Analysis of Phenolic Content and Antioxidant Capacity of Potato, *Solanum Tuberosum L* from Tamilnadu Region, India

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Abstract

Aim of this work is to significant difference existed in the antioxidant capacity of three different processed purple potato (*S. tuberosum* L.) extracts assayed via DPPH and FRAPS colorant stability. High temperature treatment would destroy the antho-cyanin compounds and significantly decrease the anthocyanin-based purple potato colorants. Our results suggest that in order to exploit and utilize purple potato colorant more effectively, colorant should be kept away from light and heat treatment. The direct lyophilization treated sample had significant higher content than other processing method. Stability study showed that both light and heat could accelerate the degradation of anthocyanin-based potato colorant. The fresh potato colorant showed the most stable property, followed by the lyophilization, oven drying, steaming before lyophilization. Our results suggest that lyophilize was a recommended suitable processing method in food industry.

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1. Introduction

Drugs used in medicine today either obtained from nature or one of the synthetic origin. Natural drugs are
obtained from plants, animals or mineral origin. Historically during the last quarter of century (or) so the pharmacognostic research on indigenous drugs and medical plants has made rapid stride [1]-[4]. The inactive constituents are structural constituents of cell wall, like cellulose, lignin, suberin, or sugars or proteins. The inactive constituents have however pharmaceuticals use [4] and [5]. Potato extracts exhibit antioxidant activity. The antioxidant activity of patatin, the tuber storage protein of potato, had also been investigated. The antioxidant property of dietary plants has been associated with phytochemicals such as a-tocopherol, ascorbic acid, b-carotene and phenolic compounds. Current antioxidant researches, however, are primarily focused on polyphenolic compounds, the principal components responsible for antioxidant activity as established by in vitro lipid oxidation models [6].

Consequently, new red and purple-fleshed cultivars with high TAC and highly methoxylated and/or hydroxylated anthocyanins could be a promising source of favourable antioxidants in human nutrition. The red- and purple-coloured potatoes contain anthocyanins and the highest amounts of phenolic compounds with high antioxidant activity. Moreover, anthocyanin-rich fruits and vegetables are bright and attractive to consumers and they were been documented as excellent sources of polyphenolic antioxidants [7].

Potato peel which is discarded as a by-product from the potato industries is reported to possess strong antioxidant properties. In this regard, They reported that potato peel contains phenolic acids, the largest portion of which consists of chlorogenic acid (50.31%). Other phenolic compounds such as gallic acid (41.67%), protocatechuic (7.81%) and caffeic (0.21%) acids were also present in potato peel. They noted that potato peel extract at various concentrations exhibited very strong antioxidant activity which was almost equal to the synthetic antioxidants (BHA&BHT) [8].

Potatoes are a major dietary source of phenolics and a number of antioxidants. These antioxidants obtained from potato have free radical scavenging effects, and decrease the risk of coronary heart diseases by reducing cholesterol accumulation in the blood serum and by enhancing the resistance of vascular walls. From a dietary point of view, potatoes are second only to tomatoes (Solanum lycopersicum L.) in the total intake of polyphenols by humans. Potato tuber skin contains more polyphenols than the cortex and pith [7].

2. Materials and Methods

2.1 FRAP Total Antioxidant Activity

Ferric Reducing Antioxidant Power (FRAP), which depends upon the reduction of ferric tripyridyltriazine (Fe (III)-TPTZ) complex to the ferrous tripyridyltriazine (Fe (II)-TPTZ) by a reluctant. Acetic acid buffer (pH 3.6) or acetate buffer is made using 3.1g of sodium acetate-trihydrate and 16mL of glacial acetic acid. TPTZ solution is made using TPTZ (2,4,6-tripyiridyl-s-triazine) and 12M hydrochloric acid. Ferric chloride solution 100mL of solution containing 0.5406 of ferric chloride- $6H_2O$ in distilled water. Working FRAP reagent was prepared by mixing 25mL of acetate buffer + 2.5 ml TPTZ solution + 2.5 ml of ferric chloride solution (10:1:1 ratio). Ascorbic Acid (concentration range from 100-1000 μmol/L).

2.2 DPPH Radical Scavenging Activity

According to Yamaguchi. T et al., 1998 [8], Free radical scavenging activity against 2,2 Diphenyl -1 picryl hydrazyl(DPPH) radical will be measured. Make 0.5mM DPPH stock Solution.[weigh 0.0197g DPPH + 100mL MeOH]. Make 1mM Ascorbic Acid.[weigh 0.0176g Ascorbic Acid + 100mL MeOH]. Make different concentration of Ascorbic Acid.
3. Results and Discussion

3.1 Total Phenolic Content

The total phenolic content of the potato varieties (Kanyakumari, Nilgiri, Erode) were expressed as mg gallic acid equivalent (GAE) per g sample. Phenolic content for the potato samples analyzed. Among the potato varieties, Kanyakumari had the highest phenolic content followed by Nilgiri and Erode. All the Three potato varieties were found to be significantly different from each other in terms of phenolic content. Antioxidant activity values also depend strongly on the preparation of sample (lyophilisation). Although steam blanching was employed primarily to deactivate degradative enzymes while minimizing losses of phenolic substances due to leaching, extended steaming may result in losses of phenolic compounds due to their susceptibility to leaching from the plant tissue and degradation of heat sensitive phenolic substances also cites the tendency of phenolic compounds to accumulate at the peel as the cause of low phenolic content in the flesh of potatoes [9].

3.2 DPPH Radical Scavenging Activity

According to Singh et.al., 2004 [10], the ability of phenolic compounds to quench reactive species by hydrogen donation was measured through the DPPH radical scavenging activity assay. Activity is measured as the relative decrease in absorbance at 517 nm as the reaction between DPPH and antioxidant progresses. DPPH radical scavenging activity is plotted as a function of μg per mL sample concentration. Percent activity was observed to increase with sample concentration between 20 and 100 μl per mL.

3.3 Ferrous Reducing Antioxidant Power

The potassium ferricyanide reduction method was used to measure the ability of phenolic compounds to quench radicals through electron donation. Activity is monitored by measuring the absorbance of complex at 593 nm, which increases as antioxidants reduce the ferric ion/ferricyanide complex to the ferrous form. Potato samples collected from Kanyakumari had the lowest reducing power among the three varieties. This indicates the presence of nonphenolic compounds capable of electron donation. Potato also contains carotenoids and vitamin C, both of which can act as electron donors [11].

3.4 Total Phenol Content

The total phenolic content of the potato varieties (Kanyakumari, Nilgiri and Erode) were expressed as mg gallic acid Equivalent (GAE). Among the potato varieties, Nilgiri had the highest phenolic content followed by Kanyakumari and Erode. All the Three potato varieties were found to be significantly different from each other in terms of phenolic content. Extended steaming may result in losses of phenolic compounds due to their susceptibility to leaching from the plant tissue and degradation of heat sensitive phenolic substances [12].

3.5 DPPH Radical Scavenging Activity

Nilgiri and Erode had the highest radical scavenging activity, while, Kanyakumari had the lowest. values of the Three potato varieties differed significantly. Genotype and growth conditions, such as water availability, light quality and temperature, affect the synthesis and accumulation of phenolic compounds in some parts of
the plant; and consequently, antioxidant activity. DPPH radical scavenging activity indicates that phenolic compounds are responsible for antiradical activity. Identification of the antioxidants in potato responsible for hydrogen and electron donation and metal chelation will supplement the findings of the study. The prospect of utilizing potato extracts as a commercial antioxidant will be greatly advanced through optimization of the extraction procedure [12].

3.6. FRAP Reducing Power

FRAP assay measures the change in absorbance at 593 nm due to the formation of a blue colored Fe2+-tripyridyltriazine compound from colorless oxidized Fe3+ form by the action of electron donating antioxidants. The ability of different treated purple potato extracts to reduce Fe3+ to Fe2+. The lyophilized sample showed the strongest reducing power, which was significantly higher than that of other treated samples. This was followed by samples treated by baking before lyophilized. However, steaming before lyophilization treated sample demonstrated the lowest reducing power. Direct lyophilization treatment, which was without heat showed much stronger antioxidant activity than other processing method treated samples. Aqueous solutions of known Fe (II) concentration, (FeSO4) were used for obtaining the calibration curve. The reducing power of sample was expressed as equivalent concentration of Vitamin C.

References