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Review Article

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Review of a medicinal psychoactive plant: *Rauvolfia vomitoria Afzel*

Abstract

The prevalence of patients with neurological disorders has increased significantly worldwide due to modern lifestyles and increased consumption of psychoactive substances (alcohol, drugs, etc.). We must therefore find solutions to slow down its development. The aim of this work is to review the literature on *Rauwolfia vomitoria* Afzel, a plant used in Togo for the treatment of central nervous system disorders. The methodological approach included keyword searches in professional online journals, most publications were related to Rauwolfia. From the surveys carried out, it appears that this plant is used in several countries. Likewise, it treats not only central nervous system disorders but also several other diseases like cancer, diabetes, heart diseases. The ethnopharmacological approach to the ethnomedicinal evidence of *Rauvolvia vomitoria* would be of considerable benefit to the communities that use it in their health system.

Keywords: Neurological disorders, Rauvolfia vomitoria, psychoactive substances, ethnomedicinal evidence, ethnopharmacology

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Introduction

In West Africa, as in the rest of the continent, more than 80% of the population uses traditional medicine and medicinal plants for their primary health care.[1] Nowadays, the medicinal plants constitute a precious heritage for humanity and particularly for the majority of poor communities in developing countries, who depend on them to ensure their primary health care and their livelihoods.[2,3] The first drugs used to treat pathologies of the Central Nervous System (CNS) were based on natural resources, in particular on plants.[4] However, studies targeting plants exhibiting this type of bioactivity represent only a very small percentage of these investigations. Thus, aware of the expansion of these disorders, African medicinal plants having bioactive properties on the CNS are increasingly attractive targets for the development of new drugs. ; in accordance with the WHO resolution (AFR/RC50/R3 of August 31, 2000) which encourages African countries to promote the achievements of their medicinal heritage and to promote their optimal uses in health care delivery systems.[4] For the strengthening of sustainable health systems with plant resources, it is necessary to investigate the ethnomedicinal heritage and to identify existing data on said medicinal plant resources. The present study aims to carry out an investigation into medicinal plants used in the treatment of CNS disorders in Togo to strengthen their scientific database but also and above all to control the advantages and risks linked to their use.

Objectives of the journal

The primary objective of this review is to collect systematic information on *Rauvolfia vomitoria*, including its chemical composition, pharmacological properties, and toxicological data.

Methodology

The documentary research was conducted in nine steps (preparation of a documentary search, selection of research sources, research and location of resources via items and search equation with concept or expert words, specification of the period, Addition of original articles from experts or international reports (West African Pharmacopoeia), Evaluation of the relevance and quality of resources by cross-referencing data (recruitment of data on *Rauvolfia vomitoria*), Import of resources via management software for existing and available bibliographies (Zotero), Implementation of dynamic documentary monitoring with reading sheet (91 documents referenced on Rauvolfia

vomitoria), Use of major and essential resources (41 bibliographical references on *Rauvolfia vomitoria)* following the GBEH (Large Base for a Holistic Study) method developed by Gbekley in 2021 (Figure 1). This systematic search of published articles was carried out in the Scopus and Google scholar database using the key concepts (Neurological disorders, *Rauvolfia vomitoria*, psychoactive substances, ethnomedicinal evidence, Ethnopharmacology). This research, carried out over the period from 2000 to 2023, was carried out with a search equation (and/keywords) with exceptions made to the references to expert documents (West African Monographs) (Figure 2). A total of 41 selected articles relate to theoretical studies, field studies, conferences, study reports and international meetings around *Rauvolfia vomitoria*.

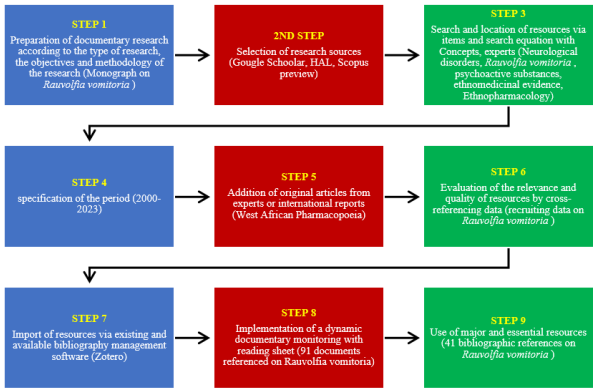


Figure 1 Diagram of the documentary research methodology adopted following the GBEH method (Gbekley, 2021).

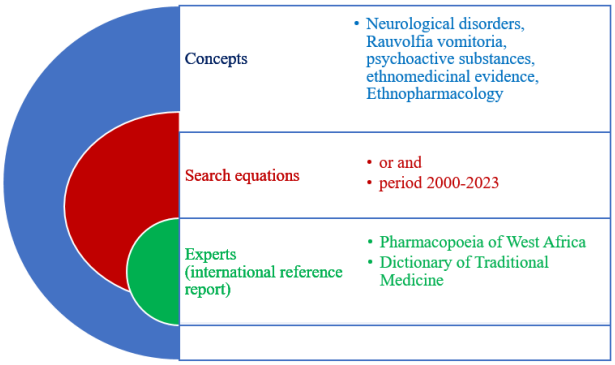


Figure 2 Development of the research equation following the GBEH method (Gbekley, 2021).

Literature review on Rauvolfia vomitoria

Botanical name

Rauvolfia vomitoria is identified at number 02111TG in the herbarium of the Faculty of Sciences of the University of Lomé (Togo).

APG III classification according to Tropicos	
Reign	Plantae
Class	Magnoliopsida
Superorder	Asteranae
Order	Gentianales
Family	*Apocynaceae*
Gender	*Rauvolfia*
Species	*Rauvolfia vomitoria Afzel.*

Binomial name: Rauvolfia vomitoria, Afzel., 1753

Family

Rauwolfia vomitoria is a species of plant belonging to the Apocynaceae family.

Synonyms

Rauvolfia senegambiae A DC; *Hylacium owariense* P. Beauv.

Common names

Swizzle stick, African Rauwolfia (English)

Photo 1 Whole *Rauvolfia plant vomitoria* Afzel. (Source: Photo by Rainer Wendt)

Photo 2 *Rauvolfia* leaves *vomitoria* Afzel. (Source: Scamperdale Photo)

Names vernacular

Burkina Faso: Dioula – Kolidjohkhi, Fulfuldé – Moyatjalal; Ligéré

Ghana: Akan– Kakapenpen; Ewe – Dodemakpowoe; Hausa–Wada

Mali: Bambara – Kolijoi

Nigeria: Yoruba – Asofeiyeje

Togo: Ewe – Ou Adja, Dodemakpowoe; Akposso – Ilonotchi, Oklubètè;

Senegal: Diola – Gi Upa.

Description of the plant

It is a shrub or small tree 15 m high, with dichotomous branching; the leaves are whorled in groups of 4 or 5, variable, oval in shape, elliptical or oblong, with an acuminate apex, a wedge-shaped,

glabrous base and lateral veins of 10-16 pairs; the inflorescence is terminal with flowering corymbs, small white flowers, a 3-4 level node and numerous green fruits which turn red when ripe.[5]

Herbarium specimen number

Togo: 02112TG

Habitat and geographic distribution

The plant grows naturally in gallery forests, but especially in forest regrowth's where fallow periods are prolonged. *R. vomitoria* is native to Cameroon, Democratic Republic of Congo, Ghana, Liberia, Nigeria, Senegal, Sudan and Uganda, but is now cultivated in many tropical and subtropical countries.[6]

Used parts of the plant

Leaves, root, root bark and stem.

Ethnomedical uses

In traditional African medicine, a decoction of the leaves or roots is administered orally to treat mental illness.[7,8] The macerated leaf is used for the treatment of hypertension and fever, and the decoction is used for gonorrhea, rheumatism, growth retardation, liver disorders and skin diseases.[9] The root decoction is used to treat hemorrhoids.[10]

Biological and pharmacological activities

All the alkaloids of *R. vomitoria* have a sympatholytic action and are therefore used in the treatment of hypertension.[11] Reserpine and rescinnamine are considered the plant's main hypotensive agents, central nervous system depressants, sedatives that have vasodilatory and antihepatotoxic actions. Although reserpine has a sedative and tranquilizing effect, it is not hypnotic. La Barre (1973) suggested that reserpine may have an antimetabolite of serotonin and catecholamines, as it causes depletion of serotonin at nerve terminals. It is used as a hypotensive agent such as rescinnamine and reserpiline in the treatment of high blood pressure and as a tranquilizer in the management of anxiety and psychoses.[11,12] Administration of the aqueous extract of the root bark to dogs caused tachypnea at medium doses and bradypnea at high doses.[12] Ajmaline has coronary and peripheral vasodilatory actions, it is therefore used in the treatment of angina and Raynaud's disease.[13] A preparation of reserpine without the root bark alkaloid has a potent hypotensive effect in cats and rats.[11] The ethanolic extract of the root bark showed significant antiplasmodial activity with an IC50 of 2.5 ± 1.0 µg/ml on *Plasmodium falciparum* stem cells. *in vitro* resistant to chloroquine. The hydromethanolic extract of the leaves of *R. vomitoria* , at a dose of 500 mg/kg in diabetic rats, showed a strong antidiabetic property with a regeneration of the pancreatic islets, an increase in insulin secretion and the rate of plasma insulin.[14] Aqueous and ethanolic extracts of the roots are effective against several sensitive and resistant strains of bacteria which have an inhibition percentage of 16 to 100.[15,16] Aqueous extract of *Rauvolfia leaves Vomitoria* has sexual stimulating activity or a potential aphrodisiac which is higher at a dose of 1000 mg/kg.[17] Aqueous extracts of the leaves showed anticonvulsant activity at a dose of 200 mg/kg in rats.[18]

Anti-inflammatory and antioxidant action

Rauvomin C and peraksin, alkaloids, show anti-inflammatory properties.[19] The antioxidant properties of the plant could be useful in the management of diseases resulting from oxidative stress.[20]

Action on the immune system

Rauwolfia vomitoria root extract on the hematology of rats, were studied.

A decrease in the number of white blood cells, indicating an improvement in the animals' immunity, was observed.[21]

Antiparasitic action

The plant has been used as an antiparasitic.

Schistosomiasis is a tropical disease that can be controlled by the use of dewormer. Only one drug, praziquantel, is currently used for this purpose.

In one study, the anthelmintic activity of the bark and roots of *Rauwolfia vomitoria* was investigated. Both parts of the plant have been shown to be active against larvae and adult worms. This report provides evidence of its schistosomicidal potency in vitro; the bark being moderately, but relatively more active and selective against parasites.[22]

Onchocerciasis transmitted by *Onchocerca volvulus* (a filarial, parasitic worm of humans) is the second leading cause of blindness worldwide and has a negative impact on the socio-economic development of affected communities. Ivermectin, a microfilaricidal drug, is the only drug recommended to treat this disease.[23] The ability of *Rauwolfia vomitoria* to combat the parasite was studied. It immobilizes microfilariae at different levels in vitro and, therefore, it has antifilarial properties.[24]

Alzheimer's

All alkaloids isolated from *Rauwolfia vomitoria* were evaluated for their acetylcholinesterase inhibitory activities.

This first report indicates that this type of alkaloids could be important sources for the discovery of new acetylcholinesterase inhibitors. It could be useful for treating Alzheimer's disease.[25]

Mental disorders

It is used by traditional medicine in certain countries to treat psychotic disorders and depression, particularly in Nigeria. The use of reserpine, an alkaloid of *Rauwolfia vomitoria*, as an antipsychotic had been abandoned by Western medicine.[26] It has made a comeback as an adjunctive treatment, in addition to other antipsychotics. It appeared that the plant negatively affects the brain functionally and structurally, but its association with another plant was able to avoid these modifications.[26] The virtues of a reference antipsychotic, chlorpromazine, the plant and reserpine were studied in mice. Only *Rauwolfia vomitoria* did not impair motor coordination. It also reduced anxiety in a dose-dependent manner. The root bark extract of the plant produced better behavioral effects, with less distortion of motor coordination, compared to chlorpromazine.[27] In another study, chlorpromazine caused a decrease in social behavior in mice and created increased sensitivity to pain. While mice treated with *Rauwolfia vomitoria* showed decreased sensitivity to pain and their social behavior was not affected. The herb has high potential as an antipsychotic and may have an advantage over chlorpromazine; there is no need to isolate the active components of this plant.[27–29] Also, synthetic antipsychotics, as well as reserpine alone, induce reproductive toxicity, while the plant does not appear to induce reproductive toxicity.[30] It modifies certain hematological indices and contributes to the improvement of energetic GABA neurotransmission. Which partly explains its action on behavior.[26]

Sexual performance

This plant is traditionally used to improve the sexual and reproductive activity of men. A study was carried out to elucidate the potential activity of ethanolic extract of *Rauwolfia vomitoria* on

sexual behavior and male reproductive function. It appeared that the ethanolic extract has an ability to improve the sexual behavior and reproductive activity of males in rats.[31]

Anti-cancer actions

It is also used for its anti-cancer properties; Yu et al.[32] having studied the abilities of the plant to inhibit tumor development *in-vitro* and on animals were able to confirm the anti-cancer properties of *Rauvolfia vomitoria*.[32]

Action on prostate cancer

Several studies have been carried out to understand the benefits of its use on prostate cancer cells, *in vitro* and in animals. Rats with benign prostatic hyperplasia were treated with an extract of the plant. The extract also significantly reduced testosterone-induced proliferation markers. Thus, it suppresses the development of testosterone-induced benign prostatic hyperplasia.[33] Due to its milder side effects, it could be a promising therapeutic agent for benign prostatic hyperplasia. The bioactive beta- carboline alkaloid alstonine present in the plant has been shown to have anticancer activity against cancer cell lines.[33] In mice, tumor volumes were decreased by 60%, 70% and 58% in the groups receiving 75, 37.5 or 7.5 mg/kg of an extract, respectively. It significantly suppressed the growth and cell cycle progression of prostate cancer cells both *in vitro* and *in vivo*.[34]

Action on pancreatic cancer

In one study, an extract from the root of the plant was investigated for its activity against pancreatic cancer stem cells. In vitro tumor spheroid formation and cancer stem cell markers were tested, and in vivo tumorigenicity was assessed in mice. *Rauwolfia vomitoria* inhibited the overall proliferation of human pancreatic cancer cell lines with an inhibitory concentration of 50%, and showed limited cytotoxicity toward normal epithelial cells.[35] The pancreatic cancer stem cell population was significantly reduced. In vivo, 20 mg per kg of an extract of the plant, administered five times a week orally, significantly reduced the tumorigenicity of certain cells in immunocompromised mice.[35] In another study, it induced apoptosis of pancreatic cancer cells and completely inhibited the formation of cancer cell colonies.[26] The combination of *Rauwolfia vomitoria* with gemcitabine had a synergistic effect on cell growth inhibition. In mice, tumor growth was significantly suppressed and metastasis was inhibited.[36]

Action on ovarian cancer

Tumor resistance to platinum-based drugs has been a barrier to ovarian cancer treatment. The anticancer effect of an extract of *Rauwolfia vomitoria* has been studied both alone and in combination with carboplatin. It decreased cell growth in all 3 ovarian cancer cell lines tested in vitro in a dose-dependent manner and completely inhibited colony formation. Apoptosis was induced. Synergy with carboplatin was detected. Tumor growth in mice was significantly suppressed by 36% or 66% with treatment alone at a low (20 mg per kg) or high (50 mg per kg) dose, respectively. The volume of ascitic fluid and the number of non-blood cells in the ascites were decreased. Its combination, with carboplatin, remarkably improved its effect and reduced tumor burden by 87% to 90%, and ascites volume by 89% to 97%.[37]

Antidiabetic action

The antidiabetic virtues and benefits of *Rauwolfia vomitoria* have been studied. In mice, normalization of blood sugar levels, reduction of lipids accumulated in the eyes and prevention of pancreatic degeneration were noted. The decoction is made by boiling the foliage of the plant, combined with the fruits of *Citrus aurantium*. It is used to treat diabetes in Nigerian folk medicine. The decoction was tested on 23 Danish patients with type 2 diabetes. At the end of the 4-month treatment period, the treated group showed an 11% decrease in 2-h postprandial blood glucose, compared to the 3% increase in the placebo group. Other markers of type 2 diabetes, such as fasting blood glucose, have been improved.[38] Saturated and monounsaturated FAs were reduced with treatment, and a modest increase in the fraction of polyunsaturated FAs was observed.[38]

Action on cardiac pathologies

Reserpine helps reduce blood pressure through different modes of action. It is used in certain allopathic medicines for these purposes. The daily dose of reserpine in antihypertensive treatment is minimal, from 0.05 to 0.25 mg and does not present major side effects at these doses.[26] A study found that other properties of the plant could be useful in the management of diseases, resulting from vascular dysfunction through other modes of action.[20] In one study, results demonstrated that a dose of vitamin A did not reduce the activities of cardiac marker enzymes. However, concomitant administration of *Rauwolfia vomitoria* root bark extract, with vitamin A, shows a significant reduction in the activities of heart disease markers.[39]

Clinical data

no available information

Chemical constituents

Alkaloids (reserpine, rescinnamine, serpentine, reserpoxidine, seredine, ajmaline, alstonine, iso- ajmaline, isoreserpiline, raumatorine, rauvomitine, reserpiline, serpagine, vomalidine, yohimbine, tetraphylline) and flavonoids[6] Figure 3–5.

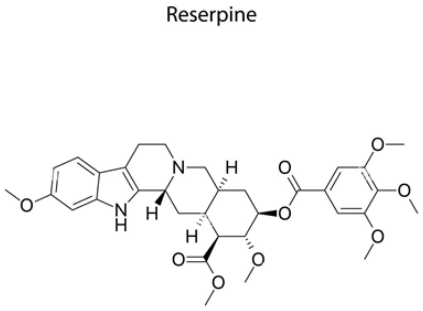


Figure 3 Reserpine.

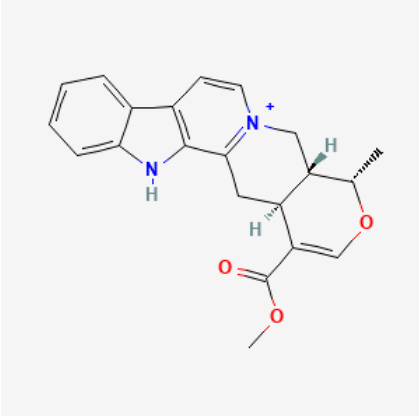


Figure 4 Serpentine.

Citation: Doumongue T, Gbekley EH, Lamboni M, et al. Review of a medicinal psychoactive plant: *Rauvolfia vomitoria Afzel*. *Open Access J Sci.* 2025;8(1):83–89. DOI: 10.15406/oajs.2025.08.00248

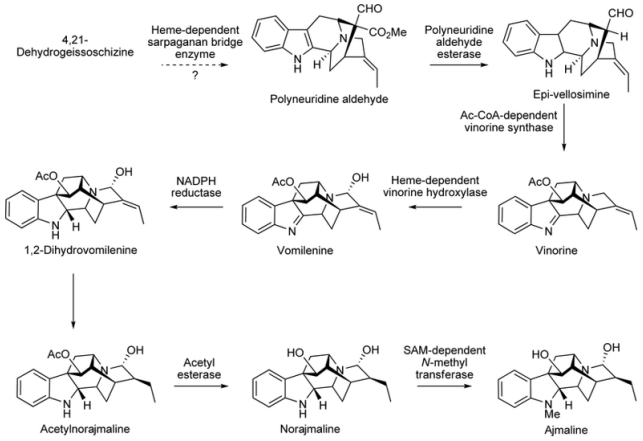
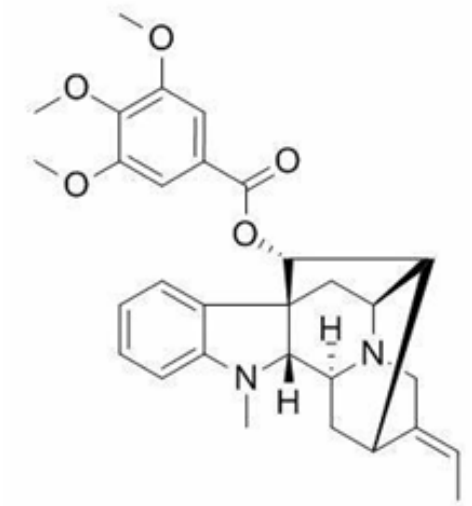


Figure 5 Biosynthesis-of-ajmaline.png.



Identity and purity testing

Moisture content: not more than 12.0%.[6]

Total ash: 11.89%.[6]

Value of substances extractable by water: not less than 21.9%.[6]

Value of substances extractable by ethanol (70%): not less than 19.7%.[6]

Chromatographic fingerprints

TLC chromatography is carried out using the chloroform extract, with stationary phase: silica gel (0.25 mm) G60 F254, and mobile phase: petroleum ether (40-60°C)/chloroform [2:8 v/ v], the revelation is carried out by spraying the mixture of anisaldehyde (0.5 ml) and glacial acetic acid (10 ml), 85 ml of methanol and 5 ml of concentrated sulfuric acid, then heated to 100-110°C for 5-10 mins. Presence of three distinct spots with R_f of 0.69 (pink), 0.50 (pink) and 0.22 (blue).

Macroscopy

Roots subcylindrical, slightly conical and sometimes branched, up to 30 cm long, 15 cm in circumference and rarely up to 9 cm in diameter. The grayish-brown outer surface is deeply fissured longitudinally or smooth obtained by friction with a few oblique sections of the rootlet; the suber, if present, breaks into a splinter in fine, porous, buff or yellow wood.[6]

Microscopy

Stratified layer consisting of leveled suberized cells each having 3 to 4 sites in a radial direction alternating with areas of woody cells with 1 to 120 sites of 55 µ. Approximately 5 to 16 layers of parenchyma consisting of, sclerites approximately 12 to 18 µ wide or long isolated or in small groups sometimes containing small prisms of calcium oxalate crystals.; phloem with scattered secretory cells with granular contents and isolated groups of sclerites. More bands are discontinuous sclerites in the phloem alternating with outer, pierced, collapsed tissues, while the inner zone is crossed by clearly defined elements, with numerous xylem vessels of about 36 to 180 µ in diameter, alone or in pairs, subcylindrical with small bordered punctuations, vessel elements approximately 75 to 1200 µ long, numerous fibers approximately 200 to 1500 µ long by 32 µ wide, with a slit in the shape of oblique hollows with broad medullary rays, three heterogeneous cells, groups of isolated sclerites; the starch grains present in all parenchyma tissues are round and measure 1-10 to 20µ in diameter.[6] There are also a few grains grouped by 2 or 4; a cross section shows a thin cork bark with stratified, compressed, suberized cells, alternating with larger lignified cells; a thin layer of cork cambium presents a secondary cortex consisting of parenchyma cells (20-40 µm x 20-28 µm) with numerous starch grains; a parenchyma is interrupted by lignified sclerites, alone or in groups, with an isodiametric diameter of 20-25 µm with a narrow lumen; the phloem has sieve elements as well as a parenchyma of prismatic crystals; a phloem is interspersed with medullary ray cells, cells 1-3 wide, which contain starch grains; lignified xylem, consisting of vessels (approximately 20-80 µm in diameter), tracheids and parenchyma.

Powdered plant material

Presence of parenchymal cells; lignified sclerites, numerous xylem vessels, pitted, numerous xylem fibers, lignified medullary ray cells, starch grains inside parenchymal cells, cork cells, small prisms of calcium oxalate crystals, secretory cells dispersed.[6]

Therapeutic actions

Antiplasmodial, antidiabetic; antibacterial; hypotensive, sedative.[15,16]

Therapeutic indications

Psychiatric disorders (psychoses), hypertension, bradycardia, insomnia, arrhythmia; angina, schizophrenia, parasitic dermatoses (e.g. head lice), constipation, lumbago, infectious diseases; yaws, malaria, snake bites, diabetes, wounds.[11,5,40,3]

Safety data

The LD50 of the aqueous extract of the root and leaves was found to be > 5000 mg/kg in rats.[41] In acute studies (300-3000 mg/kg), defecation, urination and salivation, which are clear signs of cholinergic stimulation, were observed within 24 hours.[6] In a 14-day study, a significant increase in body weight and a consequent decrease in organ/body weight of the liver, kidneys and heart only occurred at a high dose of 3000 mg/kg. Serum creatinine level increased to 3000 mg/kg. No harmful effects were observed on the blood and its cellular elements or the liver.[6]

Precautions for use

The recommended dose should not be exceeded, as this may cause cholinergic symptoms and kidney damage.

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Side effects

Hypotension, hypoglycemia, bradycardia, diarrhea, nasal congestion, intestinal disorders.[12,6]

Contraindications

Hypotension, heart failure, diarrhea.[12,6]

Dosage and dosage form

Decoction: 30 g of chopped, cut and dried roots and rhizome in 900 ml of water; simmer until reduced to 600 ml; take 1-3 cups daily.[5]

Tincture: 1-5 in 50% alcohol, 5 ml three times a day.[6]

Conservation

Store in a cool, dry place, away from light.[3]

Conclusion

Rauvolfia vomitoria is a plant with many virtues widely used in traditional African medicine. It is used as an antiplasmodial, antidiabetic; antibacterial; hypotensive and sedative. Thus, to obtain maximum efficient and effective use with minimum risks, it is advisable to consume packaged and standardized preparations, at the recommended daily doses. In case of preparations made at home it is also necessary to follow the instructions.

Acknowledgments

None.

Conflicts of interest

The authors declare that there is no conflict of interest.

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