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Research Article
Chemical Composition, Antioxidant and Cytotoxic Activities of *Hyptis suaveolens* (L.) Poit. Essential Oil on Prostate and Cervical Cancers Cells

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Abstract

Background and Objective: *Hyptis suaveolens* is an aromatic plant used in traditional medicine in Burkina Faso for management of various diseases including wounds and inflammatory diseases. Thus, the objective of this work was to characterize the chemical composition, antioxidant and cytotoxic activity of Essential Oil (EO) of *H. suaveolens* from Burkina Faso on cultured cancer cells. **Materials and Methods:** The chemical composition of EO was determined by GC/FID and GC/MS analysis and the antioxidant activity was evaluated through inhibition of DPPH radicals and $ABTS^{+\cdot}$ radical cations. The cytotoxic activity in prostate cancer cells (LNCaP) and cervical cancer cells (HeLa) of EO was evaluated by MTT assay and effect on cells cycle by flow cytometry analysis. **Results:** A total of 58 compounds were identified in the EO of *H. suaveolens* of which the major compounds identified are Sabinene 14.03%, β-Pinene 5.92%, Limonene 4.40%, Eucalyptol 12.78%, Trans-Oxide of Linalol 5.43%, β-Caryophyllene 11.27%, Germacrene-D 3.04% and Bicyclogermacrene 8.08%. The EO of *H. suaveolens* showed antioxidant activity and concentration dependent antiproliferative activities with G0/G1 arrest on LNCaP and HeLa cells. **Conclusions:** This work help to justify some uses of *H. suaveolens* in traditional medicine in Burkina Faso and also, presents a promising new application for the essential oil of *H. suaveolens* in prostate and cervical cancer research.

Key words: *Hyptis suaveolens*, essential oil, antioxidant, cytotoxic and cell cycle

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Cancer is one of the greatest challenges of modern medicine[1]. Understanding the current cancer burden in different regions is necessary for finding out potential risk factors and generate strategies for cancer control[2]. The cases of prostate and cervical cancers are therefore growing in Africa and around the world. The imperfections of the drugs currently used in the treatment of this disease and the growing problem of drug resistance have forced the search for new substances with therapeutic potential[1]. It is estimated that over 60% of approved anti-cancer agents are derived from plants. In relation to phytopharmaceuticals product with anticancer properties, research in Essential Oils (EOs) has become relevant. Some *in vitro* and *in vivo* reports have shown the applicability of EOs such as; therapeutics agents in cancer[3]. But, the variability between plants, geographic regions and extraction methods induces large differences in the composition of EOs which makes the identification of active ingredients a challenger.

Hyptis suaveolens is an aromatic plants from the Lamiaceae family widely distributed in tropical regions with an important essential oil content. Ethnomedicinal surveys showed that this plant is commonly used in Burkina Faso in the treatment of itching, scabies, fungi and mycoses, jaundice, breast abscesses, hemorrhoids and oral-like candidiasis. Moreover, the literature data showed the antioxidant activities of essential oil and extracts of *H. suaveolens*[4,5] and its anti-inflammatory activity[6,7]. Furthermore, recent evidence has found cytotoxicity against cancer cell line (PANC1) from human pancreas[8] by isolated compounds of *H. suaveolens*. However, the use of essential oil extracts from *H. suaveolens* on other types of cancer such as; prostate and ovarian has not been reported.

Therefore, the purpose of this work is to determine the chemical composition and chemotype; antioxidant and cytotoxic activities of *H. suaveolens* (L.) Poit. essential oil used in traditional medicine in Burkina Faso on prostate and cervical cancers cells.

MATERIALS AND METHODS

Plant material and Essential Oil (EO) extraction: Leaves of *H. suaveolens* were collected in August, 2017 at the National Institute of Applied Sciences and Technologies (IRSAT) in Ouagadougou, Burkina Faso. The GPS location: 12°25'29.5"N 1°29'14.3"W 12.424853, -1.487297. Plants identification and authentication were done, respectively by Dr. Abdoulaye SEREME, Plant Biology Researcher at IRSAT/CNRST and Professor Amadé OUEDRAOGO, Professor of Botany at the University Joseph KI-ZERBO (Ouagadougou, Burkina Faso). A specimen of *H. suaveolens* was conserved in the herbarium of University Joseph KI-ZERBO under the ID number 17859 and sample number 6903.

Essential Oil (EO) of *H. suavoelens* was obtained by hydrodistillation of 1 kg of fresh plant in an alambic/Clevenger-type apparatus for 3 h as described previously[9]. The EO obtained was stored at 4°C in airtight containers until GC-FID, GC/MS analyses and biological tests.

Chemical composition

Gas chromatography–flame ionization detector (GC/FID) analysis: The EO composition was determined as previously described[10]. Briefly, gas chromatography of EO (diluted in hexane (1/30, v/v)) was performed on an Agilent gas chromatograph Model 6890 (Agilent, Palo Alto, Ca), equipped with a 30 m ×0.25 mm, 0.25 µm film thickness column under a hydrogen flow from 50°C (5 min) to 300°C with an increasing temperature of 5°C/min. Sample was injected in split mode. Temperatures of injector and detector were fixed[9], respectively at 280 and 300°C.

Gas chromatography-mass spectrometry (GC/MS) analysis: Mass spectrometry (MS) analyses of EOs were also described[10]. The procedure used an Agilent gas chromatograph Model 7890 coupled to an Agilent MS model 5975. The average flow of helium was 1.0 mL/min and the oven were programmed from 50°C (3.2 min) to 300°C at 8°C/min, 5 min post run at 300°C. Sample was injected in split mode. Injector and detector temperature were 250 and 280°C, respectively[9]. The MS working in electron impact mode at 70 eV, electron multiplier, 1500 V, ion source temperature (230°C). Mass spectra data were acquired in the scan mode in m/z range 33-450[9].

Identification of components: The identification of the main compounds of *Hyptis suaveolens* EO have been previously described[10]. The state of the art methodology for main compounds identification is using standard compounds to identify EO components[9]. Component relative percentages were calculated with GC peak areas without using correction factors[9]. All chemical analyses was carried out at Chemistry Department of University Clermont Auvergne, from October-December, 2019.

Cell culture: Human prostate cell line (LNCaP) and cervical cancer cell line (HeLa) were used. LNCaP cell lines are androgen responsive cell lines with a low metastatic potential

derived from a lymph node metastasis[11]. In the other hand, HeLa cell lines come from a metastases sample carried out on an African-American cervical cancer patient Henrietta Lacks, died in 1951[12]. All these cell lines were available in the Genetics, Reproduction and Development (GReD) Laboratory, University Clermont, Auvergne, France.

Cells were cultured in 75 cm^2 tissue culture flasks, LNCaP on RPMI 1640 culture medium (Invitrogen, Carlsbad, CA, USA) and HeLa cells were cultured in DMEN medium (Invitrogen, Carlsbad, CA, USA). Both supplemented with 10% Fetal Calf Serum (FCS, Biowest, Nuaillé, France), 1% penicillin and 1% streptomycin (Invitrogen, Oslo, Norway) and incubated at 37°C in a chamber moistened with 5% CO_2.

Antioxidant activity

DPPH radical scavenging assay: DPPH (Sigma-Aldrich, L'Ile d'Abeau, France) radical scavenging activity was measured as described by Velazquez *et al.*,[13] with modifications. Briefly, *Hyptis suaveolens* EO at 8.8 mg mL^{-1} was first serially diluted in a 96-well plate successively to half. Then, 100 µL of each essential oil concentration was mixed with 100 µL of DPPH (30 mg L^{-1} in methanol) and dark incubated for 30 min. The absorbance was read at 517 nm using a UV/Visible spectrophotometer. Gallic acid was used as a control and the radical scavenging activity was expressed as a percentage inhibition according to the following formula:

$$\text{Radical scavenging capacity}(\%) = \frac{\text{Absorbance blank} - \text{Absorbance sample}}{\text{Absorbance blank}} \times 100$$

The concentrations were expressed in µg of extracts/µg of DPPH by formula:

$$\text{Concentration} = \frac{\text{Masse of EO}}{\text{of DPPH}}$$

or:

$$\text{Concentration} = \frac{\text{Concentration of EO} \times \text{volume of EO}}{\text{Concentration of DPPH} \times \text{volume of DPPH}}$$

The concentration of EO capable of scavenging 50% of the DPPH radicals were then determined graphically.

$ABTS^{+\cdot}$ radical cation decolorisation assay: The spectrophotometric analysis of $ABTS^{+\cdot}$ scavenging activity was determined according to Re *et al.*[14], method. Briefly, $ABTS^{+\cdot}$ solution was prepared by dis-solving 10 mg of ABTS in 2.6 mL of distilled water in which 1.7212 mg of potassium persulfate was added. The ABTS solution was incubated at room temperature for 12 h and diluted with ethanol in order to obtain an absorbance of 0.70±0.02 to 734 nm. In 96-well plates, 50 µL of ethanolic solution of *Hyptis suaveolens* EO at 4.4 mg mL^{-1} was added to 200 µL of freshly prepared $ABTS^{+\cdot}$ solution. In another 96-well plates, the same process was carried out for gallic acid at 0.0125 mg mL^{-1} and used as control. The plates were then dark incubated at room temperature for 15 min and the absorbance was read at 734 nm against a standard curve of 5,7,8-tetramethyl-2-carboxylic acid 6-hydroxy-2 (Trolox, Sigma-Aldrich). The activity of EO of *H. suaveolens* on the radical cation $ABTS^{+\cdot}$ was expressed in micromoles Trolox equivalent per gram of EO (µmol TE g^{-1}) using the following formula:

$$C = \frac{(cx\ D)}{Ci}$$

where, C is concentration of EO in µM TE g^{-1}, c is concentration of the sample read, D is dilution factor and Ci is concentration of the stock solution.

Antioxidant activity was carried out from December, 2018-February, 2019 at Laboratoire de Biologie Moléculaire et de Génétique (LABIOGENE) of University Joseph KI-ZERBO and Centre de Recherche Biomoléculaire Pietro Annigoni (CERBA), Burkina Faso.

Cytotoxic activity: 3[4,5-dimethylthiazol-2-yl]-diphenyltetrazolium bromide (Sigma-Aldrich) assay (MTT) was used to measure the cell survival. Briefly, 1×10^6 cells/mL were seeded for 24 h in 96-well plates. After 24 h *Hyptis suaveolens* EO has been added for 72 h of incubation and the number of living cells were measured as described[9,10] using a microplate reader spectrophotometer Thermo Fisher Scientific SN 1510-02948 REF 51119200 type 1510 at 570 nm. The cisplatin used as reference compound was dissolved in dimethyl sulfoxide (DMSO). Three independent octuplet experiments were performed on each cell line from February-December, 2019 at Laboratoire de Biologie Moléculaire et de Génétique (LABIOGENE) of University Joseph KI-ZERBO, Burkina Faso, Centre de Recherche Biomoléculaire Pietro Annigoni (CERBA), Burkina Faso and Laboratoire Génétique, Reproduction and Développement (GReD), UMR CNRS 6293, INSERM U1103, Université Clermont Auvergne, France.

Flow cytometry analysis: The LNCaP and HeLa cells were seeded (3×10^5) in 6-well dishes and treated with EO for 72 h at 37°C at the dose of 430 and 230 µg mL^{-1}. After the treatment, the cells were harvested with trypsin, centrifuged

and fixed with paraformaldehyde (4%) for 15 min at room temperature and then washed with PBS. The 10^6 cells were prepared in suspension, centrifuged and the supernatant removed. Then, 0.2 mL of FxCycle™ PI/RNase staining solution (invitrogen, oregon, USA) was added to each tube and mixed well. The samples were incubated for 30 min at room temperature, protected from light. The samples were finally analyzed by FACS using excitation at 488 nm and the emissions were collected by using a 585/42 bandpass filter. Flow cytometry analysis was carried out from October-December, 2019 at Laboratoire de Génétique, Reproduction and Développement, UMR CNRS 6293, INSERM U1103 of University Clermont Auvergne.

Statistical analysis: *In vitro* experiments were performed in triplicate and each data point represents the average of at least three independent experiments. All data are presented as Mean±Standard Deviation and the analysis of variance is followed by the Turkey multiple comparison test. The statistical analysis was performed by using 2 way ANOVA Graphpad Prism. The $p<0.05$ was used as a criterion for statistical significance.

RESULTS

Various compounds of *Hyptis suavoelens* EO by mass spectrometry analyses: After clevenger distillation, EO of *Hyptis suavoelens* was obtained. A total of 58 compounds were identified (Table 1) at a total percentage of 95.04%, the main groups of compounds were sesquiterpene hydrocarbons represent 36.59%, monoterpene hydrocarbons 31.02% and monoterpene alcohols 6.38 (Table 1). The main compounds identified in this essential oil are: Sabinene 14.03%, β-Pinene 5.92%, Eucalyptol 12.78%, Trans-Oxide of Linalol 5.43%, β-Caryophyllene 11.27% and Bicyclogermacrene 8.08% (Fig. 1). Moreover, 7 compounds that were in very small percentage were not identified (Table 1).

EOs for *Hyptis suaveolens* presented moderate antioxidant activity: The antioxidant activity of the essential oil of *H. suaveolens* in term of IC_{50} is greater than 73.33 µg EO/µg DPPH (Table 2). In addition, the gallic acid reference used has an IC_{50} of 0.12±0.06 µg EO/µg DPPH ($p<0.05$) (Table 2) on free radicals DPPH *in vitro*. In additions to the radicals $ABTS^{+\bullet}$ cations, the essential oil of *H. suaveolens* presented an IC_{50} of 0.0077±0.0001 against 2.66±0.31 for gallic acid ($p<0.05$) (Table 2).

EOs of *Hyptis suaveolens* induce cytotoxicity activity: Since many of the compounds identified in the essential oil of *H. suaveolens* have antiproliferative activity, cytotoxicity of essential oil of *H. suaveolens* in prostate and ovarian cancer cells *in vitro* was tested. Results shown on prostate cancer cell lines (LNCaP) that essential oil of *H. suaveolens* presented an IC_{50} of 163.01±15.61 µg mL^{-1} ($p<0.05$) (Table 3) in comparison of 7.98±2.05 µg mL^{-1} for cisplatin ($p<0.05$)

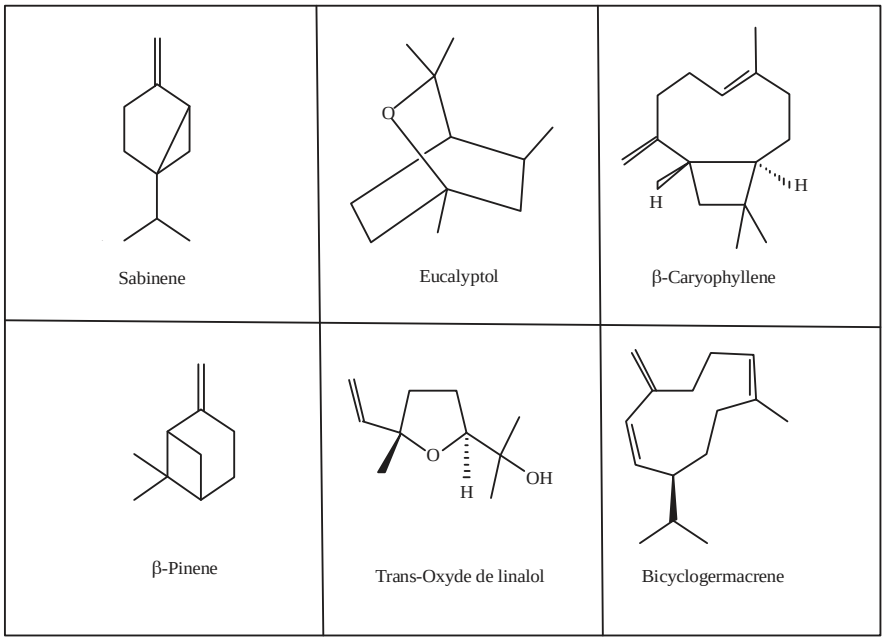

Fig. 1: Chemical structures of the major compounds found in the analyzed Essential Oil (EO) of *Hyptis suaveolens*

Table 1: Chemical composition of essential oils of *Hyptis suaveolens*

Compounds of *Hyptis suaveolens* EO	Retention time (min)	Percentage
α-Thujene	11.64	00.31
α-Pinene	11.94	02.10
Camphene	12.55	00.10
Sabinene	13.44	14.03
β-Pinene	13.62	05.92
Myrcene	13.94	01.07
2-Methyl-Butanoate d'iso-Butyle	14.50	00.02
α-Phellandrene	14.59	00.17
δ-3-Carene	14.66	00.29
α-Terpinene	14.96	00.30
p-Cymene	15.26	00.71
Limonene	15.45	04.40
Eucalyptol	15.58	12.78
(E)-β-Ocimene	15.94	00.06
γ-Terpinene	16.40	01.41
Cis-Hydrate de Sabinene	16.84	00.03
Trans-Oxyde de Linalol	17.35	05.43
p-Cymenene	17.50	00.12
Linalol	17.77	00.03
Cis-Thujone	18.24	00.03
Endo-Fenchol	18.52	00.07
Camphre	19.44	00.06
Terpinene-4-ol	20.45	00.68
p-Cymene-8-ol	20.64	00.06
α-Terpineol	20.89	00.08
*δ-Elemene	24.55	00.14
δ-Elemene	24.84	01.71
α-Cubebene	25.24	00.18
Acetate de Geranyle	25.93	00.11
α-Copaene	26.08	01.02
*β-Elemene	26.20	00.06
β-Bourbonene	26.32	00.73
β-Elemene	26.41	01.22
β-Caryophyllene	27.36	11.27
α-Trans-Bergamotene	27.53	02.01
Aromadendrene	27.80	01.68
(E)-β-Farnesene	27.92	00.19
α-Humulene+Unknown MW204	28.25	01.25
Allo-Aromadendrene	28.36	00.89
γ-Muurolene	28.65	00.29
Germacrene-D	28.89	03.04
Viridiflorene	29.12	01.69
Bicyclogermacrene	29.28	08.08
MW 202 (unidentified)	29.43	00.36
γ-Cadinene	29.64	00.12
δ-Cadinene	29.72	00.34
(E)-Nerolidol	30.65	00.05
Germacrene-D	30.83	00.06
Spathulenol	31.28	01.43
Oxyde de Caryophyllene	31.42	00.63
MW 222 (unidentified)	31.51	01.86
MW 222 (unidentified)	31.73	00.78
MW 218 (unidentified)	34.85	00.50
MW 220 (unidentified)	35.30	00.30
Abietatriene	40.63	01.90
MW 272 (unidentified)	41.41	00.46
MW 272 (unidentified)	41.61	00.13
MW 272 (unidentified)	42.06	00.30
Total		95.04
Monoterpene hydrocarbons		31.02
Monoterpene alcohols		06.38
Monoterpene ketones		00.08
Monoterpene ethers		12.09
Sesquiterpene hydrocarbon		36.59
Sesquiterpene alcohols		01.48
Others		06.59

*Unidentified isomer

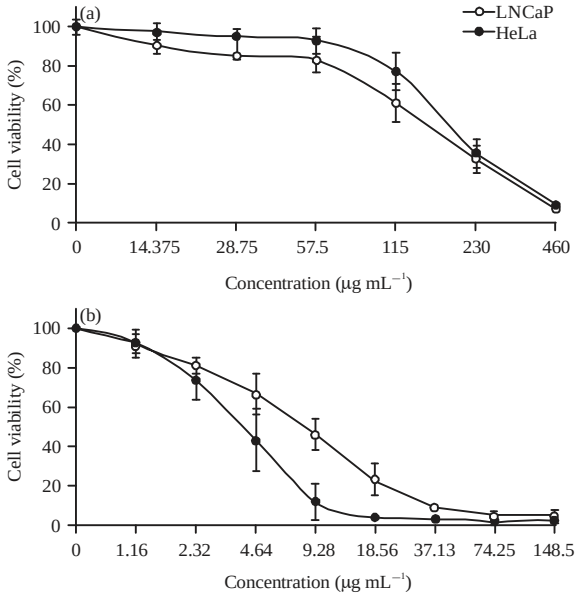

Fig. 2(a-b): Dose-dependent cytotoxic activity of EO of (a) *Hyptis suaveolens* in comparison to cisplatin and (b) on prostate and cervical cancer cells after 72 h

Table 2: Antioxidant activity of *Hyptis suaveolens* EO and gallic acid

	Antioxidant activity	
EO and compounds	DPPH (IC_{50}, (μg EO /μg DPPH))	ABTS (μMET/g)
Hyptis suaveolens	>73.33	0.0077±0.0001
Gallic acid	0.12±0.06	2.6600±0.31***

DPPH: (2,2-diphenyl-1-picrylhydrazyl), ABTS: (2,20-azinobis-[3-ethylbenzothiazoline-6-sulfonic acid]), values are expressed as Mean±SD, n = 3 independent experiments in quadruplicate for the measurement of antioxidant activity, DPPH activities is expressed as IC_{50} (μg EO/μg DPPH) and ABTS activities are given in μmol Trolox equivalent/g of *Hyptis suaveolens* EO, ***p<0.05 values significantly different

Table 3: IC_{50} (μg mL^{-1}) of EO of *Hyptis suaveolens* tested on LNCaP human prostate cancer cell lines, HeLa human cervical cancer cell lines

	IC_{50} (μg mL^{-1})	
Cancer cell line	LNCaP	HeLa
Hyptis suaveolens	163.01±15.61	181.37±28.46
Cisplatin	7.98±2.05***	4.32±1.87***

Values are expressed as Mean±Standard Deviation, n = 3 independent experiments in sextuplicate, ***(p<0.05) values significantly different for each cell line, EO: Essential Oil and in compared to chemotherapeutic agent cisplatin

commonly used as a chemotherapeutic agent (Table 3). While, cervical cancer cell lines (HeLa cells) have an IC_{50} of 181.37±28.46 μg mL^{-1} (p<0.05) (Table 3) vs. 4.32±1.87 μg mL^{-1} for cisplatin (p<0.05) (Table 3). Furthermore, tests confirmed that, the antiproliferative activity of the essential oil of *H. suaveolens* on the LNCaP cells and HeLa cells were in function of the concentration (Fig. 2a, b). Cisplatin, exhibited an antiproliferative activity superior to the essential oil of *H. suaveolens* both on the LNCaP and HeLa

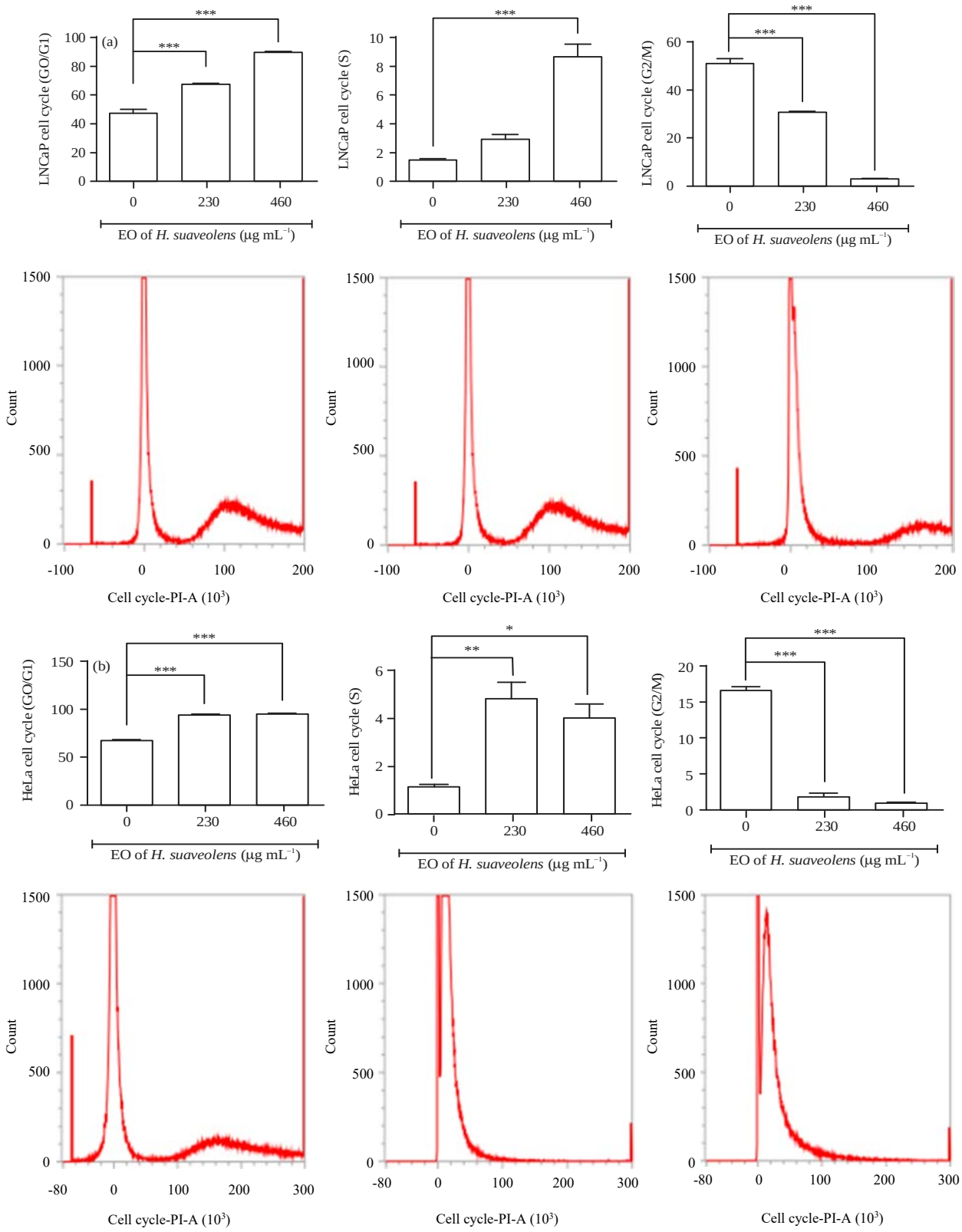

Fig. 3(a-b): Effect of *Hyptis suaveolens* EO on (a) LNCaP and (b) HeLa cells cycle

Values are expressed as Mean±Standard Deviation, n = 3 independent experiments in triplicate, *,**,***p<0.05 values significantly different compared to vehicle, EO: Essential oil

cells. Interesting, *H. suaveolens* essential oil is more active on LNCaP cell lines than on HeLa cell lines (Table 3). Regarding the mechanism, data shown that the essential oil of *H. suaveolens* acts on the cell cycle of the cancer cells (LNCaP and HeLa) and induce G0/G1 cell cycle arrest and a decreased of G2/M phase that was completed loss specially on HeLa cells (Fig. 3a, b). In addition, this process was also dose-dependent. Further, analysis by cytometry did not detect changes in the subG1 population (related to apoptosis) in any of the cancer cells examined and treated with the EOs. However, an important peak close to G0/G1 area most probably related to necrotic cells on HeLa cells was observed.

Therefore, *H. suaveolens* EO induced significant growth inhibition and cytotoxicity on human prostate/cervical cancer cells.

DISCUSSION

Several *in vitro* tests been introduced and used to measure antioxidant activities, namely radical scavenging assay using 2,2′-diphenyl-1-picrylhydrazyl (DPPH) and 2,2-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid) ($ABTS^{+\bullet}$)[15]. Unlike this work, 47 constituents were identified in the essential oil of *H. suaveolens* accounting for 89.03% of the total oil and the dominant compounds were 1,8-cineole (10.33%), (-)-isocaryophyllene (9.92%) and caryophyllene (16.17%)[5] and 24 compounds representing 90.3% of the oil were identified with the main components were β-caryophyllene (26.0%), β-elemene (10.4%), trans-α-bergamotene (7.7%), spathulenol (7.0%) and bicyclogermacrene (6.5%)[16]. Indeed, the method of extraction by hydro-distillation with clavenger used to extract the essential oils of *H. suaveolens* could justify the number (58) and a high rate (95.04%) of compounds identified from this chemical analysis (Table 1 and Fig. 1). Furthermore, the presence of majority compounds (Sabinene 14.03% and Bicyclogermacrene 8.08%. and negligible or even absent in the chemical composition of *H. suaveolens* according to the work of Xu *et al.*[5] could partly be explained by the geographical location of the plants from which the vegetable raw material of *H. suaveolens* was harvested and the nature of the soil. Geographic location and the nature of the soils have an impact on the chemical composition of plants[17].

In addition, according to the work of Peerzada[18], the main constituents were 1, 8-cineole (32%) and β- caryophyllene (29%). The essential oil of *H. suaveolens* according to its location has a variability in chemical composition[19].

In addition, the work of Xu *et al.*,[5] showed that the essential oil of *H. suaveolens* contains 4.51% of monoterpene hydrocarbons and 39.44% of sesquiterpene hydrocarbons, unlike this work which presented 31.02% of monoterpene hydrocarbons and 36.59% of sesquiterpene hydrocarbon. GC-MS analysis revealed EO to be monoterpenoid (~79% monoterpenes) in nature with α-phellandrene (22.8%), α-pinene (10.1%) and limonene (8.5%) as the major chemical constituents[20].

The antioxidant can be defined as any substances or samples capable of inhibiting free radical reactions in the oxidation reaction[15].

In order to overcome the negative effects of these radicals, some scientists have explored some natural antioxidants from plants and their by-products[15]. Thus, the essential oil of *Hyptis suaveolens* exhibited antioxidant activity by inhibiting the radicals' DPPH and $ABTS^{+\bullet}$, but in a moderate manner. Indeed, related to other works, antioxidant activity of *H. suaveolens* oil found in this assays is time and concentration dependent[21]. The antioxidant potential of *H. suaveolens* oil determined by the DPPH method expressed as IC_{50} was 3.72 mg mL^{-1} whereas, the Trolox Equivalent Antioxidant Capacity value determined by the ABTS assay[21] was 65.02 μM mg^{-1}. Free radicals are ubiquitous in bodies and are generated by normal physiological processes including aerobic metabolism and inflammatory responses, to eliminate invading pathogenic micro-organisms[22]. Thus, the use of essential oils from plants with antioxidant properties could naturally contribute to reducing the excess of free radicals in the organism, which is the source of diseases. In the same directions, some works had found that *H. suaveolens* methanol extract protect the cells against H_2O_2-induced oxidative damage in $HepG_2$ cells[23] and EO of *H. suaveolens* presented[5] IC_{50} of 19.23±0.79 μg mL^{-1}.

Free radicals, Reactive Nitrogen Species (RNS) and Reactive Oxygen Species (ROS) have been known to contribute several degenerative diseases such as cardiovascular diseases, aging and certain types of cancers[15]. The results of this work (Table 3) have shown that the essential oil of *H. suaveolens* has antiproliferative activity on the LNCaP cell lines of prostate cancer and on the HeLa lines of cervical cancer. High incidence cancers in Africa and worldwide. This observed antiproliferative activity could be explained by the presence of certain chemical compounds or groups (Table 1, Fig. 1) in the essential oil of *H. suaveolens*. Indeed, the high content of monoterpene hydrocarbons (31.02%) notably sabinene 14.03% and β-Pinene 5.92% and sesquiterpene hydrocarbon (36.59%) notably β-Caryophyllene 11.27% and Bicyclogermacrene 8.08% could justify its anti-proliferative activity. In fact Beta-caryophyllene, are natural bicyclic sesquiterpene hydrocarbon which presented anticancer

activity and induces G1 phase cell cycle arrest in Human Lung Cancer Cells[24,25]. Moreover, in the same direction that isolated compounds for *H. suaveolens* in PANC1 pancreas cancer cells[8]. Also, the antiproliferative activity of the essential oil of *H. suaveolens* is dose-dependent.

The essential oil of *H. suaveolens* exerts an antiproliferative activity on prostate cancer cells line (LNCaP) leading the arrest of GO/G1 phase and stopping of the cell cycle in the G2/M phase (Fig. 3a). Also, almost the same phenomenon G0/G1 arrest was observed on HeLa cell, but also a complete loss of G2/M phase (Fig. 3b). At this point, it propose to elucidate in future studies the mechanism of cell death induced by EOs of *H. suaveolens* in prostate and cervical cancer cells.

CONCLUSION

Ethnomedicinal surveys showed that *Hyptis suaveolens* are commonly used in Burkina Faso in the treatment of itching, scabies, fungi and mycoses, jaundice and breast abscesses. The results of this work have shown that the essential oil of *H. suaveolens* has antioxidant activity through the inhibition of the DPPH and ABTS radicals and for the first time its antiproliferative activity on the LNCaP cell lines of prostate cancer and also on HeLa cell lines for cervical cancer. This work constitutes a scientific base requiring a deepening and will allow to develop this local medicinal plant of Burkina Faso.

SIGNIFICANCE STATEMENT

This is the first study of the antiproliferative activity of EO of *H. suaveolens*, a medicinal plants of Burkina Faso on LNCaP cells of prostate cancer and HeLa cell lines of cervical cancer. These works constitute a scientific base requiring a deepening. This study will allow the valorization of the medicinal plants of Burkina Faso and contributes to the research of anti-cancer substances and molecules.

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