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Antioxidant, Total phenolic Content as well as Antimicrobial Potentiality Effect of peel white and Black Eggplant extracts

Nour Basudan*

Department of Chemistry, Faculty of Science, King Abdulaziz University, Jeddah, Saudi Arabia

Abstract : Eggplant is one of the common Egyptian medicinal plants, which belongs to family Solanaceae. All parts of the plant i.e., fruits, stem, leaf,root and flower are used for the curative of great number of diseases. For the present investigation, peels of white and black eggplant were selected for total phenolic, peroxidation antioxidants and antimicrobial activity. The antimicrobial activity of two different of ethanol extract of peel Eggplant was screened against two Gram negative bacteria, *Escherichia coli* and *Pseudomonas aeruginosa*, two Gram positive bacterium, *Staphylococcus aureus* and *Bacillus subtilus.* Also three species of fungi i.e., *Candida albicans, Aspergillus flavus* and *Aspergillus niger* were used by well and disc diffusion methods. Phytochemical investigation of the eggplant peel extracts showed antioxidants activity. However, the phenolic content of peel black eggplant was much greater than the white eggplant. White eggplant peel extract inhibition the linoleic acid peroxidation than that of black eggplant through 7 days. Ethanol extract of peel black Eggplant exhibited dose dependent significant inhibitory activities against both bacterial and fungal strains are tested concentrations.

Key words : Antimicrobial activity, Eggplant, Total phenolic, Peroxidation, Antioxidant activity.

Introduction

Eggplant (*Solanum melongena* L.), fruit generally named as melanzana, garden egg, brinjal, aubergine, patlican is class amongst the top ten vegetables in expression, of oxygen radical absorbance capacity due to the fruit phenolic constituents [1]. The shape, size, and colour of the eggplant alter significantly with the type of the eggplant, and its fruit is usually cooked as a vegetable in numerous area of the world. Eggplant has important, economic prominence in much subtropical and tropical area of the world[2]. Consuming of eggplant is increasing because of growth in ethnic better awareness and variety, of the beneficial health effectiveness correlates with increased exhaustion of vegetables and fruits [3].There are various research publication characterize the benefits health of eggplant which contain large amount of phenolic compounds. The researches on the antioxidant activity of eggplant with different assays was reported and transmit, out a formal screening of the phenolic acid content in different kind of commune eggplant [4-5]. The plant has been used as an analgesic

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and emollient to gift prickle, laxative firing and nervous efforts and expectorant. The leaves are said to have healing properties and sedative and are applied to ulcers, wounds,break off, inflammations and skin illness[6]. The fruit or ripe berries are considered to be a cure for diabetes, fever, and diarrhea and eye disease. The young shoots are given in skin illness and in psoriasis disease. The root bark is laxative, useful in diseases of ear, the eye and the nose, good for ulcers, burning of the throat and inflammation of the liver. The seeds are laxative, beneficial in thirstiness daze, inflammation, and gonorrhea[7]. The previously reported using different solvents mixtures for optimized the extraction and isolation of phenolic acids from an eggplant sample [8].

There is a requirement, to set up, a rationalistic correlation between chemical, composition and activities as therapeutic of traditional medicine [9]. Medicinal plants are rich in antibacterial compounds which could provide an alternate method to inhibit bacterial diseases[10-11].Infectious diseases are important health hazard all over the world, both in developing and developed countries. Antimicrobial drugs are currently used in medicinal practice for treating various diseases[12-13]. A various numbers of researchers represented the cooperation between antimicrobial activities and of medicinal plants extracts[14-15]. Plant derived drugs serve as a prototype to develop effective and less toxic medicines. All parts of *Solanum nigrum* are medicinally important.Various medicinal properties of *Solanum nigrum* are described [16].

In this study Family – Solanaceae is used forits antioxidants activity and certain pathogenic microorganisms antimicrobial of peelmethanol extract of two kind of *Solanum nigrum*(white and black).

Plant material

Two of the most popular hybrid varieties of eggplant (*Solanum melongena* L.) white and black were obtained from a local market in Cairo, Egypt. The peel was manually removed and immediately frozen in liquid nitrogen, comminuted to obtain a fine powder and stored frozen at D80 °C until analyses [17].

Preparation of the extracts

Exactly5 g of lyophilized peel were broken into small pieces using a cylindrical crusher, and extracted with methanol (99.8%), using a Soxhlet apparatus. Extracts were then filtered through a Buchner funnel with a filter paper (Schleicher &Schuell, Dassel, Germany) [17].The obtained filtrate was concentrated in vacuo at 28 °C to dryness. The residues were stored in dark glass bottle for further analysis.

Determination of DPPH free-radical scavenging activity

The1,1-diphenyl-2-picrylhydrazyl (DPPH) radical assay was carried out spectrophotometrically. Aliquots (50 µl) of various plants extracts were added to 5 ml of 0.004% ethanol solution of DPPH. After incubating the samples for 30 min at room temperature, the absorbance was read against a blank at 517 nm.Ascorbic acid (AA) and gallic acid (GA) were used as reference standards and dissolved in methanol to make the stock solution with the same concentration (1 mg/ml)[18].

$$I(\%) = (1- AS/ AC) \times 100 \quad (1)$$

Where AC: is the absorbance of the control reaction (containing all reagents except the tested compound) and AS is the absorbance of the tested compound. The % of inhibition was determined from a graph plotting percentage inhibition against extract concentration. All experiments were performed in duplicate.

Determination of total phenolic content

The total phenols were estimated according to the Folin–Ciocalteu method Ainsworth, and Gillepsie[19]. Peel extracts were diluted to the concentration of 1 mg/ml, and aliquots of 0.5 ml were mixed with 2.5 ml of Folin–Ciocalteu reagent (previously diluted 10-fold with distilled water) and 2 ml of $NaHCO_3$ (7.5%). After 15 min of staying at the 45 °C the absorbance was measured at 765 nm on spectrophotometer versus blank sample. Total phenols were determined as gallic acid equivalents (mg GA/g extract), and the values are presented as means of triplicate analyses.

Antioxidant activity determination in linoleic acid system

Antioxidant activity of extracts was determined by measuring the % inhibition of peroxidation in a linoleic acid system [20]. 1 ml of each extract was added to a solution containing linoleic acid (0.13 ml), 99.8% ethanol (10 ml) and 0.2 M sodium phosphate buffer, pH 7, (10.0 ml). The resulting mixture was then diluted to 25.0 ml with distilled water. ed. To 2.0 ml of the sample solution, was added 1.0 ml of 20% aq. trichloroacetic acid and 2.0 ml of aq. thiobarbituric acid (TBA) solution. The final sample concentration was 0.02% w/v. The mixture was placed in a boiling water bath for 10 minutes. After cooling, it was centrifuged at 3000 rpm for 20 minutes. Absorbance of the supernatant was measured at 532 nm. Antioxidant activity was recorded based on absorbance on the final day. In both methods, antioxidant activity is described by percent inhibition. After stirring (3 min), the absorption was measured at 530 nm. A control was performed with linoleic acid but without extracts. ascorbic acid (200 ppm) was used as a positive control. The maximum peroxidation level observed as 168 h (7 days) in the sample that contained no antioxidant component was used as a test point. Percent inhibition of linoleic acid peroxidation was calculated to express antioxidant with a little modification activity [21].

Antimicrobial activity:

Pathogenic bacteria

The organisms studied were: Gram positive bacteria namely *Bacillus subtilus* NRRL B-543 and *Staphylococcus aureus*; NRRL B-313, Gram negative bacteria *Escherichia coli*; NRRL B-210, and *Pseudomonas aeruginosa* NRRL B23 27853pathogenic yeast *Candida albicans* NRRL Y-477 pathogenic fungi *Aspergillus niger* NRRL-3 and *Aspergillus flavus* ATCC 16883. These microorganisms were obtained from Natural Research center, Department of Chemistry of Natural and Microbial product Cairo Egypt, and were grown and maintained in on nutrient agar media (Difco 0001) [22].

Well diffusion technique:

Screening of antimicrobial activity was performed by well diffusion technique. The nutrient agar medium ((NA) for pathogenic bacteria and potato dextrose agar (PDA) for fungi were used. The plates were seeded with 0.1 ml of the standardized inoculums of each test organism. The inoculums were spread evenly over plates with glass spreader. The seeded plates were allowed to dry in the incubator at 37° C for 20 minutes [23]. A standard cork borer of 8 mm was used to cut uniform wells on the surface of media and 100 µl of each peel extract was introduced in the wells. The inoculated plates were incubated at 30-37° C for 24-96 hours and zone of inhibition was measured to the nearest millimeter (mm). The zone of inhibition produced by the plant extract was compared with control [17].

Results and Discussion

DPPH radical scavenging

The depicted results in Figure (1) demonstrated that antioxidant scavenging of white eggplant is approximately one and half of that in black eggplant. These results reflect the increasing in antioxidant content of white eggplants in comparison to Black eggplant. An intensive requirement for efficacious antioxidants from natural sources is necessity as alternate to synthetic antioxidant to inhibit free radicals involved effects on health and diseases which cause intense. A large number of antioxidant compounds in plant substance are stale uncommon [24].

The essential active compositions of eggplant are quercetin-3-glucoside [25], myricetine-3-galactoside [26]and quercetine-3-rhamnoside[27]. Two novel derivatives of delphinidin were recorded latterly in the purple Chinese(delphinidin-3-glucoside-5-dirhamnoside and delphinidin-3-glucoside-5- dirhamnoside)[28]. There are differentfrom all the delphinidin derivatives identified before in other cultivars/varieties around the world[29].

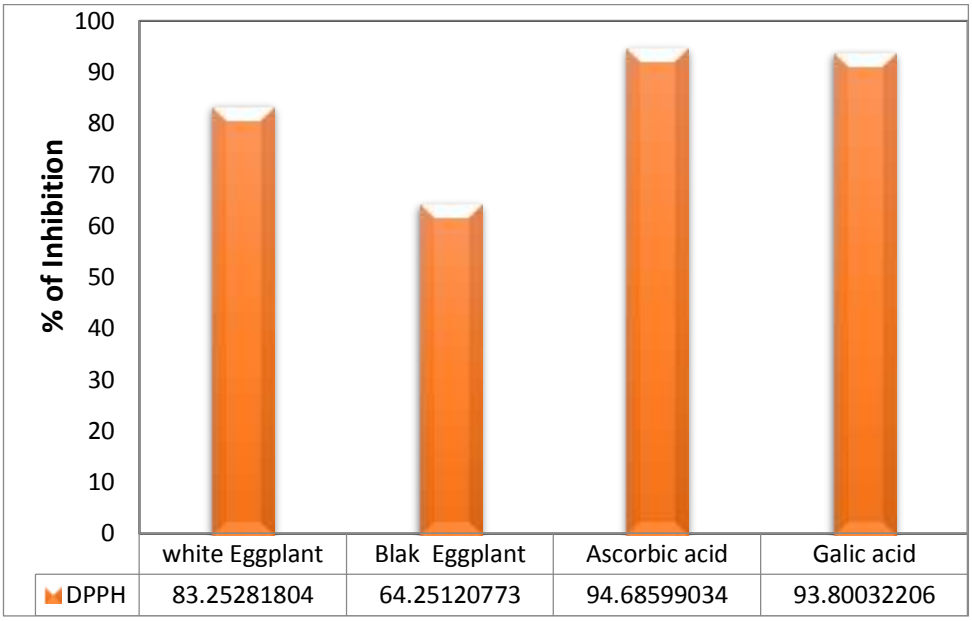

Figure (1) Antioxidant scavenging for white and Black eggplant

Total phenolic contents

In these studied the total phenolic contents of white and black eggplant were illustrated in Figure (2). The biggest total phenolic contents were recorded in black eggplant(36 mg/gdw) followed by white eggplant(22 mg/gdw). The total phenolic contents of black eggplant extract in this study are identical to the results of Singh which recorded that the total phenols in black eggplant are in the like value [30].

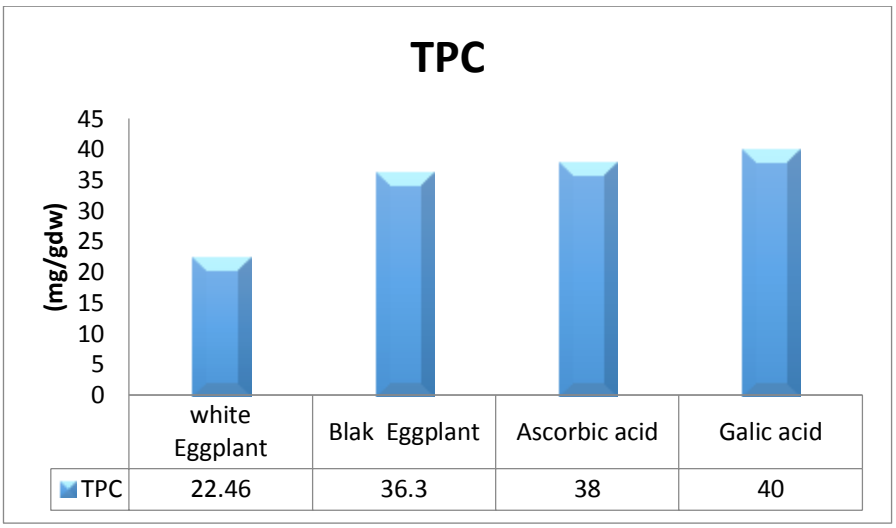

Figure (2): Total phenolic content for white and Black eggplant

Total Antioxidant activity by linoleic acid system:

Total antioxidant activity of the plant extracts was assessed by observation, their capability controlling lipid peroxidationlivel(Figure 3). The inhibition levels of linoleic acid oxidation by metabolic extracts for peel white and Black eggplant were found to be moderate 80 to 58% respectively. It refers to the presence of great amount of phenolic complex in the peel extracts [18]. These data was parallel with that reported eggplant [31] contains anthocyanins and has therapeutic potential for the treatment of hyperlipidemia also, forbidding of

atherogenic cardiovascular diseases by inhibiting lipid peroxidation. These substance are antioxidant, antidiabetic,antimicrobial and anti-inflammatory medicate [32].

Regards to progressive inhibition of linoleic acid establish in Figure (3) inducing greater decrease in the linoleic acid peroxidation than that of Black eggplant through 7 days to be almost to the ascorbic acid ($^{+}$vecontrol) effectiveness. The antioxidative characteristic of phenolic appear, from their elevation reactivity like hydrogen or electron donors also for its strength power of polyphenol-derived radicals to delocalize and establish the unpaired electron or from their strength power to chelate transformation ions metal [18].

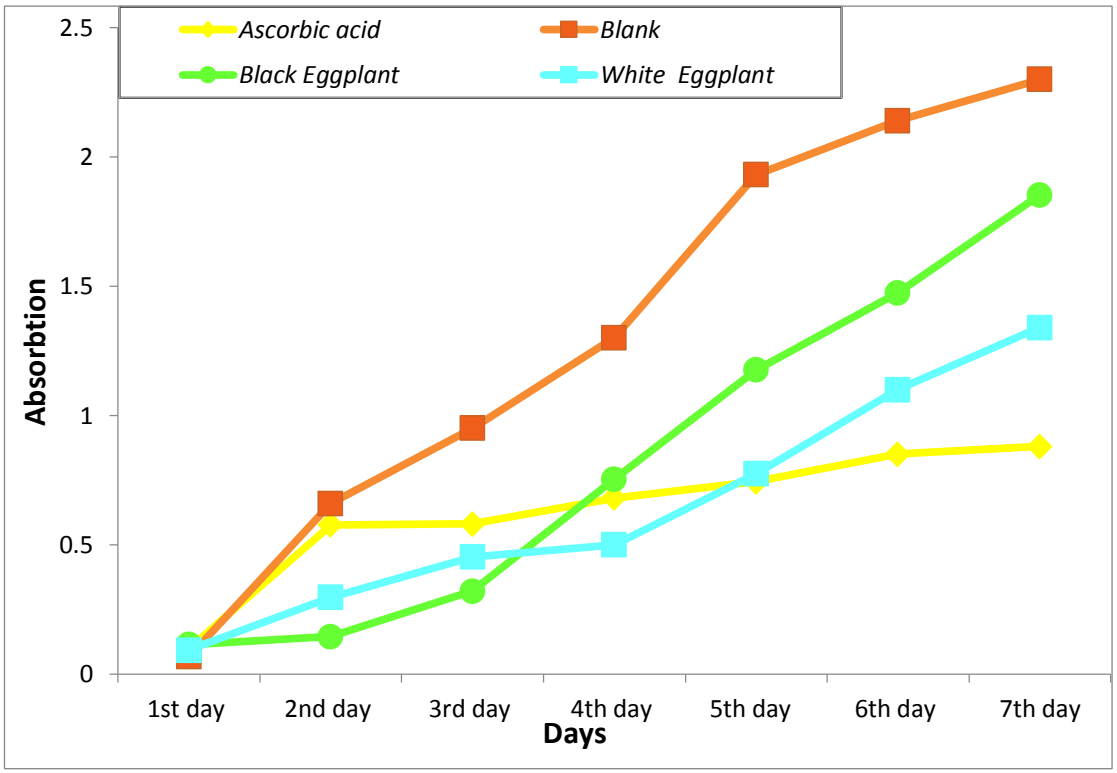

Figure (3): Percentage inhibition of linoliec acid peroxidation for white and Black eggplant

Antimicrobial Effect:

In vitro antimicrobial activities of white and back eggplant peel extracts were shown in Table (1).The presented results demonstrate that, metabolic extract of peel back eggplant has antibacterial activity against *Esherchia coli*,*Bacillus subtilus*, *Staphylococcus aureus and Pseudomonas aeruginosa*(26, 24, 24 and 22 mm respectively).These discoveries run somewhat with beforehand recorded eggplant having antibacterial action against three bacterial strains (*Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli*). The study is assisted together with the study of Shahiladevi and Jegadeesan, which they studied the activity against pathogenic bacteria for eggplant [17].

In our case, *Aspergillus niger* demonstrated the lately effect with black eggplant peel extract in contrast with white eggplant (18 and 16 mm individually), however it was directed impact utilizing *Candida albicans* (14 and 12 mm separately). At last, the *Aspergillus flavus* did not exhibite great reaction by utilizing the two extracts. Antimicrobial movement may include complex components, similar to the restraint of the union of cell dividers and cell films, nucleic acids and proteins, and in addition the hindrance of the digestion of nucleic acids. The two microscopic organisms and growths are influenced by eggplant [17].

Table (1): Antimicrobial activities were expressed as inhibition diameter zones in millimeters (mm)

Microbes	white eggplant	Black eggplant
Escherichia coli	**18**	**26**
Bacillus subtilis	**16**	**24**
Staphylococcus aureus	**18**	**24**
Pseudomonas aeruginosa	**20**	**22**
Candida albicans	**12**	**14**
Aspergillus niger	**16**	**18**
Aspergillus flavus	**00**	**00**

The excessive use of antibiotics agents prompts deliver multidrug safe microorganism. In the present situation natural items are considered as protected choices of manufactured medications. The normal impact of pharmaceutical plant has speeding up the enthusiasm of researchers and industrialists to center around natural prescription and other monetary items [33].

Conclusions

In conclusion: the mechanic extract of peel white eggplant is higher with phenolic substance that has declared ant oxidative effectiveness, and enhancement effect on antimicrobial effect against $^{+}$ve and $^{-}$ve bacteria. However, white eggplant peel was extra, effective against fungi. The maximum, active extracts can be exhibit to displacement of the curative therapeutic and antimicrobials agent to drive out further pharmacological estimation.

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