



ISSN : 2350-0743



## RESEARCH ARTICLE

### A LOOK AT PHYTOTHERAPY IN THE FIGHT AGAINST SNAKEBITES IN THE CITY OF GOMA (NORTH KIVU, DEMOCRATIC REPUBLIC OF CONGO): ETHNOBOTANICAL SURVEY AND HUMAN HEALTH

\*Kyungu Kasolene Jean Claude

University of Goma

#### ARTICLE INFO

##### Article History

Received 20<sup>th</sup> March, 2025

Received in revised form

17<sup>th</sup> April, 2025

Accepted 16<sup>th</sup> May, 2025

Published online 28<sup>th</sup> June, 2025

##### Key words:

Limb Amputation, Road Traffic Accident, Diabetes, Below Knee Amputation.

##### \*Corresponding author:

Kyungu Kasolene Jean Claude

Copyright©2025, Kyungu Kasolene Jean Claude. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Kyungu Kasolene Jean Claude. 2025. "A look at phytotherapy in the fight against snakebites in the city of Goma (North Kivu, Democratic Republic of Congo): ethnobotanical survey and human health.. *International Journal of Current Research*, 17, (06), 11340-11349.

#### ABSTRACT

Our ethnobotanical survey was carried out among 29 healers and phytotherapists in the city of Goma. From this study, 26 plant species belonging to 24 genera and 19 families used against snake bites have been inventoried. The Asteraceae family (4 species and 4 recipes) is the most represented, followed by the Malvaceae and Verbenaceae families (2 species). The leaf is the most widely used organ, trituration is the most widely used preparation method, and the poultice is the most widely adopted method of administration. *Lantana trifolia* is the plant most frequently used by Goma herbalists, and *Cassia Occidentalis* is the most frequently cited in the literature on anti-venom control.

## INTRODUCTION

In the city of Goma, snakebites are common in uncemented houses and in neighborhoods with uncut lava. The snake certainly finds its habitat in uncut stones. Today, thanks to the influence of Christianity, snakebites are rarely associated with bad spells, and are no longer considered an accident. The diagnosis of a snakebite is based on 4 obvious points or signs: the thorn-like sting, tickling, the presence of two or four healing points and intense pain. The evolution of the bite is marked by edema, thirst, sweating, nausea and tachycardia. The treatment of a snakebite does not take into account the diversity of snake species. For the time being, we recommend drinking a saline solution or one's own urine, and applying medicinal plants locally. Nevertheless, we distinguish between dangerous snakes whose bite requires urgent measures and nonvenomous snakes such as the "green snake". For anti-venom treatment, there are immunizing plants, most of which belong to the Caesalpiniaceae family. The flower of *Feretia apodanthera* (Rubiaceae) is said to be a delicacy for snakes: it is therefore used crushed and swallowed with water in the event of a bite to prevent envenomation (Maydell 1983). Traditional medicine is a term generally used to designate the health care practices of traditional societies and cultures in developing countries (ROBBERT, 1983). Today, traditional African medicine is known by many names, such as "traditional medicine" or "medicine of traditional practitioners". The WHO uses "African traditional medicine" to show that it covers all forms of therapy that are distinct from so-called modern medicine (KIMONI, 1983). Traditional African medicine is therefore a form of care specific to traditional communities with African philosophies, or in other words, the conception of health in these societies. Indeed, the WHO has wisely defined health as a state of complete physical, mental, social, moral and spiritual well-being. It therefore emphasizes the moral, social and spiritual aspects of human existence, giving a new dimension to the health care system (ROBERT, 1983). The concept of "traditional medicine" thus finds its place in this conception of health and care. Herbal treatment is the most accessible alternative (MUHAMMAD & AWAISU, 2008). Purely empirical knowledge of the curative virtues of plants goes back to the goal of therapeutics, in contrast of incomplete knowledge (SCHNEIDER, 1973). Natural, biological and specific to the human organism, medicinal plants often provide long-term care. The efficacy of a medicinal plant depends on its biochemical composition, as it is the reservoir of many primary and secondary active ingredients that man uses in his therapeutic arsenal. With the rise of chemistry, it became possible to partially synthesize many plant-based medicines, and all doctors now practise herbal medicine every day, much as Jourdain wrote prose without realizing it (Kirarahumu, 1997, personal communication). Organo-graphical study of the plant reveals three parts: leaf, stem and root. The active principles are unevenly distributed in the different parts or organs of the plant, due to the specialization of their cells (PAMPLONA, 1999). Nevertheless, all parts of the plant are necessary and useful for healing and treatment, hence the common use of the entire plant organ or plant as a whole. Despite some progress, the health situation in developing countries remains

dramatic. It depends to a large extent on economic resources, but this in turn drives productivity, at least in part, by providing each nation with profitable human capital (Gentilini, 1977). Indeed, today's economic conditions make imported techniques and medicines less and less accessible, forcing the population to resort to phytotherapy or traditional medicine. The therapeutic virtues of plants cannot be denied. The plant offers a medicinal batch with therapeutic success. Even though plants do not claim to cure everything, they are able to bring favorable results to most of the dysfunctions that can affect man, even proving their worth where modern medicine has failed. From this point of view, anti-venomous phytotherapy is seen as an alternative as safe as serotherapy and the Indian black stone, both of which remain inaccessible to people with modest savings.

**In response to this question, the present work sets out to answer the following questions:**

- Are there any medicinal plants used against snakebites?
- How are these products prepared and administered?
- What are the side effects of these plants?
- Is there any expertise in the use of these plants?

Without running the risk of asserting what has yet to be verified, our apostolate would be in favour of the existence of a variety of as yet unidentified plants capable of curing snakebites. This study thus contributes to the integration of traditional medicine into the primary healthcare system in the city of Goma.

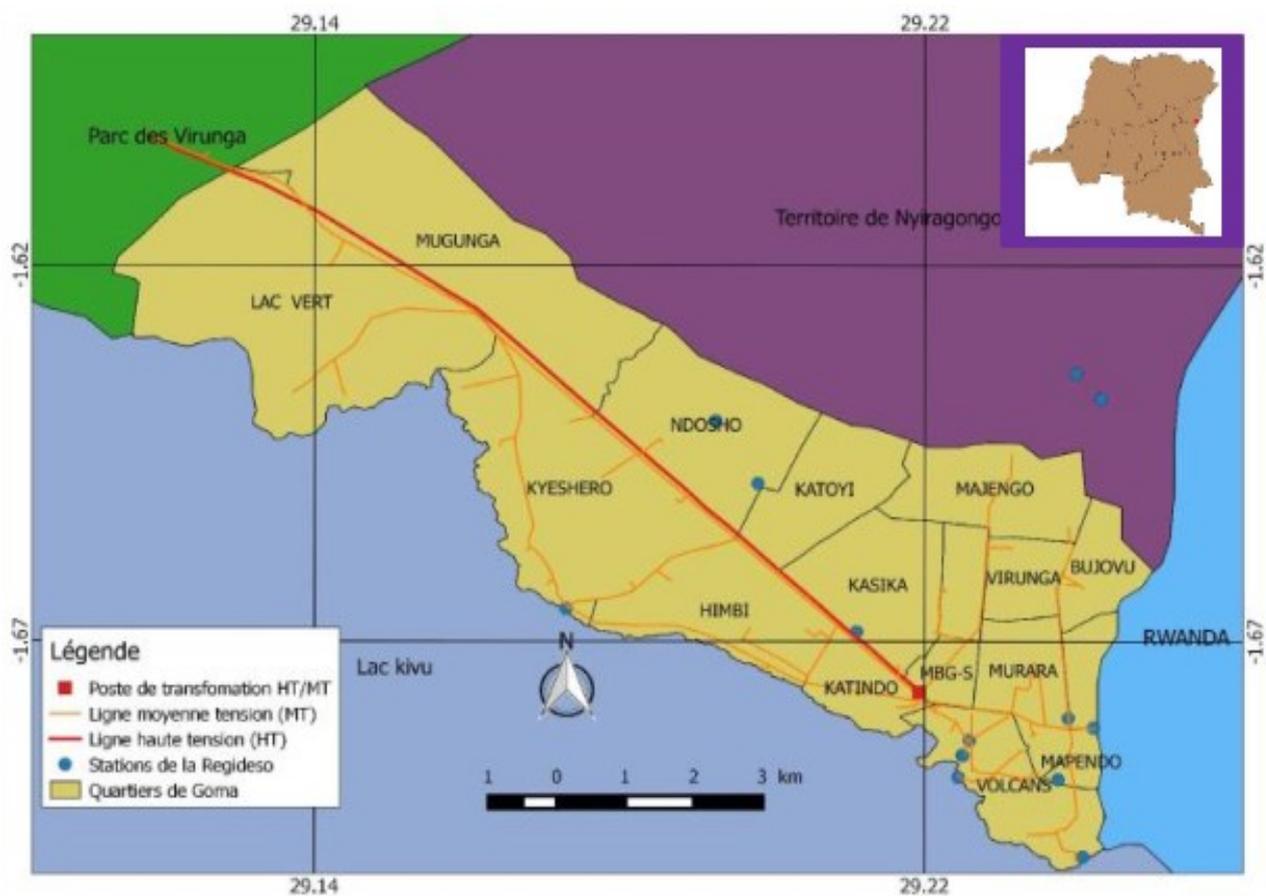


Figure 1. Map of the city of Goma(Assani et al.2017)

**Our ethnobotanical investigations have five main objectives**

- Inventory medicinal plants used against snake bites.
- Identify these plants and describe their preparation and administration methods.
- To rationalize, objectify and revalorize the African medical heritage and the scientific Congolese pharmacopoeia on medicinal plants for future studies.
- Establish scientific documentation on medicinal plants for further study.

## METHODOLOGICAL

Capital of North Kivu province. The city of Goma comprises two communes, Karisimbi and Goma, with respective areas of 40.5 km<sup>2</sup> and 42.27 km<sup>2</sup>. With a population of around 1,000,000, the city of Goma is ethnically diverse, with the largest ethnic groups being Bahavu, Bahunde, Banande, Banyanga, Baregas, Bashi, Batembo and Batutsi. The town of Goma is located in the southern graben at an altitude of 1,461 meters. It lies between 29° 14' longitude East 1° 41' latitude South. The town is bordered to the east

by the Republic of Rwanda, to the west by the Massisi territory, to the north by the Nyiragongo territory and to the south by Lake Kivu. Its relief is dominated by a plain topped by several hills, including the hill commonly known as "Mont Goma". Generally, the soil of the city of Goma is volcanic, very fertile and made of lava.

The climate is tropical, humid and temperate. The city of Goma has no rivers, so the only water supply is Lake Kivu. The flora is represented by a few fleshy plants, grasses and shrubs. Anthropogenic vegetation includes fruit trees, food crops, vegetables and ornamental plants (Mweru, 1999). The fauna includes parasitic insects such as mosquitoes in some places, small venomous snakes that make their home in the lava, and a few small-scale livestock.

## MATERIAL

Our material is exclusively plant-based. It consists of 26 plant species collected from 29 healers in the town of Goma.

## METHOD

The research method is essentially focused on ethnological and ethnobotanical survey carried out in the town of Goma. The free and directed interview were the common means of transmission used.

The interview was focused on the following points: medicinal plants used against snakebites; parts or organs of the plant used; method of preparation and administration of recipes; other illnesses treated by these plants. Once the plants had been harvested, and determined following the authors of the scientific names and verified in through documents: ADJANOHOON et al (1985), DEFOUR (1995), PAMPLONA (1999), FORTIN (1989), HIRT et al (1996) and MBILIKA (1998).

## RESULTS

### INVENTORY OF PLANTS USED AGAINST SNAKE BITES

The ethnobotanical survey in the town of Goma revealed 26 plant species belonging to 24 genera divided into 20 families as shown in Table I below, for each species, the number, scientific name, family and vernacular names of the main tribes consulted in the town of Goma. The Asteraceae, Malvaceae and Verbenaceae families are the most widely listed.

This table shows the names of these plants in different local languages, which means that these species are known and used by different ethnic groups. *Lantana camara* L. and *Thymus vulgaris* L. are uncommon plants in the city of Goma. They come from outside. The figures 2, 3 and 4 show respectively the relative importance of the plant organs used, the distribution of recipes according to species and the method of administration of these recipes.

**Table I. List of medicinal plants for snakebite control**

	NOMS SCIENTIFIQUES	Famille	Kihunde	Kinande	Kinyanga	Kinyarwanda	Mashi
1	<i>Archyrantes aspera</i> L.	Amaranthaceae	-	-	-	Umuhurura	Mushomolango
2	<i>Ageratum conyzoides</i> L.	Asteraceae	-	Umusonia	-	Inkurubwe	Kahiole
3	<i>Alium cepa</i> L.	Liliaceae	Matungulu	Ronye	Matungulu	Umuhati	Itunguru
4	<i>Aspilia africana</i> (Pers.)	Asteraceae	-	-	-	Ishikashika	Cimbuba
5	<i>Bidens pilosa</i>	Asteraceae		Ovukuto		Inyaanarasanya	Kashisha
6	<i>Brassica oleraceae</i> L.	Brassicaceae	Shu	Eshwa	Eshwa	Shu	Shu
7	<i>Carica papaya</i> L.	Caricaceae	paipai	Epaipai	paipai	Ipapayi	Ipapaye
8	<i>Cassia occidentalis</i>	Caesalpiniaceae	Umuyoka			Umukubayoka	Mushengemanjoka
9	<i>Chenopodium ugandae</i>	Chenopodiaceae				Umugombe	Mugombegom
10	<i>Citrus lemon Burn F.</i>	Rutaceae	Ndimu	Endimu	Ndimu	Ndimu	Ndimu
11	<i>Clematis hirsute per. Et Glg</i>	Renonculaceae				Umukamba	Karhumba
12	<i>Crassocephalum bojeri</i>	Asteraceae		Kilinyamuliro		Chizinyamuliro	Chizinyamuliro
13	<i>Drymaria cordata</i> (L.)	Caryophyllaceae	Omuhima			Kanyaruhima	Bwahulo
14	<i>Hibiscus Sp</i>	Malvaceae					
15	<i>Hibiscus serratens</i> L.	Malvaceae					Mukeranshungwe
16	<i>Lantana camara</i> L.	Verbenaceae	Introduite	Introduced	Introduced	Introduite	Introduite
17	<i>Lantana trifolia</i> L.	Verbenaceae	Kasengere			Umuhengeri	Kanshukanshuka
18	<i>Nicotiana tabacum</i> L.	Solanaceae	Taba	Virenga	Taba	Itabi	Irhabi
19	<i>Oxalis corniculata</i> L.	Oxalideae	Munyumbene	Munyu wa mbene		Mbunyubw'inyam anza	Munyumpene
20	<i>Phytolacca dodecandra</i>	Phytolaccaceae	Kihokolo	Ekihokolo	Kihokoro	Umuhokolo	Cimbokolo
21	<i>Plantago palmanta</i> L.	Plantaginaceae	Ekibatana	Mukunyuku nyu	-	Igibatabata	Cibarhama
22	<i>Rumex abyssinica</i> L.	Polygonaceae	Omufumba	Ekilenga lenga		Umufumba	Muberanyungu
23	<i>Sida rhomboidea</i>	Malvaceae		Omutundula	Muchundula	Mudundu	
25	<i>Thymus vulgaris</i> L.	Lamiaceae	Introduite	Introduced	Introduced	Intrduite	Introduite
26	<i>Zehneria minutiflora</i> ( Cogn) Jeffrey	Curcubitaceae	-	-	-	Umushishiro	Nkukulira

**RELATIVE IMPORTANCE :** In this paragraph, are listed in alphabetical order the scientific name of each plant, the family, the organ used, the method of preparation and administration or use, and other therapeutic uses. It indicates the informants for each recipe by the index "inf. (informant) followed by a number which refers to the names of the informants listed in the appendix.

*Arcyranthes aspera L.*

**Family:** Amaranthaceae

**Organ used:** Leaf

**Use:** crush a handful of fresh leaves, then apply a poultice of the resulting paste to the bitten area. The treatment lasts two days, but please replace the leaf paste every twenty-four hours (inf.4).

**Other uses:** tartar, cataracts, abdominal pain, dyspepsia, rheumatism (ADJANOHOOUN *et al.*, 1985).

*Ageratum conyzoides L.*

**Family:** Asteraceae

**Organ used:** Leaf

**Use:** take a sufficient quantity of leaves of this plant, make a decoction in a quantity of water and take a glass in the morning and another in the evening until cured (inf.24).

**Other uses:** Angina, conjunctivitis, diarrhoea, laryngitis, venereal diseases, otitis, mycosis wounds, intestinal worms (DEFOUR, 1995), antidiabetic, treatment of inflammation, teething, dermatitis (ADJANOHOOUN *et al.*, 1985).

*Allium cepa L.*

**Family:** Liliaceae

**Organ used:** Bulb

**Use:** divide the bulb into two parts, then garnish the chopped surface with a little of the bulb alone. Make a poultice on the bitten area, replacing the half every twelve hours. Treatment can be stopped or continued depending on whether the patient is cured or not (inf.3).

**Other uses:** panarisis, diabetes, burns (inf.3); hypertension, urinary tract infections, mycoses, abscesses, coughs (DEFOUR, 1995); avitaminoses A, B and C, coughs and sore throats, gastroenteritis, hypertension, mycoses, abscesses (HIRT *et al.*, 1996).

*Aspilia africana (pers) C.A. Adams*

**Family:** Asteraceae

**Organ used:** Leaf

**Use:** take two handfuls of fresh leaves in cold water. Make a decoction of these leaves in a liter of water and take one glass in the morning and another in the evening. Treatment lasts 3 days (inf.25).

**Other uses:** gastritis (inf.25), epilepsy, malaria, filariasis (DEFOUR, 1995).

*Bidens pilosa L.*

**Family:** Asteraceae

**Organ used:** leaf

**Use:** crush a sufficient quantity of leaves, then apply a poultice to the bitten area. This plant is indicated for snake bites presenting an oedematous syndrome. The treatment will continue until the oedema has disappeared. The crusher should be replaced every twenty-four hours (inf. 22,26).

**Other uses:** antibiotics, anthrax, liver, diarrhea, mycosis, wounds, colic, hemorrhoids, chest pain, cramps in infantile epilepsy, burns, umbilical cord healing, blocked ears, painful menstruation (DEFOUR,1995), orchitis, dysuria, angina (ADJANOHOOUN *et al.*, 1985).

*Brassica deraceae L.*

**Family:** Brassicaceae Organ used: Leaf

**Use:** Triturate a leaf of this plant, then apply a poultice to the bitten area and eat a quantity of raw leaves.

The duration of this treatment depends on the state of the edema and the quantity of venom inoculated (inf., 9,3).

**Other uses:** burns, wounds, diabetes (inf.9), abscesses, ulcers, acne, anemia, bronchitis, contusion, diarrhea, dysentery, impetigo, lumbago, insect bites (DEFOUR, 1995); scurvy, ulcers, arthritis, dermatoses (HIRT *et al.*, 1996); antiulcer (PAMPLONA, 1999).

*Carica papaya L*

**Family:** Caricaceae Organ used: Fruit

**Use:** take an unripe fruit, chop or halve, then apply a poultice of the cut side to the bitten area (inf.3).

Other uses: Bronchitis, wounds, jaundice, asthma (inf.3); loss of sight, tetanus, diphtheria, ulcers, hepatitis, amoebae, hemorrhage, verminosis, purulent wounds and anthrax, dyspepsia and gastroenteritis, malaria (DEFOUR, 1995); vermifuge, amoebiasis, avitaminosis A, b and C., infected wounds, burns, rashes, asthma, malaria, Guinea worm (HIRT *et al.*, 1996); dietetic for ulcerative colitis (PAMPLONA, 1999).

### *Cassia occidentalis L*

**Family:** Caesalpiniaceae

**Organ used:** Leaf

**Use:** Triturate a handful of fresh leaves, then apply a poultice to the bitten area for two days, replacing the treatment every 24 hours. Treatment may be extended beyond two days if edema persists (inf.3, 16).

**Other uses:** hemorrhoids, hypertension, painful menstruation, diuretics, lumbago, nausea, malaria (inf. 16); insect bites, diarrhea and dysentery, hemorrhoids, vermifuge, edema, malaria, nervous asthma, hypertension, abscesses, mycoses (HIRT *et al.* 1996), orchitis, dysuria, angina, (ADJANOHOOUN *et al.* ,1985); lumbago, antidiabetic (ADJANOHOOUN *et al.*, 1989).

### *Chenopodium Ugandae (Allen) Allen*

**Family:** Chenopodiaceae

**Organ used:** Leaf

**Use:** Triturate a handful, then apply a poultice to the bitten area for two days, repeating the treatment every 24 hours. (inf. 4).

Other uses: sexual asthenia, dermatosis (inf. 4); scabs, prurigo, diarrhea, hemorrhagic fever, purgative (DEFOUR, 1995).

### *Citrus lemon Burm f.*

**Family:** Rutaceae

**Organ:** Leaf

**Use:** Lemon tree leaves are crushed to extract the juice or juice, then mixed with a little salted water to make a compress at the site of the bite (inf. 1, 22, 28). Other uses: cough and angina (DEFOUR, 1995); vermifuge hypertension, colds and facilitation, from the dental teething (ADJANOHOOUN ,1985); sedative, antispasmodic, sudorific, vermifuge (PAMPLONA, 1999).

### *Clematis hirsuta Per. Et Gilg*

**Family:** Renonculaceae **Organ:** leaf **Use:**

- Take a handful of leaves, crush them and apply a poultice to the area. Treatment lasts three days, but the poultice should be replaced every six hours (inf., 1,2,4,25).
- Triturate the leaves and rub at the site of the bite twice a day for three days (inf. 25).

**Other uses:** rheumatism (inf. 1,28), painful menstruation, fibroids (inf.25), wounds, intestinal worms (DEFOUR, 1995).

### *Crassocephalum bojeri Moore*

**Family:** Asteraceae

**Organ:** Leaf

**Use:** triturate a handful of leaves with a handful of Plantago palamta, then make a poultice until the edema disappears (inf. 3).

**Other uses:** diarrhea, burns (inf.3).

### *Drymaria cordata WILD ex Roem et Schultes*

**Family:** Caryophyllaceae **Organ:** aerial organ, leaf

**Use:** Chew a handful of leaves, then swallow the juice.

Make a decoction of a handful of the aerial organ in a liter of water, then use two glasses daily for three days (inf. 2, 25).

**Other uses:** Cough, bronchitis, sprain, headache, sinusitis, abscess (DEFOUR, 1995), thrush (ADJANOHOOUN *et al.* 1985), bronchitis (ADJANOHOOUN *et al.*, 1988).

### *Hibiscus sp*

**Family:** Malvaceae

**Organ:** Leaf

**Use:** crush a handful of leaves, then apply a poultice to the bitten area for two to three days, renewing the application every 24 hours (inf. 19).

**Other uses:** diuretic (HIRT *et al.*, 1996), headache (ADJANOHOOUN *et al.*, 1988).

### *Hibiscus surrattens*

**Family:** Malvaceae

**Organ:** Leaf

**Use:** crush a handful of leaves and apply as a poultice for two days, replacing the treatment every four hours (inf.4).

**Other uses:** sexual asthenia, dermatosis (inf.4); scabs, prurigo, diarrhea (ADJANOHOOUN *et al.*, 1988).

### *Lamanta camara L.*

**Family:** Verbenaceae

**Organ:** Leaf

**Use:** Triturate a handful of leaves and apply as a poultice for two days, replacing the treatment every 24 hours.

**Other uses:** Coughs, rheumatism, malaria (HIRT *et al.*, 1996), colds, dyspepsia, febrifuges (ADJANOHOOUN *et al.*, 1985), malaria (ADJANOHOOUN *et al.*, 1988).

### *Lantana trifolia L.*

**Family:** Verbenaceae

**Organ used:** Leafuse

- Crush a sufficient quantity of leaves, then apply a poultice to the bitten area (inf.4).
- Triturate fresh leaves, then apply a poultice to the bitten area, replacing the treatment every twelve hours for three days (inf. 1,25,28).
- Use two handfuls of fresh leaves, then make a decoction in a liter of water and boil for three days (inf. 25).

**Other uses:** cough, bronchitis, diseases of the respiratory system (inf. 25), cough and lung, fever (DEFOUR, 1995).

### *Nicotiana tabacum L.*

**Family:** Solanaceae

**Organ:** Leaf

**Use:** Dry the leaves, then incinerate to collect the ash. Mix one teaspoon of honey with one teaspoon of *Tetradenia riparia* juice and one teaspoon of *Nicotiana tabacum* leaf ash. Take one teaspoon three times a day for two days (inf.18).

**Other uses:** Sinusitis (DEFOUR, 1995), neurosis, asthma, headaches, bronchitis (ADJANOHOOUN *et al.*, 1988).

### *Oxalis corniculata L.*

**Family:** Oxalidae

**Organ used:** Aerial organ

**Use:** Apply two tattoos to the bitten area, then triturate the entire aerial organ (a handful) (inf. 22).

**Other uses:** Lactogen, antidote for atropine intoxication, dysentery, chest pain (DEFOUR, 1995).

### *Phytolacca dodecandra L'Herit*

**Family:** Phytolaccaceae

**Organ used:** Leaf

**Use:** Crush fresh leaves, tattoo the bitten area using the starting point and others, then make a poultice of the paw obtained on the bite (inf. 24).

**Other uses:** Dermatitis, (inf. 24), light burns, boils, warts, sprains, abortifacient, liver, hemorrhoids, cancerous tumors, arthritis, Lubango, mental disorders (DEFOUR, 1995).

### *Plantago palmata L.*

**Family:** Plantaginaceae

**Organ used:** Leaf

**Use:** Triturate leaves, then apply as a poultice until swelling disappears (inf. 12).

**Other uses:** dermatitis (inf. 24), burns, insect bites, ascites, female sterility (inf. 3); cough (inf. 12); pregnancy disorders abscesses; wounds, burns, insect bites, ascites, hypertension, hemorrhoids, malaria, stomach ache (DEFOUR, 1995).

### *Rumex abyssinica L.*

**Family:** Polygonaceae

**Organ:** Leaf

**Use:** decoct two handfuls of fresh leaves in a liter of water for 30 minutes. Drink one glass in the morning and the other in the evening for 4 days.

**Other uses:** aphrodisiac (inf. 25), tonic, diuretic, laxative, dizziness, scabies, dysmenorrhea, otitis, hyperacidity, gastric, angina, threat of abortion (DEFOUR, 1995).

**Sida rhomboidea**

**Family:** Malvaceae **Organ used:** Stem, leaf **Use:**

- Peel off the stem, halve longitudinally, tattoo and apply to the surface of the bite until the stem falls off by itself (inf. 3);
- Triturate leaves, then apply a poultice of the paste to the bitten area (inf. 70).

**Other uses:** Antidotes (inf.7), diarrhea, dysentery, bacillary, gonorrhoea, tuberculosis, abscesses, inguinal lymph nodes (DOFOUR, 1995).

**Tetradenia riparia (Hoschst) Codd**

**Family:** Lamiaceae

**Organ used:** Leaf

**Use:** crush a handful of *Tetradenia riparia*, *Clematis hirsuta* and *Sida rhomboidea* leaves, then apply a poultice to the bite until the edema disappears (inf. 3, 23).

**Other uses:** antibiotics, coughs, headaches, colds (inf. 23); amoebae and diarrhea, wounds, sinusitis, fever, ganges, migraine and headaches, hemorrhoids (DEFOUR, 1995).

**Thymus vulgaris L.**

**Family:** Lamiaceae

**Organ used:** Leaf

**Use:** Triturate a quantity of fresh leaves, then apply a poultice to the bitten area. Duration of treatment depends on the evolution of the edema (inf. 3.16).

**Other uses:** Whooping cough, dermatitis, insect bites, wounds, tooth decay (inf. 16), stress

(ADJANOHOON *et al.* 1985), antiseptic, nervous system tonic, vermifuge, pharyngitis, mouth ulcers, pyorrhea and stomatitis, antitussive, diuretic, antiparasitic, hair stimulant (PAMPLONA, 1999).

**Curcubitaceae minutiflorica (Cogn) Jeffrey**

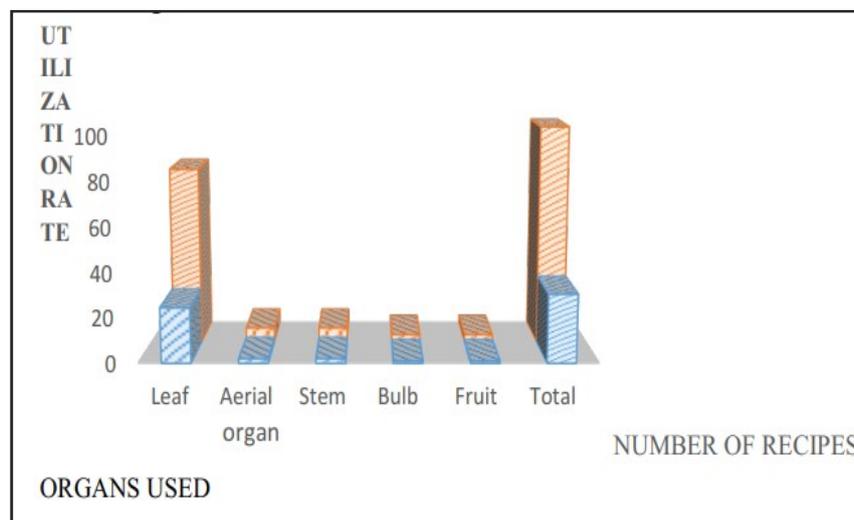
**Family:** Curcubitaceae

**Organ used:** Stem

**Use:** Use a large quantity of stem to macerate, then take half a glass in the morning and another half in the evening until cured (inf. 22).

**INTERPRETATION OF MEDICO-PHARMACEUTICAL TECHNIQUES**

**Organs used:** Generally speaking, Goma phytotherapeutics do not use all parts of the medicinal plant. However, two or three parts of a plant may be harvested as required. The relative importance of the organs used is shown in figure 2 below.



**Fig. 2. Relative importance of plant organs used**

Figure 2 shows that the leaf is the most widely used organ (80.65%), followed by the aerial organ and the stem (6.45%), while the bulb and fruit are the least used (3.225%).

**Method of preparation:** We recorded several methods of remedy preparation adopted by Goma herbalists. In Figure 3, we report on the preparation methods used in anti-venom therapy in the city of Goma.

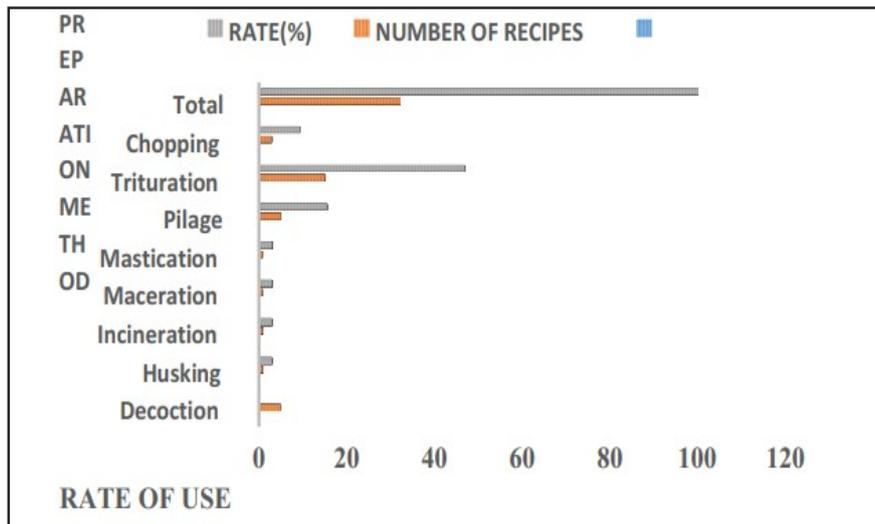


Fig. 3. Distribution of recipes by preparation method

This figure shows that trituration (46.875%) is the most widely used preparation method, followed by decoction and crushing (15.625%), mincing or splitting in second or third place with 9.4%, and finally incineration, decoction, maceration and mastication, each accounting for 3.1%.

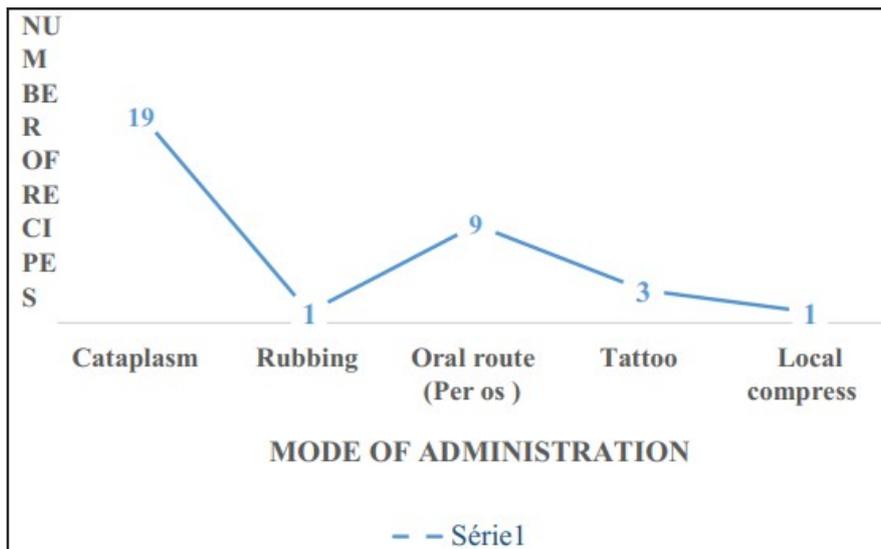


Fig. 4. Methods of administering plant-based remedies

**Method of administration:** Medicinal plants can be administered in a variety of ways. The modes of administration adopted by Goma healers in anti-venom phytotherapy are shown in figure 4. This figure shows that the poultice is the most widely used method of administration, with nineteen recipes (57.58%), followed by the oral route (27.28%). The least-used modes of administration are tattooing, rubbing and local compression, with respectively three leftovers (9.09%) and one recipe for the last two (3.03% each).

**Relative importance of families:** This table shows the distribution of species within families. Table II lists in alphabetical order the families and species harvested, as well as the recipes made from these species. The table shows that the most represented families are Asteraceae, with four species and four recipes, Malvaceae, with three species and four recipes, and Vubernaceae, with two species and four recipes.

**Comparative importance of harvested species and bibliography:** In this section, we draw a comparison between the literature consulted and the data obtained from local healers. This could teach us about the similarity of data between the healers themselves and the literature on the subject. This study would be important in orienting photochemical research on certain species. Table III summarizes the plant species mentioned at least once in the literature. In this analysis, we find that the plants *Cassa occidentalis*

and *Lantana trifolia* are the most cited, *Cassa occidentalis* being more quoted in the literature and *Lantana trifolia* by phytotherapists in Goma.

**Table II. Distribution of recipes in their families**

FAMILY	NUMBER OF SPECIES	NUMBER OF RECIPES
Amaranthaceae	1	1
Asteraceae	4	4
Brassicaceae	1	1
Caesalpinaceae	1	1
Caricaceae	1	1
Caryophyllaceae	1	2
Chenopodiaceae	1	1
Cucurbitaceae	1	1
Lamiaceae	2	2
Liliaceae	1	1
Malvaceae	3	4
Oxalideae	1	1
Phytolaccaceae	1	1
Plantaginaceae	1	1
Polygonaceae	1	1
Renonculaceae	1	2
Rutaceae	1	1
Solanaceae	1	1
Verbenaceae	2	4

**Table III. Comparison between literature consulted and plants used**

SPECIES	DOCUMENTS				INFORMATION (inf.)								TOTAL		
	A	B	C	D	1	3	4	16	22	24	25	26		28	
<i>Ageratum conyzoides</i>				+						+					2
<i>Allium cepa</i>															3
<i>Bidens pilosa</i>	+								+			+			3
<i>Cassia occidentalis</i>	+	+		+	+		+								5
<i>Carica papaya</i>		+			+										2
<i>Hibiscus sarrattens</i>		+				+									2
<i>Lantana trifolia</i>		+			+	+					+		+		5
<i>Phytolacca dodecandra</i>	+									+					2
TOTAL	3	5	1	2	1	3	2	1	1	2	1	1	1		

Legend

A ADJANOHOUN *et al.* 1988

B DEFOUR, 1995

C Secrets et vertus des plantes médicinales, 1977

D MAPERA, 1998

## DISCUSSION

Despite the diversity of venomous snake species, healers and phytotherapists in the town of Goma prescribe the same remedy to indicate that there is no specific plant or treatment for a snakebite. Similarly, as GOLVAIN (1983) points out, conventional medicine uses polyvalent serum. Despite this non-specificity, traditional medicine and conventional medicine are effective in combating snakebite. This is because the receptors for these drugs channel the curative substances to the site of their action. The family is the most widely used organ. FORTIN (1988), for example, is unanimous in this observation. Indeed, the family is the plant's chemical laboratory par excellence, the crossroads of all chemical synthesis. It is also the seat of photosynthesis, which, thanks to chlorophyll, is the basis for the transformation of solar light energy into chemical energy and the production of large quantities of energy. The leaf also produces most of the glucoses and tannins (PAMPLONA, 1999). In addition, the use of the leaf enables the preservation of the plant species and offers the possibility of obtaining a second harvest after a short period. The poultice is the most widely used method of treating snakebites (57.6%). It is said to be the simplest: a plant applied directly to the bitten area, tied with a vine or bandage (HIRT *et al.*, 1996). The poultice can be applied to the bite marks, or to a tattooed body surface if the bite marks no longer exist. The latter application would have the advantage of bringing the active plant ingredients into direct contact with the blood and lymphatic microcirculation, which is the pathway for venom propagation in the human body. Two methods of administration can be used for the same plant and the same disease, as in the case of *Brassica oleraceae*, *Lantana trifolia*, *Clematis hirsuta* and *Sida Rhomboidea*. This method has the advantage of increasing treatment efficacy. The dosage of external remedies is not strict, but they should be replaced after a certain period of time. Dosage is, on the other hand, strict for internal use or oral administration. The Asteraceae family is the most represented, with four species and four recipes, followed by the Malvaceae with three species and four recipes, and the Verbenaceae with two species and four recipes. By comparing our results with the data available in the documents consulted, the species inventoried during our study were noted by others, such as *Ageratum conyzoides*, *Allium cepa*, *Bidens pilosa*, *Carica papaya*, *Cassia occidentalis*, *Hibiscus sarrattens*, *Lantana trifolia* and *Phytolacca dodecandra*. Plants common to several phytotherapists and different regions deserve particular attention for further research in pharmacology and pharmacognosy. This simultide between several distant regions would be proof

of the efficacy attributed to these plants. On the other hand, we would not rule out the existence of a certain diffusion of information or influence between, on the one hand, the healers themselves and, on the other, the authors among themselves.

AYÉKOTCHAMI AND ADANDÉ (2021), in their study of medicinal plants against snakebite, list 176 families, of which Fabaceae, Asteraceae, Euphorbiaceae, Rubiaceae, Apocynaceae, Lamiaceae, Araceae, Malvaceae and Acanthaceae are the most frequently cited. They also point out that Felix-Silva *et al.* (2017) had found similar results with 150 families listed. On the other hand, MOLANDER *et al.* (2012), in a cross-cultural comparison study of medicinal flora against snakebites, had also mentioned Zingiberaceae as a representative family. For CHIPPAUX (2017), the choice of plants used by traditional therapists is based on a range of reasons, some of which may seem far removed from Cartesian logic. However, empiricism plays a significant role, and the results of centuries of medical observation are not without interest. This is in line with the choice made by Goma's phytotherapists (Fig. 2 and Table III).

## CONCLUSION

The ethnobotanical investigations into anti-venom control carried out in Goma have yielded data that will form the basis for further research in this field. In fact, 31 medicinal recipes were inventoried, prepared from 26 species belonging to 24 genera and 20 families. The majority of these plant species grow spontaneously, and some of them are food crops (*Allium cepa*, *Brassica derceae*, *Carica pagaya*), while others are of European or introduced origin (*Lantana Camasa*, *Thymus vulgaris*). From this analysis, the leaf is the most widely used organ, trituration is the adopted preparation method and poultice is the most commonly used administration method. The Asteraceae family is the most commonly presented, with *Cassia Occidentalis* the most cited plant in the literature consulted, and *Lantana trifolia*, by Goma herbalists. The association of two or three plants is a frequent practice, which has the advantage of increasing efficacy and reducing the potential toxicity of the plants. African pharmacopoeia is rich. In the light of previous work in this field, the balance of knowledge acquired on medicinal plants from an ethnobotanical and pharmacodynamic point of view is positive. We therefore call on all scientific researchers to contribute to the scientific development of medicinal plants.

## REFERENCES

1. Adjanohoun E., Ake Assil, Chibon P. Cuffeys's Darnaut, J-J., Eduards, MJ., Etlenne, C., Eyme, J., Groudote, E., Jeremie J, Keita A, Longue Fosse, J.L, Portecop, J., Goo Sopprramanien, A., Troian, J., J., Médecine traditionnelle et pharmacopée - contribution aux études ethnobotanique et floristique à Dominique (Commonwealth of Dominica) ACCT, 1985, 400p.
2. Adjanohoun N., E., Gahyi, A.M. R, Ake Assi, L., Bania Kina, J., Chibon, P, CUSSET, G., Doulou, V., Enzanza, A., Eyme, J., Goudopte, E., Keita, A., Mbemba, C., Mollet, J., Moustombote, JM, Mpati, Sita P., Contribution aux études ethnobotaniques et floristiques en République Populaire de Congo ACCT, 1988, 605p.
3. Ayékotchami, D. ET Adandé, F. Utilisation des plantes médicinales pour prévenir et guérir les morsures de serpents : état des lieux et perspectives (synthèse bibliographique), 2021 ; (Volume 25 (2021) - Numéro 2), DOI: 10.25518/1780-4507.18915 <https://doi.org/10.25518/1780-4507.18915>
4. Chippaux, J.P. Venins de serpent et envenimations - IRD Éditions, 2017, <https://books.openedition.org/irdeditions>, DOI: 10.4000/books.irdeditions.10612 <https://doi.org/10.4000/books.irdeditions.10612>
5. Defour, G, Eléments d'identification des 400 plantes médicinales et vétérinaires du Bushi, Bandari, Bukavu, 1995, 116p.
6. Fortin, D, Modon LO, Guy Laynart, Plantes médicinales du Shael, Canada, SENEGAL, 1989, 279p.
7. Gentilini, M., Médecine tropicale, Flammarion, Paris, 1977, 839p.
8. Golvan, Y.T, Eléments parasitologie médicinales, 4th edition, Flammarion, Médecinale Sciences, Paris, 1983, 571p.
9. Harisson, T.R, Principe de médecine interne, 4th edition, Flammarion, Médecine-Sciences, Paris, 1988, 2118p.
10. Hirt, M et M'PIA, B., La médecine naturelle en Afrique, Mariamum Press, Uganda, 1996, 120p.
11. Muhammad B.Y. & Awaisu A., 2008. The need for enhancement of research, development, and commercialization of natural medicinal products in Nigeria: lessons from the Malaysian experience. *Afr. J. Traditional Complementary Altern. Med.* 5(2), 120-130.
12. Pamplona Roger, T.R., Guide des plantes médicinales, édition vie et Sante, Tome I, Spain, 1999, 398p.
13. Pamplona Roger, Guide des plantes médicinales, édition vie et santé, tome II, Spain, 1999, 391p.
14. ROBERT, Médecine traditionnelle et couverture des soins de santé, WHO, Belgium, 1983, 335p.
15. Rbader's digit, Secrets vertus des plantes médicinales, 2nd edition, 75007, Paris, 1977, 463p.
16. Schneider, E, Des plantes pour la Sante, édition sdt 77190, DAMMARIE, Les Lys, France, 1973,

\*\*\*\*\*