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RESEACH ARTICLE

NUTRIENT COMPOSITION, PHYTOCHEMICAL CONSTITUENTS AND INVITRO ANTIOXIDANT ACTIVITY OF FRUIT SEED POWDER

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ABSTRACT

Background: Tomato, Grape fruit, Pink guava and Watermelon as a well known promising source of multiple beneficial nutrients for human beings. Processing of fruits by-products potentially represents a rich source of phenolic compounds. Fruit seeds which are generally discarded as waste in the environment, can act as potential nutraceutical resources. Due to their low cost and easy availability such wastes are capable of offering significant low-cost nutritional dietary supplements. The utilization of these bioactive rich fruit seeds can provide an efficient, inexpensive, and environment friendly platform for the production of novel nutraceuticals or for the improvement of older ones. This study summarized the potential components present in fruit seeds, which generally discarded as waste. ***Objectives:*** The present study was undertaken to carry out the drying process in seed (Tomato, Grapes, Watermelon and Pink Guava); to determine the nutrient composition of fruit seed powder: to analyze the qualitative and quantitative phytochemical analysis: and to find out the antioxidant activity of the seed powder. ***Materials and Methods:*** Seeds were separated and placed in trays and kept in cabinet dryer and the temperature was maintained at 60^0 for 7 hours. After the heat treatment ground in to a coarse powder and stored in a well closed container free from environmental climatic changes till usage. Nutrient Composition of the seed powder was analyzed by standard procedures. Phytochemical such as alkaloids, flavonoids, phenol, saponin, tannin, terpenoids, quinons, phlobatannins and steroids were analysed. Quantitative phytochemical test such as Alkaloids, Flavonoids and Total Phenol were done. UV spectrometry was used to do Lycopene analysis. DPPH method was used to find the antioxidant activity. ***Results and Discussion:*** Watermelon seed (68.57) and Grape seed (68.57) having high flavanoid. When compared with other fruit seed powder watermelon seed powder contains the high nutrient composition (Moisture 3.56 %, Ash 6.0 g, Protein 35.27g, Fat 23.89 g, Vitamin- A 85.0 mg, Vitamin- C 8.80 mg, Iron 5.04 mg , Calcium 57.0 mg) except carbohydrate (46.59 g) and Crude Fibre (10.1 g).

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INTRODUCTION

Ramandeep and Savage (2005) was to determine the major antioxidants and antioxidant activity in different fractions (skin, seeds and pulp) of three tomato cultivars (Excell, Tradiro and Flavourine) grown under hydroponic conditions in a commercial greenhouse in New Zealand. It was found that the skin fraction of all cultivars had significantly ($\mathbf{p} < 0.05$) higher levels of total phenolics, total flavonoids, lycopene, ascorbic acid and antioxidant activity (both in hydrophilic and lipophilic extracts as measured by the ABTS assay) compared to their pulp and seed fractions. The amount of antioxidants in each fraction was calculated on the basis of their actual fresh weights in whole tomato and it was found that the skin and seeds of the three cultivars on average contributed 53% to the total phenolics, 52% to the total flavonoids, 48% to the total lycopene, 43% to the total ascorbic acid and 52% to the total antioxidant activity present in tomatoes. These results show that removal of skin and seeds of tomato during home cooking and processing results in a significant loss of all the major antioxidants. Grape seeds are waste products of the winery and grape juice industry. These seeds contain lipid, protein, carbohydrate and 5-8 percent of grape polyphenols depends on the variety It is estimated that approximately 60-70 percent of grapes polyphenols exist along with procyanidines in grape seeds (Kammerer et al., 2004). Grape seeds are one of the most potent natural anti-oxidants. Polyphenols on grape seeds are mainly flavonoids, including gallic acid, the monomeric flavan-3-ols catechin, epicatechin, gallocatechin, epigallocatechin and epicatechin 3-O-gallate: and procyanidine dimmers, trimers, and more highly polymerized procyanidins (Shi et al., 2003) which are flavan-3-ol derivatives.

Natural grape seed pro-anthocyanidins are a combination of biologically active polyphenolic flavonoids including oligomeric pro-anthocyanidins which possess a broad spectrum of pharmacological, medical and therapeutic properties. Tabiri et al., (2016) studied the seeds of three varieties of watermelon (Charleston gray, Crimson sweet and Black diamond) were analyzed for their proximate, minerals, phytochemicals, total phenols content and antioxidant activity. The proximate analysis and pytochemicals screening were performed using standard procedures whereas minerals content was determined by atomic absorption spectrophotometry. DPPH free radical scavenging activity and Folin-ciocalteau assays were used to determine antioxidant activity and total phenol content, respectively.

The results indicated that the watermelon seeds had moisture content in the range of 7.40 - 8.50%; fat, 26.50 - 27.83%; protein, 16.33 - 17.75%; fibre, 39.09 - 43.28%; ash, 2.00 - 3.00%; carbohydrate, 9.55 - 15.32% and energy value of 354.05 - 369.11 kcal/100g. The seeds also contained appreciable minerals (Ca, P, Mg, Na, K and Zn) with K (3.40-3.5 mg/100g) being the highest while Na (0.07 - 0.08 mg/100g) was the least. DPPH% inhibition varied between 59.88-94.46% inhibition with trolox equivalent of 82.59-130.29 μM/g depending on the variety. Saponins, tannins, triterpenoids glycosides and alkaloids were present in all samples. Crimson sweet seeds had the highest total phenol content (5416 mgGAE/100g), followed by Black diamond (3949 mg GAE/100g) and the least, Charleston gray (1494 mg GAE/100g). Similarly, Crimson sweet had the highest antioxidant activity, followed by Black diamond and lastly, Charleston gray.

The present findings suggest watermelon seeds as considerable source of nutrients in the diet and may have health and economic benefits due to its fibre, minerals, phenolics content and antioxidant activity. Fruits and vegetables wastes and by-products, which are formed in great amounts during industrial processing, represent a serious problem, as they exert an influence on environment and need to be managed and/or utilized. On the other hand, they are very rich in bioactive components, which are considered to have a beneficial effect on health. For the last decade, efforts have been made to improve methods and ways of re-using fruits and vegetables wastes. The important purpose is the valorization of the antioxidants and other biocomponents in by-products from fruit and vegetable industries. It has been attempted to discuss which plants and their by-products can be considered as a rich source of natural antioxidants and what methods should be used for their efficient extraction. The competition between natural and synthetic antioxidants, in terms of consumer acceptance, legal needs for market access (Chodak and Tarko 2007).

Objectives

The present study was undertaken

- to carry out the drying process in seed (Tomato, Grapes, Watermelon and Pink Guava);
- to determine the nutrient composition of fruit seed powder:
- to analyze the qualitative and quantitative phytochemical analysis: and
- to find out the antioxidant activity of the seed powder.

MATERIALS AND METHODS

Selection and Collection of Fruits: Fresh and well fruits (Tomato, Grapes, Watermelon and Pink Guava) were together from dissimilar organic cultivators in Theni, Madurai and Dindigul Districts.

Processing of Fruits seed: Seeds in fruits was separated and placed in trays of cabinet dryer and the temperature was maintained at 60^0 for 7 hours. After the heat treatment ground in to coarse powder and it was stored in a well closed container free from environmental climatic changes till usage. Before and after the processing of fruit samples weight was noted and it was tabulated and interpreted.

Nutrient Composition: The Carbohydrate, Protein, Fat, Moisture, Ash, Crude Fiber, Calcium, Iron and vitamin C were analyzed by various methods. Methods used for Nutrient Composition analysis methods were given in Table - 2.1

Phytochemical Analysis: Phytochemicals are naturally occurring, biologically active chemical compounds in plants. They act as a natural defense system for host plants and provide colour, aroma and flavor (Ahmed and Urooj, 2010). Phytochemical such as alkaloids, flavonoids, phenol, saponin, tannin, terpenoids, quinons, phlobatannins and steroids were analysed by standard procedures with Methanol extracts. In Quantitative phytochemical analysis Alkaloids, Flavanoids and Total phenol were quantified with the standard procedures.

Antioxidant Activity: DPPH (2,2-diphenyl-1-picryl-hydrazyl-hydrate) free radical method is an antioxidant assay based on electron-transfer that produces a violet solution in Methanol (Huang, 2005). This free radical, stable at room temperature, is reduced in the presence of an antioxidant molecule, giving rise to colorless ethanol solution. The use of the DPPH assay provides an easy and rapid way to evaluate antioxidants by spectrophotometry. DPPH radical scavenging activity was measured according to the method of (Mensor *et al*. (2001).

RESULTS AND DISCUSSION

Table 3.1 shows the Phytochemical analysis of fruit seed powder. It revealed that the Tomato seed contain alkaloids, flavonoids, phenol, saponin, terpenoids and steroids. Pink Guava Seed comprises the alkaloids, flavonoids, phenol, Tannin, Quinons and Steroids. Alkaloids, flavonoids, phenol, Tannin and terpenoids are present in Grape seed powder. Watermelon fruit seed powder shows the presence of Alkaloids, flavonoids, phenol, Tannin, Terpenoids, Quinons and Steroids. Table 3.2 shows the Quantitative phytochemical analysis of fruit seed power. The presence of Alkaloids in Grape seed powder was noticed high mean value (94.05) Followed by Watermelon seed powder (92.36). Total phenol content was observed in Tomato seed powder (9.60), Pink Guava seed powder (6.25), Grape seed powder (87.29) and the watermelon seed powder (41.18). Watermelon seed (68.57) and Grape seed (68.57) having high flavanoid. Table 3.3 shows that the nutrient composition (Moisture, Ash, Carbohydrate, Protein, Fat, Crude Fibre, Vitamin A, Vitamin C, Iron and Calcium) of the fruit seed powder. Tomato seed powder contains Moisture 2.98 %, Ash 4.63 g, Carbohydrate 72.5g, Protein 20.4g, Fat12.0g, Crude Fibre 5.92g, Vitamin- A 53.54mg, Vitamin- C 5.03mg, Iron 2.68 mg and Calcium

Table 2.1 Methods used for Nutrient composition

NUTRIENT	METHOD OF ESTIMATION
Carbohydrate	Anthrone method (Yemm and Willis 1954)
Protein	Lowry method (Lowry et al., 1951)
Fat	Soxhlet method (Folch et al.,1957)
Ash content	AOAC 1990
Calcium	Raghuramula *et al*., 2003
Iron	Raghuramula *et al*., 2003
Crude Fibre content	AOAC 1990

Table 3.1 Qualitative Phytochemical Analysis of Fruit seed Powder

Photochemical	Tomato seed	Pink Guava Seed	Grape seed	Watermelon seed
Alkaloids	+ + +	- + +	+ + +	+ + +
Flavonoids	+ + +	+ + +	+ + +	+ + +
Phenol	+ + +	+ + +	+ + +	+ + +
Saponin	+ + +	- - -	- - -	- - -
Tannin	- - -	+ + +	+ + +	+ + +
Terpenoids	+ + +	- - -	+ + +	+ + +
Quinons	- - -	+ + +	- - -	- + +
Phlobatannin	- - -	- - -	- - -	- - -
Steroids	+ + +	+ + +	- - -	+ + +

Table 3.2 Quantitative Phytochemical Analysis of Fruit seed Powder

Fruit seed Powder	Alkaloids	Total Phenols	Flavanoids
Tomato seed	45.96 ± 1.56	9.60 ± 0.77	7.31± 0.15
Pink Guava Seed	47.44 ± 0.02	6.25 ± 0.71	10.39 ± 0.31
Grape seed	94.05 ± 0.17	87.29 ± 0.28	46.31 ± 0.58
Watermelon seed	92.36 ±0.32	41.18 ± 0.12	68.57 ± 0.48

Table 3.3 Nutrient Composition of Fruit seed Powder

Nutrients		Fruit seed Powder			
		Tomato	Pink Guava	Grape	Watermelon
Moisture	(%)	2.98± 0.26	2.56±0.37	2.49±0.9	3.56±0.62
Ash	(g)	4.63± 0.05	5.9± 0.1	3.72± 0.25	6.0±0.01
Carbohydrate	(g)	72.5±0.2	56.9±0.05	88.5±0.50	46.59±0.15
Protein	(g)	20.4±0.30	32.0±0.26	23.0±0.81	35.27±0.20
Fat	(g)	12.0±0.9	17.60±0.5	15.0±0.49	23.89±0.20
Crude Fibre	(g)	5.92±0.52	12.25±0.57	10.2±0.53	10.1±0.41
Vitamin- A	(mg)	53.54±0.03	62.02±0.30	52.9±0.60	85.0 ±0.25
Vitamin- C	(mg)	5.03±0.33	4.0±0.4	8.62±0.90	8.80±0.56
Iron	(mg)	2.68± 0.24	0.92±0.05	3.0±0.05	5.04±0.90
Calcium	(mg)	30.15± 0.38	45.05±0.32	27.02 ±0.61	57.0±0.39

30.15mg. The presence of nutrients in Pink Guava seed powder shows that the Moisture 2.56%, Ash 5.9g, Carbohydrate 56.9g, Protein 32.0 g, Fat 17.60 g, Crude Fibre 12.25g, Vitamin- A 62.02 mg, Vitamin- C 4.0 mg, Iron 0.92 mg , Calcium 45.05 mg. Grape seed powder noted that the presence of nutrients such as the Moisture 2.49 %, Ash 3.72 g, Carbohydrate 88.5 g, Protein 23.0g, Fat 15.0 g, Crude Fibre 10.2g, Vitamin- A 52.9 mg, Vitamin- C 8.62 mg, Iron 3.0 mg , Calcium 27.02 mg.

When compared with other fruit seed powder watermelon seed powder contains the high nutrient composition (Moisture 3.56 %, Ash 6.0 g, Protein 35.27g, Fat 23.89 g, Vitamin- A 85.0 mg, Vitamin- C 8.80 mg, Iron 5.04 mg , Calcium 57.0 mg) except carbohydrate (46.59 g) and Crude Fibre (10.1 g). Table 3.4 shows the antioxidant activity of the fruit seed powder. Grape seed powder shows the highest antioxidant activity (95.20) followed by Tomato seed powder (92.01), Watermelon seed powder (89.30) and Pink guava seed powder (76.05).

Table 3.4 Antioxidant activity of the Fruit seed Powder

Fruit seed Powder	% of inhibition
Tomato seed	92.01±0.69
Pink Guava Seed	76.05±0.53
Grape seed	95.20±0.90
Watermelon seed	89.30±0.35

Conclusion

The present findings suggest the seeds as considerable source of nutrients in the diet and may have health and economic benefits due to its phytochemical component and antioxidant activity. Therefore, it is important to consume fruits along with their seeds, in order to attain maximum health benefits.

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