

COMPARATIVE ANALYSIS OF PROXIMATE COMPOSITION OF RED AND WHITE FLESHED DRAGON FRUIT (*HYLOCEREUS SPP.*)

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Abstract–Dragon fruit is tropical climbing fruit native to Mexico, Central America, Now its cultivation widened in India and worldwide because of its because of its commercial interest, easy cultivation and health benefits. Proximate analysis was carried out for Red and White fleshed dragon fruits according to the methods advised by AOAC and AACC. Results showed no statistically significant differences ($p \leq 0.05$) in the proximate composition in between the two cultivars. Red and white dragon fruit had moisture contents of 86.63% and 87.43%, Carbohydrates of 11.34% and 10.05%, protein of 0.87% and 0.98%, fat of 0.14 % and 0.16%, ash of 0.9% and 0.8% and dietary fiber of 1.21% and 0.88% respectively. Calorific values were 50.46 Kcal for red and 44.84 Kcal for white dragon fruit.

INTRODUCTION

Dragon fruit or pitaya is the fruit of several different tropical climbing plants of the genus *Hylocereus*, family Cactaceae (Nishikito *et al.*, 2022; Trong *et al.*, 2022). It is a native fruit from Mexico, Central America, and South America (Carrillo-Fasio *et al.*, 2022). It is now cultivated worldwide due to its commercial interest, not demanding cultivation requirements, i.e., high drought tolerance, easy adaptation to light intensity and high temperature, a wide range of tolerance to different soil salinities, and benefits to human health (Vishakha *et al.*, 2021; Nobel & La Barrera, 2004; Nie *et al.*, 2015). The fruit is known with various regional name 'pitaya', 'pitahaya', 'night blooming cereus', 'belle of the night', 'conderella plant' and 'queen of the night', kamlam but is widely known as a dragon fruit worldwide. Several types of dragon fruits based on the color of the peel and pulp are found, with majorly 14 varieties cultivated worldwide (Ortiz-Hernández *et al.*, 2012), but mainly red and white dragon fruit varieties captured the global market for

cultivation (Kakade *et al.*, 2020).

India, dragon fruit was introduced during the late 1990 (Arivalgan *et al.*, 2019). Thereafter, area under its cultivation was gradually increased from 4 to 400 ha in different states during 2005–2017. However, its production is expected to rise by over 50, 000 hectares in rainfed and barren lands (Wakchaure *et al.*, 2023). Dragon fruit is rich in nutrient like vitamin C, B1, B2, B3, high fibre content, minerals like Ca, Fe, P moreover it contains carbohydrates, fat, carbohydrates, Betacyanins, flavonoids, polyphenols etc. (Harivaindaran, *et al.*, 2008). The pH, TSS, total sugar, moisture, ash, protein, and dietary fibre content for red variety varied between 4.8 and 5.4, 8-12%, 5.13–7.06%, 82–85%, 0.7–0.85%, 0.90–1.1% and 0.8-1.0%, respectively (Arivalagan *et al.*, 2021). Nutritional composition of dragon fruits may vary concerning the area of cultivation, variety and agroclimatic condition. Despite the growing popularity of dragon fruit, there is a lack of information regarding nutritional composition of dragon fruit. In context of this study was planned to estimate the proximate constituents of red and white

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fleshed dragon fruit grown in the Marathwada region of Maharashtra, India.

MATERIALS METHODS

Dragon fruits of Red (*Hylocereus polyrhizus*) and White (*Hylocereus Undatus*) flesh of uniform maturity (35 days after flowering) were harvested at early in the morning from Visawa agro farm, Parbhani, Maharashtra. Harvested dragon fruits are immediately transported to Department of Food Chemistry, College of Food Technology VNMKV Parbhani to perform proximate analysis. All the analysis was carried out in triplicates.

Nutritional Composition of dragon fruit

Moisture content

The moisture content was determined according to method No. 44-15 A of (A.A.C.C., 2000). 5g of sample was taken in tarred crucible and dried in a hot air oven at $100 \pm 5^\circ\text{C}$ to a constant weight.

Fat Percent

The crude fat was determined by Soxhlet extraction as per the method described (A.A.C.C., 2000).

$$\text{Crude fat (\%)} = \frac{\text{Final weight of flask} - \text{Empty weight of flask}}{\text{Weight of sample}} \times 100$$

Protein

The crude protein was determined by the Micro Kjeldhal's method as described in method No. 46-10 of (A.A.C.C., 2000). This is based on the fact that on digestion with concentrated sulphuric acid and catalysts, organic compounds are oxidized and the nitrogen is converted to ammonium sulphate. Upon making the reaction mixture alkaline, ammonia is liberated, removed by the steam distillation, collected and titrated.

$$\% \text{ N} = \frac{(\text{Sample-Blank}) \times \text{N of H}_2\text{SO}_4 \times 0.014 \times \text{D.F.}}{\text{Aliquot taken} \times \text{Weight of sample (g)}} \times 100$$

$$\text{Total Protein} = \% \text{ Nitrogen} \times 6.25$$

Total Carbohydrate (%)

Carbohydrates were calculated by difference method as follows

$$\text{Carbohydrates} = 100 - \% (\text{Moisture} + \text{Fat} + \text{Protein} + \text{Ash})$$

Ash

The ash content was determined using the AOAC

(2005) method. A 5 g sample was charred in an electric heater, then placed in a muffle furnace at $550 \pm 20^\circ\text{C}$ for 2-3 hours until gray ash formed. The crucible with ash was cooled in a desiccator and weighed.

$$\text{Ash, per cent} = \frac{W_1 - W}{W_S - W}$$

Where,

W - Wt. in g of the crucible

W_1 - Wt. in g of crucible containing ash

W_S - Wt. in g of crucible with the sample taken for the test

Crude fiber

Crude fiber was determined by following the method No. 32-10 described in (A.A.C.C., 2000). The crude fiber percentage was calculated by using the following formula.

$$\text{Crude fiber (\%)} = \frac{\text{Weight of residue} - \text{Weight of ash}}{\text{Weight of sample}} \times 100$$

Calorie values of dragon fruit

Energy value of both the dragon fruit was determined by using values of crude protein, crude fat and total sugar content of fruits and considering that 1 g of protein yields 4 Kcal energy, 1g of fat yields 9 Kcal energy and 1 g carbohydrates yields 4 Kcal energy (Gopalan *et al.*, 2004). Total energy value in Kcal is calculated by adding above three energy values which gives energy value per 100 ml of sample.

Statistical Analysis

The experiments were conducted in triplicates, and the results was presented as mean standard deviation. The statistical difference indicated by superscripts were determined using IBM SPSS statistical software (statistic version 26, IBM analytics, New York NY USA.), one-way analysis of variance (ANOVA) at the probability level of $p < 0.05$, and the mean was compared by Duncan's multiple range tests to check the homogeneity in variables.

Nutritional Composition of Red and White Fleshed Dragon Fruit

Table 1 demonstrates the comparative proximate analysis between two commonly cultivated cultivars *Hylocereus polyrhizus* and *Hylocereus Undatus*. Proximate constituents of red and white dragon fruit species were investigated, and results are given in Table 1.

Table 1. Proximate composition of Red and White Fleshed Dragon Fruit

Parameter	Nutritional Composition of <i>Hylocereus Spp.</i>	
	Red Dragon Fruit (%)	White Dragon Fruit (%)
Moisture	86.63± 0.58 ^a	87.43 ± 0.68 ^a
Fat	0.14 ± 0.02 ^a	0.16 ± 0.02 ^a
Protein	0.87 ± 0.02 ^a	0.98 ± 0.02 ^a
Carbohydrates	11.34 ± 0.16 ^a	10.05 ± 0.04 ^a
Ash	0.9 ± 0.08 ^a	0.8 ± 0.06 ^a
Dietary Fibre	1.21 ± 0.06 ^a	0.88 ± 0.05 ^a
Calorie (Kcal)	50.46 ±	44.84

The values are expressed as mean ± sd (n= 3) The values in the different row with different superscript letters are significantly different ($p < 0.05$) as per Duncan's multiple comparison test. The values in the different row with different superscript are not significantly different ($p > 0.05$) as per Duncan's multiple comparison test

Proximate composition of red dragon fruit when compared to white dragon fruit were not statistically significant ($d > 0.05$). The moisture content of red and white fleshed dragon fruits showed slight differences, comprising 86.63 % and 87.43 %, respectively. Red-fleshed dragon fruit (11.34%) had slightly higher carbohydrates compared to white-fleshed dragon fruit (10.05%). Similar results were reported by Islam *et al.*, 2023, who found a total carbohydrate content of 11.5 gm and 12.9 gm for white and red dragon fruit, respectively. Jerônimo *et al.*, 2015 reported 10.79 % of total carbohydrates in red dragon fruit. White dragon fruit had a slightly higher protein content than red dragon (0.87) fruit, which is 0.98 %. Regarding fat content, both types of dragon fruit have a very low-fat percentage, with red dragon fruit having a slightly lower percentage of fat (0.14 %) than white dragon fruit (0.16 %). Ash content which signifies total mineral content is 0.9% and 0.8% for red and white fleshed dragon fruit respectively.

The fibre content in dragon fruit contributes several human health benefits, including weight reduction and sugar control for diabetic patients (Arivalagan *et al.*, 2021). Red dragon fruit had a higher dietary fibre content (1.21%) compared to white dragon fruit, contributing to lower calorie values. Recent studies by Arivalagan *et al.* (2021) have reported similar results for dietary fibre content, with Andaman Red having 1.14% fibre content and Andaman White having 0.806% fibre

content. Moreover, calorific values were higher for red dragon fruit than White, comprising 50.46 Kcal and 44.84 Kcal respectively. Obregón-La Rosa *et al.* (2022) a study conducted in peru observed the calorific value of 47.50 Kcal for red dragon fruit. Calorific values of both the dragon fruit revealed from the present investigation can be comparable to other fruits such as apples (52 Kcal), papayas (39 Kcal), guavas (36 Kcal), lemons (47 Kcal), oranges (47Kcal), and watermelon (30 Kcal) (Sardar, 2016). Considering the low calorific values of both the dragon fruit, it can be effectively utilized in the reduction of body weight and diabetics. The proximate composition of both cultivars is in consistent with findings reported by other studies, including Islam *et al.* (2023), Hernández-Ramos *et al.* (2020), Jerônimo *et al.* (2015), Jaafar *et al.* (2009), and Arivalagan *et al.* (2021).

CONCLUSION

The study analysed the proximate composition of red and white dragon fruit varieties grown Marathwada region of Maharashtra India. Both varieties showed high moisture content, moderate carbohydrates content, low protein fat and ash content. Red dragon fruit had slightly higher carbohydrate, dietary fiber and caloric values compared to white dragon fruit. However, the differences are non-significant. The low calories values of both dragon fruit suggest their potential as a healthy food option and can be effectively utilized in weight reduction and diabetic management

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Conflict of Interests

The authors do not have any conflict of interest

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