ABSTRACT

**Objective:** The aim of the present study was to carry out phytochemical analysis of aqueous and ethanolic extract of *Moringa oleifera* and to find out antifungal property of *Moringa oleifera*.

**Methods:** *Moringa oleifera* leaf extracts was used for plant component analysis and for determination of antifungal activity. *Saccharomyces cerevisiae* (MTCC No.170), *Candida albicans* (MTCC No.183), *Candida tropicalis* (MTCC No.1000) strain were used for experimental purpose. Well diffusion method was used to assess the antifungal effect of the extracts on micro-organisms.

**Results:** The phytochemical screening indicated the presence of flavonoids, tannins, steroid, alkaloid, saponins etc., in the both extracts. Antifungal activity of ethanolic and aqueous extract of *Moringa oleifera* leaf was highly active against *Saccharomyces cerevisiae* and active against *Candida tropicalis* and not showing activity against *Candida albicans*.

**Conclusion:** The present study conclusively demonstrates that *Moringa oleifera* is a good source of various phytochemicals like alkaloids, flavonoids, carbohydrates, glycosides, saponins, tannins, terpenoids. The antifungal activity *Moringa Oleifera* was clearly shown by the present study against various fungi like *Saccharomyces cerevisiae*, *Candida albicans* and *Candida tropicalis*. All these preliminary reports warrant an in depth analysis of the usefulness of *Moringa oleifera* as a miracle drug against various ailments.

**Keywords:** Antifungal activity, *Moringa oleifera*, Phytochemical Screening

INTRODUCTION

*Moringa oleifera* is one of the species of family Moringaceae, native to, Africa, Arabia, South Asia, South America, Himalaya region, India, Pakistan, the pacific and Caribbean Islands. *Moringa oleifera* has been naturalized in many tropic and subtropics regions worldwide, the plant is referred to number of names such as horseradish tree, drumstick tree, ben oil tree, miracle tree, and “Mother’s best friend” [1]. *Moringa oleifera* is commonly known as “Drumstick”. It is a small or medium sized tree, about 10m height, found in the sub-Himalayan tract [2]. *Moringa oleifera* is a small, fast-growing evergreen or deciduous tree that usually grows up to 10 to 12m in its height, open crown of drooping fragile branches, feathery foliage of trip innate leaves and thick corky, whitish bark [3]. The *Moringa* plant provides a rich and rare combination of zeatin, quercetin, kaempferol and many other phytochemicals [4]. The leaves are outstanding as a source of vitamins A when raw as a source of vitamin C. They are also good sources of vitamin B and are among the best plant sources of minerals [5]. Ethanol extract of *Moringa oleifera* leaves contain niacin, niacinine, niacinineins A and B [6]. Benzoic acid, gallic acid, beta benzaldehyde have been isolated from methanolic extract of *Moringa oleifera* leaves [7]. Leaves of this plant are reported to possess various biological activities, including hypocholesterolemic, anti diabetic, hypertensive agent and [8,9,10,11], regulate thyroid hormone [12], central nervous system, digestive system, nutrition and metabolism eye, ear nose throat genito-urinary system [13], to treat gastric ulcers [14] and scurvy [15]. Reports have also described the plant to be highly potent anti-inflammatory agent [16] and antitumour activity [17]. The plant has also been reported to be hepato protective against antitubercular drug such as isoniazid and rifampicin [18, 19]. *Moringa oleifera* is also being studied for its anti-inflammatory, antimicrobial, diuretic [20, 21, 22], antioxidant [23], hypotensive [10], and antimicrobial properties [24]. An immune enhancing polysaccharide [25] and niacininein, having structural requirement to inhibit tumour promoter induced Epstein Barr virus activation have been reported from the leaves [17]. The alcoholic extract of leaves of *Moringa oleifera* were reported to have analgesic activity [26]. Traditionally, the plant is used as antispasmodic, stimulant, expectorant and diuretic [27]. *Moringa oleifera* is used as drug many ayurvedic practitioners for the treatment of asthma and evaluate the anthelmintic activity of methanolic extract of *Moringa oleifera* in adult Indian earthworms phereetima posithuma at different doses [28].

MATERIALS AND METHODS

**Collection of plant materials**

The experiment was conducted in the year 2013 in the college laboratory. Leaves were collected from the *Moringa oleifera* plant (Figure 1 A, B) from the herbal garden. It was ensured that the plant was healthy and uninfected. The leaves were washed under running tap water to eliminate dust and other foreign particles and to cleanse the leaves thoroughly and dried.

**Preparation of leaf extracts**

Fresh leaves (20-30 gm) of *Moringa Oleifera* were shade dried at room temperature (32 – 35°C) to constant weight over a period of 5 days. The dried leaves were ground into powdered using a mortar and pestle. 25 g of the powdered leaves were separately extracted in 500ml conical flasks with 90% ethanol (Ethereal extraction) and water (Aqueous extraction). The conical flasks were plugged with rubber corks, then shaken at 120 rpm for 30 min and allowed to stand at room temperature for 5 days with occasional manual
agitation of the flask using a sterile glass rod at every 24 hour. The extracts were separately filtered using sterile Whatman no. 1 filter paper. These extracts (Ethanolic and aqueous) were used in further process.

**Fig. 1(B): Moringa oleifera**

### Phytochemical Analysis

Phytochemical analysis of extract for qualitative detection of alkaloids, flavonoids, steroid, volatile oil, glycoside, reducing sugar, tannins and saponins was performed by the extracts.

**Alkaloids**

- **Wagner’s test**: Drug solution + few drops of Wagner’s reagent (dilute Iodine solution).
- **Dragendorff’s test**: Drug solution + Dragendorff’s reagent (Potassium Bismuth iodide).
- **Hager test**: Drug solution + few drops of Hager’s reagent (Saturated aq. Solution of Picric acid).
- **Mayer’s Test**: Drug solution + few drops of Mayer’s reagent (K2Hgl4).

**Flavonoids**

3ml of each extract was added to 10ml of distilled water and the solution was shaken. 1ml of 10% NaOH solution was added to the mixture.

**Saponins**

- **Frothing test**: 3ml of each extract and dilute with 2ml of distilled water was added in a test tube. The mixture was shaken vigorously.

### Table 1: Qualitative phytochemical screening of ethanol and aqueous leaf extract of Moringa oleifera

<table>
<thead>
<tr>
<th>Solvents used for Extraction</th>
<th>Alkaloid</th>
<th>Flavonoid</th>
<th>Saponin</th>
<th>Steroid</th>
<th>Tannin</th>
<th>Glycoside</th>
<th>Reducing sugar</th>
<th>Volatile Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Water</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Table 2: Antifungal activity of ethanol and aqueous leaf extract of Moringa oleifera

<table>
<thead>
<tr>
<th>Name of microorganism</th>
<th>Zone of inhibition ±SD (mm)</th>
<th>Standard extract</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water extract</td>
<td>Ethanol extract</td>
</tr>
<tr>
<td>Saccharomyces cerevisiae</td>
<td>12 ± 0.012</td>
<td>15 ± 0.013</td>
</tr>
<tr>
<td>Candida albicans</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Candida tropicalis</td>
<td>5 ± 0.034</td>
<td>4 ± 0.0065</td>
</tr>
</tbody>
</table>

**RESULTS AND DISCUSSION**

The present study reveals that *Moringa oleifera* plant shows the presence of phytochemical constituents like alkaloids, flavonoids, carbohydrates, glycosides, proteins, saponins, tannins and terpenoids in different solvent extracts as shown in Table 1. Antifungal activity of *Moringa oleifera* was studied against several fungi namely *Saccharomyces cerevisiae*, *Candida albicans* and *Candida tropicalis*. The ethanol and aqueous leaf extract showed maximum activity against *Saccharomyces cerevisiae* shown in the Table No: 2. Figure 2 show zone of inhibitions produced by ethanol and water extract of *Moringa oleifera* against the *Saccharomyces cerevisiae* and *Candida tropicalis*. The largest zone of inhibition was produced by water and ethanol extract of *Moringa oleifera* against *Saccharomyces cerevisiae*. Alkaloids are naturally occurring chemical compounds containing basic nitrogen atoms. They often have pharmacological effects and are used as medications and recreational drugs [29]. Flavonoids enhance the effects of Vitamin C and function as antioxidants. They are also known to be biologically active against liver toxins, tumors, viruses and other microbes [30]. Plant terpenoids are used...
extensively for their aromatic qualities. They play a role in traditional herbal medicines and are under investigation for Antibacterial, Antineoplastic and other Pharmaceutical functions [31]. Tannins have shown potential Antiviral, Antibacterial and Antiparasitic effects. Saponins cause hemolysis of red blood cells[32]. The antifungal activity was screened because of their great medicinal properties towards the pathogenic organisms. The medicinal plant Moringa Oleifera showed good antifungal activity against several organisms like Saccharomyces cerevisiae, Candida tropicalis as supported by previous study.

ACKNOWLEDGEMENT

The authors are grateful to the management of Pioneer Pharmacy Degree College for the financial support and infrastructural facilities provided to carry out the work.

REFERENCES


