under optimum environmental conditions (Airaodion et al., 2021). It has a dense crown and small, dark

brown to black fruits in hard velvety pods. Fruits are almost spherical with one or two smooth, glossy black seeds enclosed in a dry, powdery, edible pulp which is orange to brown in colour. The pulp has a distinctive sweet acid taste which is very appealing to consumers, especially children. The edible pulp is commonly eaten as a sweet, refreshing snack across West Africa; this portion of the fruit is the most economically valuable and is edible.

An extraordinary property of Dialium guineense is the versatility of its different parts. The roots, stem bark, leaves, fruits, seeds and pulp have all been reported to have moderate nutritional and medicinal values (Ogbuewu et al., 2023). Ethnobotanical studies show that the species has been used for centuries in traditional medicine with various parts of the plant used for a variety of human ailments (Banjo, 2019). Recent research in phytochemistry and pharmacology has given increasing support to many of these traditional properties, with the discovery of compounds that are active in the body and which provide the therapeutic effects.

The pulp of the fruit is the most eaten portion of the plant, and is also used medicinally. It is eaten fresh after harvest due to its freshness and pleasant taste, and is traditionally eaten immediately after harvest. Apart from the direct consumption, recent studies have shown that the pulp can be processed for a number of value-added food products such as fruit juices, beverages, syrups, pastries, and jams, candies, and other confectionery products (Ezeocha et al., 2022). Due to its pleasant sensory properties and nutritional profile, it is being explored as a raw material for the formulation of functional foods to satisfy the high consumer's interest on the creation of products with natural and health promoting properties.

In addition to it's food applications, the pulp of the fruit has several ethnomedicinal applications. It has been used traditionally for treating diarrhoea and other gastrointestinal diseases due to its putative anti-microbial and astringent activity. In addition, the fruit of S. lychnodora is traditionally eaten by women after childbirth in several communities in the south east Nigeria to boost breast milk production and lactation (Ogbuewu et al., 2023). While more research is needed to confirm its clinical efficacy, the ongoing application of this traditional practice underscores the species' cultural and medicinal relevance in traditional healthcare practices.

The leaves and stem bark of Dialium guineense are also highly valuable traditional medicines. The leaves and flowers have a very bitter flavor and are used as a medicine in the form of a tea or tincture to treat a wide variety of ailments. Bakare-Odunola et al. (2024) and Upeka et al. (2024) reported the traditional uses of preparations made from leaves and bark in the treatment of stomach disorders, peptic ulcers, cardiovascular diseases, eye infections, malaria, fever and inflammatory diseases. The extracts from these parts of the plant have also been employed in scientific studies and found to possess antioxidant, antimicrobial, anti-inflammatory, antimalarial, antihyperglycaemic, and hepatoprotective activities, which substantiate several of the traditional medicinal applications.

Dialium guineense has great medicinal value as well as industrial value. The stem yields heavy, hard and fine-textured wood of light-brown colour, and can be used in a wide range of construction applications. The ICRAF Agroforestry Database (2002) reports that the timber is often used to produce furniture, vehicle bodies, building materials, agricultural tools and floor products. The high density and durability of the wood also make it a good fuel wood and charcoal source in many rural areas. They are important in terms of the socio-economic importance of the species and additional livelihoods to those households involved in harvesting and utilizing the species.

Recent studies also have shown the industrial potential of Dialium guineense seeds. Although the seeds are usually discarded after eating the edible pulp, there are substantial amounts of extractable oils in the seeds which can be used in various industrial processes. Asante-Ampadu et al. (2023), and Upeka et al. (2024), have proved that the oil extracted from the seeds can serve as a source of renewable and environmental friendly energy through the process of biodiesel production. Further, the isolated oil has displayed beneficial therapeutic effects and may find applications in the pharmaceutical industry, cosmetics, and nutraceuticals. The results also highlight its economic potential which is yet to be utilised.

Although Dialium guineense is widely available, it is underutilized in commercial processing of food and industrial production, to the extent of being used by only a small portion of the population across Africa. The use is still very much limited to traditional consumption and to the small-scale local markets; there are few commercially processed products made from the fruit. However, several constraints have hindered its commercial exploitation to any great extent, such as poor post harvest handling systems, storage instability, limited processing technologies, lack of value addition, seasonal fruit availability, weak marketing systems, and lack of investment in fruit research and product development. In addition, consumers in non-producer areas are not well aware of the African velvet tamarind and this has limited the growth of commercial markets.

To overcome these limitations, more scientific efforts and coordination between researchers, food industries, policymakers and agricultural stakeholders are needed. Improved processing technologies which will be able to retain the nutritional value of the fruit and increase the shelf life are urgently needed. Likewise, innovative food products, optimal extraction techniques for valuable phytochemicals and sustainable value-chain development of the species should be studied. These would not only result into increased economic significance of Dialium guineense but also food security, livelihoods improvement of the rural population and biodiversity protection.

The interest of the scientific community in functional foods and traditional medicinal plants highlights the need and timeliness of a synthesis of existing data about Dialium guineense. Therefore, this review critically analyzes the food and nutritional composition, phytochemical composition, functional properties, pharmacology, and industrial perspectives of African velvet tamarind. The review provides a summary of the plant's significant functional food and medicinal potential, based on available scientific evidence, and also points out areas of scientific uncertainty and knowledge gaps that need to be addressed. The results presented are expected to give guidance to future studies, assist product development, facilitate commercial utilization as well as encourage sustainable

exploitation and conservation of this highly valuable indigenous African species.

Methodology

A total of 39 recent and relevant papers was consulted in the course of writing this review. This journal articles were accessed using Goggle Scholar, keywords like *Dialium guineense*, velvet tamarind, therapeutic, phytochemical, functional, and underutilized were used to accessed this paper. A table was also included in this review showing the proximate composition and mineral content of different part of the plant.

Botanical and ecological aspect

Dialium guineense Willd. is a tropical tree of the Fabaceae family, subfamily Caesalpinioideae, which bears edible fruits. From the taxonomical point of view, the species belong to the Kingdom Plantae, Division Angiosperms, Class Dicotyledons, Order Fabales, Genus Dialium and Species guineense (Ogbuewu et al., 2023). The tree is native to humid tropical areas of Africa and is considered one of the most important and least used indigenous fruit trees due to its nutritional, medicinal, ecological and socio-economic benefits. The species is known to grow in the wild, and is used by rural communities for generations, but it is largely underutilized for commercial agriculture and industrial food production. However, the species has become a subject of renewed interest in recent years due to its rich phytochemical content and its wide range of biological activities, particularly in the field of functional foods, sustainable agriculture and medicinal plants.

Dialium guineense is mostly found in the tropical forests of West and Central Africa where the climate is conducive to its growth and natural regeneration. The species is known to occur in several countries, including Nigeria, Ghana, Senegal, Sierra Leone, Liberia, Côte d'Ivoire, Togo, Benin, Cameroon, Equatorial Guinea and the Democratic Republic of The Congo (Upeka et al., 2024). Nigeria is considered as one of the important occurrence, utilization and commercialization centres of the fruit among these countries. The tree grows well in tropical rainforests, dense savannah forests, riverine forests, gallery forests, woodland savannahs and transitional forest areas, where there is sufficient rain, fertile soils and warm temperatures (Igu, 2023). The species typically blooms and produces fruits seasonally in the species with fruit maturation between October and January, a time when fruits are readily available in the local markets of many West Africa communities.

D. guineense is widely distributed throughout tropical Africa and hence there are a number of indigenous vernacular names given to the species that reflect important cultural use. Different ethnic groups have given different vernacular names to the species in Nigeria where the fruit is used extensively. It is called Icheku among the Igbo people and Awin among the Yoruba. In Nigeria, the Hausa name for the fruit is Tsamiya Kurm while the Niger Pidgin English name is Licky Licky due to their habit of consuming the pulp of the fruit which has a sweet-sour taste and then licking the pulp off the seed after discarding it (Aburime et al., 2024; Ajayi et al., 2024). The various local names show how popular and culturally significant African velvet tamarind was among the various ethnic groups.

African velvet tamarind is so named because of the velvety fruit pod. This defines its characteristic texture which is different from a number of tropical fruits and is one of its most distinctive botanical traits. The tree can grow to about 30 m under favorable environmental conditions (Offor et al., 2025) and is relatively large. Typically forms a wide and dense canopy with good shade, but can be shrubby in some ecological conditions (Abdulrahman & Bello, 2023). The tree is a highly valued tree in the forest and it plays an important role in the structure and stability of the forest ecosystem due to its deep root system and broad canopy.

Dialium guineense also differs from other related species from the tropics in its vegetative morphology. The leaves are compound, alternate, imparipinnate and attached to a common petiole that is about 5-13 cm long. Each leaflet is broadly elliptical to broadly ovate, and has rounded apices ending in short acuminate tips. The upper surface of the midrib is typically depressed, and the lower surface may have fine hairs, depending on the maturity of the leaf (Bashir et al., 2025). The color of young leaves is generally light green, but darkens with age. Often, the dense canopies help make the tree more ornamental, but also increase the tree's photosynthetic and ecological capabilities.

Reproductive organs of D. guineense are also unique. The tree flowers profusely with many small cream-coloured to whitish flowers in a dense cluster. These flowers have a nice smell that will draw many kinds of pollinating insects, such as bees and other beneficial pollinators. Eventually the successful pollination leads to the development of the typical fruits, which are small, round drupes about 1-2.5cm in diameter (Lely, 2025). The fruits mature into a hard, brittle brown to dark brown or black shell. The shell has many fine velvety hairs which give the common name "velvet tamarind.

The edible part of the fruit is underneath its hard shell. The pulp is dry, powdery in texture and ranges in colour from orange to reddish brown. It encloses one (or sometimes two) hard seeds at the centre of the fruit. The pulp is also sweet and sour, which is very attractive to consumers of all age groups and is crucial to its popularity as a refreshing snack in West Africa (Airaodion et al., 2021). The sweetness and acidity balance are typical for the fruit and is part of the reason for the fruit's unique flavor and the fact that it is eaten so much during its fruiting season. The seeds are hard, flattened, smooth and shiny and brown, which further defines the fruit's unique appearance (Lageiro et al., 2025).

The fruit is eaten fresh, but more and more scientific research indicates that it has great potential for value addition in the food industry. The edible pulp can be used to manufacture fruit juices, syrups, concentrates, jams and jellies, confectionery, bakery products, beverages and other functional food products. The fruit is rich in natural bioactive compounds, well-nutritious and has a nice taste, which makes it an interesting raw material for health promoting food products. Although these benefits, commercial processing of African velvet tamarind is still relatively small due to the lack of good processing technologies, storage stability, seasonal availability and low industrial investment.

Other than its nutritional significance, Dialium guineense has gained much popularity due to the fact that almost all of its parts have medicinal properties. Ethnobotanical investigations have revealed that the roots, bark, leaves, fruits, pulp and seeds have a wide range of applications in traditional medicine against various ailments such as diarrhoea, malaria, gastrointestinal disorders, fever, inflammation, microbial infections and cardiovascular diseases. In the modern phytochemical investigations, it has been further established that these therapeutic properties are due to the presence of flavonoids, tannins, phenolic compounds, saponins, alkaloids and other secondary metabolites with biological activity. The results have led to further research into the pharmacological potential of the species, as well as its potential uses in the development of pharmaceutical and nutraceutical products.

Dialium guineense has several important ecological roles besides being nutritionally and medicinally important. The species belongs to the Fabaceae family and is known for its ability to form symbiotic relationships with nitrogen-fixing microorganisms, which help to improve soil fertility by fixing nitrogen through biological nitrogen fixation (Dissanayaka et al., 2024). This natural process helps to make soil nutrients more available, boost crop productivity, and also lessen reliance on artificial nitrogen fertilizers. As a result, African velvet tamarind is gaining significance as a key element in agroforestry systems and sustainable agriculture. The wide canopy also helps to shade understory crops, prevent soil erosion, conserve soil moisture, and create good habitat for birds, insects and other wildlife, which aids in the conservation of biodiversity. Although Dialium guineense is widely distributed in many tropical areas, it is one of the least utilized indigenous fruit trees in Africa, notwithstanding its outstanding nutritional, medicinal, ecological and economic values. Commercial cultivation is still limited, most fruits are collected from naturally growing trees. Likewise, only a limited number of industrial products have been developed for the local or international market and the industrial use of the fruit is still limited. The underutilization has been blamed on lack of research for large-scale cultivation, poor post harvest management practices, limited value addition technologies, lack of commercialisation plans and low awareness of consumers in non-producing areas.

However, the rising demand for sustainable food, functional foods and bioactive compounds of plants origin has ignited the curiosity of science for African velvet tamarind. The nutritional value, the variety of phytochemical constituents, medicinal potential, ecological role, and adaptability to tropical cultivation make it a promising crop species for future agricultural, nutritional, medicinal and industrial uses. Research efforts continue into ways to enhance the cultivation, post harvest technologies, food processing and product development to optimize the socioeconomic potential of this valuable indigenous African fruit tree, while ensuring its conservation and sustainable use.

1. NUTRITIONAL COMPOSITION

Many epidemiological and nutritional studies have confirmed that eating fruits and vegetables is one of the cornerstones of human health and prevention of chronic diseases. These plant based foods are a great source of essential nutrients, dietary fibre, antioxidants, vitamins, minerals and many other bioactive phytochemicals that are beneficial to normal physiological functions and their role in disease prevention. Temperate fruits are also rich in nutrients, but the tropophils are gaining increased scientific interest as they are rich in various macro- and micronutrients with many of them still unexplored and have significant health promoting value (Mohammed et al., 2022). Therefore, there has been an increased focus on the study of indigenous tropical foods used by local communities that were not well utilized in the present food system. The African velvet tamarind, Dialium guineense Willd., is an important indigenous fruit due to its nutritional composition, medicinal benefits and potentials as a functional food ingredient (Olawoyin & Atarase, 2022).

African velvet tamarind is found in the wild throughout West and Central Africa, and has also long been used as a food and traditional medicine in these areas. While the edible fruit pulp is the most widely used part of the plant, extensive scientific studies have shown that all parts of the species from the fruits, leaves, bark, roots, and seeds are edible and have medicinal properties. Such parts of the plants have been utilized in traditional medicinal practices for treating a variety of ailments and as beneficial nutritional sources for people in rural areas (Victor-Osanyinlusi, 2022). The accumulating scientific support for these traditional uses has encouraged the interest of the species as a source of natural bioactive compounds, for use in food, pharmaceutical, and nutraceutical industries.

The edible pulp of Dialium guineense is especially sought after for its good nutritional profile. A few studies have noted the presence of significant levels of dietary fibre, essential vitamins, minerals, protein and carbohydrates in the pulp, which renders it nutritionally advantageous for human consumption (Ogbuewu et al., 2022). It has a lower protein content than legumes and some nuts but it does provide significant quantities of nutrients that can be complimented with other food sources. The multi-functionality of carbohydrates, fibres, vitamins and minerals makes it even more nutritional and grants it the status of a functional food with added health-promoting properties above its nutritional role.

African velvet tamarind pulp is the main macronutrient and it is composed mainly by carbohydrates. The high carbohydrate content renders the fruit as a significant source of energy in the diet, especially for children and rural people, who often eat it as a seasonal snack (Airaodion et al., 2021; Victor-Osanyinlusi, 2022). The carbohydrate fraction is mostly made up of naturally-occurring simple sugars which are readily available for normal metabolic activities. These sugars give the pulp its characteristic sweetness, but the fruit has a high level of natural organic acids which gives it a distinctive acidic taste. This is a unique taste that sets the African velvet tamarind apart from other varieties, and accounts for its great popularity among consumers across West Africa.

In addition to its carbohydrate, Dialium guineense pulp is considered to be a good source of dietary fibre. The gastrointestinal system benefits significantly from dietary fibre as it improves digestion, bowel movements, the feeling of fullness and the growth of beneficial microorganisms in the intestine. Intake of adequate fibre has also been linked to a lower risk of obesity, diabetes mellitus, cardiovascular diseases and some cancers. Thus, frequent intake of fibre-rich fruits like

African velvet tamarind could play a pivotal role in better digestive health and nutritional utmost.

Mineral profiling studies have also revealed the presence of significant amounts of several essential minerals of the fruit pulp essential for normal physiological functions. These include iron, magnesium, calcium and potassium, which are all essential to human metabolism. Iron is a key part of haemoglobin formation and the transport of oxygen within the body; calcium helps to form healthy bones and teeth, muscle contraction and blood clotting. Magnesium is a cofactor for many enzymatic reactions in energy metabolism; potassium is essential for blood pressure, nerve transmission, muscle function and electrolyte balance. Comparative nutritional studies revealed that the concentrations of these minerals in African velvet tamarind is comparable with the concentration of several commonly consumed indigenous fruit such as hog plum (Spondias mombin), wild mango (Irvingia gabonensis), date fruit (Phoenix dactylifera), African elemi (Canarium schweinfurthii), and pepper fruit (Dennettia tripetala) (Maduako et al., 2021; Okpomor et al., 2026). The results indicated the high nutritional value of African velvet tamarind as a source of dietary mineral.

Comparative studies carried out in recent years also have yielded useful insights into African indigenous fruits' carbohydrate composition. Lageiro et al. (2025) conducted a study to compare the nutritional composition of three indigenous African fruits and reported that African velvet tamarind contained lower amount of sugars than African locust bean pulp, however, it had relatively higher amount of organic acids. The high acidity is a major factor in the tart taste of the fruit compared with many tropical fruits. The distinctive taste adds to its sensory appeal and may also help preserve and fight against oxidative stress.

The nutritive value of Dialium guineense is further increased because of its vitamin content. The fruit pulp contains significant amounts of vitamin C (ascorbic acid), niacin (vitamin B_3) and provitamin A carotenoids, with lutein being the major carotenoid found in the fruit (Aburime et al., 2024). These vitamins are important for many of the physiological processes required for good health. Vitamin C is a potent antioxidant that enhances immunity, stimulates collagen production, aids wound healing, enhances Fe absorption and prevents damage to cells by reactive oxygen species. African velvet tamarind is a cheap and easily available dietary source of vitamin C, especially in rural areas where vitamin supplements in the form of commercial products are not easily accessible.

The available evidences suggest that the nutrient content of vitamin C of African velvet tamarind can provide over 50% of the recommended daily nutrient intake as recommended by the FAO/WHO (2004). This unique nutritional property highlights the fruit's contribution to combating Vitamin C deficiency-related diseases, as well as its role in improving immune system response and antioxidant defense mechanisms (Aburime et al., 2024). As a result, the consumption of this fruit could play a major role in enhancing micronutrient intake of vulnerable groups.

Also in African velvet tamarind, niacin is another nutrient of importance. Niacin content of fruit has been found to be higher than that of about twenty-eight other commonly consumed fruits studied by Catak and Yaman (2019) by comparative nutritional analysis. Niacin has several metabolic roles such as involvement in energetics, healthy skin, adequate nervous system activity and DNA repair. Being relatively concentrated, it also increases the nutritional value of African velvet tamarind and makes it more important as a functional fruit.

The same goes for the provitamin A carotenoids, especially lutein, which provide other health benefits. Carotenoids are powerful antioxidants that can neutralize free radicals and lower oxidative stress and damage to the cells. Lutein is particularly important for normal eye health, protection from light-induced damage to the eyes, and for decreasing the risk of age-related macular degeneration and cataracts. These carotenoids contribute to the overall health benefits of African velvet tamarind, further enhancing the plant's nutritional value and potential for long-term health benefits.

In addition to the edible pulp, recent chemical characterisation studies have shown that other parts of the fruit are also very nutritious. Flavie-Adopo et al. (2024) studied the chemical composition of the pulp, kernels and shells of Ivorian African velvet tamarind, and found that all the fractions had contents of nutritionally valuable components. Based on this research, it is concluded that only a small portion of the fruit can be considered as waste if suitable processing technologies are applied. Rather, the pulp, the kernels, the shells can all be used to produce food ingredients, nutraceuticals, animal feed or industrial raw materials. This extensive use would enhance the efficiency of using the resources, minimize the loss of resources after harvest, and boost the economic value of the species.

The scientific evidences available so far show that D. guineense is much more than seasonal indigenous fruit. The pulp is an excellent source of carbohydrates, dietary fibre, essential vitamins, minerals and bioactive compounds that play a significant role in human nutrition and health. Moreover, the nutritional value of its kernels and shells offers the opportunity to use the whole fruit in sustainable food processing systems. The growing demand for functional foods and for the use of the underutilized tropical fruits makes Africa velvet tamarind a potential source for value added industrial products, dietary supplements and nutritious foods.

Table 1: Summary of Representative Proximate Values

Nutritional and Chemical Composition	Fruit Pulp	Seed/Kernel
Carbohydrate	45.0-79.0%	40.0-60.0%
Protein	3.5- 4.0%	15.0-24.0%
Ash	12.5- 13.5%	2.5-3.5%
Moisture content	12.5-23.0%	10.0-11.5%
Fiber	0.4-2.0%	12.0-14.0%
Notable minerals	Fe,Mg,Ca,K	Ca,Mg,Fe (higher)
Distinguishing features	Vitamin C, tartaric acid, lutein	Polyphenols, tannins; reduced by roasting

Values are ranges adapted from Victor-Osanyinlusi et al. (2022), Ogbuewu et al. (2023) and Flavie Adopo et al. (2024).

2. PHARMACOLOGICAL AND MEDICINAL PROPERTIES

Dialium guineense (African velvet tamarind) is an indigenous medicinal plant with significant scientific interest due to its rich phytochemical composition and multiple *nutraceutical* properties. The plant is considered an important natural resource in many African nations and has long been employed in traditional medicine for disease prevention and treatment in relation to a variety of ailments. The medicinal potential is attributed to the presence of bioactive compounds which have antioxidant, antimicrobial, anti-inflammatory and therapeutic activities. The versatility and significance of the plant in improving human health and well-being are highlighted by its use in almost every part of the plant for indigenous healthcare systems (Ogbuewu et al., 2023). With the rising demand for plant-based medicines and functional foods around the globe, African velvet tamarind is becoming an attractive source for obtaining natural compounds of interest for pharmaceutical, *nutraceutical* and food applications.

Of all the parts of the plant, the fruits are most eaten due to their sweet-sour flavor and nutritional benefit. Fruits are usually gathered from wild trees and traded in local markets around West Africa and eaten fresh by both children and adults as a seasonal snack. In addition to being consumed as food, the edible pulp is used to make locally produced beverages, such as a refreshing drink commonly referred to as "Licky Licky juice", which is particularly enjoyed by older consumers due to its health benefits (Onah et al., 2022). The fruit's popularity is not only due to its sensory qualities but also its reputation for promoting health and vitality.

Traditionally, the fruits of Dialium guineense are used for the treatment and control of various diseases. The fruit pulp is used by herbalists to treat diarrhoea due to its antimicrobial and astringent effect reported in the literature (Ogbuewu et al., 2023). The fruits are also used traditionally for the control of bronchitis, chronic cough, malaria, stomach ailment, wounds and other infectious diseases. The fruit is also used for human consumption in the postpartum period in certain communities of southeastern Nigeria where women believe it increases breast milk production and promotes lactation (Onah et al., 2022). This is an old claim that needs to be scientifically substantiated with controlled clinical trials, but its relevance to indigenous culture and therapeutic use are evident in its continued usage.

The leaves of *Dialium guineense* also have medicinal value and have been used in traditional medicine for a long time. Leaves used for making decoctions and infusions are often used for treating cases of fever, oedema and pregnancy discomforts, especially in women (Onah et al., 2022). In addition to their medicinal uses, the leaves are also eaten as vegetables in some communities, providing a great source of nutrition and phytochemicals. They can be both food and medicine, supporting the idea of the *nutraceuticals*, the growing notion of foods derived from plants having health properties in addition to nutritional ones. The leaves' therapeutic activity has been proposed to be linked to flavonoids, tannins, phenolic compounds, saponins and other secondary metabolites which are rich in antioxidant and anti-inflammatory properties.

African velvet tamarind flowers are also edible, and sometimes used as a vegetable in some areas. Traditionally, the flowers have been consumed, but only a few studies have specifically focussed on the nutritional profile of the flowers, suggesting that they may provide other minerals, vitamins and phytochemicals. Likewise, the seeds have several industrial uses that are important apart from their medicinal properties. The gum obtained from the seeds has been reported to have excellent thickening and stabilizing properties and is used in various food products in Japan for its viscosity and texture properties (Utubaku et al., 2017). This is a commercial application of the species that is beyond food and medicinal uses.

The stem bark is also a valuable part of *Dialium guineense* and is widely used in traditional medicine. In various regions of Nigeria, the bark is used as a natural chewing stick, as an indigenous tooth brush which is used for oral care (Onah et al., 2022). Chewing sticks are widely used and are part of traditional practices that are both associated with dental care and contain beneficial compounds for oral care. Traditional healers also make bark remedies for the treatment of cough, toothache, bronchitis, headache, body pain and some types of cancer. Ovuakporie-Uvo et al. (2019) also reported that the stem bark is used by the Esan of Edo State, Nigeria as both oral hygiene and stomach ailment treatment. This ethnomedicinal use has encouraged drug- and phytochemical research to discover what bioactive compounds are responsible for the therapeutic properties of the bark.

Dialium guineense has several other economic and industrial uses apart from its medicinal use. Tree yields hardwood of high density, strength and resistance to decay for use in construction. Uses of the timber are for making furniture, building materials, floors, agricultural implements and household utensils. In rural areas, the wood is also used as a valuable fuel for cooking and heating at home, as well as for making charcoal. These many uses add to the socio-economic value of the species and other livelihood opportunities for local people.

The scientific studies recently conducted also enhanced knowledge about the pharmaceutical properties of Dialium guineense. Leaf meal of the plant has been shown to have spermatogenic activity in animal models, indicating its potential for enhancing male reproductive health and fertility (Ogbuewu et al., 2023). Furthermore, anti-ulcerogenic effects have been found, meaning that leaf extracts could help to prevent the formation of gastric ulcers and promote gut health. The results support the use of the plant as a source of scientific support for a number of traditional medicinal uses, and for the development of new therapeutic agents.

There has also been a growing interest in the use of African velvet tamarind in food processing. The fruit pulp of the variety has been found to have favourable physicochemical properties such as moisture content, particle size, acidity and functional properties for food formulation. The products made using the pulp flour have also been sensory evaluated, and shown to have good overall consumer acceptability, flavour, texture and colour. Thus, the flour is considered to be a good raw material for making value added confectionery products like candies which are highly demanded by the consumers. The use of African velvet tamarind in processed foods could then support the diversity of foods and increase the use of this largely underutilized indigenous fruit.

The phytochemical content of Dialium guineense also plays a role in its significance to oral care. Prior studies have revealed the presence of saponins in various parts of plants, including stem bark (Onah et al., 2022). Saponins contain natural surfactant properties which make them cleansing when chewed, helping to get rid of debris and micro organisms from the surfaces of teeth. Moreover, some of these compounds have been proposed as anti-plaque agents and as preventive for dental caries, thus justifying the use of the bark as a natural toothbrush. Antimicrobial property of saponins along with other phytochemicals like tannins and flavonoids may play a collective role in oral health and prevention of periodontal diseases.

In general, Dialium guineense is an indigenous tree with many nutritional, medicinal, industrial and economic applications that still have a great scientific interest. Beyond traditional uses, all parts of the plant (fruits, leaves, flowers, bark, seeds and wood) have significant applications in food science, nutraceutical, pharmaceutical and industrial processing. Its rich phytochemical composition is responsible for many of its reported therapeutic activities such as antimicrobial, anti-inflammatory, anti-ulcerogenic, spermatogenic and oral health promoting activities. Moreover, its use in food processing industry, especially for beverages, confectionaries and functional food ingredients, offers great potentials for commercial value addition. Scientific studies on its bioactive compounds, clinical validation of its medicinal properties, and the development of innovative food and pharmaceutical products will further improve its utilization and conservation as an important indigenous medicinal and nutritional resource in Africa.

4. ANTIMICROBIAL ACTIVTY

Research has investigated the antimicrobial activities of the phytochemical constituent on different part of *Dialium guineense* (African Velvet Tamarind). Madu *et al.* (2022) investigated the antibacterial effect on aqueous leaves extract as a treatment for throat infection induced by Escherichia coli. The seed extract has been reported to indicate complete antagonism effects at various concentrations range (1000-250 μgml^{-1}) on Enterococcus faecalis (30 mm) and Serratia marcescens (15 mm) isolated for general metabolic use. It was reported that the sensitivity of Gram positive and negative bacterial stains to the seed extract was driven by the cooperative actions of the secondary metabolites predominantly phenolic compound and terpenoid (Zacchaeus *et al.,* 2021). Airaodion *et al*., (2021) found that aqueous and ethanolic extract of *Dialium guineense* (African Velvet Tamarind) fruit possesses bactericide activities against C. bacillus, S. epidermidis, S. aureus, S. viridians, S. typhi, and E. coli with the ethanolic extract showing a high level of potency when compared to aqueous extract.

5. PHYTOCHEMICAL PROFILE AND ANTIOXIDANT ACTIVITY

One strategy for isolating compounds with potential bioactivities while continuously detecting the secondary metabolites present using established techniques is phytochemical profiling (Olawoyin & Atarase, 2022; Ogbuewu *et al*., 2023). According to phytochemical research, *Dialium guineense*, often known as African velvet tamarind, is a readily available, affordable, and environmentally friendly source of nourishment. The seed is filled with alkaloids, tannins, glycosides, cardenolides, and steroids, yet the seed did not show the presence of terpenes, flavonoids and resins (Olawoyin & Atarase, 2022; Upeka *et al*., 2024). Saponins, triterpenes, tannins, and flavonoids were found in the phytochemical profiling of *D. guineense* (African Velvet tamarind) leaves and fruits using ethyl acetate, chloroform, and methanol extracts. Triterpenes and steroids were found in the plant extracts, but alkaloids and anthraquinones were not (Usman *et al*., 2026). Organic acids such malic, ascorbic, tartaric, citric, and sugars are abundant in the plant (Olawoyin & Atarase, 2022; Upeka *et al*., 2024). Subsequent analysis of the fruit and leaf essential oils revealed that the leaf oil was relatively richer in alkanes and alkenes, with the polyacetylene compound "falcarinol" identified as its predominant component, whereas the fruit oil was dominated by fatty acids, with hexadecanoic (palmitic) acid as the major constituent (Asante Ampadu *et al*., 2023).

Many bioactive chemicals found in the methanolic extracts of *Dialium guineense*(African Velvet tamarind) pulp, bark, seeds, and leaves contribute to the plant's potent antioxidant activity. These bioactive substances are expected to contribute to the prevention of degenerative disorders related with oxidative stress (Ogbuewu *et al*., 2023). The antioxidant investigation of essential oils extracted from the fruits and leaves of *Dialium guineense* (African Velvet Tamarind) evaluated the antioxidant potentials using several assays, phosphomolybdenum assay, DPPH free radical scavenging assay, hydrogen peroxide scavenging assay and lipid peroxidation inhibition assay. The data suggested that the leaf and fruit essential oil displayed equivalent hydrogen peroxide scavenging capabilities. On the other hand, compared to the leaf oil, the fruit essential oil showed a greater ability to scavenge DPPH radicals. Furthermore, compared to the leaf oil, the fruit oil was more successful in preventing lipid peroxidation, indicating a stronger total antioxidant capacity (Asante-Ampadu *et al*., 2023).

6. FOOD SCIENCE AND TECHNOLOGY APPLICATIONS

From a product development perspective, *Dialium guineense* (African Velvet Tamarind) is a promising functional food ingredient that could be incorporated into flour composites, complementary foods as well as in beverage formulation. The pulp is majorly consumed fresh and sometimes consumed as a non-alcoholic drink (Onah *et al*., 2022). The pulp flour has been studied to have desirable physicochemical and sensory properties making it a useful raw material in the production of candy, cakes and other confectioneries (Cheadoloh *et al*., 2022; Ezeocha *et al*., 2022; Lageiro *et al*., 2025). The flowers and leaves of the plants are eaten as vegetables, the gum extracted from the seed is incorporated into various kinds of food in Japan to enhance their viscosity, in Nigeria the bark is used as a traditional indigenous toothbrush (Onah *et al*., 2022; Usman *et al*., 2026).

In Guinea, where processing the pulp into soft drinks is currently the main commercial use of the fruit, the seeds left over from this process have traditionally been treated as waste. A Research by Sekou *et al*. (2025) reported that flour and gum derived from the seeds can function as a thickening agent in

food, improving the colloidal stability of heat-treated fruit juice during storage at both cold and ambient temperature. This finding is significant in the food industry because it offers a practical, low-cost route for reducing waste while simultaneously improving the technological quality and shelf stability of beverages. Researchers working with the rind of velvet tamarind fruit (using *Dialium indum* species; Southeast Asian species also marketed as velvet tamarind) extracted cellulose and created a biodegradable packaging material. When used to wrap grapes, the durability and protective ability compared favorably with conventional polyvinyl chloride cling wrap (Kacaribu *et al*., 2025). These by-product studies highlights that a more circular processing model for velvet tamarind, one that captures value from seed, rind, and shell rather than treating them purely as waste, is both technically feasible and aligns with present interest in sustainable food packaging.

Previous research outside the scope of food science employed the use of *Dialium guineense* (African Velvet Tamarind) as animal feed due to its extensive agro-food chain and proof of its nutritional and antinutritional profile. Due to the bark's fibre, ash, mineral and favorable phytochemical contents, it was included into animal feed (up to 0.5g/kg of feed) and reported to enhance growth, promote blood circulation and increase biochemical indices (Ogbuewu & Mbajiorgu, 2023). However, it was also reported that the leaves contain high tannin content that can result in depressed ruminal ammonia and reduce protein use in small ruminants when fed in high quantity, suggesting that some form of pre-treatment is needed before the leaves can be safely used as a protein supplement in ruminant diets (Ogbuewu & Mbajiorgu, 2023).

7. SOCIO-ECONOMIC AND SUSTAINABILITY PERSPECTIVES

Dialium guineense (African Velvet Tamarind) offers a large market potential due to its intrinsic nutrients and numerous benefits but its trade remains largely unexploited, with varieties of novel products still untapped. Pricing of these fruits fluctuate based on season, region and the form in which its sold (fresh, processed, or converted into derivative products). Market survey conducted in Southern Nigeria identified the specie as a commercially active seasonal fruit with constant consumer demand both traditionally and commercially (Ogbuewu & Mbajiorgu, 2023; Airaodion *et al*., 2021). In Southern Nigeria, the commercialization of the plant has played a major role in women empowerment. Similar, to the African non-timber forest products such as shea and baobab, the trade is widely dominated by women leading to a shift in financial monopoly (Leite *et al*., 2024).

Dialium guineense (African Velvet Tamarind) is valued for its hard wood (timber) which can be used for creative wood works as well as its contribution to ecosystem goods and services. These includes contribution to livelihood security, socio-economic development, ecosystem functioning, biodiversity maintenance, carbon dynamics, nutrient cycling, and climate regulation. However, the continuous felling of this wood is not environmentally sustainable as it's a leading cause of deforestation and soil erosion. It could also contribute to loss of fruit production and genetic diversity (Kumar *et al*., 2022; Ogbuewu & Mbajiorgu, 2023). Kargbo *et al*. (2025) studied the sustainability of *Dialium guineense* to local people in the western region of Gambia. The ethnobotanical survey found the decline in plant population is largely because the older community members hold more knowledge about the species than younger generations, suggesting a drastic decline in knowledge as the younger generation migrate to urban areas and disengage from forest-based activities. Conservation strategies such as planting, domestication, eradication of bush burning, and more awareness should be done to preserve the growth of this plant.

8. GAPS AND FUTURE DIRECTIONS

This review has compiled the knowledges on *Dialium guineense* (African Velvet Tamarind) yet several gaps remain. First, no literature has been published on clinical trials on any therapeutic application of the plant, although there as been in-vitro and animal date but clinical evidences are required to ascertain the nutraceutical claims. Secondly, the bioavailability of bioactive compounds such as flavonoids, tannins, etc. has not been studied while some classes of phytochemical have been identified, the isolation and specific bioactivity of individual compounds need to be studied. The nutritional aspects of the fruit, leaf, seeds and bark remain underexploited in the food industry, research on food fortification should address micronutrient gaps. Finally, studies addressing utilization of the by-products remain limited representing a promising and relevant research study.

CONCLUSION

Dialium guineense (African Velvet Tamarind) is a multipurpose, nutrient dense indigenous plant that still remains underexploited across industrial, medicinal and food sectors. This review has documented that every part (fruit, leaf, seed, bark and also rind) has inherent nutritional and bioactive compounds and how they have been used in traditional medicine. Its usage when cultivated with the right knowledge stretches from making pastries and beverage in the food and drink industry, as drugs in the pharmaceutical industry and its inclusion as animal feed. Beyond its nutritional and medicinal value, it reports its usage in product development and waste management practice. The plants are known for socio economic importance by being a source of financial empowerment for women and its contribution to soil fertility and biodiversity. Due to its underutilization, knowledge gap exists which include the absence of clinical trials, limited bioavailability study and insufficient research on fortification and large-scale industrial application. The decline in knowledge also poses a threat to sustainability. Increased research into the plant specie will be essential to unlock its full commercial, nutritional and therapeutic potential which would result to the species contributing to food security and livelihood.

REFERENCES

Abdulrahman, M. D., & Bello, I. M. (2023). Morphology, anatomy, and multivariate analysis of *Dialium guineense* Willd. and Detarium microcarpum Guill. & Perr. In *AIP Conference Proceedings* (Vol. 2554, No. 1, p. 090003). AIP Publishing LLC.

Aburime, L. C., Nneoyi-Egbe, A. F., & Jeremiah, J. C. (2024). Vitamins and Phytochemical Compositions of African Velvet Tamarind (Dialium guineense) Fruit Pulp. *Journal of Home Economics Research*, *31*(2). DOI: 10.66731/jher.v31i2.514

Adopo, S. S. F., Kabran, G. R. M., Baguia-Broune, F. D., Konan, K. A. P., Mamyrbekova-Bekro, J. A., & Békro, Y. A. (2024). Chemical Composition and Antioxidant Activity of *Dialium guineense* Fruit (Fabaceae), Côte d'Ivoire. *International Journal of Biochemistry Research & Review*, *33*(6), 604-615.

Ajayi, M. G., OMON, E., AJAYI, O., & OLANIPEKUN, A. (2024). Extraction and Characterization of Velvet Tamarind (Dialium Guineense) Seed. *International Journal of Research and Innovation in Applied Science*, *9*(10), 55-62. DOI; 10.51584/IJRIAS.2024.91000

Asante Ampadu, G. A., Mensah, J. O., Boakye, A., Acheampong, P., Laryea, M. K., & Borquaye, L. S. (2023). Antioxidant, antimicrobial, and antibiofilm properties of essential oils extracted from Dialium guineense. *International Journal of Food Properties*, *26*(1), 1885-1902.

OFFOR, F. O; CHIKWE, T. N; DURU, R. U (2025) Synthesis and Modification of Alkyd Resin from Velvet Tamarind Oil Extract for Potential Use as Binders and Surface Coatings J. Appl. Sci. Environ. Manage. 29 (5) 1684-1692Ehiem, J. C., Tosin, P., Igbozurike, A. O., Oduma, O., & Okoro, O. I. (2025). Modeling of Measured Physical Properties and Determination of Chemical Composition of Black Tamarind (Dialium Guineense) Seed. Agricultural Science and Food Processing, 2(3), 123–132

Augustine I. Airaodion, Emmanuel B. Ayita, Simeon O. Oluba, Sunday A. Emaleku, Ojo J. Osunmuyiwa and Anthony U. Megwas (2021). Chemical Composition and Nutraceutical Potential of Velvet Tamarind (*Dialium guineense* wild) Fruit Pulp. *Asian Journal of Biochemistry, Genetics and Molecular Biology,* 9(2): 8-19, 2021; ISSN: 2582-3698

Bakare-Odunola, M. T., Kolawole, F. L., & Oyegoke, R. A. (2024). Exploring the Hidden Potential of Undervalued Food Plants for Nutrition and Health Security. In *Food Security and Nutrition* (pp. 34-46). CRC Press.

Oluwole-Banjo, A. K. (2019). Phytochemical and antioxidant properties of methanolic extracts of pulp, seed, leaf and stem bark of velvet tamarind (Dialium guineense) plant. *Journal of Underutilized Legumes*, *1*(1), 159-168.

Bashir, U. L., Magaji, A. S., Muhammad, I. I., & Lawal, A. A. (2025) Comparative neutraceutical potentials of Tamarindus indica and *Dialium guineense* fruits. International Journal of Plant Pathology and Microbiology 2026; 6(1): 01-05.

Çatak, J., & Yaman, M. (2019). Determination of nicotinic acid and nicotinamide forms of Vitamin B3 (Niacin) in fruits and vegetables by HPLC using postcolumn derivatization system. *Pakistan Journal of Nutrition*, *18*(6), 563-570.

Cheadoloh, R., Waeno, M., & Asae, S. A. (2022). Effects of gelatin and preparation methods on the quality and antioxidant of velvet tamarind (Dialium guineense) halal chewy product. *Food Research* 6 (1) (2022) 139 – 145.

DABRE, Z., Dibba, B., Kargbo, S., & Diarrassouba, W. (2025). Ethnobotanical knowledge of *Dialium guineense* Willd.: A way forward for sustainable use in The Gambia. *Sciences Naturelles et Appliquées*, *44*(2), 173-192.

Dissanayaka, D. M. N. S., Udumann, S. S., & Atapattu, A. J. (2024). Synergies between tree crops and ecosystems in tropical agroforestry. *Agroforestry*, 49-87.

Ezeocha, V. C., Arukwe, D. C., & Nnamani, M. U. (2022). Quality evaluation of cake from wheat, bambara groundnut (Vigna subterranean) and velvet tamarind (Dalium guineense) flour blends. *FUDMA Journal of Sciences*, *6*(4), 88-94.

Icraf Agroforestry database (22.07.02) E5275. View crop: Dialium guineese Food and Agriculture Organisation of the UN. Copy Right 2003-2007.

Igu, N. I. (2023). Species Distribution and Patterns in a Forest-savannah Ecotone: Environmental Change and Conservation Concerns. *Journal of Botanical Research| Volume*, *5*(03).

Kacaribu, A. A., Rahmi, R., JULINAWATI, J., Fathana, H., Reza, M., & Iqhramullah, M. (2025). Preparation and characterization of cellulose film from velvet tamarind rind (Dialium indum L.) for food packaging. *South African Journal of Chemical Engineering*, *52*.

Knez, M., Ranić, M., & Gurinović, M. (2024). Underutilized plants increase biodiversity, improve food and nutrition security, reduce malnutrition, and enhance human health and well-being. Let's put them back on the plate!. *Nutrition Reviews*, *82*(8), 1111-1124.

Kumar, R., Kumar, A., & Saikia, P. (2022). Deforestation and forests degradation impacts on the environment. In *Environmental degradation: Challenges and strategies for mitigation* (pp. 19-46). Cham: Springer International Publishing.

Lageiro, M., Fernandes, J., Marques, A. C., Simões, M., & Coelho, A. R. F. (2025). Nutritional Characterization of Fruits from Three African Plant Species: *Dialium guineense* Willd, Parkia biglobosa Jacq. and Andansonia digitata L. *Plants*, *14*(15), 2344

Leite, A., Westengen, O. T., Catarino, L., Monteiro, E., Mango, S. P., Indjai, B., & Cuní-Sanchez, A. (2024). From the wild to the market: The trade of edible plants in Guinea-Bissau. *Economic Botany*.

Lely, H. V. (2025). *The useful trees of Northern Nigeria*. Good Press.

Madu, G. C., Okolie, N. J., Iwuji-Aguzie, C. C., Okechukwu, E., Ndubueze, C. W., Iwuji, C. I., ... & Chibuike, V. ANTIBACTERIAL EFFECT OF *DIALIUM GUINEENSE* AQUEOUS LEAF EXTRACT ON ESCHERICHIA COLI INDUCED URINARY TRACT INFECTION IN ADULT WISTAR RAT.

Maryann Chinenye MADUAKO, Jonathan Chinenye IFEMEJE, Kizito Ifeanyi AMAEFULE, Anthony Uzoeto OKECHUKWU, Chinenye Nnenna ENEMCHUKWU (2021) Comparative study of proximate composition, antioxidant vitamins and mineral profile of six local wild fruits consumed in South-eastern, Nigeria. Biokemistri 0795-8080/2021

Mohammed, J., Aremu, M. O., Abubakar, I., Kuna, H. U., & Mohammad, I. A. (2022) Chemical Science & Engineering Research. DOI: 10.36686/Ariviyal.CSER.2022.04.09.049

Ogbuewu, I., Modisaojang-Mojanaga, M., Mokolopi, B. & Mbajiorgu, C. (2023). Nutritional and chemical composition of black velvet tamarind (*Dialium guineense* Willd) and its influence on animal production: A review. Open Agriculture, 8(1), 20220174. https://doi.org/10.1515/opag-2022-0174

Okpomor, O. E., Nwankwo, C. S., Mbachiantim, J. T., Balogun, A. A., Okoyeuzu, C. F., Eze, J. I., & Agbaji, M. U. (2026). Ethnobotany and biofunctional properties of selected edible wild plants in Nigeria: a comprehensive review. *Exploration of Foods and Foodomics*, *4*, 1010161.

Olawoyin, C. O., & Atarase, T. J. (2022) Phytochemical and Proximate Analysis of *Dialium guineense* (Velvet Tamarind) Seed.

Ololade Zacchaeus, S., Anuoluwa Iyadunni, A., Adejuyitan Johnson, A., & Uyaboerigha Daubotei, I. (2021). Black velvet tamarind: phytochemical analysis, antiradical and antimicrobial properties of the seed extract for human therapeutic and health benefits. *J. Phytopharm*, *10*, 249-255.

Onah, G. T., Ajaegbu, E. E., & Enweani, I. B. (2022). Proximate, phytochemical and micronutrient compositions of *Dialium guineense* and Napoleona imperialis plant parts. *GSC Biological and Pharmaceutical Sciences*, *18*(3), 193-205. DOI: https://doi.org/10.30574/gscbps.2022.18.3.0099

Ovuakporie-Uvo, O., Idu, M., & Omoregie, E. S. (2019). Nutrients and chemical composition of Desplatsia dewevrei. *Food science & nutrition*, *7*(5), 1768-1777.

Peduruhewa, P. S., Jayathunge, K. G. L. R., & Liyanage, R. (2021). Potential of underutilized wild edible plants as the food for the future–a review. *Journal of Food Security*, *9*(4), 136-147.

Sekou Ii, C., Émilie, K., Lonsény, T., & Michel, H. (2025). Valorization of *Dialium guineense* fruit seeds as a new hydrocolloid for food application. *International Journal of Food Science and Technology*, *60*(1), vvae054.

Upeka, D. A., Udukala, D., & Gunaratna, M. (2024). A comprehensive review of the chemical composition and pharmacological activities of the genus Dialium. *Jordan Journal of Chemistry (JJC)*, *19*(3), 133-157.

Usman, H. S., Hassan, S. M., Sadiq, I. Z., Olawoyin, C. O., Danja, M. I., & Sallau, A. B. (2026). Pilot Evaluation of *Dialium guineense* Fruit and Leaf Extracts in Inhibition of Glucose-Induced Protein Glycation and DPPH Radical: An In vitro Study. *UMYU Scientifica*, *5*(2), 91-99. https://doi.org/10.56919/usci.2652.009

Utubaku, A. B., Yakubu, O. E., & Okwara, D. U. (2017). Comparative Phytochemical Analysis of Fermented and Unfermented Seeds of Dialium giuneense. *Journal of Traditional Medicine and Clinical Naturopathy*, *6*(3), 226-228.

Victor-Osanyinlusi, R. (2022). Nutrional composition of the fruit, leave, root and bark of Africa black velvet tamarind (Diallum guineense. *International Journal of academic research and development*.