International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 4 Issue 3, April 2020 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Phytochemical Screening and Review of the Pharmacological Importance of *Erythrina Senegalensis*

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ABSTRACT

The plant *Erythrina senegalensis* have been observed by the natives to have medicinal values. The present study was carried out to investigate the phytochemicals of the root and pharmacological importance of the plant. The crushed root was subjected to sequential extraction (maceration) by increasing polarity index of solvents (hexane, ethyl acetate and methanol). The methanol extract gave the highest percentage yield (4.28%) followed by Ethylacetate (3.62%) and Hexane (2.48%) was the least in the yield in extraction. All the three solvent extracts were then used for phytochemicals screening test. The phytochemical screening has shown the presence of Flavonoids, alkaloids, anthraquinones, phenols, quinones, steroids, saponins, tannins, terpenoids, Xanthoproteins. All the phytochemiscals were found to be present in atleast one of the extract with Flavonoids, Quinone, Anthraquinones and Xanthoproprotein present in all the three extracts. This result of the phytochemical screening of the root shows why the plant *Erythrina senegalensis* has such pharmacological importance.

KEYWORDS: *Erythrina senegalensis; extraction; pharmacological; phytochemicals*

How to cite this paper: Bioltif, Yilni Edward | Sase, Terver John | Nehemiah, Tonkum Obadiah "Phytochemical Screening and Review of the Pharmacological Importance of Erythrina Senegalensis" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-3, April 2020, pp.292-296, URL: www.ijtsrd.com/papers/ijtsrd30350.pdf

IJTSRD30350

INTRODUCTION

Plant material has remained central to traditional medical practices and has remained useful sources of new drugs [1]. For a long period of time, plants have been a valuable source of natural products for maintaining human health especially in the last decade, with more intensive studies for natural therapies [2]. Medicinal plant would be the best source to obtain a variety of drugs while 80% of the developing countries rely directly on crude concoctions, infusions, decoctions of plants in traditional medicine for their health remedies [3]. Phytochemical and pharmacological studies are very important since a single plant may contain up to thousands of compounds, the possibility of making new discovery become evident [4]. The understanding of plants and investigation to better understand their properties, safety and efficiency in therefore important.

Phytochemicals are chemicals produced by means of secondary reactions resulting from primary carbohydrates, amino acids and lipids [5]. Such chemicals are known to participate in plant defense mechanisms against herbivores and pathogens [6]. The most common classes of these chemicals are saponins, tannins, anthraqinones, flavonoids, and alkaloids which are widely distributed amongst various plant families in abundant quantities. It is these chemicals which attract so much attention from scientists due to their ability to inhibit the growth of microbes pathogenic to man and to aid in drug discovery [7, 8].

Plants have served as models for drugs development for three basic reasons; 25% percent of all prescription drugs contain active compounds from higher plants, secondly because secondary plant metabolites are useful in studying biological systems and disease processes, and lastly because biologically active compounds sometimes have poor pharmacological activity in humans, and in this case these compounds are used as template for synthetic modification and or manufacturing [9].

A. Erythrina senegalensis

Figure 1: Erythrina senegalensis Plant

1. Taxonomy

Kingdom	Plantae
Phylum	Tracheophyta
Class	Equisetopda
Subclass	Magnoliidae
Superclass	Rosanae
Order	Fabales
Family	Leguminosae
Genus	Erythrina
Scientific Name—	*Erythrina senegalensis* D.C

Vernacular Names: English- coral tree, Hausa –Mijirya, Tiv –shor, Yoruba –ologun

2. Geographical Location and Distribution

The plant is commonly found in savannah areas of West Africa and is native to Senegal, Gambia, Guinea, Guinea-Bissau, Sierra Leone, Liberia, Mali, Burkina Faso, Ivory Coast, Niger, Ghana, Togo, Benin, Nigeria and Cameroon. There are about 108 species of Erythrina distributed all over the world today. Such species exist in different forms as trees, shrubs, and herbs in Africa, America and Australia [10].

3. Habitat and Ecology

E. senegalensis is a tree which occurs in dry open savannah woodlands, burned savannah, plateau with fine gravel, degraded regrowths, coastal savannah (in Ghana), bank of streams and roadsides by grassland.

4. Morphological Description

Overview: A tree growing up to 7m tall, rarely to 15m, with deeply fissured, corky bark. The branches and bark are armed slightly hooked spines up to 10mm long.

Leaves: The leaves are composed of three leaflets, each measuring 5-15×4-10cm and having a thorny stalk

Flowers: The flowers appear in large groups at the end of the branches, when the tree is leafless (in the first half of the dry season). The flowers are bright red and 4-5cm long.

Fruits: The fruit is a bent, twisted and slightly hairy pod, 7-15×1cm. it is constricted between the seeds, which are bright red.

B. Uses and Application of The Plant

Erythrina senegalensis is used by traditional healers to treat many ailments, infections, and used as diuretic for horses. The bark of *Erythrina senegalensis* is use by traditional healers in Northern Nigeria to treat jaundice and other ailments. The bark infusion with spices and honey is widely used for the treatment of gonorrhoea and as muscle relaxant [10]. In Ghana, the bark is recommended as emmenagogue and in French Guinea it is given to women after child birth. In Senegal the bark is considered as remedy for dysentery and colitis. The fruits of *Erythrina senegalensis* are used in jos locally for treatment of malaria fever. The roots are pounded and use as sponge by the Dagombas. The bark and leaves decoction are sometimes given as drinks, baths or as tonic for children with rickets and also to weak old men [11].

Some phytochemicals such as alkaloids, flavonoids, tannins, saponins, phenols, steroid, quinone, xanthoprotein and terpenoid have been identified in the *Erythrina sengalensis* root [12]. The root extract of the plant has been reported in Nigeria studies to have antimalarial, analgesic, anti-inflammatory and antibacterial action. The root bark is used by traditional herbalist to cure wide range of illnesses [13].

C. Pharmacological Activities of Erythrina senegalensis

The pharmacological studies of this plant are demonstrated and include antibacterial, antifungal, and antiplasmodial activities, it also induces analgesic and antipyretic action. *Erythrina senegalensis* is used by traditional healers to treat many ailments, infections, and used as diuretic for horses [12]. In Gambia and Senegal, the sap from the crushed leaves is applied to wounds for two or three days to promote healing. The pounded bark and leaves are also used in Nigeria as a tooth ache remedy and in Ivory Coast for general disease treatment [14]. In Mali, ethanol extract of the plant was found to contain active bacteriocides against staphylococcus aureus, *Enteracoccus faccalis, Bacillus subtilis* and *Streptococcus pyogenes* and thus have found application in the treatment of bronchial infect, cough and throat inflammation, malaria, jaundice, sterility, onchocerchiasis, body pain and wound infection [15].

MATERIALS AND METHODS

D. Plant Material

Erythrina senegalensis root extract was collected from federal college of forestry Jos, Plateau State. The plant taken was identified and authenticated at the Department of herbarium federal college of forestry Jos. The sample was then chopped into small sizes and dried at room temperature for four (4) weeks. The dry sample was crushed into small sizes using mortar and pestle.

E. Preparation of Plant Extract

The dried sample (50g/200ml) was extracted successively extracted with n-hexane, ethyl acetate and methanol using cold extraction method (maceration). The solvent is left in contact with the plant for 72 hours (3 days) in each case. The extract is decanted and allowed to stand, after which it is filtered through a Whatman No. 42 filter paper. The extract was concentrated using a rotary evaporator. The extract was transferred into a pre-weighed beaker and placed on a water bath at 40°C until a plastic form of the extract is obtained. All the crude extracts were then weighed to determine the percentages yield of extraction. The percentage yield of extraction was calculated by using the following equation:

$$\%Yield = \frac{\text{Weight of the dry concentrated crude extract}}{\text{Weight of the dried crushed plant sample used}} \times 100\%$$

F. Preliminary Phytochemical Screening

The phytochemical test for various phytochemicals present in the extract was carried out using standard methods as described below [16].

Test for Alkaloid

0.2g of the molten extract was mixed with little amount of HCl and then wagners reagent. Formation of a white precipitate indicates the presence of alkaloid.

Test for Flavonoid

0.2g of the molten extract was mixed with 1ml of 2% ammonium chloride and the exposed to light. Yellow precipitate indicates the presence of Flavonoid.

Test for Anthraquinone
A few drops magnesium acetate was added to 0.2g of the molten extract. Pink colour formation indicates the presence of anthraquinone.

Test for Quinone
0.2g of the molten extract was treated with few drops of conc. H_2SO_4 or aqueous NaOH solution. Red colour formation indicates the presence of quinone.

Test for Phenols
0.2g of molten extract was mixed with ferric chloride solution. A green or dirty green precipitate indicates the presence of phenol.

Test for Tannins
0.2g of the molten extract was mixed with few drops ferric chloride solution. A blue-black, green or blue-green precipitate indicates the presence of tannin.

Test for Saponins
0.2g of extract was shaken 5ml of distilled water in a test tube. Frothing which persists on warming indicates the presence of saponin.

Test for Xanthoproteins
0.2g of extract was mixed with few drops of conc. HNO_3 and then few drops of ammonia. A red precipitate indicates the presence of xanthoproteins.

Test for Steroids (Salkowski's test)
0.2g of the extract was mixed with 3ml of chloroform and 2ml of conc. H_2SO_4. A red colour appearance indicates the presence of steroid.

Test for Terpenoid
About 0.2g extract was mixed with 2ml Chloroform and 3ml of concentrated sulphuric acid was added carefully to form a layer. A reddish brown coloration of the interface formed indicates the presence of terpenoids

RESULTS

Table1: Weight and Percentage Yield of Extract

Extract	Colour of extract	Wt. of sample (g)	Wt. of extract (g)	%Yield (w/w)
Hexane Extract	Yellow	500	14.2	2.84
Ethylacetate Extract	Orange	500	18.1	3.62
Methanol Extract	Orange	500	21.4	4.28
Total Extract		1500	53.7	10.74

Table2. Showing the results for the phytochemical screening of the root extract of *Erythrina senegalensis*

Phytochemicals	Hexane Extract	Ethyl acetate Extract	Methanol Extract
Alkaloids	+	-	+
Flavonoids	+	+	+
Steriods	-	-	+
Tannins	-	+	+
Phenols	+	-	-
Quinones	+	+	+
Saponins	+	+	-
Terpenoids	-	-	+
Anthraquinones	+	+	+
Xanthoproteins	+	+	+

Present (+) Absent (-)

DISCUSSION
The solvents used in the present study were selected based on their different polarity ranges. In term of chemistry, polar substances would dissolve in polar solvents while non-polar substances will dissolve in non-polar solvents. [17].

The percentage yield of crude methanol extract (4.28%) is the highest among the three solvent extracts, followed by ethylacetate extract (3.62%), whereas hexane extract showed the lowest percentage yield (2.84%). Thus total percentage yield by *E. senegalensis* root was found to be 10.74%.

The result of the preliminary phytochemicals screening of three solvent (N-hexane, ethylacetate and methanol) extracts of the plant *Erythrina senegalensis* root is presented in the Table 2. The result revealed that root bark of *Erythrina senegalensis* contain alkaloids, flavonoid, steroid, tannin, phenol, quinine, saponin, terpenoid, anthraquinone and xanthoprotein. The N-hexane root extracts of the plant reveal that the root contain alkaloid, flavonoid, phenol, quinine, xanthoprotein, saponon, and anthraquinone but showed a negative test for steroid, tannins and terpenoid. The ethylacetate root extracts of the plant reveal that its contain flavonoid, tannins, quinone, xanthoprotein, saponin, anthraquinone but show negative result for alkaloid, terpenoid, steroid and phenol. The methanol root extract of the plant revealed that the root contain alkaloid, flavoniod, steroid, tannin, quinine, terpenoid, xanthoproteins and anthraquinone but show negative result for phenol, saponin. The preliminary phytochemical screening of the root extract of *Erythrina senegalensis* is similar with other research findings [18].

The present research brings out information on different active compounds in plants from root extracts of *Erythrina senegalensis*.

Flavonoids shows biological activities like antimicrobial, anti-inflammatory, analgesic, anti-allergic, antioxidant properties and anticancer activities [19]. Because of the presence of flavonoids in the plant, thus makes the plant to be use as antioxidants and antimicrobial.

Tannins are known to interact with protein to give the astringent effects which is important for the treatment. They form irreversible complex with proline-rich protein resulting in the inhibition of cell protein synthesis. *E. senegalensis* is thus useful as antiseptic and this activity is due to presence of tannins [20, 21].

Phenolic compound in the plant proves that they have anti-microbial and anti-fungal effect. Also, plants that contain phenols could be used as anti-inflammatory, immune enhancers and hormone modulators [22]. Phenolic compounds are well known potential phytotoxins and exist as free forms, esters or as glycoside when combined with sugars. Such compounds contribute to the bitter taste [23].

Plant steroids (cardiac glycosides) are naturally occurring plant phytoconstituents that have found therapeutic applications as arrow poisons or cardiac drugs [24]. Steroids are reported to exhibit strong antiviral and antibacterial activities; they are used as treatment for congestive heart failure [18].

Saponins are often referred to as "soap like behaviour" in water, because of their foamy nature. They have anti-carcinogenic properties, immune modulation activities and regulation of cell proliferation as well as health benefits such as inhibition of the growth of cancer cell and cholesterol lowering activity [25]. Saponins are also important therapeutically as they are shown to have hypolipidemic and anticancer and anticancer activity.

Alkaloids have wonderful physiological effect on human and used for the development of powerful analgesic drugs [26]. Alkaloids have pharmacological applications as anesthetics and CNS stimulants, also serve as muscle relaxant [27].

Anthraquinones are also used as laxatives such as in the drug senna glycoside
The curative properties of medicinal plants are perhaps due to the presence of various chemicals. Therefore, apart from giving an insight into valuable chemical constituents, screening of different parts of medicinal plants would be a prerequisite for evaluation of the pharmacological activities of a plant and drug development.

CONCLUSION

The study has shown that the plant extract from the root of *Erythrina senegalensis* possessed bioactive constituents like saponins, tannins, alkaloids, terpenes and cardiac glycosides which shows that it has high medicinal potential and can be utilized in treatment of diseases. This confirms its phamarcological importance and justifies its usage for various health remedies.

REFERENCES

[1] Anishetty, R., Swapna, S., Aishwarya, B., & Sravanthi, K. C. (2012). Evaluation of antibacterial activity potential of extracts of Ricinus communis, Zingiber officinalis and Punica granatum in a Polyherbal Extract. *Research Journal of Pharmacy and Technology*, *5*(11), 1385-1388.

[2] Sofowora, A. (1981). Problems and Prospects of Integrating Traditional and Western Medicine in Nigeria. *Nigerian Journal of Pharmacy*, *12*(1), 277-283.

[3] Sofowora, A. (1993). Recent trends in research into African medicinal plants. *Journal of ethnopharmacology*, *38*(2-3), 197-208.

[4] Banso, A., & Adeyemo, S. O. (2007). Evaluation of antibacterial properties of tannins isolated from Dichrostachys cinerea. *African Journal of Biotechnology*, *6*(15).

[5] Hussain, M. S., Fareed, S., Saba Ansari, M., Rahman, A., Ahmad, I. Z., & Saeed, M. (2012). Current approaches toward production of secondary plant metabolites. *Journal of pharmacy & bioallied sciences*, *4*(1), 10.

[6] Edreva, A., Velikova, V., Tsonev, T., Dagnon, S., Gürel, A., Aktaş, L., & Gesheva, E. (2008). Stress-protective role of secondary metabolites: diversity of functions and mechanisms. *Gen Appl Plant Physiol*, *34*(1-2), 67-78.

[7] Pereira, D. M., Valentão, P., Pereira, J. A., & Andrade, P. B. (2009). Phenolics: From chemistry to biology.

[8] Balunas, M. J., & Kinghorn, A. D. (2005). Drug discovery from medicinal plants. *Life sciences*, *78*(5), 431-441.

[9] Farnsworth, N. R. (1994). Ethnopharmacology and drug development. *Ethnobotany and the search for new drugs*, *185*, 42-51.

[10] Daziel, J. (1955). The Useful Plants of West Tropical Africa Published by Crown Agents for Overseas Government and Administration.

[11] Games, D. E., Jackson, A. H., Khan, N. A., & Millington, D. S. (1974). Alkaloids of some African, Asian, Polynesian and Australian species of Erythrina. *Lloydia*, *37*(4), 581.

[12] Rawaa, A., Adawai, K., & Mohammed, H. (2016). "Antibacterial activity of *Asphodelin intea* and Asphodelus microcarpus against *methicillin*. Resistant Staphylococcus aureus isolates". International Journal of Pharmacognosy and Phytochemical Research, 8 (12); 1964-1968.

[13] Obidah, W., Badung, H. L., Ajuji, J., Peter, H., & Bello, H. (2014). Effects of Erythrina senegalensis aqueous leaf extract in rats. *American Journal of Research Communication*, *2*, 179-185.

[14] Udem, S. C., Obidoa, O., & Asuzu, I. U. (2010). Acute and chronic toxicity studies of Erythrina senegalensis DC stem bark extract in mice. *Comparative Clinical Pathology*, *19*(3), 275-282.

[15] Togola, A., Austarheim, I., Theïs, A., Diallo, D., & Paulsen, B. S. (2008). Ethnopharmacological uses of Erythrina senegalensis: a comparison of three areas in Mali, and a link between traditional knowledge and modern biological science. *Journal of ethnobiology and ethnomedicine*, *4*(1), 6.

[16] Trease, G.E. and Evans, W.C. 1989. Pharmacognosy. Thirteenth Edition.

[17] Ali, R. M., Houghton, P. J., Raman, A., & Hoult, J. R. S. (1998). Antimicrobial and anti-inflammatory activities of extracts and constituents of Oroxylum indicum (L.) Vent. *Phytomedicine*, *5*(5), 375-381.

[18] Saidu, K., Onah, J., Orisadipe, A., Olusola, A., Wambebe, C., & Gamaniel, K. (2000). Antiplasmodial, analgesic, and anti-inflammatory activities of the aqueous extract

of the stem bark of Erythrina senegalensis. *Journal of ethnopharmacology*, *71*(1-2), 275-280.

[19] Hodek, P., Trefil, P., & Stiborová, M. (2002). Flavonoids-potent and versatile biologically active compounds interacting with cytochromes P450. *Chemico-biological interactions*, *139*(1), 1-21.

[20] Adegboye, M. F., Akinpelu, D. A., & Okoh, A. I. (2008). The bioactive and phytochemical properties of Garcinia kola (Heckel) seed extract on some pathogens. *African Journal of Biotechnology*, *7*(21).

[21] Shimada, T. (2006). Salivary proteins as a defense against dietary tannins. *Journal of chemical ecology*, *32*(6), 1149-1163.

[22] Okwu, D. E., & Omodamiro, O. D. (2006). Effects of hexane extract and phytochemical content of Xylopia aethiopica and Ocimum gratissimum on the uterus of guinea pig. *Bio-research*.

[23] Okwu, D. E. (2005). Phytochemicals, vitamins and mineral contents of two Nigerian medicinal plants. *Int. J. Mol. Med. Adv. Sci*, *1*(4), 375-381.

[24] Firn, J. (2010). Ten Commitments, Reshaping the Lucky Country's Environment.

[25] Jimoh, F. O., & Oladiji, A. T. (2005). Preliminary studies on Piliostigma thonningii seeds: Proximate analysis, mineral composition and phytochemical screening. *African Journal of Biotechnology*, *4*(12).

[26] Kam, P. C. A., & Liew, S. (2002). Traditional Chinese herbal medicine and anaesthesia. *Anaesthesia*, *57*(11), 1083-1089.

[27] Madziga, H. A., Sanni, S., & Sandabe, U. K. (2010). Phytochemical and elemental analysis of Acalypha wilkesiana leaf. *Journal of American Science*, *6*(11), 510-514.