

EFFICACY OF CITRUS FRUIT PEEL EXTRACTS AGAINST PATHOGENS CAUSING GASTROINTESTINAL DISORDERS

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ABSTRACT

Gastrointestinal disorders are very common among adults; the contaminated food and water are the main sources of the organisms which can cause gastric problems. Due to the intake of antibiotic drug against the pathogen causing gastrointestinal disorders, the bacterial strains are becoming resistant to the particular. To overcome this, citrus fruit peel extract can be used to treat these disorders. The citrus fruit peel extract used Citrus paradisi Mac fad (Grapefruit) Citrus sinensis (Orange), Citrus Limon (Lemon), and Citrus aurantifolia (Lime) against the gastrointestinal pathogens and lesser side effects than the synthetic drugs used against gastrointestinal pathogens.

Keywords: Citrus peel, Resistance and Prevention, Gastrointestinal disorders.

INTRODUCTION

People have used citrus fruits as a source of medicines for thousands of years, but not in the citrus-flavored foods familiar to us today, like orange juice, lime pie or lemon slices on slabs of salmon, while we usually consume the flesh and nectar of these succulent fruits as food, herbalists have used the peels of these citrus fruit as medicine for numerous maladies throughout history.

In some cases, these discoveries in the apothecary led to innovation in the kitchen. For example, in Asia, the use of orange zest, lemon zest and dried orange peel in cooking developed out of the knowledge of their application as remedies for digestive disorders. A little citrus peel in your diet can go a long way.

Food and waterborne disease is caused by eating contaminated food or drinking impure water. The gastric infections can be bacterial, viral, protozoa or helminthes. Many bacteria contaminating food and water can cause acute gastroenteritis or inflammation of the stomach and intestinal lining. Common symptoms of such food poisoning are nausea, vomiting and diarrhea. Traditional Chinese herbal medicine uses several citrus peels for specific health support, including those of mandarin orange (*Citrus reticulata* 'Blanco') and bitter orange (*C. aurantium*).

For hundreds of years, herbalists trained in Traditional Chinese Medicine (TCM) have used orange peel, known as chen pi or ju pi in Chinese medicine, to improve digestion, relieve intestinal gas and bloating, and resolve phlegm. This peel acts primarily on the digestive and respiratory systems. We apply it in conditions involving a sense of distension and fullness in the chest and upper middle abdomen combined with loss of appetite, vomiting or diarrhea, or coughs with copious phlegm.

Immature mandarin orange peel, known as qing pi in Chinese medicine, acts primarily on the liver and stomach to promote digestion, relieve food retention and abdominal distension, and promote good liver function. Practitioners of Chinese herbology use this herb when the sense of distension and discomfort lies primarily under the rib cage rather than the central abdomen.

Since the of diverse bacterial introduction of antibiotics there has been tremendous increase in the resistance coexisting in the human body. The medicinal actions of citrus peels come in part from their primary essential oil, d-limonene. D-limonene has antimicrobial and anti-inflammatory properties. It also acts as a solvent for cholesterol, which has led some physicians to use it to dissolve cholesterol- D-limonene, neutralizes gastric acid and supports normal peristalsis, making it useful for relief of gastro esophageal reflux disease (GERD).

MATERIALS AND METHODS

The citrus fruit peels were procured from markets. They were washed well to remove dust and other external contaminants and by following standardized laboratory methods the Aqueous, Ethanol, Acetone, Chloroform, Hexane and Crude extracts were prepared. The Antibacterial Activity of the Gram Negative Microorganisms selected for this study (*E. coli*, *Salmonella* spp and *Shigella* spp) was conducted using Agar Well Method (Cup Plate Method) and Filter Paper Method. Kirby Bauer Method was employed for Antibiotic Sensitivity Testing. Intestinal disorders than the antibiotics usually administered.

Activity Assessment

The effect of four citrus fruit peels (using aqueous, crude and solvents like ethanol, acetone, chloroform and hexane) on three common pathogens which causes stomach disorders were studied. In addition, a comparative study with antibiotics and various plant extracts was also carried out. Following the incubation of fruit peel extracts with the organisms, the zone of inhibition was measured in mm. The following results as per the inhibition were thus obtained. In the ethanol extract concentrate, *Citrus aurantifolia* and *Citrus limon* showed a better inhibitory effect on *E. coli* and *Shigella* spp. *Salmonella* showed less inhibition compared to other two and *Citrus paradisi* Macfad, showed less inhibition to *Shigella* and *Salmonella* spp. *Citrus sinensis* showed inhibitory effect on *E. coli* and *Shigella* spp, than *Salmonella*. In crude extract concentrate, *C. aurantifolia* showed more inhibitory activity against *Shigella* spp than *E. coli* and *Salmonella*. In *C. limon* inhibitory activity was seen more in *E. coli* compared to *Shigella* spp, and *Salmonella*. In *C. sinensis*, less zone of inhibition was witnessed than in others. In acetone extract concentrate, *C. aurantifolia* showed better inhibition against *E. coli* and *Shigella* spp. In *C. paradisi* Mac fad less inhibition was seen in all three organisms. In aqueous extract, *C. sinensis* inhibitory activity was better in *E. coli* but less in *Salmonella* spp. *C. aurantifolia* showed inhibitory activity against *Shigella* spp and *E. coli* than *Salmonella* spp. *C. paradisi* Mac fad showed inhibitory activity against all the organisms. None of the chloroform extracts showed any result for any of the organisms. For hexane extract concentrate, *C. sinensis* showed inhibitory effect in *E. coli* while for other two organisms it didn't show much effect. *C. aurantifolia* and *C. Limón* showed inhibitory activity against *E. coli* than the other organisms. *C. paradisi* Macfad did not show much significant effect on the organisms (Figures1-6)

Each plate was examined and the zone of inhibition i.e. clear zone diameter (in mm) was noted individually for all the fruit peel extracts. Primarily the effect of ethanolic extract was observed and the inhibition zones were noted and tabulated. Among the four fruit peels, *C. limon* and *C. sinensis* showed an even inhibitory activity over all the three microbes. The highest activity was observed in the

extract of *C. aurantifolia* for *Shigella* spp. and *E.coli*. In figure 1 the graphical representation shows a comparative analysis of the inhibitory activity of ethanolic fruit peel extract.

After the study conducted on ethanolic extracts, crude fruit peel extracts were taken for further investigation. The plates were observed and the readings were tabulated, and the readings were interpreted and a graphical representation was made (fig.2). Highest activity was observed in the extract of *C. aurantifolia*. Lowest activity was seen in *C. paradisi* Macfad against *Shigella* Spp.,

Acetone extracts of all the fruit peels showed a similar range of activity on *shigella* spp., and *E.coli* strains as seen in case of ethanolic extracts. The graphical representation is given in fig.3.

In case of aqueous extract, lowest activity was observed in the *C.limon* among all the three microbes and highest zone of inhibition was observed for the extract of *C. aurantifolia* on *shigella* and *E.coli*, which is shown in the fig.4.

Chloroform extract seems to be ineffective in the microbial population control, except *Shigella* spp., which shows a moderate inhibition in the presence of the *C. paradisi* Macfad fruit peel. The comparison is represented in the graph (fig.5).

Figure.6 shows the range of inhibition activity of hexane extract of citrus fruit peels. Among which *C. aurantifolia* and *C. limon* shows high and even zone of inhibition against *Shigella* Spp., and *E.coli* strains. Whereas *C. aurantifolia* is effective against *Salmonella* Spp.,

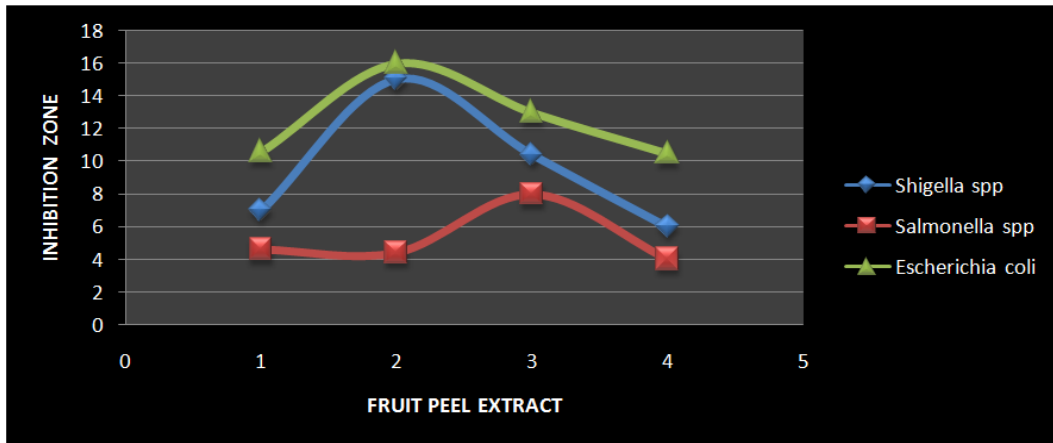


Fig. 1: Effect of ethanol extracts of the fruit peels on the organisms

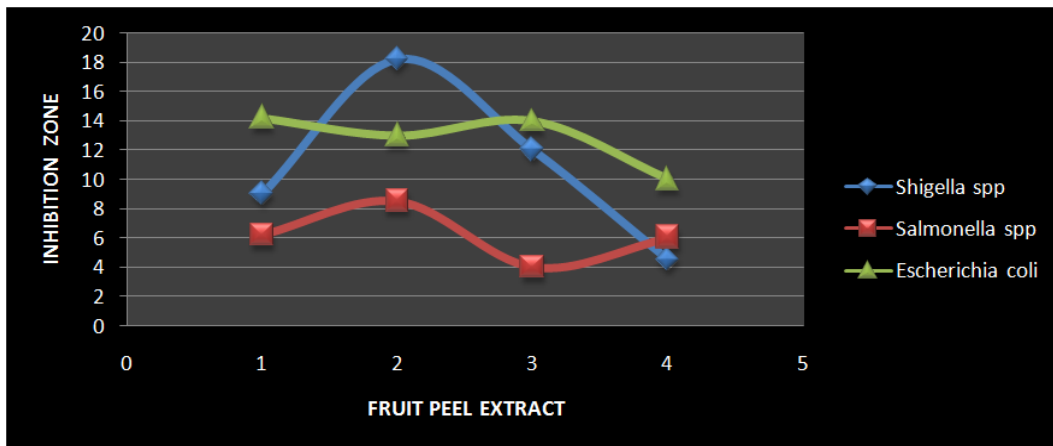


Fig. 2: Effect of crude extracts of the fruit peels on the organisms

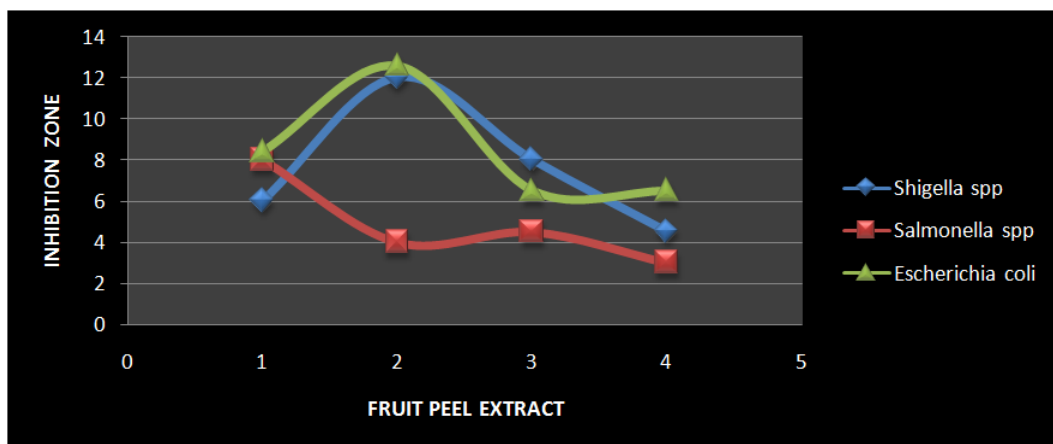


Fig. 3: Effect of acetone extracts of the fruit peels on the organisms

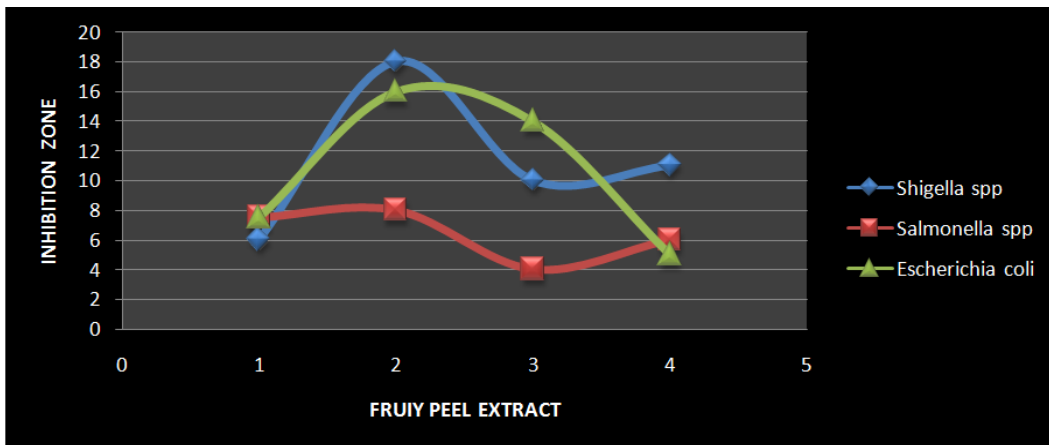


Fig. 4: Effect of aqueous extracts of the fruit peels on the organisms

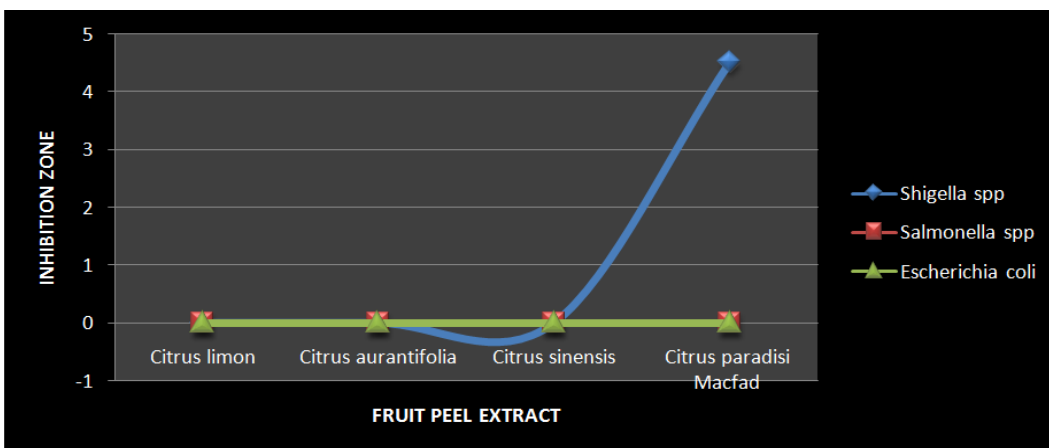


Fig. 5: Effect of chloroform extracts of the fruit peels on the organisms

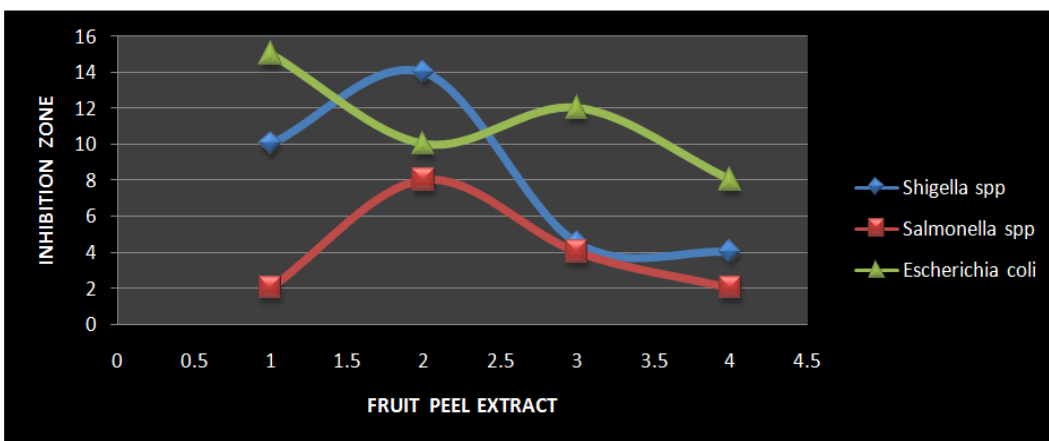


Fig. 6: Effect of hexane extracts of the fruit peels on the organisms

CONCLUSION

Microorganisms which cause infections are becoming resistant to the drugs that are being commercially used against pathogens causing gastrointestinal disorders. This citrus fruit peel extract study against the common pathogens of the gastrointestinal tract revealed them as better inhibitory agents than synthetic compounds. There is the need for novel compounds which can have a significant effect on these organisms and it is always preferred to take natural medicines which have lesser side effects than the synthetic ones.

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