ANTIMICROBIAL ACTIVITY OF SPINACH AND PUMPKIN AGAINST PATHOGENIC MICROORGANISMS

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Abstract

Traditional medicines make use of natural products and are of great importance. Plants are wealthy sources of antimicrobial agents as they contain a different variety of phytoconstituents. These types of natural drugs are always a better substitute of synthetic drugs. Thus numerous drugs have entered the international pharmacopoeia through ethanobotany and traditional medicine.The aim of present study is to investigate in vitro antimicrobial activity of isopropanol extracts of fresh and dried spinach leaves, pumpkin, as well as fresh spinach leaves and pumpkin juice against pathogenic Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, and Proteus vulgaris.

The obtain results suggested that these extracts have shown antibacterial activity. This may be due to various pharmacological active compounds, and thus provided scientific basis for the traditional uses of the studied vegetables (spinach leaves and pumpkin) in the treatment of bacteria.

Keywords: Antimicrobial activity, spinach leaves and pumpkin, Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, and Proteus vulgaris.

Introduction

Since ancient times many herbal medicines in different formulations have been recommended for the treatment of various diseases. Traditional and/or indigenous drugs have special significance of having been tested over a long time, and are relatively safe, easily available and affordable (1). The WHO has also recommended the initiation of studies to identify and characterise new herbal preparations from traditionally known plants and the development of new effective therapeutic agents.(3,4).In the ongoing search for more effective and safer drugs, attention is being paid to new and safe medicinal herbs or food components(2,4).

Green leafy vegetables have been used as medicine since ancient times and have been playing a very important role in our diet and nutrition. The chief chemical constituents of spinach (*Spinacia oleracea*) are essential amino acid, iron, vitamin A, folic acid, vitamin K. It contains almost all minerals, and is richest source of carotenoids, beta-carotene and lutein (5).Spinach has been found valuable for dyspepsia, anaemia (6), neuritis, nerve,exhaustion,tumors,insomnia,arthritis,obesity,high blood pressure and bronchitis. They contains choline and inositol, the substances that help to prevent arteriosclerosis, or hardening of the arteries(7).This is a good source of vitamin K(8),which aids in the formation of the blood substances required for clotting of blood(9,10).Spinach is beneficial source for various carotenoids and lipophilic active compounds(i.e. neoxanthin, lutein, zeaxanthin, and chlorophylls).Dietary intake of spinach extract has been reported to have beneficial effects on various types of cancer i.e.ovarian,lung,prostatic,breast,and colon(11).Spinach contains special protective carotenoid compounds that have been linked with decreasing the risk of many diseases, including heart disease(12,13),diabetes(14),neurodegenerative disease and obesity(12).Spinach's phytonutrients include such carotenoids as beta-carotene, lutein, and zeaxanthin. Spinach also

supplies flavonoids, which are a type of powerful antioxidant (15) that protect against disease by fighting free radical damage within the body.

The fruit of pumpkin (*Cucurbita maxi*ma) is cooked as a vegetable; this fruit has good beta-carotene content and has moderate content of carbohydrates, vitamins and minerals (16) and also used in traditional systems of medicine. Most of the compounds present in pumpkin fruits have biological activities and medicinal properties; antidiabetic (17, 18, 19, 20), antioxidant (21), anti-carcinogenic (22).

The present work was designed to investigate the antibacterial effect of isopropanol extracts fresh and dried spinach (leaves) and pumpkin (fruit) as well as juices of fresh spinach leaves and pumpkin against pathogenic *Escherichia coli, Staphylococcus aureus, Pseudomonas aerogenosa and Proteus vulgaris.*

2. Materials and methods:

2.1 Collection of plant materials:

Spinach and pumpkin was purchased from local market. Samples were washed thoroughly in running tap water and rinsed with distilled water,

Dry powder: For dried powder samples, spinach leaves and pumpkin were dried in shed, and crushed using mortar and pestle to make fine powder.

For fresh leaves paste: For fresh sample paste spinach leaves and pumpkin was crushed using mortar and pestle to make fine paste.

2.2 Preparation of leaf extract:

Fifty grams (50 gms) dried powder and paste was mixed with 50 ml isopropanol and kept it overnight. Then it was filtered through muslin cloth. The filtrate was collected, and stored at refrigerated temperature for further use. The extracts were tested for antimicrobial property against selected pathogens.

2.3 Microorganisms

Bacteria cultures of *Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa, Proteus vulgaris* were isolated from clinical isolates. The strains were maintained on agar slant at 4 °C and activated at 37 °C for 24 h on nutrient agar before any susceptibility test.

2.4 Media preparation

Muller Hingone agar (MHA) was prepared for antimicrobial activity, and was autoclaved for 15 minutes at 121 ^{0}C. It was cooled upto 45 ^{0}C, and was poured into sterilized petriplates.

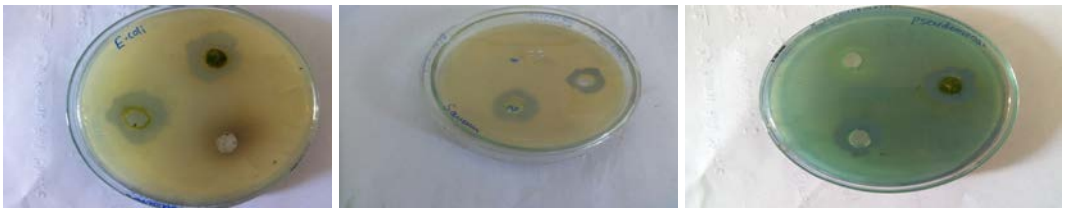
2.5 Antimicrobial activity

Antimicrobial activity was assayed by disc diffusion method. For all bacteria strains, overnight culture was grown in nutrient broth was adjusted to an inoculums density. Further 0.1 ml of inoculums was spread on MHA agar with sterile spreader. The surface of the medium was allowed to dry for about 3 minutes. Wells were punchered with sterile borer (2 mm size) into the media. In one well 0.1 ml all the vegetable extracts were taken. Control was also set for this experiment. Plates were kept in the incubator at 37°C for 24 hours for the observation of zone of inhibition (mm).

3. Results

3.1 Antimicrobial activity of fresh spinach leaves and pumpkin (isopropanol extract & fresh juice)

Antimicrobial activity was tested against four bacterial strains by agar disc diffusion method. Isopropanol extracts of fresh spinach leaves and pumpkin as well as fresh juices of spinach leaves and pumpkin has shown antibacterial activity against all test organisms except *proteus vulgaris* (Figure no. 1 & 2 ; Plates 1 & 2).Isopropanol extracts of dried spinach leaves and pumpkin powder was effective only against *E.coli* (fig 3).



(a) (b) (c)

Plate 1: Antimicrobial activity of Isopropanol extracts of fresh spinach leaves and pumpkin against

a) *Escherichia coli* (b) *Staphylococcus aureus (c) Pseudomonas aeruginosa*

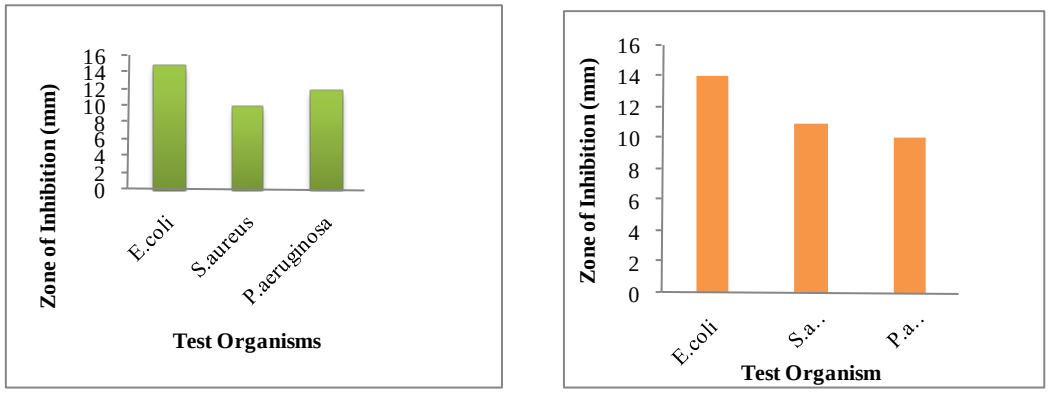
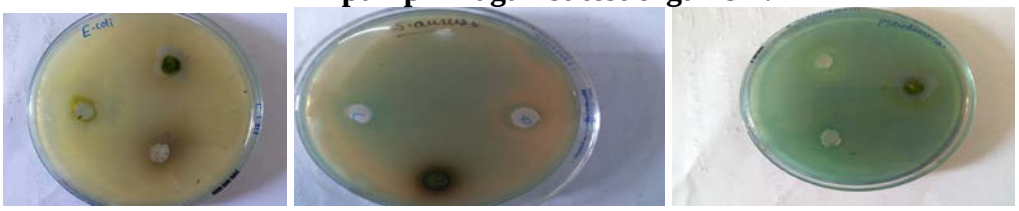


Figure 1: Antimicrobial activity of Isopropanol extracts of Fresh spinach leaves and pumpkin against test organism.



(a) (b) (c)

Plate 2: Antimicrobial activity of fresh spinach leaves and pumpkin juice against (a) *Escherichia coli, (b) Staphylococcus aureus,(c) Pseudomonas aeruginosa*

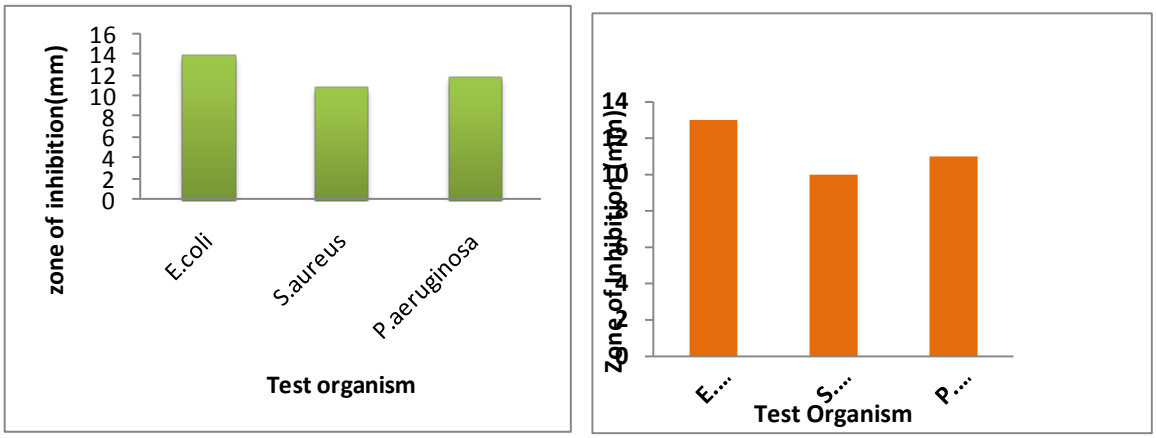


Figure No 2: Antimicrobial activity of fresh spinach and pumpkin extract (without isopropanol) against test pathogen

Plate 3: Antimicrobial activity of Isopropanol extracts of dried spinach leaves and pumpkin against *Escherichia coli*

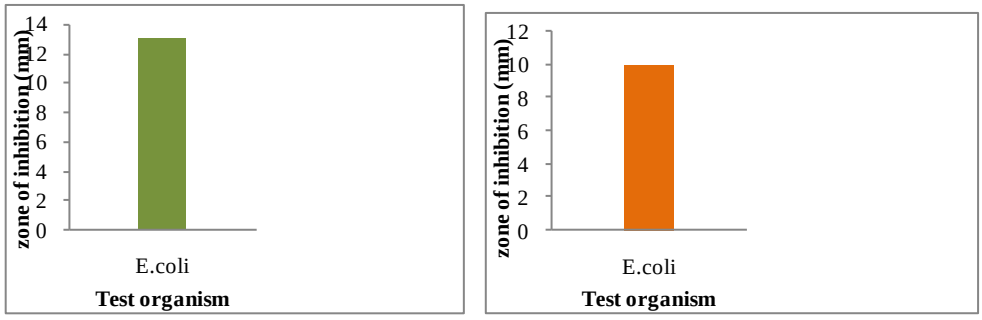


Figure 3: Antimicrobial activity of Isopropanol extract of dried spinach leaves and pumpkin against test organisms

Discussion

The fresh spinach leaves and pumpkin juice as well as its isopropanol extracts has shown antimicrobial activity against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* whereas dried vegetables isopropanol extract was effective only against *E.coli.* All the extracts were not effective against *Proteus vulgaris*.

The antimicrobial activity shown by these extracts against tested pathogens may be due to presence of some pharmacologically important phytochemical.

Conclusion

From this study it can be concluded that fresh and dried spinach leaves and pumpkin isopropanol extracts, and fresh spinach leaves and pumpkin juice possessed antimicrobial activity against tested pathogen. The antimicrobial activity has many applications, including preservation, pharmaceuticals, alternate medicine and natural therapies. Therefore spinach and pumpkin can be used for pharmaceuticals, alternate medicine and for natural therapies.

Acknowledgment

The authors are thankful to the Management of Kamla Nehru Mahavidyalya, Nagpur, for proving the facilities for this work.

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