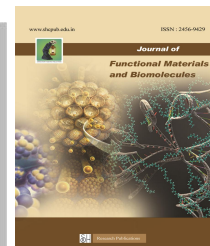




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## ANTICANCER ACTIVITY OF LEAF EXTRACT FROM MORINGA OLEIFERA

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### Abstract

*Moringa oleifera*, an important medicinal plant, is one of the most widely cultivated species of the family *Moringaceae*. It has been highly valued from time immemorial because of its vast medicinal properties. The current study investigates the anticancer activity of the methanol extract of *Moringa oleifera* leaves. The cytotoxic efficacy was evaluated on the methanol extract of *Moringa oleifera* leaves and showed least viability at the highest dose compared to the control group. So *Moringa oleifera* is a good antioxidant and anticancer activity. Every part of *Moringa* is said to have beneficial properties that can serve humanity, so the whole plant can be extensively studied for further research aspects like anaemia, anxiety, asthma, blackheads, blood impurities, bronchitis, catarrh, chest congestion, cholera, conjunctivitis, cough, diarrhoea, eye and ear infections, fever, abnormal blood pressure, pain in joints, scurvy, semen deficiency, headaches, and tuberculosis.

**Keywords:** *Moringa oleifera*, pharmacological and medicinal properties.

### 1 Introduction

Cancer is the abnormal growth of cells in our bodies that can lead to death. Cancer cells usually invade and destroy normal cells. These cells are born due to imbalance in the body and by correcting this imbalance, the cancer may be treated. Every year, millions of people are diagnosed with cancer, leading to death. According to the American Cancer Society, deaths arising from cancer

constitute 2–3% of the annual deaths recorded worldwide. Thus cancer kills about 3500 million people annually all over the world. Several chemo preventive agents are used to treat cancer, but they cause toxicity that prevents their usage [1]. Cancer is the second leading cause of death in America. The major causes of cancer are smoking, dietary imbalances, hormones and chronic infections leading to chronic inflammation. Breast cancer is the most common form of cancer in women worldwide.

Amongst South African women, breast cancer is likely to develop in one out of every 31 women in the country. Colon cancer is the second most common cause of cancer deaths in the US. Prostate cancer is the most frequently diagnosed cancer among men in the US, second to skin cancer with an estimated 180,000 new cases and 37,000 deaths expected by American Cancer Society each year[2]. With increase in longevity, the disease is going to be a problem even in India. Cancers affecting the digestive tract are among the most common of all the cancers associated with aging. About one out of every 14 men and women in America is diagnosed with gastrointestinal cancer at some time in his/her life. Because of high death rate associated with cancer and because of the serious side effects of chemotherapy and radiation therapy, many cancer patients seek alternative and/or complementary methods of treatment [3].

The important preventive methods for most of the cancers include dietary changes, stopping the use of

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tobacco products, treating inflammatory diseases effectively, and taking nutritional supplements that aid immune functions. Recent researches revolve round the urgency to evolve suitable chemotherapy consistent with new discoveries in cell biology for the treatment of cancer with no toxic effect [4]. Chemotherapy, being a major treatment modality used for the control of advanced stages of malignancies and as a prophylactic against possible metastasis, exhibits severe toxicity on normal tissues. Plants have been used for treating various diseases of human beings and animals since time immemorial. They maintain the health and vitality of individuals, and also cure diseases, including cancer without causing toxicity. More than 50% of all modern drugs in clinical use are of natural products, many of which have the ability to control cancer cells [5].

According to the estimates of the WHO, more than 80% of people in developing countries depend on traditional medicine for their primary health needs. A recent survey shows that more than 60% of cancer patients use vitamins or herbs as therapy. Over the past decade, herbal medicines have been accepted universally, and they have an impact on both world health and international trade. Hence, medicinal plants continue to play an important role in the healthcare system of a large number of the world's population.

Traditional medicine is widely used in India. Even in USA, use of plants and phytomedicines has increased dramatically in the last two decades [6]. A National Centre for Complementary and Alternative Medicine has been established in USA. The herbal products have been classified under 'dietary supplements' and are included with vitamins, minerals, amino acids and 'other products intended to supplement the diet [7]'. Use of plants as a medicinal remedy is an integral part of the South African cultural life. It is estimated that 27 million South Africans use herbal medicines from more than 1020 plant species. In fact, there are several medicinal plants all over the world, including India, which are being used traditionally for the prevention and treatment of cancer. However, only

few medicinal plants have attracted the interest of scientists to investigate the remedy for neoplasm (tumour or cancer). Hence, an attempt has been made to review some medicinal plants used for the prevention and treatment of cancer in foreign countries [8].

*Moringa oleifera* Lam. (drumstick tree, horseradish tree) is an indigenous tree from northwestern India and is often cultivated in hedges and home yards. The tree is valued mainly for the tender pods, which are esteemed as a vegetable (Ramachandran *et al.*, 1980). Flowers and young leaves are also eaten as vegetables. The leaves are a rich source of essential amino acids such as methionine, cysteine, tryptophan, and lysine [9]. Decoctions and extracts from the leaves are also variously employed in native medicine. The alcoholic extract of *Moringa oleifera* reduced a toxicity of some drugs in rats. Most of the Philippines women consume *Moringa* leaves mixed in chicken or shellfish soups to enhance breast milk production. In southern India, village people use the fresh leaves to prepare cow and buffalo ghee from butter fat. It has been found that there is a significant increase in the shelf life of ghee and that *Moringa* leaves can be a good source of natural antioxidants [10].

## 2. MATERIALS AND METHODS

### 2.1. Plant Material

The *Moringa oleifera* leaves were collected from Tirupattur, Tirupattur district, Tamil nadu, India.

### 2.2. Preparation of the extract



**Fig.1 Moringa oleifera leaves**

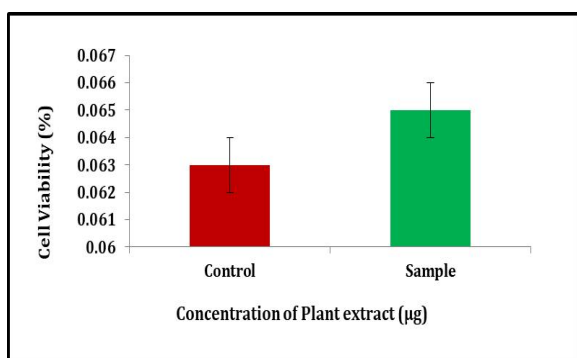
The leaves were chopped to small pieces and dried in shade. The dried leaves were powdered and extracted (10g) successively with 100 ml of methanol

in a soxhlet extractor for 18–20 h. The extracts were concentrated to dryness under reduced pressure and controlled temperature (40–50 °C). The extract used for further experimental analysis. The Fig.1. shows the *Moringa oleifera* leaves are in the picture.

### 2.3. Cell Viability test [MTT assay]

Goat liver was procured from the local slaughter house aseptically in 250ml sterile chilled phosphate buffered saline. It was chopped to fine pieces with the help of sterile scissors in vertical laminar air flow. The chopped pieces were incubated with equal amount of TPVG for 45min in Orbitech rotary shaker at 37°C at 105 rpm. 10% Serum was added to inhibit the action of trypsin after the completion of incubation. The cells were centrifuged at 3250 rpm for 10min; the supernatant was subjected to Neubaur's Chamber for cell counting. Fifteen to twenty thousand cells were seeded in 96 well plates in 40µl of PBS, incubated on rotary shaker for 2 hours at 37°C at 95 rpm. 10µl, 20µl and 40µl of plant extract were added in each well followed by addition of 10µl MTT reagent [Yellow tetrazolium salt]. The plates were incubated in Orbitech rotary shaker at 37°C at 100 rpm for 4 hours. After the incubation 10µl of lysis solution [20% SDS in 50% DMSO] was introduced in each well. The plates were further incubated at 37°C at 100 rpm to solubilize the purple coloration developed by conversion of tetrazolium salt. The O.D was recorded using Eliza reader at 492nm and % cell viability determined by: %viability = Mean absorbance of sample X 100/Mean absorbance of control

### 3. RESULT AND DISCUSSION



**Fig. 2. Anticancer efficacy of methanol extract of *Moringa oleifera* leaves**

The anticancer activity of methanol extract of *Moringa oleifera* leaves showed in the Fig.2. The cell viability count at 40µl sample [maximum] was 96% for *Moringa oleifera* leaves.

The cytotoxic efficacy was evaluated on the methanol extract of *Moringa oleifera* leaves showed least viability at highest dose compared to control group. So the *Moringa oleifera* is a good antioxidant and anticancer activity. The antitumor potential was due the presence of three known thiocarbamate (TC) and isothiocyanate (ITC)-related compounds which are acting as inhibitors of tumor promoter teleocidin B-4- induced Epstein-Barr virus (EBV) activation in Raji cells. Interestingly, only niaziminin among 10 TCs including 8 synthetic ones showed considerable inhibition against EBV activation [11].

On the other hand, among the ITC-related compounds, naturally occurring 4-[(4'-O-acetyl-alpha-L-rhamnosyloxy) benzyl] ITC and commercially available allyl- and benzyl-ITC significantly inhibited activation, suggesting that the isothiocyano group is a critical structural factor for antitumor activity [12]. The anticancer activity from the methanol extract of seeds of *Moringa oleifera* extract was found to contain various antitumor compounds like Oethyl- 4-(alpha-L-rhamnosyloxy)benzyl carbamate which was a new compound, together with seven known compounds, 4(alpha-L-rhamnosyloxy)-benzyl isothiocyanate, niazimicin, niazirin, beta-sitosterol [13]. Their potential antitumor promoting activity was performed using an in vitro assay which tested their inhibitory effects on Epstein- Barr virus-early antigen (EBV-EA) activation in Raji cells induced by the tumor promoter, 12-Otetradecanoyl- phorbol-13-acetate [14]. The extracts were tested for cytotoxicity by using the brine shrimp lethality assay, sea urchin eggs assay, hemolysis assay and MTT assay using tumor cell lines [15].

The cytotoxic effect of various extracts of leaves of *Moringa oleifera*. The cytotoxic efficacy was evaluated on human multiple myeloma cell lines. Of the organic extracts, methanolic extracts of *Moringa* leaves showed

least viability at highest dose[16]. *Moringa oleifera*, an important medicinal plant is one of the most widely cultivated species of the family *Moringaceae*. Various parts of the plant have been used for human medication. Insight of literature review on this plant clearly explained its various traditional uses as antispasmodic, stimulant, expectorant etc. Bark is emmenagogue and even abortifacient, antifungal, antibacterial [17]. Flowers are cholagogue, stimulant, tonic and diuretic. Root-bark is used as antiviral, anti-inflammatory, analgesic. Pharmacologically reported activities includes antimicrobial, anti-inflammatory, antioxidant, anticancer, antifertility, hepatoprotective, cardiovascular, antiulcer, analgesic, wound healing, anticonvulsant, antiallergic and anthelmintic activities[18]. Phytochemically, it is known as rich source of glycosides, phenols, sterols, flavanol glycosides present in *Moringa oleifera* might be medicinally important and/or nutritionally valuable. The ethanolic extracts of *Moringa oleifera* leaves, niazirin and niazirin and three mustard oil glycosides, 4-[(4'-O-acetyl-alpha-L-rhamnosyloxy) benzyl] niaziminin A, and niaziminin B[19].The seeds only contained alpha-l-rhamnopyranosyloxy at high concentrations. Roots of *Moringa oleifera* contains high concentrations of both 4-(alpha-l-rhamnopyranosyloxy)-benzylglucosinolate and benzyl glucosinolate. Leaves of the plant contains benzylglucosinolate and three monoacetyl isomers of this glucosinolate and various amino acids like aspartic acid, glutamic acid, glycine, threonine, alanine, valine, leucine, isoleucine, histidine, lysine, phenylalanine, tryptophan, cysteine, methionine [20].

#### 4. CONCLUSION

From the above results and discussion it can be concluded that the methanol extract of *Moringa oleifera* possesses the potent antioxidant substances which may be responsible for its anti-inflammatory, anticancer and chemoprotective mechanism as well as justify the basis of using this plant's extract as folkloric remedies.

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**Conflict of Interest:** Nil

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