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Comprehensive review of *Adansonia digitata* (Kalpvriksha): Ethnobotany, phytochemistry, and potential applications

Arun Kumar Srivastava[1] * Arundhati Singh[2] and Vinay Kumar Singh[3]

1- Department of Zoology, M.G.P.G. College, Gorakhpur- 273001, U.P. India
2- Department of Zoology, D.D.U. Gorakhpur University, Gorakhpur - 273009 U. P. India
3- Department of Zoology, D.D.U. Gorakhpur University, Gorakhpur - 273009 U. P. India

* *Corresponding author.* E-mail address: aksgkp5@gmail.com
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ABSTRACT

Adansonia digitata (Baobab) is a multi-purpose tree species belongs to family Malvaceae, commonly known as 'Kalpvriksha' in Indian Mythology. The Baobab is widely uses, as medicine, food, and beverages. Plant contains calcium oxalate and resin and also has lots of important phytochemical constituents. The tree provides food, shelter, clothing and medicine as well as material for hunting and fishing. Older baobab trees in the Sudan represent potential sources of water for local people and land travellers. Baobab pulp is rich in vitamin C. The leaves of Adansonia are rich in good quality of proteins mostly essential amino acids, minerals and fat in seeds. A variety of chemicals from A. digitata noted that they belong to the classes of terpenoids, flavonoids, steroids, vitamins, amino acids, carbohydrates and lipids. Fatty acids present in the seed oil include linoleic and oleic acids in high concentration as well as lesser amounts of palmitic, linolenic, stearic and arachidic acids. Numerous studies on the biological activities of baobab have been conducted with promising results including anti-inflammatory, analgesic, anti-bacterial, anti-oxidant, anti-viral activity, anti-diarrheal and anti-dysenteric activity etc.

Keywords: Terpenoids, Flavonoids, Steroids, vitamins C, Linoleic acids, Palmitic.

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1. Introduction

Adansonia digitata L. is a multi-purpose tree species belongs to family Malvaceae, commonly known as African Baobab and is called 'Kalpvriksha' in Indian mythology [1-2]. It has another name, and that is Tree of Life [3]. Wan et al. [4] recently reported that DNA analysis revealed that the Baobab tree originated in Madagascar 21 million years ago. From there it reached Australia and then Africa through the sea. Where many of its species evolved. The Baobab (Adansonia digitata) is widely distributed throughout the sub-Saharan Africa and Western Madagascar areas and has many uses, such as medicine, food, and beverages [5]. Zahrau et al. [6] mentioned in his article that that the name Adansonia digitata was given by Linnaeus, the generic name honouring Michel Adanson who had been to Senegal in the eighteenth century and described Baobab. Baobab or Adansonia digitata is a deciduous tree native to arid Central Africa to attain the age hundred to thousand years, very few species may estimate to 5000 years [5]. Mishra [7] communicated that an ancient hollow baobab tree in Zimbabwe is so big that 40 people can take shelter inside its trunk. These can be 20 to 100 feet tall. They also reported that there are thousands of trees in the ancient city of Mandu in Madhya Pradesh, India. However, gradually they are disappearing. It is a tree with trunk of an enormous size; fruit bottle or cucumber shaped; shell hard, woody and light and covered with dull green felt- like yellowish down or brown hairs [8]. Kumar et al. [9] updated that the seeds of Adansonia are enclosed in a horny shell; they are kidney shaped, rough externally, of a rusty red colour, acid flavor and sour taste and the bark yields a white semi-fluid gum, which is colourless, tasteless and insoluble in water. Chhavi et al. [8] also reported that plant contains calcium oxalate and resin and also has lots of important phytochemical constituents; pulp contains phlobaphenes, mucilage and gum, glucose, tartrate and acetate of potash and other salts. The leaves contain wax, glucose, albuminoids, carbonate and chloride of sodium and potassium and a glucoside adansonin antagonistic to strophanthus [10]. Rahul et al. [1] updated that baobab is a very long-lived tree with multipurpose uses like medicinal, nutritional and different plant parts are widely used as foods, medicines and the bark fibres. They also reported that the tree provides food, shelter, clothing and medicine as well as material for hunting and fishing [1]. Every part of the baobab tree is reported to be useful [5]. Ecologically, baobabs are very important in the savannah, providing food and shelter for a great variety of animals. All kinds of small birds, squirrels, rodents, lizards, snakes and tree frogs, as well as spiders, scorpions and insects live in the canopy [11]. Deafalla [12] updated that older baobab trees in the Sudan represent potential sources of water for local people and land travellers, because of that hollows of their trunk such hollows represent natural crevices that humans can enlarge to provide a capacity that may measure hundreds of gallons. They also reported that water storage capacities range from 1000 to 9000 liters per tree. World Health Organization (WHO) defines traditional medicinal plants as natural plant materials which are used at least or in the absence industrial processing for the treatment of diseases at a local or regional scale [13]. They also described that traditional herbal medicine has been used in developing and developed countries for thousands of years because it is natural and causes comparatively fewer complications and early medical history is consistent with the history of herbal medicine. Sugandha et al. [15] also described that different types of traditional drugs are widely used in Asia, Africa and Latin America to meet basic health needs. This use is growing rapidly in industrialized countries, which are often referred to as complementary or alternative medicine [15]. The tree already faces a crisis of survival and is listed as an endangered species in the Red Data Book [9]. The paper captures the broad scope of the review, including the taxonomic features, traditional uses, chemical properties and potential benefits of *Adansonia digitata*.

2. Taxonomic features

1. Stems of *Adansonia*

Wealth of India [5] reported that the main stem of larger baobab trees may reach enormous proportions of up to 28 m in girth, although baobab trees seldom exceed a height of 25 m. The massive, usually squat cylindrical trunk gives rise to thick tapering branches resembling a root-system, which is why it has often been referred to as the upside-down tree looking like it has been picked out of the ground and stuffed back in upside-down [5]. Maazu et al. [15] updated that the stem is covered with a bark layer, which may be 50-100 mm thick and the bark is greyish brown and normally smooth but can often be variously folded and seamed from years of growth. The large cylindrical trunk gives rise to thick tapering branches resembles a root system. The bark is smooth but can often be variously folded, reddish brown or greyish [5]. Kotina et al. [16] mentioned in his research paper that the bark is followed by a one cell thick cork cambium separating the cork cells from the phyllodermis which is composed of many layers of parenchyma and sclerenchyma cells and suggests that baobabs with short, stout trunks have a better survival value in the drier areas than taller and thinner baobabs. Eltahir

and Elsayed [17] also reported that the large woody stem is found to contain large quantities of parenchyma cells and small amounts of vessels and fibres. The also noted that this feature makes the woody stem soft which will enable the people to increase the natural hollow to store large quantities of water in it.

Newly Adansonia digitata for plantation (Source: cactus- art.biz)

25 years old *Adansonia digitata* plant (Source-flickr.com)

100 years old *Adansonia digitata* plant (Source-hodnick.com)

About more than thousand years old *Adansonia digitata* plant (Source-pinterest.com)

2. Leaves of *A. digitata*

Zingare [18] reported in his paper that the baobab is leafless for nine months of the year and the leaves are hand-sized and divided into 5-7 finger-like leaflets. They also described that being deciduous; the leaves are dropped during the winter months and appear again in late spring or early summer. Komane et al. [20] also updated that the large, pendulous flowers are white and sweetly scented and they emerge in the late afternoon from large round buds on long drooping stalks

from October to December. Leaves are 2-3-foliate at the start of the season and they are early deciduous [1]. Rahul et al. [1] also reported that the eaves are alternate at the ends of branches or occur on short spurs on the trunk and leaves of young trees are often simple. They also described that leaflets are sessile to shortly petiolate with great variation in size and overall mature leaf size may reach a diameter of 20 cm and the medial leaflet can be 5-15 ×2-7 cm, leaflet elliptic to ovate-elliptic with acuminate apex and decurrent base. Zahrau et al. [6] reported that the leaves of baobab tree are a staple for many populations in Africa, especially the central region of the continent and during the rainy season when the baobab leaves are tender, people harvest a fresh batch of leaves. During the last month of the rainy season, leaves are harvested in great abundance and are dried for domestic use and for marketing during the dry season [6]. Abioye et al. [20] updated that young leaves od Adansonia are widely cooked as spinach, and frequently dried, often powdered and used for sauces over porridges, thick gruels of grains, or boiled rice. They also mentioned that the utilization of African baobab leaves is common amongst African folks especially to inhabitants of the central regions of Africa serving as a source of food [20].

3. Flowers:

Mishra et al. [21] updated in his review article that the flower of *Adansonia digitata* are solitary, axillary, pendulous, bi-bracteolate, large, white and pedicels reaching 20 cm long, softly hairy. They also mentioned that the calyx are leathery, tawny tomentose outside, gray silky-villous inside, cup shaped, 5-cleft, lobes 5 cm long, oblong-lanceolate and petals 5, white, exceeding the sepals, adnate below the numerous one celled stamens. Sundarambal et al. [22] reported that the bats primarily pollinate the large white flowers with their ruffled petals at night, although many different insects and other creatures such as birds also visit the sweetly scented flowers. They also updated that the flowers, being white, are more visible at night and being sweetly scented also help to attract a wide variety of potential pollinators.

Flower of *Adansonia digitata* (Source- pinterest.com)

Fruit of *Adansonia digitata* (Source-zimbabweflora.co.zw)

4. Fruits pulp of *A. digitata*

Stadlmayr et al. [23] reported that the fruit pulp has very high vitamin C content, almost ten times that of oranges. It is important to overcome problems in prolonging the shelf-life of the pulp in order to retain its nutritive value and sensorial properties. Nasreldin et al. [24] updated that it contains sugars but no starch and is rich in pectin which can be dissolved in water or milk and then the liquid is used as a drink and sauce for food, a fermenting agent in local brewing, or as a substitute for cream of tartar in baking. The fruit of the *A. digitata* is the most useful part of the tree, serving as a source of food for a larger population of the rural dwellers [25]. They also highlighted that in Sudan, the drink is called gunguleiz which is also known as talbadi juice – a name coined from their indigenous name for *A. digitata*. Jacqueline et al. [26] communicated that the pulp has found application as a seasoning in traditional dishes and can also serve as appetizers and the fruit can also serve as a supplement to complement other staple foods like cornmeal. They also discussed that the African baobab pulp, obtained from the fruit, has found use as a substitute to the cream of tartar due to the presence of

citric and tartaric acids in the pulp.

5. Seeds of *A. digitata*

The seeds of *A. digitata* are uniformed and embedded in the pulp; the color is dark brown to reddish black with smooth testa [27]. Seed kernels are widely used in cooking are eaten fresh. Kernels have an energy value of 1803 kJ/100 g, approximately 50% higher than leaves [8]. Rana et al. [28] communicated in his article that the seed is a good source of phosphorus, calcium and magnesium and seed oils are important sources of nutritional oils, industrial and pharmaceutical importance. Rahul et al. [1] also reported that the African baobab seeds can be consumed in their fresh state or ground into a flour that can be used in soup or stew preparations as thickeners. Kabore et al. [29] reported that the seeds can also be roasted and eaten as a snack or ground into a paste for use as flavouring agents or boiled, fermented and dried for later use as a flavouring agent.

Seeds of *Adansonia digitata* (Source- etsy.com)

Phytochemistry

Baobab pulp is rich in vitamin C [30]. Eltahir and Elsayed [17] reported that the leaves of *Adansonia* are rich in good quality of proteins mostly essential amino acids, minerals and fat in in seeds. Shahat [31] isolated a variety of chemicals from *A. digitata* and noted that they belong to the classes of terpenoids, flavonoids, steroids, vitamins, amino acids, carbohydrates and lipids. Several classes of compounds have been identified from various parts like fruit pulp, seed oil, leaves; roots are terpenoids, flavonoids, sterols, vitamins, amino acids, carbohydrates and lipids [32]. Ramakrishna et al. [33] reported ten aromatic compounds including isopropyl myristate and nonanal in the fruit pulp using GC–MS. Kamatou et al. [34] have been isolated several compound from the pericarp using column chromatography and include: (–)-epicatechin, epicatechin-(4β→8)-epicatechin (B2), epicatechin-(4β→6)-epicatechin (B5), epicatechin- (2β→O→7, 4β→8)-epicatechin (A2), and epicatechin-(4β→8)- epicatechin-(4β→8)-epicatechin (C1). Other compounds such as 3,7-dihydroxy-flavan-4-one-5- O-β-D-galactopyranosyl (1→4)-β-D-glucapyroside and a flavonone 3,3′,4′-trihydroxy flavan-4-one-7-O-α-L-rhamnopyranoside and quercetin-7-O-β-D-xylopyranoside were isolated from the roots of *A. digitata*. Sharma et al. [36] also detected many compounds such as campesterol, cholesterol, isofucosterol, β-sitosterol, stigmasterol and tocopherol (α, β, γ, and δ) in the seed oil. Fatty acids present in the seed oil include linoleic and oleic acids in high concentration as well as lesser amounts of palmitic, linolenic, stearic and arachidic acids [34]. Jithender et al. [34] also mentioned in his article that the presence of organic acids such as citric, tartaric, malic, succinic and ascorbic acid and several amino acids such as alanine, arginine, glycine, lysine, methionine, proline, serine, valine from fruit pulp was first highlighted in the early fifties.

Biological activity:

1. Anti-oxidant activity

The high antioxidant capacity of *Adansonia digitata* derived products demonstrates their therapeutic, nutraceutical and cosmeceutical potential [28]. Dhlakama et al. [37] suggested that anti-oxidant activity of baobab tree is very high than other tree due to presence of vitamin C and it prevents from oxidative stress related disease such as cancer, cardiovascular disease and inflammation. Kumar et al. [9] updated that vitamin C play important role in human nutrition and low blood pressure. They also mentioned that the daily recommended of vitamin c is obtained from 13g of baobab tree. Bendary et al. [38] reported that dietary antioxidants, such as polyphenolic compounds, vitamins E and C, and carotenoids, are thought to

be effective nutrients in the prevention of oxidative stress related diseases like inflammation, cardiovascular disease, cancer and aging. Donkor et al. [39] investigated that the antioxidant capacity of baobab fruit pulp by using the Photo-chemiluminescence (PLC) assay, comparing the antioxidant properties of the fruit pulp to the antioxidant properties of several other fruits including kiwi, orange, apple and strawberry. They noted that the baobab fruit was found to have the highest content of vitamin C at 280 to 300 mg/100 g, out of all fruits investigated. The high vitamin C and antioxidant content of the fruit pulp may have a role to play in the extension of shelf-life for foods and beverages, as well as cosmetics [39].

2. Diuretic activity

Rana et al. [28] updated the methanolic and aqueous extracts of *Adansonia digitata* leaf for diuretic activity in rats. The parameters studied on individual rat were body weight, total urine volume and urine concentrations of Na+, K and Cl ions [40]. The methanolic and aqueous extract of leaves (100 mg/kg body weight) showed increase in urine volume and cation and anionic excretion [28].

3. Anti-viral activity

A. digitata leaves, fruit-pulp and seeds have shown antiviral activity by *in vitro* and *in vivo* experiments against influenza virus, herpes simplex virus and respiratory syncytial virus [41]. They concluded that the leaves of the baobab have the most effective effect against these viruses [41]. Kumar et al. [9] also studied that the influenza virus, herpes simplex virus and respiratory syncytial virus using the minimal inhibitory concentration approach and noted that the leaf extract had the best antiviral activity, with MIC values ranging from 0.12g/ml (DMSO) to 2.8g/ml (water). The leaf extract had promising efficacy against the herpes simplex virus (MIC: 1.0 to 11.7g/ml), however the pulp and seed had significantly lesser activity (MIC: N72.5g/ml) [9]. Adamu et al. [42] noted that baobab tree shows antibacterial activity to work against *Staphylococcus aureus*, *Bacillus subtilis* and noted that Baobab stem and root barks have bioactive constituents which are responsible for anti-microbial activity. The extract of *Adansonia* stem and bark is used in traditional medicine to treat fever caused by malaria [1].

4. Anti-diarrhoeal activity

Kia et al. [13] explained briefly in his review article that ancient healthful plants widely used in most developing countries for treating diarrhoea because diarrhoeal unwellness may be a potential reason for morbidity and mortality particularly in kids and young animals. Treatment of diarrhoea is mostly non-specific and typically aimed at reducing the discomfort and inconvenience of frequent bowel movements. World Health Organization (WHO) has enclosed a programme for the management of diarrhoea that involves the employment of traditional flavouring medication [25]. Asogwa et al. [23] also reported that two main factors attributed to the antidiarrhoeic action of baobab are thought to include the astringent action of the tannins causing an inhibition of osmotic secretions in addition to the anti-inflammatory action of the boabab mucilage on the intestinal mucous membrane. Silva et al. [43] also described that the presence of tannins, mucilage, cellulose and citric acid present in the baobab may also have a role to play against diarrhoea.

5. Anti-bacterial activity

Baobab plant components have been used to treat microbial illness in humans and animals for generations and numerous scientific investigations to support their traditional antibacterial benefits [44]. Zingare [18] reported ethanolic and aq. extracts of the *Adansonia digitata* for the presence of possible anti-microbial activity using the well-agar plate diffusion method against gram-positive bacteria (*Staphylococcus aureus*) and gram-negative bacteria (*Escherichia coliformium*). The recorded the susceptibility of the microorganisms to the extracts of these plants on the basis of their zone of growth of inhibition. Abdallah et al. [45] conducted an experiment to determine the secondary metabolites and antibacterial efficacy of Adansonia digitata stem bark and leaf extracts. The agar well diffusion method was used to determine the antibacterial activity of leaf and stem bark of *Adansonia digitata* extracted using water, ethanol and chloroform against *Escherichia coli* and *Salmonella typhi*. The preliminary phytochemical screening of the leaf and stem bark of the plant showed the presence of alkaloid, saponin, tannin, Flavonoid, terpenoid and steroid. The antibacterial activity of the leaf and stem bark extract of the plants showed that the plant extracts used were effective against the isolates tested. The ethanol extracts of the plant parts showed higher antibacterial efficacy against the test isolates when compared to aqueous and chloroform extracts. The results also demonstrated that the leaf extract is more active than stem bark extracts.

6. Anti-Sickling activity

Rana et al. [28] also updated aqueous methanolic extract of *Adansonia digitata* bark and its either fraction at various doses demonstrated reversal anti sickling properties when incubated with 2% sodium meta-bi-sulphite sickled

washed Hbss blood samples. He also suggested that when extract was preincubated with Hbss blood sample without being washed with sodium meta-bi-sulphite, no inhibitory anti sickling activity was seen [28].

7. Anti-inflammatory activity

Selvarani and James [46] reported multiple inflammatory and antiviral activities in *Adansonia digitata* (Baobab) leaves, fruits and seeds. They concluded that several of the extracts, especially leaf extracts, were also active as cytokine modulators, some being pro-inflammatory and others being anti-inflammatory. The results overall indicated the presence of multiple bioactive compounds in different parts of the plant and these activities could explain some of the medical benefits attributed to traditional leaf and pulp preparations, in the treatment of infectious diseases and inflammatory conditions. Ayele et al. [47] investigated methanol extract of *Adansonia digitata* L. leaf (MEAD) of its antioxidant and anti-inflammatory effects. Anti-inflammatory effects were assessed by measuring inducible nitric oxide synthase (iNOS) expression in lipopolysaccharide (LPS)-stimulated RAW264.7 cells. In DPPH assay, MEAD also showed a strong ROS scavenging effect. MEAD significantly inhibited iNOS activity (IC50=28.6 μg/ml) of LPS-stimulated Raw264.7 cells. They also investigated the relationship between iNOS expression and nuclear factor kappa B (NF-κB) activation. MEAD inhibited IκBα degradation and NF-κB translocation from the cytosol to the nucleus in LPS-induced RAW264.7 cells without significant cytotoxic effects, as confirmed by MTT assay. These results suggest that MEAD inhibits anti-inflammatory iNOS expression, which might be related to the elimination of peroxyl radicals and thus the inhibition of IκBα-mediated NF-κB signal transduction. Quartey et al. [48] reported anti-inflammatory property of the different parts of *Adansonia digitata* extracts. Carrageenan-induced pedal oedema in 7-day old chicks was the model used to determine the anti-inflammatory property of the extracts obtained from six different parts of *A. digitata.* The extracts were also assessed for their acute toxicity. The six extracts demonstrated varying degrees of anti-inflammatory effects, in a dose-dependent manner; with the stem extract giving the most potent activity with an ED50 of 145.3 ± 7.6 mg/kg, followed by the flower (167.5 ± 10.42 mg/kg), leaves (169.7 ± 8.76 mg/kg), root bark (187.8 ± 11.2 mg/kg), fruit pulp (218.8 ± 6.86 mg/kg), and the seed (267.1 ± 12.3 mg/kg) as compared to the positive control (diclofenac, ED50 = 55.08±6.11 mg/kg).

8. Anti-diabetic activity

Gwarzo and Bako [49] reported that hypoglycaemic properties of the methanolic extract of *Adansonia digitata* fruit pulp on blood glucose. Forty-eight of the rats were randomly distributed into six. Group one served as the normal control and Group two rats were administered with alloxan (150 mg/kg) intraperitoneally and served as the diabetic control. Groups 3, 4 and 5 were intraperitoneally administered with alloxan (150 mg/kg) and orally administered with methanolic extract of *Adansonia digitata* fruit pulp (100, 200 and 300 mg/kg) once daily for 4weeks. Group six rats were intraperitoneally administered with alloxan (150 mg/kg) and orally administered with chlorpropamide (84 mg/kg) once daily for 4 weeks. The serum concentration of glucose of all the rats in each group was determined after the 14th and 28th dose of treatment. There was significant ($p<0.001$) reduction of serum glucose in the three groups of rats administered with methanolic extract of *Adansonia digitata* fruit pulp at second and fourth week of the treatment. The group of animals treated with chlorpropamide (84 mg/kg) also showed significant ($p<0.001$) reduction of serum glucose compared to most effective dose of the methanolic extract (300 mg/kg) during the second and fourth week of the treatment. The result of qualitative phytochemical analysis of methanolic extract of *Adansonia digitata* fruit pulp indicated the presence of glycosides, flavonoids, tannins,saponins, terpenoids and steroids. Maazu et al. [50] also investigated acute toxicity and anti-diabetic potential of solvents extract (n-hexane, Chloroform, Ethyl acetate and Methanol) of *Adansonia digitata* stem bark. For each solvent, twelve (12) rats were used for Oral LD50 determination, and were grouped into four (4) groups of three rats (3) each. The first three groups were administered with 10 mg/kg, 100 mg/kg and 1000 mg/kg body weight of the extract respectively, while the last group was subdivided into three groups of one rat each and were administered with 2500mg/kg, 3500mg/kg and 5000mg/kg body weight of the extract respectively. Thirty (35) rats were used for the diabetic study and were grouped into seven (7) groups of six (5) rats each. Group I served as normal control, group II served as diabetic control while Groups III, IV, V, VI and VII were induced with diabetes and administered with standard drug, n-hexane, Chloroform, Ethyl acetate and Methanol extract respectively for two weeks. The research found the oral LD50 of all the extract to be greater than 5000 mg/kg indicating that the extract was practically non-toxic. Farrau et al. [50] investigated the effects of ethanol and aqueous fruit pulp extracts of *Adansonia digitata* on blood glucose, serum electrolytes and plasma proteins in high fat diet and streptozotocin induced diabetic rats. They noted that the ethanol extract significantly increased fasting blood glucose level while the ethylacetate fraction and aqueous extract significantly decreased it as compared to the diabetic untreated rats in which it was significantly increased when compared to normal rats. The induction of diabetes significantly decreased serum chloride concentration while having no significant effects on

other electrolytes and plasma proteins.

9. Hepatoprotective activity

Mohamed et al. [51] investigated the hepatoprotective effect of *Adansonia digitata* fruits pulp methanolic extract on CCl4-induced hepatotoxicity in rats and found that the two doses of the plant extract showed dose-dependent hepatoprotective effect on CCl4-induced hepatotoxicity, as evident by the significant reduction ($P < 0.05$) in serum levels of AST, ALT, ALP and bilirubin along with the improved histopathological liver sections compared to CCl4-treated animals. They concluded that plant material could provide a suitable source for new drug development, and its possible role in treatment of some liver disorders. Hanafy et al. [52] reported that methanol extract of the fruit pulp of *Adansonia digitata* its hepatoprotective activity against liver damage induced by acetaminophen in rats. The principle depends on the fact that administration of acetaminophen will be associated with development of oxidative stress. In addition, hepato specific serum markers will be disturbed. Treatment of the rats with the methanol extract of the fruit pulp of *Adansonia digitata* L. prior to administration of acetaminophen significantly reduced the disturbance in liver function. Liver functions were measured by assessment of total protein, total bilirubin, ALP, ALT, and AST. Oxidative stress parameter and antioxidant markers were also evaluated. Moreover, histopathological evaluation was performed in order to assess liver case regarding inflammatory infiltration or necrosis. Qaravi et al. [53] tested for hepatoprotective activity against chemical toxicity with CCL4 in rats. The aqueous extract exhibited significant hepatoprotective activity and consumption of *Adansonia digitata* fruit may play an important part in human resistance to liver damage in areas in which the plant is consumed (2). The mechanism of liver protection is unknown, but could possibly result from triterpenoids, β-sitosterol, β-amyrin palmitate, or/and α-amyrin, and ursolic acid in the fruit.

10. Vitamin C healing effect

Vitamin C is most important in human nutrition and powerful antioxidant capacity [53]. Padayatty et al. [54] suggested that vitamin C works against low blood pressure, enhance immunity against many tropical disease, low incidence of cataract development and coronary disease. They also reported that the daily requirements of vitamin C intake for healthy life in adults are 65 mg and daily recommendation can be obtained through 23 g of baobab powder [54].

11. Antidote to poisoning

Kabore et al. [55] reported that seeds, fruits pulp, and bark appear to contain an antidote poisoning by *Strophanthus species*. Baobab contains alkaloids which has a strophanthus like action [56]. Asogwa et al. [25] also reported that the juice of baobab tree used widely as an arrow poison especially in East Africa, a baobab extract is poured onto the wounds of animal killed in this way to neutralize the poison before the meat is eaten. The also noted that Baobab fruit pulp powder has good lubricating, binding agent, and diluting characteristics [25].

3.Conclusion

Adansonia digitata is one of the largest and long-lived trees in the world. It is a tree that can provide food, water, shelter and relief from sickness. Every part of the plant reported to be useful. Based on the review, it can be seen that the baobab tree is promising considering the nutritional benefits of the fruit pulp in terms of its vitamins C content, while the leaves based on their mineral and vitamin A content. The seed oil's fatty acid composition and antioxidant activity is what makes it unique as functional oil. Oleic acid is probable the most abundant monounsaturated fatty acid. Numerous studies on the biological activities of baobab have been conducted with promising results including anti-inflammatory, analgesic, anti-pyretic, anti- oxidant, anti-viral activity, anti-diarrheal, anti- dysenteric activity, due to increased interest in baobab products and slow growth of the plant, research should be directed on how to develop a new cultivation with a short maturation period. It is hoped that the review will be a strong stimulus for research and development efforts towards better understanding and utilization of the plant A. digitata

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