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# STUDIES ON CONTROL OF BACTERIAL CONTAMINANTS FROM KITCHEN SURFACES USING NATURAL EXTRACTS AND CHEMICALS

**[1] Dr Sonal Sareen Pathak, [2]Sarasveti Rajpoot & [3]Sakshi Patel**

Department of Biotechnology, Mata Gujri Mahila Mahavidyalaya (Auto.), Jabalpur, M.P. India

## Abstract

Bacteria readily colonize kitchen surfaces, and the exchange of microbes between humans and the kitchen environment can impact human health. However, we have a limited understanding of the overall diversity of these communities, how they differ across surfaces and sources of bacteria to kitchen surfaces diverse bacterial communities are widely distributed in residential kitchens and that the composition of these communities is often predictable. The purpose of the present study is to explore the diversity of pathogenic bacteria present in household sink and basin. These can be eradicated by use of chemical compounds & floor cleaners. The emergence of resistance of pathogenic microbes may lead to explore the natural compounds from plant showing antimicrobial properties on resistant strains. Keeping in view the above points, the study was designed with the collection of sample from kitchen sink and kitchen counters. Further isolation of bacteria from collected samples and study of colony inhibition by natural extracts and chemical compounds was done. The study revealed a total of 71 colonies and 39 colonies were obtained from the sample A (kitchen sink) and sample B (kitchen surface) showed a total count of 36 and 61 colonies. The resistant colonies were further inhibited by natural extracts the results showed that jeera extract was found to give maximum zone and can be used in formulating cleaning agents of household surfaces.

**Keywords:** pathogenic bacteria, household sink and basin, natural extracts, colony inhibition

## INTRODUCTION

Bacteria constitute a large domain of prokaryotic microorganisms. Typically a few micrometers in length, bacteria have a number of shapes, ranging from spheres to rods and spirals. Bacteria were among the first life forms to appear on earth, and are present in most of habitats. Bacteria inhabit soil, water, acidic hot springs, radioactive waste, and the deep portions of Earth's crust. Bacteria also live in symbiotic and parasitic relationship with plants and animals.

There are typically 40 million bacterial cells in a gram of soil and a million bacterial cells in a millilitre of fresh water. There are approximately bacteria on Earth, forming a biomass which exceeds that of all plants and animals. Bacteria are vital in many stages of the nutrient cycle by recycling nutrients such as the fixation of nitrogen from the atmosphere. The nutrient cycle includes the decomposition of dead bodies and bacteria are responsible for the putrefaction stage in this process. In the biological communities surrounding hydrothermal vents and cold seeps, extremophile bacteria provide the nutrients needed to sustain life by converting dissolved compounds such as hydrogen sulphide and methane to energy.

**Bacteria can be harmful and useful.**

**Beneficial Bacteria:**

Some species of bacteria live in the human intestines where they help in digestion of food by releasing certain components. They also produce some vitamins which are helpful for the human body. *E. coli* is the specie which resides in the digestive tract of humans and help in breaking down the lactose. The new born babies do not suffer or have fewer chances of suffering from diarrhea if they are administered with the bacteria *lactobacillus reuteri* or *bifid bacterium.*

The process of fermentation takes place with the help of bacteria. If the milk is fermented and contains live bacteria *Lactobacillus casei*, it removes the harmful bacteria helicobacter pylori from children's body. There are many bacteria which live inside mouth, throat, nose and intestines and perform various useful functions. They also do not let the harmful microorganisms live inside or on the human body and in return provide benefit to the human body. Various species of bacteria work with the immune system to protect the body against various diseases. Some intestinal bacteria are able to produce vitamin A and K. the main function of bacteria residing in the stomach is to maintain the pH and acidity level in the stomach.

**Harmful bacteria**

Along with the beneficial importance of bacteria, they also have some harmful effect on the human body. Some bacterial species are the source of causing diseases like typhoid fever, tuberculosis, cholera, syphilis and food borne illness. *Streptococcus* bacterium causes throat infections and some *Streptococcus* species are even fatal. Though bacteria are mostly beneficial for the human body but if the person is weak and his immune system does not fight against diseases then these beneficial bacteria can also cause infections in the body.

Not all the bacteria which live in the human intestines are beneficial but some of them which enter the intestines through mouth cause infections and can be fatal sometimes. Bacteria present in food are the source of causing botulism. in this disease paralysis can occur and it can be fatal if one millionth of a bacterium is ingested through mouth.

Mostly antibiotics are used to kill harmful bacteria. Some precautionary measures should also be taken so that they do not cause infections in the body, like washing hands before meal will kill the bacteria. Eating and drinking from unhealthy places causes bacterial infections. The bacteria present in the sink and basin can be pathogenic & need to be removed frequently.

A wet sink can be a dangerous sink. The high moisture level creates the ideal conditions for some types of bacteria to thrive because up to 80 percent of a bacterial cell's weight is water. The location of a sink can affect the types of bacteria found. A kitchen sink in a home may contain more bacteria than one in the bathroom and contain up to 500,000 bacteria per square inch.

The kitchen is probably the most crucial area that harbors and transmits infection. Germs are prevalent everywhere in the kitchen in sink sponges, countertops, cutting boards, kitchen utensils, refrigerators, sinks, towels, and even stove tops. Growth of undesirable contaminating bacteria not only causes deterioration in the sensory and organoleptic properties of food but can also cause illnesses. Most pathogenic microorganisms in food products are intestinal in origin; however, some are found in nasal passages, in the throat, on hair, and on skin. Thus, food handlers are often a main source of contamination and cross-contamination. *Salmonella* sp. and *Campylobacter* sp. are easily transferred from chicken to a variety of kitchen surfaces, utensils, hands, and other food items. The ability of bacteria to adhere to food contact surfaces compromises the hygiene of those surfaces. Surface physicochemical properties of the bacterial cell as well as of the materials, such as hydrophobicity and roughness, are determinants during the initial attachment phase. It has also been demonstrated that, even after adhering to typical and specific hygienic procedures, pathogenic microorganisms can survive in kitchens, often for hours. The main sites in the kitchen responsible for cross-contamination are chopping boards, sinks, taps, dish cloths, knives and other working surface.

**Plants extract: Alternative to floor cleans**

The micro organism are becoming resistant to present day floor cleaners, the study can be done to reveal antimicrobial action of natural herbs to formulate herbal cleaners. The purpose of the present study is to explore the diversity of pathogenic bacteria present in household sink and basin. These can be eradicated by use of chemical compounds & floor cleaners. Sink the emergence of resistance of pathogenic microbes lead to explore the natural compounds from plant showing antimicrobial properties on resistant strains.

Plants are prospective source of antimicrobial agents in different countries. Plants are rich in a variety of phytochemicals including tannins, terpenoids, alkaloids, and flavonoids which have been found *in vitro* to have antimicrobial properties. Although the mechanism of action and efficacy of these herbal extracts in most cases is still needed to be validated scientifically.

The increasing incidence of drug-resistant pathogens has drawn the attention of the pharmaceutical and scientific communities towards studies on the potential antimicrobial activity of plant-derived substances, an untapped source of antimicrobial chemotypes, which are used in traditional medicine in different countries. The focus on natural plant products as a useful source of antimicrobial molecules, active in particular, on bacteria and provide. The antimicrobial activity of plant extracts and phytochemicals was evaluated with antibiotic susceptible and resistant microorganisms. In addition, the possible synergistic effects when associated with antibiotics are also area of major concern. The Extracts from the following plants: *Cuminum cyminum* (jeera), *Azadirachta indica* (neem), Z*ingiber officinalis* (ginger), C*itrus sinesis* (orange), *Melissa offficinalis* (lemon-balm), *Psidium guajava* (guava), *Punica granatum* (pomegranate), *Rosmarinus officinalis* (rosemary), *Salvia officinalis* (sage) and *Thymus vulgaris* (thyme). (Dianella Savoia 2012) The phytochemicals benzoic acid, cinnamic acid, eugenol and farnesol can also be utilized. However, the recent failure of antibiotics due to the dramatic emergence of multidrug resistant pathogens and the rapid spread of the new infections, urge the health organizations and pharmaceutical industries all over the world to change their strategy and stop going on the slow growing production of more synthetic antibiotics against. The fast growing antibiotics-resistant microorganisms, while there are considerable alternative sources of natural antimicrobials from plants with different mode of actions.

Global prevalence of infectious diseases caused by bacteria is a major public health problem. The bacterial agents including *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, and *Proteus vulgaris* cause several human infections. Recent emergence of antibiotic resistance and related toxicity an issue limit the use of antimicrobial agents and is prompting a revival in research of the antimicrobial role of plants against resistant strains due to comparable safety and efficacy.

The determination of antibacterial activity of water, oil and methanol extracts of jeera (cuminum *cyminum*), neem (*Azadirachta indica*) ginger (*zingiber officinalis*), lemon (*citrus lemon*) and orange (*citrus sinensis*) against different species of bacteria, *Pseudomonas* spp., *Vibrio cholerae*, *Vibrio parahaemolyticus* (*V. parahaemolyticus*), *Klebsiella* spp., *Escherichia coli*, *Salmonella* spp. and *Staphylococcus aureus* (*S. aureus*) are major concern in recent years.

**EXAMPLES OF NATURAL EXTRACTS**

**Jeera** - Cumin is a small flowering herbaceous plant belonging to the *Apiaceae*, family, of the genus; *Cuminum*. Its scientific name is ***Cuminum cyminum***. The cumin plant flourishes well in sandy, fertile soil, assisted with hot summer weather conditions. It bears small, gray-yellow, oblong shaped seeds with vertical ridges on their outer surface. The seeds closely resemble caraway seeds in appearance. Cumin seeds impart distinctive strong flavor and warm perception on taste buds.It comes from the particular group of essential oils in them. The chief constituent and important aromatic compound in the seeds is **cuminaldehyde** (4 isopropylbenzaldehyde).Cumin seeds contain many phytochemicals that are known to have antioxidant, carminative and anti-flatulent properties. The seeds are an excellent source of dietary fiber.

**Neem**- ***Azadirachta indica***, also known as Neem, Neem leaves are dried in India and placed in cupboards to prevent insects eating the clothes, and also in tins where rice is stored. Neem leaves are dried and burnt in the tropical regions to keep away mosquitoes. An ayurvedic herb, neem is also used in baths. Neem (neem) is a key ingredient in non-pesticidal management (NPM), providing a natural alternative to synthetic pesticides. Neem seeds

are ground into a powder that is soaked overnight in water and sprayed onto the crop. To be effective, it must be applied repeatedly, at least every ten days. Neem does not directly kill insects on the crop.

**Ginger** -The rhizomes of the *Zingiberaceae* family are a vegetable widely used in many Asian countries, and their medicinal functions have been broadly discussed and accepted in many traditional recipes.

**Lemon** -.These compounds, not only play an important physiological and ecological role, but are also of commercial interest because of their multitude of applications in the food and pharmaceutical industries.

**Example of Biochemical compounds**

EDTA, in particular tetra sodium EDTA (tEDTA), as a potential antimicrobial and antibiofilm agent, in its own right, for use in skin and wound care. EDTA's synergism with other antimicrobials and surfactants will also be discussed. The use of EDTA as a potentiating and sensitizing agent is not a new concept. However, currently the application of EDTA, specifically tEDTA as a stand-alone antimicrobial and antibiofilm agent, and its synergistic combination with other antimicrobials to make a "multi-pronged" approach to biofilm control is being explored. EDTA's excellent inherent antimicrobial and antibiofilm activity and proven synergistic and permeating ability results in a very beneficial agent, which could be used for the development of future antibiofilm technologies. The effect of Tween 20 on antimicrobial (Acetyl pyridinium chloride) and alkaline (Trisodium phosphate) decontaminants to reduce the numbers of *Salmonella*.

## METHODOLOGY

**Collection of sample:** The sample was collected randomly from the kitchen counter and kitchen sink area of hostel and house. The sample was collected by wiping surface of sink and basin with cotton swab which was then kept in sterile container and brought to the laboratory for further processing.

**Isolation of bacteria from collected samples:** The sample collected from kitchen counter and sink were spreaded onto nutrient agar plates.

**Growth and Maintenance of pure culture**: The viability and purity of the isolate is maintained by keeping the pure cultures free from contamination. The pure cultures were transferred periodically into a fresh nutrient agar medium (sub-culturing) to allow continuous growth and viability of microorganism. This is done under aseptic condition to avoid contamination (Aneja, 2000).

**Characterization of bacterial colonies:** The isolated bacteria were identified by study of morphological characters of the colony and Gram staining method.

**Colony characteristic**: Each distinct colony on the plate was identified by colony characteristics like color, elevation, margin and shape (Aneja, 2000).

**Study of Colony Inhibition:** In the present study, the bacterial colonies from kitchen sink and basin were first examined for their inhibition by the cleaning agent 70% (v/v) ethanol solution. The solution was prepared by mixing 70 mL absolute ethyl alcohol in 30 ml distilled water. The colony inhibition was performed by agar well diffusion method (Aneja, 2000). The nutrient agar media plates were prepared and 25 µL of bacterial suspension was applied on the plated by spread plate method. The surface of the media was allowed to dry for some time. Wells of 8 mm diameter were aseptically made in the seeded agar plates using sterile cork borer method. The extracts were poured in prepared wells of the solid medium. The Petri-plates were incubated at 37±1$^{o}$C in a bacterial incubator. The plates were observed for presence of zone of inhibition after 24 h of incubation and their diameter was measured in millimeter using transparent Hi-MEDIA antibiotic zone scale.

The colonies not inhibited by the cleaning agent, 70% (v/v) ethanol solution, were further analysed by the chemical compounds like SDS, EDTA, Tween-20 and sodium hypochlorite (NaOCl) in the present study. The effect of the natural extracts of Jeera, Neem, Ginger, Orange and Lemon were also examined for study of antibacterial activity in vitro.The diameter of the clearing zone appeared encircling the wells were measured as

zone of inhibition. The results were recorded as size of the zone of inhibition appearing around the well diffusion methods.

**Table-1: List of chemical compounds**

| S.NO. | NAME | Chemical compound |
|---|---|---|
| 1. | SDS | Sodium Dodecyl Sulphate |
| 2. | EDTA | Ethylenediaminetetra acetic acid |
| 3. | Tween-20 | Tween-20 |
| 4. | NaOCl | Sodium hypochlorite |

**Table-2: List of natural extracts**

| S.NO. | NAME | BOTANICAL NAME |
|---|---|---|
| 1. | JEERA | *Cuminum cyminum* |
| 2. | NEEM | *Azadirachta indica* |
| 3. | GINGER | *Zingiber officinalis* |
| 4. | ORANGE | *Citrus sinensis* |
| 5. | LEMON | *Citrus lemon* |

**Determination of Minimum Inhibitory Concentration**

Minimum inhibitory concentration (MIC) of compound was determined by serial broth dilution method (Gogoi *et al.,* 2008). The stock solution was serially diluted to obtain various ranges up to $10^{-5}$ in test tube. The turbidity of the bacterial suspension was adjusted to the absorbance of 0.8 to 1.0 at 620 nm to get $10^5$ to $10^6$ cells per ml (Bauer, 1966). 1 ml of bacteria suspension was added to rows of active fraction solution and incubated at 37ºC overnight and observed for turbidity. MICs were determined after 24 h of incubation by removing 10 µl of the content from each tube and spreading them on to Nutrient agar plate. After 24 h of incubation, growth of any colony was observed. MIC was determined as the least concentration that inhibited the growth of bacterial contaminants.

**RESULTS AND DISCUSSION**

The microbial mediated contamination of food and surface of common households cause specific illness. This may be due to ubiquitous nature of bacteria and other microbes. The members belonging to Enterobacteriaceae such as *Salmonella*, *Shigella* and *Escherichia coli* are among the common microorganisms that cause fatal illnesses in humans. During the course of present study, an attempt was made to examine the effect of natural extracts on colony inhibition of microbes isolated from household. In total, chemical compounds like SDS, EDTA, Tween-20 and sodium hypochlorite (NaOCl) was compared with natural extracts of Jeera, Neem, Ginger, Orange and Lemon for study of in vitro antibacterial activity.

**Isolation of bacteria from collected samples**

In the present study, microflora from kitchen sink and kitchen counter was isolated from home (sample A) and hostel area (sample B) of kitchen. The sample collected in cotton swab were spread plated on nutrient agar media and incubated at 37°C for 24 to 48 h. The isolates were quantified using colony counter.

The results indicated diversity in microbial colonies from the swab of an un-cleaned dry kitchen sink and counter surface. A total of 71 colonies and 39 colonies were obtained from the sample A. Similarly, sample B revealed a total count of 36 and 61 colonies from kitchen sink and kitchen surface shown in Table 3. The control set where sample from sterile cotton swab was spread on NA plate revealed no appearance of microbial colonies in comparison to the NA plate with samples.

**Table-3: Isolation of bacterial colonies from Home (Sample A) and Hostel (Sample B)**

| S.No | Sample | Area | Number of colonies | Color | Shape |
|---|---|---|---|---|---|
| | Control | - | -- | - | - |
| 1. | Sample A | Kitchen sink | 71 | cream-38<br>white-25<br>Pink-8 | Spherical<br>Irregular<br>Circular |
| | | Kitchen counter | 39 | Cream-20<br>White-13<br>orange-6 | Irregular<br>Rod |
| 2. | Sample B | Kitchen sink | 36 | White-24<br>Cream-29<br>Pink-13 | Spherical<br>Rod |
| | | Kitchen counter | 61 | Cream-32<br>White-23<br>Yellow-6 | Spherical<br>irregular |

**Characterization of bacterial colonies**

The colonies were characterized based on their color and shape. Most colonies were circular, spherical, irregular and rod shaped. On the basis of colour, the colonies were differentiated: Cream (38), white (25) and Pink (8) for kitchen sink and Cream (20), white (13) and orange (6) for kitchen counter of sample A. Similarly, sample B showed Cream (29), white (24) and pink (13) for kitchen sink and Cream (32), white (23) and yellow(6) for kitchen counter.

Kitchen sink

Kitchen counter

**Fig 1- Colonies of sample A**

Kitchen sink

Kitchen counter

**Fig 2- Colonies of sample B**

**Study of Colony Inhibition by natural extracts:**

In the present study, the bacterial colonies from kitchen sink and kitchen counter were first examined for their inhibition by the cleaning agent 70% (v/v) ethanol solution. The colonies not inhibited by the cleaning agent were further analysed by the use of natural extracts of Jeera, Neem, Ginger, Orange and Lemon for study of antibacterial activity in vitro.

The data in Table 4 shows that in kitchen counter of sample A, the maximum zone of inhibition is observed in jeera extract (22mm) followed by orange extract (18mm) followed by lemon extract (16mm) followed by neem (14mm) and minimum zone of inhibition is observed in ginger (13mm).In kitchen sink of sample A, the maximum zone of inhibition is observed in lemon extract (18mm) followed by orange extract (17mm) followed by jeera extract (16mm) followed by neem extract (14mm) and no zone of inhibition is observed in ginger extract.

**Table-4: Colony inhibition of Home (Sample A) bacteria by natural extract**

| Extract | Sample name | Zone measurement (diameter in mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Stock | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ | $10^{-4}$ | $10^{-5}$ |
| Jeera | Kitchen counter | 22mm | 20mm | 17mm | 15mm | 14mm | 12mm |
| | Kitchen Sink | 16mm | 15mm | 14mm | 13mm | 12mm | 11mm |
| Neem | Kitchen counter | 14mm | 12mm | 11mm | 10.5mm | -- | - |
| | Kitchen Sink | 14mm | 13mm | 11mm | - | - | - |
| Ginger | Kitchen counter | 13mm | 12mm | 10mm | - | - | - |
| | Kitchen Sink | - | - | - | - | - | - |
| Orange | Kitchen counter | 18mm | 16mm | 15mm | 13mm | - | - |
| | Kitchen Sink | 17mm | 15mm | 13mm | 11mm | - | - |
| Lemon | Kitchen counter | 16mm | 14mm | 11mm | 10.5mm | - | - |
| | Kitchen Sink | 18mm | 17mm | 15mm | 13mm | 11mm | - |

The data in Table 5 shows that in kitchen counter of sample B, the maximum zone of inhibition is observed in jeera extract (20mm) followed by orange extract (19mm) followed by lemon extract (17mm) followed by neem (14mm) and minimum zone of inhibition is observed in ginger (13mm).In kitchen sink of sample B, the maximum zone of inhibition is observed in lemon extract (19mm) followed by orange extract (18mm) followed by jeera extract (18mm) followed by neem extract (14mm) and no zone of inhibition is observed in ginger extract.

**Table-5: Colony inhibition of Hostel (Sample B) bacteria by natural extract**

| Extract | Sample name | Zone measurement (diameter in mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Stock | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ | $10^{-4}$ | $10^{-5}$ |
| Jeera | Kitchen counter | 20mm | 19mm | 17mm | 15mm | 14mm | 12mm |
| | Kitchen Sink | 18mm | 16mm | 14mm | 13mm | 12mm | 11mm |
| Neem | Kitchen counter | 14mm | 12mm | 11mm | 10.5mm | - | - |
| | Kitchen Sink | 14mm | 13mm | 11mm | - | - | - |
| Ginger | Kitchen counter | 13mm | 12mm | 10mm | - | - | - |
| | Kitchen Sink | - | - | - | - | - | - |
| Orange | Kitchen counter | 19mm | 16mm | 15mm | 13mm | - | - |
| | Kitchen Sink | 18mm | 15mm | 13mm | 11mm | - | - |
| Lemon | Kitchen counter | 17mm | 14mm | 11mm | 10.5mm | - | - |
| | Kitchen Sink | 19mm | 17mm | 15mm | 13mm | 11mm | - |

**Study of Colony Inhibition by chemicals:**

In the present study, the selected colonies were also analysed for their inhibition by the chemical compounds like SDS, EDTA, Tween-20 and sodium hypochlorite (NaOCl).

The data in Table 6 shows that in kitchen counter of sample A, the maximum zone of inhibition is observed in NaOCl (38mm) followed by SDS (25mm) followed by Tween-20 (23mm) and minimum zone of inhibition is observed in EDTA (16mm). In sink sample the maximum zone of inhibition is observed in NaOCl (40mm) followed by SDS (28mm) followed by Tween-20 (18mm) and minimum zone of inhibition is observed in EDTA (17mm).

**Table-6: Colony inhibition of Home (Sample A) bacteria by chemicals**

| Sample name | Sample Area | Zone measurement (diameter in mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Stock | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ | $10^{-4}$ | $10^{-5}$ |
| SDS | Kitchen counter | 25mm | 22mm | 21mm | 20mm | 19mm | 16mm |
| | Kitchen Sink | 28mm | 23mm | 21mm | 19mm | 18mm | 16mm |
| EDTA | Kitchen counter | 16mm | 14mm | - | -- | -- | - |
| | Kitchen Sink | 17mm | 14mm | - | - | - | - |
| Tween-20 | Kitchen counter | 23mm | 20mm | 17mm | 16mm | 14mm | 12mm |
| | Kitchen Sink | 18mm | 17mm | 15mm | 14mm | 11mm | - |
| NaOCl | Kitchen counter | 38mm | 33mm | 26mm | 24mm | 20mm | - |
| | Kitchen Sink | 40mm | 37mm | 27mm | 23mm | 18mm | - |

The data in Table 7 shows that in kitchen counter of sample B, the maximum zone of inhibition is observed in NaOCl (37mm) followed by SDS (26mm) followed by Tween-20 (24mm) and minimum zone of inhibition is observed in EDTA (17mm). In sink sample the maximum zone of inhibition is observed in NaOCl (39mm) followed by SDS (27mm) followed by Tween-20 (19mm) and minimum zone of inhibition is observed in EDTA (18mm).

**Table-7: Colony inhibition of Hostel (Sample B) bacteria by chemicals**

| Sample name | Sample Area | Zone measurement (diameter in mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Stock | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ | $10^{-4}$ | $10^{-5}$ |
| SDS | Kitchen counter | 26mm | 24mm | 22mm | 20mm | 19mm | 16mm |
| | Kitchen Sink | 27mm | 26mm | 24mm | 20mm | 18mm | 16mm |
| EDTA | Kitchen counter | 17mm | 14mm | - | - | - | - |
| | Kitchen Sink | 18mm | 14mm | - | - | - | - |
| Tween-20 | Kitchen counter | 24mm | 22mm | 20mm | 16mm | 14mm | 12mm |
| | Kitchen Sink | 19mm | 17mm | 16mm | 14mm | 11mm | - |
| NaOCl | Kitchen counter | 37mm | 34mm | 26mm | 24mm | 20mm | - |
| | Kitchen Sink | 39mm | 37mm | 27mm | 23mm | 18mm | - |

**Sample**

**Kitchen sink** **Kitchen counter**

**Fig3: Zone of inhibition by SDS extract**

**Fig 4: Zone of inhibition by EDTA extract**

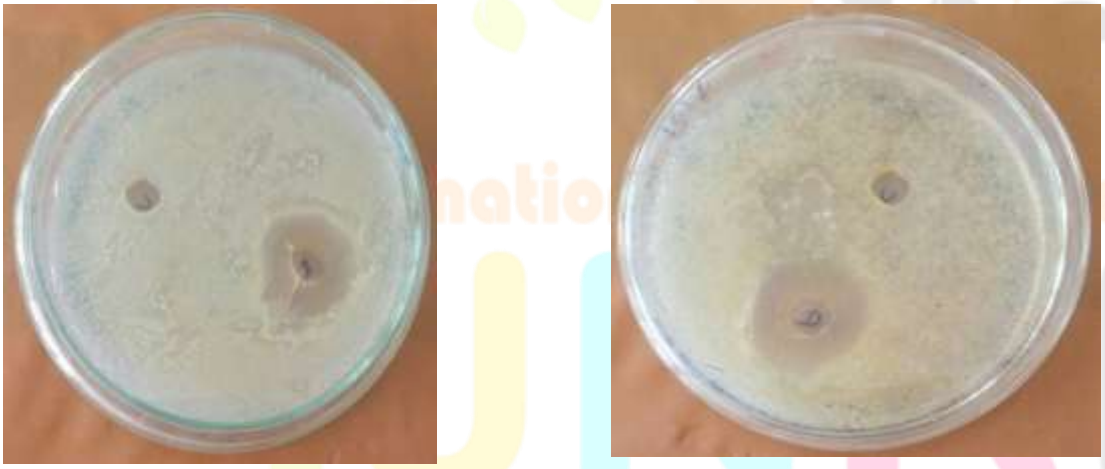

**Fig 5: Zone of inhibition by Tween-20 extract**

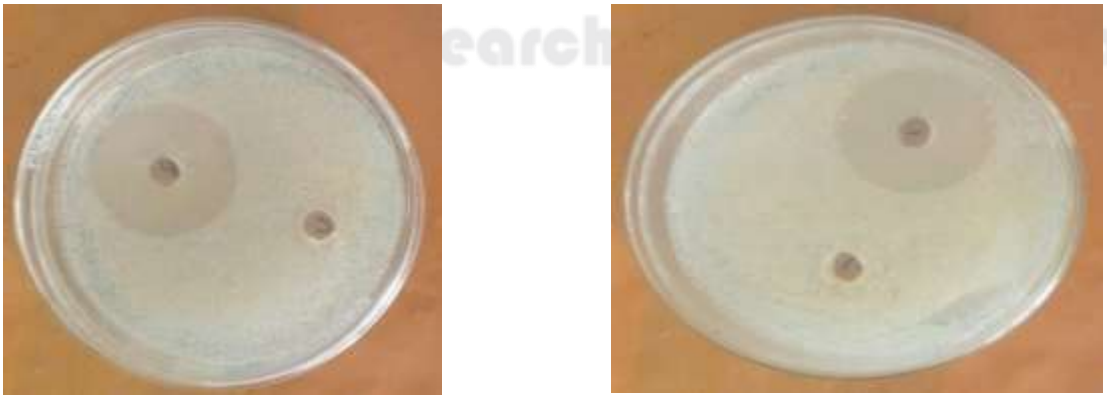

**Fig 6: Zone of inhibition by NaOCl extract**

## CONCLUSION

The microbial flora observed from the un-cleaned surfaces of various locations in the house can be considered as non-pathogenic microbial biota. A variety of bacterial colonies were observed from the kitchen surface and kitchen counter of un-cleaned sample of study site (hostel and home). Even though these locations are routinely cleaned, the occurrence of microorganisms is assumed to be part of normal microbial flora. However, the unanticipated number of microorganisms at the various un-cleaned surfaces in the house is a major concern. The large number of microbial flora on NA plates from un-cleaned surfaces suggests that exploration of alternative and safe natural extracts to sanitize our households routinely. In the present study, a total of 71 colonies and 39 colonies were obtained from the sample A and sample B revealed a total count of 36 and 61 colonies from kitchen sink and kitchen surface respectively. The colonies were characterized based on their color and shape. Most colonies were circular, spherical, irregular and rod shaped. On the basis of colour, the colonies were differentiated as total of colony types: Cream, white, orange and Pink. These Gram negative colonies were analysed for their inhibition by 70% ethanol. The resistant colonies were further inhibited by natural extracts and chemicals. The results showed that *Cuminum cyminum* (jeera) extract was found to give maximum zone and can be used in formulating cleaning agents of household surfaces. It can be safe and effective disinfectant that could provide efficient elimination of microorganisms.

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