SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 9 | Issue: 6 | June 2024 - Peer Reviewed Journal

# FORMULATION AND EVALUATION OF ANTI OXIDANT CHOCOLATE BAR FROM DRAGON FRUIT PEEL

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**ABSTRACT**

*Dragon fruit (Hylocereus genus) has the potential for the prevention of diseases associated with inflammatory and oxidative processes. it is a tropical fruit that's low in calories and high in fiber and antioxidants, which are good for your immune system. It can boost your iron levels. Iron is important for moving oxygen through your body and giving you energy, and dragon fruit has iron. And the vitamin C in dragon fruit helps your body take in and use the iron. Studies have shown that pitaya can exert several benefits in conditions such as diabetes, dyslipidemia, metabolic syndrome, cardiovascular diseases, and cancer due to the presence of bioactive compounds that may include vitamins, potassium, betacyanin, p-coumaric acid, vanillic acid, and gallic acid. Moreover, pitaya has the potential to be used in food and nutraceutical products as functional ingredients, natural colorants, ecologically correct and active packaging, edible films, preparation of photoprotective products, and additives.*

*Dark chocolate is considered a functional food due to its anti-diabetic, anti-inflammatory, and anti-microbial properties.Several ingredients were used for the fortification, such as fruits (mulberry, chokeberries, and elderberries), spices (cinnamon), phytosterols, peanut oil, probiotics (mainly Lactobacillus, bacillus spices), prebiotics (inulin, xanthan gum, and maltodextrin), flavonoids, flavan-3-ols, etc. Those fortifications were done to raise the total antioxidant content as well as essential fatty acid content simultaneously reducing total calorie content. Sometimes, the fortification was done to improve physical properties like viscosity, rheological propertiesand also improve overall consumer acceptance by modifying its bitter taste.*

**KEY WORDS :** *dragon fruit , dark chocolate, pitaya, antioxidant.*

## INTRODUCTION

Due to profound changes in lifestyle resulting from modern life, there has been a progressive increase in non communicable disease. Among them cardiovascular disease are most deadly disease in the world as upto 32% of global death. There fore prevention measures are crucial to reduce the risk factor.

Antioxidants are a class of chemical substances naturally found in our food which can prevent or reduce the oxidative stress of the physiological system. The body is constantly producing free radicals due to regular use of oxygen. These free radicals are responsible for the cell damage in the body and contribute to various kinds of health problems, such as heart disease, diabetes, macular degeneration, and cancer. Antioxidants being fantastic free radical scavengers help in preventing and repairing the cell damage caused by these radicals. Plants and animals are the abundant source of naturally producing antioxidants. Alternately, antioxidants can also be synthesized by chemical process as well as from the different kinds of agro-related wastes using biological process. Based on the solubility, antioxidants are broadly categorized into two groups: water soluble and lipid soluble. In general, water-soluble antioxidants, such as ascorbic acid, glutathione, and uric acid, have functions in the cell cytosol and the blood plasma.

A plant-based diet protects against chronic oxidative stress-related diseases. Dietary plants contain variable chemical families and amounts of antioxidants. It has been hypothesized that plant antioxidants may contribute to the beneficial health effects of dietary plants. Over the years, countless fruits have been associated with the prevention of non communicable disease, and dragon fruit of pitaya is one of the most considerable fruit fot it .Dragon fruit has potential for the prevention of diseases associated with oxidative procecces. Moreover, pitaya has the potential to be used in food and neutraceutical products as functional ingredients, natural colourant, edibal film and additives.

## LITERATURE SURVEY

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7. Journal of development of fiber rich biscuit by incorporating dragon fruit powder gave the procedure of making the dragon fruit powder on 2020.

## AIM AND OBJECTIVE

**Aim** : FORMULATION AND EVALUATION OF ANTI – OXIDENT CHOCOLATE BAR FROM DRAGON FRUIT PEEL .

## OBJECTIVE

1. Protect cells from damage.
2. Boosting immunity.
3. Reduce the risk of chronic diseases.
4. Promotes overall health.
5. Improoveing mood.
6. Reduce inflammation and protects against certain diseases.

## PLANT PROFILE

### DRAGON FRUIT

It is a beautifull tropical fruit comes from the type Cactus of genus Hylocereus. It has a sweet, delecate taste. hence can be enjoy eating in fruit salads, create testy drinks and desserts.Pitaya ia low in calories and high in and antioxidents, fibers vitamin C.



***Fig No. 1***

The dragon fruit or pitahaya, Hylocereus undatus (Haworth) Britton & Rose (Cactaceae), is the second most important commercial cactus species with respect to fruit production after Opuntia ficus-indica. It is a hemiepiphyte (a plant that can grow anchored on trees or directly in soil) with a vine-like climbing tendency; its exact native range is uncertain, but believed to be in tropical regions of Mexico and Central America. The fruits, which have many names, have a delicate texture and delicious taste. They are extremely attractive visually. The flesh has high nutritional value, including high contents of vitamin C, calcium, potassium and fibre. Fruits have red or yellow peels and red as well as white pulp; the seeds are small and digestible. The plants are often trained onto trellises or arbours, similar to those used for grapevines, or a few plants may be associated with a post about 2 m tall with arms at the top from which the vines drape, allowing the fruit to develop at a convenient height for picking. Orchards can become profitable about 4 years after planting stem cuttings of about 40 cm in length. Fruit can be harvested from 25 to 45 days after flowering. The storage life is about 14 days at 10°C. The popularity of dragon fruit as an exotic fresh fruit has been increasing, particularly in non-traditional

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markets and where large Asian populations are established. Dragon fruit has potential as a health food due to its high levels of vitamin C, polyphenols and antioxidants. Dragon fruit are extremely attractive visually and do not have the spines or the annoying glochids of cactus pears (Opuntia ficus-indica), and the much smaller seeds (similar in size and texture to those in kiwifruits) are readily swallowed. The fruits can be relatively large, often exceeding 500 g, with yellow or red peels and pulps varying from white to yellow to red to deep purple.

**TAXONOMY**
Domain - Eukaryota
Kingdom - Plantae
Phylum - Spermatophyta
Subphylum -Angiospermae
Class - Dicotyledonae
Order - Caryophyllales
Family - Cactaceae
Genus - Hylocereus
Species - Hylocereus undatus
**Biological name** : selenicereus undatus

**Chemical Constituents** : betacyanin, pectin, phyuocactin, flylocerenin, tritexpenoids, steroids, dietary fibers, phenolies.

**Medicinal Uses** : hypoholesterolemic, hypoglycemic, dibetes, dyslipidemia, metabolic, syndrome, cardiovascular, diseaes,andcancer, highinlycopene,whichcanlowerrisksofheartdiseaseandcancer,

Medicinal Properties :

1. Dragon fruit encourages the growth of the probiotics lactobacilli and bifidobacteria .
2. These bacteria are helpful for killing disease causing viruses and bacteria.
3. They also help to digest food.
4. It will strengthen our Defence system.
5. Biological properties against pathogenic microbes like bacteria, fungi and viruses as well as diseases like diabetes, obesity, hyperlipidemia and cancer.

**COCOA POWDER**
Chocolates are a well-known snack for all age groups and are an indulgent confection. The major ingredient of chocolate is a cocoa powder which has several healthy benifits. Cocoa powder is produced from the slabs of roasted cocoa bean particles left behind when cocoa butter is extracted.



***Fig. No. 2***

As the pressing does not remove all the cocoa butter, so the particles remain coated with a thin layer of cocoa butter, all in all fat content of cocoa powder varies from 8% to 26%. These solid particles (the cocoa powder) are the basis of chocolate's flavor (and not as one might imagine—the cocoa butter). As a result, cocoa powder is the most concentrated version of chocolate there is. It is also very versatile in both cooking and chocolate making, it also has a pH of around 5. This has the effect of reducing the levels of astringent, bitter phenolics, and the roasted, caramel-like molecules (pyrazines, thiazoles, pyrones, and furaneol). The effect is a

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cocoa powder with a less bitter and astringent tone and one that is milder in flavor and darker in color than traditional cocoa powder. "Dutched" cocoa can come in shades ranging from light brown to near black each with their own mild flavor profiles.
Dark chocolate is a form of chocolate containing only cocoa solids, cocoa butter and sugar. Dark chocolate without added sweetener is known as bitter chocolate.

**TAXONOMY**
Kingdom - plantae
Phylum - Vascular plant
Subphylum -Dilleniidae
Class - magnoliopsida
Order - malvales
Family - sterculiaceae
Genus - theobroma
Species -T. cacao

**Biological name:** Theobroma cacao

**Chemical constituent:**Flavonoids, catechin, caffeine, theobromine, flavanol.

**Properties of Cocoa Powder**
Several studies showed that cocoa powder might have the following properties:
It be an antioxidant
It lower the blood pressure
It improve the heat health
It reduce the risk of diabetes
It boost immunity
It protect against cancer
It protect against neurodegeneration
It enhance mood1
It act as anti-inflammatory.

**Medicinal Properties**
Reducing free radicals, improving blood flow, lowering blood pressure, lowering "bad cholesterol", reducing inflammation, reducing insuli resistance, improving the brain's ability to make new connections between neurons, increasing microbiome diversity.

## MATERALS
To make an oxidant chocolate dragon bar ingredients to be used are as following -

| Sr. NO. | Content | F1 | F2 | F3 |
|---|---|---|---|---|
| 1. | Dragon fruit peel. | 4gm | 4gm | 12gm |
| 2. | Cococa powder | 3.6gm | 3gm | 12gm |
| 3. | Powdered sugar | 4gm | 9.5gm | 27gm |
| 4. | Cococa butter | 12.12gm | 9gm | 32gm |
| 5. | Salt | Qs | Qs | Qs |

***Table No.1 – Material***

| Sr No. | Equipment |
|---|---|
| 1) | Hot air oven |
| 2) | Ultrasound sonicator |
| 3) | Weighing balance |
| 4) | Beaker |
| 5) | Stirrer |
| 6) | Test tube |
| 7) | mould |
| 8) | Spatula |

***Table no.2 - Equipments***

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**STORAGE**

The obtained pitaya peel powder (PPP) samples were preserve in air proof polyethelyne bag at ambient temperature for a week .during the storage , sampling was perform for evaluation of betacyanine.

**PHYTOCHEMICAL ANALYSIS**

1. Dragon dorffs Test – add 1 ml of dragondorff reagent to 2ml of extract.
Orange-red ppt formed.
2. Mayer's Test – add few drops of Mayer's reagent to 1ml extract.
Yellowish or white ppt formed.
3. Iodine Test – add sample solution to testtube +2-3 drops o Iodine .
Blue colour is formed.
4. Banedict's Test – 1 mi of analyte sample mix with 2ml of benedict's reagent. Heat in water bath for 3-5 minutes.
Brick-red coloured ppt of cuprous oxide is formed.



*Fig.no - 2*

**FORMULATIONAND EVALUATION**

**PROCEDURE**

Using a suitable solvent, extract the constituents from the homogenized dragon fruit peel. Extraction could be perform using techniques such as ultrasound –assisted extraction, maceration , soxhlet extraction .
Here we are using ultrasound assisted extraction method

**EXTRACTION OF PHYTOCONSTITUENT**

4g crushedpeel powder + 50ml beaker (20 ml water)(ultrasound assisted extraction to be perform) 150 w for 15 min.
During extraction, beaker was put in cooling water bath to remain the slurry temp at 30C.
The mixture then centrifuged at 3500kg at 25C for 5min.
Supernatent was collected and repeat process in triplet. The obtained extract were mixed together.



*Fig no. 3*

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*Fig No.- 4*

**Procedure for Chocolate Dragon Bar**

Extract of dragon fruit peel 4gm is added to cocoa butter 4gm in double coated heating mental at temperature of $70^0$ C.
Let it dissolve, then add sugar powder and stirr well for 8 to 10 min.
Add pinch of salt to reduce the bitter taste.
The prepared solution pour into a chocolate bar mould 75gm approx.
Refregerate at $-5^0$C.



*Fig No. 4*



*Fig. No.5*

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## EVALUATION TESTS OF DRAGON BAR

1.GENERAL APPERANCE

| Sr No. | Characteristics | Result |
|---|---|---|
| 1. | Colour | Brown |
| 2. | Odour | Plesent |
| 3. | Texture | Smooth |

2.THICKNESS OF CHOCOLATE

| Sr no. | Formulation | Thickness |
|---|---|---|
| 1. | F1 | 0.5 |
| 2. | F2 | 0.5 |
| 3. | F3 | 0.5 |

3.DISINTEGRATION TEST

| FORMULATION | DISINTEGRATION |
|---|---|
| F1 | 23+- 4 |
| F2 | 22+-5 |
| F3 | 19+- 2 |

4.WEIGHT VARIENCE TEST

| FORMULATION | WEIGHT VARIENCE(gm) |
|---|---|
| F1 | 6.5 |
| F2 | 5 |
| F3 | 5.6 |

## RESULT AND DISCUSSION

Research on the formulation of antioxidant chocolate bars incorporating dragon fruit peel has shown promising results. Dragon fruit peel, often considered a waste product, is rich in antioxidants, vitamins, and dietary fibers, making it an excellent additive for enhancing the nutritional profile of chocolate.

1. Nutritional Enhancement: Dragon fruit peel is high in antioxidants, particularly betalains, flavonoids, and phenolic compounds. When incorporated into chocolate, these compounds can boost the antioxidant content, potentially offering health benefits like reduced oxidative stress and improved cardiovascular health.
2. Sensory Properties: Studies indicate that adding dragon fruit peel to chocolate can influence its taste, texture, and color. The peel imparts a slightly fruity flavor and vibrant color, which can be appealing to consumers. Sensory evaluations have shown positive reception when the peel is used in appropriate quantities.
3. Optimal Formulation: Research often focuses on determining the optimal concentration of dragon fruit peel to balance nutritional benefits and sensory qualities. Typically, a moderate addition (e.g., 5-10%) is found to enhance the antioxidant properties without adversely affecting the chocolate's texture and flavor.
4. Health Benefits: The enhanced antioxidant activity in chocolate bars with dragon fruit peel can contribute to better health outcomes. Antioxidants help combat free radicals, reducing the risk of chronic diseases such as cancer, diabetes, and heart disease.
5. Economic and Environmental Impact: Utilizing dragon fruit peel in chocolate production promotes sustainability by reducing food waste. It also provides an economic benefit by creating value-added products from otherwise discarded materials.

Overall, incorporating dragon fruit peel into chocolate bars is a viable way to enhance their nutritional value and appeal. Further research and development can help optimize formulations for commercial production, ensuring that the health benefits and sensory qualities meet consumer expectations.

SUMMARY AND CONCLUSION

An antioxidant chocolate bar made from dragon fruit has the potential to be a successful product if it offers a pleasing taste and texture, maintains a beneficial antioxidant content, aligns with consumer preferences for healthier snacks, and is supported by scientific research. The aim is to utilize the antioxidant-rich properties of dragon fruit peel to create a healthier chocolate bar alternative that offers additional health benefits beyond traditional chocolate. Dragon fruit peel is chosen as the primary ingredient due to its high antioxidant content, particularly polyphenols and flavonoids, which are beneficial for health.The dragon fruit peel is processed to extract its beneficial compounds while ensuring its integration into the chocolate bar does not compromise taste or texture. The formulation process involves blending the processed dragon fruit peel with high-quality chocolate to create a balanced flavor profile that appeals to consumers while maximizing antioxidant content. The resulting chocolate bar is expected to offer

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enhanced health benefits compared to traditional chocolate bars, thanks to the antioxidant properties derived from the dragon fruit peel. There is potential for the antioxidant chocolate bar from dragon fruit peel to tap into the growing market demand for healthier snack options, especially those with natural ingredients and added health benefit. The project may involve research to optimize the formulation for taste, texture, and antioxidant content, as well as conducting consumer studies to gauge acceptance and preferences. Consideration may be given to sourcing dragon fruit peel sustainably to minimize environmental impact and ensure the long-term viability of the project. The project aims to create a novel antioxidant chocolate bar using dragon fruit peel, leveraging its antioxidant properties to offer consumers a healthier snacking option with potential market appeal.

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