The Pharma Innovation Journal 2021; 10(12): 1361-1363

www.ThePharmaJournal.com

The Pharma Innovation

**ISSN (E): 2277- 7695**
**ISSN (P): 2349-8242**
**NAAS Rating: 5.23**
TPI 2021; 10(12): 1361-1363

www.thepharmajournal.com
Received: xx-0-2021
Accepted: xx-11-2021

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# Evaluation of the nutritional characteristics for grape seed powder incorporated cookies

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**Abstract**
Grape seed are the one type of under-emphasized by products of the grape juice industry. The seed is the fair source of protein, carbohydrates, fat and minerals, which can replace conventional flour to develop the new food products. This study aim is to exploit and under-utilized grape seed for value addition and improve grape seed based food products for acceptability and consumption. the 2 percent level of grape seed flour incorporated cookies nutritional values are moisture of 2.32%, protein of 6.29%, carbohydrates content of 67.52%, fat of 2.02%, fiber of 3.25%, and ash of 1.12%, respectively. The developed cookies had higher fiber and protein content than control cookies, which depicts its potential to the better alternative for the conventional flour.

**Keywords:** Evaluation, nutritional, characteristics, incorporated, cookies

## Introduction
Grape (Vitis spp.) is one of the most economically important plant species due to its diverse uses in production of juice, wine, resins and other food products.it is cultivated in aal the regions where tempreture condition prevails (Georgia *et al*, 2014). Grape is the one the widely grown the world, total production of grapes approximately 60 million tons worldwide. The major producer of the grapes in china, USA, Italy, and france. Grape are classified in to wine grapes, seedless grapes, raisin grapes and table grapes (Ma and Zhang *et al*, 2017). Grape marc consist of grape seed (25%), skins (50%), and stalks (25%). Grape is the one of the industrial byproduct of the wine process. grape seed are treated as waste if extracts are not made and it is estimated that about 10-12 kg of grape seed in 100 kg of wet residues are produced by the industry (Matthaus, 2008).
Grape seeds are complex matrix containing approximately 10 to 20% oil (Sabir *et al.*, 2012), 40% fiber, 11% proteins, 26.43% of total carbohydrates (Owon, 1999) and 7% complex phenols including tannins, in addition to minerals. Grape seed are rich in phenolic acids, antioxidants, flavonoids, anthocyanins, and oligomeric proanthocyadin complexes (OPCs)
Grape seed extract (GSE) has different medicinal properties including anti-inflamatory (Terra *et al*., 2009), platelet aggregation inhibiting, anticarcinogenic, and metal chelating properties etc., grape seed extract (GSE) is one the best-known sources of proanthocyanins. Due to its high antioxidant content, GSE can help tissue damage, protect against oxidative stress, and prevent disease. Grape seed oil contains nutritionally essential fatty acids and to copherols (El-Mallah and Murui, 1993).
There is an increased demand for value addition from waste products of food processing industries (Balasundram *et al*., 2006). Grape seed possesses nutritional, nutraceuticals and medicinal value, which serves as an important source for value addition in food products. The study aims to value add the grape seed by pulverizing it into grape seed flour and replacing the conventional flour with grape seed flour.

## Material and Method
### Raw material collection
The grape seed were purchased from a local market in Madurai, Tamil Nadu, India, together with a hull measuring 12.22 mm in length and 10.86 mm in width.

### Processing of raw material
Grape seed powder, whole wheat flour, were sieved to remove any inedible matter and stored

in airtight containers.

**1 Standardization of grape seed powder incorporated Cookies**

the cookies was developed by grape seed flour incorporated with refined wheat flour at five different levels like 2%, 4%, 6%, 8%, 10% and incorporated grape seed oil level like 1%, 2%, 3%, 4%, and 5% The cookies preparation formula given bellow in table 1

**Table 1:** The cookies preparation formula given bellow

| Composition | Control | Level of incorporation (%) | | | | |
|---|---|---|---|---|---|---|
| | C | $T_1$-2% | $T_2$-4% | $T_3$-6% | $T_4$-8% | $T_5$- 10% |
| Refined Wheat flour (g) | 100 | 98 | 96 | 94 | 92 | 90 |
| Grape seed flour (g) | - | 2 | 4 | 6 | 8 | 10 |
| Grape seed oil (ml) | - | 1 | 2 | 3 | 4 | 5 |
| Milk powder (g) | 5 | 5 | 5 | 5 | 5 | 5 |
| Sugar(powdered) (g) | 50 | 50 | 50 | 50 | 50 | 50 |
| Ammonium bicarbonate (g) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Vanilla powder (g) | 1 | 1 | 1 | 1 | 1 | 1 |
| Shortening agent (g) | 50 | 50 | 50 | 50 | 50 | 50 |

**Preparation of grape seed flour incorporated cookies**

The raw ingredients was weighed the refined whole wheat flour and grape seed flour was sieved using sieve of BS 60 mesh size. Creaming was done by kneading shortening agent, powder sugar and aluminum bicarbonate. Mixing the refined wheat flour and grape seed flour, milk powder, vanilla powder with optimum quantity of water to form the dough for cookies. Than kneading and sheeting the dough was done. Than next step is moulding with the help of cookies cutter and after moulding, moulded cookies were arranged in trays and baked 135°C for 15-30 minutes. After baking the cookies cooled in ambient temperature. For Prepared cookies used the packaging materials are stand up pouches and HDPP (High density polypropylene) packages.

**Nutritional analysis of cookies**

The proximate analysis, namely moisture, carbohydrate, crude fat, protein, crude fiber and ash, were analyzed as per the method of the Association of Official Analytical Chemists (AOAC, 2000) [2]. The changes in the above parameters of developed cookies were analyzed in the initial and end of 45 days of storage at room condition by using different packaging materials such as High-density polypropylene packages (P1) and stand-up pouches (made up of polypropylene) (P2). The pictorial representation of control and grape seed flour incorporated cookies packed indifferent packaging materials.

**Statistical Analysis**

The factorial completely randomized design was adopted for analysis to study the impact of packaging materials using AGRES software, treatments and storage period on the quality of cookies.

**Results and Discussion**

**Cookies analysis**

**Moisture**

The percentage of the moisture content for developed cookies is given in Table 2. The initial moisture content of control and grape seed incorporated cookies was 2.45 and 1.62%, respectively. The final moisture content was 3.08% and 1.79%, respectively, in high-density polypropylene packages and 2.60 and 2.02%, respectively in stand-up pouches. The highest moisture was recorded in developed cookies packed in high density polypropylene packages at the end of the storage days. Statistically, the storage period, treatments and packaging material had an impact on the moisture content of the cookies.

**Table 2:** Changes in Moisture, Carbohydrate and Protein content of grape seed incorporated cookies

| Parameters | Moisture% | | | | Carbohydrate(g/100g) | | | | Protein(g/100g) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Storage period | $P_1$ | | $P_2$ | | $P_1$ | | $P_2$ | | $P_1$ | | $P_2$ | |
| | $T_0$ | $T_3$ | $T_0$ | $T_3$ | $T_0$ | $T_3$ | $T_0$ | $T_3$ | $T_0$ | $T_3$ | $T_0$ | $T_3$ |
| 0 day | 3.25 | 2.62 | 2.45 | 2.22 | 56.23 | 57.79 | 56.23 | 56.79 | 6.65 | 7.28 | 6.55 | 7.05 |
| 10 days | 3.22 | 2.64 | 2.49 | 2.16 | 58.22 | 59.78 | 58.22 | 59.68 | 6.62 | 7.26 | 6.42 | 7.06 |
| 20 days | 3.34 | 2.70 | 2.54 | 2.46 | 62.98 | 64.54 | 62.98 | 63.54 | 7.60 | 8.24 | 7.50 | 8.12 |
| 30 days | 3.42 | 2.79 | 2.60 | 1.94 | 51.02 | 52.58 | 51.02 | 52.58 | 5.58 | 6.22 | 5.88 | 6.52 |

$T_0$- 100% Refine Wheat Flour
$T_3$-2% grape seed flour + 98% Refined Wheat flour
$P_1$- High density polyethylene packages (HDPE)
$P_2$- Polyethylene packages

| | Moisture% | | | Carbohydrate (g/100g) | | | Protein (g/100g) | | |
|---|---|---|---|---|---|---|---|---|---|
| | SED | CD (0.05) | CD (0.01) | SED | CD (0.05) | CD (0.01) | SED | CD (0.05) | CD (0.01) |
| P | 0.00953 | 0.01916** | 0.02556 | 0.31790 | 0.63922** | 0.85282 | 0.02351 | $0.04726^{NS}$ | 0.06306 |
| T | 0.00953 | 0.01916** | 0.02556 | 0.31790 | $0.63922^{NS}$ | 0.85282 | 0.02351 | $0.04726^{NS}$ | 0.06306 |
| S | 0.01348 | 0.02710** | 0.03615 | 0.44958 | 0.90400** | 1.20606 | 0.03324 | 0.06684** | 0.08918 |
| PT | 0.01348 | 0.02710** | 0.03615 | 0.44958 | $0.90400^{NS}$ | 1.20606 | 0.03324 | $0.06684^{NS}$ | 0.08918 |
| TS | 0.01906 | 0.03832** | 0.05113 | 0.63581 | $1.27845^{NS}$ | 1.70563 | 0.04701 | $0.09453^{NS}$ | 0.12612 |
| PS | 0.01906 | 0.03832** | 0.05113 | 0.63581 | $1.27845^{NS}$ | 1.70563 | 0.04701 | $0.09453^{NS}$ | 0.12612 |
| PTS | 0.02695 | 0.05420** | 0.07230 | 0.89917 | $1.80800^{NS}$ | 2.41213 | 0.06649 | $0.13368^{NS}$ | 0.17835 |

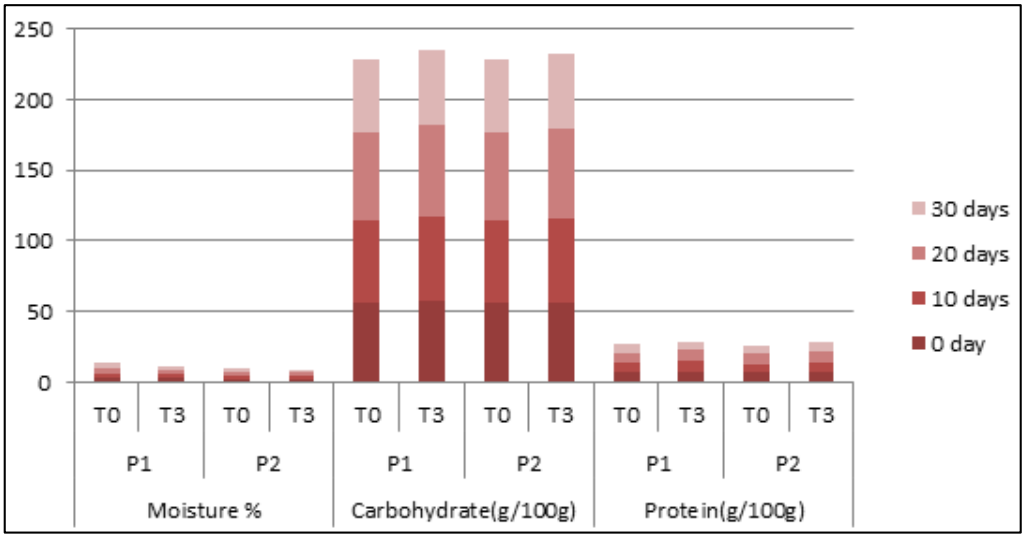


**Fig 1:** Show the moisture carbohydrate and Porte

**Moisture**

The biscuits made with 100% wheat flour had a moisture content of 5.25 + 0.5g/100g and biscuits made with 15% incorporation of grape seed flour had a moisture content of 7.82+ 0.5g/100g [El-Gindy *et al*., (2015) [3]]. Akbar (2018) [1] recorded that the initial moisture content of control cookies (100% Wheat flour) made) was 3.20% and the final moisture content of cookies [after 90 days of storage]) was 3.25%. The initial moisture content of treated cookies made (50% Wheat flour + 50% Maize flour) was 3.23% and the final moisture content of cookies [after 90 days of storage] from wheat flour and maize flour (T3) was 3.31%.The increase in moisture content was attributed to the hygroscopic nature of the cookies packed in packaging materials, the nature and porosity of the packaging material [Goyat *et al*., 2018] [4]

**Carbohydrate**

The percentage of the carbohydrate content of cookies is given in Table 2. The carbohydrate content of control (T0) and grape seed incorporated cookies (T3) was 5.59% and 56.79%, respectively, in 108 | 1-3 | 3 both the packaging materials. The final carbohydrate content of control and grape seed flour incorporated cookies was 58.09 g and 59.39 g in high-density polypropylene packages and 58.32 g and 59.34 g in stand-up pouches. There was a decreasing trend in carbohydrate content in both the control and grape seed flour incorporated cookies in both the packaging materials at the end of storage days. The loss of carbohydrate content of grape seed flour incorporated cookies in high-density polypropylene packages was 2.30% and 1.28% in stand-up pouches. Statistically, the storage period, treatments and packaging material had an impact on the carbohydrate content of the developed cookies and was significant at a 0.05% level of significance.

**Protein**

The percentage of the protein content of cookies is given in the table 2. The protein content of control (T0) and grape seed incorporated cookies (T3) was 6.65, 7.28, 6.55, and 7.05, respectively, in 108 | 1-3 | 3 both the packaging materials. The final protein content of control and grape seed flour incorporated cookies was 7.60 g and 8.24 g in high-density polypropylene packages and 7.50 g and 8.12 g in stand-up pouches. There was a decreasing trend in protein content in both the control and grape seed flour incorporated cookies in both the packaging materials at the end of storage days. The loss of protein content of grape seed flour incorporated cookies in high-density polypropylene packages was 2.30% and 1.28% in stand-up pouches. Statistically, the storage period, treatments and packaging material had an impact on the protein content of the developed cookies and was significant at a 0.05% level of significance.

**Conclusion**

The value addition of grape seed in the form of cookies yielded the best results in terms of nutrient density. The protein content and fiber content of the grape seed flour incorporated cookies was 9.26 g and 3.25 g, which was substantially higher than the control cookies. It can potentially address protein-calorie malnutrition and prevent life-style disorders. The storage studies revealed that there is minimal loss in stand-up pouches when compared to high density polypropylene packages. The value-added products from grape seed flour could gain good recognition in the food industries. Thus, the value addition of underutilized grape seed would reap benefits to both the grower in terms of increased income and consumer in terms of increased nutritional value.

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