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## Preparation of energy drink using jackfruit seed powder

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### Abstract

The energy drink enriched with jackfruit seed powder, coffee powder, and date powder was a more nutritious option when compared to other energy drinks available on the market. The energy drink was created in three different concentrations of energy drinks (the first sample contains the jackfruit seed powder extract, date powder extract, and coffee powder extract in the concentration of 3:2:1, and the concentration in the second and third samples are 2.5:2 and 2:2:2). The second sample was more popular than the other two. Per 100 ml, the developed drink contains 0.32 g of protein, 25 mg of vitamin C, and 9.6 g of total sugars. The drink also contained some nutrients such as calcium and potassium. The functional analysis of the energy drink was also done in the food technology and nutrition lab of Lovely professional university, Phagwara. The sensory analysis was also done with the help of 9 points hedonic scale.

**Keywords:** Caffeine, antioxidants, jackfruit powder, sensory, pharmaceuticals

### Introduction

Energy drinks are the beverage industry's fastest-growing segment. Energy drinks have been shown to boost alertness and concentration, improve simulated driving when drowsy, and minimize drowsiness in night workers, according to various studies. The first energy drink was invented in Europe and Asia in 1960, and subsequently, in 1987 in Austria and 1997 in the United States of America, a new energy drink called Red Bull entered the spotlight. Young adults are the main consumers of energy drink manufacturers and merchants. These beverages are widely consumed on a worldwide scale in nations such as the United States, United Kingdom, Thailand, Vietnam, Cuba, Mexico, Australia, Germany, Poland, and Saudi Arabia. An energy drink is defined as a drink that contains stimulant compounds as ingredients, mainly caffeine. Caffeine is found naturally in a variety of foods, as well as being used as a food additive and in pharmaceuticals. It can be found in coffee, tea, and cocoa in small amounts, depending on cultivation circumstances and processing. Filter coffee – 100–150 mg (5 oz cup); instant coffee – 50–60 mg; tea – 35–45 mg; milk chocolate – up to 15 mg; dark chocolate – up to 35 mg are some general estimations of the caffeine content of items. Soft drinks also contain caffeine.

Jackfruit is a tropical fruit that is cultivated in tropical areas. It's a South Indian native. It belongs to the Moraceae family of plants, which includes figs, mulberry, and breadfruit. Jackfruit is a green or yellow fruit with spiky outer skin. The unusually large scale of jackfruit is one of its distinguishing features. It is the world's largest tree fruit, weighing up to 35 kg. The flavor of jackfruit is sweet and fruity. It is said to taste like a mixture of fruits such as apples, pineapples, mangoes, and bananas. The popularity of jackfruit, a rare tropical fruit, has grown in recent years. It has a distinct sweetness to it and can be used in several dishes. It's also high in nutrients and can have a variety of health benefits. Since jackfruit can withstand tropical climates, it can be a significant source of calories and carbohydrates for people in developing countries who are on the verge of going hungry.

The date powder from premium Arabian dates is used here to decrease the amount of sugar that we need to add additional. This date powder was also rich in some nutrients like carbohydrates, minerals, vitamins, etc. This powder can be used as a natural sweetener as a substitute for sugar in milk products, cakes, halwa, etc.

In recent years, a rising number of caffeine-containing beverage consumers have been recorded, due to the overpopulation and long unpleasant working hours. So here is the scope of this project, because here in this project, the caffeine is not added separately. The coffee powder is used here and the caffeine is not added separately.

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Then jackfruit seed powder and date powder are also used in this product, so they provide good nutrients also.

Here we are preparing an energy drink which contains some important nutrients. Nutrients may include carbohydrates, vitamins, minerals, and some amount of protein because the core ingredient, jackfruit seed powder is rich in nutrients, and also date powder contains some of these. Date powder is used here as a substituent for sugar.

**Materials and Methods**

**Proximate analysis of the raw materials.**

Coffee powder and sugar were bought from the nearby market, and jackfruit seed flour and date powder were bought from the Amazon shopping app. The jackfruit powder was produced by the ‘lap of nature store’. The nutritional information of jackfruit seed powder, (obtained from the labeling information of the packaging material) is given in Table 1.

**Table 1:** Nutritive information of jackfruit seed powder

Nutrients	Values per 100 grams
Energy	140 kcal
Total fat	0 g
cholesterol	0 g
Protein	5 g
Carbohydrate	36 g
Potassium	400 mg
Sodium	12 mg

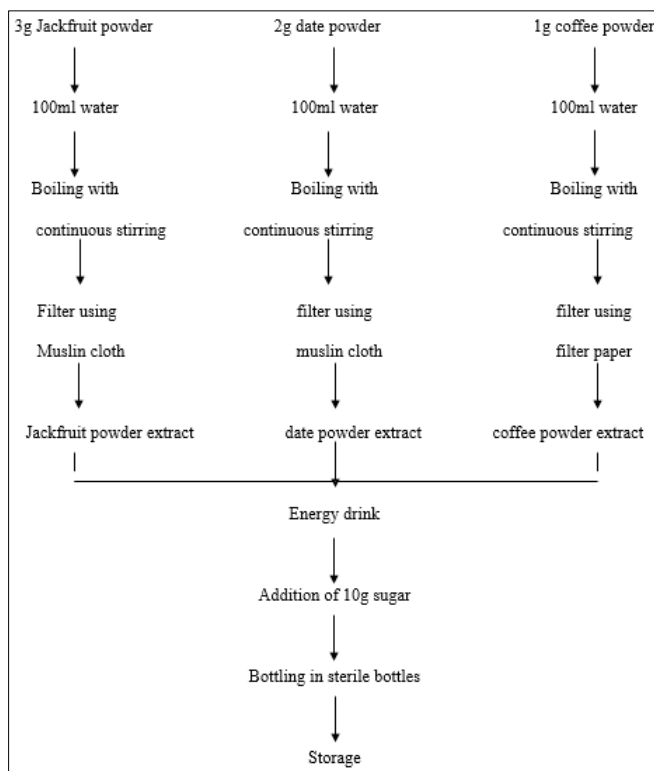
The date powder was mainly used as a natural sweetener as a substitute for sugars in milk, cakes, halwa, pancakes, etc. This powder also contains B vitamins and some minerals like iron, zinc, etc. Nutritional information on date powder is given in Table 2, the following pieces of information are determined from the packaging material of the product.

**Table 2:** Nutritive information of date powder

Nutrients	Values per 10 grams
Energy	38 kcal
Carbohydrate	9 g
Total sugars (natural)	6.9 g
fiber	0.7 g
Protein	0 g

**Preparation of energy drink**

The coffee extract was prepared by boiling 1 gram of black coffee powder in 100 ml of distilled water for 2 to 3 minutes at 100°C. Then it was sieved through a filter paper. Date powder extract was prepared by boiling 2 grams in 100 ml distilled water for 5 minutes, it is then sieved using a muslin cloth and then by filter paper. Then 3g of jackfruit powder was then put into 100 ml of hot water and stirred continuously, then it is also sieved using a muslin cloth. Then these three are mixed in 3 different ratios with the required amount of sugar. It is then filled in sterile glass bottles followed by pasteurization at a temperature of 85 °C to 90 °C for 10 to 15 minutes. Then the bottles are stored under refrigeration for further analysis.



**Fig 1:** Flow chart of energy drink preparation

**Sensory analysis**

The samples prepared are then put for sensory analysis. The three samples are then named A9, S1, and D4. Five students pursuing masters in food science and technology participated in the sensory analysis. An overall acceptance rate is also calculated. The sensory analysis was determined in the Food technology and nutrition lab of Lovely Professional University, Phagwara, Punjab.

**Table 3:** Sensory analysis table

Sample: Energy drink      Date of evaluation: \_\_\_\_\_  
 Evaluator name: \_\_\_\_\_

Sample code	Colour	Odour	Texture	Sourness	Flavour	Overall acceptability
A9						
S1						
D4						

**Table 4:** Score distribution of the 9-point Hedonic scale

9-Point hedonic scale	
Panellist hedonic rating	Liking score
Like extremely	9
Like very much	8
Like moderately	7
Like slightly	6
Neither like nor dislike	5
Dislike slightly	4
Dislike moderately	3
Dislike very much	2
Dislike extremely	1

### Optimization of different ratios for the preparation of energy drinks

The energy drink was prepared in three different ratios. Here first the extracts of three raw materials were prepared by boiling each raw material in 100 ml of distilled water separately. Then they were filtered using a muslin cloth. The quantity of jackfruit seed powder, date powder, and coffee powder added to every 100 ml of water was in the ratio of 3:2:1, but the quantity of filtrate used for the preparation of energy drink was different. The first sample contains the jackfruit seed powder extract, date powder extract, and coffee powder extract in the concentration of 3:2:1. The concentration in the second and third samples are 2.5:2 and 2:2:2.

### Titrateable acidity and pH

In general, energy drinks have significantly higher titrateable acidity (11.78) than sports drinks (3.58). The pH of the various energy drinks was discovered to be between 2 and 4. (Jain *et al.*, 2012). The pH of black coffee was found to be around 5, and the jackfruit seed flour's pH and titrateable acidity (as lactic acid) were 5.78 and 1.12%, respectively. The titrateable acidity of the drink was estimated at 0.35±0.024% percent in the developed drink. The pH of the drink was recorded as 4.6 by using pH. As a result, when compared to other energy drinks, the newly developed energy drink has lesser acidity.

### Protein

The protein content is estimated by the Kjeldahl method, here the protein present is jacalin. It is a protein found in the jackfruit seed flour. The total protein content in the energy drink was found to be 0.322±0.0012 g per 100 ml. Jacalin has many health benefits such as providing immunity to HIV-affected people. The energy drinks generally contain 0.3 g of protein per 100 ml (Yunusa & Ahmad, 2011). So, there is a slight gain found in the amount of protein in the newly developed energy drink. Energy drinks provide customers with the necessary energy boost while also providing essential nutrients for their bodies.

### Total sugar

The total sugar estimated in the newly developed energy drink is 9.64±0.0081 g per 100 ml. When compared to other popular energy drinks, the total sugars in this product are slightly lesser. Generally, energy drinks contain about 11.5 grams per 100 ml. Here date powder is used as a substituent

for table sugar and that's why the total sugar content in the developed drink was recorded as lesser when compared to other energy drinks. It is because date powder contains natural sugars such as glucose, sucrose, and fructose, while the other popular energy drinks contain table sugar and other artificial sweeteners such as aspartame, sucralose, acesulfame (Basilio *et al.*, 2020) [2].

### Vitamin C

Jackfruit seed powder is rich in vitamin C. But the vitamin C content in energy drinks of popular beverages is found to be zero (USDA). But the developed energy drink contains 24.66±1.247 mg per 100 ml of ascorbic acid, because as I mentioned above that the jackfruit seed powder contains a good amount of vitamin C. Here the amount of vitamin C is calculated by the titration method. The vitamin C content of the energy drink available on the market is recorded as 0 mg per 100 grams (USDA). So, there was a good difference in the amount of vitamin C when compared with the newly developed energy drink.

### Minerals

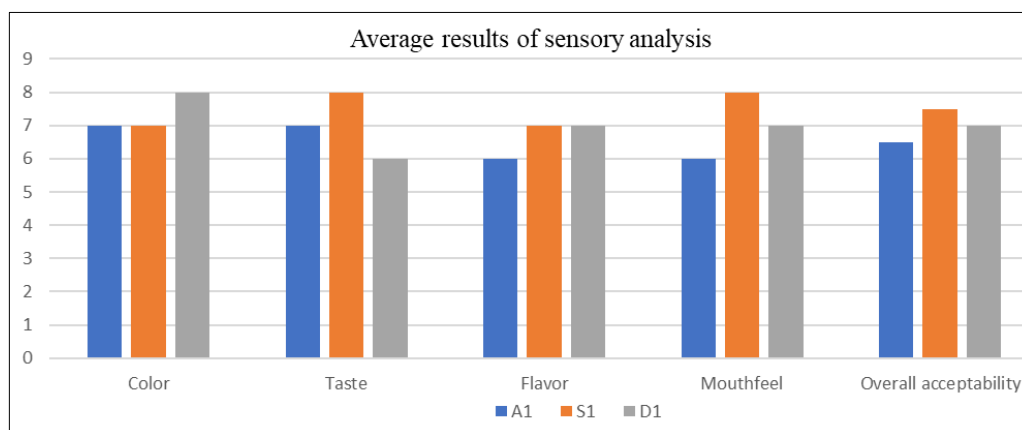
The minerals found in the developed drink were potassium, calcium, and sodium. These are present in an amount of 24.36, 8.36, and 1.8 mg respectively. The popular energy contains a lesser amount of minerals when compared to the developed drink.

**Table 5:** Nutritional composition of the developed energy drink

Nutritional	Values (per 100ml)
Energy value	42.34±2.51 Kcal
Protein content	0.322±0.0012 g
Total Sugars	9.64±0.0081 g
Vitamin C content	24.66±1.247 mg
Total Phenolic content	104.33±1.24 mg GAE/g
Titrateable acidity	0.35±0.024%
Sodium	1.95±0.12 mg
Potassium	24.156±1.287 mg
Calcium	8.911±0.796 mg

**Table 6:** Results of sensory analysis (each value is the average of 5 panelists)

Sample	Colour	Taste	Flavour	Mouthfeel	Overall acceptability
A1	7	7	6	6	6.5
S1	7	8	7	8	7.5
D1	8	6	7	7	7



**Fig 2:** Graphical representation of sensory analysis

## Functional analysis

### Caffeine content

Generally, energy drinks contain a high amount of caffeine content and that's why the energy drink provides mental alertness, and concentration and improves simulated driving when drowsy. Caffeine is not added separately in the newly developed energy drink. Here caffeine is provided by the coffee powder we added. The caffeine content of various popular energy drinks was found to be 20 to 40 mg per 100 ml. The FDA has cited that healthy adults can consume 400 mg of caffeine per day (Rosenfeld *et al.*, 2014) [9]. The caffeine content in the developed drink was recorded at 57 mg in 250 ml.

### Total phenolic content

The total phenols in the developed drink were determined 1.17 mg per mg. Because the raw materials used here contain a good content of total phenols. The total phenols in jackfruit seed flour were found to be 104.33±1.24 mg per ml (Canbay *et al.*, 2015) [3], and the total phenols in the coffee powder were found as 741 µg/ml of gallic acid per 2 grams of coffee (Al Doghaither & Al-Malki, 2017) [1]. The total phenolic content present in the energy drink made by date pulp was recorded as 0.65 ± 0.04 mg/g (Djaoud *et al.*, 2020) [5].

### DPPH Assay of antioxidant activity

The DPPH percentage inhibition of the developed product is found as 74.6%. The total antioxidant capacity of the jackfruit seed flour was 14 mg/g (Gupta *et al.*, 2011) [6]. The DPPH assay of the classic energy drink is determined between 73 mg/L and 83mg/L (Nowak *et al.*, 2020). The energy drink prepared without jackfruit seed flour has less antioxidant activity (58.2%) than the energy drink prepared with jackfruit seed flour.

### Tannin

The total tannin content in the developed drink is found to as 0.49884%. Here the tannin content is low, but the other popular energy drinks do not contain tannin. The tannin content present in the drink prepared here is due to the addition of coffee powder which contains 4.6% of tannin in the form of tannic acid (Das, 2021) [4].

### Conclusion

The preparation of an energy drink using jackfruit seed powder, date powder, and coffee powder was found an innovative product and the prepared energy drink was found as more nutrients than other energy drinks available on the market. The core ingredient jackfruit seed is cheaply available, and it is underutilized due to the lack of knowledge about its nutritional facts. A single jackfruit may contain hundreds to five hundred seeds, and these are thrown into waste. These seeds are not only highly nutritious but also provide some health benefits also.

The energy drink enriched with jackfruit seed powder, coffee powder, and date powder can be considered a more nutritious alternative compared to other energy drinks. I developed energy drinks in three different concentrations (the first sample contains the jackfruit seed powder extract, date powder extract, and coffee powder extract in the concentration of 3:2:1, and the concentration in the second and third samples are 2.5:2 and 2:2:2). The second sample got more acceptance than the other 2 samples. The developed

drink contains protein (0.32g), vitamin C (25 mg), and total sugars (9.6 g) per 100 ml. Some nutrients like calcium and potassium were also found in the drink.

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