A phyto pharmacological review on a medicinal plant: *Holarrhena floribunda*

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Abstract

*Holarrhena floribunda* (G. Don) T. Durand and Schinz (Apocynaceae), commonly called false rubber tree, is a tree that grows up to 17 meters high. The plant is widely distributed in West Africa, where several parts of the plant are used for medicinal purposes. The stem-bark and leaves are used to treat various ailments such as malaria, fever, dysentery, amoebic diseases, diarrhea, infertility, amenorrhea and diabetes. The review of literature revealed the presence of many active phytochemical constituents which may be responsible for the various medicinal uses and pharmacological activities of *Holarrhena floribunda*. According to this review *Holarrhena floribunda* has analgesic, antimicrobial, hypoglycemic, anticancer, antimalarial and Trypanocidal activities.

Keywords: *Holarrhena floribunda*, phytochemical constituents, pharmacological activities, Medicinal uses

1. Introduction

In recent years, there has been a monumental increase in the use of plants medicinally. Medicinal plants are progressively gaining acceptance in both developing and developed countries due to their natural source and minimal side effects. The World Health Organization (WHO) has listed 21,000 plants, which are used curatively worldwide. Plants have proven to be a novel source for bioactive natural products, their ethnopharmacological effects have been used as a primary source for drug discovery. About 25% of the contemporary pharmacological drugs are derived directly or indirectly from plants. Approximately 80% of the plant derived drugs were related to their initial ethnopharmacological purpose. Therefore, screening of medicinal plants is required for the discovery and development of useful bioactive agents for treatment of ailments.

*Holarrhena floribunda* (G. Don) T. Durand and Schinz (Apocynaceae), commonly called false rubber tree, is a tree that grows up to 17 meters high in the deciduous forest and savannah woodland. The plant is widely distributed in West Africa, where several parts of the plant are used for medicinal purposes. The stem-bark and leaves are used to treat various ailments such as malaria, fever, dysentery, amoebic diseases, diarrhea, infertility, amenorrhea and diabetes. The plant contains various phytochemical constituents with potential pharmacological activities such as: holarrhesine, conessine from the bark of the root. The leaves contain holaphylline and holaphyllamine, and other alkaloids: holaphylline, holaphyllamine, holamine, holaphyllinol, holaphyllidine, holadysamine, holarrhesine, conessine, and progesterone. Progesterone and some flavones (robinoside).

2. Common names [7, 8]

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<td>Pehul</td>
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<td>Yoruba</td>
<td>Ako-ire, are-ibeji, areno, isi</td>
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Holarrhena floribunda
(G.don) T. durand & Schinz

Synonyms
Holarrhena africana A.D.C
Holarrhena floribunda var. tomentella H. Huber
Holarrhena ovata A.D.C
Holarrhena wulfsbergii Stapf
Rondeletia floribunda G.Don

4. Plant Description
Holarrhena floribunda is a shrub to medium sized tree, 4.5-15 m high. The leaves are shiny, mostly ovate-acuminate, or ovate-lanceolate, 5-18 cm long and 2-8 cm broad with 6-12 pairs of lateral nerves. Flowers are white, scented and in almost umbel-like inflorescences; corollatube 5-9 mm long and lobes 3.5-8 mm and overlapping to the right. Anthers are fertile to the base. It has paired narrowly cylindrical fruiting follicles, 30-60 cm, with seeds having apical tufts of hair.

5. Traditional Uses
Stem bark: The bark is used as a febrifuge, tonic, as remedy for snake bite and for the treatment of venereal diseases and dysentery. In some parts of West Africa, the bark is used to treat abdominal pains, nausea, indigestion and diarrhea.

Roots: The roots of H. floribunda are used in the treatment of constipation, colic discomforts and sterility. It is also used to treat diarrhea and dysentery. The root is boiled in milk and used to bathe boys attaining puberty and it is also used as a cure for snakebites and venereal disease.

Leaves: The leaves of H. floribunda have been used to treat malaria and dysentery, diarrhea, amenorrhea and management of diabetes. The leaves, mixed with those of Myrianthus arboresus and fruits of Capsicum in water, are applied as an enema against kidney pain. In Sierra Leone the leaves mixed with kola nut are eaten to treat gonorrhea. The leaf sap is sprinkled on wounds as a haemostatic.

Fruit: In Guinea Bissau the fruit is used to prepare a remedy for dropsy. The latex is applied to snakebites.

6. Chemical Constituents
The tree yields a large number of alkaloids which are greatest in the roots (2%), decreasing in the stem (1 – 1.5%) and least in the leaves (< 1.0%) [15]. The bark contains a steroidal alkaloid called holarrhensine and conessine from the bark of the root. The leaves contain holaphylline and holaphyllamine, and other alkaloids: holaphlyline, holaphyllamine, holamine, holaphyllin, holaphyllidine, holadysamine, holarrhesine, conessine, and progesterone [9]. Progesterone and some flavones (robinoside) were found in leaf extracts [6].

Trichotheccenes namely; 8-dihydrotrichotheccinol A, lokucainol A, and lokucainol B and the compounds; trichotheocolone, trichothen, trichotheccin A (6), rosenonolactone, 6β-hydroxyrosononolactone, rosololactone and lupeol were isolated from stem [16, 17].

7. Pharmacologic activities
7.1. Analgesic activity
Aniefiok Udobre et al., 2014 [11] evaluated the analgesic activity of methanol root extract of Holarrhena floribunda using thermally induced pains, acetic acid induced writhing and formalin-hind paw licking in mice models. The extract showed significant analgesic effect in all the models.

7.2. Antibacterial activity
The methanolic extract and conessine isolated from the stem bark of Holarrhena floribunda were tested for their antibacterial activities on Bacillus cereus, Bacillus subtilis, Bacillus megaterium and Bacillus stearothermophilus using the disc diffusion method. Conessine exhibited a significant antibacterial effect against all the strains studied comparable to that of chloramphenicol used as reference reported. The ethanolic extract of leaves of H. floribunda was active on Staphylococcus aureus and clinical strains of Staphylococcus aureus, Salmonella typhi and Klebsiella pneumoniae [18, 19].

7.3. Anti-cancer activity
The antiproliferative and apoptosis induction potential of methanolic leaf extracts of Holarrhena floribunda against breast (MCF-7), colorectal (HT-29), and cervical (HeLa) cancer cells relative to normal KMST-6 fibroblasts was investigated. The MTT assay with combination of the trypan blue dye exclusion and clonogenic assays were used to test for the effects of the extracts on the cells. The result of the MTT assay reveal that all the cells were sensitive to the cytotoxic effects of the plant extract in a dose- and time-dependent manner but the HeLa cancer cells, show more sensitivity to the plant extract [13].

7.4. Hypoglycemic activity
N’guessan et al., 2015 [12] reported the hypoglycemic activity of Ethyl Acetate Fraction Extract of Holarrhena floribunda leaves in Streptozotocin-Induced diabetic rats. The result showed significant hypoglycemic effect comparable to glibenclamide used as standard. Gnangoran et al., 2012 evaluated the hypoglycemic activity of ethanolic leaf extract and fractions of Holarrhena floribunda in normal fasted and fed-hyperglycemic rats. The dichloro-methane and ethyl acetate fractions of the plant showed significant hypoglycemic activity similar to Glibenclamide the standard drug [14].

7.5. Antioxidant activity
Badmus et al., 2010 [19] investigated the antioxidant potential of defatted methanol leave extract of Holarrhena floribunda using the 1,1 diphenyl-2-picrylhydrazyl (DPPH) radical, hydroxyl radical, nitric oxide radical scavenging and inhibition of lipid peroxidation methods. Total antioxidant activity was measured using phosphomolybdenum method. Total phenol content and the reductive potential of the extract activity was measured using phosphomolybdenum method.

7.6. Antimalarial activity
The in vivo antimalarial activity of Holarrhena floribunda leaf extract was reported. The experiment was performed in...
mice using the 4-day suppressive test. The mice were inoculated by intra-peritoneal injection with red blood cells of donor mouse parasitized with *Plasmodium berghei*. The extract significantly suppressed (P < 0.05) the parasitaemia at all dose levels compared to the negative control group. *P. berghei* infected mice treated with extract showed a shorter survival time as compared to chloroquine treated infected mice [19].

### 7.7. Trypanocidal activity

NNadi *et al.*, 2017 [20] studied the activities of leaf and bark extracts of *Holarrhena floribunda* and their alkaloid fractions on *Trypanosoma brucei*. The extracts and their fractions showed significant in vitro activity against bloodstream forms of *T. brucei* rhodesiense.

### 7.8. Toxicity

Bogne *et al.*, 2012 [21] investigated the Acute and sub-acute toxicity of the methanol extracts from *Holarrhena floribunda* G. Don. The result of the study showed that moderate intake of the plant extract up to 1g/kg has no toxic effect while high intake up to 2g/kg was toxic. According to Koudou *et al.*, 2017 administration of *Holarrhena floribunda* in wistar rats did not result in functional disturbances or cardiac damage in rats [22]

### 8. Conclusion

The review of literature revealed the presence of many active phytochemical constituents which may be responsible for the various medicinal uses and pharmacological activities of *Holarrhena floribunda*. Further studies need to be carried out on Holarrhena floribunda in order to confirm its medicinal uses and also investigate other potential pharmacological activities. This plant can serve as source of bioactive molecules for future drug development.

### 9. References

17. Bogne Kamga Patrice, Penlap Beng Véronique, Lontsi...


