

Ethnobotany of Janjangbureh Island, The Gambia, West Africa

Seema Choudhary

Honors Undergraduate Research Thesis

Department of Biology, Queens College

City University of New York

Supervisor: Prof. David C. Lahti

Collaborator: Baba Jarra, village elder and woodworker,

late of Janjangbureh, The Gambia



## THESIS ABSTRACT

In 1999, David Lahti, Ph.D., interviewed a village artisan, Baba Jarra, in Janjangbureh, The Gambia, West Africa. Mr. Jarra was respected as the most knowledgeable person in the area in the uses of plants. These interviews produced a transcript covering thirty-seven local plants with uses ranging from medicine, to crafts, to magic. For the present study, I identify nine of these plants, report Mr. Jarra's claims as to their uses, and determine whether or not the same uses have been documented in previous research, focusing especially on medicinal applications. This study covers nine plants: *Adansonia digitata* L. (Baobab), *Azadirachta indica* (Neem), *Ziziphus mauritiana* (Tomborrong), *Lippia multiflora* (Sisiliñamo), *Acacia sieberiana* (Naning-Kayo), *Ceiba pentandra* (Cotton Tree), *Mitragyna inermis* (Jungo), *Daniellia oliveri* (Santango), and *Combretum glutinosum* (Jambakato). Of these plants, Mr. Jarra reported uses for three that had not been previously documented. These plants are *Ziziphus mauritiana* (Tomborrong), *Mitragyna inermis* (Jungo) and *Acacia sieberiana* (Naning-Koio). These results can lead to future studies in ethnobotany, folk medicine, and ethnopharmacology.

## INTRODUCTION AND BACKGROUND

The Gambia is the smallest nation in tropical Africa, located in the northwestern region of the continent in the sub-Saharan tropical climate zone, with forests covering about 17% of the land. It is surrounded by Senegal to the north, east, and south, and the Atlantic Ocean to the west. This poor nation has a population density of 1.4 million (Population and Housing Census 2003), with about two-thirds of the population living below the national poverty line (Integrated Household Survey 2003/04), and a Human Development Index rank of 155 out of 177 countries (Human Development Index 2006). The Gambian economy is based on subsistence farming, in which 80% of the population is engaged (World Health Organization Country Cooperation Strategy 2009), with the main crops being rice, maize, and millet. Some of the main ethnic groups in this country are the Jola, Mandinka, Wolof, and Fula (Campbell 1997:103-104; Madge, 1998: 286-7). Adequate health care is not available to much of the population, especially in rural areas (World Health Statistics 2008). As a consequence, The Gambia faces high infant, child, and maternal mortality rates, and has a life expectancy at birth (64, according to the Population and Housing Census 2003) that is one of the lowest in the world (Madge 1998: 294-5), despite national political stability. Traditional medicine is widely practiced in the rural region of the country and is prominent in the history and culture of the people. In The Gambia as in much of sub-Saharan Africa, traditional medicine and biomedicine coexist, with the former being more prevalent in rural communities where locals have negligible money or access to healthcare. Traditional medicine in The Gambia is embedded in the culture, within myth, magic, and folklore. Illnesses are often thought to originate socially or spiritually, and a psychosocial approach is often considered

necessary to remove illness and disease. An estimated 95% of African medicine comes from plant materials, with each remedy intertwined in folklore (Madge 1998:294-5). The ethnobotany of The Gambia has been explored to some extent (e.g., Madge 1995; Starley et al. 1999; reviewed in Madge 1998). However, research has tended to focus on the western, more urban part of the country, whose people are predominantly Wolof and Jola. Less attention has been paid to the less accessible and more rural interior of the country, where the Mandinka and Fula peoples predominate, and where traditional practices are more likely to persist under minimal Western influence. Historically, the inaccessibility of means of long-distance travel and the fact that the Gambia River has been (and still is) unbridged may have tended to socially isolate areas of the country that are nevertheless geographically proximate.

This study documents the traditional uses of plants among the people of Janjangbureh, the largest and only populated island in the Gambia River. These uses are based on interviews in 1999 with Baba Jarra, a Mandinka man who was one of the island's most respected sources for local traditions and was considered a local expert in the uses of wood and plants. The goals of this study are to (1) identify the plants referred to in the local accounts, (2) document the local uses of these plants, (3) determine whether any of these uses has escaped notice in the broader ethnobotanical literature, and, to a lesser extent, (4) assess whether medicinal claims have been tested scientifically. For this thesis project, I chose nine of the thirty-seven plants discussed in the interviews for identification, documentation, and analysis.

## METHODS

In July-August 1999, Dr. David Lahti, Mrs. April Lahti, and Mr. Jarra toured the island in an attempt to identify important local plants and summarize their uses according to the memory of Mr. Jarra. The resulting data are photographs, field notes, and a videotape. I digitized these materials and created a transcript of the interview. I then chose nine of the discussed plants and identified them by scientific name (See Table 1). I located previous documentation of the local uses, medical efficacy, and biological status of each species, and compiled this information into a series of reports, which comprise the bulk of this thesis. I compare the previously documented uses to those described by Mr. Jarra, with the aim of indicating future possibilities for research on the uses of these plants.

Each ethnobotanical report here contains four sections: Local Description and Uses, Identification and Biological Description, Previous Documentation of Uses, and Synthesis. The first section, Local Description and Uses, contains Mr. Jarra's claims as to the local uses of each plant. The second section, Identification and Biological Description, is a brief description of the species including botanical and range information. The third section, Previous Documentation of Uses, contains both previously documented claims in any geographical area, and scientific research on the efficacy of medicinal properties. This section includes any claimed uses of the plant, whether for medicine, agriculture, the environment, or industry. The final Synthesis section of the report brings together these documentations with the claims by Mr. Jarra, highlighting cases where Mr. Jarra's claims have not been previously documented. This will point the way for further studies that can focus on the particular species.

## RESULTS

### **REPORT #1- BAOBAB (*Adansonia digitata* L.)**

#### Local Uses in Janjangbureh, The Gambia

The baobab trunk is used for rope and the seeds are crushed to make something like ice cream. In the Gambia, Baobab is locally known as monkeybread.

#### Identification and Biological Description of Plant

The scientific name of the baobab is *Adansonia digitata*. This is one of eight *Adansonia* species. This plant is native to the arid parts of Central Africa where it grows wild, but it is also cultivated throughout Africa and Asia (Yazzie et al., 1994, pp.189). Each *Adansonia* species varies in size and height, and each is indigenous to a different region and climate of Africa. The other seven species are: *Adansonia grandidieri*, *Adansonia gregorii*, *Adansonia madagascariensis*, *Adansonia perrieri*, *Adansonia rubrostipa*, *Adansonia suarezensis*, and *Adansonia za*. The baobab belongs to the Bombaceae family (Gebauer, et al. 2002:155). *Adansonia digitata*. can be described as deciduous and massive, up to 25m high with thick, angular, wide spreading branches and a short, stout trunk reaching 10-14m or more in circumference (Gebauer, et al. 2002:155). Jones (1970:32) describes the fruit as being green in color with a velvet-like texture holding seeds inside a dry pulp; the fruits remain on the tree until the next time it becomes leafless. “The large brown seeds are arranged in rows in two to eight locules per

fruit. The seeds are attached to fibrous strands from the wall of the fruit and are embedded in a yellowish-white pulp” (Nour A.A. . 1980:384). This species is also characterized by a long, extensive root system and high water-holding capacity. Even when the baobab is leafless, it is distinctive in appearance and is known as Africa’s ‘upside-down tree’ (Jones 1970:32). The bark is smooth, reddish brown or grayish with a purplish tinge, or rough and wrinkled like the skin of an elephant. The leaves are hand-shaped with 3-9 leaflets, about 10 x 5cm, located at the ends of branches. The large white flowers are 12cm across and arranged axially(around main stem). The flowers have a stale smell, only blooming for one night and are bat-pollinated (Jones 1970:32). The fruit’s capsule hangs alone on a long stalk and contains a woody shell covered outside with greenish-brown felted hair (Gebauer et al. 2002:156).

#### Previous Documentation of Uses(Claimed and Confirmed)

There are a very wide range of uses of the baobab, and it tends to be used thoroughly, with nothing wasted. Three categories of use are widely discussed: nutritional value, local diet, and medicinal uses. Gebauer et al. (2002:157) compiled a long list of uses, including some beyond nutrition and medicine. Some of these extended uses are the tree as a whole as a boundary line to separate plots of land; the bark which produces strong fiber for ropes, mats, bags, and hats; the wood for fuel, and the seeds for cattle feed. Jones (1970:33) mentions other uses: the soft and spongy wood is used for light canoes and floats for fishing nets, the roots produce a red dye, the ashes can be used for fertilizer or in soap-making, the bark yields tannin, and the smoke from the burning fruit is an insect repellent.

The baobab is a staple food source in many parts of Africa. Gebauer et al. (2002:157) explains that the fruit pulp is used in preparing hot and cold drinks, use of 'baobab milk' is very common, fruit pulp is processed locally to obtain sweets and is also eaten fresh, young leaves are commonly used as a vegetable in soups or cooked and eaten as spinach, dried green leaves are used throughout the year mostly in soups served with millet, and flowers can be eaten raw or used in flavor drinks. Jones (1970:33) writes that in The Gambia, the fruit pulp is eaten raw or mixed with water and sugar to make a 'cream soda' and sold frozen in plastic bags. It is also popular in iced drinks in urban areas in other parts of Africa. In the Gambia, the seeds are ground and eaten, tasting like almonds. In Sudan the seeds are pounded whole into a coarse meal and added to soups and other dishes like 'Burma'. In some areas seeds are roasted and used as a coffee substitute. Osman (2004) notes that fermented seeds are used as flavoring soups, where the roasted seed is used as a side dish substituting peanut and the seeds are pressed for oil (Osman 2004:29). The baobab leaves are sundried, pounded into powder, and cooked in the daily sauce (Scheuring et al. 1999:21).

With regard to nutrition, baobab is widely accepted as a good source of nutrients to supplement often deprived local diets. The seed has been found to be an excellent source of energy, protein, and fat. Both the kernel and the pulp contain sizeable quantities of calcium, potassium, and magnesium. Amino acid analyses revealed high glutamic and aspartic acid contents (Osman 2004:29). The leaves represent an important source of iron, which is vital given the numerous cases of anemia in the area (Yazzie et al. 1994:193). The pulp of the fruit has a very high Vitamin C content, almost 10 times that of oranges; it contains sugar but no starch and is rich in pectins, a naturally-occurring

fruit sugar extracted from citrus peels (Gebauer et al. 2002:156). The simple practice of drying baobab leaves in the shade doubles the provitamin A (converted to vitamin A in the body) content of the baobab powder (Scheuring et al. 1999:22).

In terms of medicinal value, Oliver-Bep (1986:49) points out that West African local medicine uses all parts of the baobab tree; it is said to treat excessive perspiration, alleviate fevers, treat severe diarrhea relating to intestine infection, induce menstrual flow, and treat filerina (parasitic infectious tropical disease) and wounds. The leaf extracts, in particular, have the most potent antiviral properties of any part of the tree. Usually aqueous, the leaf extracts have been used for a variety of traditional medicinal purposes, including fever, respiratory and intestinal symptoms and a variety of skin afflictions, some of which probably involve infectious diseases or inflammation, (Vimalanathan et al. 2009:581). In folk medicine, the baobab is used in treatment of fevers and dysentery. Pulp extracts are used as eyedrops in cases of measles. A mash prepared by dried powdered roots is used as a tonic for malaria treatment. Semi-fluid gum obtained from baobab bark is used to treat sores (Gebauer, et al. 2002:.157).

### Synthesis

Both of the uses stated by Baba Jarra have been previously documented. Baba Jarra states that the baobab trunk is used for rope and the seeds crushed to make something like ice cream. Gebauer et al. (2002: 157) writes that the bark which produces strong fiber is used in making ropes, mats, bags, and hats. Scheuring et al. (1999:22) exclaims that the fruit pulp is popular in iced drinks in urban areas. It wasn't directly stated that the seeds

were used to create ice cream but articles did mention that the fruit was used in making iced drinks.

## **REPORT #2- NEEM (*Azadirachta indica*)**

### Local Uses in Janjangbureh, The Gambia

Mr. Jarra indicated neem as useful but provided no particular information.

### Identification and Biological Description of Plant

Neem is native to India and South Asia, and is also naturalized in several other tropical regions of the world, including Indonesia, West Africa, and Australia. There are two closely related species, *A. indica* and *A. azedarach* (Bramachari 2004: 409). The neem grown in The Gambia is *Azadirachta indica*. It is classified in the order Rurales, suborder Rutinae, family Meliaceae (mahogany family), subfamily Melioideae, and tribe Melieae. It is a tropical evergreen tree (deciduous in drier areas) native to the Indian sub-continent and has a reported lifespan of up to two centuries (K. and Bhat 2008:102). The Sanskrit name for the tree is 'Arishtha', meaning 'reliever of sickness' (Biswas 2002:1336). Since neem has adaptability to a wide range of climates, topographies, and soil conditions, it is now grown in most tropical and sub-tropical areas of the world. Neem requires little water and plenty of sunlight, growing naturally in areas where the rainfall is in the range of 450 to 1200 mm. It can even grow in areas with the rainfall occurring as low as 150 to 250 mm. Neem grows on altitudes up to 1500 m and can grow

well in the temperature range of 0°C to 49°C. It cannot, however, withstand water-logged areas and poorly drained soils (K. and Bhat 2008:102).

*Azadirachta indica* is fast-growing, large and broad-leaved, growing up to 30m tall with spreading branches that span about 10m across and a semi-straight to straight trunk 3m in circumference (K. and Bhat 2008:102). The leaves are divided with 6-9 pairs of sub-opposite leaflets and each segment has a toothed leaf blade edge, asymmetric at the base. The slender, branched clustered flowers hold small and fragrant white flowers, with the floral parts in fives (Jones 1970:51). It normally starts fruiting after three to five years, and from its tenth year it becomes fully productive, able to produce up to 50 kg of fruits annually (K. and Bhat 2008:102). When ripe, the clusters of flowers and fruits are greenish-yellow, with a sweet pulp, each enclosing a seed. The seed consists of a shell and one to three kernels that contain azadirachtin. Mature trees may produce some 2kg of seed per year (Mordue 2000:616).

#### Previous Documentation of Uses (Claimed and Confirmed)

The neem tree is the most researched tree in the world and is said to be the most promising tree of the 21st century (K. and Bhat 2008:102). The entirety of the tree is used, with each part benefiting society in some way. Scientific research has proven the beneficial effects of neem in the areas of medicine (human and veterinary), nutrition, the environment, agriculture, and industry.

In medicine, *Azadirachta indica* is a widely applicable plant. The parts of the Neem tree, including the leaves, bark, fruit, oil and root, have all been used widely in traditional medicine to treat various human ailments (Maity et al.:2009:749). Biswas et al.

(2002:1337) writes that neem is anti-inflammatory, antiarthritic, antipyretic (used to reduce fevers), hypoglycemic, spermicidal, antifungal, antibacterial, diuretic (increases urine flow), antibacterial, and antimalarial. Neem oil and the bark and leaf extracts have been used in folk medicine to control leprosy, intestinal helminthiasis (parasitic worm infestation), respiratory disorders, and constipation, and has been taken generally to maintain health. It is also used for the treatment of rheumatism, chronic syphilitic sores and painless ulcer. Bark, leaf, root, flower and fruit are considered to remedy blood morbidity, biliary conditions, itching, skin ulcers, burning sensations, and tuberculosis (Biswas et al. 2002:1339). Both the neem bark and leaf contain several important compounds that display medicinal properties (Maity et al. 2009:749).

The leaves are considered helpful in the treatment of anorexia and skin diseases while the fruits are used as laxatives, used in treating dry skin, and are effective in the treatment of intestinal worms, urinary diseases and piles (Maity et al. 2009:749). The leaf extract has also been reported as non-toxic and non-mutagenic (Van der Nat et al.:1991). Based on a research study on the effects of neem on the liver status of skin tumor bearing mice, *Azadirachta indica* leaf extracts have been observed to effectively suppress oral squamous cell cancer induced by DMBA (Koul et al. 2006:.170). The observations in Koul et al.'s (2006:176) study show that the crude aqueous *Azadirachta indica* leaf extract has a promising role in the removal and modulation of certain tumors. The aqueous extract of neem leaves also significantly decreases blood sugar level and prevents adrenaline as well as glucose-induced hyperglycemia (Biswas et al. 2002:1339). Clinical studies with the dried neem leaf extract indicated its effectiveness in curing ringworm, eczema, and scabies. In The Gambia, neem leaves are used to treat headaches,

sores, and stomach pains (Madge 1998:298). Lotion derived from neem leaf, when locally applied, can cure these dermatological diseases within as little as a fortnight and as long as a few days (Biswas et al. 2002:1341).

In vitro studies show that the bark extract possesses anti-inflammatory activities and properties to help the immune system. It has an additional advantage in that it is nontoxic and effective in patients without appearing to show any adverse effects at therapeutic doses. Existing evidence proves that neem has tremendous potential in the development of new nontoxic antiulcer products (Maity et al. 2009:753). The chloroform extract of stem bark is effective against swelling of the paw due to excess fluidity in rats (caused by algae), ear inflammation in mice, and inflammatory stomach conditions in children (Biswas et al. 2002:1339).

With respect to veterinary medicine and care, neem has been used for centuries to provide health care to live stock in various forms, and is very widely used as animal feed. All parts of neem, including gum, bark, leaves, fruits, seeds, have been used to treat animals. Neem leaves have been used as antiviral agents against vaccinia virus, variola major virus, and newcastle disease viruses. The hot infusion of leaves is used to treat swollen glands, bruises and sprains. Bark is effective against skin diseases whereas, the seed and kernel oil are used as antiseptic, antifungal, and antibacterial agents. The Neem oil has effects that counter high sugar levels.

The nutrients found in neem are proteins, minerals, carotene, and adequate amounts of trace minerals except for zinc. Neem also has considerable amounts of digestible crude proteins (DCP) and total digestible nutrients (TDN). Significant antioxidant activity was

observed with neem leaf aqueous extracts and with flower and stem bark ethanolic extracts (K. and Bhat 2008:106-7).

*Azadirachta indica* is also helpful in the restoration and balancing of the environment where trees may partially help such global problems such as deforestation, desertification, soil erosion, and even global warming. It is drought resistant with a deep root system that tolerates poor soils of semi-arid to arid regions and so the fairly coarse root system with very few root hairs. Neem trees can survive under low fertility conditions, particularly low phosphorus availability (Phavaphutanon et al. 1996:65). It is also known to increase soil fertility and water holding capacity. Neem has a high rate of photosynthesis and liberates more oxygen than many other tree species. The temperature under the neem was found to be ten degrees cooler than the surrounding temperature during hot summer months in the northern parts of India. Along 10 km on the plains of Arafat, about 50,000 neem trees were planted, producing a notable difference in the area's microclimate, microflora, microfauna, and sand soil properties. In areas of low rainfall and high wind speed, neem is useful as a wind break. In the Maijia valley in Niger, 20% increase in grain yield was observed in millet crops protected by double rows of neem trees providing 500 km of wind break. Large-scale planting of neem has been initiated in the Kwimba afforestation scheme in Tanzania. Neem plantations have been used for halting the spread of Sahara desert in the countries from Somalia to Mauritania. A grown neem tree produces 10-100 tons of dried biomass per hectare, comprised of leaves (50%) and fruits and wood (25% each). Neem wood is durable and termite-resistant and is thus used in making poles for house construction, furniture, etc. In rural India, neem is a good source of firewood and fuel; its charcoal has high calorific value.

Neem resprouts after cutting, and re-grows its canopy after pruning of the upper branches, making it highly suited for pole production. Neem products have water purifying activity, and neem leaf powder can be used as a biosorbent for the removal of dyes like Congo red from the water (K. and Bhat 2008:105).

In agriculture, neem is regarded as the most reliable source of eco-friendly biopesticidal properties and tops the list of 2,400 plant species reported to have pesticidal properties (K. and Bhat 2008:105-6). The oil extracted from neem seeds controls plant fungal diseases such as powdery mildew and rust (Phavaphutanon et al. 1996:59). Azadirachtin, a phytochemical compound from the neem seeds, is the primary compound responsible for causing both antifeedant and toxic effects in insects. Other phytochemical and sulphur-containing compounds with repellent, antiseptic, contraceptive, fever-reducing, and antiparasitic properties are found elsewhere in the leaves, flowers, bark, and roots (Mordue 2000: 616). Indian farmers have been aware of the insecticidal properties of neem tree for thousands of years, hanging neem branches in granaries to protect stored grain from pest attacks (Bramachari 2004: 410). In The Gambia, dried leaves placed on clothes are said to protect the clothes against insect attacks, and green leaves added to a bonfire produces a smoke that drives off mosquitoes and sandflies (Jones 1970:51).

In industry, the most useful and valuable product of the tree is the seeds, which yield 40% of a deep yellow oil, 'Margosa oil'. The industries that use this are the pharmaceutical, cosmetics, disinfectants, rubber, bio-pesticide and textile industries. In India, neem is highly exploited by many Ayurvedic drug industries. The oil and powdered neem leaves are used in various cosmetic preparations such as face creams,

nail polish, nail oils, shampoos, and conditioners. A new shampoo based on seed extract of neem is more effective than synthetic insecticides that were used against head lice under in vivo conditions. Neem cake, a byproduct of neem oil industry, is used as livestock feed, fertilizer, and as a natural pesticide. Neem oil is used to manufacture medicated neem soap and neem-based toothpaste is widely used in India and European countries. *Azadiracta indica* is also a source for many oral-hygiene preparations and dental care products. Neem bark yields gum and tannins which are used in tanning, dyeing, etc. The seed pulp is used as a rich source of carbohydrate in fermentation industries and for methane gas production. The cultivation of neem and processing of neem products provides employment and income generation opportunities for the poor households, especially the rural women (K. and Bhat 2008:104-108).

### Synthesis

Baba Jarra's interview only included a description of the neem plant and a general indication of its usefulness; the academic literature has confirmed an extensive breadth of use of this plant.

### **REPORT #3- TOMBORRONG (*Ziziphus mauritiana*)**

#### Local Uses in Janjangbureh, The Gambia

The leaves of Tomborrong are eaten for high blood pressure.

#### Identification and Biological Description of Plant

Tomborrong, *Ziziphus mauritiana* Lam., is a shrub or small tree found in dry savanna and coastal dunes (Jones 1970:50). *Ziziphus mauritiana* and a similar species, *Z. spina*, both belong to the family *Rhamnaceae* (Dahiru and Obidoa 2009:1884). *Ziziphus mauritiana* is native to India and is currently naturalized and cultivated in many tropical regions such as South and South-East Asia, the Adrar Mountains of Mauritania, the Cameroons, Chad, and Kenya (Baumer: 253-4). Tomborrong may be evergreen or leafless for several weeks during the summer.

This woody species is usually 4-6ft. in height as a shrub and 10 to 40ft. as a tree. It is erect and wide-spreading, with gracefully drooping branches with smaller offshoot branches, sometimes creating dense groups of bush in the savannahs due to its sturdy curved thorns. Tomborrong branches from the ground and is typically very thorny, with light branches and an intricate crown. The leaves are alternate, oval-shaped or oblong-elliptic, 2.5-6.25 cm long and about 2-4cm wide (Dahiru and Obidoa 2009:1884). There are only 4-6 tertiary veins and they are not very noticeable beneath the surface. The tertiary veins are 3-5 mm distant from two ellipsoidal veins. The fruits ripen in March in the Sahel or in October and its growth is rather slow (Baumer 1983:253-4). The tree bears small, spherical fruits that turn reddish-brown when ripe (Muchuweti et al. 2005:570). The flowers are yellowish appearing in clusters near the axils with edible fruit (Jones 1970:50).

#### Previous Documentation of Uses (Claimed and Confirmed)

*Ziziphus mauritiana* is used in local diet, has a considerable amount of nutritional value, medicinal applications, and displays several other local uses. In terms of diet, the

ripe fruit of the plant is usually consumed raw, although it is sometimes stewed. In Indonesia, locals eat the young leaves (Dahiru and Obidoa 2007:706). The fruit is commonly consumed in Zimbabwean households fresh or is dehydrated for later use. The powder from the fruit is used for baking, to prepare jam, and to make a traditional loaf. Mature unripe fruits are used in India to prepare chutney, pickle, and jelly (Muchuweti et al. 2005:570). In Kenya and Sudan, the leaves are sometimes cooked in soups and gruels. In Sudan, the pulp of the fruit is fermented and dried. When the fruit is soaked in water, it produces a refreshing drink, high in Vitamin C (Baumer 1983:254). Through a survey of traditional processing techniques of this fruit in Mudzi, Mt. Darwin, and Muzarabani districts in Zimbabwe, Nyanga et al. (2008) cites that the surplus fruits are sun dried and made into porridge, traditional cakes, *mahewu*, and fermented to create a spirit called *Kachasu*. The ethanol content of the fermented fruit pulp ranged from 2.1 - 3.7 mL 100mL<sup>-1</sup> and the liquid that was condensed from vapor, made traditionally, consisted of 23.8 - 45.6 mL 100 mL<sup>-1</sup>.

Nutritionally, *Ziziphus mauritiana* is an excellent source of the essential fatty acid linoleic acid. It also contains levels of iron, calcium, magnesium, and zinc. Tomborrong's content of other essential nutrients, however, is rather low. After conducting research examining the levels of each nutrient component in the plant, Sena et al. (1998:24) found that the leaves only contained 7.37% protein, very little iron (43.1 ug/g), appreciable amounts of calcium ranging from 2000-9000 ug/g, high lipid content (270 mg/g), and low amounts of magnesium. Becker (1983:261) writes that tomborrong is an excellent source of Vitamin C. Muchuweti et al. (2005:571-2) studied the sugars, organic acids, and phenolic acids in *Z. mauritiana*. The sugars identified were fructose,

glucose, and galactose and the non-volatile organic acids determined were citric, malic and malonic.

*Ziziphus mauritana* is applied medicinally around the world to alleviate common illnesses. The leaf extract possesses antiulcer activity, antibacterial activity, and antioxidant activity, stimulates the engulfment of waste, and aids the intracellular killing potency of human white blood cells (Mishra and Bhatia 2010:341). The leaves are locally applied as poultices on sores and cuts; it is also said to be helpful in asthma, fever, and liver problems. Dahiru and Obidoa (2007:706) carried out an experiment where they pretreated rats with an aqueous extract of *Ziziphus mauritiana* before giving them alcohol. The extract was found to protect rats from chronic alcohol-induced liver injury and weight loss. The action of the extract was made possible through inhibition of lipid peroxidation (oxidative degradation of lipids resulting in cell damage), subsequently increasing the total antioxidant status of the liver. Another experimental study by Dahiru and Obidoa (2009:1887) addressed the chronic ingestion of alcohol in rats, which significantly increased the levels of cholesterol and triglyceride in both serum and liver. Pretreatment with aqueous extract of *Ziziphus mauritiana* leaf inhibited this high content of fatty substances in blood and fatty liver more than co- or post-treatment.

The bitter, astringent bark decoction is taken to stop diarrhea and relieves gingivitis. The bark paste is applied on sores and the root is used as a laxative. A root decoction is given to treat fevers and the powdered root is dusted on wounds. The juice of the root bark is said to alleviate gout and rheumatism. An infusion of the flowers serves as an eye lotion and it was reported that the aqueous extracts of the *Ziziphus mauritiana* leaf demonstrate antisalmonella activities (Dahiru and Obidoa 2009:1884). The tomborrong fruit has

traditionally been used as an immune stimulant in traditional Chinese medicine. However, it is not known which part of the fruit (pulp or seed) possesses the bioactivity. The bark has been reported to exhibit anticancer properties and extracts from the pulp and seeds were prepared and assessed for humoral (involves antibodies) and cell-mediated (involves T-lymphocytes) immune response. This study, completed by Mishra and Bhatia (2010:341), suggests that plant extracts can exhibit selectivity in immune therapy.

In India, the fruits are used as a painkiller and tonic. They form one of the ingredients of Joshanda, an herbal tea mix manufactured in Pakistan used to remove flu-like symptoms. The leaves, combined with *Areca catechu*, are commonly used to constrict body tissues or canals and to reduce excessive perspiration. Mahesh and Satish (2008:842) conducted an experiment, demonstrating the antifungal properties of *Ziziphus mauritiana*. The methanol leaf, root/bark extracts showed activity against *B. subtilis*, *E. coli*, *P. fluorescens*, *S. aureus*, *X. axonopodis* pv. *Malvacearum*, *A. flavus*, *D. turcica* and *F. verticillioides*. The seeds are sedative and taken sometimes with buttermilk to halt nausea, vomiting, and abdominal pains associated with pregnancy (Abalaka et al. 2010:135).

In other uses, the spiny branches of *Ziziphus mauritiana* are used for temporary fencing against animals. Temporary fences are preferential to permanent ones because of disease transmission risks between herds using the same fencing (Baumer 1983:254). Becker (1983:261) states that the agricultural uses include providing protection for young tree seedlings during their first vegetation period. The wood is durable and pliable and the tree itself is used to create live or dead hedges (Danthu et al. 2004:247).

### Synthesis

Tomborrong is used locally for high blood pressure. The research that was examined for this report does not second this claim. Despite a very broad range of medicinal properties claimed for this plant, apparently this use has not yet been documented, nor has a scientific study yet focused on or revealed the effects of *Ziziphus mauritiana* on blood pressure.

### **REPORT #4- SISILIÑAMO (*Lippia multiflora*)**

#### Local Uses in Janjangbureh, The Gambia

Sisiliñamo is pounded and put on one's head for lice. It is then rinsed off with hot water the next day.

#### Identification and Biological Description of Plant

Sisiliñamo is *Lippia multiflora*. The genus *Lippia* includes approximately 200 species of herbs, shrubs, and small trees. *Lippia* belongs to the family Verbenaceae, many members of which thrive in tropical climates. The species are native to West Africa and are found in South America, Central America, and tropical Africa (Pascual et al. 2001, pp. 201). *Lippia multiflora* is an herb that flourishes in a wide ecological range throughout the region of West Africa as a native species (Bassole et al. 2009, pp. 209). Sisiliñamo can grow on a wide variety of terrain, although it is a savannah plant. This species naturally grows on deep sandy soils located at the mid-level or the bottom of hills

(Yao-Kouame et al. 2009). The plant will naturally grow to a height of 2.7m to 4.0m in the wild. It is woody, perennial, and has fragrant white flowers stalked on cone-like heads in a terminal panicle at about 120 mm long (Jigam et al. 2009, pp. 148-9).

#### Previous Documentation of Uses (Claimed and Confirmed)

Sisiliñamo (*Lippia multiflora*) is reportedly used as a remedy against malaria, respiratory diseases, hepatic diseases, increasing the amount of bile secretions coming out from liver, viral and fungal infections, fever, stress, arterial hypertension, conjunctivitis (pink eye), sexually transmitted infections, and it also functions as a laxative (Abena et al. (2003), Jigam et al. (2009), Okpekon et al. (2004), and Pascual et al. (2001)). In Africa, the leaves of *Lippia multiflora* are widely prepared as an infusion. In The Gambia, Sisiliñamo is widely known as 'Tea of Gambia' (Abena et al. 2003, pp. 231). Most of the medicinal properties are credited to the glycoside, essential oils, and other phytochemical (chemical compounds occurring naturally in plants) parts of *Lippia*. In an effort to determine whether *Lippia multiflora* actually contain anti-inflammatory, fever-reducing, and pain-relieving properties, Abena et al. (2003) conducted a study to observe these properties in rats and mice. The results show that monoterpenes (compound of essential oils found in plants) are the major components of the oil, and although the experiments prove that the plant does possess pain-relieving and fever-reducing activities, there is no evidence of anti-inflammatory properties. Jigam et al. (2009) conducted a similar study where antiplasmodial, pain-relieving, and anti-inflammatory tests were done on crude leaf extracts of the plant in efforts to verify claims of the plant containing anti-malarial properties. The results demonstrate the potentially beneficial

pain-relieving and anti-inflammatory effects of *Lippia* extracts in vivo. The authors conclude that the use of leaf extracts of this plant species would be a good option in endemic malaria zones. Oladimeji et al. (2000) conducted a study to test *Lippia multiflora* for its activities against bodylice, headlice, and scabies' mites. The study concludes that the oil of the plant species is more effective than that of the more popularly prescribed drug, benzyl benzoate. The essential oil is more successful in treating head lice in an enclosed system with a cap. This article also states that the oil from the plant species has been documented as potentially useful pesticides in plant pest control, most likely due to the terpenoid compound, the chemical constituents of essential oils long known to be insect repellent (Oladimeji et al. 2000, pp. 306).

### Synthesis

Mr. Jarra has reported that Sisiliñamo (*Lippia multiflora*) is used to combat head lice. The research studies on *Lippia multiflora* not only support his claim, but also state that the plant serves as a remedy for malaria, fever, stress, hypertension, conjunctivitis (pink eye), sexually transmitted diseases, and also as a laxative. Mr. Jarra states that the plant is crushed and applied to one's head; the literature supports this claim, but adds that it is commonly taken as an infusion preparation, a very popular tea in The Gambia. *Lippia multiflora* is most likely taken as an infusion as a remedy for other, more internal ailments, but as a cure for external conditions, it is placed directly on the skin.

### **REPORT #5- COTTON TREE (*Ceiba pentandra*)**

### Local Uses in Janjangbureh, The Gambia

One makes an amulet (necklace) with a thorn to remedy a child's toothache.

### Identification and Biological Description of Plant

*Ceiba pentandra*, a pantropical plant native to West Africa, is a fast-growing species from the Bombacaceae family. Like other members of this family, this tree has alternate compound leaves with deciduous stipules and large five-part flowers. *Ceiba pentandra* is native to the tropical Americas as well as West Africa, and has been introduced to Southeast Asia. This species is pollinated by pteropodid bats and also contains high levels of self-fertility, with the West African species only needing a single viable seed to be the founder of a new colony (Steentoft 1988:114 and Gribel et al. 1999:247).

### Previous Documentation of Uses (Claimed and Confirmed)

*Ceiba pentandra* is locally known as Cotton Tree. It has been recorded that the bark, shoot, root, and leaves are used for gingivitis treatment, hypertension, diabetes, weight gain, dermatological remedies, and various other infectious diseases (Ladeji et al. (2003), Djomeni et al. (2006), Noumi et al. (1999), Noumi and Dibakto (2000:409), and Leonti et al. (2003)). Through a study conducted by Ladeji et al. (2003), the effectiveness of this plant against diabetes was tested using streptozotocin-induced diabetic rats. The results showed the hypoglycemic (low blood-sugar levels) and nontoxic qualities of the bark extract, confirming the anti-diabetic properties of the plant. Another research project, conducted by Djomeni et al. (2006), tested the effectiveness of the root bark extract of the cotton tree in combating diabetes. The researchers tested the extract in both normal and

streptozotocin-induced diabetic rats. The results indicated that the root bark is effective in decreasing the blood glucose level in normal and induced diabetic animals. With the help of local traditional healers from the Bafia region of Cameroon, Noumi et al. (1999) collected a group of twenty-six medicinal plants used to treat hypertension. The preparation instructions for *Ceiba pentandra* explain that the parts to be used are the bark, leaves, and roots. To make the remedy, 250 g of bark should be soaked in 3 liters of water. And, as far as dosage, 150 mL should be consumed three times a day. A study by Noumi and Dibakto (2000:409) presents a paper reporting thirty-nine herbal treatments that are used in the treatment of peptic ulcers (sore in stomach lining) in western Cameroon. To prepare the remedy with *Ceiba pentandra*, 200g of stem-bark is boiled in 1 liter of water and one cup is taken three times a day. It was further added that the stem bark is used in the treatment of gingivitis and is to be prepared the same way as the peptic ulcer treatment. A research project carried out in the Lowland Mixe and Zoque-Popoluca communities in the Isthmus of Tehuantepec, Mexico analyzed the ethnobotanical knowledge of the two communities to compare their medicinal traditions for the same list of plant species. One of the communities reported that *Ceiba pentandra* is used in weight gain, which the researchers categorized as a cultural syndrome; the other community explained that it was employed in the treatment of dermatological conditions (Leonti et al. 2003).

### Synthesis

Mr. Jarra reported that Cotton Tree was used in the treatment of toothaches in children in the form of an amulet. The above review of previously documented research

points to a much greater variety of medicinal uses in the treatment of gingivitis, diabetes, weight gain, hypertension, dermatological-related conditions, and various others. All of the sources that document the preparation of the remedy explain that it is taken in liquid form, orally.

### **REPORT #6- NANING-KAYO (*Acacia sieberiana* DC. *Var sieberiana*)**

#### Local Uses in Janjangbureh, The Gambia

One binds 10-12 naning-koyo stems together, pricks the gums, bleeds them to alleviate toothache, and then put salt on the gums. It is also prepared as a tea, or else the leaf is sucked, for stomach-aches during pregnancy.

#### Identification and Biological Description of Plant

*Acacia sieberiana* is a medium-sized tree characterized by a wide crown and short trunk. The “bark is green with brown scales on younger trees, corky, ridged, dark brown on old ones. Branches are armed with pairs of short spines to 2cm long at the leaf nodes. Leaves are feather-like with 3-6 pairs of pinnae, each with 20-40 pairs of tiny narrow leaflets. A flat gland is at the base of the first pinna,” (Kasper 1993:94). The flowers are white and arranged in a cluster on thin stalks, blooming from January to April. The fruits are thick and woody pointed pods. This species is natively found in West Africa and can be found in semi-arid areas throughout Africa. It is usually found in mudflats and close to upcountry streams.

### Previous Documentation of Uses (Claimed and Confirmed)

The documented uses of *Acacia sieberiana* include the following: the pods and young shoots are used as fodder for livestock, the gum extracts from the bark are locally prepared as an ink, the wood is used as firewood, and each part of the tree is also used medicinally to treat gonorrhoea, syphilis, rheumatism, acne, and eye diseases (Kasper 1993:94). In a study conducted by Vlietinck et al. (1995) testing traditional claims of antimicrobial or antiviral capacities of Rwandese plants, it was reported that *Acacia sieberiana* contained antiviral properties on the leaf, root-bark, and roots, locally used against anthrax and diarrhoea. In Ethiopia, *Acacia sieberiana* is collected by children and the gum is the only substance used. It is prepared raw and the harvesting time is from December to January (Addis et al. 2005). The Zulu use the bark infusions of this species to treat backpain and the leaves are used for inflammation (Hutchins et al. 1996).

### Synthesis

Neither of Mr. Jarra's observations (sticks are used to prick the gums for toothache and that the leaves are used to alleviate pregnancy-related stomach aches) have been documented in academic literature. This could indicate a promising avenue of research in the field of ethnopharmacology with regard to new medicinal applications of this plant.

### **REPORT #7- JUNGO (*Mitragyna inermis*)**

#### Local Uses in Janjangbureh, The Gambia

The leaves of jungo are boiled, after which a woman sits on the poultice. She then presses the leaves on her sore areas after childbirth. The leaves can also be taken for wounds, applying its milk to the wound.

#### Identification and Biological Description of Plant

*Mitragyna inermis* falls under the Rubiaceae family, and is a medium-to-tall deciduous shrub, growing to around 10m in height with a trunk of wide diameter and light-colored bark. The leaves are light green and opposite and oval-shaped with a short blunt point, around 6 to 9 cm in length. The young leaves and twigs are red in color. The tree blooms from May to September into small, fragrant white flowers, in round heads of up to 2 cm in diameter on short stalks. The tree bears fruits year-round that are hard, woody, and spherical clusters of capsules. *Mitragyna inermis* is most often found in mud flats and near upcountry mangroves. This species tolerates periodic flooding and salty soils. This plant is native to an area from Senegal south to the rainforest areas of the Ivory Coast, and eastward to Zaire and Sudan (Kasper 1993:114).

#### Previous Documentation of Uses (Claimed and Confirmed)

Jungo is listed in published literature as being a source of firewood, utensils and small articles of furniture, branches used for roofing houses, and food for livestock during the dry season. In terms of medicinal purposes, *M. inermis* has been traditionally used to treat fever, headaches, diarrhea, cholera, malaria, and other illnesses. The leaves, in particular, have been used to treat ailments of the liver, and both the leaves and roots are soaked with the extract drunk to treat fevers and stomach pains. A poultice made from the

leaves is applied on boils and can also relieve rheumatic pains (Asase et al. 2005:276, Asaz et al. 2002:165, Fiot et al. 2005:30, Kasper 1993:114, Toure et al. 1996: 59, Traore et al. 2000:608 and Zonga et al. 2009: 172).

Toure et al. (1996) reported on the effect of the alkaloid properties of the species affected the hepatic (liver) activity and hepatic cellular necrosis. The experiments, conducted on lab rats, show that the alkaloid extracts greatly increased the bile flow of the rats; in fact, these extracts appear to be more effective than the more commonly used sodium dehydrocholate, in increasing biliary flow. As a result of the increased bile flow, an increased amount of bile was excreted, decreasing the concentration of enzymes in the liver and total cholesterol. This proves that the alkaloids induce liver cellular activity without cellular necrosis, confirming the local medicinal use of this plant species.

In a study conducted in Mali to test fungicidal, larvicidal, molluscicidal, antioxidant, and radical scavenging activities, a collection of 20 plants were tested. The bark extracts of *Mitragyna inermis* were tested for larvicidal properties on the larvae of three mosquito species and the *Anopheles gambiae* species of mosquitoes was the one that tested positive for this particular plant species. This knowledge is beneficial in preventing the spread of malaria through eliminating the mosquitoes that spread the disease (Diallo et al. 2001). Azas et al. (2002) conducted a study showing that Malian traditional healers actually combine *M. inermis* with three other anti-malarial medicinal plants as a combination to treat fevers and malaria. An ethnobotanical study completed in Ghana reports this species as one of many that treat malaria. To prepare, one boils the leaves and twigs, and drinks the liquid. The twigs must be boiled with the whole plant of *Indigofera pulchra* and drunk three times every day (Asase et al. 2005:276).

In an experiment carried out by Zongo et al. (2001) in Burkina Faso on *Mitragyna inermis*, the antimicrobial activity of the total alkaloids from the leaves was evaluated using both a disc diffusion and a broth microdilution analysis. The study concludes that alkaloids from *M. inermis* also exhibit *in vitro* antimicrobial activities, supporting its use by traditional healers to treat various infectious diseases.

### Synthesis

Mr. Jarra's description of medicinal uses for Jungo have not been documented in academic literature to date. His claim states that it relieves pain experienced from childbirth and that it can be used to treat wounds. These uses are not explicitly among the various applications that have been previously documented for the species.

## **REPORT #8- SANTANGO (*Daniellia oliveri*)**

### Local Uses in Janjangbureh, The Gambia

Santango is locally used to kill mosquitoes; one achieves this by putting the stems into fire.

### Identification and Biological Description of Plant

*Daniellia oliveri* belongs to the family Caesalpinaceae and is distributed across the regions of Senegal, Gambia, Mali, Guinea Bissau, Sierra Leone, Ivory Coast, Cameroon, Nigeria, Dahomey, Zaire, and Sudan, in woodland savanna habitat. The genus *Daniellia* is comprised of nine species of medium to large trees found in tropical and subtropical

areas of West Africa. Each of the species grows from sea level to 1500m, ranging in habitat from swampy to seasonally dry forests. *Daniella oliveri* is the most widespread species of this genus in the lowland savannah and is easily distinguished from the others because the flower contains one larger petal among many smaller ones. This tree is physically sturdy and medium-to-tall with grey-pink bark and knotted, wedge-shaped branches with a flat-topped crown. The leaves of this tree are pinnate with 5 to 10 pairs of slightly stiff, elliptic-lanceolate pointed leaflets, 8 cm x 15 cm, with a rounded base. The white flowers that occupy this tree contain five petals and a filamentous stamen with a long and flat ovary. The tree is leafless from February to March. The fruits are short and flat with pods hanging in clusters from branches, consisting of only one seed (Kasper 1993 and De La Estrella 2009).

#### Previous Documentation of Uses (Claimed and Confirmed)

The uses of Santango include the gum (copal) being used as an incense to get rid of insects. After being collected, dried, and burned, the leaves are also eaten by the livestock. The dried bark mixed with water is used as a cough syrup. The wood is used to make kitchen utensils, for some building, and firewood (Kasper 1993:46). In Northern Nigeria, the leaves are traditionally used in the curing of diabetes, gastrointestinal problems, diarrhea, as a diuretic (causing an increased pass of urine), and aphrodisiac (Ahmadu et al. 2007). An infusion of the stem bark is also used as a body lotion. The dried leaves are powdered and taken orally to treat yellow fever, backaches, headaches, and applied after a cut. Along the Ivory Coast, both the dried root and stem bark have been used as a chewing stick and the water extract of the stem bark exhibits antibacterial

activity. The bark extracts show pain-relieving, anti-inflammatory activities, and smooth muscle relaxant activity (Ahmadu et al. 2004).

Ahmadu et al. (2007) ran phytochemical tests on the plant species *D. oliveri* and saw that the extract tested positive to carbohydrates, reducing sugars, antioxidants, and anti-inflammatory components. Another experiment showed that the extracts of *D. oliveri* provided protection against castor oil-induced diarrhea in mice. The same substances found in this species has also been said to have antimicrobial and anti-diarrheal activity.

Palsson and Jaenson (1999) conducted a study in Guinea Bissau where they collected data on which plant species people used to reduce mosquito biting activity. In the twenty-three villages where the interviews were conducted, a number of plants were identified as being used to combat mosquitoes, and *D. oliveri* was on this list. In Guinea Bissau and The Gambia, the bark and resins are burned to reduce mosquito-biting indoors. After comparisons were made, it was found that *D. oliveri* is one of the most commonly used traditional mosquito repellents. When used, the reduction in mosquito-biting was greater than 74% in households in the area covered and it was also preferred along with mosquito coils by 17.5% of the 63 participants. Results confirm previous studies that show that this species is one of the most effective as an insect repellent.

Schwob et al. (2008) conducted a study to identify the unstable components of *D. oliveri* leaves gathered from Senegal and Ivory Coast. Since this plant is used throughout the region as a medicinal plant, this study sought to isolate essential oils from the plant. Results indicated that all of the volatile components that were identified are terpenoids and the leaf oil was rich in sesquiterpenoids. These compounds might be responsible for medicinal or insect repellent values of this plant.

### Synthesis

Considerable reports and testing corroborate Mr. Jarra's observation that santango is used against mosquitoes, among a much broader variety of uses. Although Mr. Jarra claims that the burning or smoking plant actually kills mosquitoes, scientific research and other documentation tends to refer not to an insecticidal but only a repellent quality.

### **REPORT #9-JAMBA KATANG (JAMBAKATO) (*Combretum glutinosum*)**

#### Local Uses in Janjangbureh, The Gambia

Sticks are used for teeth, and leaves for tea.

#### Identification and Biological Description of Plant

*Combretum glutinosum* is a shrub or small tree, growing to about 15 m. The pointed gray-green leaves are ovate-elliptic and about 14 cm long. The flowers bloom from January to March, and are tiny and yellow with fuzzy white hairs inside of them. The fruits are four-winged *Combretum glutinosum* is very common in savanna woodland as well as around the edges of mud flats and frequently burned areas. This plant can be found in West Africa from Senegal to Cameron and east to Sudan (Kasper 1993:55).

#### Previous Documentation of Uses (Claimed and Confirmed)

Jambakato is documented to have a wide range of uses, both industrially and medicinally. Both the bark and the roots create a yellow dye, and the wood is used to

build furniture and household utensils, and is also used for firewood and charcoal.

Among medicinal uses, this plant is used as a tea, where it is made with the leaves to fight colds, bronchitis, pneumonia, and fevers, rheumatism, and toothaches. In Burkina Faso, this plant is used for malaria treatment (Thiombiano 1996). In traditional veterinary medicine, the leaves are boiled and given to cattle to eliminate worms, or the liquid is added to baths as a purge (Gambia, Nigeria). The twigs are used as chewing sticks. Research shows that substances from this tree are diuretic (increase passing of urine), reduce hypertension, and facilitate the discharge of bladder stones, as well as aiding in the treatment of hepatitis (liver inflammation) (Kasper 1993:55). The young leaves of *C. glutinosum* have also been documented to have active agents within them that counteract fevers and jaundice (Kerharo and Adam, 1974).

Ouattara et al. (2006) conducted an experiment testing the anti-malarial properties within the plant compound of *C. glutinosum* and found that it does possess some measure of antimalarial activity. The methanol and alkaloid extracts showed higher activity than the aqueous extracts, which are normally used in traditional medicine. A study conducted by Pousset et al. (1993) concluded that the methanolic extracts (which contains antibacterial and antioxidant activities) from this plant showed antihepatitis B activity *in vitro* and contained a substance called gallic tannin, which Asres et al. (2001) proved to have an intermediate level of activity against a certain strain of malaria.

### Synthesis

Mr. Jarra's claim of the uses of Jambakato (*Combretum glutinosum*) as a tooth cleaner and a tea are also documented in the academic literature. Mr. Jarra observed that

this plant is used to make teas, but he did not specify what kinds of remedies are provided. Previous documentation suggests that the tea is used very generally for a variety of ailments including those of lungs, joints, and teeth.

## DISCUSSION

The nine plants identified in this study are *Adansonia digitata* L. (Baobab), *Azadirachta indica* (Neem), *Ziziphus mauritiana* (Tomborrong), *Lippia multiflora* (Sisiliñamo), *Acacia sieberiana* (Naning-Kayo), *Ceiba pentandra* (Cotton Tree), *Mitragyna inermis* (Jungo), *Daniellia oliveri* (Santango), and *Combretum glutinosum* (Jambakato). All of the plants are woody. Seven are native to West Africa: *Adansonia digitata* L. (Baobab), *Lippia multiflora* (Sisiliñamo), *Acacia sieberiana* (Naning-Kayo), *Ceiba pentandra* (Cotton Tree), *Mitragyna inermis* (Jungo), *Daniellia oliveri* (Santango), and *Combretum glutinosum* (Jambakato). The other two plants, *Azadirachta indica* (Neem) and *Ziziphus mauritiana* (Tomborrong), were introduced to the region and cultivated. The ways in which these introduced plants have been adapted by the local culture in traditional healing are worth further research in medical anthropology.

The plants covered here have many and diverse uses. *Adansonia digitata* L. (Baobab), possesses nutritional and medicinal value, is incorporated into the local diet of the region, and is used in construction. *Azadirachta indica* (Neem) is applied in various industries, agriculture, medicine, construction, environment, and nutrition. Tomborrong is used nutritionally, medicinally, and in construction and agriculture. *Lippia multiflora* (Sisiliñamo) and *Ceiba pentandra* (Cotton Tree) are documented for their medicinal properties. *Acacia sieberiana* (Naning-Kayo), *Daniellia oliveri* (Santango), *Mitragyna*

*inermis* (Jungo), and *Combretum glutinosum* (Jambakato) have been used in both construction and medicine.

Of the nine plants identified and researched here, three were attributed uses by Mr. Jarra that were not previously documented. These plant species are *Ziziphus mauritiana* (Tomborrong), *Mitragyna inermis* (Jungo) and *Acacia sieberiana* (Naning-Koio). Mr. Jarra reports *Ziziphus mauritiana* (Tomborrong) as a treatment for high blood pressure, *Mitragyna inermis* (Jungo) as relieving pain experienced from childbirth and also for treating wounds, and *Acacia sieberiana* (Naning-Koio) as a treatment for toothaches and pregnancy-related stomachaches. These medicinal uses can serve as a basis for future research in the disciplines of ethnobotany, anthropology, and medicine.

A few plants lacked scientific studies testing their active components and medical uses. For instance, previous documentation supports Mr. Jarra's claim that *Ceiba pentandra* (Cotton Tree) is a remedy for tooth-related ailments, but no scientific study has confirmed its efficacy. Scientific confirmation is also needed for medical uses of *Acacia sieberiana* (Naning-Koio), *Mitragyna inermis* (Jungo), and *Combretum glutinosum* (Jambakato).

The practical implications of this project are that it indicates potential avenues of scientific medical research and suggests further studies on the efficacy of local plants used for healing. Such focused studies of local ethnobotany can also help us to gain a deeper understanding of the cultures and traditions involved, including their perceptions of healing and wellness.

## **ACKNOWLEDGMENTS**

I would like to thank my research mentor, Dr. David Lahti, for his incredible contribution to this research project with regards to the field component, constant feedback and suggestions, assistance with the structure, focus, and approach, and looking after every last detail in the writing process to ensure the execution of this thesis. I'd also like to thank Mr. Jarra for the valuable knowledge that he has shared with Dr. Lahti during the interviews. The combined efforts of Mr. Jarra and Dr. Lahti form the foundation of this research study. Thanks to the information shared during the interview between them, this thesis can serve as a guide, providing direction for future research in ethnobotany.

## BIBLIOGRAPHY

Abalaka, M.E., S.Y. Daniyan, and A. Mann

2010 Evaluation of the Antimicrobial Activities of Two *Ziziphus* Species (*Ziziphus mauritiana* L. and *Ziziphus spinachristi* L.) on Some Microbial Pathogens. African Journal of Pharmacy and Pharmacology 4(4):135-139.

Abena, A.A., M. Diatewa, G. Gakosso, M. Gbeassor, Th. Honde-Assah, J.M. Ouamba

2003 Analgesic, Antipyretic and Anti-Inflammatory Effects of Essential Oil of *Lippia multiflora*. Fitoterapia 74:231-36.

Addis, G. , K. Uрга, and D. Dikasso

2005 Ethnobotanical Study of Edible Wild Plants in Some Selected Districts of Ethiopia. Human Ecology 33(1):83-118.

Ahmadu, A., A.K. Haruna, M. Garba, J.O. Ehinmidu, and S.D. Sarkar

2004 Phytochemical and Antimicrobial Activities of the *Daniellia oliveri* Leaves. Filoterapia 75:729-732.

Ahmadu, A.A., A.U. Zezi, and A.H. Yaro

2007 Anti-Diarrheal Activity of the Leaf Extracts of *Daniella Oliveri* Hutch and Dalz (Fabaceae) and *Ficus sycamorus* Miq (Moraceae). African Journal of Traditional Complementary Alternative Medicine 4(4):524-528.

Asase, A. , A.A. Oteng-Yeboah, G.T. Odamtten, M.S.J. Simmonds

2005 Ethnobotanical Study of Some Ghanaian Anti-Malarial Plants. Journal of Ethnopharmacology 2005:273-279.

Asres, K., F. Bucar, F. Knauder, V. Yardley, H. Kendrick, and S.L. Croft

2001 *In vitro* Antiprotozoal Activity of Extract and Compounds of Stem Bark of *Combretum molle*. *Phytothermal Research*, 15 (7): 613-617.

Assogbadjo, A.E., R. Glele Kakai, F.J. Chadare, L. Thomson, T. Kyndt, B. Sinsin, and P. VanDamme

2008 Folk Classification, Perception, and Preferences of Baobab Products in West Africa: Consequences for Species Conservation and Improvement. *Economic Botany* 62(1):74-84.

Azas, N., N. Laurencin, F. Delmas, C. Di Giorgio, M. Gasquet, M. Laget, and P. Timon-David

2002 Synergistic *in vitro* Antimalarial Activity of Plant Extracts used as Traditional Herbal Remedies in Mali. *Parasitol Research* 88:165-171.

Bassole, H.N., A.S. Outtara, R. Nebie, C.A.T. Ouattara, Z.I. Kabore, S.A. Traore

2003 Chemical Composition and Antibacterial Activities of the Essential Oils of *Lippia chevalieri* and *Lippia multiflora* from Burkina Faso. *Phytochemistry* 62:209-212.

Baumer, M.

1983 Notes in Trees and Shrubs in Arid and Semi-Arid Regions. Food and Agriculture Organization of the United Nations, Rome.

Becker, B.

1983 The Contribution of Wild Plants to Human Nutrition in the Ferlo (Northern Senegal). *Agroforestry Systems* 1:257-267.

Biswas, K., I. Chattopadhyay, R.K. Banerjee, and U. Bandyopadhyay

- 2002 Biological Activities and Medicinal Properties of Neem (*Azadirachta indica*).  
Current Science 82(11):1336-1345.
- Bramachari, G.
- 2004 Neem—An Omnipotent Plant: A Retrospection. ChemBioChem 5:408-421.
- Dahiru, D. and O. Obidoa
- 2007 Pretreatment of Albino Rats with Aqueous Leaf Extract of *Ziziphus mauritiana* protects against alcohol-induced liver damage. Tropical Journal of Pharmaceutical Research 6(2):702-710.
- 2009 Effect of Aqueous Extract of *Ziziphus mauritiana* Leaf on Cholesterol and Triglyceride Levels in Serum and Liver of Rats Administered Alcohol. Pakistan Journal of Nutrition 8(12):1884-1888.
- Danthu, P., M.A. Toure, P. Soloviev, and P. Sagna
- 2004 Vegetative Propagation of *Ziziphus mauritiana* var. *gola* by micrografting and its Potential for Dissemination in the Sahelian Zone. Agroforestry Systems 60: 247-253.
- De La Estrella, M., C. Aedo, and M. Velayos
- 2009 A Morphometric Analysis of *Daniellia* (Fabaceae-Caesalpinioideae). Botanical Journal of the Linnean Society 159:268-279.
- Diallo, D., A. Marston, C. Terreaux, Y. Toure, B. Smestad Paulsen, and K. Hostettmann
- 2001 Screening of Malian Medicinal Plants for Antifungal, Larvicidal, Molluscicidal, Antioxidant and Radical Scavenging Activities. Phytotherapy Research 15:401-406.

Djomeni, P.D.D., L. Tedong, E.A. Asongalem, T. Dimo, S.D. Sokeng, and P. Kamtchouing

2006 Hypoglycaemic and Antidiabetic Effect of Root Extracts of *Ceiba pentandra* in Normal and Diabetic Rats. *African Journal of Traditional Medicine* 3(1): 129-136.

Fiot, J., B. Baghdikian, L. Boyer, V. Mahiou, N. Azas, M. Gasquet, P. Timon-David, G. Balansard, and E. Ollivier

2005 HPLC Quantification of Uncarine D and the Anti-Plasmodial Activity of Alkaloids from Leaves of *Mitragyna inermis* (Willd.) O. Kuntze. *Phytochemical Anal.* 16:30-33.

Gebauer, J., K. El-Siddig, and G. Ebert

2002 Baobab (*Adasonia digitata* L.): A Review on a Multi-Purpose Tree with Promising Future in the Sudan. *Gartenbauwissenschaft* 67(4): 155-160.

Gribel, R., P.E. Gibbs, and A.L. Queiroz

1999 Flowering phenology and pollination biology of *Ceiba pentandra* (Bombacaceae) in Central Amazonia. *Journal of Tropical Ecology* 15:247-263.

Hori, K., M.E. Flavier, and S. Kuga

2000 Excellent Oil Absorbent Kapok [*Ceiba pentandra* (L.) Gaertn.] Fiber: Fiber Structure, Chemical Characteristics, and Application. *The Japan Wood Research Society* 46: 401-404.

Hutchings, A., A.H. Scott, G. Lewis, and A.B. Cunningham

1996 Zulu Medicinal Plants. An Inventory. University of Natal Press. Pietermaritzburg.

Jigam, Ali A., H.O. Akanya, E.O. Ogbadoyi, B.E.N. Dauda, and E.C. Evans

- 2009 *In vivo* Antiplasmodial, Analgesic and Anti-Flammatory Activities of the Leaf Extract of *Lippia multiflora* Mold. Journal of Medicinal Plants Research 3(3):148-154.
- Jones, M.B.
- 1970 Flowering Plants of The Gambia. Rotterdam. A.A. Balkema Press.
- K., G. and S. Bhat.
- 2008 Neem – A Green Treasure. Electronic Journal of Biology 4(3):102-111.
- Kasper, P.
- 1993 Some Common Flora of The Gambia. Stiftung Walderhaltung in Afrika. Hamburg.
- Kerharo, J. and J.G. Adam
- 1974 La pharmacopée sénégalaise traditionnelle: Plantes médicinales et toxiques. Ed. Vigot & Frères, Paris, 1011 pages.
- Koul, A., A. R. Ghara and S.C. Gangar
- 2006 Chemomodulatory Effects of *Azadirachta indica* on the Hepatic Status of Skin Tumor Bearing Mice. Phytotherapy Research 20:169-177.
- Ladeji, O., I. Omekarah, and M. Soloman
- 2003 Hypoglycemic Properties of Aqueous Bark Extract of *Ceiba pentandra* in Streptozotocin-Induced Diabetic Rats. Journal of Ethnopharmacology 84:139-142.
- Leonti, M., O. Sticher, and M. Heinrich
- 2003 Antiquity of Medicinal Plant Usage in Two Macro-Mayan Ethnic Groups (Mexico). Journal of Ethnopharmacology 88:119-124.
- Madge, C.

- 1998 Therapeutic Landscapes of the Jola, The Gambia, West Africa. *Health & Place* 4(4):293-311.
- Mahesh, B. and S. Satish
- 2008 Antimicrobial Activity of Some Important Medicinal Plant Against Plant and Human Pathogens. *World Journal of Agricultural Sciences* 4: 839-843.
- Maity, P., K. Biswas, I. Chattopadhyay, R.K. Banerjee, and U. Bandyopadhyay
- 2009 The Use of Neem for Controlling Gastric Hyperacidity and Ulcer. *Phytotherapy Research* 23:747-755.
- Mishra, T. and A. Bhatia
- 2010 Augmentation of Expression of Immunocytes' Functions by Seed Extract of *Ziziphus mauritiana* (Lamk.). *Journal of Ethnopharmacology* 127: 341-345.
- Mordue, L., A. Jennifer, and A.J. Nisbet
- 2000 Azadirachtin from the Neem Tree *Azadirachta indica*: Its Action Against Insects. *An. Soc. Entomol. Brasil* 29(4):615-632.
- Muchuweti, M., G. Zenda, A.R. Ndhhlala, and A. Kasiyamhuru
- 2005 Sugars, Organic Acid and Phenolic Compounds of *Ziziphus mauritiana* Fruit. *Eur Food Res Technol.* 221:570-574.
- Noumi, E. and T.W. Dibakto
- 2000 Medicinal Plants used for Peptic Ulcer in the Bangangte Region, Western Cameroon. *Filoterapia* 71:406-412.
- Noumi, E., F. Houngue, and D. Lontsi
- 1999 Traditional Medicines in Primary Health Care: Plants Used for the Treatment of Hypertension in Bafia, Cameroon. *Filoterapia* 70:134-139.

Nour, A.A., B.I. Magboul and N.H. Kheiri

1980 Chemical Composition of Baobab Fruit (*Adansonia digitata* L.). *Tropical Sci.* 22(4):383-388.

Nyanga, L.K., M.J. R. Nout, T. H. Gadaga, T. Boekhout, M.H. Zwietering

2008 Traditional Processing of *Masau* Fruits (*Ziziphus Mauritiana*) in Zimbabwe. *Ecology of Food and Nutrition* 47(1):95-107.

Okpekon, T., S. Yolou, C. Gleye, F. Roblot, P. Loiseau, C. Bories, P. Grellier, F.

Frappier, A. Laurens, R. Hocquemiller

2004 Antiparasitic Activities of Medicinal Plants Used in Ivory Coast. *Journal of Ethnopharmacology* 90:91-97.

Oladimeji F.A., O.O. Orafidiya, T.A.B. Ogunniyi, and T.A. Adewunmi

2000 Pediculocidal and Scabidical Properties of *Lippia multiflora* Essential Oil. *Journal of Ethnopharmacology* 72:305-309.

Osman, M.A.

2004 Chemical and Nutrient Analysis of Baobab (*Adansonia digitata*) Fruit and Seed Protein Solubility. *Plant Foods for Human Nutrition* 59:29-33.

Ouattara, Y., S. Sanon, Y. Traore, V. Mahiou, N. Azas, and L. Sawadogo

2006 Antimalarial Activity of *Swartzia madagascariensis* Desv. (Leguminosae), *Combretum glutinosum* Guill. & Perr. (Combretaceae) and *Tinospora bakis* Miers. (Menispermaceae), Burkina Faso Medicinal Plants. *African Journal of Traditional Complementary and Alternative Medicines* 3(1):75-81.

Palsson, K. and T.G.T. Jaenson

1999 Plant Products used as Mosquito Repellents in Guinea Bissau, West Africa.

Acta Tropica:39-52.

Pascual, M.E., K. Slowing, E. Carretero, D. Sanchez Mata, A. Villar

2001 *Lippia*: Traditional Uses, Chemistry, and Pharmacology: A Review. Journal of

Ethnopharmacology 76:201-214.

Phavaphutanon, L., F.T. Davies, Jr., and S.A. Duray

1996 Growth, Root Alteration, and Nutrient Uptake of Neem Tree (*Azadirachta indica* A. Juss) Seedlings In Response to Vesicular-Arbuscular Mycorrhizal Fungi and Phosphorus Nutrition. International Tree Crops Journal 9: 59-67.

Pousset, J. L., J.P. Rey, and J. Levesque

1993 Hepatitis B Surface Antigen (HBsAg) Inactivation and Angiotensin-Converting Enzyme (ACE) Inhibition in vitro by *Combretum glutinosum* Perr. (Combretaceae) Extract. Phytother. Research 7:101-102.

Scheuring J.F., M. Sidibe, and M. Frigg

1999 Malian Agronomic Research Identifies Local Baobab Tree as Source of Vitamin A and Vitamin C. Sight and Life 1: 21-24.

Schwob, I., J. Viano, J.M. Bessiere, and C. Haddad

2008 Comparison of Essential Oil Composition of *D. oliveri* (Rolfe) Hutch et. Dalz. (Caesalpinaceae) Leaves from Senegal and Ivory Coast. Journal of Essential Oil Research 20:155-157.

Sena L.P., D.J. Vanderjagt, C. Rivera, A.T.C Tsin, I Muhamadu, O. Mahamadou, M.

Millson, A. Pastuszyn, and RH Glew

- 1998 Analysis of Nutritional Components of Eight Famine Foods of the Republic of Niger. *Plant Foods for Human Nutrition* 52:17-30.
- Steentoft, M.
- 1988 Flowering Plants in West Africa. Cambridge University Press. Cambridge.
- Thiombiano, A.
- 1996 Contribution à l'étude des Combretaceae dans les formations végétales de la région Est du Burkina Faso. Thèse de 3ème cycle de Sciences Biologiques Appliquées - Université de Ouagadougou.
- Toure, H., G. Balansard, A.M. Pauli, and A.M. Scotto
- 1996 Pharmacological Investigation of Alkaloids from Leaves of *Mitragyna inermis* (Rubiaceae). *Journal of Ethnopharmacology* 54:59-62.
- Traore, F., M. Gasquet, M. Laget, H. Guiraud, C. Di Giorgio, N. Azas, O. Doumbo, and P. Timon-David
- 2000 Toxicity and Genotoxicity of Antimalarial Alkaloid Rich Extracts Derived from *Mitragyna inermis* O. Kuntze and *Nauclea latifolia*. *Phytotherapy Research* 14:608-611.
- Vimalanathan, S., and J.B. Hudson
- 2009 Multiple Inflammatory and Antiviral Activities in *Adansonia digitata* (Baobab) Leaves, Fruits and Seeds. *Journal of Medicinal Plants Research* 3(8):576-582.
- Vlietinck, AJ, L. Van Hoof, J. Totte, A. Lasure, D. Vanden Berghe, P.C. Rwangabo, and J. Mvukiyumwami
- 1995 Screening of Hundred Rwandese Medicinal Plants for Anti-Microbial and Antiviral Properties. *Journal of Ethnopharmacology* 46:31-47.

Yao-Kouame, A., K.Y. Nangah, K.A. Alui, K.A. N'Guessan, G.F. Yao, and A. Assa

2009 Pedo-Landscape and Development of *Lippia multiflora* in the Southern Cote

D'Ivoire. *Journal of Environmental Science and Technology* 2(1):56-62.

Yazzie, D., D.J. Vanderjagt, A. Pastuszyn, A. Okolo, and R.H. Glew

1994 The Amino Acid and Mineral Content of Baobab (*Adansonia digitata* L.)

Leaves. *Journal of Food Composition and Analysis* 7:189-193.

Zongo, C., E.F.O. Akomo, A. Savadogo, L.C. Obame, J. Koudou, and A.S. Traore

2009 *In vitro* Antibacterial Properties of Total Alkaloids Extract from *Mitragyna*

*inermis* (Willd.) O. Kuntze, a West African Traditional Medicinal Plant. *Asian*

*Journal of Plant Sciences* 8(2):172-177.

TABLE 1-SUMMARY OF ETHNOBOTANICAL PLANTS FROM JANGJANGBUREH ISLAND, THE GAMBIA, WEST AFRICA

Local Name	Common English Name	Scientific Name	Local Uses	Documented Uses	Photograph
Baobab, Monkeybread	Baobab, Monkeybread tree	<i>Adansonia digitata L.</i>	<b>construction</b> (trunk used for rope); <b>food</b> (seeds crushed to make ice cream).	<b>nutrition</b> (Source of energy, protein, fat, calcium, potassium, magnesium, high glutamic and aspartic acid contents, iron, vitamin C, pectins, provitamin A); <b>food</b> (Fruit pulp makes sweets, leaves used in soup or eaten as spinach, flowers used as flavoring in drinks and eaten raw, fruit pulp used to make cream soda or eaten raw, seeds ground and eaten or added to soups and used as coffee substitute, fermented seeds pressed for oil, peanut substitute, cooked into sauce); <b>medicine</b> (treats excessive perspiration, fevers, dysentery, fileria, wounds, respiratory symptoms, skin problems, malaria, sores, induces menstrual flow, used as eyedrops for measles treatment); <b>construction</b> (boundary line to separate plots of land, fiber for ropes, mats, bags, and hats, and wood for fuel, light canoes and floats for fishing nets, roots make red dye, ashes used for fertilizer or in soap-making, bark yields tannin, smoke from the burning fruit is an insect repellent) <b>others</b> (the seeds for cattle feed)	 <p data-bbox="1782 1073 2386 1101"><a href="http://www.tarcherbooks.net/?tag=baobab-tree">http://www.tarcherbooks.net/?tag=baobab-tree</a></p>

Neem(Nim)	Indian Lilac	<i>Azadirachta indica</i>	<p><b>agriculture</b>(biopesticidal, pesticidal, controls plant fungal diseases such as powdery mildew and rust responsible for causing both antifeedant and toxic effects in insects, mosquitoes and sandflies); <b>construction</b>(making poles for house construction, furniture, firewood and fuel, charcoal has high calorific value.)<b>environment</b>(helps solve deforestation, desertification, soil erosion, global warming, drought-resistant, increases soil fertility, gives off a lot of oxygen, water purifier, biosorbent, cools temperature under tree by 10 degrees, used as wind break, neem wood is durable and termite-resistant); <b>industry</b>( ‘Margosa oil’ . pharmaceutical, cosmetics, disinfectants, rubber, bio-pesticide and textile industries. Ayurvedic drug industries. The oil and powdered neem leaves are used in various cosmetic preparations such as face creams, nail polish, nail oils, shampoos, and conditioners, toothpaste, oral-hygiene preparations and dental care products, used in tanning, dyeing, carbohydrate in fermentation industries and for methane gas production);<b>medicine</b>(<i>human</i>- Anti-inflammatory, antiarthritic, antipyretic; hypoglycemic, spermicidal, antifungal, antibacterial, diuretic, antibacterial, antimalarial, controls- leprosy, helminthiasis, respiratory disorders, and constipation, Treats rheumatism, chronic syphilitic sores, painless ulcer, remedy for- blood morbidity, biliary conditions, itching, skin ulcers, burning sensations, tuberculosis, used as laxative, treat dry skin, anorexia, skin diseases, removing tumors, decreases blood-sugar levels, prevents hyperglycemia, cures ringworm, eczema, scabies, headaches, sores, stomachaches, <i>veterinary</i>-Animal feed, leaves used as antiviral agents against vaccinia virus, variola major virus, and Newcastle disease viruses, Newcastle disease virus, swollen glands, bruises, sprains, antiseptic, antifungal, antibacterial); <b>nutrition</b>(proteins, minerals, carotene, trace minerals, digestible crude proteins (DCP), total digestible nutrients (TDN),antioxidant activity).</p>	 <p>(<a href="http://justneem.com/pages/about-neem">http://justneem.com/pages/about-neem</a>)</p>
-----------	--------------	---------------------------	--	--

Tomborrong	bear tree, ber, Chinese apple, Chinese date, common jujube, desert apple, dunks, geb, Indian cherry, Indian jujube, Indian plum, jujube	<i>Ziziphus mauritiana</i>	<b>medicine</b> (high blood pressure)	<p><b>construction</b> (fencing for corral, wood, used as hedges); <b>food</b>(ripe fruit eaten raw/stewed, young leaves eaten, powder from fruit used in baking to make jam and bread, used to make chutney, jam, jelly, soups, gruel, mixed with water to make drink, porridge, traditional cakes); <b>magic</b>(used to make spirit called <i>Kachasu</i>); <b>medicine</b>(antiulcer, antibacterial, antioxidant, poultices on sores and cuts, treats asthma, liver problems, fever, inhibits high fat content, stops diarrhea, laxative, treats gingivitis, alleviates gout and rheumatism, antisalmonella, eye lotion, immune stimulant, anticancer, painkiller, tonic, removes flu-like symptoms, antiperspirant, astringent, antifungal, sedative, treats nausea, vomiting, and abdominal pains relating to pregnancy); <b>nutrition</b>(source of linoleic acid, iron, calcium, magnesium, zinc, protein, vitamin C, fructose, glucose, galactose, citric, malic, and malonic acid);</p>	 <p><i>Ziziphus mauritiana</i> Photos: J. Dodd &amp; R. Randall</p> <p><a href="http://florabase.calm.wa.gov.au/browse/profile/4847">http://florabase.calm.wa.gov.au/browse/profile/4847</a></p>
Sisiliñamo	Gambian tea bush	<i>Lippia multiflora</i>	<b>medicine</b> (treats headlice)	<p><b>medicine</b>(treatment for malaria, respiratory disease, liver diseases, viral and fungal infections, fever, stress, arterial hypertension, conjunctivitis, STI's, used as laxative, tea infusion, anti-inflammatory, fever-reducer, treats bodylice, headlice, and scabies, pain-reliever); <b>nutrition</b>(glycoside, essential oils, phytochemicals)</p>	

Naning-Kayo	paperbark thorn	<i>Acacia sieberiana</i>	<b>medicine</b> (tooth aches, stomach pains)	<b>agriculture</b> (fodder for livestock); <b>construction</b> (firewood); <b>medicine</b> ( treats gonorrhea, syphilis, rheumatism, acne, and eye diseases, antimicrobial, antiviral, antidiarrheal, infusions for backpain, treats inflammations).
Cotton Tree	silk-cotton tree, cotton tree	<i>Ceiba pentandra</i>	<b>medicine</b> (tooth aches); <b>magic</b> (amulet)	<b>medicine</b> (treats gingivitis, hypertension, diabetes, ulcers, weight gain, dermatological remedies, hypertension, diabetes, weight gain, infectious diseases);



Jungo		<i>Mitragyna inermis</i>	<b>medicine</b> (treats wounds, relieves sores from childbirth)	<b>agricultural</b> (livestock food); <b>construction</b> (firewood, utensils, furniture, roofing); <b>medicine</b> (treats liver ailments, treats fevers, stomach pains, rheumatic pains, treats boils, larvicidal, molluscicidal, radical scavenging activities, antimalarial) <b>nutrition</b> (antioxidents)	
Santango	African Copaiba Balsam Tree	<i>Daniellia oliveri</i>	(kills mosquitoes)	<b>agriculture</b> (food for livestock); <b>construction</b> (building, firewood) <b>medicine</b> (cough syrup, diabetes, gastrointestinal problems, diarrhea, diuretic, aphrodisiac, body lotion, treats yellow fever, backaches, headaches, cuts, anti-inflammatory and smooth muscle relaxant activity, antimicrobial); <b>nutrition</b> (antioxidants, phytochemicals); <b>others</b> (kills mosquitoes, kitchen utensils);	 

<http://www.pendjari.net/english/spip.php?article37>

Jambakato		<i>Combretum glutinosum</i>	<b>Medicine</b> (teeth ); <b>food</b> (tea)	<b>construction</b> (furniture, firewood, charcoal); <b>medicine</b> (humans-treats colds, bronchitis, pneumonia, fevers, jaundice, rheumatism, toothaches, malaria, diuretic, reduces hypertension, helps discharge bladder stones, treatment of hepatitis, antibacterial, veterinary-eliminates worms in cattle, added as purge in baths); <b>nutrition</b> (antioxidants); <b>others</b> (yellow dye, household utensils)	
-----------	--	-----------------------------	---	--	---