

1.3.2 Average percentage of courses that include experiential learning through project work/field work/internship for the year 2020-2021

Student Study Project

(2/02/2021 to 15/02/2021)

- 1) Comparative study of antimicrobial activity of allium sativum and allium cepa.

STUDENT STUDY PROJECT (2020-2021)

Name of the Topic:

Comparative study of antimicrobial activity of allium sativum and allium cepa.

Under the Guidance of

R. Shyamala Chandra

Asst.Prof of Biochemistry

DEPARTMENT OF BIOTECHNOLOGY

Kakatiya Government College , Hanamkonda.

Names of the Students

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5	T.Abiliash	006-19-3137	BTBC 3 rd Year
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Introduction

The use of higher plants and their extracts to treat infections is an age old practice in traditional African Medicine. Traditional medical practice has been known for centuries in many parts of the world (Sofowora, 1984). It is however observed that these practices vary from one country to another. Numerous plants & herbs are used all over Nigeria by traditional medicine practitioners. The use of herbs is the most ancient approach to healing known. The herbal medicines may be in form of powders, liquids, or mixtures which may be raw or boiled, ointments liniments & incisions (Apata 1979) roots, barks & leaves of various plants are employed in ethno medicine plant extracts are given singly or as concoctions for various ailments, more than 70% of the people living in Nigeria depend on these various forms of concoctions & herbal decoctions for the treatment of some diseases (Kimi & Fagbenro - Beyioku, 1996).

Many investigators have demonstrated the antimicrobial activity of the constituents of some higher plants (Akobundu & Agyekara, 1987 ; Rocio & rion, 1982; Almaghoul et al 1988 ; Misra et al 1992 ; Hablemariam et al 1993) & quite a number of chemical compounds of plant origin have been shown to possess antimicrobial activity (Corthout et al 1997). In diseases of microbial origin, the plants function as a result of antimicrobial activity against the causative agents (Sofowora, 1993).

This work reports the antimicrobial effect of garlic (*Allium sativum* Linn) & onion juice on some bacterial species this is in pursuance of the efforts to search for drugs from plants & the verification of the scientific basis of some known practices in traditional medicine.

Medicinal plants may be defined as any plant that can be put to culinary or medicinal use and include those we associate with, orthodox drugs such as fox glove and opium poppy, as well as everyday plants, such as garlic. We shall not forget that all drugs of the past were substances with a particular therapeutic action extracted from plants. More and more researchers find that food and their individual constituents perform similar fashion to modern drugs and sometimes better without the dreaded side effects. The use of herbs and medicinal plants as the first medicines is a universal phenomenon. Every culture on earth, through written or oral tradition, has relied on the vast variety of natural chemistry found in healing plants for their therapeutic properties.

The onion is one of the oldest cultivated vegetables in history. It is thought that bulbs from the onion family have been utilized as a food source for Millennia. Onion consists of its herbaceous plant part and its edible bulb part. It is probably a native to southwestern Asia. The leaves are bluish-green and hollow. The bulbs are large, fleshy and firm. There are three main varieties - white, red and purple skinned. The relative pungency of onion has both genetic and environmental components. Sulphur compounds in onions have also been shown to be anti-inflammatory both by inhibiting formation of thromboxanes and by inhibiting the action of platelet-activating factor (PAF). Thiosulfinates condition anti-thrombotic benefits, including antioxidant activity, reduced serum cholesterol and enhance in vitro platelet activity. This later effect is important for cardiovascular health by reducing the probability that platelets aggregate in the blood, a major cause of heart attacks and strokes. Hence, thiosulphinates found in onion have been shown to inhibit in-vitro platelet aggregation.

Flavonoids are a second class of health enhancing compound produced by onions, an example is quercetin. Flavonoids are chemical

compounds active against micro-organisms. They have been found in-vitro to be effective antimicrobial substance against a wide array of micro-organisms.

The genus *Salmonella* is among the most common causes of food and water borne infectious diseases in the world. The organism has a wide host range which comprises most animal species including mammals, birds and cold-blooded animals in addition to human. A number of studies in Nigeria have shown that *Salmonella* infections is endemic in many parts of the country, and its endemicity increases especially in areas with low environmental hygiene.

Bacillus subtilis has been implicated in various food spoilage including ropiness in bread, production of CO₂ in canned meats, sliminess and coagulation in milk, etc.,

Escherichia coli is one of the main causes of both nosocomial and community-acquired infections in humans and one of the micro-organisms most frequently isolated from blood. *E.coli* in humans is a common inhabitant of the gastrointestinal tract. It can also cause various intestinal and extra-intestinal diseases. The pathogenic isolates of *E. coli* have a relatively large potential for developing resistance. The spread of microbial drug resistance is a global public health challenge, which impairs the efficacy of antimicrobial agents and results in substantial increased illnesses and death rate, hence, this work was therefore undertaken to investigate as well as authenticate the antimicrobial potentials of the two medicinal plants.

Materials And Methods:

All the chemicals that were used in the experimentation were obtained from hi-media unless stated.

Nutrient agar medium (NAM)

Peptone (gm/l) – 5gm

Beef extract (gm/l) – 3 gm

NaCl (gm/l) – 5 gm

Agar (gm/l) – 16 gm

Test Organism Confirmation

The test organisms *Escherichia coli*, *Salmonella typhi* *Bacillus Subtilis* and *Shigella* was collected from the Micro Biology Dept. The pure cultures were subcultured on Nutrient Broth medium and incubated for 24 hrs at 37 c and preserved in the refrigerator at 4°C until required for the study.

Collection of Plant Materials.

The plant materials, onion bulbs (*allium cepa*) and garlic (*Allium Sativum*) were purchased from main market where greater quantities were purchased by the sellers.

Extraction of The Plant Materials

Preparation of Raw Extracts:

- The onions were washed with clean sterile distilled water and allowed to air dry for one hour. The outer covering of the onion were manually peeled off. The onion bulbs being separated were washed and extracted in the following ways:
- Exactly 200g of fresh onion bulbs were blended 10 ml of ethanol was added during the process and the raw juice was extracted.
- In the same way cloves of garlic were also blended with 10 ml of ethanol and the raw juice was extracted.

Preparation of Nutrient Agar Plates by Pour Plate method:

- Nutrient Agar Medium was prepared and sterilized in an autoclave.
- 0.5ml of bacterial suspension of *Escherichia coli*, *Salmonella typhi* *Bacillus subtilis* and *shigella* was poured in to different Petri plates.
- The sterilized media was poured in to the above Petri plates containing bacterial suspensions.
- The media was allowed to solidify.
- In the same way another set of Petri plates were also prepared.

Screening of Antibacterial activity of Raw Extracts:

- The sensitivity of the test organisms, *Escherichia coli*, *Salmonella typhi*, *Bacillus subtilis* and *shigella* to the extracts of *Allium cepa* (onions) and *Allium sativum* (garlic) were carried out using the cup-plate diffusion method bacteria grew everywhere except in areas around the holes in the medium. Then, the resulting inhibition zones obtained were measured in millimeters and recorded against the corresponding concentrations.
- After solidification of media wells were made with the help of a gel bores.
- Wells of one set are filled with garlic extract and wells of another set is filled with onion extracts.
- Control plates were also maintained without garlic and onion extracts. The plates were maintained in duplicates.
- All the plates were incubated at 37°C for 24 hrs.
- After the incubation period the inhibition zones were measured.

Preparation of boiled extract

- Garlic and onion are boiled separately for 10 min at 50°C.
- Then the boiled garlic and onion are grinded by using ethanol.
- Two sets of nutrient agar plates were prepared by pour plate method by using bacterial cultures.

Screening of antibacterial activity of boiled extracts

- After solidification of media, wells were made with the help of a gel bores.
- Wells of one set is filled with boiled garlic extract & another set with boiled onion extract.
- Control plates were also maintained without boiled garlic & onion extracts, the plates were maintained in duplicates.
- All the plates were incubated at 37°C for 24 hrs.
- After the incubation period the inhibition zones were measured.

Results

The results of the antimicrobial properties of the extracts on the test organisms are shown in tables below:

Table 1: Sensitivity pattern of *Escherichia coli*, *Salmonella typhi* and *Bacillus subtilis* and *Shigella*.

For raw extracts

S.No.	Organism	Zone of inhibition (mm)	
		Garlic	Onion
1	<i>E. coli</i>	29 mm	12 mm
2	<i>Salmonella</i>	22 mm	20 mm
3	<i>B. subtilis</i>	38 mm	13 mm
4	<i>Shigella</i>	18 mm	12 mm

Discussion

The result of this work indicates that the raw extracts of onions and garlic (*Allium sativum*) have antibacterial properties. When these raw extracts were tested on *Escherichia coli*, *Salmonella typhi* and *Bacillus subtilis*, the widest zones of inhibition was obtained with *B. subtilis* for garlic extract & *salmonella* for onion extract. Garlic extract effect on gram positive organism was found to be higher than that of the gram negative organism.

But, when the same experiment is carried out with boiled extracts of onion (*A. cepa*) and garlic (*A. sativum*) very little antimicrobial activity was exhibited by the boiled garlic extract. The inhibition zones were very small. Whereas the boiled onion extract had no antibacterial effect, inhibition zones were not observed. The reason may be explained by the fact that the antimicrobial substance in the onion extracts, which are mainly phenolic compounds are destroyed by heat.

This investigation indicates that though plants had antibacterial activity on the four test organism, garlic had more inhibitory effect thus confirming their use in folk medicine.

From this study we can also confirm that the raw garlic & onion are good antibacterial agents, if we cook them or boil them, the antibacterial activity is decreasing. So it is preferable to take or consume them in raw or semi boiled form.

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KAKATIYA GOVERNMENT COLLEGE, HANAMKONDA, DIST. WARANGAL

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STUDENT STUDY PROJECT (2020-2021)

Name of the Topic: Isolation of DNA from Onion

Under the Guidance of

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