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PHYTOCHEMICAL SCREENING, PROXIMATE ANALYSIS AND ANTI-CANCER ACTIVITY OF ETHANOLIC SEED EXTRACT OF MORINGA OLEIFERA

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ABSTRACT

Moringa oleifera is a native tree which has been reported to have medicinal properties. The leaves and the seeds were traditionally reported for the treatment of peltic ulcers and have an anti-cancer properties. The objectives of this study was to carry the phytochemical screening, proximate analysis and anti-cancer activity of the seed ethanolic extracts of *Moringa oleifera (*Lam). The preliminary phytochemical screening revealed the presence of flavonoids, Saponin, Alkaloids, Steroids and terpenoids and the results of proximate analysis in methanolic *Moringa oleifera* leaves extract shows relatively low moisture content (9.21%) and low protein content (6.22%), however, it shows high carbohydrate content (49.60%) and high fibre content (23.77%). The anti-cancer activity of the ethanolic seed extract of *Moringa oleifera* seed was evaluated against HL-60 Cancer cell line (Human T-promyelocytic leukemia), MCF-7 Cancer cell

Introduction

Moringa oleifera (MO) is native to the western and sub-Himalayan region, India, Pakistan, Asia, Africa and Arabs. The Moringa tree is cultivated and used as a vegetable (leaves, pods flowers, roasted seeds), for spice (mainly roots), cooking and cosmetics oil (seeds) and as a medicinal plant (all plant organs) (Rebecca *et al.,* 2006). Important medicinal properties of the plant include antipyretic, antiepileptic, anti-inflammatory, anti-ulcerative, anti-hypertensive, cholesterol lowering, anti-oxidant, anti-diabetic, hepatoprotective, anti-bacterial and anti-fungal activities (Nickson et al., 2005). In addition, *M. oleifera* seeds possesses water purifying powers (Ruckmani *et al.,* 1998).

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lines (Human breast cancer), HeLa Cancer cell line (Human cervical carcinoma cancer) and mouse embryonic fibroblast normal cell line (3T3) lines with with IC_{50} values of 8.51, 8.62, 12.33 and 2.78 µg/ml respectively. These findings suggested that *Moringa oleifera* seeds possess anti-cancer properties which have the potential to contribute to its ethno-medicinal uses.

Keywords; Proximate analysis, Phytochemical screening, Anti-ulcer activity, *Moringa oleifera,* cancer cell lines.

They are known to be anti-helminthic, antibiotic, detoxifiers, immune builders and have been used to treat malaria and it can also be used as a less expensive bio-absorbent for the removal of heavy metals (Sharma *et al.,* 2006). *Moringa oleifera* is a highly valued plant, distributed in many countries of the tropics and subtropics. It has impressive range of medicinal uses with high nutritional value. Different parts of this plant contain a profile of important minerals, and a good source of protein, vitamin, â carotene, amino acids and various phenolics (Farooq *et al.*, 2007). The Moringa plant provides a rich and rare combination of zeatin, quercetin, kaempferom and many other phytochemicals. Due to the massive water and significant electrolyte content of the fruit, it is largely consumed during hot weather conditions such as summer and heat waves to quench thirst and provide relief for dehydration. However, a very important step in the screening of the sanitizing and preservative activity of a plant material is to evaluate its antimicrobial properties. It is important to evaluate the antimicrobial properties of *M. oleifera* leaves on some selected microorganisms and also to verify its phytochemical constituent.

In northern Nigeria, *M. oleifera* is highly a sourced as food vegetables, particularly because of their health-promoting and disease-preventing properties strongly suspected to be due to the presence of many phytochemicals in them. Phytochemicals are a group of non-nutrient bioactive compounds found naturally in plant parts such as flowers, buds, leaves, fruits, roots, barks, spices and medicinal plants; and work in conjunction with other plant components as a defensive mechanism for the plants against diseases and many external attacks.

Phytochemicals also provide characteristic color, aroma and flavour in plants. They are plant metabolites. In humans, many phytochemicals have been found to be protective and preventive against many degenerative diseases and pathological processes such as in ageing, coronary heart disease, Alzheimer's

disease, neurodegenerative disorders, atherosclerosis cataracts, and inflammation. Both epidemiological and clinical studies provided evidence that most of these phytochemicals exhibit their protective and disease-preventing functions through their antioxidant activities.

Moringa oleifera, commonly called the drumstick, is a tree native to India, but has been planted and domesticated in many other countries, including Nigeria. It is the most known and widely cultivated variety of the genus *Moringa,* family *Morigaceae*. *Moringa oleifera* is also known by other common names such as Mallungay (Philippines), Benzolive tree (Haiti), Horse raddish tree (Florida) and Nebeday (Senegal). In Nigeria, it is known as Zogale in Hausa, Okwe Oyibo in Igbo, Ewe Ile in Yoruba and Jeghel-agede in Tiv. The leaves, seeds and flowers all have good nutritional and therapeutic value. The flowers are eaten cooked in soups and resemble mushrooms while the leaves are eaten cooked as vegetables. The flowers and leaves are good sources of vitamins A, B group and C when raw and are among the best sources of minerals. The plant has been linked to the treatment or at least suppression of many degenerative diseases among many rural consumers.

Parvathy and Umamaheshwari (2007) investigated the effects of extract from *Moringa oleifera* leaves in human multiple myeloma cell lines (U266 B1 human B-lymphocyte plasmacytoma). The cells were incubated with MO leaf extract dissolved in methanol, ethanol, ethyl acetate and chloroform, and cytotoxicity testing was performed using neutral red dye uptake assay. The findings showed that methanol extract was characterised by the highest cytotoxic activity related to these cells. It was observed that even its small quantity significantly inhibited proliferation of these cells, which suggests its high anti-cancer activity. Another study also reports anticancer effect of *Moringa oleifera* leaf extract observed in primary cell lines of acute myeloid leukaemia (AML) and acute lymphoblastic leukaemia (ALL), collected from patients, as well as a line of hepatocarcinoma cells (HepG2). Khalafalla *et al*., (2011) also conducted another research on the anticancer effects of hot water, cold water and 80% ethanol extracts of moringa leaves in the primary cells of the two types of leukaemia and liver cancer. The findings related to cytotoxicity of these extracts, determined using MTT (the tetrazolium dye,3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay, showed the highest activity of the ethanolic extract with respect to both AML and ALL cells, while the hot water extract was more active than the cold water extract. In the case of HepG2 cells, hot water extract showed the strongest

anticancer activity. Another study by Varalakshmi and Nair (2011) examined anticancer properties of aqueous, methanol and hexane extracts of *Moringi oleifera* leaves with respect to cervix cancer cell line (HeLa) and normal human lymphocytes. Following incubation with *M.oleifera* extract, antiproliferative effects were assessed using MTT assays and trypan blue dye. Based on DNA fragmentation analysis performed using acridine orange–ethidium bromide (AO/EB), they identified apoptotic effect of these extracts. The findings showed good cytotoxicity of aqueous extract, depending on its concentration, with respect to cancer cells, compared to methanol and hexane extracts. However, aqueous extract produced the lowest cytotoxic effects in lymphocytes. Sreelatha *et al.,* (2011) also evaluated the effects of an aqueous extract from *M. oleifera* (MO) leaves on a human tumor (KB) cell line derived from glandular cancer of cervix. After incubation of the KB cell culture with MO extract (0-200 ug/ml), based on the cell viability assessment (MTT test) they showed its inhibitory effect on the cell proliferation increasing with concentration. The anti-proliferative effect of this extract resulted from the induction of apoptosis and morphological changes of cells determined by DAPI and propidium iodide staining. The authors point to the strong antiproliferative effect of *M. oleifera* leaf extract on cells of this type of cancer cell lines. In another study described the effects of *Moringa oleifera* seed methanolic extract on human cancer cell lines such as lung (A-549), liver (Hep-2), colon (502713 and HT-29) and neuroblastim (IMR-32). The cytotoxicity of this extract (100 µg/ml) was determined by these sulforhodamine B (SRB) dye test on this tumor cell lines. Growth inhibition was observed in the lung, colon HT-29 cell line and neuroblastima 80%, 95% and 93% respectively. In contrast, the results showed no cytotoxicity to the Hep-2 line, and the maximum for the colon cell line 502713. Likewise, a study by Tiloke *et al*., (2013) provided supporting evidence showing anticancer effects of aqueous extract of *Moringa oleifera leaves* in human cell line of lung cancer (A549). Following 24 h incubation of human cancer cell lines with MO extract the researchers assessed the level of oxidative stress (TBARS method) and the level of glutathione. Proapoptotic effect of aqueous extract of MO, on the other hand, was reflected by significantly increased expression of protein and mRNA. In addition, subsequent studies determined the anti tumor properties of the *Moringa oleifera* aqueous leaf extract against two human pancreatic cancer cell lines (Panc-1 and COLO-357). It was determined by means of colorimetric analysis and flow cytometry that MO extract inhibited the growth of pancreatic cancer cells of both tested lines. Test

results showed that the highest inhibition of Panc-1 and COLO-357 cell growth was observed at a concentration of ≥0.75 mg/ml extract. Charoensin *et al.*, (2014) investigated anticancer properties of *M. oleifera* leaves in relation to human cell lines of hepatocarcinoma (HepG2), colorectal adenocarcinoma (Caco-2) and breast adenocarcinoma (MCF-7). Cytotoxicity of methanol and dichloromethane extract with respect to cancer cell lines was assessed using MTT assay, and chemoprevention was examined using quinone reductase induction testing. The findings showed greater anticancer effect of dichloromethane extract in the cells of Hep G2 and MCF-2 as well as greater chemopreventive effect. In subsequent studies, Jung *et al*., (2014) have shown anti-tumor activity of *Moringi oleifera* leaf extract against human cancer line lung (A549). They observed that an aqueous extract (300 mg/ml) of MO strongly induced apoptosis, inhibited the growth of cancer cells and lowered the level of internal reactive oxygen species (ROS) in human lung cancer cells. Activity of *Moringa oleifera* leaves and bark in relation to human cancer cell lines of breast (MDA-MB-231) and colorectal (HCT-8) was investigated by Al-Asmari *et al.,* (2015). They determined that the extracts, by inducing apoptosis and inhibiting cell cycles, produced phenotype changes in the cells of both cancers and cell death. Similarly, a study carried out by Jung presented evidence for antiproliferation effect of extract from *Moringa oleifera* leaves. Following incubation of human cell line of hepatocellular carcinoma (HepG2) with aqueous extract of *Moringa* leaves, flow cytometry was applied to assess effects in DNA content and cell cycle stages. It was found that the extract induced apoptosis of cancer cells. Other studies have determined the antitumor effect of extracts (n-hexane, chloroform, ethyl acetate, 50% methanol) from *M. oleifera* leaves and 15 fractions of ethyl acetate extract (F1 to F15) against human epidermoid cancer cell line (Hep2). After incubation, cell viability was assessed by sulforodamine B staining. Among all tested MO extracts and fractions, the isolated F1 fraction showed the highest cytotoxic activity against tumor cells. It was found through the use of *High-Performance Thin-Layer Chromatography* (HPTLC) technique that F1 contains a large amount of antioxidants – phenolic compounds that affect these properties. Kaur *et al.,*(2015) also analyzed the chemical composition of the obtained methanolic extract from *M.oleifera* leaves. They isolated and identified on the basis of melting point, Nuclear Magnetic Resonance (13C-NMR, 1H-NMR), Infrared Spectroscopy (IR), Fast Atom Bombardment Mass Spectrometry (FAB-MS) chemical compound β-D-glucopyranoside tetradecanoate belonging to the group of antioxidant

flananoids. They then evaluated its cytotoxic activity against human cancer cell line colon (Colo-320DM), oral (KB-403), ovary (PA-1), breast (MCF-7). After incubation, the cytotoxicity of this compound was assessed by the MTT test on the tested tumor lines. Inhibition of cell growth of the Colo-320 DM line was observed already at a concentration of 2.52 µg/ml of this flanovide, while for KB-403 at 3.62 µg/ml, for Pa-1 at 6.46 µg/ml and MCF-7 at 10.00 µg/ml. The results indicate that this compound has the highest cytotoxicity against colon cancer compared to the other 3 lines. Milungo *et al.,* (2016) examined the antiproliferative activity of extracts (50% methanol in dichloromethane) from *Moringa oleifera* leaves against human liver (Hep-G2) and muscular (RD). After incubation with the MO leaf extract, tumor cell viability (crystal violet staining and Optical Density measurement) was assessed. Significant inhibition of cell growth of both tumor lines was observed already at 0.017 mg/ml extract concentration for the RD line and at 0.50 mg/ml higher concentration for Hep-G2.

In subsequent studies, researchers analyzed the effect of *M.oleifera* leaf extract on human cancer cell lines ovarian (A2780CP20) and prostate (PC3). By using colorimetric analysis with the Alamar Blue dye after exposure of both tumor cell lines with extract, their viability was assessed. It was observed that the concentration of the extract inhibiting the growth of A2780CP20 cells was 0.27mg/ml and for prostate cancer cells 0.17 mg/ml. Madi *et al.,* (2016) presented the results of research on the antitumor activity of *Moringi oleifera* leaf extract against human cancer cell line lung (A549), liver (Hep-G2), colon (CaCo2), leukemia-associated T cells (Jurkat). All tumor cell lines were incubated with an aqueous extract (dried leaf powder soaked in hot water) of varying concentration (0.05-2.5%). Subsequently, after incubation, cell viability was determined by MTT test and the anti-proliferative effect of MO extract on them was assessed. It was observed that the MO extract caused a decrease in the viability of all tested cell line types depending on the concentration of the extract. However, the most cytotoxic effect was already determined at 0.05% of the extract used versus A549 compared to Jurkat, Caco2, Hep2 at 0.1-0.4%.41 Guon and Chung conducted scientific studies to evaluate the effect of *Moringa oleifera* fruit extract on human melanoma cells (A2058). It was observed thanks to the MTT test that the *Moringa oleifera* fruit extract signifIcantly inhibited the viability of A2058 cells and propagated their apoptosis depending on the concentration (0-200 µg / ml). It was determined that at concentrations of 150 and 200 µg/ml MO extract there

was a significant reduction in the proliferation of these cells, to 11.3 and 10.1%, respectively. Thanks to the double staining test for Annexin V-PI to distinguish the stages of apoptosis, it was found that *Moringa oleifera* fruit extract effectively induces mitochondrial apoptosis of A2058 cells. Subsequent results of the conducted tests showed the cytotoxic properties of *Moringa oleifera Lam* leaves against the colon cancer cell line (HCT116). The obtained methanolic MO leaf extract was fractionated by column fraction chromatography (MOL1-MOL4). It was determined by MTT and Western blotting that the fractions showed high antiproliferative activity against HCT116 cells especially MOL2, MOL3 and MOL4. Adebayo *et al.*, (2017) also analyzed the cytotoxic activity of *Moringa oleifera* seeds on a breast cancer cell line (MCF7). The obtained aqueous and ethanol extracts from MO seeds were divided into 4 fractions (hexane solvent, dichloromethane, chloroform and n-butanol). It was determined by MTT that all fractions showed high antiproliferative activity on MCF7 cells. The MO seed extracts analyzed inhibited the multiplication of MCF7 cells, aqueous at 280 µg/ml, respectively, and the hexane fractions 130 µg / ml and dichloromethane, respectively 26 µg/ml. Jinghua *et al.*, (2018) investigated antioxidative potential of extract from MO leaves and they described molecular mechanisms associated with its anticancer activity. Following incubation of human cell line of colon cancer with hexane extract from MO leaves, the researchers assessed toxicity using MTT assay, and examined apoptotic effects by measuring caspase activity. The findings showed cytotoxic effects of extract from MO leaves in these cancer cell lines. The study demonstrated that extract from leaves of *Moringa* significantly inhibits proliferation of colon cancer cells and induces cell death via mitochondrial pathway of apoptosis. The research shows the potential for using extracts from MO leaves in prevention and treatment of this type of cancer. Therefore, the objectives of this study are to carryout phytochemical screening, proximate analysis and anti-cancer activity of the ethanolic seed extract of *Moringa oleifera.*

Materials and Methods

Sample collection

Seeds from an uninfected and healthy *Moringa oleifera* tree was collected from Ringim Local Government Area, Jigawa State. The seed was air dried for one week at room temperature after which the dried leaves will be blended into powdery form and stored in a sealed container prior to use. Swiss albino mice of both sexes

weighing 120 - 150 g were housed in cages and they were maintained at a temperature of approximately 25^{o}C. They were fed with standard dry pellets and tap water *ad libitum*. The mice were allowed to acclimatize to the environmental conditions for 14 days before the experiments commenced.

Extraction of *Moringa oleifera* seeds

The method of Debela (2012) will be employed. The aqueous and ethanol extract of *Moringa oleifera* leaves will be prepared by soaking 50g of the powdered sample in a conical flask containing 100 ml of methanol respectively placed on a shaker for 24 h. The extract will then be filtered using sterile Whattman filter paper. The extract will be concentrated using rotavapor and stored in an airtight container.

Phytochemical analysis of *Moringa oleifera* leaf and seed

Test for tannins: The method as described by Debela (2012) will be employed. About 0.5 g of the sample will be mixed with 10 ml of distilled water and filtered. Few drops of 1% ferric chloride solution will be added to 2 ml of the filtrate. The occurrence of blue-black, green or blue green precipitate indicates the presence of tannins.

Test for steroids: Salkowski test as described by Debela (2012) will be employed. The crude extract was mixed with chloroform and a few drops of concentrated H_2SO_4 will be added. The mixture will be agitated vigorously and allowed to stand for 5 mins. A red coloration at the lower layer indicates the presence of steroid.

Test for cardiac glycosides: The method as described by Debela (2012) will be employed. 0.5% (w/v) extract, 2 ml of glacial acetic acid and few drops of 5% ferric chloride will be mixed together followed by the addition of 1 ml of concentrated sulphuric acid. The formation of a brown ring at the interface indicates the presence of cardiac glycosides.

Test for saponins: The method as described by Debela (2012) will be employed. 1 g of each sample extract will be boiled with 5 ml of distilled water and filtered. About 3ml of distilled water will then be added to the filtrate and shaken vigorously for about 5 mins. Persistent frothing indicates the presence of saponins.

Test for phenol: The method as described by Debela (2012)will be employed. 1% (w/ v) of the extract will be mixed with 2 ml of distilled water followed by the

addition of few drops of 10% ferric chloride. The formation of a blue or green color indicates the presence of phenols.

Test for alkaloids: The method as described by Debela (2012)will be employed. 0.5% (w/v) of the extract will be mixed with 5 ml of 1% aqueous HCl on water bath with continuous stirring for few minutes and then filtered. 1 ml of the filtrate will be pipetted individually into 3 test tubes. To each 1 ml in each test tube; Mayer, Wenger and Dragendroffs reagents will be added respectively. The formation of precipitate indicated the presence of alkaloids. Mayer's gives a white precipitate, Wenger's gives a reddish brown precipitate while Dragendroff's gives orange brown precipitate the three reagents can be used to ascertain the presence of alkaloids.

Test for terpenoides: The method as described by Debela (2012) will be employed. 5% (w/v) of each sample extract will be mixed with 2 ml of chloroform ($CHCl_3$) in a test tube. 3 ml of concentrated H_2SO_4 will be carefully added to the mixture to form a layer. An interface with reddish brown coloration indicates a positive result.

Test for flavonoids: The method as described by Debela (2012) will be employed. A small quantity of each test extract will be dissolved separately in dilute NaOH. A yellow solution that turns colorless on addition of concentrated HCl indicates the presence of flavonoids.

Test for quinones: The method as described by Debela (2012) will be employed. 1% (w/v) of extract will be mixed with 1 ml of concentrated H_2SO_4. The formation of a red color indicates the presence of quinones.

Test for antraquinones: Borntrager's test was used as described by Debela (2012) will be employed. About 0.2% (w/v) of the sample extract was shaken with 10 ml of benzene and then filtered. 0.5 ml of 1% ammonia solution was added to the filtrate and thereafter shaken. Appearance of pink, red or violet color indicates the presence of free anthraquinones.

Proximate analysis of ethanolic seed extract of *Moringa oleifera.*

Proximate analysis of the powdered *Moringa oleifera* will be carried out using standard procedure Debela (2012). The parameters to be determined were ash content, moisture content, protein content, lipid content, fibre content and carbohydrate.

Anti-cancer activity of the ethanolic seed extract of *Moringa oleifera*

Cytotoxic activity of the ethanolic seed extract was evaluated against HL-Cancer cell line (Human T-promyelocytic leukemia), MCF-7 Cancer cell lines (Human breast cancer), HeLa Cancer cell line (Human cervical carcinoma cancer) and 3T3 cell line (Mouse embryonic fibroblast cancer) respectively. All these cell lines were supplied by IBS and were purchased from American Type Cell Culture Collection (ATCC), USA. Cultures were maintained according to Harish *et al*., (2010) as monolayers in RPMI-1640 supplemented with 10% heat inactivated fetal bovine serum and 1% penicillin/streptomycin at 37^{o}C in a humidified atmosphere using 5% carbon(IV) oxide (CO_2). The cytotoxic activity of the synthesised product was evaluated using the sulforhodamine-B (SRB) (Sigma Aldrich) microculture calorimetric assay. Exponentially the growing cells were plated in 96-well microplates (Coster Corning Inc.) at a density of $5x10^3$ cells per well in 100 µL of the culture medium and these were allowed to adhere for 72 h before treatment in order to prevent confluence Harish *et al*., (2010). After 72 h of incubation, the fractions of the surviving cells were measured relative to the untreated cell population by calorimetric Microculture Tetrazolium salt assay (MTT) Harish *et al*., (2010). A volume of 20 ml of MTT salt (mg/ml) in phosphate buffer solution was added to each microtiter well and incubated again for 3-4 h. Dimethyl sulfoxide (DMSO) (100 µl) was then added to dissolve the remaining MTT formazan crystal by pippeting up and down 10-20 times. The plates were left at room temperature for 15-30 minutes. The optical density (OD) was measured on an ELIZA microplate 55reader at 570 nm and the percentage of cell viability was calculated using the equation:

% viability = (OD sample / OD control) 100%

A plot of percentage cell viability against the concentration of the drug gives a measure of the cytotoxicity. The cytotoxic index used was IC50, the drug concentration lethal to 50% of the tumor cells as calculated from the plate.

Results and Discussion

The results of the phytochemical screening was of the ethanolic seed extract of *Moringa oleifera* was presented in **Table 1**. This study has confirmed the presence of secondary metabolites such as flavonoids, phenols, tannins, saponins, alkaloid and glycosides which are claimed to be found in *Moringa oleifera*. The proximate analysis of *Moringa oleifera* leaves provides an information that its consumption is safe and beneficial to human health. The

results of the nutrional content in *Moringa oleifera* seeds (**Table 2)** shows relatively low moisture content (7.36%) and low protein content (6.99%), however, it shows high carbohydrate content (45.60%), ash content (12.63%), carbohydrate (45.60%) and high fibre content (21.28%). The low moisture content indicates that the powered sample in less liable spoilage by microbial contamination of properly stored. The ash value indicate that the powdered sample contain more of organic components. It is a good source of protein, carbohydrate and fat as these are present in large amount and within the dietary recommended allowance. According to the work conducted by Oluduro (2012), it was revealed that *Moringa oleifera* contains carbohydrate (45.43%), protein (16.15%), fat (9.68%), crude fibre (9.68%), moisture (11.76%) and ash (10.64%), which was in good agreement with our findings.

Table 1: Results of phytochemical of *Moringa oleifera* leaves

PHYTOCHEMICALS	INFERENCE
Flavonoids	Positive
Alkaloids	Positive
Phenols	Positive
Tannins	Positive
Saponins	Positive
Glycosides	Positive

Table 2: Results of phytochemical of *Moringa oleifera* leaves

COMPOUNDS	% COMPOSITION
Fibre	21.28
Moisture	7.36
Ash content	12.63
Carbohydrate	45.60
Protein	6.99
Lipids	15.4

The cytotoxic activity of the ethanolic seed extract was evaluated against HL-60 Cancer cell line (Human T-promyelocytic leukemia), MCF-7 Cancer cell lines (Human breast cancer), HeLa Cancer cell line (Human cervical carcinoma cancer) and mouse embryonic fibroblast normal cell line (3T3) lines with with IC_{50} values of 8.51, 8.62, 12.33 and 2.78 µg/ml respectively. Based on IC_{50} values, compounds with IC_{50} < 10 µg/ml were strongly active, those with IC_{50}

ranging from 10-30 µg/ml were considered to be moderately active while compounds with IC_{50} > 30 µg/ml were considered as weakly active Yasin *et al*., (2004). Based on the bioactivity results obtained, the ethanolic seed extract of *Moringa oleifera* showed high activity against cultured human breast cancer (MCF-7), human Tpromyeloctic leukaemia (HL-60), human cervical carcinoma cancer (HeLa) cell lines. Figures 1-4 depicts the effects of ethanolic seed extract of *Moringa oleifera* against the different cancer cell lines used.

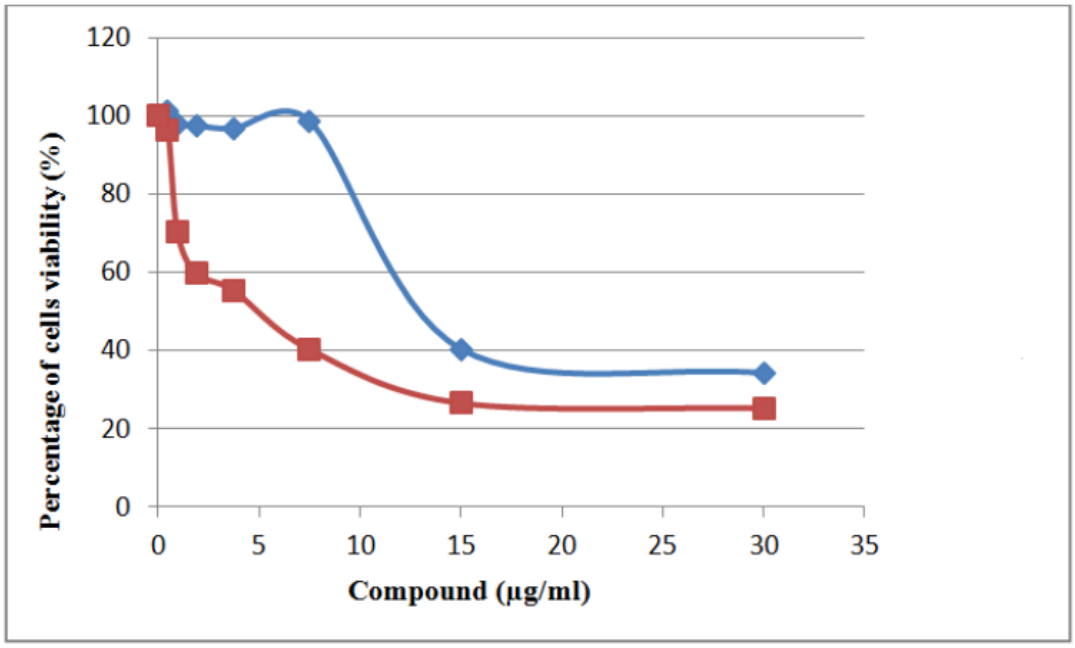

Figure 1: Effect of ethanolic seed extract against HeLa cell line

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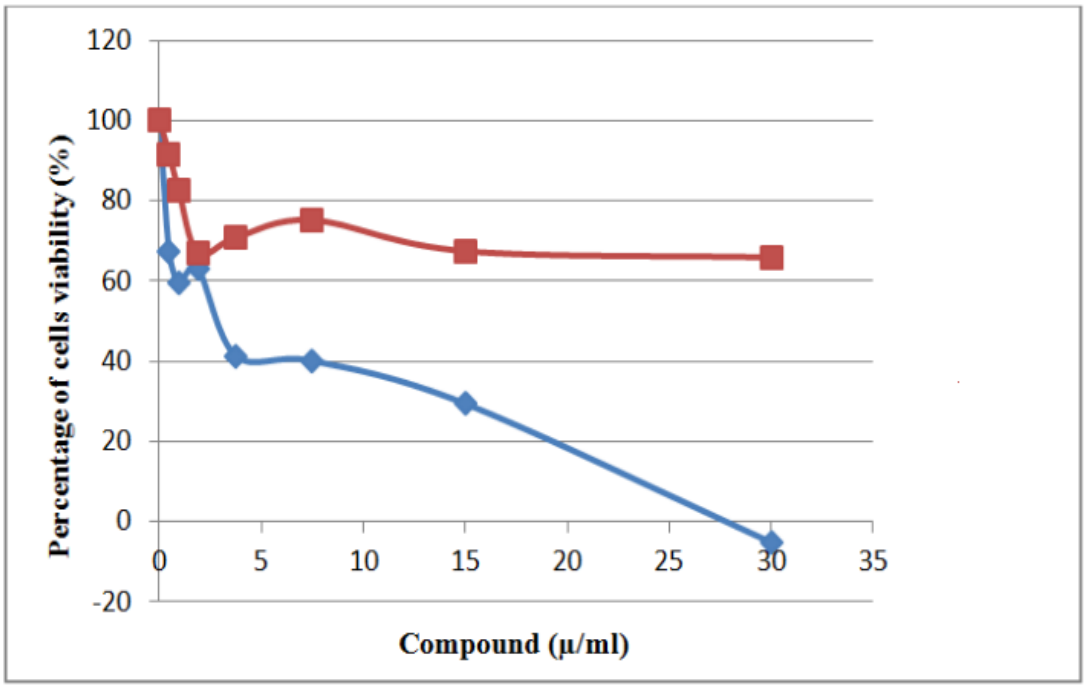

Figure 2: Effect of ethanolic seed extract against 3T3 cell line

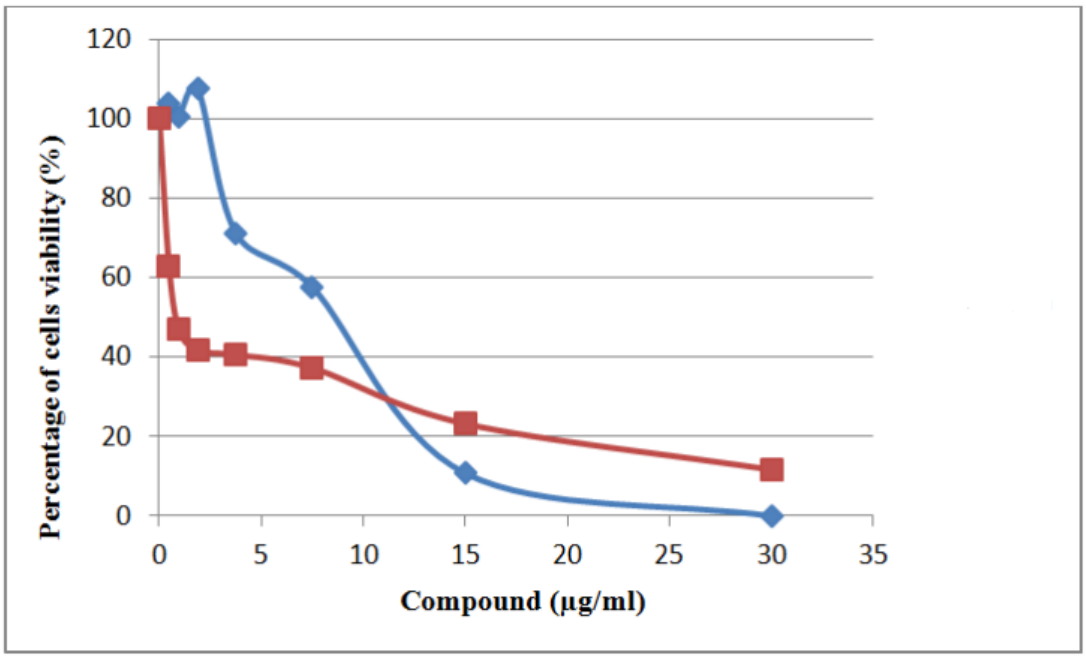

Figure 3: Effect of ethanolic seed extract against MCF-7 cell line

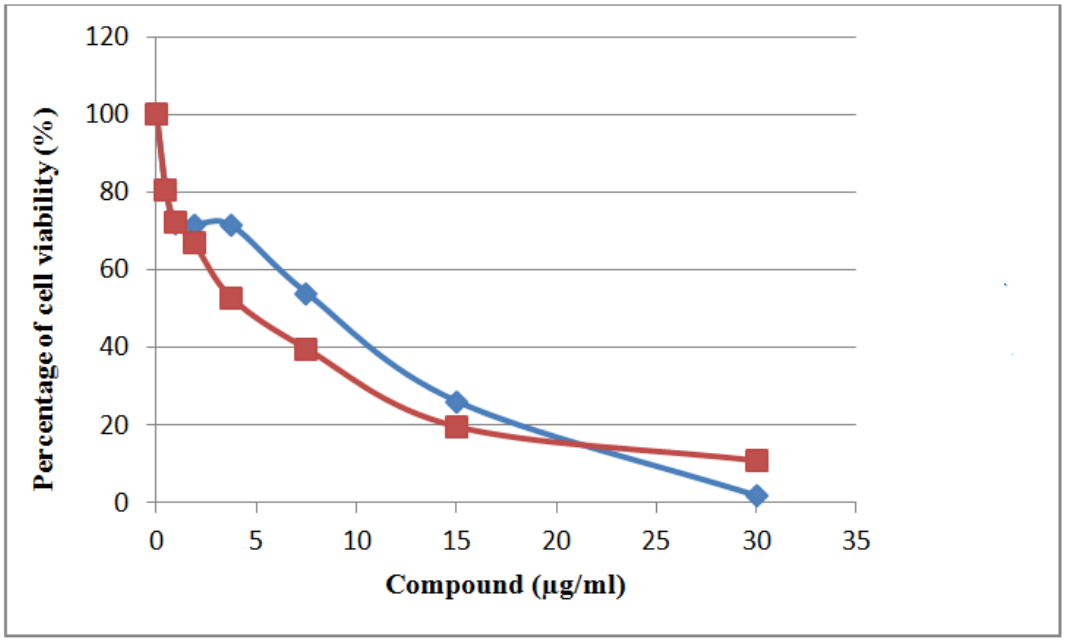

Figure 4: Effect of ethanolic seed extract against HL-60 cell line

Conclusion

The present study of proximate and phytochemical screening revealed that *Moringa oleifera* leaves are safer to be used. These findings suggest that *Moringa oleifera* leaves possess anti-cancer potential which may be contributed to its ethno-medicinal uses The results of the study presented in this paper suggested that *Moringa oleifera* may be highly valued in medicine for its anticancer properties. This is an indication that *Moringa oleifera* may be used in the prevention and treatment of various types of cancer.

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