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# Antibacterial Effect of Some Medicinal Plant- A-Review Article

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**Introduction:**Plants are the life for the human beings on the earth. They play an important role in day to day life. As well as they are the producers of all ecosystems. Human uses of plants as medicine could be dated back to middle Paleolithic age, which is about 60000 years ago, according to fossil records (Fabricant and Frans worth 2001).

A medicinal plant is a plant that has similar properties as conventional pharmaceutical drugs. Humans have used them throughout history to either cure or lessons symptoms from an illness.

Knowledge on the medicinal plants, before the birth of writing, were transmitted orally. It is known that the first written text on the use of medicinal plants is about 4000 years old and appears in a clay small board in the Sumerian Culture, an antique groups of people who lived at the south of Euphrates and Tigris rivers. Health care in ancient time included the use of leaves flowers stems berries and roots of herbs for their therapeutic or medicinal value. These medicines initially took the form of crude drugs such as tinctures teas powders and other herbal formulation( Balick and Cox 1996,Samuelsson 2004).Knowledge of the specific plants to be used and the methods of application for particular aliments were passed down through oral history.

Medicinal plants possess immunomodulatory and antioxidant properties leading to antibacterial activities .They are known to have versatile immunomodulatory activity by stimulating both non specific and specific immunity (Pandey and chowdhry, 2006)

The use of plant extracts and phytochemicals both with known antimicrobial properties can be of significance in therapeutic treatments. In the last few years a number of studies have been used because of their antimicrobial traits which are due to compounds synthesized in the secondary metabolism of the plant ( Nascimento et al.,2000)

More recently a drug β methoxypsoralen has been produced from the plant Ammimajus ( Bishops weeds) which was reported by Egyptian medical practitioners to treat vitiligo , a skin condition characterized by the loss of pigments. This drug is now used to treat psoriasis and other skin disorders, as well as T –cell lymphoma( Gurib -Fakim 2006).

**Aim & Objective:**To assess the antimicrobial effect of some medicinal plant extract against bacteria.

**Specific Objectives:** The following specific objectives were achieved.

*To collect and to identify the medicinal plants.

*To extract the selected medicinal plant part using different solvents.

*To determine the anti-oxidant properties and phytochemical analysis of the plant extract.

Ethnobotany is the study of the relationship between plants and people: From "ethno "study ofpeople and "botany "study of plants. Ethnobotany is considered a branch ofethnobiology. Ethnobotany studies the relationships between (uses of) plants and cultures. The complex focus of ethnobotany is on how plants have been or are used,managed and perceived in human societies and includes plants used for food, medicine, divination cosmetics, dyeing, textiles, for building, tools, currency, clothing, rituals,social life and music. Ethnobotany is a multidisciplinary science defined as theinteraction between plants and people. The relationship between plants and human cultures is not limited to the use of plants for food, clothing and shelter but also includes their use for ornamentation and health care (Choudhary, 2008). However, a large number of medicinal plants remain to be investigated, for their possible pharmacological value. Most of the pharmaceutical industry is highly dependent on wild population for the supply of raw materials for extraction of medicinally important compounds.

Medicinal plants have been a part of modern life style of a man and these plants are a source of important therapeutic aid for alienating human ailments. Most of medicinal plants, even today, are collected from wild. The continued commercial exploitation of these plants has resulted in receding the population of many species in their natural habitat.

**1.Ginger (Zingiberofficinale)**

**Family:Zingiberaceae**

Ginger is the underground rhizome of the ginger plant with a firm, striated texture. The flesh of the ginger rhizome can be yellow, white or red in color, depending upon the variety. It is covered with a brownish skin that may either be thick or thin, depending upon whether the plant was harvested when it was mature or young.

Historically, ginger has a long tradition of being very effective in alleviating symptoms of gastrointestinal distress. In herbal medicine, ginger is regarded as an excellent carminative (a substance which promotes the elimination of intestinal gas) and intestinal spasmolytic (a substance which relaxes and soothes the intestinal tract). Modern scientific research has revealed that ginger possesses numerous therapeutic properties including antioxidant effects, an ability to inhibit the formation of inflammatory compounds, and direct anti-inflammatory effects.

Ginger contains very potent anti-inflammatory compounds called gingerols. These substances are believed to explain why so many people with osteoarthritis or rheumatoid arthritis experience reductions in their pain levels and improvements in their mobility when they consume ginger regularly. In two clinical studies involving patients who responded to conventional drugs and those who didn't, physicians found that 75% of arthritis patients and 100% of patients with muscular discomfort experienced relief of pain and/or swelling.

A study published in the November 2003 issue of Life Sciences suggests that at least one reason for ginger's beneficial effects is the free radical protection afforded by one of its active phenolic constituents, 6-gingerol. In this in vitro (test tube) study, 6-gingerol was shown to significantly inhibit the production of nitric oxide, a highly reactive nitrogen molecule that quickly forms a very damaging free radical called peroxynitrite. Another study appearing in the November 2003 issue of Radiation Research found that in mice, five days treatment with ginger (10 mg per kilogram of body weight) prior to exposure to radiation not only prevented an increase in free radical damage to lipids (fats found in numerous bodily components from cell membranes to cholesterol), but also greatly

lessened depletion of the animals' stores of glutathione, one of the body's most important internally produced antioxidants.

**Protection against Colorectal Cancer**

Gingerols, the main active components in ginger and the ones responsible for its distinctive flavor, may also inhibit the growth of human colorectal cancer cells, suggests research presented at the Frontiers in Cancer Prevention Research, a major meeting of cancer experts that took place in Phoenix, AZ, October 26-30, 2003.

In this study, researchers from the University of Minnesota's Hormel Institute fed mice specially bred to lack an immune system a half milligram of (6)-gingerol three times a week before and after injecting human colorectal cancer cells into their flanks. Control mice received no (6)-gingerol.

Tumors first appeared 15 days after the mice were injected, but only 4 tumors were found in the group of -gingerol-treated mice compared to 13 in the control mice, plus the tumors in the -gingerol group were smaller on average. Even by day 38, one mouse in the (6)-gingerol group still had no measurable tumors. By day 49, all the control mice had been euthanized since their tumors had grown to one cubic centimeter (0.06 cubic inch), while tumors in 12 of the (6)-gingerol treated mice still averaged 0.5 cubic centimeter—half the maximum tumor size allowed before euthanization.

Research associate professor Ann Bode noted, "These results strongly suggest that ginger compounds may be effective chemopreventive and/or chemotherapeutic agents for colorectal carcinomas."

In this first round of experiments, mice were fed ginger before and after tumor cells were injected. In the next round, researchers will feed the mice ginger only after their tumors have grown to a certain size. This will enable them to look at the question of whether a patient could eat ginger to slow the metastasis of a nonoperable tumor. Are they optimistic? The actions of the University of Minnesota strongly suggest they are. The University has already applied for a patent on the use of (6)-gingerol as an anti-cancer agent and has licensed the technology to Pediatric Pharmaceuticals (Iselin, N.J.).

**Ginger Induces Cell Death in Ovarian Cancer Cells**

Lab experiments presented at the 97th Annual Meeting of the American Association for Cancer, by Dr Rebecca Lui and her colleagues from the University of Michigan, showed that gingerols, the active phytonutrients in ginger, kill ovarian cancer cells by inducing apoptosis (programmed cell death) and autophagocytosis (self-digestion).

Ginger extracts have been shown to have both antioxidant, anti-inflammatory and anti-tumor effects on cells. To investigate the latter, Dr Liu examined the effect of a whole ginger extract containing 5% gingerol on a number of different ovarian cancer cell lines.

Exposure to the ginger extract caused cell death in all the ovarian cancer lines studied.

A pro-inflammatory state is thought to be an important contributing factor in the development of ovarian cancer. In the presence of ginger, a number of key indicators of inflammation (vascular endothelial growth factor, interleukin-8 and prostaglandin E2) were also decreased in the ovarian cancer cells.

Conventional chemotherapeutic agents also suppress these inflammatory markers, but may cause cancer cells to become resistant to the action of the drugs. Liu and her colleagues believe that ginger may be of special benefit for ovarian cancer patients because cancer cells exposed to ginger do not

become resistant to its cancer-destroying effects. In the case of ovarian cancer, an ounce of prevention—in the delicious form of liberal use of ginger—is an especially good idea. Ovarian cancer is often deadly since symptoms typically do not appear until late in the disease process, so by the time ovarian cancer is diagnosed, it has spread beyond the ovaries. More than 50% of women who develop ovarian cancer are diagnosed in the advanced stages of the disease.

**2.CLOVE(Syzgiumaromaticum)**

**Family:Myrtaceae**

Like other spices, cloves are available throughout the year. They are renowned for providing their uniquely warm, sweet and aromatic taste to ginger bread and pumpkin pie, but they can also make a wonderful addition to split pea and bean soups, baked beans and chili. Cloves are the unopened pink flower buds of the evergreen clove tree. The buds are picked by hand when they are pink and dried until they turn brown in color. Cloves are about 1/2-inch long and 1/4-inch in diameter and with their tapered stem, they resemble tiny nails. In fact, their English name is actually derived from the Latin word clavus, which means nail. Although cloves have a very hard exterior, their flesh features an oily compound that is essential to their nutritional and flavor profile.

**Health Benefits**

Clove contains significant amounts of an active component called eugenol, which has made it the subject of numerous health studies, including studies on the prevention of toxicity from environmental pollutants like carbon tetrachloride, digestive tract cancers, and joint inflammation. In the United States, eugenol extracts from clove have often been used in dentistry in conjunction with root canal therapy, temporary fillings, and general gum pain, since eugenol and other components of clove (including beta-caryophyllene) combine to make clove a mild anaesthetic as well as an anti-bacterial agent. For these beneficial effects, you'll also find clove oil in some over-the-counter sore throat sprays and mouth washes.

**Anti-Inflammatory Activity**

Eugenol, the primary component of clove's volatile oils, functions as an anti-inflammatory substance. In animal studies, the addition of clove extract to diets already high in anti-inflammatory components

(like cod liver oil, with its high omega-3 fatty acid content) brings significant added benefits, and in some studies, further reduces inflammatory symptoms by another 15-30%. Clove also contains a variety of flavonoids, including kaempferol and rhamnetin, which also contribute to clove's anti-inflammatory (and antioxidant) properties.

**A Nutrient-Dense Spice**

Like its fellow spices, clove's unique phytonutrient components are accompanied by an incredible variety of traditionally-recognized nutrients. Using our nutrient ranking system, we determined cloves to be an excellent source of manganese, a very good source of vitamin K and dietary fiber, and a good source of iron, magnesium, and calcium.

**Materials and Methods**

**1. Collection of Medicinal Plant Samples:**

The medicinal plant sample was collected from the local area and market.

**2. Extraction of the Medicinal Plants**

Each sample of the tested medicinal plants was prepared into aqueous and methanol extracts. Aqueous extracts were prepared by dissolving 20gm of fine powder of each plant separately in 100 ml distilled water. The contents were kept on a shaker for 48 h. Then the extract was filtered and dried in air-oven at 40 o

The extracts were stored under refrigeration at 4°C for further studies. Methanolic extracts of the tested plants were prepared according to [30]. The extracts were obtained using soxhlet extraction of 20 g of each sample for 6 h in about 250 ml methanol then concentrated to dryness under reduced pressure using rotatory evaporator and the residues were stored at 4°C.

**3. Antibacterial Activity Screening**

The first screening step, in this study, was carried out to prop the antibacterial activity of aqueous and methanol extracts of Ginger and Clove plants against Bacillus cereus, Staphylococcus aureus, and Clostridium perfringens as Gram-positive, Salmonella

typhimurium and Escherichia coli as Gram-negative bacteria species. All experiments were duplicated. The diameter in mm of the clear zone indicated the inhibition activity.

In the second screening step, the antibacterial activity of the selected extracts of Ginger and Clove against Bacillus cereus (Gram+), Staphylococcus aureus (Gram+) and Salmonella typhimurium (Gram–) was measured by the inhibition zones produced Antibacterial activity of aqueous and methanol extracts of the tested plant samples was determined according to [31] using disk diffusion assay. The tested bacteria strains were suspended in 5ml 0.1% peptone water and 100µl of suspension were swabbed on entire surface of Plate Count Agar (PCA) for bacteria. Sterile 6-mm filter paper discs (Whatman, Kent, UK) immerged with aqueous and methanol extracts of the tested samples individually were aseptically placed on the center of the inoculated plates. The diameters of inhibition zones were measured in mm after incubation at 37°C for 24 h. Each sensitivity test was performed by using an antibiotic drug as a control. The antimicrobial activity was measured by the inhibition zones produced. All the testes were performed in duplicate.

The antimicrobial activities of the selected plant extracts against the tested bacteria were compared with the available antibiotics. The antibiotic discs such as Chloramphenicol, Penicillin, Gentamycin and Deoxtetracycline were placed on the surface of the plates. The plates were incubated at 37 o C for 24 h and after incubation the diameter of the inhibition zones were measured in mm and recorded [32].

**Results and Discussion**

The current work was designed to investigate the antimicrobial activity of some medicinal plant extracts: Ginger and Clove against some food-borne and spoilage pathogenic bacteria (Salmonella typhimurium, Bacillus cereus, Clostridium perfringens, Staphylococcus aureus and Escherichia coli). Theantibacterial activity of the tested plant extracts was qualitatively assessed by the presence or absence of inhibition zones . In the first preliminary screening step, the aqueous and methanol extracts of Ginger showed antibacterial activity with clear zone (+) against Salmonella typhimurium and Staphylococcus aureus. Meanwhile, methanol extract only of this plant displayed the same inhibition zone against Bacillus cereus and Escherichia coli. On the other hand, the methanol extract of Clove showed antibacterial activity with clear zone (+) against Salmonella typhimurium, Bacillus cereusandStaphylococcus aureus; whereas aqueous and methanol extracts of this plant showed the same activity and inhibition zones against Clostridium perfringens and Escherichia.

Clove aqueous and methanol extracts were noticed for their antibacterial activity against Salmonella typhimurium and Bacillus cereus. The methanol extract only was of same activity against Staphylococcus aureus. Thus, in the present study the obtained screening results showed potential antimicrobial activity of the tested medicinal plant extracts against all the screened bacterial strains. It was also observed that the methanol extracts exhibited higher antibacterial activity than aqueous extracts. Various publications have been documented for the antibacterial activity of essential oil constituents and plant extracts . This activity could be attributed to the presence of phytochemicals in the tested medicinal plant extracts.

Medicinal plants are a rich source of antimicrobial agents due to the secondary metabolites such as alkaloids, flavonoides, tannins and terpenoids that are found in these plants [7]. The medicinal plant extracts exhibited remarkable activity against some of the representative food-borne and spoilage pathogenic bacteria such as Staphylococcus aureus KCTC 1916, L. monocytogenesATCC 1916.

According to the results given above plant extracts showed high bacterial activity in the first screening step. Therefore, the antibacterial activity of aqueous and methanol extracts of these medicinal plants were selected to be tested against Bacillus cereus(Gram+), Staphylococcus aureus (Gram+) and Salmonella typhimurium (Gram–) and their antibacterial effect was comparable to the antibiotics used as control.

In the second screening step, disk diffusion test on agar diffusion method was used for determination of the antimicrobial activity of aqueous and methanol extracts for the selected medicinal plants (Ginger and Clove) against Bacillus cereus, Staphylococcus aureus and Salmonella typhimurium. The inhibitory activity was measured by zone diameter (mm) of inhibition.

Bacillus species are common microbes found in most natural environments including soil, water, plant and animal tissues. Most of these species are regarded as having little pathogenic potential. Both Bacillus cereus and Bacillus subtilis were known to act as primary attacker or secondary infectious agents in a number of diseases and implicated in some cases of food poisoning [33]. Many of the plants in the food and medicine of the indigenous people may have helped to combat these microbes [34].

**Conclusion:**

It can be generally concluded that the obtained results indicated the possibility of using the tested medicinal plants and spices (traditional food ingredients) as natural sources and their extracts were recommended to be used as natural preservatives in food against the screened bacterial specieswhich cause food-borne diseases and food spoilage.

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