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Research Article

ANTIMICROBIAL ACTIVITY ON PEELS OF DIFFERENT FRUITS AND VEGETABLES

B. Raja Narender *, M. Rajakumari, B. Sukanya, S. Harish

Sree Chaitanya Institute of Pharmaceutical Sciences, Thimmapoor, Karimnagar-505527, Telangana, INDIA.

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ABSTRACT

Generally, many of the fruits and vegetables skins are thrown in the garbage or fed to livestock. These are having very rich in bioactive components which are considered to have beneficial effects on health. But the aim of this study was to evaluate the antibacterial activity and antifungal activity. Here by we present the antibacterial and antifungal activity of different peels of vegetable and fruits due to their numerous antioxidants and odd compounds. The peel powders were effective in inhibiting antibacterial and antifungal activity. We aimed to evaluate the activity of different vegetable and fruit peels powders against E. coli, Lacto bacillus, Proteus vulgaris, Staphylococcus aureus, and Saccharomyces cerevisiae., were known to causes antibiotic resistant infections. We performed the agar diffusion method and indicated the bactericidal and fungicidal action. We suggest that peels of fruits and vegetables might be effective sources as they have numerous antioxidants.

KEYWORDS: *Antibacterial activity, Antifungal activity, Peels of different Vegetables and Fruits and different Microorganisms.*

INTRODUCTION

Numerous scientific investigations point at consecutive rich sources of anti-microbes, especially among fruits and vegetables, but few of them involve waste parts of fruits ie., seeds and peels .Many of the fruits and vegetables skins are thrown in the garbage or fed to livestock. These are having very rich in bioactive components which are considered to have beneficial effects on health. In the present investigation, the antimicrobial property of peels of different vegetables and fruits, that is commonly available and readily consumed in India [1].

Undoubtedly, fruit and vegetable peels comprise the highest percentage of wastes in most kitchen garbage bins. This is not something to be shocked about, especially if the members in the household cook their food at home. However, it can be shocking at times that people are not yet knowledgeable on the proper means of recycling and reusing peels. While you can eat some of them, a lot of peels are actually beneficial when it comes to the home's sanitary purposes. But wait, peels aren't just all about cleaning the house, they're more than that. Here are is a list of some of the most beneficial uses of fruit and vegetable peel [2].

Firstly, edible peels are good sources of numerous antioxidants and odd compounds, which are actually combatants against cancer and other degenerative diseases. In fact, studies show that most cures for rare diseases are found by eating certain fruit or vegetable peels. Consequently, the nutrients and beneficial compounds of some fruits are found in its skin. For instance, an apple's skin has tons of phytochemicals and other valuable substances. The more you eat deeper, the lesser nutrients you get because they're all jam packed in its skin and outermost parts. Although some peels are skin irritants, they're highly nutritious. However, make sure to consume peels of produce that are well-washed and organic since they contain lower to zero traces of chemicals compared to non-organic and unwashed goods. Most citrus fruits are best when mixed with dips and sauces, made into candies and flavor confectionery, and pickled. They're also best when eaten with the fruit [3].

Secondly, peels are best for skin whitening, scrubbing, and cleansing. Lemon peel, apple peel, papaya peel, pomegranate peel, and banana peel can be made into facial masks and body scrubs that provide natural glowing effects.. These peels provide relief against dark spots, wrinkles, and skin roughness. They also provide elasticity, visible smoothness, and even-toned skin. Ditch those commercial products today and start making peel powders now [4].

Aims and Objectives:

Aim:

The aim of present study is to determine the anti-bacterial and anti-fungal activities of different peels of vegetables and fruits on various micro-organisms.

***Objectives*:**

1. Procurement of vegetables and fruits.
2. Procurement of micro-organisms(bacteria and fungi)
3. Preparation of peel powders.
4. Preparation of pure cultures.
5. Determination of anti-bacterial and anti-fungal activities of different peels of vegetables and fruits on various micro-organisms.

Table No. 1: List of Fruit and Vegetable Peels

S. No.	List of Vegetables	List of Fruits
1	Papaya	Tamarind
2	Potato	Muskmelon
3	Cucumber (Green)	Watermelon
4	Cucumber (Yellow)	Mango
5	Beet Root	Sapodilla
6	Ginger	Ogange

***Corresponding author:**

B. Raja Narender

Associate Professor,

Sree Chaitanya Institute of Pharmaceutical Sciences,

Thimmapoor, Karimnagar-505527, Telangana, INDIA.

** E-Mail: rajanarenderbongoni@gmail.com*

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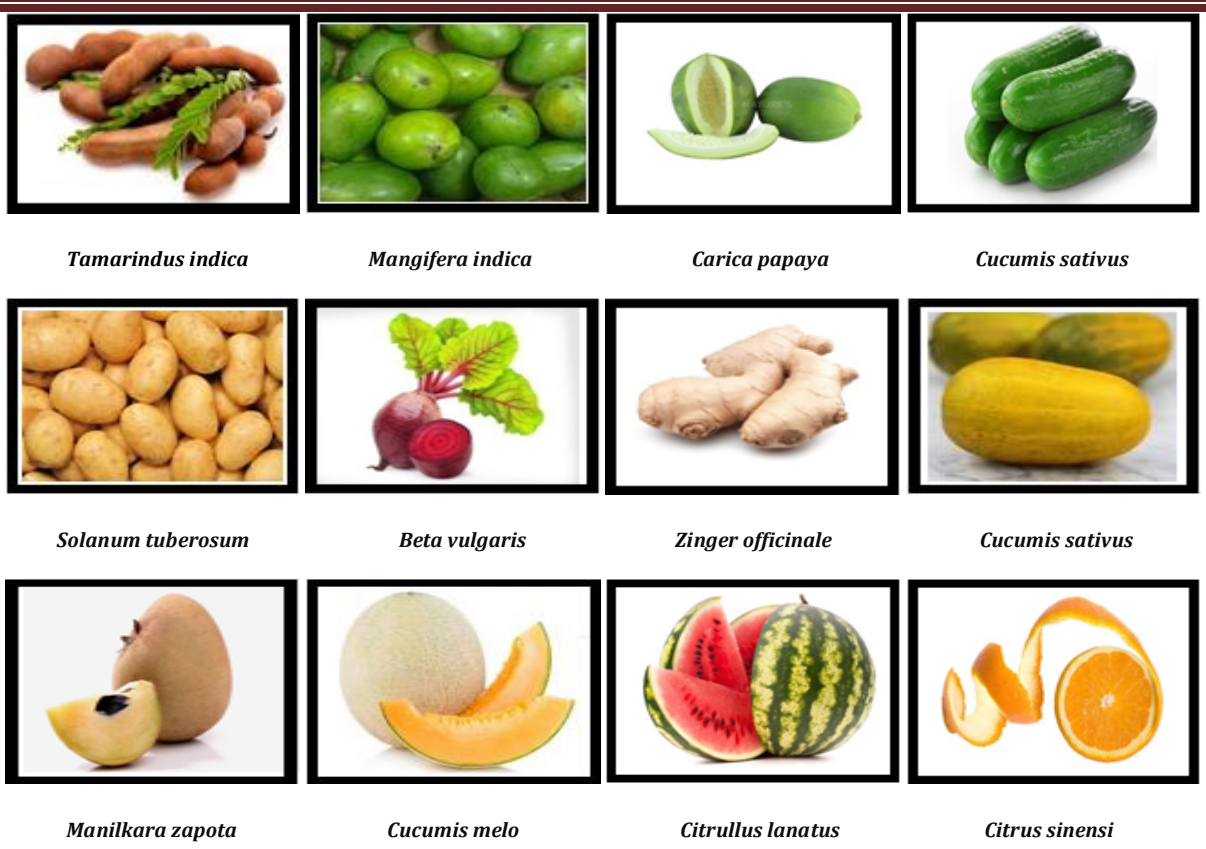

Fig. 1: Vegetables and Fruits

MATERIALS AND METHODS [5]

Material:

Sample:

The project work had carried out in Sree Chaitanya Institute of Pharmaceutical Sciences. Vegetables and fruits were obtained from the local market. Vegetables and fruits were washed, cleaned of extraneous matter and peeled it. The peels were dried at room temperature in a shaded region for a period of 1week. The dried peels were grinded in mortar and pestle.

Microbial Cultures: [6]

Pure cultures were collected from department of microbiology, Kakatiya University, Warangal.

Culture Media:

For culturing of the microorganisms, nutrient agar medium was used. Nutrient broth and sabouraud dextrose media was used for the incubation and standardisation of the microorganisms. The following cultures were used for the study: *Escherichia coli, Staphylococcus aureus, Proteus vulgaris, Lacto bacillus* and *Saccharomyces cerevisiae* [7].

Media:

Nutrient Agar, Nutrient Broth was procured from HiMedia and fungal media was procured from standard Sabouraud Dextrose Agar Media [8].

Preparation of Media: [9]

The required quantities of nutrient agar (2.8 g 100ml-1) and nutrient broth (1.3g 100ml-1) and sabouraud dextrose agar (6.3g 100ml-1) were prepared by dissolving it in distilled water in conical flasks.

Preparation of Nutrient Broth:

Broth was sterilized in an autoclave at 15psi pressure and 121° C for 15 min. After sterilization, some of the nutrient broth (approximately 20 ml test tube-1) was also poured into the test tubes. Then pure cultures are taken with the help of inoculating loop, the cultures were inoculated and then they are kept for incubation for 24hours at 37° C [10].

Preparation of Nutrient Agar Media: [11]

Nutrient agar media of 50ml was separated in other conical flasks and is inoculated with 0.5ml of cultures in the same way fungal media is also prepared but standard media that is sabouraud dextrose agar media is used and poured aseptically into sterilized petri plates. The media was allowed to be solidified in petri plates and then wells are made with sterile borer having 0.5cm diameter and then placed in an incubator at 37° C for 24 h for bacteria and 28-30° C for 48 h for fungi [12].

Standard Reference Antibacterial Agent:

The reference antibacterial used is crude form of Streptomycin (1mg/ml).

Standard Reference Antifungal:

The reference antifungal used is Fluconazole (1mg/ml).

Disc Diffusion Susceptibility Method: [13-15]

In this method, nutrient agar media plates were seeded with 18 to 24 h cultures of microbial cultures and then different peels of vegetables and fruits were applied on the discs. Petri plates were incubated at 37° C for 18-24 h in an incubator and in this sabouraud dextrose agar media plates were seeded with 48 h cultures of microbial culture (Yeast) and then different peels of vegetable and fruits were applied on the discs. Media plates were incubated at 28-30° C for 48 h. The chemicals diffused from the discs into the agar media thus preventing the growth of microorganisms (if susceptible) in the area around the discs known as zone of inhibition. The next day, zones of inhibition were calculated from each treatment.

Positive Controls: [16]

For gram positive bacteria and for gram negative bacteria Streptomycin was used and for fungi Fluconazole was used.

Anti-Microbial Activity:

The antimicrobial activities were carried out according to the conventional disc diffusion test, using cultures of *E. Coli, Lactobacillus, Staphylococcus aureus, Proteus vulgaris* and *Saccharomyces cereviseae*. The bacterial strains were cultured on nutrient medium, while the fungi were cultured on fungal medium, respectively. For bacteria, the broth media were incubated for 24 h. As fungi, the Sabouraud Dextrose Agar media were incubated for approximately 48 h, the solution containing the cells was used for inoculation. For preparation of plate inoculation, 0.5ml of cultured were inoculated to 50ml of agar media (50° C) and mixed by simple inversion. The agar was poured into 120mm petri dishes and allowed to room temperature. The microbial growth inhibition zone for bacteria was measured after incubation at 37° C and for fungi was measured after incubation at 28-30° C, the appearance of the clear microbial free Inhibition Zones, begin within 24 h for bacteria and 48-72 h for fungi [17].

Different microbial species were used to screen the possible antimicrobial activity of different peels of vegetables and fruits. To determine antimicrobial activity, peels were tested against different organisms. This was assumed to be sufficient for the antimicrobial screening. Very clear differences were found between the effects of different peels in the study. The results of the antimicrobial screening assay of different peels are shown in table [18].

Antimicrobial activity was observed with different peels of vegetables and fruits against gram negative bacteria, gram positive bacteria and fungi. The different resistant patterns are likely to be related to differences in fungi and bacteria cell wall structures and protein synthesis.

Antibacterial activity and antifungal activity was carried out using standard drugs like Streptomycin and Fluconazole respectively with concentrations of 1mg/1ml [19].

RESULTS AND DISCUSSION

Among all peels, the highest antibacterial activity was found with Beetroot against *E.coli* and *Lacto bacillus* and the highest antifungal activity was found with Papaya against *Saccharomyces cerevisiae.*

The different peels of vegetable and fruits were subjected for anti-bacterial and antifungal activities and the results were investigated, the peel powders were revealed the presence of antibacterial and antifungal activities.

The results of antibacterial activity by agar plate method indicate the highest activity on beetroot against *E. Coli and Lacto bacillus*. The highest antifungal activity was shown by papaya against *Saccharomyces cerevisiae*. Peels powder showed good activity of all organisms like *E. Coli, Lactobacillus, Proteus vulgaris, Staphylococcus aureus, Saccharomyces cerevisiae.*

Standard antibiotic streptomycin was shown 26mm and standard antifungal Fluconozole was shown 25mm of zone of inhibition. The results of the investigation showed that peels of different fruits and vegetables have good antibacterial activity against *E. Coli, Lactobacillus, Proteus vulgaris, Staphylococcus aureus,* and antifungal activity against *Saccharomyces cerevisiae.*

Table No. 2: Indicates the Anti-Bacterial Activity of Vegetables Peels

S. No.	Name of the Peels	Zone of Inhibition (mm)			
		E.coli	*Staphylococcus aureus*	*Lacto bacillus*	*Proteus vulgaris*
1	Papaya	22	22	22	18
2	Potato	10	17	18	15
3	Cucumber(y)	21	21	12	13
4	Cucumber(g)	16	16	15	18
5	Beetroot	26	25	26	22
6	Ginger	10	7	8	8

**Cavity diameter=5mm*

Table No. 3: Indicates the Antibacterial Activity of Fruit Peels

S. No.	Name of the Peels	Zone of Inhibition (mm)			
		E.coli	*Staphylococcus aureus*	*Lacto bacillus*	*Proteus vulgaris*
1	Tamarind	19	17	22	17
2	Muskmelon	17	13	10	16
3	Watermelon	11	10	10	26
4	Mango	15	13	14	16
5	Sapodilla	21	20	29	28
6	Orange	15	20	22	19

**Cavity diameter=5mm*

Table No. 4: Indicates the Antibacterial Activity of Streptomycin

S. No.	Name of Antibacterial Agent	Zone of Inhibition (mm)			
		E.coli	*Staphylococcus aureus*	*Lacto bacillus*	*Proteus vulgaris*
1	Streptomycin	26	20	26	22

**Cavity diameter=5mm*

Table No. 5: Indicates the Antifungal Activity of Vegetable and Fruit Peels

S. No.	Name of The Peels	Zone of Inhibition (mm)
		Saccharomyces cerevisiae (Yeast)
1	Tamarind	14
2	Sapodilla	13
3	Mango	12
4	Muskmelon	10
5	Watermelon	7
6	Orange	8

7	**Papaya**	35
8	**Potato**	12
9	**Ginger**	13
10	**Cucumber(yellow)**	14
11	**Cucumber(green)**	10
12	**Beetroot**	16
13	**Fluconazole**	25

**Cavity diameter=5mm*

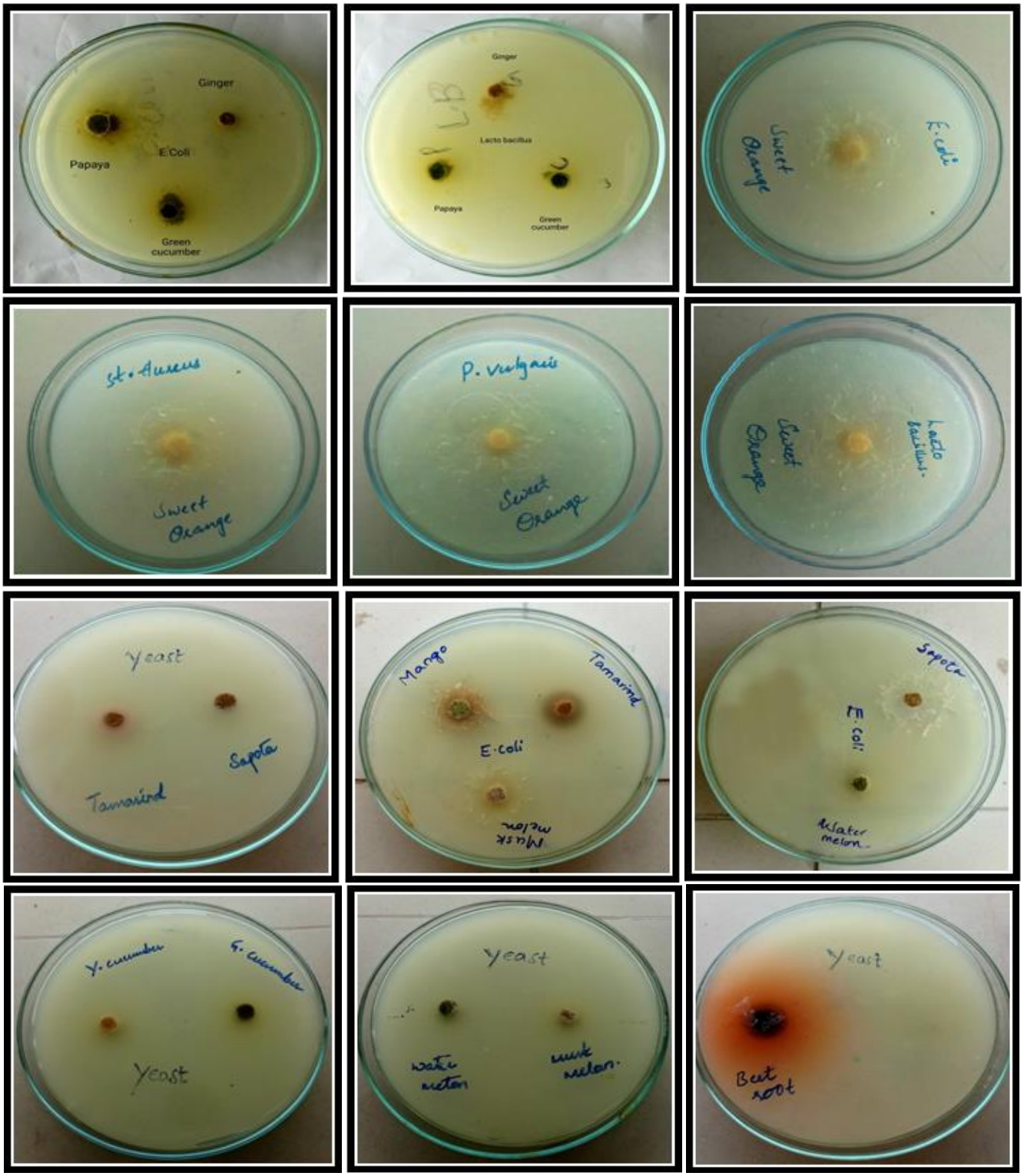

Fig. 2: Zone of Inhibition of Vegetable and Fruit Peels (E. Coli, Yeast, *Staphylococcus aureus, Lacto Bacillus, Proteus Vulgaris*)

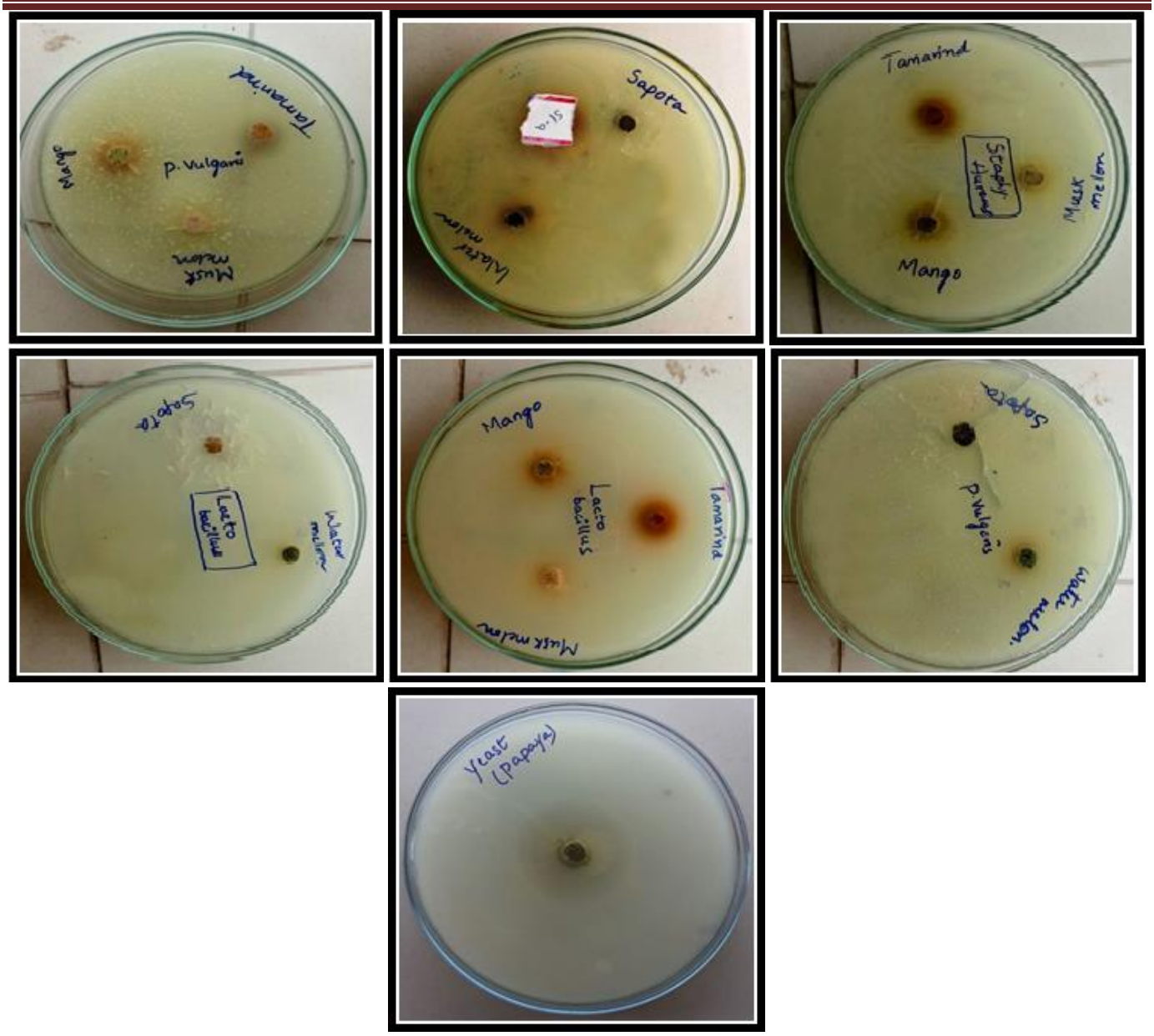

Fig. 3: Zone of Inhibition of Vegetable and Fruit Peels (E. Coli, Yeast, *Staphylococcus aureus, Lacto Bacillus, Proteus Vulgaris*)

Fig. 4: Zone of Inhibition of Standard Drug with Steptomycin and Fluconazole

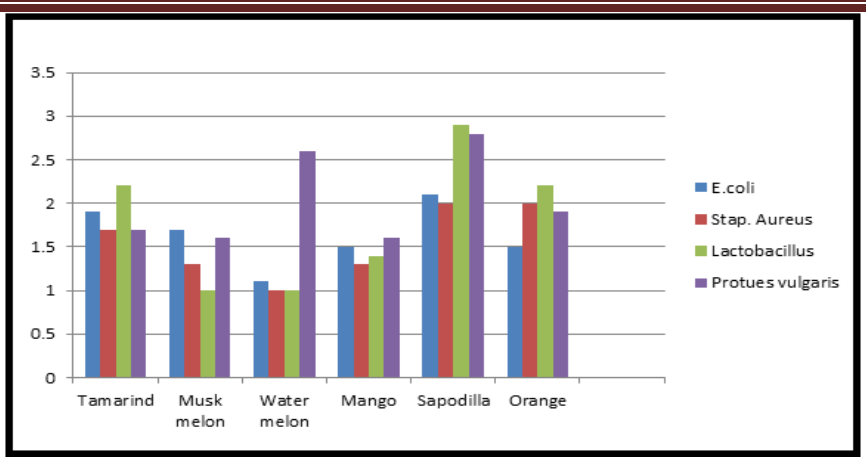

Fig. 5: Antibacterial activity graph of fruit peels

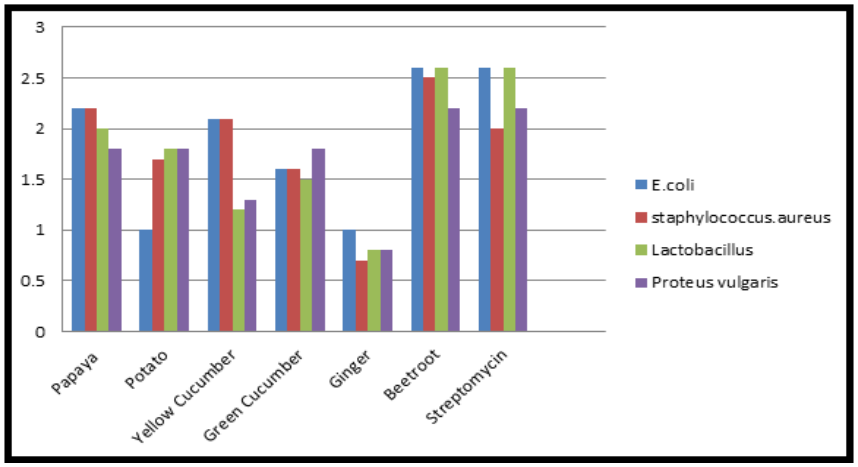

Fig. 6: Antibacterial activity graph of vegetable peels

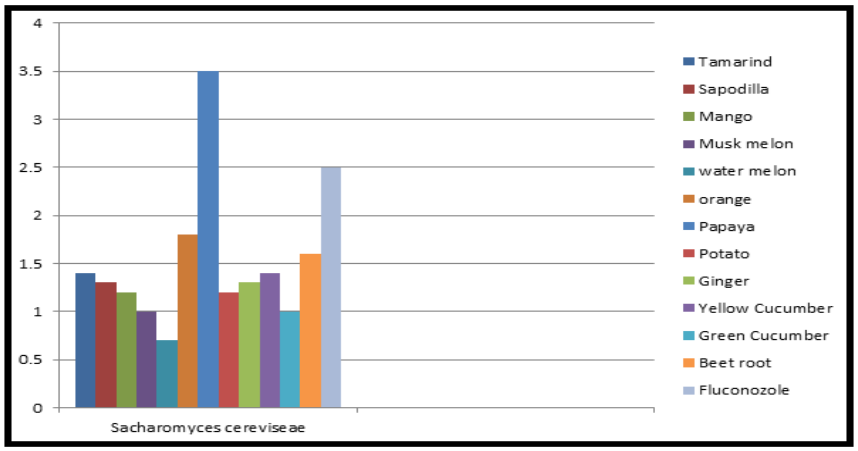

Fig. 7: Antifungal activity graph of vegetable and fruit peels with standard antifungal drug

CONCLUSION

The different fruits and vegetables were collected from local market. The fruits and vegetables were washed, cleaned of extraneous matter and peeled it. The peels were dried at room temperature in a shaded region for a period of one week. The dried peels were grinded with the help of motor and pestle.

The works states that the peels of different fruits and vegetables were responsible for antibacterial and antifungal activity, These peel powders exhibit a maximum zone of inhibition against *E.coli, Lacto.bacillus, Proteus.vulgaris, Staphylococcus.aureus, Saccharomyces cerevisiae*. It is interesting to observe the results of high antibacterial activity on beetroot and sapodilla, antifungal activity on papaya.

FUTURE ASPECTS

Hence the present investigation results shows promising evidence of utilising the fruit and vegetable peels as a source for natural antimicrobial. Thus new aspects concerning the use of the wastes therapeutically are very attractive. The present investigation focuses on

the possibility of using plant peel waste as a source of low-cost natural antimicrobial. M. indica peel, usually a waste product which is thrown into the environment has a very good antimicrobial potentiality. The demonstration of broad spectrum of antibacterial activity by M. indica peels may help to discover new chemical classes of antibiotic substances that could serve as selective agents for infectious disease chemotherapy and control. This investigation has opened up the possibility of the use of this plant in drug development for human consumption possibly for the treatment of various infections caused by microbes. These are novel, natural and economic sources of antimicrobics, which can be used in the prevention of diseases caused by pathogenic microbes. Therefore, this study will definitely open up as a scope for future utilization of the waste for therapeutic purpose.

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