



Annona senegalensis Persoon: A Multipurpose shrub, its Phytotherapeutic, Phytopharmacological and Phytomedicinal Uses

Alqasim A. Mustapha

Department of Biochemistry and Molecular Biology, Nasarawa State University, Keffi, Nigeria

ABSTRACTS

Medicinal plants have been employed in various ways for the management, and healing of treatment of different diseases. For many years, researchers have grown interest among the usage of different medicinal from folklore system of medicine for the treatment of different illness. The folklore system of medicine consists of enormous number of plants with a variety of medicinal, pharmacological and therapeutic importance and therefore represents a priceless reservoir of novel bioactive ingredients. *Annona senegalensis* Persoon is a multipurpose plant with a high traditional and medicinal uses for the maintenance of free health life. Traditionally the plant is used as stimulant, pain reliever etc. whereas the plant possess beneficial effects such as anti-oxidant, antimicrobial, Antidiarrheal, antiinflammatory, antiparasitic, anticonvulsant, antimalarial, antitripasomal, antisnake venom and Antinociceptive and many other medicinal properties. These properties of the plant possess is due to the important phytochemical constituents like triterpenes, anthocyanes, glucids, coumarins, flavonoids and alkaloids etc. This review attempts to include the available literature on *Annona senegalensis* with reference to its phyto-therapeutic properties, phyto-chemical constituents, phytopharmacological phytomedicinal activities and traditional uses for the future research work.

Keywords: *Annona senegalensis*, *Annonaceae*, phytochemical, phyto-therapy, phyto-pharmacology.

I. INTRODUCTION

Nature has made plants useful throughout the existence of man. Man uses plants as food, clothing, fuel, shelter and the most useful necessity of life which is the maintenance and management of different diseases. Man suffers many diseases and God have provided the cure through the use of plant's roots, seeds, leaves, flowers, berries, or bark for medicinal purposes. Today, most pharmaceutical drugs are derived from excellent ingredients in medicinal plants. In folk medicine, many natural raw drugs have the potential to treat many diseases and disorders, one of which is *Annona senegalensis*; Family: *Annonaceae* generally known as 'African custard-apple' and usually known as Gwándàn dààjì (Hausa), dukuuhi (Fulani). The plant is widespread throughout savannah or sub-tropical regions of Nigeria and used in the treatment of diseases.

Morphology

African custard-apple plant is a wild growing shrub or small tree up to 7 meters or more, but this plant is not resilient in nature. This plant was cultivated for leave, fruits, flower, bark, and stem for medicinal purpose. Leaves are alternate, simple, oblong to oval to almost ovoid, 6- 185 x 25- 120 mm in size. The stem are different in their natural colour as is grey and smooth to coarsely in older trees. The undeveloped branches are with yellow hairs which are lost during development. The flowers are up to 35 mm in diameter, on stalk up to 30 mm long, directly above the leaf axils. The fruit is formed from several fused, freshly and ovate carpels about 45 mm in diameter. At early development, it is dark green ripening to yellow and finally to orange during the

developmental stage of life. It has a curved inner whorl over the stamens and ovary and several stamen [1].

Habitat

This plant is common and quite wild in the shrubbery, open bush and along rivers and streams in Nigeria and it is cultivated throughout Northern Nigeria, primarily in the Nasarawa, Kaduna, Kano, Plateau and Niger State and Federal Capital Territory (FCT), Abuja.

II. SCIENTIFIC CLASSIFICATION

Kingdom: Plantae
Subkingdom: Tracheobionta
Superdivision: Spermatophyta
Division: Magnoliophyta
Class: Magnoliopsida
Subclass: Magnoliidae
Order: *Magnoliales*
Family: *Annonaceae*
Genus: *Annona*
Species: *A. senegalensis*

Benefits of the Plant

The fruit obtained from this multipurpose plant is widely used locally in the treatment of two commonly energy deficiency syndrome known as kwashiorkor and marasmus. Dalziel [2] made report about the plant to be of great medicinal value and it uses in native medicine which include headache and body ache [3,4], eyelid swelling [5], the stem bark of *A. senegalensis* is used by local populations all over Africa in treating guinea worms, diarrhea and especially in northern Nigeria, gastroenteritis, snake bites, toothache, respiratory

infections and malaria [6,7]. Awa and colleagues [8] reported the use of leaves in the treatment of pneumonia, and as a stimulant to improve health. A decoction from the roots is used to stop chest colds, venereal diseases, stomach ache and dizziness [8].

Phytochemistry

The Preliminary Phytochemical analysis of *A. senegalensis* showed the presence of sterols and/or triterpenes, anthocyanes, glucids, coumarins, flavonoids and alkaloids. GC/MS study of stem bark of *A. senegalensis* showed the presence of 1, 2 benzenediol, butylated hydroxytoluene (BHT), Phenol, 2, 6 bis (1, 1-dimethylethyl-4methyl, methylcarbamate, n hexadecanoic acid, hexadecane, 13-hexyloxacyclotridec-10-en-2one, oleic acid, tetracosane, 9-octylheptadecane, heneicosane, 12-mehtyl-E, E-2, 13-octadecadien-1-ol, octadecanoic acid, 9, 17-octadecandienal, pentadecane, tetratriacontane and squalene [8]. Biochemist in Ahmadu Bello University, Zaria, Nigeria has been reported that a hydroxylated phenol which is 2-benzenediol or catechol is toxic to microorganisms [8]. Okoye and co-workers [9] identified diterpenoid, kaur-16-en-19-oic acid or kaurenoic acid as phytochemical constituents responsible for the antibacterial effects of root bark. The work done by earlier researchers is astonishing, the plant is reported to contain in addition, wax, alkaloids [10,11], proteins, amino acids, antraquinones [12,13,14], sterols, glycosides, flavonols, terpenoids [15,16,17,18,19] and terpenes [20].

Phytotherapy, Phytopharmacology and Phytomedicine

Antidiarrhoeal Activity

The methanol stem-bark extract of *Annona senegalensis* was investigated using both *in vivo* and *in vitro* models by oral application of effective dose (5000mg/kg). The extract was administered orally to mice fed with charcoal meal in order to investigate intestinal transit time. The extract decreased intestinal transit time by decreasing the spontaneous contractions of the intestine, thus the findings provided a scientific basis for the use of *Annona senegalensis* stem bark extract in the treatment of diarrhoea. Therefore, *A. senegalensis* is a potent phytomedicine for diarrhoea [21].

Antimicrobial Activity

The antimicrobial activities of *Annona senegalensis* were good against pathogenic bacterial strains *Staphylococcus aureus*, *Shigella flexneri*, *Salmonella paratyphi* and *Pseudomonas aeruginosa*. The result showed that the ethanolic and aqueous leaf extracts possess good zone of inhibition [22] whereas methanolic extract showed significant antimicrobial activity against clinical isolates of *S. enteritidis*, *S. dysenteriae* and *E. coli* [8]. The different solvent extracts of leaf of *Annona senegalensis* possess antimicrobial activity by using Agar-well Diffusion method diffusion method against pathogenic microorganisms such as *Staphylococcus aureus*, *Shigella flexneri*, *Salmonella paratyphi* and *Pseudomonas aeruginosa* as reported by Johnson and Olatoye [22].

Antioxidant Activity

It is concluded that antioxidant activity and drug detoxification activity of *Annona senegalensis* leave in carbon tetrachloride-induced hepatocellular damage in rats using 2, 2-diphenyl-1-picrylhydrazyl (DPPH), superoxide ion, hydrogen peroxide (H_2O_2), 2, 2'-azinobis-(3-ethylbenzthiazoline-6-sulfonate) (ABTS) and ferric ion models decreased significantly [23]. The responsible chemical constituent of antioxidant activity may be due to the presence of flavonoids in the extracts.

Cytotoxic and antiparasitic activity

Sahpaz et al., [24] reported the cytotoxic activity of *Annona senegalensis* against human epidermoid carcinoma (KB) and normal (VERO) cell lines and antiparasitic activity against *Trypanosoma brucei brucei*, *Leishmania donovani* and *Leishmania major*.

Anti-Inflammatory Activity

Anti-inflammatory activities of the leaves extract were determined in rats in inflammatory models. The extract induced a significant decrease in the number of inflammatory cells. This effect is probably due to higher concentrations of tannins and phenolic compounds in the extract of plant [25].

Anticonvulsant Activity

Anticonvulsant activities of the root bark extract on pilocarpine-induced seizures in animal model. The results proved the efficacy of *Annona senegalensis* in the treatment of epilepsy and convulsions [26].

Antimalarial Activity

The methanol extract of *Annona senegalensis* possess antimalarial activity against *Plasmodium berghei* and the extract showed better antimalarial activity than compared to the standard reference drug Chloroquine disphosphate which had a 96.2% chemosuppression activity [27].

In vivo Trypanocidal activity

Anti-trypanocidal activity of *Annona senegalensis* is aimed in the treatment sleeping sickness, the endemic disease in Africa. The aqueous extract of *A. senegalensis* possesses trypanocidal activity against *Trypanosoma brucei* in infected mice [28].

Anti-Snake Venom Activity

Adzu et al., [29] tested the power of the methanol extract of the root bark of the *Annona senegalensis* was tested on brine shrimp (*Artemia saline* Leach) against cobra (*Naja nigricollis nigricollis* Wetchn) venom in rats. They further reported that the reduction in the induced hyperthermia directly detoxified the snake venom used by 16–33%. It, however, failed to restore the biochemical functions of the liver.

Anti-nociceptive Activity

The methanolic extract of *Annona senegalensis* exhibited antinociceptive activity against the hot plate test, acetic acid writhing test, and the late phase of formaline induced nociception. The analgesic effect of the methanolic extract might be through peripheral mechanisms and thus justifying its folkloric use in the treatment of rheumatic pain [30].

Anthelmintic Activity

Alawa et al., [31] investigated the efficacy of the extract of *Annona senegalensis* against *Haemonchus contortus* eggs and was shown a significant reduction in the egg hatch and larval recovery as the concentration increases.

III. CONCLUSION

Annona senegalensis or African custard-apple is a potent medicinal plant generally used traditionally in the treatment of many diseases. Though, many researchers have been isolating bioactive compounds from the plant. The phytopharmacological activities reported in the present review confirm that the medicinal value of *A. senegalensis* is unimaginable. The presence of bioactive compounds and pharmacological activities proved the potency of the plant in the development of novel drugs in future.

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REFERENCES

- [1] Coates Palgrave K. (2002). Trees of Southern Africa. Struik Publishers, Cape Town.
- [2] Dalziel, J. M. (1937). The useful plants of West Tropical Africa. Crown overseas agents for the colonies, London, 2–3.
- [3] Arnold, H. J., Gulumian, M. (1984). Pharmacopoeia of traditional medicine in Venda. *Journal of Ethnopharmacology*, 12, 35–74
- [4] Chhabra, S. C., Mahunnah, R. L. A., Mshiu, E. N. (1987). Plants used in traditional medicine in Eastern Tanzania. 1. Pteridophytes and Angiosperms (Acanthaceae to Canellaceae). *Journal of Ethnopharmacology*, 21, 253–277.
- [5] Klaus, V., Adala, H. S. (1994). Traditional herbal eye medicine in Kenya. *World Health Forum*, 15, 138–143.
- [6] Obi C. L., Potgieter, N., Bessong, P. O., Masebe, T., Mathebula, H. and Molobela, P. (2003). *In vitro* antibacterial activity of Venda medicinal plants. *South African Journal Botany*, 69 (2), 1- 5.
- [7] Peters, W. (1965). Drug resistance in *Plasmodium berghei*. Chloroquine resistance. *Experimental Parasitology*, 17, 80-89.
- [8] Awa, E. P., Ibrahim, S. and Ameh, D. A. (2012). GC/MS Analysis and antimicrobial activity of Diethyl ether fraction of Methanolic extract from the stem bark of *Annona senegalensis* pers. *IJPSR*, 3(11), 4213- 4218.
- [9] Okoye, T. C., Akah, P. A., Okoli, C. O., Ezike, A. C., Omeje, E. O. and Odoh, U. E. (2012). Antimicrobial Effects of a Lipophilic Fraction and Kaurenoic Acid Isolated from the Root Bark Extracts of *Annona senegalensis*. *Evidence-Based Complementary and Alternative Medicine*, 25- 34.
- [10] Philipov, S., Kande, K. M., Machev, K. (1995). Alkaloids of *Annona senegalensis*. *Fitoterapia*, 66, 275-276.
- [11] You, M., Wickramaratne, D. B. M., Silva, G. L., Chai, H., Chagwedera, T. E., Farnsworth, N. R., Cordell, G. A., Kinghorn, A. D. and Pezzuto, J. M. (1995). (–)-Roemerine, an aporphine alkaloid from *Annona senegalensis* that reverses the multi-drug resistance phenotype with culture cells. *Journal of Natural Products*, 58, 598–604.
- [12] Bamba, P. D., Abalansard, G., Maillard, C., Demenil, G., Gayte-Sorbier, A. (1984). Characterization of amino acids in the stem bark of *Annona senegalensis* Pers. *Plante Medicinales Phytotherapie*, 18, 36- 45.
- [13] Burkill, H. M. (1985). The Useful Plants of West Africa. Royal Botanical Gardens, Kew, 103–105.
- [14] Ekpendu, T.O.E., Obande, O.D., Anyogo, P. O., Attah, A. D. (1998). Nigerian ethnomedicine and medicinal plant flora – the Benue experience part 1. *Journal of Pharmaceutical Research and Development*, 3, 37–46.
- [15] Mackie, A., Misra, A. L. (1956). Chemical investigation of the leaves of *Annona senegalensis* 1. Constituents of the leaf wax. *Journal of Science, Food and Agriculture*, 7, 203.
- [16] Mackie, A., Ghatce, N. (1958). Leaves of *Annona senegalensis* 11. Carbohydrates, glycosides, proteins, amino acids, sterols. *Journal of Science, Food and Agriculture*, 9, 88.
- [17] Adesogan, E. F., Durodola, J. I. (1976). Antitumor and antibiotic principles of *Annona senegalensis*. *Phytochemistry*, 15, 1311–1312.
- [18] Fatope, M. O., Ibrahim, H., Takeda, Y. (1993). Screening of higher plants reputed as pesticides using the brine shrimp lethality assay. *International Journal of Pharmacognosy*, 31, 250–254.
- [19] Sahpaz, S., Gonzalez, M. C., Hocquemiller, R., Zafra-Polo, M. C. and Cortes, D. (1996). Annosenegalinal and Annogalene: two cytotoxic monotetrahydrofuran acetogenins from *Annona senegalensis* and *Annona cherimolia*. *Phytochemistry*, 42, 106–107.

- [20] Ekundayo, O., Oguntimein, B. (1986). Composition of the essential oils of *Annona senegalensis* Var. *senegalensis*. *Planta Medica*, 52, 202–204.
- [21] Suleiman, M. M. Dzenda, T. and Sani, C. A. (2008). Antidiarrhoeal activity of the methanol stem-bark extract of *Annona senegalensis* pers. (Annonaceae). *Journal of Ethnopharmacology*, 116 (1), 125– 130.
- [22] Johnson, T. O. and Olatoye, R. S. (2002). Phytochemical and Antimicrobial Screening of Aqueous and Ethanolic Extracts of *Annona senegalensis* Leaf. *Journal of Medicine in the Tropics*, 14(2).
- [23] Ajboye T. O., Yakubu, M. T., Salau, A. K., Oladiji, A. T., Akanji, M. A. and Okogun, J. I. (2010). Antioxidant and drug detoxification potential of aqueous extract of *Annona senegalensis* leaves in carbon tetrachloride induced hepatocellular damage. *Pharmaceutical Biology*, 48 (12): 1361- 1370.
- [24] Sarpaz, S., Bories, C. H., Loiseau, P. M., Cartes, D., Hocquemiller, R., Laurens, A. and Cave, A. (1994). Cytotoxic and antiparasitic activity from *Annona senegalensis* seeds. *Planta Medica*, 60, 538– 540.
- [25] Yeo, D., Dinica, R., Yapi, H. F., Furdui, B., Praisler, M., Djaman, A. J. and N'Guessan, J. D. (2011). Evaluation of the anti-inflammatory activity and phytochemical screening of *Annona senegalensis* leaves. *Therapie*, 66 (1), 73- 80.
- [26] Konate, A., Sawadogo, W. R., Dubruc, F., Caillard, O., Ouedraogo, M. and Guissou, I. P. (2012). Phytochemical and Anticonvulsant Properties of *Annona senegalensis* Pers. (Annonaceae), Plant Used in Burkina Folk Medicine to Treat Epilepsy and Convulsions. *British Journal of Pharmacology and Toxicology*, 3 (5), 245- 250.
- [27] Ajaiyeoba, E., Falade, M., Ogbole, O., Okpako, L. and Akinboye, D. (2006). *In vivo* antimalarial and cytotoxic properties of *Annona senegalensis* extract. *African Journal of Traditional, Complementary and Alternative Medicines*, 3 (1), 137- 141.
- [28] Ogbadoyi, E. O., Abdulganiy, A. O., Adama, T. Z. and Okogun, J. I. (2007). *In vivo* trypanocidal activity of *Annona senegalensis* Pers. leaf extract against *Trypanosoma brucei brucei*. *Journal of Ethnopharmacology*, 30: 112 (1), 85- 89.
- [29] Adzu, B., Abubakar, M. S., Izebe, K. S., Akumka, D.D. and Gamaniel, K. S. (2005). Effect of *Annona senegalensis* rootbark extracts on *Naja nigricollis nigricollis* venom in rats. *Journal of Ethnopharmacology*, 96, 507- 513.
- [30] Adzu, B. Amos, S. Adamu, M. and Gamaniel, K. (2003). Anti-nociceptive and Anti-inflammatory effects of the methanol extract of *Annona senegalensis* root bark. *Journal of natural remedies*, 3(1), 63 – 67.
- [31] Alawa, C. B., Adamu, A. M., Gefu J. O., Ajanusi, O. J., Abdu, P. A., Chiezey, N. P., Alawa, J. N. and Bowman, D. D. (2003). *In vitro* screening of two Nigerian medicinal plants (*Vernonia amygdalina* and *Annona senegalensis*) for anthelmintic activity. *Veterinary parasitology*, 113(1):73- 81