ANTIBACTERIAL ACTIVITY OF GINGER (ZINGIBER OFFICINALE) AND HONEY ON ESCHERICHIA COLI.

*Dr. Kapadnis Kailas H.

ABSTRACT
Most agents used by humans in the treatment of diseases are of plant origin. *Escherichia coli* helps in preventing the entry of pathogenic microorganisms. *E. coli* are non-pathogenic in normal conditions, but if present in excess, will become causative agent of various diseases like urinary tract infection, diarrhea, vomiting etc. Herbs and spices are used in Indian recipes as they impart aroma and flavor to it. When these plant products are used as ingredients of food, the effectiveness of extracts using organic solvents should not be a criterion. In the present study, frequently used herbs and spices are selected; their extracts are made using distilled water and tested for its antimicrobial effect against *E. coli*. The antibacterial effect of various herbs and spices were evaluated using various methods. All the herbs and spices tested were able to inhibit *E. coli* growth, but Thyme (herb) and Turmeric (spice) were found to be most effective against *E. coli*. Ginger (*Zingiber officinal*) and honey were chosen to examine their effects on the bacteria *E Coli*. To obtain an extract from the spices, an aqueous extraction method combined with filtration was used. The extracted compounds were applied to the bacteria through the paper disk diffusion method.

KEYWORDS: Honey, Ginger, antibacterial activity, Wound healing, Medicinal property.

INTRODUCTION
The use of traditional medicine to treat infection has been practiced since the origin of mankind, and honey produced by *Apis mellifera (A. mellifera)* is one of the oldest traditional medicines considered to be important in the treatment of several human ailments. Currently, many researchers have reported the antibacterial activity of honey and found that natural
unheated honey has some broad-spectrum antibacterial activity when tested against pathogenic bacteria, oral bacteria as well as food spoilage bacteria in most ancient cultures. Honey has been used for both nutritional and medical purposes.

Food borne diseases have always been a major concern. *Campylobacter jejuni, Staphylococcus aureus, Salmonella* (over 1600 types), *Escherichia coli* O157:H7, *streptococci*, etc. are some of the major bacterial species that causes food borne diseases. *E. coli* are the most commonly found bacterium in the human intestinal tract. Under normal conditions, its presence is conducive to digestive processes, but when present in excess or in virulent form it causes diseases. Virulent strains of *E. coli* can cause gastroenteritis, urinary tract infections, neonatal meningitis etc. With increasing use of drugs, microorganisms are attaining resistance to commonly used antibiotics, which leads to downfall of effectiveness of conventional medicines and therefore, search for new antimicrobial agents has become necessary. Traditional medicines have been used for many centuries by a substantial proportion of the population of India. The interest in the study of medicinal plants as a source of pharmacologically active compounds has increased worldwide. It is recognized that in developing countries like India, plants are the main medicinal source to treat infectious diseases. Approximately 20% of the plants found in the world have been subjected to pharmacological or biological test, and a substantial number of new antibiotics introduced in the market are obtained from natural or semi-synthetic resources. The active ingredients of plants against microorganisms are mostly some of the secondary metabolites (i.e. alkaloids, glycosides etc.) that are present in abundance in herbs and spices commonly used in Indian food preparations. Herbs are small plants used by human being for various purposes like medicines, food supplements for imparting flavor or scant. Spices have been defined as plant substances from indigenous or exotic origin, aromatic or with strong taste, used to enhance the taste of foods. Spices include leaves (bay, mint, rosemary, coriander, laurel, oregano), flowers (clove), bulbs (garlic, onion), fruits (cumin, red chili, black pepper), stems (coriander, cinnamon), rhizomes (ginger) and other plant parts.

The belief that honey is a nutrient, a drug and an ointment has been carried into our days, and thus an alternative medicine branch, called apitherapy has been developed in recent years, offering treatments based on honey and other bee products against many diseases including bacterial infections. At present a number of honey products are sold with standardized levels of antibacterial activity. The *Leptospermum scoparium (L. scoparium)* honey, the best known
of the honeys, has been reported to have an inhibitory effect on around 60 species of bacteria, including aerobes and anaerobes, gram-positives and gram-negatives Tan et al reported that Tualang honey has variable but broad-spectrum activities against many kinds of wound and enteric bacteria. Unlike glucose oxidase, the antibacterial properties from *Leptospermum* spp. honeys are light and heat-stable. Natural honey of other sources can vary as much as 100-fold in the potency of their antibacterial activities, which is due to hydrogen peroxide. In addition honey is hygroscopic, which means that it can draw moisture out of the environment and dehydrate bacteria, and its high sugar content and low level pH can also prevent the microbes from growth.

**Medicinal property**

Honey is an ancient remedy for the treatment of infected wounds, which has recently been ‘rediscovered’ by the medical profession, particularly where conventional modern therapeutic agents fail. The first written reference to honey, a Sumerian tablet writing, dating back to 2100-2000 BC, mentions honey's use as a drug and an ointment. Aristotle (384-322 BC), when discussing different honeys, referred to pale honey as being “good as a salve for sore eyes and wounds”. Manuka honey has been reported to exhibit antimicrobial activity against pathogenic bacteria such as *Staphylococcus aureus* (*S. aureus*) and *Helicobacter pylori* (*H. pylori*) making this honey a promising functional food for the treatment of wounds or stomach ulcers.

The honey has been used from ancient times as a method of accelerating wound healing and the potential of honey to assist with wound healing has been demonstrated repeatedly Honey is gaining acceptance as an agent for the treatment of ulcers, bed sores and other skin infections resulting from burns and wounds The healing properties of honey can be ascribed to the fact that it offers antibacterial activity, maintains a moist wound environment that promotes healing, and has a high viscosity which helps to provide a protective barrier to prevent infection. There are many reports of honey being very effective as dressing of wounds, burns, skin ulcers and inflammations; the antibacterial properties of honey speed up the growth of new tissue to heal the wound The medihoney and manuka honey have been shown to have *in vivo* activity and are suitable for the treatment of ulcers, infected wounds and burns.

The honey, when applied topically, rapidly clears wound infection to facilitate healing of deep surgical wounds with infection The application of honey can promote the healing in
infected wounds that do not respond to the conventional therapy, *i.e.*, antibiotics and antiseptics, including wounds infected with methicillin-resistant *S. aureus*. Moreover, it can be used on skin grafts and infected skin graft donor sites successfully.

The manuka, jelly bush and pasture honeys are capable of stimulating the monocytes, the precursors of macrophages, to secrete TNF-α. On the other hand, glycosylated proteins can induce TNF-α secretion by macrophages and this cytokine is known to induce the mechanism of wound repairing. Furthermore, the ability of honey to reduce ‘reactive intermediates release’ may well limit tissue damage by activated macrophages during wound healing. Thus, the immune modulatory property of honey is relevant to wound repair.

The support for using honey as a treatment regimen for peptic ulcers and gastritis comes from traditional folklore as well as from reports in modern times. Honey may promote the repair of damaged intestinal mucosa, stimulate the growth of new tissues and work as an anti-inflammatory agent. Raw honey contains copious amounts of compounds such as flavonoids and other polyphenols which may function as antioxidants. Clinical observations have been reported of reduced symptoms of inflammation when honey is applied to wounds. The removal of exudate in wounds dressed with honey is of help in managing inflamed wounds and their antibacterial activities in this review, the use of honey as a traditional remedy for microbial infections dates back to ancient times. Research has been conducted on manuka (*L. scoparium*) honey, which has been demonstrated to be effective against several human pathogens, including *Escherichia coli* (*E. coli*), *Enterobacter aerogenes*, *Salmonella typhimurium*, *S. aureus*. Laboratory studies have revealed that the honey is effective against methicillin.

**MATERIAS AND METHODS**

Collection of Plant material: - honey and ginger rhizomes were purchased at the konark nagar market Nashik, Maharashtra, India.

**Chemicals**

The chemicals used for the work are acetone and methanol, peptone, agar, sodium chloride and meat extract.
The Microorganisms
Microbial strains were selected for experiment on the basis of their pathogenic activity in human beings that is Escherichia coli.

Preparation of bacterial culture
The stock culture of the bacteria used was sub cultured at 37 °C for 24 hrs.

Preparation of extract of each species was prepared by 40 gm of the dry material in 400ml acetone and methanol for 48hrs. at 37 °C for extract preparation.

Assay for Antimicrobial Activity
Antimicrobials are agents that kill microorganisms or inhibit their growth. The antimicrobial effects of the plant extracts are sufficient in a way to cater the healing effect.

Paper Disc Method
The inoculum was spread uniformly in N-agar plates with the help of glass spreader and kept for five minutes. Pre-sterilized paper discs were dipped into different samples (Ginger and honey extracts) placed in inoculated plates. The plates were incubated for 24 hrs. at 37°C and size of clear zones developed surrounding each disc was measured by scale to the nearest mm and were plotted in the graph.

Table 1 (A): Zone of Inhibition of Spice Extracts Against E.coli in Well Diffusion Assay

<table>
<thead>
<tr>
<th>Plant extract</th>
<th>Dilution of plant extract. %</th>
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<tbody>
<tr>
<td></td>
<td>Acetone extract</td>
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<tr>
<td></td>
<td>Conc. extract</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Ginger</td>
<td>5</td>
</tr>
<tr>
<td>Honey dilution in water</td>
<td>30%</td>
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</table>

Well diffusion method
Determination of MICs of the spice extracts was done by well diffusion and agar dilution techniques and the concentrations of the extracts used were 30,40,50… 100!l/ml. The lowest concentration that did not permit any visible growth when compared with the control was considered as the minimum inhibitory concentration.
RESULTS AND DISCUSSION

From the antibacterial screening tests of the crude extracts of *A. indica* carried out on the selected bacterial isolates *E. coli*,

In present studies antimicrobial activity of two spices honey and ginger were done. Table -1, shown the antimicrobial activity of material extracted in acetone shows maximum zone of inhibition is 11 mm Similarly the antimicrobial activity of honey maximum zone of inhibition is 7 mm.

CONCLUSION AND RECOMMENDATION

The present work has shown that *E. coli* were susceptible to crude extracts of ginger and honey in vitro which means the plant has antibacterial property. It is hereby recommended that further research be done towards isolating, purifying and standardizing the active antibacterial ingredients in both, also more work should be carried out to determine the pharmacokinetics, pharmacodynamics and possible toxicity of the pharm coactive ingredient(s).

ACKNOWLEDGEMENT

Authors are gratefully acknowledging for providing necessary, research facilities by M.G. Vidyamandir's education society Nashik.

REFERENCES