






Review Article: A Short Review on Plants Used as Anti-Snake Venom

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ABSTRACT

Snake envenomation from different nations causes an emergency in public health, which result in high levels of mortality and morbidity. Snakebites are mostly treated with anti-venom administration to neutralize venom toxins. However, anti-venoms have some limitations due to their high cost, inadequate storage facilities, and hypersensitivity reactions in some people. This brings about the need to search for other alternatives in the snakebites treatment using medicinal plants. Plant extracts have been used over the years as an antidote in the treatment of envenomation by snakes worldwide. However, the efficacy of these plants has not been validated. This review aims at providing a mini review of some twenty-nine plant extracts used traditionally as antidotes to treat snakebites.



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1. Introduction

Medicinal plants play a vital and important role in world health since they provide a rich source of bioactive compounds with therapeutic activities [1-3]. Recently, different medicinal plants have been investigated by researchers to ascertain claims of these therapeutic properties [4-8], and other research areas.

Over the years, different parts of plant varieties have been used in the treatment of different diseases, including snake bites and animal bites [9, 10]. Information over the past years has revealed that there are over 420 different species of snakes in Africa while 100 of these snakes occur in Nigeria; 40 of the snakes are very dangerous, while 10 of them are deadly [11, 12].

Snake venom contains high levels of protein toxins that exhibit neurotoxic and cytotoxic effects that cause damage and are harmful to

humans. Snake envenomation brings about inflammation, hemorrhage, necrosis, neurotoxicity, cardiotoxicity, and eventually death [13].

Anti-snake venom (ASV) is presently considered as the best antidote in the treatment of specific snake bites. Antivenin is hardly available in rural areas due to its high cost and poor storage conditions. Moreover, hospitals and centers that control snake bites are very few, creating a need for the development of a new and affordable antidote against snake envenomation [11, 13].

Various studies have revealed that plant extracts have been found to inhibit enzymes in snake venom and act as antidotes. This review aims at evaluating some medicinal plant extracts with anti-venom activity against snakes [14, 15, 18].

Table 1 indicates a list of twenty-nine plants that presented anti-snake venom activity against snake bite.

Table 1. Details of selected medicinal plants with anti-snake venom activity

Botanical Name of Plant/Family	Plant Part used/Solvent	Phytochemicals	Results	Ref.
<i>Cassia hirsuta</i> (Fabaceae)	Root/ Ethanol, Aqueous	Saponins, cardiac glycosides Tannins, Oxalates; Alkaloid	The extracts showed neutralization of <i>Naja naja</i> venom induced lethality, inhibition of phospholipase A ₂ and inhibition of anti-coagulation. Hence, the study indicate potential anti-venom role of the plant extracts against tested snake venom.	[15]
<i>Costus Afer</i> (Zingiberaceae)	Leaves/ Methanol Extract	Alkaloids, Saponins, cardiac glycosides Tannins, Oxalates.	The results have shown that <i>C. afer</i> leaves methanol extract may be adopted for treating snakes bites.	[16]
<i>Pluchea indica</i> (Asteraceae)	Root / Petroleum ether and Methanol	β -sitosterol and stigmasterol	This study suggests that β -sitosterol and stigmasterol may play an important role, along with antiserum, in neutralizing snake venom-induced actions.	[17]

<i>Acalypha Fruticosa</i> (<i>Euphorbiaceae</i>)	Leaves/ Ethanol Extract	Alkaloids,Flavanoids, Triterpenoid.	The observed result clearly mentions that A. Fruticosa leaves has potent anti-snake activities.	[18]
<i>Salvia leucantha</i> Cav. (<i>Lamiaceae</i>)	Leaves/ Water, Aqueous Extract	Flavanoids,Bornyl acetate,Dillapiol,Bicy clogermacrene.	The observations proved that aqueous extract has the anti-venom efficacy against venom enzymes.	[19]
<i>Securinega virosa</i> (<i>Euphorbiaceae</i>)	Leaves/ Hexane, Ethyl Acetate, and Methanol Extract	Phenols,Saponins, Steroids,Triterpenes	S.Virosa leaf extract possessed anti-venom potential activity.	[20]
<i>Solanum dasyphyllum</i> (<i>Solanaceae</i>)	Leaves and Fruits/95% Methanol Extracts	Alkaloids,Flavanoids, carbohydrates,Terpenoids,Cardiac glycosides,Tannins.	The result substantiates the ethno medicinal usage of S. dasyphyllum and would help to develop potent antidote therapy against N.nigncolls envenomation.	[21]
<i>Vitex Negundo</i> (<i>verbenaceae</i>)	Roots Petroleum Ether, Methanol Extract	Triterpenoids	The investigation showed that V.negundo have neutralizing capacity against V.rusellii and N. kauthia venom.	[22]
<i>Emblica Officinalis</i> (<i>Euphorbiaceae</i>)	Roots/ Petroleum Ether, Methanol Extracts	Triterpenoids,tannoids.	The result has shown that C.officinalis have a neutralizing capacity against V.Rusellii and N.Kauthia venom.	[22]
<i>Moringa oleifera</i> (<i>Moringaceae</i>)	Leaves/ Ethanolic extract	Flavanoids, Terpenoids,Tannins, Saponins, and cardiac glycosides	The study has shown that ethanol leaves extract of M. Oleifera has anti-venom properties.	[23]
<i>Acorus calamus</i> (<i>Araceae</i>)	Roots/ Water (H ₂ O) Aqueous Extract	Glycosides,Carbohydrates,Phenolic compounds,Alkaloids ,flavonoids,steroids.	The observation confirmed that A.calamus extract possesses potent snake venom neutralizing compound.	[24]
<i>Withania Somnifera</i> (<i>Solanaceae</i>)	Roots/ Water (H ₂ O) Aqueous Extracts	Glycoprotein,withanolides,steroids,flavonoids,phenolics	The observation confirmed that W.somnifera extract possesses potent snake venom neutralizing compound.	[24]
<i>Clusia Fluminensis</i> (<i>Clusiaceae</i>)	Leaves, Stems, Flowers, Fruits/ Hexane, Methanol, Ethyl Acetate, and Acetone	Lanosterol, Clausianone, polyisoprenylated benzophenones, and Flavonoids	From the results observed, the plant C.Fluminensis inhabits the B.Jara raca snake venom.	[25]
<i>Annona Senegalensis</i> (<i>Annonaceae</i>)	Stem bark/ Petroleum Ether, and Ethanol Extract	Saponins,Alkaloids,Tannins,Flavonoids,Glycosides	This study showed that A. Senegalensis possesses bioactive ingredients with the potential to be used in managing black snake spitting cobra bites.	[26]
<i>Olax viridis</i> (<i>Olacaceae</i>)	Leaves/ Methanol Extract	Triterpenes, alkaloidal, and flavanoids	The result suggests that oral admiration of O.viridis extract possesses anti-venin property.	[27]

<i>Syzygium Guineense</i> (Myrtaceae)	Leaves	gallotannins, flavonoids, and ellagitannins.	The results suggest that S.guineense extracts when orally administered possesses antivenin property.	[28]
<i>Uvaria chamae</i> (Annonaceae)	Leave/ Methanol Extract	Delta-cadinene and sesquiterpenes	The study showed that U.chamae extract was effective in neutralizing the toxic effect of Naja nigricollis venom.	[29]
<i>Diospyros mespiliformis</i> (Ebanaceae)	Stem Back/ Ethanolic Extract	Tannins, Saponins Alkaloids, and Terpenoids	Based on the result observed, it was established that D.Mespiliformis stem bark extract has anti snake venom activity	[30]
<i>Hibiscus aethiopicus</i> (Malvaceae)	Whole Plant/ Water (H ₂ O) Aqueous Extract	Phenols	The finding suggest that H. aethoepicus extract may contain are endogenous inhibitory venom induced hemorrhage.	[30]
<i>Coix Lacrymajobi</i> (Poaceae)	Roots/ Petroleum Ether Ethanol Extracts	Alkaloids, Carbohydrates, Flavonoids, Glycosides, triterpenoids, and Resins.	Ethanoic extract of C.Lacrymajobi. Successfully inhibited D.Ruselli venom induced myonecrosis.	[31]
<i>Sapindus saponaria</i> (Sapindaceae)	Whole Plant/ Crude Extracts	B.sitosterol, glucoside, stigmasterol, flavanone, and polyamines	Sapindus saponaria extracts and fractions presented anti-ophidian activity.	[32]
<i>Mikania glomerata</i> (Asteraceae)	Leaves, Stem and Roots/ Boiled H ₂ O Aqueous	Coumarin,diterperpenes,lactones,sesquiterpenes	The extract of M.glomerata significantly inhibited the snake venom.	[33]
<i>Cordia macleodii</i> (Ehretiaceae)	Bark/ Ethanol Extracts	Cardiac glycosides,Alkaloids, triterpenes.	The bark extracts of C.macleodii has significant activity against then N.naja venom.	[34]
<i>Citrullus colocynthis schrad</i> (Cucurbitaceae)	Whole plant/ Methanol Extracts	Carbohydrate,protein,tannins,saponins,phenolics,flavanoids,glucosides,steroids,cucurbitacins,saponarin.	The presents study demonstrated that C.colocynthis has anti-hemorrhagic potentials for hearing in N.naja larachiensis envenomation.	[35]
<i>Alstonia venenata</i> R.Br.(Apocynaceae)	Leaves, stems bark/ Ethanolic extracts	Alkanoids, Flavonoids, Tannins, Proteins,Steroids,Amino acids, and triterpenoids	The obtained result shows that the leaves and stem bark of A. venenata possess promising antisnake venom activity.	[36]

<i>Casearia sylvestris</i> (<i>salicaceae</i>)	Stems, Leaves/ Water Solvent (H_2O) Aqueous Extracts	Clorodane diterpenes casearins and casearvestrins	The aqueous extract of <i>C.sylvestris</i> inhibits the enzymatic and toxic activities of various snake venoms and toxic PLA2S.	[37]
<i>Tectona Grandis</i> (<i>Lamiaceae</i>)	Stem Bark/ Methanol, and Crude Extracts	Saponins, Alkaloids, Tannins, Flavanoids glycosides, and phenols	These findings justify the folkloric use of <i>T.grandis</i> in the treatment of snake bite.	[38]
<i>Boswellia Delzielli</i> (<i>Burseraceae</i>)	Stem Bark/ Water solvent (H_2O) Aqueous extracts	Tannins, flavonoids, steroids, and saponins	The result showed that the plant possessed anti-snake venom activity.	[39]

2. Discussion

Snake venom causes a high rate of mortality in the world. Venoms are toxic saliva containing mixtures of bioactive compounds that consist of proteins, nucleotides, and inorganic ions. Plant extracts containing phenols, flavonoids, and tannins have reported anti-snake venom activity [25, 40].

Some phytoconstituents active against snake envenomation isolated from some of these plants include: wadelolactone from *Eclipta prostate*, melanin from *Thea sinensis*, D-mannitol from *Mimosa pudica*, and 2-Hydroxy-4-Methoxy Benzoic acid from *Hemidesmus indicus* [18, 20, 41]. However, computational studies have been employed to ascertain the efficacy of compounds including those from medicinal plants [42-47].

Based on the literature research carried out, medicinal plants are displayed in **Figures 1-25** and have anti-venom activity, as presented in



Figure 1. Leaves of *Cassia hirsute*



Figure 2. Leaves of *Costus afer*



Figure 3. Leaves of *Asparagus racemosus*

Table 1. Some plant families were found to contain plants with anti-snake venom activity against snake envenomation; some of these families include: *Fabaceae*, *Acanthaceae*, *Apocynaceae*, *Malvaceae*, *Euphorbiaceae*, etc. This review shows a list of some plants from these families that have anti-venom activity [16, 27, 38].

One of the key outcomes of the current investigation was that the phytochemicals present in medicinal plants potentiated the effects of snake venom antiserum in experimental animals and neutralized snake venom. The phytochemicals, alkaloids, flavonoids, tannins, steroids, coumarins, polyphenol, etc. from the medicinal plants extract of the twenty-nine medicinal plant were shown to potentiate the anti-serum activity in a manner similar to that was reported in [48-53]. This shows that protection by medicinal plants against snake venom will be of great value for snakebite victims, especially in rural regions.



Figure 4. Leaves of *Acalypha fruticosa*.



Figure 5. Leaves of *Salvia leucantha*.



Figure 6. Leaves of *Securinega virosa*.



Figure 7. Leaves of *Solanum dasyphyllum*.



Figure 8. Leaves of *Vitex negundo*.



Figure 9. Leaves of *Emblica officinalis*.



Figure 10. Leaves of *Moringa oleifera*.



Figure 11. Leaves of *Acorus calamus*.



Figure 12. Leaves of *Withania somnifera*.



Figure 13. Leaves of *Clusia fluminensis*.



Figure 14. Leaves of *Annona senegalensis*.



Figure 15. Leaves of *olax viridis*.



Figure 16. Leaves of *Syzygium guineense*.



Figure 17. Leaves of *Uvaria chamae*.



Figure 18. Leaves of *Diospyros mespiliformis*.



Figure 19. Leaves of *Hibiscus aethiopicus*.



Figure 20. Leaves of *Coix Lacrymajobi*.



Figure 21. Leaves of *Sapindus saponaria*.



Figure 22. Leaves of *Mikania glomerata*.



Figure 23. Leaves of *Cordia macleodii*.



Figure 24. Leaves of *Citrullus colocynthis*.



Figure 25. Leaves of *Alstonia venenata*.



Figure 26. Leaves of *Casearia sylvestris*.



Figure 27. Leaves of *Tectona grandis*.

3. Conclusion

The medicinal plants have shown anti-snake venom activity with very small sides or more preferred side effects than the serum treatment and can be considered as a better alternative and option for effective treatment against snakebite.

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