Review Article

Securidaca longipedunculata as a remedy against many physiopathology: An updated systematic review and meta-analysis from traditional use to scientific research

ABSTRACT

Introduction: *Securidaca longipedunculata* is a plant that has been used for medicinal purposes throughout the world for thousands of years.

Aims: Update and discuss the chemistry, traditional and biological activities of *Securidaca longipeduncula* based on surveys and literature.

Study Design: This is a review based on data collection method.

Methodology: Investigations and Electronic database engines such as PubMed, Scopus, Google Scholar, ScienceDirect, Biomed Name Meaning Finder were used to carried out the work.

Results: *Securidaca longipedunculata* has antibacterial, anticonvulsant, antidepressant, anti-diarrheal, anti-inflammatory, analgesic, anticancer, antiparasitic, antioxidant, antivenomous, antiviral, cardiovascular and neuromuscular properties, hypoglycemic, pesticidal and immunostimulant. All parts of the plant are used in traditional medicine and have been used as drugs in several pharmacological and toxicological trials in vivo and/or in vitro. The interpretation of local names testifies to the usefulness and potency of *Securidaca longipedunculata*, that is confirmed by scientific research.

Conclusion: *Securidaca longipedunculata* has potential pharmacological effects. This raises doubts about its use as a candidate plant for the manufacture of drugs against many diseases.

Keywords: *Securidaca longipedunculata*, traditional use, phytochemical, pharmacological activities, toxicological studies

1. INTRODUCTION

All the sources of history like the Sumerian tablet of Nippur which mentions a dozen recipes and over 250 different plants, the first medical treaty “Shennong bencao jing" and the Ebers papyrus have revealed that the plant kingdom has always contributed to curing all kinds of pathologies for thousands of years [1–3]. These sources have showed the use of plants for spiritual purposes for protection, traditional to treat illnesses and are an integral part of the culture [4–6]. In addition, thousands of plant drugs have been the subject of scientific studies to reveal their phytochemical compounds in order to truly prove their efficacy in the treatment of disease. *Securidaca longipedunculata* which is a plant of the polygonaceae family is no excluded from these valuable uses of plants for safeguarding and preserving the quality of life of humanity [7,8].

In Africa *Securidaca longipedunculata* is known by a variety of names in local languages that reflect the medicinal importance of the plant in their daily lives. In Togo as in other African country plants names alert scientific researchers to orient their studies on these plants.

The present study deals with *Securidaca longipedunculata* in its entirety. It aims to summarize the traditional use and biological activities of *Securidaca longipedunculata* based on surveys and literature.

2. MATERIALS AND METHODS

The research was carried out through documentation in various sources including surveys among the elders of Ewe people of Togo, manuscripts published in electronic database engines such as Google Scholar (https://scholar.google.com), ScienceDirect (https://www.sciencedirect.com), PubMed (https://pubmed.ncbi.nlm.nih.gov), Scopus (www.scopus.com), Biomed Central (https://www.biomedcentral.com), Name Meaning Finder (www.nameslook.com).

3. RESULTS AND DISCUSSION

3.1.Monograph of *Securidaca longipedunculata*

3.1.1. Etymology, synonyms and common names in English and French of *S. longipedunculata*

- The generic name *Securidaca longipedunculata* would come from Latin: *Securis* which means axe and refers to the nut form with its curved membranous wing; *longipedunculata* referring to its long peduncle [9].

- Synonymous names for S. longipedunculata are: *Securidaca spinosa* Sim and *Lophostylis pollida* Klotzsch
- "Violet tree" is its common name in English and "Arbuste à Serpent" or "Arbre aux hachettes" in French, meaning respectively "snake shru" or "hatchet tree".

3.1.2. Vernacular names of *S. longipedunculata* in African languages

Table 1 summarizes the names of *Securidaca longipedunculata* in various African languages, and their meanings.

Table 1: Names of *S. longipedunculata* in African languages and their meanings in English

Countries	**Local languages**	**Names of *Securidaca longipedunculata***	**Meaning**
Burkina Faso	Mooré	Pélga	Honesty, sincere, light precision
	Bissa	Hensasi,	Brave for travel
	Dioula	Djoro; Djoto	Light or powerful or strong, freedom
	Fulfuldé	Alali	Supreme, excellent
	Lyélé	Syanabwe	Strength, center of the web
	Nuni	Sye	strength
Ivory coast	Lobi	Samuele	God has hearkened
	Gagou	Dioro	Gift of God
	Malinké	Diulo, Ndjuru	Warrior
Gambia	Malinké	Juto, Djuto	Life
	Wolof	Fuf	Snake hiss
	Fula	Alali	Supreme, excellent
Ghana	Akan	Ofodo, Kyrito	warrior, abundance; strong, powerful, wealthy
Guinea Conakry	Malinké	Diodo,	Gift of God
	Fula	Diantu	Divine

Mali	Bambara	Djoro, Dioro*	Strong, powerful, gift of God*
	Peulh	Iguili,	Life
Niger	Hausa	Warna gunguna	Warn me
	Fula	Adali	Noble, justice
Nigeria	Hausa	Sanya	Beneficent, First light of sun, justice
	Fula	Adali	Justice, noble
	Yoruba	Ipeta	Ring, satisfied
Senegal	Diola	Fu Daray	Brave, warrior, strong, powerful, light
	Serer	Kuf Kuf	Snake hiss
	Wolof	Fuf	Snake hiss
Sierra Leone	Malinké	Juto, Jodoo	Live
Tanzania	Iringa	M'yangabako	I'm helping you
Togo	Ouatchi	Etritu	It's stronger than the gun
	Mina	Metritu	I' am stronger than the gun
	Ewé	Kpeta*, Etritu, Metritu	Pioneer*, leader*, on the rock*, Stronger than the gun
	Kabyè	Bonbona bwobwona	Wisdom, precision
	Kotokoli	fose	Strength, power

3.2.Habitat and geographical distribution of *S. longipedunculata*

Securidaca longipedunculata is a tropical and subtropical plant. It is frequently found in shrub and woodland Sudanian savannas, from the Sahel to the Guinean forest. *Securidaca longipedunculata* doesn't live in colonies, but in isolated individuals [10].

It can be found on laterites and rocks in humid areas, hence its name "Kpeta", which means "on stones" in the Ewe region of Togo; or on the banks of rivers in much drier areas.

3.3.Use of *Securidaca longipedunculata* in traditional African medicine

Securidaca longipedunculata is a plant widely used for medicinal purposes in tropical Africa.

In Togo, powdered root bark is inhaled to cure headaches and migraines, and has a strong sternutatory effect. Maceration of the plant root is used to treat sickle cell anemia, amoebiasis, aches, malaria, pains, and intestinal worms [11]. According to surveys from Togo's Ewe tribal elders, the roots of *S. longipedunculata* have spiritual power. They are used during wars and ceremonies. Hence its name in Ewe language “metritou” or “etritou”, which means respectively “I am stronger than the gun” or “he is stronger than the gun”. Fumigation, or bathing with leaves, stem bark or roots, is used to treat poisoning, madness and to banish evil spirits.

In Senegal, but also in some other countries in the West African such as Togo, Burkina Faso and Mali; the roots which is specially characterized by the smell of methyl salicylate are used to repel snakes and to keep them away from homes, protecting animals and people with foot bracelets made from the plant's twigs and roots, that is why the plant is known in French as “arbuste à serpent” and in Wolof as “Fuf”, an onomatopoeia which refers to snake hissing [12].

In veterinary medicine, Peulhs give small quantities of root macerate to animals in the process of dying. The marc is used for grooming as an invigorating, an external parasiticide and antiseptic for small wounds. *S. longipendunculata* root powder is mixed with soybean paste to treat swelling in Nigeria. Aqueous solutions of the plant's roots and leaves have an oxytocic effect due to the presence of rye ergot alkaloids, causing uterine contractions and hence abortion [12–15].

In the Kinshasa region, *S. longipedunculata* fruit juices are used to treat otitis by instillation [16].

In Tanzania, Benin and Burkina Faso, *S. longipedunculata* is used to treat certain forms of non-insulin-dependent diabetes, gonorrhea, syphilis, malaria and some opportunistic infections in HIV-positive patients [17–20].

It is used in Chad to cure gout [21].

In South Africa, it is the most popular traditional medicinal plant. The plant is said to be the most famous intra-vaginal poison, where female suicides are said to be frequent by introducing various root preparations into the vagina [10,19,22]. Among the Minianka people of Mali, Côte d'Ivoire and Burkina-Faso, powdered root bark of *S. longipedunculata* mixed with shea butter is used locally to treat rheumatism, sprains and swellings. The leaves and roots are also used fresh as a decoction against skin diseases. The Lobis people drink root powder in lemon juice to strangle hernias [16,23].

3.4.Phytochemical compounds of *S. longipedunculata*

Securidaca longipedunculata is best known for its high content of triterpenoid saponosides in the roots (24). Chemists at the Imperial Institute of London have reported the presence of methyl salicylate and saponin in the roots. In 1966, Moers demonstrated that *S. longipedunculata* contained the same sapogenin and senegin, found in *Polygala senega* [16]. Sugars (glucose, rhamnose, galactose and arabinose) and aglycones from *Polygala senega* such as presenegine, senegenine, securunine, senegenic acid and dihydrochlorosenegenine have been isolated from *S. longipedunculata* [25]. Elymoclavin and dihydroelymoclavin are also present in the roots [26,27]. Photochemical studies on leaves have shown the presence of saponins, tannins, anthraquinones, sterols and terpenes and flavonoids [11,28].

3.5.Pharmacological studies on *securidaca longipedunculata*

3.5.1. Summary of biological properties of *S. longipedunculata* studied by pharmacological research

Table 2 shows the pharmacological activities carried out of with drugs derived from *S. longipedunculata*.

Table 2: Pharmacological effects of *Securidaca longipedunculata* extracts

Properties studied	**Plant parts**	**Types of extracts**	**Experimental model used**	**Doses**	**Controls**	**results**	**Authors**
Antibacterial and antifungal	Roots	essential oil	Micro plate broth Dilution for Candida albicans	Two fold dilutions	No control	MIC = 0.40 mg/ml	Alitonou et al., 2012 [29]
		Aqueous extract, methanolic extract	Broth microdilution method for *Klebsiella sp., Staphylococcus aureus, Shigella sp., Escherichia coli, Candida glabrata, Candida tropicalis, Candida krusei, Candida kfyer and Candida albicans*	62.5; 125; 250 and 500mg/ ml	Positive control: ciprofloxacin and fluconazole	Zone of inhibition ZI (mm) for 500mg/ml are respectively for methanolic extract: *E. coli* 20, *Shigella sp*. 16; *S. aureus* 16; *C. krusei* 14 and for aqueous extract: *E. coli* 15; *S. aureus* 14; *Shigella sp*. 14	Namadina et al., 2020 [30]
		n-hexane extract	Broth microdilution method for *Mycobacterium bovis* BCG and *Mycobacterium tuberculosis H37Ra*.	Serial dilutions	Positive controls: Rifampicin, isoniazid, kanamycin and puromycin	MIC *Mycobacterium bovis* = 31.2 µg/ml and MIC *Mycobacterium tuberculosis* = 62.5 µg/ml	Luo et al., 2011 [31]

		Acetone soluble portion of ethanol extract and other various fraction	Cup agar diffusion method and Micro plate broth dilution assay for *Bacillus subtilis*, *Escherichia coli, Salmonella typhi* and *Pseudomonas aeruginosa.* Two disc diffusion methods with minimum inhibitory concentration.	0.04 ml	Positive controls: Nyastatin and Chloramphenicol	The zone of inhibition is 30 mm for B. subtilis. The MIC = 0.010 mg/ml for both Pseudomonas aeruginosa and Escherichia coli	Ajali and Chukwurah, 2004 [32]

		Aqueous, ethanol and acetone crude extracts. Fractions of dichloromethane, hexane, ethyl acetate and *n*-butanol	Agar well diffusion method, Micro plate broth dilution for Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa.	Serial dilutions for MIC, MBC, and MFC	MIC: 0.3125 mg/ml	MIC: 0.3125 mg/ml (n-butanol fraction) for *E. coli;* 0.013 mg/ml (Acetone crude) for *S. aaureus;* 0.3125 mg/ml (acetone) for *P. aeruginosa*; MBC: 0.625 mg/ml (aqueous) for *S. aureus*/ (DCM fraction) for *E. coli*/ (acetone) for *P. aeruginosa.*	Ngonda et al., 2012 [33]
	Leaves and roots	Hydro-ethanolic and hydro-methanolic extracts	*In vitro* against *Escherichia coli*, *Shigella sp*., *Salmonella typhus* and *Staphylococcoccus sp*.	50, 100, 150, 200 mg/ml	Positive control: gentamicin	ZI for aqueous root extract is 14, 19 and 21 mm against S spp.., S. typhi and E. coli.	Junaid et al., 2008 [34]
		Chloroform, methanol and aqueous crude extracts	Disc diffusion method, Micro plate broth dilution assay	7.5 mg/disc in	Positive control: ampiclox	Respectively ZI, MIC and MBC of chloroform and methanol extracts of the leaves 15-19 mm. 0.591	Ndamitso et al., 2013 [35]

			for *Escherichia coli, Salmonella typhi* and *Pseudomonas aeruginosa.*	Disc diffusion method and two fold dilutions for MIC and MBC		mg/ml, 5.91 against S. typhi.	
	Root barks	Crude extracts, acetone extract and the pure compounds	Disc diffusion method against *S. aureus* ATCC 25923, *B. subtilis* ATCC 6633, *E. coli* ATCC 35218, *P. aeruginosa* ATCC 27853	200mg/ ml	Positive control: gentamycin	Crude extracts exhibited significant antibacterial effect. Acetone extract showed highest activity against B. subtilis and P. aeruginosa. The isolate compound 3 showed the best activity against *B. subtilis* with inhibition zone diameter 15 mm, which is comparable to that of gentamycin.	Tikisa et al., 2019 [36]

		Methanolic extract, petroleum ether fraction	*In vivo* in mice: inhibition of topical edema of ear induced by xylene.	5 mg/ear	Left ears were left untreated and served as controls	Petroleum ether fraction exhibited 65.63% inhibition	Okoli et al., 2006 [37]
	Leaves	Sorbitan isolated, n-hexane, ethyl acetate, and methanol extracts	Agar well diffusion and broth dilution methods	500 µg/cm3	Positive control: sparfloxacin and ciprofloxacin; fluconazole and fulcin	Mean zone of inhibition range of 18-29 mm. The Minimum inhibitory concentration (MIC) for the extracts ranges from 62.5 - 250µg/cm3. The Minimum Bactericidal/Fungicidal Concentrations (MBC/MFC) range from 250 - 500 µg/cm3. The ethyl acetate extracts showed higher antimicrobial activity among the three extracts tested against S. Aureus.	Hassan et al., 2024 [38,39]

		70 % methanol extract	Micro plate broth Dilution for *Rhizopus nigricans, Fusarium oxysporum* and *Mucor rouxi*	Two fold dilutions	No control	MIC = 1.2 mg/ml Against *Rhizopus nigricans, Fusarium oxysporum and Mucor rouxi*	Karou et al., 2012 [40]
	Steam barks, root barks	Aqueous and methanolic extracts	agar well diffusion method against *Escherichia coli*	25 mg/ml to 50 mg/ml	Positive control: ciprofloxacin	Max ZI = 22.00 ± 0.50 mm; MIC = 3.125 mg/ml and MBC = 1.563 mg/ml	Abdullahi, 2024 [41]
Anticonvulsant, anxiolytic and sedative effect	Root barks and leaves	Aqueous extract	In rats by forced swimming test using naloxone	200mg/kg and 400 mg/kg	No control	A significant ($p<0.05$) naloxone reversible antidepressant like effect.	Adebiyi, 2006 [42]
	Roots	Aqueous extract	in mice using the strychnine- and picrotoxin-induced seizure models for anticonvulsant activity.	100 mg/kg; 200mg/kg and	Positive controls: Phenobarbitone (anticonvuls	Dose dependent increase in onset of convulsion. A prolongation of the cumulative time spent in the open arms of the elevated plus maze and Y maze	Adeyemi et al., 2010 [8] Okomolo et al., 2011 [43]

			The anxiolytic activity was evaluated using the elevated plus maze (EPM) and the Y maze (YM) methods. The hexobarbitone induced sleep and the hole board models were used to evaluate the sedative and exploratory activities in mice respectively	400mg/kg	ant, sedative, hypnotic), Diazepam (anxiolytic) Chlorpromazine (antipsychotic)	compared with the control. A reduction in the time of onset of sleep induced by hexobarbitone. The reduction in exploratory activity.	
	Leaves	Dichloromethane (DCM) and ethanol (EtOH extract (xanthones and benzoates)	Inhibition of pentylenetetrazol (PTZ)-induced seizure-like paroxysms in Zebrafish Danio rerio larvae	12.5-200 µM	Fish water and 0.5% DMSO (dimethyl sulfoxide) were used as negative control	1,7-dihydroxy-4-methoxyxanthone and 2-hydroxy-1,7-dimethoxyxanthone displayed the most significant inhibition of paroxysms by altering the locomotor behavior in $GABA_A$ receptor antagonist, PTZ. The EtOH extract, benzyl benzoate, and benzyl-2-hydroxy-6-methoxy-benzoate increased locomotor	Moussavi et al., 2024 [44]

						activity in treated larval zebrafish and decreased locomotor activity in nontreated larval zebrafish.	
Anti-inflammatory	Steam barks and leaves	Methanolic extract	carrageenan induced paw edema in rats (calculation of % inhibition).	100, 200, 400 and 800 mg/kg	Positive control: aspirin	Exhibition of anti-inflammatory activity greater than 70% at all doses tested	Alafe et al., 2014 [45]
	Leaves	Hydro-ethanol extract	chicken egg albumin denaturation inhibition, membrane stabilization, and C-reactive protein (CRP) tests	200 and 400mg/kg	Negative control: cyclophosphamide. Positive control: levamisole	99.87±0.26 µg/ml albumin assay; 05.657± 0.133 and 471.750± 0.096 (respectively hypotonic and heat stabilization); 400mg/kg decreased significantly the concentration of CRP.	Dermane et al., 2024 [11]
	Root	Decoction 10%	In rats using fresh egg albumin-induced pedal oedema	50-800mg/kg	Positive control: diclofenac	Dose-dependent and significantly inhibited ($p<0.05$-$p<0.001$) fresh egg albumin-induced acute inflammation	Ojewole 2008 [46]
		Hydro-ethanolic extract	egg albumin and bovine serum albumin denaturation.	12.5 to 200 µg/ml	Positive control:	In chicken egg albumin denaturation IC_{50} = 30.77 ± 1.77 µg/mL	Kola et al., 2022 [47]

					aspirin and diclofenac		
Analgesic	Root-bark	Decoction 10%	In mice using hot-plate and acetic acid tests	50-800mg/kg	Positive control: morphine	Dose-dependent analgesic effect against thermally and chemically induced nociceptive pain	Ojewode, 2008 [46]
	Steam barks and leaves	Methanolic extract	acetic acid induced writhing in mice (calculation of % inhibition)	100; 400 and 800mg/kg	Positive control: aspirin	The analgesic activity of each extract was below 50%, though comparable with that of aspirin	Alafe et al., 2014 [45]

Anti-cancer or cytotoxicity	Root barks	Ethyl acetate extract	*In vitro* against human cervical cancer cell line KB-3-1. Evaluation of isolates for their cytotoxic activity with ten compounds. Examples: compounds five and six respectively: 1,7-dihydroxy-4-methoxyxanthone. 1,4-dihydroxy-7-methoxyxanthone)	25; 50 and 100 mM	Positive control: cryptophycine-52 and griseofulvin	The compounds 5 (IC50 = 0.38 µM) and 6 (IC50 = 52 µM) showed significant inhibitory activities against the human cervical cancer KB-3-1 cell line. Compound 5 displayed superior activity, which is even better than griseofulvin, IC50 = 17 µM)	Feyisa et al., 2022 [48]
	Root	Hydro-ethanolic extract	Cytotoxicity assay on human peripheral mononuclear blood cells (PBMC) using flow cytometry (PI Staining)	500 µg/ml and 1000 µg/ml of four extracts for 24 h at 37 ◦C	Not reported	Exhibition of severe cytotoxicity at high concentration compared to control (1000 µg/ml: 7-fold, $P < 0.0001$)	Kola et al., 2022 [47]

				under 5% CO2			
	Root bark	Ethanolic extract fractionated by silica gel column chromatography	Assessment on the viability of U87 malignant brain tumor cell line by using hemacytometer, annexin V-PE and 7-AAD flow cytometry and western blot detection of Poly-ADP-Ribose-Polymerase (PARP) cleavage	3; 10; 30 and 100 µg/ml	Control wells	Inhibition significantly ($p<0.01$) of proliferation of U87 cell line (IC_{50} 20.535 µg/ml). Extract and polar fraction induced apoptosis respectively 41.53 ± 10.33% and 47.3 ± 2.7%) by cleavage of PARP	Saidu et al., 2019 [49]
Antiparasitic	Steam barks	Crud methanol extract, Ethyl acetate extract, hydro-methanolic	Mixture of 50 µl of blood containing 8.1 × 106 trypanosomes and incubated at 37°C for 90 min (determination of time of immobilization of the parasite).	of 3 and 6 mg/ml for each extract	Positive control: Diminazen aceturate	Immobilization of the parasite: 75 min for crud methanol (3 and 6 mg/ml). Ethyl acetate and aqueous methanol showed slightly reduced parasite motility 90 minutes for 3 and 6mg/ml)	Tauheed et al., 2017 [50]

	Leaves and roots	Dichloromethane extract	*In vitro* against 3D7 *Plasmodium falciparum* (determination of median inhibitory concentration)	3.13 ,6.25, 12.5, 25, 50, 100 mg/ml	controls: DMSO (dimethyl sulfoxide) and chloroquine	Very active against 3D7 *Plasmodium falciparum* ([IC95%: 5-9], IC50=7µg/ml for dichloromethane extract)	Bah et al., 2007 [51]
Antiulcer and gastroprotective	Leaves	Methanolic extract, ethyl acetate extract, hexane extract	In rats using ethanol-induced gastric ulcer model	150 and 300mg/kg	Positive control: Cimetidine	The extracts increased the protein content in the gastric tissues. Lipid peroxidation levels were significantly ($p<0.05$) lowered in the pretreated groups	Kayode et al., 2015 [52]
Antioxidant	Leaves	Hydroethanolic extract	2,2-diphenyl-1-picrylhydrazyl, total antioxidant capacity, and inhibition of lipoperoxidation tests	200 and 400mg/kg for 14 days	Negative control: cyclophosphamide.	TAC= 97.83 ± 1.29 mg GAE/g; DPPH(IC_{50}) = 76.22 ± 0.02 µg/mL; A significant ($P<0.0001$) increase of MDA was (0.3923 ± 0.1110 nM/mg Pr/g of bone marrow) compared with the normal control group	Dermane et al., 2024 [11]

Antivirus	Roots	caffeoylquinic acids	*In vitro* against Human Immunodeficiency Virus (HIV)	0.4-50 µg/ml	Positive control: zidovudine (AZT)	3,4,5-tri-O-caffeoylquinic acid exhibited a greater selective inhibition of HIV replication. EC50 for HIV-1_{IIIb} are: 0.32; 06; 0.16; 200; 200; 200 µg/ml. The inhibition of HIV infection was more pronounced when compounds were present during virus adsorption than when added 1 or more hours after infection	Mahmod et al, 1993 [53]
Cardiovascular and neuromuscular	Root barks	Methanolic extract	*In vitro* experiments by the rat isolated portal vein, rat isolated aortic ring, guinea pig isolated ileum and guinea pig isolated uterus	50-800mg/kg	Not reported	Inhibition or abolition in a concentration-dependent manner the myogenic spontaneous contractions	Ojewole, 2001 [54]

		Ethanolic extract	*In vivo* evaluation of modulatory responses by intravenous, intraperitoneal and electrocardiograph	1 to 56mg/kg	Not reported	The intravenous and intraperitoneal produced a dose-dependent gradual decrease in mean arterial blood pressure. decreased heart rate from 300 ± 0.00 to 49.02 ± 0.39 at about 122 minutes. The amplitude was significantly ($P < 0.001$) raised from 10.42 ± 0.24 mV to 21.60 ± 0.67 around 122 minutes. The ST-segment was elevated and QRS complex was predominantly negative towards the death of animal	Salami et al., 2018 [55]
	Root	Xanthones isolates from roots	Bioassay guided isolation of the bioactive compounds using a smooth muscle relaxation bioassay and structural elucidation was carried out using different spectroscopic techniques including 2D NMR	$1.8x^{10-5}$ mg/ml	Positive control: Sildenafil (Viagra)	Potent activity to relax the corpus cavernosal smooth muscle by 97% in comparison to sildenafil	Meyer et al, 2008 [56]

		96 % ethanol extract	A buffer solution prepared from citric acid and its sodium salt for dissolving streptozotocin (pH= 4.5)	200 mg/kg	Positive control: Glibenclamide	Ethanol extract lowered blood glucose level better at 4 hr compared to control drug but not at 1hr	Keshebo et al., 2014 [57]
Hypoglycemic	Roots-bark	Decoction 10%	*In vivo* in rats using streptozotocin (STZ)-induced diabetes mellitus models.	50-800mg/kg	Positive control: chlorpropamide	Significant hypoglycemia ($p<0.05$-0.001) in normal and STZ-treated diabetic rats	Ojewole, 2008 [46]
	Roots	Powder	Insect toxicity bioassay, direct contact with the insects (*Callosobrunchus maluculutus, Sitophilus zeamais, Prostephanus Truncates* and *Rhyzopertha dominica*)	0.5, 1 and 5 % w/w	Not reported	5 % of the roots exhibited 75 % inhibition against *R. dominica*	Belmain et al., 2001 [58]

Pesticide	Roots	powder, its methanol extract, and the main volatile component, methyl salicylate	Direct contact with the insects (*Sitophilus zeamais Rhyzopertha dominica,* and *Prostephanus truncates*)	30 and 60microl	Not reported	Methyl salicylate vapor had a dose-dependant fumigant effect against *S. zeamais, Rhyzopertha dominica,* and *Prostephanus truncates,* with a LD100 achieved with a 60 microl dose in a 1l container against all three insect species after 24 hours of exposure.	Jayasekara et al., 2005 [59]
	Leaves	Powder	Direct contact with the insects (*Callosobruchus maculatus*)	2; 4; 6 and 8 g/kg		86.12% mortality of *C. maculatus* at 8g/kg dose on day five.	Elie et al., 2023 [60]
Immunostimulant	Leaves	Hydro-ethanolic extract	*In vivo* in rats by blood count method	200 and 400mg/kg for 14 days	Negative control: cyclophosphamide. Positive control: levamisole	400mg/kg increased significantly the number of neutrophils and monocytes ($p<0.05$) respectively 218 ± 55.80 to 316 ± 82.79; 10 ± 3.016 20 ± 10.49 60±41.47 per microliter of blood	Dermane et al., 2024 [11]

Testicular morphometry	Root bark	Methanolic extract	Morphometric indices of the testes (testes weight, testes length and testes width) on of New Zealand rabbits	0; 50 and 100 mg/kg for 29 days	Not reported	The dose of 50 mg/kg had the highest mean absolute and relative paired testes weight of 3.325 ± 0.1349g and 0.2098 ± 0.0139 % with mean absolute and relative testes length of 2.4522 ± 0.0250 cm and 0.1538 ± 0.0040%.	Chibuogwu et al., 2017 [61]
Anti-snake venom (*Naja nigrocollis*)	Root	Aqueous extract	The monitoring of the levels of liver enzymes: alanine aminotransferase (ALT), aspartate aminotransferase (ASP), alkaline phosphatase (ALP), creatinine kinase (CPK), lactate dehydrogenase, (LDH) and amylase	15 to 20mg/kg for two days	Not reported	Significant ($p<0.05$) dose-dependent alteration in serum enzymes and urea analyzed.	Wannang et al., 2005 [62]

Invigorating or energizing effect	Leaves	Hydro-ethanolic extract	In vivo in rats by measure the titer of lactate dehydrogenase using automated system	200 and 400mg/kg for 14 days	Not reported	The extract increased the LDH enzyme value from 2167±287.7 IU/mL (cyclophosphamide animal's group) to 3052±613.3 IU/mL (200mg/kg) and 3049±293.9 IU/mL (400mg/kg)	Dermane et al., 2024 [11]

3.5.2. Possible explanations of *S. longipedunculata* pharmacological activities

This section attempts to give possible explanations for the various effects of *S. longipedunculata*. This will enable researchers to come up with new specific research projects on *S. longipedunculata* in order to find the targets on which the extracts act.

3.5.2.1. Antibacterial and antifungal effects

According to table 2, different extracts of *securidaca longipedunculata* exhibited inhibitory effect against microorganisms like *Mycobacterium sp*, *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *Rhizopus nigricans, Fusarium oxysporum*, *Staphylococcus* aureus, Mucor *rouxi* etc. In fact, the drugs active on microorganisms' act by different mechanisms: inhibition of peptidoglycan, inhibition of protein synthesis, destruction of membrane envelopes, inhibition of nucleic acids, inhibition of folate synthesis.

3.5.2.2. Antiparasitic activity

Different extracts of *securidaca longipedunculata* showed inhibition effect against trypanosome and plasmodium. Extracts or drugs act against parasites (dangerous eumetazoans and parametazoans) by binding to tubulin, preventing its polymerization, blocking fumarate reductase which is an enzyme required for global parasite metabolism, blocking neuromuscular transmission in parasites or on the contrary, causing extreme excitation by binding to certain neurotransmitters such as GABA.

3.5.2.3.Anti-epileptic, anxiolytic and sedative activities

Some research carried out with dichloromethane and ethanolic extracts of *S. longipedunculata* leaves has shown the plant to have anti-seizure properties, thought to be due to an increase in GAGA-mediated inhibition, or a decrease in the action of the excitatory neurotransmitter (glutamate), or modulation of calcium and sodium channels.

3.5.2.4. Antidepressant effect

Aqueous extracts of root and leaf bark have an antidepressant effect. The extract is thought to either increase the concentration of monoamines at the synaptic cleft by inhibiting their degradation by monoamine oxidase inhibitors or by inhibiting their reuptake.

3.5.2.5.Anti-inflammatory activity

The clinical signs of inflammation were first described in the 1st century AD (anno domino) by a Roman physician named Celsus. He set out the "Quadrilateral of Celsus", describing the symptoms accompanying wound infection: tumor (edema), rubor (redness), calor (heat) and dolor (pain). These four qualifications refer to the tissue changes associated with the inflammatory process: blood vessel dilation, leukocyte recruitment and local plasma accumulation. These clinical symptoms are only manifestations of the physiological mechanisms that anti-inflammatory drugs must target.

Thus, the anti-inflammatory activity of *S. longipedunculata* is manifested by stabilization of the lysosome membrane to prevent the release of its pro-inflammatory constituents, inhibition of cyclooxygenase-1 that prevents the formation of prostaglandin, thromboxane A2 and prostacyclin. This can be achieved by suppressing pro-inflammatory cytokines, inhibiting neutrophil adhesion and extravasation to the inflammatory site, or by preventing hepatocytes from releasing C-reactive protein (CRP), hence its hepato-protective effect.

3.5.2.6.Analgesic activity

By inhibiting cyclooxygenases, the drug prevents the formation of prostaglandins which make nerve cells more sensitive to pain signals. At the central level, *S. longipedunculata* would have inhibited acetylcholine release. In fact, a drug with antidepressant and anti-inflammatory properties is analgesic because these three effects have interlocking mechanisms.

3.5.2.7.Antiulcer activity

Kayode et al (2015) (52) have demonstrated that the methanolic extract, ethyl acetate extract and hexane extract of *S. longipedunculata* leaves have a gastroprotective effect. In fact, ulcers are deep wounds in the inner wall of duodenum or stomach which causes chronic inflammation. The anti-ulcer effect of *S. longipedunculata* extracts is therefore linked to its anti-inflammatory effect, or to another mechanism involving inhibition of the proton pump.

3.5.2.8.Antioxidant activity

Several authors have demonstrated that *S. longipedunculata* is capable of ensuring the transfer of hydrogen in order to block lipid radicals. It could also be that extracts act on factors promoting oxidative stress, such as singlet oxygen deactivation, oxygen reduction and chelation of metal ions.

3.5.2.9. Anti-viral property

Inhibition of viral replication, inhibition of virus attachment to target cells or membrane fusion, inhibition of nucleic acid synthesis, inhibition of protein synthesis, inhibition of virus protease, stimulation of innate and acquired immunity or virostatic effect are some of the mechanisms of extracts or drugs that have an anti-viral activity.

3.5.2.10. Cardiovascular effect

Extracts of *S. longipedunculta* would have thinned the blood to prevent a clot formation around an atherosclerotic plaque, thus blocking blood circulation. Furthermore, they would have reduced the absorption of fats and cholesterol by the intestine, decreased LDL (low-density lipoprotein) cholesterol levels in the blood.

3.5.2.11. Neuromuscular property

The mechanisms of neuromuscular action of the *S. longipedunculata* extracts could involve the inhibition of the degradation of neurotransmitters such as acetylcholine, GABA, glutamine etc., the blocking of their release, the blocking of postsynaptic receptors for these neurotransmitters or a sustained depolarization partly linked to their massive release.

3.5.2.12. Hypoglycemic activity

Extracts would have stimulated insulin secretion by blocking the ATP-sensitive potassium channel in beta-pancreatic cells.

3.5.2.13. Pesticidal activity

The pesticidal effect methyl salicylate vapor derived from *S. longipedunculata* could be explained by the destabilization of acetylcholinesterase which regulates acetylcholine (neurotransmitter), or by disruption ion flow at the axonal or synaptic level, thus disrupting nerve impulse transmission.

3.5.2.14. Immunostimulant effect

The immunostimulation activity of *S. longipedunculata* extract can be occur through several mechanisms: stimulation of bone marrow to produce white blood cells; direct activation of B lymphocytes; increased levels of specific Ab (antibody); acceleration of plasmocyte maturation into plasmoblasts, which promotes the synthesis of Ig (immunoglobulin) that may be specific to a single Ag (antigens), as it increases IgG (immunoglobulin G) levels rather than the primary

IgM (immunoglobulin M) response; increased lymphocyte proliferation; stimulation of the various complement factors that are the main chemotactic factors; significant increase in NK (natural killer) cells cytotoxic power.

3.6.Toxicological study on *S. longipedunculata*

The toxicological study on *Securidaca longipedunculata* has been the subject of several toxicological research. The table 3 below summarizes the results of some of this research.

Table 3: Toxicological studies of *S. longipedunculata* extracts

Plant parts	Types of extracts	Animals	LD_{50} (mg/kg)/results	Class of toxicity (oral)		Probably lethal dose in humans 70kg	Authors
				Scale of Hodge and sterner	Scale of Gosselin, Smith and Hodge		
Fresh root	Crude extract of saponosides	mice	0.875 (oral route) and 50 (parenteral route)	Extremely toxic	Super toxic	-	Tubery, 1969 [63]
Root	10% aqueous macerate lyophilizate	rat	5 (oral route)	Highly toxic	Extremely toxic	4ml (between 7 d and 1tsp)	Oussoumanou et al., 1991 [64]
	Injection of whole root orally	mice	irritation	-	-	-	Scandola et al., 1994 [65]
	Aqueous extract	rat	37.74	Highly toxic	Extremely toxic	4ml (between 7 d and 1tsp)	Dapar et al., 2007 [66]
	Methanolic extract		5000	Practically non-toxic	Slightly toxic	30 to 600 ml	Namadina et al., 2020 [30]
Root bark	Aqueous extract	rat	771	Slightly toxic	Moderately toxic	30 ml (between 1 tsp and 1 f.o	Auwal et al., 2012 [67]
	Methanolic extract	mice	282 (oral route) et 11 (voie parenteral route)	Moderately toxic	Very toxic	-	Okoli et al., 2006 [37]

Abbreviations: d drops; sp teaspoonful; f.o fluid ounce

We have used scale of Hodge/sterner and the scale of Gosselin/Smith/Hodge to classify the toxicity of extracts carried out orally in rats because these scales are only based on these criteria: the animal must be the rat and the route of administration must be oral. The scale of Gosselin/Smith/Hodge was also used to determine the *S. longipedunculata* lethal dose of toxicity in a human by referring to that of man weighing 70kg in table 3. This will allow traditional doctors to know the dose that can be used during their treatments. Furthermore, researchers could use it to extrapolate studies carried out on rats for human use.

4. Conclusion

This study reveals that the names given to *S. longipedunculata* in local languages often refer to its traditional use. Scientific research has confirmed that *S. longipedunculata* has pharmacological potentials. However, toxicological studies warn of the potential toxic effect of *S. longipedunculata*. This research proves that *S. longipedunculata* has been the subject of several pharmacological and toxicological studies to reveal their potential effects on the body's biological functions. However, more specific studies to determine the mechanisms of action remain largely to be carried out. It is therefore a large "door" of research which is opened to the scientific world on *S. longipedunculata* to improve the works already carried out on the "leader" as the Ewe people of Togo call him.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that no generative AI (artificial intelligence) technologies such as text-to-image generators and Large Language Models (ChatGPT, COPILOT, etc) have been used during writing or editing of manuscripts.

CONSENT AND ETHICAL APPROVAL

Ethical issues, including double publication, plagiarism and data fabrication have been completely observed by the author.

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