

Medicinal Plants from Democratic Republic of the Congo as Sources of Anticancer Drugs

Koto-te-Nyiwa Ngbolua^{1,2,*}, Damien S. Tshibangu², Pius T. Mpiana², Virima Mudogo², Dorothée D. Tshilanda², Colette Masengo Ashande¹, Selvaraj Divakar³, Muthiah Ramanathan³, Govindarajan Syamala³

¹University of Gbadolite, P.O. Box 111 Gbadolite, Nord-Ubangi Province, Democratic Republic of the Congo

²Faculty of Science, University of Kinshasa, P.O. Box 190 Kinshasa XI, Democratic Republic of the Congo

³Department of Pharmacology, PSG College of Pharmacy, Coimbatore, India

*Corresponding author: Koto-te-Nyiwa Ngbolua, Ph: +243 81 68 79 527, E-mail: jpngbolua@unikin.ac.cd

Received: December 02, 2017, Accepted: January 14, 2018, Published: January 14, 2018.

ABSTRACT:

According to the WHO, more than 80% of the population in Africa resort to the traditional medicine for their health care. In the present study, a survey was carried out among traditional practitioners and the most cited plant species was submitted to anticancer experiments *in vitro*. The results revealed that *Gardenia ternifolia* contains secondary metabolites with anticancer activity and is selective towards breast (MCF-7) cancerous cell lines.

Keyword: Evidence based Medicine, indigenous knowledge, botanical Medicine, cancer, DR Congo.

INTRODUCTION

Cancer is a major public health problem all over the world and constitutes the second leading cause of death after cardiovascular disease [1]. Because of serious side effects of both chemo- and radiation therapies, many patients seek alternative and complementary methods of treatment. Several anti-cancer agents derived from plant species (Taxol, Camptothecin, Topotecan, etc. and their derivatives) are in clinical use or in preclinical development (Flavopiridol, Silvestrol, Betulinic acid, etc.) [2].

Democratic Republic of the Congo (DRC) as one of the hotspots of plant biodiversity in the world could play a key role in the R & D of new anti-cancer agents from its flora [3]. The aims of this multidisciplinary research program were: (a) To validate scientifically the traditional use of selected plant species by investigating anti-cancer activity of their extracts as a possible source of anti-cancer hits using human prostate (PC-3) and breast (MCF-7) cancerous cell lines and non-cancerous rat skeletal muscle L6 cell lines as model systems (Scientific evidence based Traditional Medicine); (b) To evaluate the therapeutic index of the biologically active extracts; (c) To develop anti-cancer phytomedicines as a result of the transformation of indigenous/ethno-medical knowledge into large scale action by the mean of Science and Technology (Research for sustainable development).

MATERIALS AND METHODS

An ethno-botanical survey was conducted in DRC according to the principles laid out in the Declaration of Helsinki and the Nagoya protocol. Traditional Healers and/or medicinal plant vendors (50) were interviewed about medicinal plants used in Congolese folk medicine [4]. The powdered leaves of *Gardenia ternifolia* were extracted by maceration. Successive extractions were carried out with organic solvents of increasing polarity (Petroleum ether, Chloroform, Ethyl acetate, Methanol and Methanol 80%). Anti-cancer bioactivity of different extracts was assessed by MTT assay. Paclitaxel was used as positive control [5].

RESULTS AND DISCUSSION

Ethno-botanical survey revealed that the most cited plant species was *Gardenia ternifolia* (or Lembanzau in Kikongo) with a high value of informant consensus factor (0.361). Biological screening revealed that chloroform and ethyl acetate soluble fractions are biologically active against MCF-7 cell lines with a CC50 (50% cytotoxic concentration) of $21.62 \pm 1.6 \mu\text{g/mL}$ and $45.44 \pm 2.2 \mu\text{g/mL}$ respectively. For PC-3 cell lines, the CC50 were $9.66 \pm 2.6 \mu\text{g/mL}$ and $24.47 \pm 1.1 \mu\text{g/mL}$, respectively for chloroform and ethyl acetate extracts. The petroleum ether, methanol and methanol 80% crude extracts were inactive against both MCF-7 and PC-3 cell lines ($50 < \text{CC50} < 100$ or $\text{CC50} > 100 \mu\text{g/mL}$). The chloroform extract displayed interesting therapeutic index or safety ratio ($\text{CC50 L6/CC50 MCF-7}$ or $\text{PC-3} \geq 3$). This extract is 3 or 7 times selective in killing the cancerous cell lines (MCF-7 or PC-3) than the non-cancerous cell lines (L6) [5]. This could be due to the different secondary metabolites extracted with the chloroform solvent.

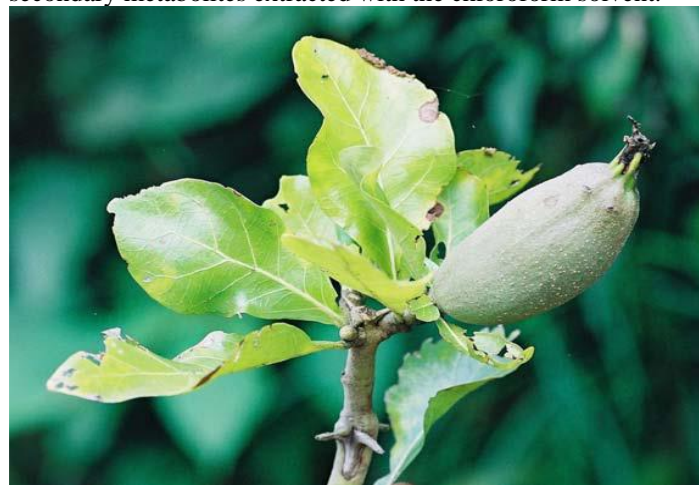


Figure 1 : *Gardenia ternifolia*

CONCLUSION

The chloroform extract of *Gardenia ternifolia* decreases the cancerous cell lines density in vitro. As potential candidate, *G. ternifolia* could be developed as therapeutic phytomedicine against human prostate and breast cancers. Further studies are therefore in progress to purify and elucidate the structure(s) of bioactive compounds.

Acknowledgments

The authors are indebted to the Organization staff of Unesco-Merck Africa Research Summit 2017 on Cancer Research & Vaccines development held in Port Louis, Mauritius founded by Merck Foundation.

REFERENCES

1. Rajandeeep K, Jagpreet S, Gagandeeep S, Harpreet K. Anticancer plants: A review. *Nat Prod Plant Res.* 1(4): 131-136, 2011
2. Tshibangu DST, Selvaraj D, Muthiah R, Govindarajan S, Ngbolua KN, Mudogo V, Tshilanda DD, Misengabu MN, Mpiana PT. In Vitro Anticancer Assessment of *Annickia*
3. chlorantha (Oliv.) Setten & Maas Stem (Annonaceae) Bark from Democratic Republic of Congo. *Journal of Biosciences and Medicines* 4: 23-29, 2016.
4. Ngbolua KN, Rakotoarimanana H, Rafatro H, Ratsimamanga US, Mudogo V, Mpiana PT, Tshibangu DST. Comparative antimalarial and cytotoxic activities of two *Vernonia* species: *V. amygdalina* from the Democratic Republic of Congo and *V. cinerea* subsp *vialis* endemic to Madagascar. *Int. J. Biol. Chem. Sci.* 5 (1): 345-353, 2011.
5. Ngbolua KN, Shetonde OM, Mpiana PT, Inkoto LC, Masengo CA, Tshibangu DST, Gbolo ZB, Baholy R, Fatiany PR. Ethnopharmacological survey and Ecological studies of some plants used in traditional medicine in Kinshasa city (Democratic Republic of the Congo). *Tropical Plant Research* 3(2): 413-427, 2016.
5. Tshibangu DST, Divakar S, Ramanathan M, Syamala G, Ngbolua KN et al. In vitro Screening of the leaf extracts from *Gardenia ternifolia* (Forest *Gardenia*) for their anticancer activity. *Journal of Complementary and Alternative Medical Research* 1 (2): 1-7, 2016.

Citation: Koto-te-Nyiwa Ngbolua *et al*(2018), Medicinal Plants from Democratic Republic of the Congo as Sources of Anticancer Drugs. *J. of Advanced Botany and Zoology.* V6I1.01. DOI: 10.5281/zenodo.1162973

Copyright: © 2018 Koto-te-Nyiwa Ngbolua, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.