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*Mini -Review*

## **Medicinal and Economic Value of *Spondias mombin***

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### **ABSTRACT**

This article reviewed the folk medical value of *Spondias mombin* with the correlated research findings on the uses of *Spondias mombin*. Most of the folk uses had been scientifically proven in most of the regions where those beliefs are based. The plant was described with habitat, the local uses including the uses of its parts mentioned. We reviewed the ethnomedicinal uses, the biological activities and the phytochemistry of *Spondias mombin*.

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**Key Words;** *Spondias mombin*, Neurological, Sedative, Antipsychotic, Antiepileptic, GABA-nergic transmission

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## INTRODUCTION

In recorded history, medicinal plants have been in use for the treatment of man and animal diseases (Osai, 1998; Ibewike et al, 1997). A plant becomes a medicinal plant only when its biological activity has been ethnobotanically reported or scientifically established (Elujoba, 1997). In 1978, the World Health Organisation (WHO) emphasized the importance of scientific research into herbal medicine. Many developing countries of the world look upon native medicinal plants as possible addition to the WHO's list of "essential drugs" once their values have been clinically proven. A simple first-principle biological technique in the evaluation of plant with no known biological activity is to conduct a screening test (Elujoba, 1999).

*Spondias mombin* is a fructiferous tree having habitat in Nigeria, Brazil and several other tropical forests in the world. This plant is readily common around us in South West of Nigeria (Yoruba) and is commonly used in folk medicine. Various cultures frequently maintain within their collection of traditional medicine substances valued as drugs for treating diseases (Elizabetshy, 1992). The entire dependence of man on plants and plant products directly for his basic needs as food, clothing and shelter and indirectly for their beneficial influence on the climate and maintenance of his immediate and remote environment make plants vital to his survival and the basis of his continued existence.

Our survival and continued existence in turn depends on the efficiency with which man, with all the resources and technology available to him, harnesses, develops and utilizes plants and plant products. The present review shows *Spondias mombin* as a medicinal plant with a lot of potential, valuable, untapped resource of active drugs for treating diseases.

### THE PLANT: *Spondias mombin*

*Spondias mombin* Linn belongs to the family *Anacardiaceae*. It grows in the rain forest and in the coastal area. It can reach a height of 15 – 22m. The trunk has deep incisions in the bark, which often produces a brown resinous substance. The

leaves and the flowers are at the end of the branches. Before the tree starts to flower, it strips itself from most of the leaves. The fruit, an 1½-inch long oval yellow plum, has a leathery skin and a thin layer of fruit pulp with a very exotic taste. It hangs in numerous clusters of more than a dozen on the tree. Very rich in vitamins B<sub>1</sub> and C, the fruit mostly exists as an oval seed. The mode of propagation of the plant is by seeds and cuttings. Other common names, according to Morton (1987) are Bala (Costa Rica), Jobito (Panama), Jobo blanco (Colombia), Jobo corronchoso (Venezuela), Hoeboc (Surinam), Acaiba, Caja, Pau da tapera (Brazil), Ubo (Peru), Hobo (Mexico), Iyeye (Yoruba), Uvuru (Igbo).

A medium-sized, occasionally large, tree, with long compound leaves, each leaf has an odd number of leaflets, from 9 – 19. Usually, the leaves are alternate, but bunched towards the end of the branches, emanating like spokes of a wheel in all directions from the branch. The leaflets are opposite except for the terminal ones. Particularly on young plants, the leaf stalk tends to be reddish towards the outer leaflets. Crushed leaves have faint turpentine-like smell. The trunk and bark are gray, and sometimes have distinctive bur, blunt, gray spines (often more like warts than spines) (Nelson, 1951; Watt and Berger-Brandwijk, 1962).

### NON-MEDICINAL USES

It is commonly used for living fences, in farmlands and shelter by artisans. The fruits are edible and sometimes called monkey-plum, but the wood is of low quality and seldom used. The bark is used for carving figures, while the leaves and roots are used as medicine.

The yellow *mombin* is less desirable than the purple *mombin* and it is appreciated mostly by children and way-farers as a means of alleviating thirst. Ripe fruits are eaten out-of-hand, or stewed with sugar. The extracted juice is used to prepare ice cream, cool beverages and jelly in Costa Rica and Brazil. It is used in Panama, Peru and Mexico in fairly large quantities as jams.

In Amazon, the fruit is used mainly to produce wine sold as "Vinho de Taperiba". In Guatemala, the fruit is made into a cider-like drink. Mexicans pickle the green fruits into vinegar and eat them

like olives with salt and chili, as they do with unripe purple *mombin*. Young leaves are cooked as greens.

The fruits are widely valued as feed for cattle and pigs. The tree exudes a gum that is used as glue. The wood is yellow or yellowish-brown with darker markings, light in weight, buoyant, flexible and prone to attack by termites and other pests. It is much used in carpentry, for match sticks, match boxes, physician's spatulas, stick for sweet meats, pencils, pen-holders, packing cases, interior sheathing of houses and boats and as a substitute for cork. It is not suited for turnery and does not polish well. In Brazil, the woody tubercles on the trunk are cut off and used for bottle stoppers and to make seals for stamping sealing wax. In tropical Africa, saplings serve as poles for huts, branches for garden poles and for axes and hoe handles. In Costa Rica and Puerto Rico, the wood is employed only as fuel. Ashes from the burnt wood are

utilized in indigo-dyeing in Africa. The bark is used in dyeing. It is so thick that it is popular for carving amulets, statuettes, cigarette holders and various ornamental objects. Portable water can be derived from the roots in emergency. The flowers worked intensively by honeybees early in the morning.

#### ETHNOMEDICINAL USES OF *Spondias mombin*

The fruit juice is drunk as a diuretic and febrifuge. The decoction of the astringent bark serves as an emetic, a remedy for diarrhea, dysentery, haemorrhoids and a treatment for gonorrhoea and leukorrhea. In Mexico, it is believed to expel calcifications from the bladder. The powdered bark is applied on wounds. A tea made from the flowers and leaves is taken to relieve stomach ache, biliousness, urethritis, cystitis and eye and throat inflammations.

**Table 1**

Local Uses of *Spondias mombin*

S/N	Morphological part	Non-Medicinal Uses
1	Root	It is used for emergency water source
2	Stem	Living fences in farm land. Shelter by artisans and has low quantity wood
3	Wood	In carpentry for match sticks, match boxes, physicians spatulas, stick for sweet meats, pencils, pen-holder, racking cases, interior sheathing of homes and boats and as a substitute for cork. In Brazil, used as bottle stoppers and to make seal wax. In Tropical Africa, it serves as poles for huts, garden poles and for axes and hoe handles. In Costa Rica, it is used as fuel
4	Wood Ashes	In Africa, it is used as indigo-dye
5	Bark	It is used in carving figures like amulet, statuettes, cigarette holder and various ornamental objects and also as dyeing agent
6	Gum	Glue
7	Leaves	The young leaves are cooked as green vegetable
8	Fruit	Edible – eaten out of hand in stewed with sugar, extracted to prepare ice-cream, cool beverages and jelly in Costa Rica and Brazil. It is used as jam in Panama, Peru and Mexico; wine in Guatemala and Mexicans pickle the green fruit into vinegar. It is widely valued as feed for cattle and pig
9	Flowers	It is used for decoration
10	Nector	It is worked on intensively by honey bees

**Table 2:** Medicinal Uses of Different Morphological Parts of *Spondias mombin*

S/N	Morphological Part	Medicinal Uses
1	Root	Decoction as purgative
2	Bark	Decoction as emetic, a remedy for diarrhea, dysentery, haemorrhoids and a treatment for gonorrhoea. In Mexico, it is used to expel calcification from the bladder, powder for healing wounds
3	Gums	Expectorant and to expel tapeworm
4	Leaves	Tea with flower relieves stomach ache, biliousness, inflammation. Decoction of the young leaves is a remedy for diarrhea and dysentery. Juice of crushed leaves and powder of dried leaves on wounds and inflammations and abortifacients
5	Fruit	Juice drink as diuretic and febrifuge
6	Flowers	Tea with flower relieves stomach ache, biliousness, urethritis, cystitis and eye and throat inflammation

In Belize, a decoction of the young leaves is a remedy for diarrhea and dysentery. The juice of crushed leaves and the powder of dried leaves are used as poultices on wounds and inflammations. The gum is employed as an expectorant and to expel tapeworms (Rodrignes and Hesse, 2000; Rodrigne and Samuels, 1999; Corthout et al, 1994; Sierra and Buchelli, 1986; Ajao and Shonukan, 1985; Morton, 1987 and USDA, ARS, 2002).

Concerning the popular use of this plant, the leaves were mentioned in the literature as abortifacient (Offiah and Anyanwu, 1989), anti-diarrhoea (Irvine, 1961), anti-microbial (Abo et al, 1999), anti-viral (Corthout et al, 1979; Corthout et al, 1991; Corthout et al, 1999); contain a lot of vitamin C (Keshinro, 1985); wound-healer (De Ferreyra 1981 and Jaramillo and Ahunada-barona 1983); but this healing effect could not be confirmed by Vellegas et al (1997). Daniel (1990) reports the several uses of the plant based on oral communication and not on any recorded scientific investigation. Infusion of its leaves has been used since long time, without any report of collateral effects, due to its activity (Corthout et al, 1991).

This plant is part of the 'Living Pharmacy' program developed by the Laboratory of Natural Products University 'Federal de Cearal', Brazil, a project aiming to teach local people how to cultivate and use correctly traditional medicinal plants. One step to preserving this knowledge will be the establishment of 'Forest Reserve' dedicated

to the survival of medicinal plants and the healers that use them (Swain, 1975).

#### Biological Activities

All parts of the tree are medicinally important in traditional medicine. The fruits decoction is drunk as a diuretic and febrifuge, the decoction of the bark and the leaves as emetic, antidiarrhoea and used in the treatment of dysentery, haemorrhoids, gonorrhoea and leukorrhoea. The antimicrobial, antibacterial, antifungal, and the antiviral properties of *Spondias mombin* have been reported (Ajao et al, 1985; Verpoorte and Dihal, 1987; Abo et al, 1999; Corthout et al, 1991; Rodrigues and Hasse, 2000). A tea of the flowers and the leaves is taken to relieve stomach ache, various inflammatory conditions and wound healings (De Ferreyra, 1981; Jaramillo and Ahunada-Barona, 1983; and Villegas et al, 1997). Offiah and Anyanwu (1989) have also reported the abortifacient activity of the aqueous extract. Preliminary reports suggest that the phenolic acid, 6-alkenyl-salicylic acid from *Spondias mombin* are responsible for the antibacterial and molluscicidal of this plant extract (Corthout et al, 1994). In another study, the anacardis acid derivative from the hexane extract of the plant was showed to possess beta lactamase inhibitory properties (Coates et al, 1994).

**Table 3:** Tested activities demonstrated by *Spondias mombin* Extracts

S/N	ACTIVITY	AUTHOR(S)
1	Abortifacients	Akubue et al, 1983; Offiah and Anyanwu, 1989
2	Anti epileptic	Ayoka et al, 2006
3	Anti psychotic	Ayoka et al, 2006
4	Anti viral	Corthout et al, 1992, 1994
5	Anti-ageing	Corthout et al, 1992; Panly and Flerry, 2002
6	Anti-bacterial	Ajao et al, 1985; Corthout et al, 1994
7	Anti-diarrhoea	Akubue et al, 1983
8	Anti-fertility	Raji et al, 2006
9	Anti-helminthic	Ademola et al, 2005
10	Anti-inflammation	Akubue et al, 1983; Abed et al, 1996
11	Anti-malarial	Carabolla et al, 2004
12	Anti-microbial	Verpoote and Dahal, 1987; Corthout et al, 1994; Abo et al, 1996
13	Anti-oxidant	Shaltes and Raffant, 1990; Corthor Costner et al, 1988; Panly and Flerry, 2002
14	Anxiolytic	Ayoka et al, 2005
15	Beta-lactamase inhibitor	Coattes et al, 1994
16	Haemostatic function	Kone-Bamba et al, 1987
17	Hypnotics	Akubue et al, 1983; Ayoka et al, 2006
18	Increased capillary	Villegas et al, 1997
19	Molluscicidal	Corthout et al, 1994
20	Purgative	Akubue et al, 1983
21	Reduced glutathione synthesis	Pauly and Flerry, 2002
22	Sedative	Akubue et al, 1983; Ayoka et al, 2006
23	Vitamin C substitute	Keshinro, 1985
24	Wound-healing	Deferreyra, 1981, 1997; Jaramillo and Ahmadebormol, 1983; Ajao et al, 1985; Villegas et al, 1997

The plant extract has been shown to possess phenolic derivatives with antiherpes and antioxidant properties, which have been

formulated for use in Brazil (Corthout et al, 1992; Caster et al, 1998; Shultes and Raffauf, 1990; Mats, 1994). Aregheore and Singh (2003) reported that macro- and micro-mineral concentrations in *Spondias mombin* were affected by seasonal climatic condition.

Recent reports show the anxiolytic effect (Ayoka et al, 2005), sedative, antiepileptic and antipsychotic effects of the leaves extract in mice and rats (Ayoka et al, 2006). The method used for the study in our laboratory are observation of novelty-induced behaviour, effect on hexobarbitone induced sleeping time, swimming test, effect on induced convulsion which was carried out through standard pharmacological tools. Raji et al (2006) in their study showed the antifertility action of aqueous *Spondias mombin* bark extract. They reported a marked dose-dependent reduction in epididymal sperm progressive motility, sperm count, viability (live/dead ratio) and a dose-dependent increase in percentage abnormal spermatozoa. Epididymal  $\alpha$ -glucosidase activity was significantly reduced. However, cessation of treatment within four weeks resulted in full recovery.

#### Phytochemistry of *Spondias mombin*

According to Hamano and Marcadante (2001), the high-performance liquid chromatography (HPLC) revealed the following: carotenoids, phytoene, alpha-trans-beta-carotene, alpha-carotene, beta-cryptoxanthin (cis and trans), zeinoxanthin and lutein from *Spondias mombin*.

The gum exudates from *Spondias mombin* are very soluble in water (Leon-De-Pinto et al, 1995) containing arabinose, mannose and rhamnose. The cationic composition of the ash gums has high calcium, potassium, sodium and magnesium contents. There is evidence of arabinofuranose residues as structural features of the *Spondias* gums. Coates et al (1994) isolated a novel beta-lactamase inhibitor from *Spondias mombin*. Two caffeoyl esters: 2-O-caffeoyl-(+)-allohydroxytricric acid and chlorogenic and butyl ester with antiviral properties were isolated by Corthout et al (1992). Also, two ellagitannins with antiviral properties were earlier isolated by Corthout et al (1991).

**Table 4**Phytochemical Isolates from *Spondias mombin*

S/N	Compound	Biological Effect	Author(S)
1	Geraniin, Balloyl Geraniin	Anti viral	Corthout et al, 1991
2	Allohydroxycitric acid, Chorogenic acid, Butylester	Anti viral	Corthout et al, 1992
3	Tannin	Not tested	Onwuka, 1992; Abo et al, 1999; Apori, 1998; Ayoka et al, 2006
4	Limonoids, Naphthoquinones	Not tested	Caraballo et al, 2004

They are geraniin and galloygeraniin. *Spondias mombin* has high extractable phenolic and tannin content (Apori, 1998). The anti-malarial activity of *Spondias mombin* may be linked to a range of compounds like anthraquinones, berberine, flavonoids, naphthoquinones, sesquiterpenes, quassinioids, indole and quinoline alkaloids (Caraballo et al, 2004).

Abo et al (1999) reported that *Spondias mombin* contains tannins, saponins and anthraquinone glycosides that showed significant antimicrobial activity without any significant antifungal activity. Moronkola et al (2003) reported more than 54 component constituents of the *Spondias mombin*'s essential oils, chiefly caryophyllene as most abundant compound, delta cadinine, alpha-muurolene, alpha-gurjunene, 5-isocedranol and -cadinene. Augusto et al (2000) screened *Spondias mombin*'s fruit to contain alcohols, esters, carbonyl compounds and terpenoids. Lemos et al (1995) showed that *Spondias mombin* leaf oil was rich in 3-hexenol and beta-caryophyllene. Edeoga and Eriata (2001) showed that it contains alkaloids, proanthocyanins and saponins.

Carthout et al (1994) isolated 6-alkenylsalicylic acid from the ethanolic extract of the leaves using chromatographic methods. The structures were 6-(7<sup>1</sup>8<sup>1</sup> Z, 11<sup>1</sup> Z, 14, Z-heptadecatrienyl)-salicylic acid, 6-(8<sup>1</sup> Z, H<sup>1</sup> Z-heptadecadienyl)-salicylic acid and 6-(10<sup>1</sup> Z-heptadecenyl)-salicylic acid, 6-(12<sup>1</sup> Z-nonadecenyl)-salicylic acid. These phenolic acids and pelandjuaic acid were active against *Biomphalaria glabrata*, an intermediate host in the

schistosome life cycle. Corthout et al (1990) isolated a long chain compound belonging to phenolic acid group from *Spondias mombin*; later in 1992, they isolated two caffeoyl esters with antiviral properties from the leaves and stem of *Spondias mombin* by bioguided array. The compounds are 2-O-caffeoyl-(+)-allohydroxycitric acid and chlorogenic acid butylester. Onwuka (1992) equally reported tannin and saponin in *Spondias mombin* while Adedeji et al (1991) reported that the flavour compound in *Spondias mombin* is isobutyl-3-hydroxybutanoate.

Most of the effects observed with extract of *Spondias mombin* may be attributed to the constituent compounds of phenols, tannins, anthraquinones and flavonoids presence in the plant (Ayoka, 2004; Ayoka et al, 2005 and 2006; Akubue et al, 1983; Caraballo et al, 2004; Corthout et al, 1994). The presence of these active compounds has been reported for several activities like antibacterial (Corthout et al, 1994; Ajao et al, 1985), anti-inflammation (Abad et al, 1996), haemostatic activity (Kone-Bamba et al, 1987), anti-microbial (Corthout et al, 1994; Abo et al, 1999; Verpoorte and Dihal, 1987), antioxidant (Castner et al, 1998; Shaltes and Raffauf, 1990), abortifacients (Akubue et al, 1983; Offiah and Anyanwu, 1989), purgatives (Akubue et al, 1983), hypnotics (Akubue et al, 1983; Ayoka et al, 2005), anti-diarrhoea (Akubue et al, 1983), anti-helminthic (Ademola et al, 2005), anti-malarial (Caraballo et al, 2004), wound-healing (Villegas et al, 1997; Ajao et al, 1985), enzyme inhibitor (Coates et al, 1994), increased capillary permeability in rats (Villegas et al, 1997), anti-free radical action, anti-

aging, reduced glutathione synthesis (Pauly and Fleury, 2002). The phenolic acids composition was observed to cause antibacterial and molluscicidal effect (Corthout et al, 1994).

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