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CHEMICAL COMPOSITION AND ANTIOXYDANT ACTIVITY OF ESSENTIAL OIL OF ENANTIA POLYCARPA ENGL. & DIELS (ANNONACEAE) STEM BARK HARVESTED IN AZAGUIE (COTE D'IVOIRE)

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ABSTRACT

This reseach was conducted to contribute to the values of medicinal and aromatic plants of Côte d'Ivoire. *Enantia polycarpa* is an Annonaceae whose different parts are used in traditional medicine. Essential oil was extracted by hydrodistillation from his stem bark. We carried out the phytochemical composition of essential oil of *Enantia polycarpa*'s stem bark harvested in Azaguié (Côte d'Ivoire), by gas chromatography coupled to mass spectroscopy (GC-MS) and evaluate the antioxidant activity by spectrophotometer. Hydrocarbon sesquiterpenes and oxygenated compound have been identified. *E. polycarpa* stem bark's oil is dominated by oxygenated compounds (45,71%). The major compound is the cyclic sequiterpene β-elemene (16.36%). It contained also significant content of spathulenol (11.53%), cadinol (8.37%), caryophyllene oxide (6.60%), α-copaene (6.09%), 4,5,9,10-dehydro-isolongifolene (6.07%), β-humulene (5.13%) and globulol (5.40%). Evaluation of antioxidant activity showed that essential oil of *Enantia polycarpa*'s stem bark possess hight antioxydant activity (RC_{50} = 0.036 ± 0.02 mg/mL) more than vitamin C (RC_{50} = 0.083± 0.003mg/mL) taken as a reference. which could be due to its chemical composition. This strong antioxidant activity would justify among other things the use of this part of the plant in traditional medicine.

KEYWORDS: *Enantia Polycarpa*, Essential Oil, Côte D'Ivoire.

1. INTRODUCTION

The Ivorian flora has a great biodiversity that benefits traditional medicine, used by the vast majority of rural populations. Using plants for the treatment of diseases in Cote d'Ivoire is systematic. Plant species used in traditional medicine include aromatic plants, which are a source of high value-added products such as essential oils, extracts and resins.[1–2] Essential oils produced by aromatic plants appear as a potential source of active molecules. They are being studied for their possible use as an alternative for the treatment of certain infectious diseases.[3] Many studies have been carried out on aromatic and medicinal plants from the Ivorian flora.[4–7]

E. polycarpa (*Annickia polycarpa*) is small to medium up to 20 m; bark smooth to slightly rough or fissured, green to blackish, inner bark fibrous and bright yellow species of *E. polycarpa* limited to West and Central Africa, from Sierra Leone to Nigeria and western Cameroon, but one endemic to Tanzania north-eastern. It is traditionally used to treat sores, ulcers, leprosy and ophthalmia. The Guéré use bark extract as a nerve poison of hunting arrows. Bark decoction is also used to treat fever and malaria.[8]

Several phytochemical and antimicrobial tests have been carried out on solvent extracts from the bark.[9–10] The essential oil of the leaves of this plant has been biologically investigated.[11–12] But, the essential oil of *Enantia polycarpa*'s sterm bark has not yet been biologically investigated to our knowledge.

This work is to determine the chemical composition and antioxidant activities of essential oils extracted from the *Enantia polycarpa*'s stem bark.

2. MATERIAL AND METHOD

Plant Material and Hydrodistillation: The vegetable material is composed of *Enantia polycarpa*'s stem bark from Azaguié (5° 37' 59.999" N 4° 4' 59.999" W)**.**[13] The plant have been identified thanks to herbarium of National Floristic Center of Côte d'Ivoire under the numbers UCJ001183. The material was dried in a room temperature. The essential oil extraction was realised in four hours with a Clevenger type hydro-distiller.

GC-MS analysis: A GC (7890A, Agilent Technologies) instrument coupled with MS (5975C, Agilent Technologies). The liquid sample volume of 1 µl was injected to a liner with 250°C and a split ratio of 100:1. The capillary column HP-5MS was used. Oven temperature programming was as follows: 40°C (hold 5 min), then a rate of 2°C/min to 250°C; then a rate of 10°C/min to 300°C. The carrier gas helium flow was 1 mL/min. Solvent delay: 2 min. The source and transfer line of MS detector were at 230 and 280°C, respectively, while the detector voltage was 1.4 kV, and the scan range of mass to charge ratio of ion was 40-500.

In vitro radical scavenging test: 2.2-Diphenyl-1-picrylhydrazyl (DPPH, Cat.: D913-2, Lot : STBB0555), is solubilized in the absolute methanol to get concentrated solution of 0.03 mg/mL. 10 mg of essential oil are diluted within 5 mL of the same solvant. Different concentrated ranges comprised between 0.0625 to 2 mg/mL of each sample of essential oil are made by successive dilutions in the absolute methanol. In some dry and sterile tubes we introduce 2.5 mL of essential oil sample and 1 mL of methanolic solution of DPPH. After stirring, we put the tubes in dark for 30 min. the absorbance is then measured with a spectrophotometer (UVvisible WPA S800, N0113648) at 517 nm against a blank consisting of 2.5 mL of pure methanol and 1 mL of alcoholic solution of DPPH. The positive control vitamin C prepared under the same condition as the study samples. The inhibitory half-concentration (IC_{50}) of the sample was determined graphically.

3. RESULT AND DISCUSSION

Chemical composition: The composition of *E. polycarpa*'s stem bark essential oil being investigated for the first time, a sample has been submitted to detailed analysis using gas chromatography coupled to mass spectrometry (GC-ms). The retention indices were determined from retention times.[14–15] Twenty four (24) compounds were identified in the essential oil of the of stem bark of *E. polycarpa*, about 89.55% of total composition (Table1). Analysis has shown that *E. polycarpa* sterm bark's oil is dominated by oxygenated compounds (45,71%) and hydrocarbon sesquiterpenes (43.84%). The major compound is the cyclic sequiterpene β-elemene (16.36%). It contained also spathulenol (11.53%), cadinol (8.37%), caryophyllene oxide (6.60%), α-copaene (6.09%), 4,5,9,10-dehydro-isolongifolene (6.07%), β-humulene (5.13%) and globulol (5.40%) (Table 1). Accordind to Kouassi and *al*., the main compounds of the essential oil of *E. polycarpa* leaves are β-elemene, samely Yapi and *al*, studied the chemical variability of the extracted essential oil from *Enantia polycarpa* leaves, and showed that its composition is dominated by β-elemene.[11–12] These studies revealed the same majority compound. It would therefore seem that the dominant compound in the essential oil of leaves and stem bark of *E. polycarpa* is β-elemene.

Table 1: Compounds identified in the essential oil of *E. Polycarpa* stem bark.

N°	Compounds	RT (min)	RI	m/z	% of total
1	elemene d	40.615	1333.70		1.28
2	α-copaene	42.957	1370.16		6.09
3	β-elemene	44.086	1387.74		16.36
4	β-caryophyllene	45.602	1411.97		1.68
5	β-cubebene	46.251	1422.62		1.23
6	α-humulene	46.665	1429.42		0.76
7	germacrene D	47.689	1446.23		1.15
8	β-humulene	49.405	1474.41		5.13
9	(+)-epi-bicyclosesquiphellandrene	50.318	1489.40		1.10
10	aromadendrene	50.674	1495.25		0.73
11	9,10-dehydro-isolongifolene	51.426	1508.04		0.95
12	4,5-dehydro-isolongifolene	52.044	1518.78		1.31
13	4,5,9,10-dehydro-isolongifolene	53.572	1545.32		6.07
14	spathulenol	54.351	1558.86		11.53
15	globulol	55.029	1570.63		5.40
16	caryophyllene Oxide	55.242	1574.33		6.60
17	humulène Epoxide	56.261	1592.04		1.05
18	humuleneEpoxide II	56.755	1600.65		2.29
19	γ-eudesmol	57.036	1605.78		3.68
20	epi-Cubenol	58.031	1623.94		2.00
21	cadinol oc	59.274	1646.62		8.37
22	cadina-1,4-diene-3-ol	60.018	1660.20		1.21
23	α-cyperone oc	63.991	1734.35		0.72
24	isoaromadendrene epoxide	65.149	1756.55		2.86
Sesquiterpene					43.84
Oxygenated compounds					45,71
TOTAL					89,55

RI : retention indice; RT : retention time; m/z : mass to charge

Antioxydant activity

Essential oil possess hight antioxydant activity (RC_{50} = 0.036 ± 0.02 mg/mL) more than vitamin C **(**RC_{50} = 0.083± 0.003mg/mL) taken as a reference (Figure 1).

Compared to the essential oil of the leaves of this species (RC_{50} = 0.27± 0.05 mg/mL) investigated by our team.[12] that of the trunk bark has greater antioxidant activity.

Also the huge proportion of oxygenated compositions in the essential oil of *E. polycarpa* leaves could justify its high antioxydant activity ; In fact, according to the works of Kalemba and *al*. in 2003, the activity of molecules depend on both the lipophilic character of their hydrocarbonate skeleton and the hydrophilic character of their functional group. The oxygenated molecules are generally more active than the hydrocarbon molecule.[16–18]

In addition, β-elemene (16.36%) is the majority compound. β-elemene is a sesquiterpene chemical derived from plant that has been used in traditional medicine to cure a variety of cancers with no serious side effects observed. β-elemene has been found to decrease cell proliferation, halt the cell cycle, and cause cell death in recent research employing in vitro and in vivo investigations coupled with molecular techniques. Several authors have shown that beta elemene and its derivatives have a very good antioxidant activity.[19–21]

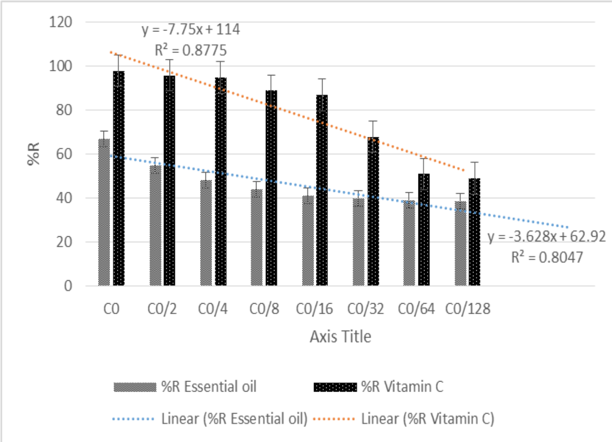

Figure 1: Percentage of reduction of *E.polycarpa's* stem bark essential oil and vitamin C.

4. CONCLUSION

This study permitted to identify the composition through GCMS and evaluate the antioxydant activity of essential oil of *Enantia polycarpa* harvested in of Côte d'Ivoire. *E. polycarpa* stem bark's essential oil is dominated by oxygenated compounds (45,71%) and hydrocarbon sesquiterpenes (43.84%). The major compound beta elemene (16.36%).

Evaluation of antioxidant activity showed that the essential oil of the stem of *Enantia polycarpa* has very good antioxidant activity (RC_{50} = 0.036 ± 0.02 mg/mL). This good antioxidant activity that could justify among other things the abundant use of the bark of this plant by the population in traditional medicine.

5. ACKNOWLEDGEMENT

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6. Statement of conflict of Interest and Source of funding

The Authors declare the absence of conflicts of interest. In addition, no funding source mobilization.

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