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SELECTION OF UNDERUTILIZED GRAPE FRUIT PARTS AND TO ASSESS THE PHYSIO-CHEMICAL CHARACTERISTICS OF ITS EXTRACTION

Science

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ABSTRACT

As world-wide efforts focus on feeding a growing population, the global food industry continues to be burdened by the impacts of food wastes. In fact, it is widely reported that 30 to 40 percent of food produced is never consumed by humans and end up as trash. Reducing the amount of wasted food is a key element in developing a sustainable food system. Various studies have indicated that different kind of food wastes from fruits, vegetables, cereals and other food processing industries can be used as potential source of bioactive compounds and nutraceuticals. Demands for food with natural bioactive compounds interact with biological molecules which give efficient results. The aim of the study is to select an underutilized fruit parts and to assess it physio-chemical characteristics of its extraction.

KEYWORDS

Food waste, by product, grape fruit, nutraceutical

INTRODUCTION

India is the second largest producer of fruits in the world. The processing of fruits results in accumulation of a substantial amount of residues in the form of peels, seeds, pulp and stones. Because of non-availability of proper infrastructure to handle a huge quantum of biomass, such residues not find any commercial use in India. Their disposal in open spaces or in municipal, compounds the environmental pollution problems. The production of nutraceuticals using bioactive compounds from fruit residues would help in efficient, inexpensive and environmentally friendly use of these fruit residues. The aim of the study is to select a fruit and its parts from the bio-waste.

SELECTION OF UNDERUTILIZED FRUIT PARTS

Healthcare in India consists of medicinal pluralism and ayurveda still remains dominant compared to modern medicine, particularly for treatment of a variety of chronic disease conditions (Morrison, 1988). The basis of traditional medicine is in its use for a number of years and therefore its clinical existence comes as a presumption. Clinical experiences, observations or available data led to a starting point of Ayurvedic medicinal research (Vaidya *et al* 2001). In the traditional medicinal systems consumption of plant derived food has always been shown to have a health benefit which is mainly associated with the phytochemical constituent such as polyphenols present in some plants (Chaudhary and Mukhopadhyay, 2012).

The association of nutraceuticals with traditional medicine is bound to bring the long lasting consumer acceptance. When supported by modern research, the acceptance is whole hearted. There are thousands of Ayurvedic literatures with the drug actions of single, multiple combinations and processed formulations. Combining the strengths of the knowledge base of traditional systems such as ayurveda with the dramatic power of combinatorial sciences helps for generations. Traditional knowledge is one of the powerful tools for researching on natural products and it is considered to be an important exploration to review the properties of various compounds which in turn forms no difficulties in compound development (Patwardhan, 2004).

During the last two decades, various parts of the plant has been subjected to extensive phytochemical, pharmacological and clinical investigations, many interesting findings have been reported in various fields (Artik *et al* 1998).

In the modern pharmacology and drug development the single chemical entity which is present is responsible for the main therapeutic activity of the drug. The ayurvedic traditional extraction formulation in the ayurvedic formulary of India has more therapeutic benefits and in recent technology revolution explores the unique identity of the traditional system.

Plants Food is packed with many miraculous phytonutrients play a powerful tool for protecting one's health. Nutraceuticals are extraction of food used therapeutically. Nutraceuticals are the emerging class of natural products that makes the line between food and drugs to fade (Adelaja and Schilling, 1999).

Among Fruit seeds, Grape Seed Extract (GSE) provides highly concentrated polyphenols and proanthocyanidins, potent compounds shown to reduce oxidative stress, inflammation and improve endothelial dysfunction. Polyphenols from GSE increase the activity of endothelial nitric oxide synthase causing an endothelium-dependent vasorelaxation. Grape seed extract has been used for traditional remedy of health conditions like heart and blood vessels, such as atherosclerosis, high blood pressure, high cholesterol, and poor circulation; complications related to diabetes, such as nerve and eye damage; vision problems, such as macular degeneration; swelling after an injury or surgery; cancer prevention; and wound healing. Recent studies about oligomeric proanthocyanidin from grape seed extract have effect on lowering cholesterol (Razavi *et al* 2013).

EXTRACTION OF GRAPE SEED

Grape Seed contains naturally occurring bioactive components. Grape Seed is generally underutilized and thrown away part in wine industries as a waste product. Grape Seed provides highly concentrated polyphenols and proanthocyanidins; potent compounds shown to reduce oxidative stress, inflammation and improve endothelial dysfunction. Polyphenols from Grape seed extract increase the activity of endothelial nitric oxide synthase causing an endothelium-dependent vasorelaxation (Badavi *et al* 2013)

Plate I – Grape fruit & Seed

In Ayurvedic Pharmacopoeia of India the Draksa, grapes and its seeds as extracted, fermented forms were used in important formulations such as Draksasava, Draksarista, Draksavaleha, Draksadi kvatha, Curna, Draksadi Curna, Eladi Gutika and has more therapeutic values. There are some published reports on the phenolic content and antioxidant potential of bioactive compounds extracted from grape residues (Robards *et al* 1999 and Montealegre *et al* 2006).

Grape seeds are a particularly rich source of proanthocyanidins and only the procyanidin – type of proanthocyanidins have been detected in the seeds (Buelga *et al* 1995 and Silva, 1997). Proanthocyanidins are the major polyphenols in red wine as well as in grape seeds and they have potent antioxidant activity (Ariga and Hamano, 1990 and Silva, 1991) inhibit low density lipoprotein oxidation (Teissedre *et al* 1996). Help to support a variety of biological activities in the human body

(Arii, 1998; Dauer *et al* 1998; Saito *et al* 1998 and Yamakoshi *et al* 1999). Proanthocyanidins extracted from grape seeds are widely used mainly as nutritional supplements. For these reasons, proanthocyanidin-rich extracts from grape seeds have appeared on the market as nutritional supplements mainly in United States, Australia, Japan, Korea as well as in other countries. The grape seed extract is also being used in Japan as an additive for various food applications (Yamakoshi *et al* 2002).

The extraction of medicinal plants is important for the quality and quantity of bioactive components. Using solvent extraction helps to separates components from the cellular matrix (Benthin *et al* 1999 and Ong, 2004).

Distinct absorption and bioavailability of several extractable proanthocyanidins, depending on their extractability with different solvents, have been demonstrated by Jimenez - Ramsey *et al* (1994). They demonstrated that proanthocyanidins soluble in water and ethanol are absorbed from the intestinal tract, while the proanthocyanidin fractions soluble in aqueous acetone but insoluble in water and ethanol are not at all bioavailable. Generally the dimeric, trimeric and tetrameric proanthocyanidins or bioflavonoids have been shown to exhibit highly bioavailability and provide exceptional health benefits. Vries *et al* (1998) have further demonstrated that flavonoid glycosides are more bioavailable compared to the pure aglycone. These low molecular proanthocyanidins are also known as sustained release antioxidants and are found to remain in plasma as well as tissues for up to 7- 10 days exhibiting antioxidant properties, which is mechanistically different from other water soluble antioxidants.

METHODOLOGY

Selection of Sample

Proanthocyanidin rich extract was prepared from grape seeds (*Vitis Vinifera L*). Grapes were procured from local market in Chennai.

Chemicals, Glassware and Reagents

Test tube, Incubator shaker, High speed blender, Centrifuge, Conical Flask, Beaker, Ethanol, distilled water

Method of Extraction – Grape seed

After extracting juice, grape seed and skin were separated manually. Seeds were washed with distilled water and then left to dry under sunlight for 48 hours. They were crushed in a high speed blender for 2 min, but during this time the grinding was halted for 15 sec at periodic intervals to prevent heating of the sample. The samples were wrapped and stored at 0-5ºC until the extraction was performed.

The grape seed was extracted with ethanol and proanthocyanidin to obtain rich extracts. Grape seeds (4 g) were extracted with aqueous ethanol (ethanol concentration of 20, 30, 40, 50, 60, 70, 80 and 95 percent by volume) in incubator shaker, at 2000 rpm at room temperature for 1 hr. The mixture was centrifuged at 2000 rpm for 6 min and the supernatant was collected. The seed residue was extracted twice more under the same conditions with an extracts being frozen prior to analysis. Supernatant from each extraction was stored in a freezer at –30ºC. Because polyphenols are extremely sensitive to light, all procedures were conducted under dim light. The extract was condensed to remove solvents, and then the concentrate was filtrated through cellulose powder. The filtrate was spray – dried to obtain powder of proanthocyandin rich extract. The Bio-based solvent "Green Solvent" was used for the extraction.

RESULTS AND DISCUSSION

The proanthocyandin percentage in the extract powder was detected by HPLC method (Amarowicz *et al* 2006). The moisture content of grape seed extract was 1.938 percent and ash content was 2.65 percent.

Table I: Physical and Chemical Characteristics of Grape Seed Extract

Tests	Results
Description	Reddish Colour Powder
Odour	Tea – like
Taste	Bitter & Astringent
Solubility	Soluble in Water
Ash (percent)	2.65
Moisture (percent)	1.93

Plate II- Extraction Picture a) Grape seed

The extraction of Grape seed was spray dried and it is reddish in colour, Tea-like odour, bitter and astringent in taste. The Grape seed extract is soluble in water. The Physio-chemical charactertics of the extracted grapes seed is similar to the reviewed grape seed extract powder.

CONCLUSION

Utilization of by-products for the production of functional food is a current trend in the food industry. The search for functional food ingredients from natural sources is one of the challenges in food science and technology. By-products are the main raw materials for the formulation of functional foods in food industry. Grape fruit parts were selected for assessing the physio-chemical properties. The selected grape seed was similar to the reviewed grape seed. This grape seed can be utilized for the usage in the functional food ingredients.

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