American Journal of Pharmacological Sciences, 2021, Vol. 9, No. 1, 36-39
Available online at http://pubs.sciepub.com/ajps/9/1/3
Published by Science and Education Publishing
DOI:10.12691/ajps-9-1-3

Phytochemical Profile and Potential Pharmacological Properties of Leaves Extract of *Senna italica* Mill

Euloge Sènan Adjou, Alain Yaya Koudoro, Guevara Nonviho, Edwige Dahouenon Ahoussi, Dominique C. K. Sohounhloue*

Laboratory of Study and Research in Applied Chemistry, University of Abomey-Calavi, Polytechnic School of Abomey-Calavi, 01, P. O. Box 2009, Cotonou
*Corresponding author: csohoun@gmail.com

Received February 15, 2021; Revised March 19, 2021; Accepted April 01, 2021

Abstract The leaves of *Senna italica* Mill., were screened for phytochemical properties using standard methods. Anthocyanins, leucoanthocyanins, catechics tannins, flavonoids, alkaloids, anthraquinones and reducer compounds were detected. However, saponins, coumarines and cyanogenic derivatives were not detected in the leaves extract. Taking into account of presence of these secondary metabolites in the plant extract, it could be suggested that this plant has a potential as a source of therapeutic agents. This supports the traditional use of the plant in curing human diseases. It is therefore suggested that further studies be carried out to isolate, purify and identify all active compounds present in all part of this plant.

Keywords: *Senna italica, phytochemistry, secondary metabolites, pharmacological properties, Benin*

Cite This Article: Euloge Sènan Adjou, Alain Yaya Koudoro, Guevara Nonviho, Edwige Dahouenon Ahoussi, and Dominique C. k. Sohounhloue, "Phytochemical Profile and Potential Pharmacological Properties of Leaves Extract of *Senna italica* Mill." *American Journal of Pharmacological Sciences*, vol. 9, no. 1 (2021): 36-39. doi: 10.12691/ajps-9-1-3.

1. Introduction

The use of plants as source of remedies for the treatment of diseases dates back to prehistory and people of all continents have this old tradition [1]. The use of complementary traditional medicine which include herbal medicines in the treatment of various diseases has expanded rapidly in both developed and developing countries, attributable to affordability, accessibility and efficacy. Faced with the repeated therapeutic failures encountered in the treatment of severe forms of certain pathologies such as arteriosclerosis, cardiovascular and neurological diseases, as well as cancer, nutraceutical products, nowadays, have become progressively popular to improve health, and to prevent or treat diseases [2]. Kawo et *al*. [3], reported that secondary metabolites which protected plants against herbivores and diseases caused by virus, bacteria, molds and parasites phytochemical components are also responsible for pharmacological activities of plants. Then, according to Agbankpe et al. [4], the Resolution AFR/RC50/R3 of 31 August 2000 of WHO encourages African countries to develop regional strategies on traditional medicine to undertake research on medicinal plants and to promote their optimal uses in delivery health care systems [5]. *Senna italica* with synonyms *Cassia italica* and *Acacia abovata* belongs to the family of Fabaceae. It is a small herb that grows to about two feet high with smooth and pale green stem having long spreading branches. It has peculiar odor and sweetish taste [1]. (Figure 1). Family of Fabaceae commonly known as the legume, comprises about 730 genera and more than 19,000 species [6]. Senna is an important genus of flowering plants, comprising nearly of 350 species, and widely distributed in tropical and subtropical zones [7]. *Senna italica* is native to many African countries, from Cape Verde to Somalia, and South Africa. It is also native to Asia, from the Near East to Sri Lanka, including Iraq, Iran, Pakistan and India, and it has been introduced and naturalized in the Caribbean and Venezuela. In Benin, it is widely known in the cultivated states such as localities of *Agoue* in the department of Mono (Southern Benin). It represents a major source of income for the populations of Agoue and its production extends over several hectares in theses localities [4]. Literature reported that throughout its range, the leaves, pods and ripe seeds of *Senna italica* are used for their purgative properties. They are most often taken as a decoction or maceration, to treat stomach aches, fever, jaundice, venereal diseases and bilious crises, as well as an abortifacient and against intestinal worms. The leaves, fresh or dried and pulverized, are used as a dressing for skin problems, such as burns and ulcers. The flower tea is used as a purgative and to induce childbirth. Root maceration is taken to treat colic and flu, and boiled roots are used as a dressing on wounds. The root infusion is used as eye drops to relieve sore eyes. The roots are also an ingredient in remedies for indigestion, liver problems, spleen problems, nausea, vomiting and dysmenorrhea. According to Vijaya et *al.* [8], leaves, pods and unmatured seeds are used as purgative, decoction and maceration are used to cure stomach complaints, fever, jaundice, veneral

diseases and biliousness. Nevertheless, in pregnant women, *S. italica* could be responsible of abortion because of its mimetic effect of oxytocin on the uterus [9]. Over the past few decades, a number of publications reported on the biological activities of extracts from different S*enna* species. However, few works has been performed on the phytochemical profile of *Senna italica*, especially in light of connection between the major biochemical groups present in plants and its potential pharmacological properties. Thus, the current work, investigated the relation between the major biochemical groups present in plants and its potential pharmacological properties of *Senna italic* in other to help in validating the widely claimed ethnobotanical usage of this plant in traditional and folk medicine.

Figure 1. Leaves and flowers of *Senna italica* Mill

2. Material and Methods

2.1. Plant Sampling and Extraction

The fresh leaves of *Senna italica* were harvested at Agoué in Benin and identified at the National Herbarium of Benin. Leaves extraction was made as described by *Savithramma* et al. [10] as follow: the leaves were washed thoroughly 2-3 times with running tap water, leaf material was then air dried under shade after complete shade drying the plant material was grinded in mixer, the powder was kept in small plastic bags with paper labeling. The grinded leaves material of 5gm weighed using an electronic balance and were crushed in 25 ml of sterile water, boiled at 50-60°C for 30 minutes on water bath and it was filtered through Whatman No.1 filter paper. Then filtrate was centrifuged at 2500 rpm for 15 minutes and filtrate was stored in sterile bottles at 5°C for further uses.

2.2. Phytochemical Screening

Preliminary qualitative phytochemical screening was were perfomed using standard procedures (Sofowora, 1993).

- **Tannins:** 2 ml of extract was added to few drops of 1% lead acetate. A yellowish precipitate indicated the presence of tannins. The gallic tannins has been characterized by an aqueous solution of ferric chloride (FeCl3) to 2% driving to the development of a coloration bruise-black or green black characterizing the presence of tannoïdes. The catechic tannins has been put in evidence by the reagent of Stiasny (formalin 30% in HCl extract: 2/1 v/v).
- **Saponins:** 5 ml of extract was mixed with 20 ml of distilled water and then agitated in a graduated cylinder for 15 minutes. Formation of foam indicates the presence of saponins.
- **Anthocyanins:** 2ml of aqueous extract is added to 2ml of 2N Hcl and ammonia. The appearance of pink-red turns blue-violet indicates the presence of anthocyanins.
- **Leucoanthocyanins:** 5 ml of aqueous extract added to 5ml of isoamyl alcohol. Upper layer appears red in colour indicates for presence of leucoanthocyanins.
- **Coumarins:** 3 ml of 10% NaOH was added to 2 ml of aqueous extract formation of yellow colour indicates the presence of coumarins.
- **Alkaloids:** Each dry extract powder (100 mg) was dissolved in 5ml of methanol and then filtered. 5ml of hydrochloric acid (1%) was mixed with 2ml of the filtrate, and then1 ml of the mixture was taken separately in two test tubes. Few drops of Dragendorf's reagent (potassium iodide-bismuth nitrate) were added in the tube and appearance of orange red precipitate was taken as positive. Few drops of Mayer's reagent (composed of mercuric chloride and potassium iodide dissolved in distilled water) were added to the second tube and appearance of buff-colored precipitate designates the existence of alkaloids.
- **Test for reducing sugars (Fehling's test):** The aqueous ethanol extract (0.5 g in 5 ml of water) was added to boiling Fehling's solution (A and B) in a test tube. The solution was observed for a colour reaction.
- **Test for anthraquinones:** 0.5 g of the extract was boiled with 10 ml of sulphuric acid (H_2SO_4) and filtered while hot. The filtrate was shaken with 5 ml of chloroform. The chloroform layer was pipette into another test tube and 1 ml of dilute 4ammonia was added. The resulting solution was observed for colour changes.
- **Test for flavonoids:** Three methods were used to test for flavonoids. First, dilute ammonia (5 ml) was added to a portion of an aqueous filtrate of the extract. Concentrated sulphuric acid (1 ml) was added. A yellow coloration that disappear on standing indicates the presence of flavonoids. Second, a few drops of 1% aluminium solution were added to a portion of the filtrate. A yellow coloration indicates the presence of flavonoids. Third, a portion of the extract was heated with 10 ml of ethyl acetate over a steam bath for 3 min. The mixture was filtered and 4 ml of the filtrate was shaken with 1 ml of dilute ammonia solution. A yellow coloration indicates the presence of flavonoids.
- **Cyanogenic derivative**: They were detected by the picric acidic test 1% resulting in a brown coloration characteristic of the presence of cyanogenic derivatives.

- **Mucilages**: They were revealed by the obtaining a flaky precipitate of a decoction in ethylic ether indicating the presence of mucilages.

2.3. Statistical Analyses

The data generated from these studies were analyzed using Statistical Analysis Software (SAS) and SYSTAT 5.05. [11].

3. Results and Discussion

The phytochemical screening of *Senna italica* indicates the presence of some important secondary metabolites in leaves of such as anthocyanins, leucoanthocyanins, catechics tannins, flavonoids, alkaloids, anthraquinones and reducer compounds (Table 1). Gallic tannins, saponins, coumarines and cyanogenic derivatives were not detected in the leaves of *Senna italica*. Nowadays, important biological properties of various extracts from many plants have recently been of great interest in both research and the food industry, because their possible use as natural additives emerged from a growing tendency to replace synthetic antioxidants and antimicrobials with natural ones [12]. The presence of some important bioactive compounds indicate the medicinal value of the plants of *Senna italica*. Indeed, several studies reported the antiviral effect of anthocyanins [10,13] in helping human immune system to work more efficiently to protect against viral infections. Specific types of them may have a direct effect in decreasing influenza viruses infectivity by decreasing the ability of the virus itself to get into the human cell or to be related from infected cells or by having a viricide effect [13]. Lot of pharmaceutical studies have demonstrated that tannins have many biological effects, such as antimicrobial activities, by inhibiting the growth of many fungi, yeasts, bacteria and viruses [14]. Tannins also contribute to the property of astringency and inflamed mucous membrane [14]. Alkaloids are in great demand for their physiological effects, thus constituting substances of particular interest for their pharmacological activities. Alkaloids are also antibiotics such as cycloserine and mytomycin. These properties give plants rich in alkaloids such as *Senna italica*, a prominent place in both traditional and modern pharmacopoeia, given their wide range of therapeutic activities. Flavonoids are a large group of natural substances with variable structures present almost in all growing parts of the plants, being reported as the most abundant plant pigment along with chlorophyll and carotenoids, also providing fragrance and taste to fruits, flowers and seeds, which makes them attractants for other organisms. These compounds are also one of the largest groups of secondary metabolites. Besides their relevance in plants, flavonoids are important for human health because of their high pharmacological activities. Recent interest in these substances has been stimulated by the potential health benefits arising from the antioxidant activities of these polyphenolic compounds [15]. Anthraquinones constitute an important class of natural and synthetic compounds with a wide range of applications. Anthraquinone derivatives have been used since centuries for medical applications, for example, as laxatives, antimicrobial and antiinflammatory agents. Current therapeutic indications include constipation, arthritis, multiple sclerosis, and cancer. Moreover, biologically active anthraquinones derived from Reactive Blue 2 have been utilized as valuable tool compounds for biochemical and pharmacological studies. They may serve as lead structures for the development of future drugs [16]. Previous studies such as those reported by Khalaf et al. [7] indicated that the presence of six compounds, namely: physcion, emodin, 2-methoxy-emodin-6-O-ßD-glucopyranoside, 1-hydroxy-2-acetyl-3-methyl-6hydroxy-8-methoxynaphthalene (tinnevellin), quercetin 3-O αL-rhamnopyranosyl-(1→6)-ß-D-glucopyranoside (rutin) and 1,6,8-trihydroxy-3-methoxy-9,10-dioxo-9,10-dihydroanthracene in *Senna italica* plant by bio-guided fractionation. The presence of all these bioactive compounds in plant of *Senna italica*, justified the all broad spectrum of biological applications such as anti-inflammatory [17], antitrypanosomal [18], antiprotozoal [19], antioxidant [20], and antiproliferative [21] of plant from Senna genus.

Table 1. Phytochemical composition of *Senna italica* Mill., leaves

Secondary metabolites	Results
gallic tannins	-
catechic tannins	+
coumarins	-
Saponins	-
anthocyanins	+
leucoanthocyanins	+
alkaloids	+
reducer compounds	+
anthraquinones	+
flavonoids	+
cyanogenic derivative	-
mucilages	-

4. Conclusion

Phytochemical screening of medicinal plants is very important because it lead to the identification of new sources of therapeutically and industrially important compounds, in other to improve the health status of people. *Senna italica* Mill., leaves, with the presence of these important secondary metabolites, involves further investigation by implementation techniques of extraction, purification, separation, crystallization and identification.

Conflict of Interest

The authors declare that there are no conflicts of interest.

References

[1] Dabai, Y. U., Kawo, A. H., Aliyu, R. M. (2012). Phytochemical screening and antibacterial activity of the leaf and root extracts of *Senna italica*. African Journal of Pharmacy and Pharmacology, 6(12), 914-918.

[2] Adjou, E.S., Ladekan, E.Y., Koudoro, A.Y., Dahouenon-Ahoussi, E., Sohounhloue, D.C.K. (2020). Phytochemical profile and associated microflora of *Morinda citrifolia* L. (Rubiaceae) juice

used as source of traditional nutraceuticals. Journal of Pharmacognosy and Phytochemistry, 9(4), 776-779.

[3] Kawo, A.H., Suleiman, Z.A., Yusha'u, M. (2011). Studies on the antibacterial activity and chemical constituents of *Khaya senegalensis* and *Ximenia americana* leaf extracts. Afr. J. Microbiol. Res., 5(26), 4562-4568.

[4] Agbankpe A. J.., *et al*. "HPLC Standardization of Herbal Drugs and Evaluation of their Antimicrobial Properties: Studies of Leaves and Flowers of *Senna italica* Mill. Grown in Benin (Western Africa)". *EC Pharmacology and Toxicology* 8.2 (2020): 01-17.

[5] World Health Organization (WHO). "Promoting the role of traditional medicine in the health system: Strategy of the African region AFR/RC50/9". Harare: Africa regional office (2001): 20.

[6] Rahman, A. H. M., Parvin, M. I. A. (2015). Study of medicinal uses of Fabaceae family at Rashayi, Bangladesh. Plant, 3, 20-25.

[7] Khala, O. M., Ghareeb M. A., Saad A. M., Madkour H.M.F., El-Ziaty AK., Abdel-Aziz. M S. (2017). Phenolic Constituents, Antimicrobial, Antioxidant, and Anticancer Activities of Ethyl Acetate and n-Butanol Extracts of Senna italica. Acta Chromatographica 312, 138-145.

[8] Vijaya B.R., Radha R., Micheal R.S., Praveena M., Sasikala S. (2018). A review article on *Senna italica* Mill. Int. J. Pharm. Sci. Rev. Res., 52(2), 44-46.

[9] Ahangarpour, A., Oroojan, AA. (2010). The effects of *Cassia italica* leaves aqueous extract on non-pregnant uterus contraction in rats". *Iranian Journal of Reproductive Medicine* 8. (4), 179-184.

[10] Sofowora A. (1993). Medicinal plants and Traditional Medicine in Africa. Spectrum Books, Ibadan. pp 150.

[11] Ogbeibu A.E. (2005). Biostatistics, a Practical Approach to Research and Data Handling (Mindex Publishing Company Ltd., Benin City. pp264.

[12] Deba, F., Xuan T.D., Yasuda M., Tawatu, S. (2008). Chemical composition and antioxidant, antibacterial and antifungal activities of the essential oils from *Bidens pilosa* Linn. Var. Radiata. Food Control, 19, 346-352.

[13] Liu, A.L., *et al.*, (2009). *In vitro* anti-influenza viral activities of constituents from *Caesalpinia sappan*, Planta Med., 75, 337-9.

[14] Okwu, D.E., Josiah, C. (2006). Evaluation of the chemical composition of two Nigerian medicinal plants. Afri. J. Biotech., 5, 357-361.

[15] Ruiz-Cruz S., et al. (2017). Flavonoids: Important Biocompounds in Food, Flavonoids - From Biosynthesis to Human Health, Goncalo C. Justino, IntechOpen.

[16] Malik E.M., Müller CE (2016). Anthraquinones as pharmacological Tools and Drugs. Med Res Rev, 36(4), 705-48.

[17] Susunaga-Notario, A. C (2014) Bioassay-guided chemical study of the antiinflammatory effect of *Senna vilosa* (Miller) HS irwin Barnely (leguminosae) in TPA-induced ear edema. Molecules, 19 (7), 10261-10278.

[18] Jimenez-Coello, M., Guzmán, E. S., Pérez, M. S., Polanco, G., Acosta, K. (2011). Antitripanosomal Activity of *Senna villosa* in infected Balb /C mice with Trypanosoma cruzi during the sub-acute phase of infection. Afr. J. Tradit. Complement. Altern. Med, 8, 164-169.

[19] Guzmán, E. S., Pérez, C., Zavala, M. A., Pérez, M. S. (2008). Antiprotozoal activity of 8-hydroxymethylen)-trieicosanylacetate isolate from *Senna villosa*. Phytomedicine, 15 (10), 892-895.

[20] Mokgotho, M. P., Gololo, S. S., Masoko, P., Mdee, L. K., Mbazima, V., Shai, L.J. (2013). Isolation and chemical structural characterization of the coumpound with antioxidant activity from the roots of *Senna italica.* Evid. Based Compl. Alt. Med., 1-6.

[21] Masoko, P. A., Gololo, S. S., Mokgotho, M. P., Eloff, J. N., Howard, R. I., Mampuru, L. (2010). Evaluation of the antioxidant, antibacterial and antiproliferative activities of the acetone extract of the root of *Senna italica.* J. Afr. J. Tradit. Complement. Altern. Med., 7(2), 138-148.