IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Potential Anticancer properties of Hexanoic Root Bark Extracts of East African Herb: *Caylusea abyssinica*

[a]Kemboi Willy

University of Nairobi, School of Graduate Studies, Department of Medical Microbiology and Immunology

[b]Marianne Wanjiru Mureithi

Department of Medical Microbiology, School of Medicine, University of Nairobi

[c]Gracelyn Portia Antthony Doss

Department of Biological Sciences and Agriculture, University of Eastern Africa, Baraton

[d]Antony Otinga Otengo

Department of Biological Sciences and Agriculture, University of Eastern Africa, Baraton

Abstract

Caylusea abyssinica is an erect herb which can grow as tall as above one metre. It grows mainly in disturbed soils, however it is mainly found in wet and cold regions of East Africa. Communities in these regions of Africa, value the herb though there is little scientific information about its medicinal value. This study sought scientific evidence of the claim that the plant is anticancer. Hexanoic extraction was done and Gas Chromatography and Mass spectroscopy (GC/MS) techniques were used to identify its phytochemicals in reference to NSTL, 2014. The findings revealed that GC/MS chromatograph depicted 100% Benzene, (2-isothiocyanatoethyl)-. Reports from showed that *C. abyssinca* has so far, the highest amount of anticancer compound. This compound is packaged for medical use.

Key words: *Caylusea abyssinica,* Benzene, (2-isothiocyanatoethyl)-. anticancer

1. Introduction

The classification systems applied in botanical studies put the target plant Kingdom plantae, clade angiosperm, clade Eudicots, clade rosids, order brasssicales, family resedaceae , genus caylusea and species abyssinica.

There is little published evidence for *Caylusea Abyssinica*. As cited by Ruffo, Birnie and Tengnas (2002), it is an erect shrub that grows mainly around farms and in disturbed ecosystems. It should be emphasized that plants grow

very well even in a disturbed ecosystem. In a series of observational studies conducted by researchers, the plant was found growing in a nature reserve at the University of Balaton in East Africa.

Literature on the subject of "frezen" is scarce, but its importance may not be so overridden. It grows as a weed in maize and wheat fields around the world, including India, Nandi County, and Elgueiyo Marakwet in Africa. Depending on soil conditions, it can reach a height of 1.5 meters. It is used as a food and as a flavoring agent. When mixed with grains, this plant imparts a bitter taste to dishes. It grows well in tropical eastern Africa such as Sudan, Eritrea, Ethiopia, Uganda, Kenya, Rwanda, Burundi, Tanzania and Malawi. Boiling the leaves can help soothe an upset stomach and get rid of intestinal parasites. A charred whole plant or root mixture is used as hash (Ruffo, Bernie, Tennas, 2002).

Heneman and Zidenberg (2008) while acknowledging the significance of phytochemicals, mentioned that phytochemicals functions in the life of plants can also be translated into humans. This statement created a potential research area which till this time has not been fully exploited.

In response to Heneman and Zidenberg (2008) other scientific studies conducted previously have established criteria for the classification of phytochemicals.

Two compounds isolated from *Caylusea absyssinica*, were discovered as β-sitosterol and stigmasterol. These two isolates were proven to be active against all the bacterial strains in the experiment where zone of inhibition was used as a determining criterion. Interestingly, the extract identified had showed inhibition zones ranging from 12 millimeters 15 millimeters by phytochemical one and eleven millimeters eighteen millimeters by phytochemical two against the different strains of *bacteria* (Edilu, Adane , & Woyessa , 2015).

Currently the herb used as antibacterial, antiglycemia, and other conditions by communities in Ethiopia, Rift Valley region of Kenya and as a vegetable in Tanzania. Its anti-cancer properties have never been ascertained.

2. Materials and Methodology

Collection of the sample

The roots of *Caylusea absyssinica* were collected in May, 2019 from the University of Eastern Africa, Baraton Nature Conservancy. The University geographical coordinates are approximately 0.2574° N, 35.0826° E. Botanical identification of the plant was done by a Botanists at the University of Eastern Africa, Baraton, the specimen voucher

number UEAB-BH-28-5 was deposited at the Herbarium of the Department of Biological sciences, University of Eastern Africa, Baraton.

After collection, plant sample was washed using tap water to remove any dirt and other materials attached to the plant. Wiping the samples with clean and dry cloth improved the process of drying.

The study employed natural drying method where the plant sample was kept under the shade at the university of Eastern Africa Chemistry Research Laboratory until the moisture content was enough to allow extraction process.

The collected plant root bark material was chopped into small pieces and air-dried under shade without exposing it to direct sunlight and the dried plant material was grounded to 0.5 µm sizes using laboratory blender.

Extraction of Phytochemicals

Extraction was done using hexane employing maceration technique and procedural shaking that lasted for 72 hours at 25°C for using a shaker. The extracted material from acetone was filtered first using a cotton followed by Whatman filter paper. The filtrates were intense using rotary evaporator under reduced pressure. The resulting crude isolates was weighed and stored at 4°C at University of Eastern Africa, Baraton in Medical Microbiology Laboratory (Szewczyk & Bogucka, 2006).

Gas Chromatography and Mass Spectroscopic Analysis of the Extract

Japan's shimadzu GCMS GP 2010 SE was used equipped with a BPX5 column (length 30m, thickness 0.25µm, diameter 0.25mm). The column oven temperature was set at 55^0C, injection temperature at 200^0C and a temperature below was used to achieve separation of compounds.

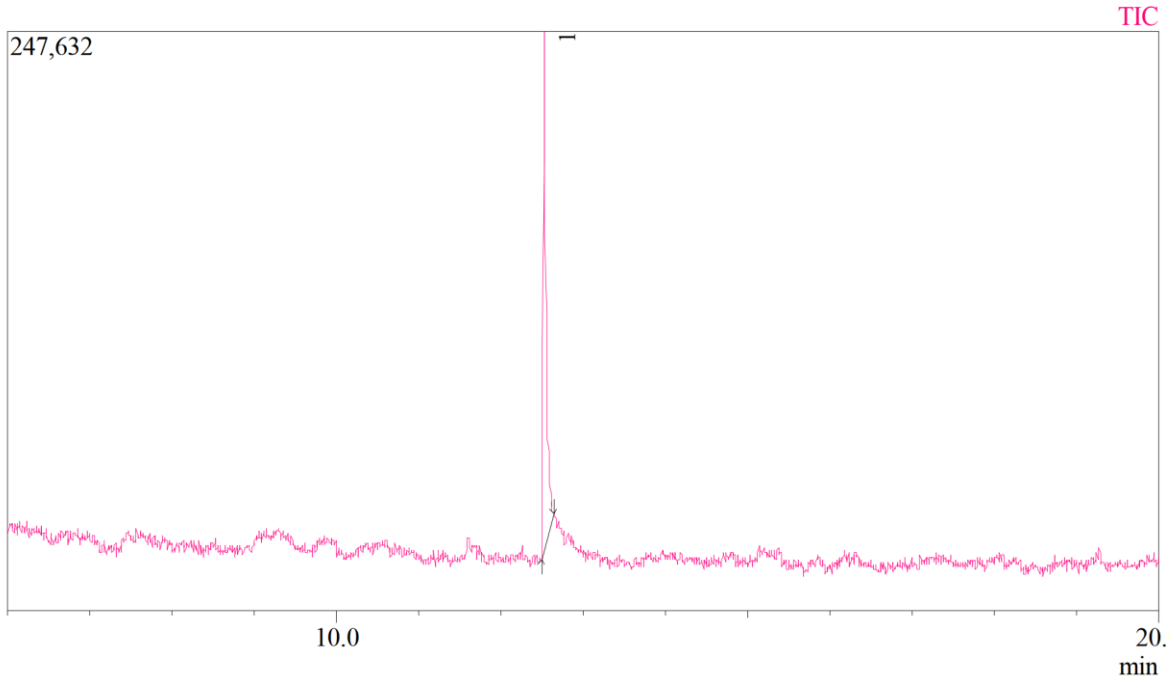
Rate	FT	Hold Time
-	55	1
10^oc/min	280	13

The total program time was 37 minutes. The sample from column chromatography was injected in a split mode of 1:10.

The mass spectrometer was run in scan mode starting from m/z of 35 – 55^OC. 10n source temperature was at 200ºC and interface temperature 250ºC.

National Institute of Standards and Technology Library 2014 was used to identify the compounds based on their mass to charge ratios. The compounds were recorded and presented in the results section.

3. Results



Peak Report TIC

Peak#	R.Time	Area	Area%	A/H	Name
1	12.525	542942	100.00	2.46	Benzene, (2-isothiocyanatoethyl)-
		542942	100.00		

Figure 1: Retention peaks of the identified phytochemicals

Figure 1 shows the GC/MS output of *C. abyssinca*. It depicts only one peaks with a retention time of 12.525 and total percentage of 100%. The phytochemical is identified as Benzene, (2-isothiocyanatoethy) is the most abundant phytochemical identified using GC/MS. The extraction solvent used was hexane. Hexane is a non-polar solvent with a boiling point of 68°C, and is therefore the solvent of choice for oil extraction of oils such as 2-Isothiocyanotoethyl.

4. Discussion

Anticancer properties of 2-Isothiocyanotoethyl

Zeda et al. (2015) in their study extracted (2-fluoro-2-isothiocyanatoethyl)benzene, (2-chloro-2 isothiocyanatoethyl)benzene,(2-bromo-2-isothiocyanatoethyl)benzene,(2-isothiocyanatopropyl) benzene, (2-isothiocyanato Butyl)benzene and (1-isothiocyanatoethane-1,2-diyl)di benzene are carried out including exchange and correlation. The phytochemicals were obtained from shyshaq plant using nano technology. The study findings are close the present study's findings because of the presence of stem isothiocyanato and in addition, the presence of benzene ring. The findings showed that these compounds correlate with the present study's findings had anticancer properties.

In addition, Kumar et al. (1993) synthesized Methyl 4-(isothiocyanatomethyl) thiazole-2-carbamates, -selenazole-2-carbamates, and related derivatives which was then used as antitumor compounds. 2-isothiocyanoto ethyl is mainly found in several species of vegetables, where it is commonly called mustard oil. There is no single plant ever reported in the literature that contains a large amount of this compound. However, its anticancer properties could be elucidated by the fact that local communities in Rift Valley region of Kenya use the herb as antibacterial, anticancer, antiviral and antihelminth. Currently, there is scanty information about this vital phytochemical.

Isothiocyanates were isolated from various forms of wasabi (Hu &We, 2013) using extraction and distillation methods to describe their medicinal properties. Experiments with isothiocyanates on liver cancer cells was carried out. As a result, the isothiocyanate content of wasabi was found to in roots, stems, and leaves. Allyl isothiocyanate and (2-isothiocyanatoethyl) benzene were the major volatile compounds in wasabi strains. Wasabi distillate inhibited liver cancer cells and killed them within one and half hours after treatment. The results of this study provided scientific evidence for the medicinal benefits of isothiocyanates isolated from wasabi in fighting cancer. This study is directly related with the present study's findings especially the phytochemical composition of their target herb. The only difference is that *C. abyssinca* has the highest amount of (2-isothiocyanatoethyl) benzene.

5. Conclusion

Caylusea abyssinca is rich in Bezene 2(isothiocyanato ethyl) which is natural anticancer compound. The plant's phytochemical is a potential anticancer treatment.

6. Acknowledgement

University of Eastern Africa, Baraton for provision of space and materials during extraction process. Jomo Kenyatta University of Science and Technology, Chemistry department, the chromatographic analysis and comparisons.

7. References

Edilu, A., Adane, L., & Woyessa, D. (2015). In vitro antibacterial activities of compounds isolated from roots of Caylusea abyssinica. *Ann Clin Microbiol Antimicrob*, 14(15), 233-248.

Heneman, K., & Zidenberg, S. (2008). Nutrition and Health Infor Sheet. *ANR publication*. Retrieved from https://anrcatalog.ucanr.edu/pdf/8313.pdf

Hu, S. Q., & Wei, W. (2013). Study on extraction of wasabi plant material bio-activity substances and anti-cancer activities. *In Advanced Materials Research* (Vol. 690, pp. 1395-1399). Trans Tech Publications Ltd.

Kumar, Y., Green, R., Borysko, K. Z., Wise, D. S., Wotring, L. L., & Townsend, L. B. (1993). Synthesis of 2, 4-disubstituted thiazoles and selenazoles as potential antitumor and antifilarial agents. 1. Methyl 4-(isothiocyanatomethyl) thiazole-2-carbamates,-selenazole-2-carbamates, and related derivatives. *Journal of medicinal chemistry*, 36(24), 3843-3848.

Ruffo, C., Birnie, A., & Tengnas, B. (2002). Edible Wild Plants of Tanzania. Nairobi. ISBN:9966-896-60-0: Regional Land Management Unit.

Szewczyk , K., & Bogucka, A. (2006). Analytical Methods for Isolation,Separation and Identification of Selected Furanocoumarins in Plant Material. *Intechopen,* 59-81. Retrieved from http://cdn.intechopen.com/pdfs/32938.pdf

Zadeh, M. A. A., Lari, H., Kharghanian, L., Balali, E., Khadivi, R., Yahyaei, H., ... & Monajjemi, M. (2015). Density Functional Theory Study and Anti-Cancer Properties of Shyshaq Plant: In View Point of Nano Biotechnology. *Journal of Computational and Theoretical Nanoscience*, *12*(11), 4358-4367.