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Studies on impact of different drying Technique on phyto-chemical and antioxidant properties of jackfruit seed Powder

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Abstract

The purpose of this study was to determine how different drying processes affected the phytochemical components and antioxidant activity of dried jackfruit seed powder. The jackfruit seed contained good proportion of phyto-chemicals such as flavonoids, alkaloids and possessed better antioxidant properties. The jackfruit seed extract were prepared for determining phyto-chemical and antioxidant activity. From the research it was observed that the tray dried jackfruit seed powder contain higher amount of total flavonoids and polyphenols as compare to sun dried jackfruit seed powder. The antioxidant activity of jackfruit seed powder revealed that the tray drying was found significantly superior over sun drying. From the research it was concluded that the dried jackfruit seed powder prepared by tray drying contained good proportion of phyto-chemicals and better antioxidant properties than jackfruit seed powder prepared by sun drying method.

Keywords: Antioxidant activity, flavonoids, jackfruit seed powder, total phenols

Introduction

The crop jackfruit is less well-known and underutilised. Jackfruit belong to the family moraceae. India is the world's greatest cultivator and producer of jackfruit, often known as the poor man's fruit, which is found more in rural than metropolitan areas. It is a pretty huge tree that bears the world's largest edible fruit. The jackfruit is a tropical and subtropical fruit that originated in India.

Consumption of jackfruit seeds provides a number of phytochemicals or plant chemicals some of them may be like polyphenols, having antioxidant activity and other phytochemicals found in jackfruit seeds include saponins, which may have some anticancer activity and flavonoids, which helps limit the risk for blood clots (Jessica, 2015) [5]. Jackfruit seed contains lignans, isoflavones, saponins, all phytonutrients and their health benefits are wide ranging from anti-cancer to anti-hypertensive, anti-aging, antioxidant, anti-ulcer, and so on (Omale and Friday, 2010) [10].

Jackfruit seeds contain antimicrobial effects helping to prevent contamination with bacteria that cause food borne illness (Theivasanthi and Alagar, 2011) [15]. According to Haq (2006) [2], seed contains two lectins known as jacalin and artocarpin. Jacalin has potential application for evaluation of immunological status of patient infected with human immunodeficiency virus. In spite of having lots of medicinal, nutritional and physiological benefits, the jackfruit seeds are underutilized. Jackfruit seeds are generally discarded or steamed and eaten as a snack or used in making some local dishes. People eat jackfruit raw, ripe and cooked by making several delicious dishes. Jackfruit seed is also edible and can be eaten. Jackfruit seeds are consumed as roasted, as flour or boiled, sometimes eaten as canned curry, tomato sauce, a sweet, syrup or brine. Addition of jackfruit seed in the diet is a genius way to make food nutritious (Jessica, 2015) [5].

Plant products are thought to be the most significant components of a healthy diet. Fruits and vegetables have been found to have anti-cancer properties. Carotenoids, alkaloids, vitamins, minerals, and polyphenols are some of the phytochemicals contained in fruits and vegetables that have been identified to be responsible for such effects. According to research, phenolic compounds are beneficial to the body.

Materials and Methods

Materials: The raw material such as jackfruit were purchased from local market of Parhani.

Methods

Phyto-chemical screening of jackfruit seed extract

Procedure for dried jackfruit seed extracts preparation

Take 50 gram of dried jackfruit seed powder and extracted with aqueous, ethanolic, and perolium ether by use of soxhlet unit at 55 to 85 °C for around 8 to 10 hours in order to separate the polar and non-polar compounds (Elgorashi and Staden, 2004) [1]. For each extraction process the powdered get dried and then used for extraction process. Aqueous, ethanolic, and perolium ether based jackfruit extracts were used for qualitatively analysis of phyto-chemical present in jackfruit sample following the standard procedures (Harbone, 1973) [3].

Alkaloid test

Wagner's test: 10 mg of jackfruit seed extract was used and add some drops of Wagner's reagent in the extract. It was observed that development of reddish brown color indicates that alkaloids are present in test sample. The wagner's reagent can be prepared by dissolving 2g of iodine and 6g of potassium iodate in 100 cm³ of water.

Flavonoid test

Lead acetate test: 10 mg of jackfruit seeds extract was added with some drops of 10 percent lead acetate solution. The development of yellow color of extract indicates that flavonoids are present in sample.

Phenol test

Sodium hydroxide test: 5 mg of jackfruit seeds extract was dissolved in 0.5 ml of 20 percent H₂SO₄ solution. Followed by addition of some drops of aqueous Na (OH)₂ solution. If the color changes to blue it indicates the presence of phenolic compound in the jackfruit extract.

Carbohydrates test

Fehling's test: 5 ml of Fehling's solution was added to 0.5 mg of jackfruit extract seeds and heated in a water bath. The formation of yellow or red color precipitate showed the presence of reducing power.

Phyto-chemical analysis of dried jackfruit seed

Determination of total poly phenolic content seed

A Protocol for preparation of extract

Approximately 50g of freshly prepared dried jackfruit seed powder which was in triplicates forms were kept in brown envelopes and complete dried at a 65°C temperature to constant weight. Using ambient temperature (30°C) of percolation, a 0.7g of jackfruit powder from each sample was taken separately to 25 ml of distilled water and maintained at this temperature with continuous shaking for around 4 hrs. Add Another 25 ml of distilled water was added to the mark and repeat the extraction process. The filtrates were collected to provide a 50 ml extract for each sample.

Determination of total phenolic content of jackfruit seed extract

According to the Pinelo *et al.* (2005) [11] total phenolic contents from the dried jackfruit extracts were determined using Folin-Ciocalteu's method. 5 ml of Folin Ciocalteu

reagent was added in 1 ml jackfruit extract sample in tube. Then, 4 ml of 7.5 percent sodium carbonate was added. After 1 hr of incubation at ambient temperature the absorbance was read at 765 nm against blank. The produced results were taken as as mg gallic acid equivalent per gram of fresh sample (mg GAE/g). The formula for calculating the total phenolic contents present in jackfruit extract samples as follows.

$$C = c V/m$$

Where, C = total poly phenolic content present (mg GAE/g)
 c = gallic acid concentration obtained from calibration curve (mg/ml)
 V = Extract volume (ml)
 m = Extract mass (g)

Determination of total flavonoid content of jackfruit extract seed

The total flavonoid content of dried jackfruit extracts was quantified by using a procedure reported by Meda *et al.* (2005) [6]. 0.5 ml of completely diluted jackfruit sample was mixed with 0.5 ml methanol, 50 µl of 10 percent of AlCl₃, 50 µl of 1 mol/l potassium acetate and 1.4 ml water and incubates at ambient temperature for half hour. The absorbance of the sample extract was subsequently measured at 415 nm. The total flavonoid was quantified by use of formula,

$$\text{Total flavonoids contents} = \frac{A \times DF}{A^{1\%}_{1\text{cm}} \times (w - ld)}$$

Where, A = Absorbance in spectrophotometer
 DF = Factor of dilution
 A^{1%}_{1cm} = Absorption by AlCl₃
 w = plant material weight
 ld = Drying loss

2.4.4 Determination of alkaloids content of jackfruit seeds extract

5 g of the dried jackfruit seeds sample was taken into a 250 ml beaker and 200 ml of 10 percent acetic acid in ethanol was added and kept aside for 4 min, and then it was filtered through filter paper and extract was concentrated on a water bath to 1/4th of its original volume. Add concentrated ammonium hydroxide drop by drop to the extract till it precipitate completely. The entire solution was allowed to settle down and obtained precipitate was collected and by using ammonium hydroxide it was washed and then filtered through filter paper. The residue then dried and weighed (Harbone, 1973) [4]. The obtained dried residue was alkaloids contents present in the jackfruit sample.

$$\text{Alkaloid (\%)} = \frac{W_3 - W_2}{W_1} \times 100$$

Where, W₁ = Initial weight of jackfruit sample,
 W₂ = Extract weight
 W₃ = Residue weight

Determination of antioxidant activity

A preparation of extract

The extracts were prepared in the usual way; 2 grams of dried

jackfruit seeds was used for antioxidant activity assay. The decoction was prepared by placing the dried jackfruit in 100 ml boiling distilled water for 3 minutes. The infusion was prepared by steeping the jackfruit in freshly boiled distilled water for 30 minutes. The extracts were cooled, filtered and the volume was brought up to 100 ml using distilled water (Toda, 2011) [16].

Antioxidant Activity Assay

The antioxidant activity of the extracts was measured using the diphenylpicrylhydrazyl (DPPH) assay according to Zaeoung *et al.* (2005) [17]. Two milliliters of 100 µM DPPH solution in absolute ethanol was added to 2 ml of jackfruit seed extract and mixed. The samples were allowed to react

with DPPH for 20 minutes and the absorbance was measured at 520 nm (Lab Spectronic) after reaction was complete. Ascorbic acid (1percent in distilled water) was used as positive control while distilled water was used as blank for all the samples. Antioxidant activity was expressed as per cent inhibition of the DPPH radical and observed by the decolourization of the DPPH reagent from dark violet to a lighter tone or colourless solution. In the DPPH radical scavenging assay, antioxidants react with DPPH and convert it to the yellow coloured a, a-diphenyl-β-picryl hydrazine. The degree of discoloration indicates the radical-scavenging potential of the sample.

It was computed as follows:

$$\text{DPPH scavenging activity (Percent)} = \frac{\text{Absorbance of DPPH blank} - \text{Absorbance of sample}}{\text{Absorbance of DPPH blank}} \times 100$$

Results and Discussion

Phytochemical screening of Jackfruit seed

Qualitative phyto-chemical analysis was carried out to know

the secondary metabolites present in the different extracts of jackfruit seed. The data related to phyto-chemical screening of jackfruit seed is summarized in table 1.

Table 1: Phytochemical screening of jackfruit seed

Phytochemical Constituents	Extracts			Name of the Test
	Aqueous	Ethanol	Petroleum ether	
Alkaloid	+	+	-	Wagner's Test
Flavonoid	+	-	+	Lead acetate test
Phenol	+	-	+	Sodium hydroxide test
Carbohydrate	+	+	+	Fehling's test

The jackfruit seed prepared by aqueous, ethanol petroleum ether were used to qualitatively identify the presence of secondary metabolites in ginger. The data present in table Table 1 revealed that aqueous extract of jackfruit seed contained alkaloid flavonoids, phenols and carbohydrate. However ethanolic extract of jackfruit seed contained alkaloids and carbohydrate. Aqueous extract of jackfruit showed the presence of flavonoids, phenol and carbohydrate. Each bioactive component is known for various medicinal properties. Phenol is important in modifying the erythrocyte membrane. Alkaloids protect the body from chronic diseases.

Flavonoids come under class of good antioxidants. Similar results were obtained by Sreeletha *et al* (2017) [14].

Phyto-chemical constituents of dried jackfruit seed

The attention in the study of phenol and flavonoid content was because of the bioavailability of these components related to their antioxidant activity (Rufino *et al.*, 2010) [12]. The RDI for polyphenol has been showed one gram per day (Scalbert and Williamson, 2000) [13]. The data related to phyto-chemical contents of dried jackfruit seed presented in table 2.

Table 2: Effects of different processing on phyto-chemical constituents of dried jackfruit seed

Processing methods	Total poly phenol ^a (mg/100g)	Total flavonoids ^b	Total alkaloids (%)
Fresh	1.57	2.88	4.03
Sun drying	1.10	2.08	6.82
Tray draying	1.18	2.19	6.30
SE±	3.221	6.983	0.271
CD at 5%	10.344	22.079	0.862

*Each value is average of three determinations

^a – µg of Gallic Acid Equivalent/ml

^b – µg/ml of Quercetin Equivalent

The data presented in table 2 depict the effects of different processing on phyto-chemical constituents of dried jackfruit seed. It was observed that the total poly phenolic compound of fresh seed was 1.57 g of Gallic acid/ml. The processing of seed results in decreasing the polyphenolic contents of dried jackfruit seed. The maximum contents of polyphenol was observed in jackfruit seed processed by tray method i.e. 1.18 mg of Gallic acid/gm. The total polyphenol contents of seed processed by Sun draying method were 1.10 mg of Gallic acid/gm respectively.

The total flavonoids content of jackfruit seed expressed in

mg/gm of quercetin equivalent. The total flavonoids content of fresh jackfruit seed was 2.88 mg of quercetin/gml. The maximum flavonoids contents was observed in dried seed processed by tray draying method i.e. 2.19 mg of quercetin/g,m. The minimum contents of flavonoids was observed in seed processed by sun method i.e. 2.08g of quercetin/gm. Middleton and Kandaswami (1994) [8] reported that plant containing phenolic compounds including flavonoids are good antioxidants and also contributes anti-mutagenic and anti-carcinogenic effects.

Alkaloids are formed as biochemical by-products and the

antibacterial activity has been reported to be responsible. For analgesic, antispasmodic and microbial effects an isolated plant alkaloids and their synthetic derivatives are used as a essential medicinal agent (Okwu, 2004) [9]. The alkaloids present in fresh jackfruit seed were 4.03percent. The total alkaloids contents of seed processed by Sun and tray drying

method were 6.82 and 6.30 percent respectively.

Antioxidant activity of dried jack fruit seed

The effect of drying on antioxidant activity of dried jackfruit seed powder were analyzed and tabulated in Table 3.

Table 3: Effect of drying on antioxidant activity of jackfruit powder

Sr. No.	Drying method	Antioxidant activity (%)	
		Infusion	Decoction
1	Fresh	67.33	68.01
2	Sun	56.25	60.09
3	Tray	57.18	61.72
	SE±	0.880	1.776
	CD at 5%	2.905	6.354

The data presented in table 3 showed the impact of drying on antioxidant activity of dried jackfruit seed. The DPPH (diphenylpicrylhydrazyl) of dried jackfruit seed was significantly affected by temperature and drying process. The tray drying process was found statistically significant over sun drying. For the infusion prepared from fresh, sun and tray dried jackfruit seed, the antioxidant activity readings were 67.33, 56.25 and 57.18 percent respectively. It was cleared from the obtained data; the antioxidant activity was significantly decreased with increase in drying temperature.

Decoction was prepared by placing the jackfruit seed powder in hot boiling water for about 3 minutes. The antioxidant activity was measured and observed fresh jackfruit seed had highest DPPH assay i.e. 68.01 percent. The antioxidant activity of decoction of jackfruit seed prepared by sun and tray drying were 60.09 and 61.72 percent respectively. The antioxidant activity was contained by amount of polyphenolic compounds and flavonoid present in dried jackfruit seed materials. The highest content of antioxidant activity was observed in tray dried samples might be due to lack of any heat used in tray drying.

Conclusion

From the research it was concluded that the dried jackfruit seed powder prepared by tray drying contained good proportion of phyto-chemicals and better antioxidant properties than jackfruit seed powder prepared by sun drying method.

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