

In-vitro analysis of antibacterial properties of fresh and dry waste peels of fruits and vegetables against gram positive and gram negative pathogens

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Abstract:

Phytochemicals present in all parts of plants are of great significance to humans in various ways, they contribute life sustaining properties and have a potential to provide vigor against diseases viz. cancer and cardiovascular diseases. The objective of this analysis was to acquire enough amounts of data about the anti-bacterial activity of fresh and dry form waste of fruits and vegetables against three different pathogens viz. *Escherichia coli*, *Klebsella pneumoniae*, *Bacillus subtilis*.

The extracts were prepared via solvent extraction method by dissolving different samples of waste fruits and vegetables in solvents viz Hexane, Petroleum ether, Methanol and Acetone 48 hours, these solvents were kept under dark condition for two days so that the solvent retains its efficiency. Samples were then subjected to Anti- microbial susceptibility test and the analysis revealed that fresh Acetone and Dry Methanol extract of Precap of *Punica granatum* gave the best result against *Escherichia coli*, *Klebsella pneumoniae*, *Bacillus subtilis* with zone of inhibition 20 mm, 23 mm, & 20 mm and 18 mm, 22mm & 18.5. Similarly almost all extracts of Dry and Fresh *B. oleracea* var *capitata*, *B. oleracea* var *botrytis*, *A. sativum*, *A. fistulosum*, *P. sativum*, & *C. arietinum* also gave result against three pathogens. With metal ion Mg^{++} , Fe^{+++} and pH (5, 7, 9, 11) try to enhance the activity of all extracts but their activity not enhanced it will be suppressed. Minimal Inhibitory concentration of Methanol extract of dry *Punica granatum* precap against *K. pneumonia* is 39.06 mg/ml and Acetone extract of Acetone *Punica granatum* precap against *K. pneumonia* is 0.238 mg/ml.

Phytochemicals are non-nutritive plant chemicals that have taken care of or disease preventive properties. They are non-essential nutrients, meaning that they're not required by the physical body for sustaining life. It is well-known that plant produces these chemicals to protect themselves but recent research demonstrates that they're going to also protect humans against diseases. There are more than thousand known phytochemicals. Some of the popular phytochemicals are lycopene in tomatoes, isoflavones in soy and flavanoids in fruits.

Foods containing phytochemicals are already a neighbourhood of our daily diet. In fact, most foods contain phytochemicals apart from some refined foods like sugar or alcohol. Some foods, like whole grains, vegetables, beans, fruits and herbs, contain many phytochemicals. The easiest thanks to get major phytochemicals is to eat major fruit (blueberries, cranberries, cherries, apple...) and vegetables (cauliflower, cabbage, carrots, broccoli,...). It is recommended take daily a minimum of 5 to 9 servings of fruits or vegetable. Fruits and vegetables also are rich in minerals, vitamins and fibre and low in saturated fat. Phytochemicals are naturally present in many foods, but it's expected that through bioengineering new plants are getting to be developed, which may contain higher levels. This would make it easier to include enough phytochemicals with our food.

Fruits and vegetables are absorbed as fresh or processed and known to be among the most important sources of phytochemicals for the human diet. About 200,000 phytochemicals are known thus far and 20,000 of them are recognized as originating from fruits, vegetables and grains. Phytochemicals has many health issues as antioxidants against many diseases or antibacterial, antifungal, antiviral, cholesterol-lowering, antithrombotic, or anti-inflammatory effects. Phytochemicals are used for many purposes like pharmaceuticals, agrochemicals, flavors, fragrances, coloring agents, biopesticides and food additives. Their chemical structures composed of phytochemicals like phenolics, alkaloids, saponins and terpenoids. These compounds are referred to as secondary metabolites having various identifiable structures, although a benzene formula with one or more hydroxyl groups may be a common feature. They are commonly classified as flavonoids (anthocyanins, flavan-3-ols, flavonols, proanthocyanidins or flavones), non-hydrolyzable tannins, isoflavones and flavanones) and non-flavonoids (hydroxycinnamic, hydroxy acid, hydrolyzable tannins, benzoic acids and stilbenes). Sugars, acids and polysaccharides are a crucial source of phytochemicals, secondary metabolites of plants also referred to as their antioxidant activity and other properties. Lately, there are various investigations on plant "antimicrobial," "antiviral," or "antibacterial" effects.

In addition, phytochemicals are a number of the foremost important natural preservation structures to scale back and inhibit pathogenic microorganism growth and preserve the general quality of food products. These antimicrobials can protect food products, extending the time period naturally. Chilling, fermentation, freezing, acidification, nutrient restriction, water moments reduction, synthetic antimicrobials and pasteurization are utilized in food preservation technology and phytochemicals like flavonoids, polyphenols, anthocyanins and carotenoids are also wont to preserve and control microbial spoilage in foods traditionally. In general, food antimicrobials are often classified as natural and artificial substances counting on their origin. Synthetic antimicrobials are found in fruits naturally like carboxylic acid in cranberries, hydroxy acid in grapes, carboxylic acid in rowanberries, malic acid in apples and acid in lemons. Auxiliary metabolites are in close contact through complex correspondence including metabolic assaults by plants on their microorganisms. Foods grown from the ground have phenolics which are naturally dynamic mixes. Leafy foods have a unique phytochemical bunch which shields plants from their current circumstance stress like contamination, microbes, or different abiotic stresses.

Even if secondary metabolites having different structures, they will have similar functions. First, plant-defensive metabolites indicate phytoalexins biosynthesized to send to biotic and abiotic stresses with the effect of both protecting the plant and controlling the pathogen growth. Secondly, most of those metabolites are liable for the organoleptic and qualitative properties of foods originating from such plants. For example, anthocyanins constitute a pigment group liable for the colour of an excellent sort of fruits, flowers and leaves and flavan-3-ols are polyphenols involved within the bitterness and astringency of tea, grapes and wine. Thirdly, these compounds are unique sources of commercial material within the sort of food additives, pharmaceuticals and flavors. Finally, they're considered to be beneficial for health, mainly thanks to their antioxidant activity..