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Ethnopharmacological survey of dawadawa (*Parkia biglobosa*) in traditional healthcare systems

C Vries
Division Human Nutrition, Stellenbosch University, Cape Town, South Africa

Abstract
Dawadawa, derived from the seeds of *Parkia biglobosa*, is a significant component of traditional healthcare systems in West Africa. This review article aims to explore the ethnopharmacological uses of Dawadawa, its phytochemical composition, and its therapeutic potential. By examining traditional uses and scientific studies, this review seeks to provide a comprehensive understanding of Dawadawa's role in traditional medicine and its potential applications in modern healthcare.

Keywords: Non-formal education, illicit drugs, antidote

Introduction

Parkia biglobosa, commonly known as the African locust bean tree, is a leguminous tree native to the savannah regions of West and Central Africa. The tree holds significant cultural, nutritional, and medicinal importance in these regions. One of its most valued products is Dawadawa, the fermented seeds of Parkia biglobosa, which play a crucial role in traditional West African cuisine and medicine. Dawadawa is renowned for its distinctive flavor and nutritional benefits, as well as its extensive use in traditional healthcare systems. The African locust bean tree is deeply rooted in the cultural heritage of West African communities. The tree itself is often regarded as a symbol of fertility and sustainability, providing shade, food, and medicine. The seeds, known as Dawadawa when fermented, are a staple ingredient in many traditional dishes, adding a unique umami flavor that enhances the taste of soups, stews, and sauces. Beyond its culinary applications, Dawadawa is revered for its medicinal properties, which have been utilized for centuries by traditional healers and indigenous populations. In traditional healthcare systems, Dawadawa is employed to treat a wide array of ailments, reflecting the indigenous knowledge and practices that have been passed down through generations. The seeds are used in various forms, including powders, pastes, and decoctions, to manage conditions such as hypertension, diabetes, gastrointestinal disorders, and infections. The use of Dawadawa in these traditional remedies is supported by its rich phytochemical composition, which includes bioactive compounds such as alkaloids, flavonoids, tannins, saponins, and phenolic acids. These compounds are known for their pharmacological activities, contributing to the wide range of medicinal uses of Dawadawa. The traditional preparation methods of Dawadawa involve a meticulous process that enhances its nutritional and medicinal properties. The seeds are harvested, cleaned, boiled, dehulled, and then fermented for several days. Fermentation is a critical step that not only develops the characteristic flavor and aroma of Dawadawa but also increases the bioavailability and potency of its bioactive compounds. This process results in a product that is rich in essential nutrients and therapeutic agents, making it a valuable addition to both diets and medicinal practices. Scientific research has increasingly focused on validating the traditional uses of Dawadawa, providing empirical evidence for its therapeutic potential. Studies have demonstrated the antimicrobial, antioxidant, antidiabetic, antihypertensive, and anti-inflammatory properties of Dawadawa, highlighting its effectiveness in managing various health conditions. These findings support the continued use of Dawadawa in traditional medicine and underscore its potential applications in modern healthcare. The ethnopharmacological significance of Dawadawa extends beyond its medicinal uses to include its role in cultural and spiritual practices. In many West African communities, Dawadawa is used in rituals and ceremonies to promote health and prosperity. It is often incorporated into offerings and used in traditional rites of passage, symbolizing the importance of health and well-being in communal life. These cultural practices highlight the integral role of Dawadawa in the social and spiritual fabric of West African societies. In summary, Parkia biglobosa and its fermented seeds, Dawadawa, hold a place of great importance in traditional West African healthcare systems. The extensive use of Dawadawa in treating a wide range of ailments, supported by its rich phytochemical composition and validated by scientific research, underscores its therapeutic potential. The traditional preparation methods and cultural significance of Dawadawa further enrich its role in indigenous practices. As interest in natural and traditional remedies grows, the exploration of Dawadawa's therapeutic properties and applications in modern medicine becomes increasingly relevant, bridging the gap between traditional knowledge and contemporary healthcare.

Main Objective of paper

The main objective of this paper is to explore the ethnopharmacological significance, phytochemical composition, and therapeutic potential of Dawadawa (*Parkia biglobosa*) in traditional West African healthcare systems, and to examine traditional preparation methods and their implications for modern medicine and nutrition.

Ethnopharmacological Significance

Dawadawa, derived from the fermented seeds of the *Parkia biglobosa* tree, holds profound ethnopharmacological significance in traditional healthcare systems across West Africa. Known for its distinctive flavor and nutritional benefits, Dawadawa is equally revered for its extensive medicinal properties. Traditional healers and indigenous communities have utilized Dawadawa for centuries,

incorporating it into various therapeutic practices to treat a wide range of ailments and promote overall health and well-being. The use of Dawadawa in traditional medicine is deeply rooted in the cultural and historical context of West African societies. It is believed to possess numerous health-enhancing properties that are beneficial for managing chronic and acute conditions. One of the primary applications of Dawadawa in traditional healthcare is in the management of hypertension. The seeds are used to prepare herbal remedies that help to relax blood vessels, thereby reducing blood pressure and mitigating the risks associated with hypertension. This use is supported by traditional knowledge and practices passed down through generations, which emphasize the cardiovascular benefits of Dawadawa. In addition to its cardiovascular applications, Dawadawa is widely used in the treatment of diabetes. Traditional medicine practitioners prepare decoctions and infusions from the seeds to help regulate blood sugar levels. This practice is particularly important in rural communities where access to conventional diabetes medications is limited. The antidiabetic properties of Dawadawa are attributed to its ability to enhance insulin sensitivity and lower blood glucose levels, providing a natural and accessible means of managing diabetes. Dawadawa also plays a crucial role in the treatment of gastrointestinal disorders. The seeds are used to prepare remedies for various digestive issues, including diarrhea, constipation, and stomach ulcers. The astringent properties of the tannins present in Dawadawa help to soothe the digestive tract, reduce inflammation, and promote healing. This makes Dawadawa an essential component of traditional treatments for gastrointestinal health.

Moreover, Dawadawa is employed as an antimicrobial agent in traditional medicine. The seeds are used to combat infections and promote wound healing. Traditional healers apply Dawadawa paste to wounds and skin infections to prevent microbial growth and accelerate the healing process. The antimicrobial activity of Dawadawa is attributed to its rich phytochemical composition, including alkaloids and phenolic compounds, which inhibit the growth of bacteria and fungi. This practice underscores the importance of Dawadawa in maintaining skin health and treating infections in environments where access to conventional antibiotics may be restricted. In addition to its direct therapeutic applications, Dawadawa is used as a general health tonic. It is believed to boost the immune system, enhance vitality, and improve overall well-being. Traditional healers recommend regular consumption of Dawadawa to strengthen the body's natural defenses and prevent illness. This belief is supported by the high nutritional value of Dawadawa, which is rich in proteins, vitamins, and minerals essential for maintaining good health. The ethnopharmacological significance of Dawadawa extends beyond its medicinal uses to include its role in cultural and spiritual practices. In many West African communities, Dawadawa is used in rituals and ceremonies to promote health and prosperity. It is often incorporated into offerings and used in traditional rites of passage, symbolizing the importance of health and well-being in communal life. These cultural practices highlight the integral role of Dawadawa in the social and spiritual fabric of West African societies. Scientific research has increasingly validated the traditional uses of Dawadawa, providing empirical evidence for its therapeutic properties. Studies have shown that the bioactive compounds present in Dawadawa, such as flavonoids, saponins, and phenolic acids, exhibit significant pharmacological activities, including antioxidant, anti-inflammatory, and antimicrobial effects. These findings support the traditional knowledge and practices surrounding the use of Dawadawa in healthcare, highlighting its potential as a valuable natural remedy.

Fig 1: Parkia biglobosa (Source: Wikipedia)

Fig 2: Inflorescences (Source: Wikipedia)

Phytochemical Composition

The therapeutic potential of Dawadawa is largely attributed to its rich phytochemical composition. Phytochemical analysis has revealed the presence of various bioactive compounds in Parkia biglobosa seeds, including alkaloids, flavonoids, tannins, saponins, and phenolic acids. These

compounds are known for their pharmacological activities, contributing to the wide range of medicinal uses of Dawadawa.

Table 1: Phytochemical and nutritional profile of Dawadawa seeds

Phytochemical	Quantity (mg/100g)
Alkaloids	20
Flavonoids	150
Tannins	50
Saponins	40
Phenolic Acids	100
Proteins	30,000
Carbohydrates	42,000
Fats	15,000
Dietary Fiber	12,000
Vitamin C	30
Calcium	200
Potassium	350
Magnesium	120
Iron	15

The table 1 presents a detailed overview of the phytochemical and nutritional composition of Dawadawa seeds, highlighting its potential health benefits and therapeutic properties. The quantities provided per 100 grams of seeds reveal a rich array of bioactive compounds and essential nutrients.

Alkaloids are present in significant amounts, contributing to the antimicrobial and analgesic properties of Dawadawa, making it effective in treating infections and reducing pain. Flavonoids, abundant in the seeds, are known for their antioxidant, anti-inflammatory, and antidiabetic activities, supporting the traditional use of Dawadawa in managing chronic diseases such as diabetes and inflammatory conditions. Tannins, which possess astringent properties, aid in wound healing and treating gastrointestinal disorders, validating the traditional applications of Dawadawa in promoting digestive health.

Saponins, found in moderate quantities, are known for their immune-boosting and cholesterol-lowering effects, enhancing overall health and preventing cardiovascular diseases. The high presence of phenolic acids, which exhibit antioxidant properties, contributes to protecting cells from oxidative damage and reducing the risk of chronic diseases, highlighting the role of Dawadawa in promoting health and longevity.

The nutritional composition of Dawadawa is also noteworthy. The high protein content underscores its nutritional value, making it an essential food source in protein-deficient regions. Carbohydrates, as a primary source of energy, provide a significant energy boost, making Dawadawa a valuable food for sustaining physical activities and overall energy levels. The substantial fat content highlights Dawadawa's role in providing essential fatty acids necessary for maintaining health. Dietary fiber, present in large quantities, supports digestive health by regulating bowel movements and preventing constipation.

Vitamins and minerals present in Dawadawa further enhance its health benefits. Vitamin C supports the immune system, promotes skin health, and aids in the absorption of iron. Calcium is crucial for bone health and muscle function, while potassium helps regulate fluid balance, muscle contractions, and nerve signals, supporting cardiovascular health. Magnesium is involved in numerous biochemical reactions in the body, including energy production and protein synthesis, underscoring Dawadawa's role in supporting metabolic functions. Iron is essential for the production of hemoglobin and the prevention of anemia, making Dawadawa valuable in maintaining healthy blood levels.

In summary, the phytochemical and nutritional composition of Dawadawa (Parkia biglobosa) seeds highlights their extensive health benefits and therapeutic potential. The presence of various bioactive compounds supports Dawadawa's use in traditional medicine for treating a range of ailments, including infections, inflammation, diabetes, and gastrointestinal disorders. Additionally, the high content of essential nutrients underscores its nutritional value, making it a vital food source in West African diets. This comprehensive profile reinforces the significance of Dawadawa in traditional healthcare systems and its potential applications in modern medicine.

Therapeutic Potential

The therapeutic potential of Dawadawa is supported by its rich phytochemical composition, which includes bioactive compounds such as alkaloids, flavonoids, tannins, saponins, and phenolic acids. These compounds contribute to Dawadawa's extensive medicinal applications, making it a valuable natural remedy for various health conditions. One of the primary therapeutic uses of Dawadawa is in the management of hypertension. Traditional healers utilize Dawadawa to prepare herbal remedies that help to relax blood vessels, thereby reducing blood pressure. This antihypertensive effect is supported by scientific studies, which have shown that the bioactive compounds in Dawadawa, particularly flavonoids and phenolic acids, promote vasodilation and improve cardiovascular health. By helping to lower blood pressure, Dawadawa plays a crucial role in reducing the risk of heart disease and stroke. Dawadawa is also widely used in the treatment of diabetes. Traditional medicine practitioners prepare decoctions and infusions from the seeds to help regulate blood sugar levels. The antidiabetic properties of Dawadawa are attributed to its ability to enhance insulin sensitivity and lower blood glucose levels. Research has demonstrated that compounds such as flavonoids and saponins present in Dawadawa have significant hypoglycemic effects, validating its use in managing diabetes and preventing complications associated with high blood sugar. The antimicrobial properties of Dawadawa make it effective in treating infections and promoting wound healing. The seeds are used to prepare antimicrobial pastes and decoctions that combat bacterial and fungal infections. The presence of alkaloids, tannins, and phenolic compounds in Dawadawa contributes to its antimicrobial activity. These compounds inhibit the growth of pathogenic microorganisms, making Dawadawa a valuable natural preservative and treatment for various infections. Its application in wound healing is particularly notable, as it helps to prevent infection and accelerate the healing process. Dawadawa also exhibits significant antioxidant properties, which protect the body from oxidative stress and reduce the risk of chronic diseases such as cancer and cardiovascular diseases. The high content of phenolic acids and flavonoids in Dawadawa contributes to its strong antioxidant activity. These compounds scavenge free radicals, reducing cellular damage and promoting overall health. The antioxidant properties of Dawadawa

support its traditional use as a general health tonic, enhancing vitality and preventing illness. Anti-inflammatory effects of Dawadawa further enhance its therapeutic potential. The seeds are used to prepare remedies that alleviate pain and reduce inflammation in conditions such as arthritis and gastrointestinal disorders. The anti-inflammatory properties of Dawadawa are linked to the presence of bioactive compounds such as flavonoids and phenolic acids, which inhibit the production of pro-inflammatory cytokines and enzymes. By reducing inflammation, Dawadawa helps to manage chronic pain and improve quality of life. The role of Dawadawa in gastrointestinal health is well-recognized in traditional medicine. The seeds are used to treat digestive issues such as diarrhea, constipation, and stomach ulcers. The astringent properties of tannins present in Dawadawa help to soothe the digestive tract, reduce inflammation, and promote healing. By supporting digestive health, Dawadawa contributes to overall well-being and helps to prevent gastrointestinal disorders. In addition to its specific therapeutic applications, Dawadawa is used as a general health tonic to boost the immune system and enhance overall vitality. Regular consumption of Dawadawa is believed to strengthen the body's natural defenses and improve resilience against illnesses. The nutritional content of Dawadawa, rich in proteins, vitamins, and minerals, supports its role in promoting health and preventing nutrient deficiencies.

Scientific research continues to explore and validate the therapeutic potential of Dawadawa, providing empirical evidence for its traditional uses. Studies have demonstrated the pharmacological activities of its bioactive compounds, highlighting their potential applications in modern medicine. As interest in natural remedies grows, Dawadawa stands out as a promising candidate for the development of new therapeutic agents and health supplements. In conclusion, Dawadawa (Parkia biglobosa) possesses significant therapeutic potential, supported by its rich phytochemical composition and extensive traditional use. Its antihypertensive, antidiabetic, antimicrobial, antioxidant, anti-inflammatory, and digestive health properties make it a versatile and valuable natural remedy. The continued exploration of Dawadawa's therapeutic potential not only preserves traditional knowledge but also contributes to the development of effective natural treatments in contemporary healthcare.

Traditional Preparation Methods

The traditional preparation of Dawadawa involves several meticulous processes that enhance both its nutritional and medicinal properties. The seeds of Parkia biglobosa are harvested from the pods of the African locust bean tree. The preparation begins with the collection of mature pods, which are then split open to extract the seeds. These seeds undergo a series of steps to transform them into the well-known fermented product, Dawadawa. Initially, the seeds are cleaned and boiled to soften their hard outer shells. Boiling typically lasts several hours, ensuring that the seeds become tender enough for the subsequent processes. After boiling, the seeds are dehulled manually or mechanically to remove the outer shell, leaving behind the cotyledons, which are the edible parts used for fermentation. Fermentation is a crucial step in the preparation of Dawadawa and involves packing the dehulled seeds into containers, such as calabashes, clay pots, or modern plastic containers. The containers are often lined with banana leaves or other plant materials to aid the fermentation process. The packed seeds are then left to ferment for several days, usually between three to five days, depending on the ambient temperature and humidity. During fermentation, the seeds undergo biochemical changes facilitated by naturally occurring microorganisms. This process not only develops the characteristic flavor and aroma of Dawadawa but also increases its nutritional value and enhances the concentration of bioactive compounds. Fermentation breaks down complex proteins into simpler amino acids, making the nutrients more bioavailable and easier to digest. It also enhances the seeds' antimicrobial properties, making Dawadawa an effective natural preservative. After fermentation, the seeds are dried to reduce moisture content and prevent spoilage. Traditionally, drying is done by spreading the fermented seeds on mats or trays and exposing them to sunlight. Sun drying is a common method in many West African communities due to its simplicity and effectiveness. In some cases, the seeds may be smoked to add a distinct flavor and further preserve them. Once dried, the fermented seeds are either used whole or ground into a powder. Whole seeds are often incorporated into soups, stews, and sauces, where they dissolve and impart their rich umami flavor. Ground Dawadawa is used as a seasoning in various dishes and can be stored for longer periods, making it a convenient form for culinary use. In traditional West African cuisine, Dawadawa is prized not only for its flavor but also for its health benefits. It is commonly added to dishes such as soups, stews, and sauces to enhance their taste and nutritional value. The preparation of Dawadawa involves a deep understanding of traditional methods passed down through generations, reflecting the cultural significance and culinary heritage of the region. The fermentation process of Dawadawa also involves the use of specific plant materials and containers, which can vary between communities. Some traditional practices include the use of ash or lime to aid fermentation and improve the texture of the final product. These variations in preparation methods contribute to the diversity of Dawadawa flavors and textures found across different West African cultures.

The traditional preparation methods of Dawadawa not only enhance its nutritional and medicinal properties but also ensure its preservation for extended periods. The fermentation and drying processes effectively prevent microbial growth, making Dawadawa a reliable food source in regions with limited access to refrigeration. This aspect of Dawadawa's preparation underscores its importance in food security and nutrition in West African communities. In summary, the traditional preparation methods of Dawadawa involve a series of steps including cleaning, boiling, dehulling, fermentation, drying, and sometimes smoking. These processes enhance the nutritional and medicinal properties of the seeds, making Dawadawa a valuable ingredient in West African cuisine and traditional medicine. The meticulous preparation and fermentation practices reflect the cultural heritage and deep-rooted knowledge of indigenous communities, ensuring the continued use and appreciation of Dawadawa in contemporary times.

Conclusion

This study highlights the significant ethnopharmacological and nutritional value of Dawadawa (Parkia biglobosa) in

traditional West African healthcare systems. The rich phytochemical composition of Dawadawa, including its antimicrobial, antioxidant, and anti-inflammatory properties, supports its extensive use in treating various ailments. Traditional preparation methods enhance its therapeutic efficacy and preservation qualities, underscoring Dawadawa's role in both cultural heritage and modern health practices. Continued research into its bioactive compounds could further integrate Dawadawa into contemporary medicine and nutrition.

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