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Garlic is the most potential antibacterial against air borne bacteria

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Abstract
The present study reveals the antibacterial nature of garlic paste to be maximum as compared to ginger and onion paste. This is attributed to the presence of maximum sulphur compounds in it. However all these 3 medicinal extracts prove to be significant antimicrobials.
The paste of onion, garlic and ginger were mixed in nutrient agar medium separately and air borne bacteria were observed. The colony count showed that minimum bacterial colonies existed in NA with garlic paste.

Keywords: Garlic, antibacterial, air borne bacteria, sulphur compounds

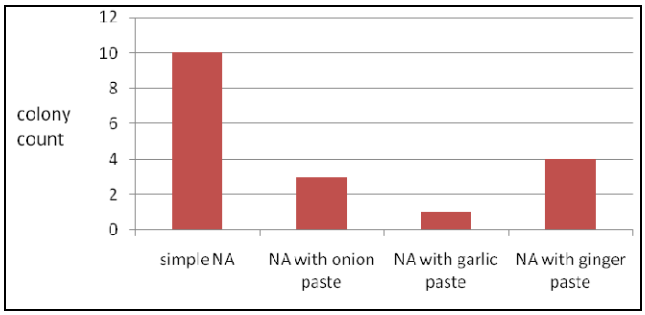
1. Introduction
The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance in therapeutic treatments. In the last few years, a number of studies have been conducted in different countries to prove such efforts. Many plants have been used because of their antimicrobial traits, which are due to compounds synthesized in the secondary metabolism of the plant. These products are known by their active substances, for example, the phenolic compounds which are part of the essential oils, as well as in tannin [1].
The most common side effects of almost all antibiotics are stomach problems such as diarrhoea, nausea and vomiting. Between 1 and 10 in every 100 people taking an antibiotic will experience these side effects (up to 10%).
These side effects happen because antibiotics can sometimes cause the gut (intestine) lining to become inflamed, and may disturb the balance of 'good' (harmless) and 'bad' (potentially disease-causing) bacteria in the gut. These effects may result in your intestines being less able to absorb water and nutrients from food, resulting in diarrhea
Based upon the above facts, the present study is based on antibacterial effects of some medicinal plant extracts on air borne bacteria.
Based on the above criteria, the aims and objectives of the present research are:
1. Extraction of juice from clove, ginger and onion using *in vitro* techniques
2. Mixing the particular medicinal plant extract in NA medium and inoculation of air borne fungi
3. Colony count of air borne bacteria in simple NA and NA containing medicinal plant extracts separately.
4. Comparative study of potentiality of medicinal plant extracts against air borne bacteria

2. Materials and Methods
2.1 Preparation of medicinal plant extracts
1 gm onion bulb part (fleshy leaves) is crushed in pestle mortar.
1 gm cloves (flower buds) are crushed in pestle mortar.
1 gm ginger rhizome part (rhizome) is crushed in pestle mortar.
NA medium is prepared according to standard protocol.
25 ml NA is poured in petriplate and solidified.
1 gm crushed onion paste is added to 25 ml NA and poured in petriplate and solidified.
1 gm crushed ginger paste is added to 25 ml NA and poured in petriplate and solidified
1 gm crushed garlic paste is added to 25 ml NA and poured in petriplate and solidified
The media are opened in suitable area in MJRP Campus outside laboratory for inoculation of air borne bacterial spores.
The bacterial colony count is done after 24 hours in all the media and comparison can be made in relation to the best antibacterial agent.

2.2 Observations

Table 1: colony count of air borne bacterial species in simple NA and NA with medicinal extracts

S. No.	Air borne bacterial colonies in simple NA	Air borne bacterial colonies in NA+onion paste	Air borne bacterial colonies in NA+garlic paste	Air borne bacterial colonies in NA+ ginger paste
1.	10	3	1	4



Graph 1: Colony count of air borne bacterial spp in NA and NA with different medicinal extracts

3. Results and Discussion

The study revealed that sulphur compounds in garlic and onion made them more antiseptic. Garlic was the maximum antibacterial agent as compared to the 2 extracts taken viz. ginger, onion. NA containing garlic paste showed minimum bacterial count [3].

Onions have been valued for their medicinal qualities by many cultures around the globe. Numerous health benefits have been attributed to the vegetable, including prevention of cancer and cardiovascular disorders. Scientific studies have shown a positive relationship between vegetable intake and risk for these common diseases. This has led many researchers to test whether the proposed medicinal attributes of onions are valid. Some of these studies have shown that including onion in the diet [2]

The super spice, cloves, comes from a dried bud on the Myrtaceae tree that grows in tropical climates throughout the world, but that originated in Sri Lanka, Indonesia, and Southern India. The health benefits of cloves are so great that the spice is harvested profusely in Zanzibar and is used in folk-remedies around the world – including Chinese medicine. Over 1000 tons of cloves are imported to the US ever year [12]. This incredible spice has an ORAC value Oxygen Radical Absorbance Capacity) that is through the roof – of over 290,000 [11]. That's a lot of antioxidants. This herb is also full of manganese, more than almost any other food. Manganese is an important trace mineral for the body because it activates multiple enzymes, particularly anginas which help in the formation of urea. Manganese also form the enzyme peptides which are responsible for the hydrolysis of proteins in the intestines [13]. This mineral helps with lipid metabolism (getting rid of fat) and keeping the nervous system stable (reducing irritability).

Using fresh ginger is an easy way to flavor foods and drinks without adding unnecessary sodium [15]. Since it is often consumed in such small amounts, ginger does not add significant quantities of calories, carbohydrate, protein or fiber. Ginger does contain numerous other anti-inflammatory and antioxidant compounds beneficial to health such as Gingerols, beta-carotene, capsaicin, caffeic acid, curcumin and salicylate [14]. Ginger provides a variety of vitamins and minerals: Carbohydrate - 17.77 g Dietary Fiber - 2 g Protein - 1.82 g Dietary Fiber - 2 g Sugars - 1.7 g Sodium - 13 mg Vitamin B6 - 0.16 mg Calcium - 16 mg Iron - 0.6 mg Vitamin C - 5 mg Potassium - 415 mg Magnesium - 43 mg Phosphorus - 34 mg Zinc - 0.34 mg Folate - 11 mcg Riboflavin - 0.034 mg Niacin - 0.75 mg Iron - 0.6 mg [4]

4. Conclusions and Future Scope

Present study reveals that garlic is the best antibacterial as compared to onion and ginger. Garlic (Allium sativum L.) is a particularly rich source of organosulfur compounds, which are currently under investigation for their potential to prevent and treat disease [10]. Crushing or chopping garlic releases an enzyme called alliinase that catalyzes the formation of allicin. Allicin rapidly breaks down to form a variety of organosulfur compounds. Since cooking can inactivate alliinase, some scientists recommend letting garlic stand for 10 minutes after chopping or crushing before cooking it [5]. Several different types of garlic supplements are available commercially, and each type provides a different profile of organosulfur compounds depending on how it was processed. The results of randomized controlled trials suggest that garlic supplementation inhibits platelet aggregation, but it is not known whether garlic supplementation can prevent cardiovascular disease. The results of a few epidemiological studies suggest that high intakes of garlic and other Allium vegetables (e.g., onions and leeks) may help protect against gastric and colorectal cancer, but it is not known whether garlic-derived organosulfur compounds are effective in preventing or treating human cancer [6].

Two classes of organosulfur compounds are found in whole garlic cloves: γ-glutamylcysteine, and cysteine sulfoxides. Allylcysteine sulfoxide (alliin) accounts for approximately 80% of the cysteine sulfoxides in garlic [9]. When raw garlic cloves are crushed, chopped, or chewed, an enzyme known as alliinase is released. Alliinase catalyzes the formation of sulfenic acids from cysteine sulfoxides. Sulfenic acids spontaneously react with each other to form unstable compounds called thiosulfinates [7]. In the case of alliin, the resulting sulfenic acids react with each other to form a thiosulfinate known as allicin (half-life in crushed garlic at 23 °C is 2.5 days). The formation of thiosulfinates is very rapid and has been found to be complete within 10-60 seconds of crushing garlic. Allicin breaks down *in vitro* to form a variety of fat-soluble organosulfur compounds including diallyl trisulfide (DATS), diallyl disulfide (DADS), and diallyl sulfide (DAS), or in the presence of oil or organic solvents, ajoene and vinyldithiins [8]. Crushing garlic does not change its γ-glutamylcysteine content. Water-soluble organosulfur compounds, such as S-allylcysteine, are formed from γ-glutamylcysteine during long-term incubation of crushed garlic in aqueous solutions, as in the manufacture of aged garlic extracts.

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