

Original Research Article

doi: <https://doi.org/10.20546/ijcrbp.2021.810.002>

Diversity of medicinal plants used in the treatment of typhoid fever in the High Guinean savannah zone of Cameroon

Boris Nyeck^{1,2*}, Djongmo Victor Awé¹, Djomo Cedric Chimi³, Noumi Valery Noiha⁴

¹Institute of Agricultural Research for Development (IRAD) Wakwa Regional Research Center,
P.O. Box 65 Ngaoundéré - Cameroon

²Department of Biological Sciences, Faculty of Science, University of Ngaoundere, P.O. Box 454,
Ngaoundere, Cameroon

³Institute of Agricultural Research for Development (IRAD) Yokadouma research station,
P.O. Box 136 Yokadouma - Cameroon

⁴Department of Life Science, Higher Teacher Training College of Bertoua, University of Ngaoundere,
P.O. Box 652, Bertoua, Cameroon

*Corresponding author; e-mail: nyeck1.boris@yahoo.com

Article Info

Abstract

Keywords:

Cameroon
Medicinal plants
Naturopaths
Traditional medicine
Typhoid fever

The present study consisted of an inventory of medicinal plants used in the treatment of typhoid fever by the populations of the Vina division of Cameroon. Ethnobotanical surveys were carried out among 20 naturopaths using survey forms. The naturopaths were 80% male and over 50 years of age. Twenty-four species were identified in the Vina subdivision as treating typhoid fever. Leaves were the most commonly used parts (58%) and decoction was the most commonly used preparatory method (99%). The oral administration is the most used mode in the treatment of typhoid (100%). These results show us that medicinal plants can contribute to the treatment of some diseases, subject to biological exploration of their activity so that these plants can constitute a source of improved traditional medicines for the treatment of typhoid fever.

• Received: 20 June 2021 • Revised: 14 September 2021 • Accepted: 22 September 2021 • Published Online: 6 October 2021

Introduction

Enteric infection diseases are responsible for more than 17 million deaths per year worldwide and more than half in Africa (Bourgeois et al., 2016). Many diseases except parasitic and viral diseases originate from food poisoning (Gagnon, 2007). Typhoid (Salmonellosis) is an acute febrile disease with orofaecal transmission occurring in areas with poor hygiene and caused by the bacterium *Salmonella typhi*

belonging to the large family of enterobacteria (Gake et al., 2015). It affects between 11 and 20 million people per year worldwide and results in the death of 128,000 to 161,000 people (WHO, 2018). It is common in Africa and particularly in developing countries where sanitation and hygiene conditions are poor (WHO, 2021) and its transmission is through consumption of water and food contaminated by people infected with *Salmonella typhi* (Oguon and Ogaba, 2010; Iroha et al., 2010).

In Cameroon, the death rate related to unsafe water and poor sanitation and hygiene is 45.2 per 100,000 inhabitants (Minsante, 2020). The department of La Vina, with its 156,056 inhabitants, is faced with several health concerns, particularly typhoid fever, and the people of La Vina are not spared this disease linked to unsanitary water. Faced with the lack of local health structures and the low income of the population, many patients resort to traditional medicine through naturopaths when they suffer from typhoid fever even though it can be treated by conventional medicine. The effectiveness of the treatment of typhoid through plants being proven, it would be important to know the plants used in the treatment of typhoid in order to value them through the manufacture of improved medicines for the

treatment of the disease. The purpose of this study is to make an inventory of the plants used by naturopaths in the Vina Subdivision in the treatment of typhoid fever.

Materials and methods

Study site

The study was conducted in July 2021 in five localities (Bamiyanga, Selbe-Darang, Sabongari, Beka-Hosséré and Gada-Mabanga) in the district of Ngaoundéré 1er and Ngaoundéré 2ème belonging to the Vina Subdivision in the Adamawa Region of Cameroon. This area is located between 7°26'16" North latitude and 13°33'34" East longitude (Fig. 1).

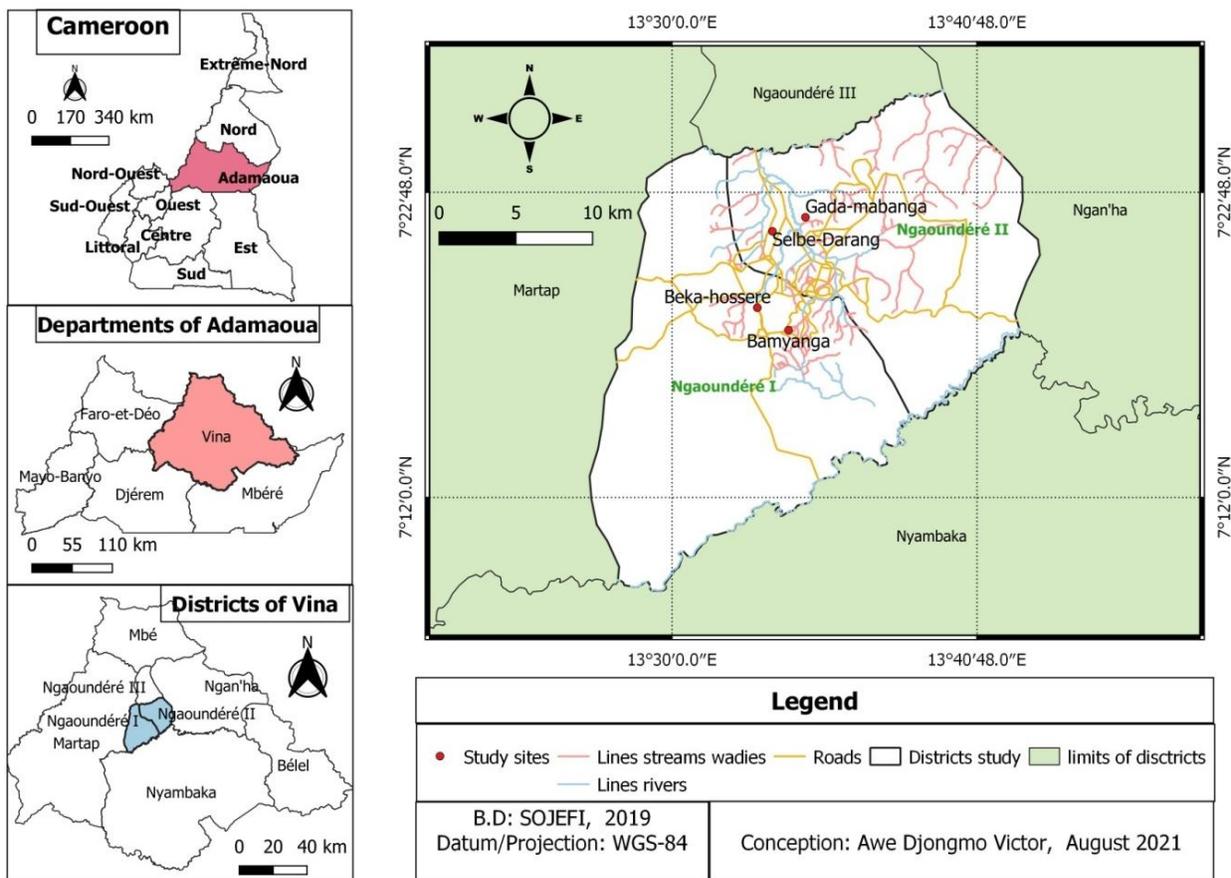


Fig. 1: Map of the location of the study area.

The climate is Sudano-Guinean, characterized by annual rainfall ranging from 1400 to 2000mm; while average temperatures range from 22°C to 24°C (Noiha et al., 2017b). The dominant soils are ferruginous with intrusions of ferralitic soils that cover basaltic, granitic

and sedimentary rocks. From a phytogeographic point of view, this site belongs to the domain of the high Guinean savannahs and consists of high and low altitude savannahs whose dominant plant species are: *Daniellia oliveri* and *Lophira lanceolata* (Hamadou,

2016). The dominant ethnic groups are the Mboum, Mbaya and Foulbé (Bronsvort et al., 2002). The main economic activities in this area are agriculture and livestock. Traditional medicine is the main means of treatment used by the local populations in this area.

Survey methods

The five localities where this study was conducted were chosen on the basis of areas where traditional medicine occupies a place of choice for the local populations. In these localities, on the orientations of the Lamidos of the villages, we went to the naturopaths. Only those who agreed to receive us within the framework of this work were considered in the framework of work.

A semi-structured questionnaire was administered to these naturopaths. The information on the plants was collected according to a standard model inspired by the pharmacy cards (Adjanooun et al., 1989). This ethnobotanical study was carried out with 20 traditional therapists. The questionnaire was structured in two parts: the first part dealt with the socio-demographic characteristics of the respondents (age, sex, marital status and level of education), followed by information on typhoid (local name, organs or parts of the plant used, methods of harvesting, methods of preparation, mode of administration, dosage, duration of treatment, effectiveness of treatment and origin of knowledge). After the administration of the questionnaire, the

naturopath took us to the collection sites where botanical samples were collected and their identification was done with the help of the Floras.

Data analysis

The data collected on the survey forms were then entered into an EXCEL spreadsheet and analyzed using SPSS.17.0 software. The Frequency of Citation (FC) reflects the regularity in the distribution of a species within the naturopathic community. It is expressed as the percentage of citations for a species relative to the total number of people surveyed. The CF of each species censored is calculated by the formula used by (Gbekley et al., 2015; Orsot, 2016) defined as: $CF = \frac{\sum (n/N) * 100$; with n: number of people who cited the species; N: total number of people surveyed.

Results

Socio-demographic characteristics of the respondents

The surveys carried out among naturopaths in the Vina Subdivision showed that the majority of respondents were men (80%) whose age varies between 20 and 70 years with a dominance of 50% of the age group 50 - 60 years. The majority (50%) were not educated and were mostly married (60%), with 50% stating that their knowledge was hereditary (Table 1).

Table 1. Socio-demographic characteristics of respondents (n= 20).

Variables	Categories	Workforce	Percentage (%)
Genres	Female	4	20
	Male	16	80
Ages (years)	20-30	0	0
	30-40	2	10
	40-50	5	25
	50-60	10	50
	60-70	3	15
	Level of study	Not in school	10
Primary		9	45
Secondary		1	5
Superior		0	0
Marital status	Married	14	70
	Single	3	15
	Divorced	1	5
	Widow (er)	2	10
Nature de l'acquisition des connaissances	Hereditary	12	60
	Empirical	7	35
	Reading	1	5

Table 2. Diversity of medicinal plants used in the treatment of typhoid fever in the Vina sub-division.

Vernacular name	Scientific name	Family	Frequency of citation (%)	Associated plants	Morphological type	Parts used	Method of preparation	Method of administration / Posology / Duration of treatment
Guayave	<i>Psidium guajava</i>	Myrtaceae	33.0	No	Tree	Leaf	Decoction	Oral way, 1 glass morning and evening for one week
Samatadjé	<i>Hymenocardia acida</i>	Hymenocardiaceae	45.83	<i>Annona senegalensis</i>	Shrub	roots	Decoction	Oral way, 1 glass morning and evening for one week
Doukoudjé Ladé	<i>Annona senegalensis</i>	Annonaceae	62.0	<i>Hymenocardia acida</i>	Shrub	roots	Decoction	Oral way, 1/2 glass morning and evening for one week
Doukoudjé Wouro	<i>Annona muricata</i>	Annonaceae	4.16	No	Shrub	Leaf	Decoction	Oral way, 1 glass morning and evening for one week
Annas	<i>Ananas comosus</i>	Bromeliaceae	33.0	<i>Bidens pilosa</i>	Herbaceous	Fruit	Decoction	Oral way, 1 glass morning and evening for one week
Lémou	<i>Citrus limon</i>	Rutaceae	8.33	<i>Psidium guajava</i>	Tree	Fruit	Decoction	Oral way, 1/2 glass morning and evening for one week
Djabbé	<i>Tamarindus indica</i>	Cesalpiniaceae	41.66	No	Tree	Leaf	Decoction	Oral way, 1 glass morning and evening for one week
Sabali	<i>Ageratum conyzoides</i>	Asteraceae	12.50	No	Herbaceous	Leaf	Decoction	Oral way, 1 glass morning and evening for one week
Mama tasba	<i>Senna occidentalis</i>	Fabaceae	37.50	<i>Cassia arereh</i>	Shrub	Leaf	Decoction	Oral way, 1 glass morning and evening for one week
Cauladjé	<i>Terminalia glaucescens</i>	Combretaceae	4.16	No	Shrub	Leaf	Decoction + beef oil	Oral way, 1 glass morning and evening for one week
Sobotoro	<i>Leptadenia lancifolia</i>	Apocynaceae	25.0	No	Liane	Leaf	Decoction + honey	Oral way, 1 glass morning and evening for one week
Gambohi	<i>Cassia arereh</i>	Cesalpiniaceae	29.16	No	Shrub	Roots	Powder	Oral way, 1/2 glass morning and evening for one week
Kokodi	<i>Afromosia laxiflora</i>	Fabaceae	33.33	No	Shrub	Bark	Decoction	Oral way, 1 glass morning and evening for one week
Bodilohi	<i>Vitex doniana</i>	Verbenaceae	20.0	No	Tree	Roots	Decoction	Oral way, 1/2 glass morning and evening for one week
Padewandou	<i>Erythrina sigmoides</i>	Fabaceae	70.0	No	Tree	Roots	Decoction	Oral way, 2 glass morning and evening for one week
Kolidjué	<i>Anogeissus leiocarpus</i>	Combretaceae	66.0	No	Tree	Bark	Decoction + natron	Oral way, 2 glass morning and evening for 9 days
Niesbali	<i>Erythrina senegalensis</i>	Fabaceae	37.50	No	Tree	Leaf	Decoction	Oral way, 1 glass morning and evening for one week
Dalehi	<i>Khaya senegalensis</i>	Meliaceae	75.0	No	Tree	Bark	Powder	Oral way, 1 glass morning and evening for one week
Bambou d chine	<i>Bambusa vulgaris</i>	Poaceae	4.16	No	Liane	Leaf	Decoction	Oral way, 1 glass morning and evening for one week
Fio	<i>Persea americana</i>	Lauraceae	4.16	No	Tree	Leaf	Decoction	Oral way, 2 glass morning and evening for one week
Mangoro	<i>Mangifera indica</i>	Anacardiaceae	4.16	<i>Khaya senegalensis</i>	Tree	Leaf	Decoction	Oral way, 2 glass morning and evening for one week
Safoutier	<i>Dacryodes edulis</i>	Burseraceae	4.16	<i>Khaya senegalensis</i>	Tree	Leaf	Decoction	Oral way, 2 glass morning and evening for one week
gnacabré	<i>Bidens pilosa</i>	Asteraceae	62.0	<i>Ananas comosus</i>	Herbaceous	Leaf	Decoction	Oral way, 1/2 glass morning and evening for one week
Bokassa	<i>Chromoleana odorata</i>	Asteraceae	20.83	No	Herbaceous	Leaf	Decoction	Oral way, 2 glass morning and evening for one week

Diversity of species used in the treatment of typhoid fever

A total of 24 species belonging to 22 genera and 16 families were identified in the study area as treating typhoid fever. The medicinal plant species most cited by the respondents were *Khaya senegalensis* (75%), *Erythrina symoides* (70%), *Anogeissus leiocarpus* (66%), *Bidens pinosa* (62%), *Annona senegalensis* (62%) and *Hymenocardia acida* (45.83%), and these plant species have an index of over 45% (Fig. 2).

Trees (45%) represent the most used morphological type by naturopaths, followed by shrubs (29.16%),

herbs (16.66%) and lianas (8.33%) (Table 2). Regarding the organs, leaves (58%), the most used parts/organs are followed by roots (21%), barks (13%) (Table 2). Two modes of preparation of recipes exist in the treatment of typhoid, the decoction which is dominant and the use of powder. For the modes of preparation, 99% of the plants treating typhoid fever in the study area are harvested manually with knives, in terms of time, 98% of these species are permanent and available throughout the year. All the recipes prepared and prescribed for the treatment of typhoid are taken orally. The duration of treatment varies between one and two weeks, for what concerns the dosage it varies between a glass and half a glass morning and evening (Table 2).

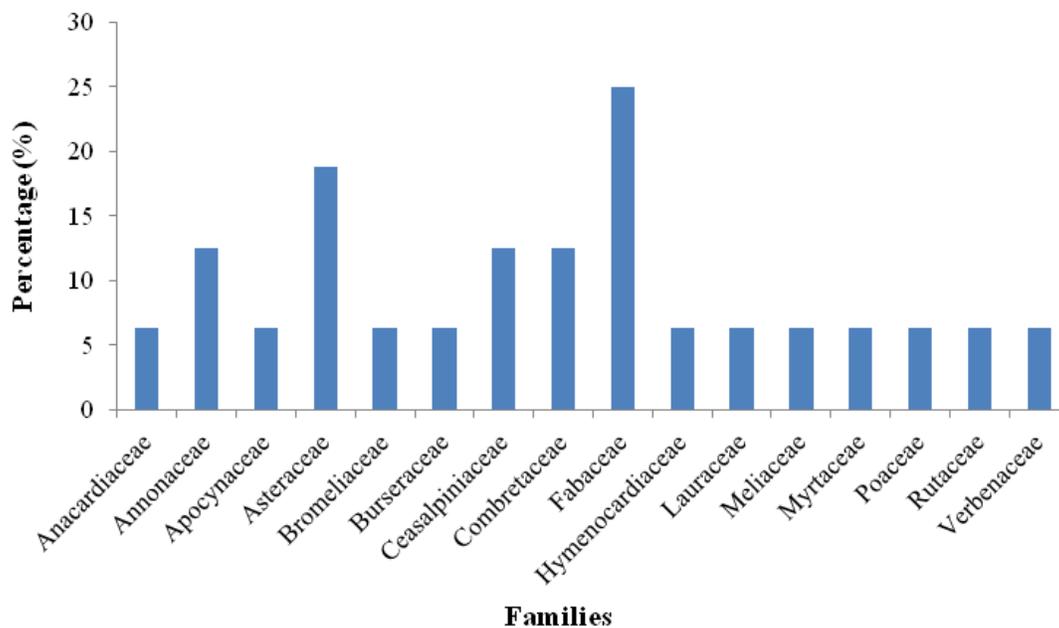


Fig. 2: Diversity of species families used in the treatment of typhoid fever.

Discussion

The field surveys allowed us to interview 20 people, the majority of whom were men. This result is similar to the findings of (Mpondo et al., 2012) during their work on phenol plants used by the people of Douala. The dominance of the male gender can be justified in the culture of this locality because parents give primacy to men in matters of inheritance, succession within the family.

The majority of respondents belong to the adult class, which has a proven knowledge of plant-based pharmacopoeia. Naturopaths of this age group have a strong experience and reputation in the treatment of

typhoid fever in the village and many patients trust them more than their younger colleagues. The absence of young people in this activity can be justified by their lack of interest in traditional medicine because they are more occupied with their studies. We observe that the majority of naturopaths get their knowledge from their ancestors (60%). The conservation and transmission of the knowledge of traditional medicine is necessary. Most of the respondents are illiterate.

The study carried out reveals 24 species distributed in 22 genera and 16 families, this result is not similar to that of (Inimbock et al., 2021) who found 16 species that treat fever in their work on plants treating Covid-19 carried out in the eastern region. This difference is

related to the ecology of the study areas, their work was conducted in a forest area while our work is on a savanna area. Trees are the morphological type most solicited for their leaves and roots, this result is similar to that of (Dibong et al., 2020) who worked in plants treating digestive tract diseases in the Noun department. Exploitation of these organs may pose a threat to these plants and even to the ecosystem (Betti, 2002).

The leaves (58%) are the parts of the plant most used for the preparation of recipes, This result is close to those (Tchatat and Ndoye, 2006; Mpondo and Dibong, 2012) , who worked on the knowledge of traditional plants used by ethnic groups in the city of Douala. The strong solicitation of the leaves can be related to its accessibility and the multitude of chemical groups that they contain, they are known as the places of synthesis of secondary metabolites responsible for the biological properties of the plant (Mpondo and Dibong, 2012) . Decoction (98%) is the most common method of recipe preparation as it allows complete extraction of the active principles of a plant during boiling (Ladoh-Yemeda et al., 2016). The most used harvesting technique remains manual, This result corroborates those of (Njouondo et al., 2015) in Cameroon who found that 93.94% of the plants studied are harvested manually.

Conclusions

With the aim of listing the plants used by naturopaths in the Vina Subdivision as traditional medicines used for the treatment of typhoid fever, this study identified 24 medicinal plant species, mainly trees, whose leaves were the most requested organ. However, knowing that the leaves and roots are the most used parts of the plants, further studies on the active ingredients of these plants to confirm their effectiveness should be an important source for the development of improved traditional medicines (TAMs) for the treatment of typhoid in Cameroon.

Conflict of interest statement

Authors declare that they have no conflict of interest.

Acknowledgement

We would like to thank all the referees whose contributions have been very important for the improvement of this manuscript.

References

- Adjanohoun, E., Cusset, E., Issa, L.O., Keita, A., Lebras, M., Lejoly, J., Waechter, P., 1989. Banque de données de médecine traditionnelle et de pharmacopée (Pharmel). Notice pour la récolte et l'entrée des données, ACCT, Paris.
- Bourgeois, A.L., Wierzba, T.F., Walker, R.I., 2016. Status of vaccine research and development for enterotoxigenic *Escherichia coli*. *Vaccine*, 34(26): 2880-2886.
- Betti, J.L., 2002. Medicinal plants sold in Yaoundé markets, Cameroon. *Afr. Study Monogr.*, 23(3): 47-64.
- Bronsvort, W.F, Bidara, R., Noort, A., 2002. Feature model visualization. *Comp. Graphics Forum*, 21(4): 661-673.
- Dibong, S. D. U., EtaméLoé, G., Okalla Ebongué, C., Ngaba, G.P., Boudjeka Guemkam, V., Yinyang, J., Nnanga Nga, E., Mpondo Mpondo, E., 2020. Contribution à l'étude ethnobotanique des plantes médicinales traitant les maladies de l'appareil digestif des peuples Bamouns au Cameroun. *Ethnopharmacologia*, 63: 58-69.
- Gagnon, M., 2007. Rôle des probiotiques lors d'infections entériques d'origines bactérienne et virale: Analyse in Vitro et étude in Vivo chez les modèles murins, PhD thèse, Université Laval, Québec, 170p.
- Gake B., Ngaroua, E. C., Gake, N. M., Keugoung, B., Mevoula Onana, D. E., 2015. Epidémie de fièvre typhoïde à Gassa, extrême –Nord Cameroun en 2011. *J. Méd. d'Afr. Noire*, 6205: 257-264.
- Gbekley, E.H., Karou, D.S., Gnoula, C., Agbodeka, K., Anani, K., Tchacondo, T., Agbonon, A., Batawila, K., Simpore, J., 2015. Étude ethnobotanique des plantes utilisées dans le traitement du diabète dans la médecine traditionnelle de la région Maritime du Togo. *Pan Afr. Med. J.*, 20: 437-452.
- Hamadou, M., 2016. Diversité floristique, potentiel de séquestration et stock de carbone dans les reboisements à *Eucalyptus* spp. de la région de l'Adamaoua. Mémoire de master II, université de Ngaoundéré (Cameroun), 64p.
- Inimbock, S.L., Chimi, D.C., Enamba, Y.C., Tsemo, T.D.C., Somnjom, E.D., Mounmenie, K.H., Bogne, T.L.V., Noudem, J.C., Nanfack, T.C.L., Misse, A.C., 2021. Contribution to traditional knowledge used for the prevention and healing of the Covid-19 symptoms by local people of Deng-Deng massif forest Cameroon. *Int. J. Curr. Res. Biosci. Plant Biol.*, 8(7): 7-16.

- Iroha, J.R., Ilang, D.C., Ayugu, T.E., Oji, A.E., Ugbo, E.C., 2010. Screening for anti-typhoid activity of some medicinal plants used in traditional medicine in Ebony state Nigeria. *Afr. J. Pharm. Pharmacol.*, 4(12): 860-864.
- Ladoh-Yemeda, C.F., Vandi, D., Dibong, S. D., Mpondo, M. E., Wansi, J. D., Betti, J. L., Choula, F., Ndongo, D., Tomedi, E. M., 2016. Etude ethnobotanique des plantes médicinales commercialisées dans les marchés de la ville de Douala, Cameroun. *J. Appl. Biosci.*, 99: 9450-9468.
- MINSANTE, 2020. Plan National de Développement Sanitaire (PNDS) 2016-2020.
- Mpondo, M. E., Dibong, S. D., 2012a. Traditional knowledge on medicinal plants use by ethnic communities in Douala, Cameroun. *Eur. J. Med. Plants*, 2(2): 159-176.
- Mpondo, M. E., Dibong, S. D., Ladoh Yemeda, C. F., Priso, J. R., Ngoye, A., 2012. Les plantes à phenols utilisées par les populations de la ville de Douala. *J. Anim. Plant Sci.*, 15(1): 2083-2098.
- Ndjouondo, G. P., Nguene, J. P., Ngoule, C. C., Kidik, M. C., Ndjib, R. C., Dibong, S. D., Mpondo, M. E., 2015. Inventaire et caractérisation des plantes médicinales des sous bassins versants Kombo et Long mayagui (Douala, Cameroun). *J. Anim. Plant Sci.*, 25(3): 3898-3916.
- Noiha Noumi V., Zapfack L., Hamadou R.M., Awé Djongmo V., Witanou N., Nyeck B., Ngossomo J. D., Tabue Mbobda R. B., Mapongmetsem P. M. (2018). Floristic diversity, carbon storage and ecological services of *Eucalyptus* agrosystems in Cameroon. *Agrofor. Syst.*, 92: 239-250.
- Oguoru, C. V., Ogaba, J. O., 2010. Ethnobotanical survey of anti-typhoid plants amongst the Idona people of Nigeria, *Int. Sci. Rest.*, 2: 34-40.
- Orsot B.A.M.B., 2016. Étude ethnobotanique des plantes médicinales utilisées dans le traitement des maladies de la peau par les Abbey du Département d'Agboville (Côte d'Ivoire) et évaluation de l'activité antifongique des extraits de quatre plantes sur *Sclerotium rolfsii*, un phytopathogène. Thèse de Doctorat Unique de Botanique, Université Félix HOUPHOUËTBOIGNY, Côte d'Ivoire, 168 p.
- Tchatat, M., Ndoye, O., 2006. Etude des produits forestiers non ligneux d'Afrique centrale :réalités et perspectives. *Bois For. Trop.*, 289: 27-39.
- WHO, 2018. Fièvre typhoïde. <http://www.who.int/features/qa/typhoid-fever/fr/> consulté le 28 juillet 2021.

How to cite this article:

Nyeck, B., Awé, D. V., Chimi, D. C., Noiha, N. V., 2021. Diversity of medicinal plants used in the treatment of typhoid fever in the High Guinean savannah zone of Cameroon. *Int. J. Curr. Res. Biosci. Plant Biol.*, 8(10): 10-16.
doi: <https://doi.org/10.20546/ijcrbp.2021.810.002>