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Carrot Powder Incorporated Nutritious Drink Mix Powder

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ABSTRACT:Carrot is one of the nutritious and economical vegetable. It has high carotene with abundant vitamins, dietary fibre and minerals. The objective of this study was to develop the drink mix powder with the incorporation of carrot powder, evaluate the sensory attributes and its nutritive composition. Carrot powder was added to the drink mix at different levels 5, 10 and 15. The chemical composition and sensory values of these samples were studied. The results shows that an increasing level of beta carotene, protein and energy of the drink mix powder by increasing the level of addition of carrot powder. The moisture content of the sample ranges from 3.64 to 4.09, ash 2.49 to 2.84, protein 4.29 to 4.53 and fats 4.06 to 4.2. Protein value shows that treatment 2 (4.56) has the high protein content followed by treatment 3 (4.53), treatment 1 (4.44) and constant (4.29). The energy of the sample ranges from 143.89kcal to150.5 kcal and carbohydrates ranges from 22.51gms to 32.76gms. There is an increase in the carbohydrates content, the treatment 3 shows the highest content (32.76) followed by treatment 1 (3213), constant (22.51) and treatment 2 (23.46). The iron content of the sample varies from the 10.45mg to 10.77mg, calcium 158.78mg to 189.68mg and beta carotene from 34.64mcg to 160.8mcg. The sensory evaluation score for colour ranged from 3.48 to 4.4, taste 3.8 to 4.68, texture3.4 to 4.44, flavour 3.36 to 4.6 and overall acceptability 3.44 to 4.88 on 5point hedonic scale. Taste and flavour of the product scored was good at incorporation of carrot powder at 15 gms. sensory evaluation scores for overall acceptability showed that treatment 3 (4.88) was best accepted followed by treatment 1 (3.68), constant (3.44) and treatment 2 (3.32).

KEYWORDS: Carrot Powder,Beta Carotene, Nutritious Drink Mix.

I. INTRODUCTION

People's concerns toward health are always shifting as their worries about health issues rise. Consuming a nutritious diet has emerged as a pressing concern. Eating healthily requires more than just basic foods. As a result, a diverse range of healthy drink mix are accessible. While some of these nutritious beverages boost workout performance, others focus on balancing the body's nutritional needs (Zijian Zhang, 2021).

Additions of nutritious powders to any diet are beneficial. A combination of fiber, protein, mono- and polyunsaturated fatty acids will aid in fulfilling the daily dietary requirements. Eating nutrient-dense powder has been linked to giving the body the extra energy it needs and the protein helps to develop muscle (Shinjini Parel and SS Vijayanchali., 2014).

The need for energy and nutritional supplements is rising in the modern world. Health drinks offer energy and nutrients to adults and teenagers alike. Health drinks are often marketed and sold as nutritious beverages to growing youngsters(Shery et al., 2013).

There are many different kinds of health drink mixes accessible; thus, it was the best food product to treat the deficit since it was simple to consume and well-liked by kids. The gap between children's needs and frequent deficiencies which can occasionally lead to diseases like acute respiratory infections and diarrhoea, must be filled by health drinks with vitamin enrichments. According to a number of studies, taking iron supplements increases growth rate and lowers the likelihood of illnesses (Dr. Sangeeta Pandey and Affrin Noor, 2020).

Lepidium sativum Linn., also known as garden cress, is an edible annual herb that grows quickly and is extensively planted throughout several nations. It is a member of the Brassicaceae

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family and is valued for its medicinal and nutritional properties. The therapeutic qualities of the seeds are attributed to their abundance of phytochemical components. Lepidine, a diuretic, is included in garden cress seeds (Tanu Jain 2017). Compounds in seeds called imidazole's have antihypertensive properties. Semilepidinosides (a and b), flavonoids and glucosesinolates have antiasthmatic, antioxidant and anti-caricnogenic properties, respectively. (Zidan and Nahla S. 2019). The hypoglycaemic, hypotensive, bronchodilator, cardiotonic, antibacterial and antidiarrheal effects might be attributed to the bioactive components of the plants under research, such as flavonoids. The primary subclasses of flavonoids include flavones, flavanones, isoflavones, flavanols, chalcones, and anthocyanins; these chemicals are then joined to sugars to create C-glycosides and O-glycosides. (M. A. Abdelaleem., 2019) The seeds have almost equal amounts of fat and protein, ranging from 23 to 25%. Seeds include 317 mg of calcium per 100g. Along with other vitamins and minerals, it has excellent amounts of zinc (4–5 mg/100g) and iron (17–33 mg/100g). The macro and micronutrient-rich seeds have been added to food items as a means of preventing anemia, malnutrition and other illnesses. (Hanan and Colleagues, 2019).

The substance made by condensing the sweet fluids of sugarcane or palm trees into a solid or semi-solid condition is known as jaggery. It mainly contains high iron and copper than refined sugar, making it a powerful source of iron (nitinthakareet al., 2020). Jaggery, also known as gur, is an energy food that is believed to help maintain bodily health, cleanse blood and regulate liver function. A high-quality jaggery/gur comprises fewer than 5% minerals and more than 10% glucose and fructose (P.A. Unde et al. (2011).

Naturally, milk powder is an excellent source of many different nutrients that are necessary for the development, growth and maintenance of the human body. One manufactured dairy product that is produced by drying out milk is powdered milk. The majority of milk powders are rich in soluble vitamins and minerals and provide the essential standard amino acids and protein building blocks. The quality of the raw ingredients and the processing method have a major impact on the qualities of milk powder. Milk powder can be kept in a temperature and humidity range above zero degrees Celsius. However, 0 to 10°C storage temperatures and RH below 85% are advised by Russian regulatory requirements (A.G. Galstyan and V.K. Semipyatny.,2023).

Carrot (Daucus carota L) is one of the popular sources of vitamins and dietary carotenoids in many countries (Stephen Sule etal.,2019). It is most popular due to its high carotene content which has anti-oxidative and anti-cancer property with abundant vitamins, dietary fibre and various minerals. B-carotene is converted into vitamin A in our body and plays key role in the maintenance of integrity of epithelial tissue and immune system. Carotenoid in carrot have inhibitory mutagenic activity thus lowers the risk of cancer also; they are potent anti-oxidants which helps to neutralise the effect of free radicals (Sudha Tiwari and Nandita Sarkar,2018).

II. METHODS AND MATERIALS

The raw materials such as garden cress seeds, carrots, jaggery powder and milk powder were procured from the local market of Guntur, Andhra Pradesh.

Processing of carrot powder

The carrots was subjected to two methods viz., Blanching and Dehydration process before pulverizing.

a. Blanching

The carrots were cleaned, peeled, chopped into little cubes and blanched before being dehydrated. Blanching involves immersing small carrot cubes in hot water for five minutes to inactivate the polyphenol oxidase enzyme. After five minutes, small pieces were immersed in tap water.

b. Dehydration

After blanching, tiny cubes were grated and dried in a hot air oven (Fisher Scientific model 230) at 50 ºC for 4-5 hours until no weight change was noticed. They were then finely ground into powder using a food processor (Murphy Richards, SKU:640080). The granulated powder was filtered through a 0.40mm mesh screen and stored (Sudha Tiwari and Nandita Sarkar., 2018).

Development of Drink Mix Powder:

Preparation of drink mix powder:

Garden cress seeds are cleaned from impurities, roasted and allow them to cool until room temperature (25℃ - 30℃). Then seeds are grinded to fine powder. Then all the ingredients were mixed in proportions as mentioned in table 1. Then stored in an air tight container at ambient temperature.

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Table 1: Quantity of the ingredients used for drink mix powder

Ingredients	Quantity(g)			
	Constant	Treatment 1	Treatment 2	Treatment 3
Carrots powder	0	5	10	15
Aliv seeds powder	10	10	10	10
Jaggery powder	15	25	15	25
Milk powder	10	10	10	10

III. ESTIMATION OF NUTRITIONAL PARAMETERS

The chemical parameters analysed includes proximate composition such as moisture, ash, energy, protein, carbohydrates, fats, iron and calcium (AOAC, 1980).

Moisture was determined by taking about 5 g of powdered sample in petri dish and dried in an oven at 60℃ till the weight of the Petri dish was constant. Each time before weighing, the petri dish was cooled in desiccators. Moisture content of the sample was expressed in g/100 g of sample.

$$\text{Moisture Content (\% db)} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Weight of the sample}} \text{ X } 100$$

The ash content of the sample was obtained by dry ashing the samples completely over a flame followed by ashing in a muffle furnace for 4 hours at 600 ºC. this was expressed as g/100 g of the sample (AOAC, 1980).

$$\text{Ash Content (\%)} = \frac{W1 - W2}{\text{Weight of sample}} \text{X } 100$$

Were,
W_1 = Initial Weight of the dish with sample (g)
W_2 = Weight of (dish + sample) after removing from muffle furnace (g)
Energy was computed as follows for all the samples.

Energy [kcal] = [protein [g] x 4] + [carbohydrate [g] x 4] + [fat [g] x 9]

The protein content of the dried samples was estimated as per cent total nitrogen by micro kjeldhal method. Protein per cent was

calculated by multiplying the per cent nitrogen by the factor 6.25.

$$\text{Protein(g)} = \frac{\text{Titre value} \times \text{normality of HCl} \times 0.014 \times 6.25}{\text{weight of sample(g)}} \times 100$$

Carbohydrate content was calculated by difference method.

Carbohydrate [g/100 g] = 100 – [protein [g] + fat [g] + fiber [g] + ash [g] + moisture [g]]

Fat content of the sample was estimated as crude ether extract using moisture free samples. The solvent was removed by evaporation and the residue of fat was weighed.

$$\text{Fat (\%)} = \frac{\text{Weig ht of the ether extract}}{\text{Weig ht of the sample}} \text{ X } 100$$

The iron content of the sample was estimated by using atomic absorption spectrophotometer and the results were expressed in mg/100 g of the sample.

The total amount of carotenoids was determined using a Ultra Violet Spectrophotometer at 450 nm (Julie A howe and sherry A tanumihardjo., 2006)

Carotenoids content (µg/ g) = A × V (mL) × 104 / A1% 1cm ×P(g)
Where,
A = Absorbance; V = Total extract volume; P = sample weight; A1cm 1% = 2592 (β-carotene Extinction Coefficient in petroleum ether).

Statistical analysis
All the data were presented in the form of mean ±SD. To test the significant difference between the organoleptic scores of the product Holm Sidak method was applied.

IV. RESULTS AND DISCUSSION

Sensory assessment is an important component to consider when evaluating the potential of ingredients to strengthen food formulations and the acceptance of finished goods by customers (Snehal Giri and Neena Joshi, 2020). The sensory assessment ratings of health drink mix powder (15 g) blended with warm milk (100 ml) are shown in Table 2.

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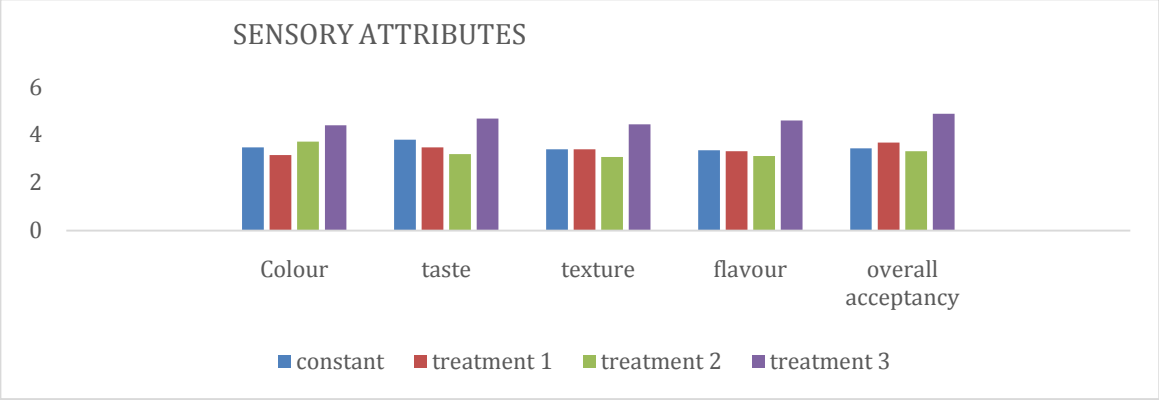
Sensory Parameters	Constant	Treatment 1	Treatment 2	Treatment 3
Colour	3.48±0.65	3.16±0.62	3.72±0.84	4.4±0.64
Taste	3.8 ± 0.76	3.48±0.50	3.2±0.95	4.68±0.47
Texture	3.4±0.64	3.4±0.81	3.08±0.70	4.44±0.50
Flavour	3.36±0.63	3.32±0.47	3.12±0.78	4.6±0.5
Overall Acceptability	3.44±0.65	3.68±0.62	3.32±0.69	4.88±0.33

Table 2: Sensory attributes of the developed drink mix powder; Values are mean ± SD[n=25].

Constant: Standard drink mix powder.
Treatment 1: Drink mix powder with the incorporation of 5gms of carrot powder.
Treatment 2: Drink mix powder with the incorporation of 10gms of carrot powder.
Treatment 3: Drink mix powder with the incorporation of 15gms of carrot powder.



The scores for colour ranged from 3.48 to 4.4, taste 3.8 to 4.68, texture 3.4 to 4.44, flavour 3.36 to 4.6 and overall acceptability 3.44 to 4.88. Among the sensory indicators, color is the first indicator reflecting the quality of a product that attracts consumer's attention. Taste and flavour of the product scored was good at incorporation of carrot powder at 15 gm. Sensory evaluation scores for overall acceptability showed that treatment 4 (4.88) was best accepted followed by treatment 1 (3.68), constant (3.44) and treatment 3 (3.32).

Proximate Composition

The proximate analysis plays a crucial role in assessing its nutritional significance. The chemical composition of drink mix powder for their moisture content, ash, protein and fats are shown in the table 3.

Proximate(g)	Constant	Treatment 1	Treatment 2	Treatment 3
Moisture content	3.64 ± 0.51	3.83 ± 1.60	4.11 ± 0.41	4.09 ± 0.45
Ash	2.49 ± 0.23	2.31± 0.3	3.21 ± 0.06	2.84 ± 0.16
Protein	4.29 ± 0.02	4.44 ± 0.02	4.56 ± 0.41	4.53 ± 0.25
Fats	4.06 ± 0.02	4.16 ± 0.11	4.1 ± 0.2	4.2 ± 0.1

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Energy	143.8± 0.50	146.33 ±0.15	148.3± 0.1	150.5± 0.17
Carbohydrates	22.51± 0.17	32.13 ±0.2	23.46 ±0.2	32.76 ±0.51
Iron	10.45 ± 0.2	10.73 ± 0.22	10.48 ± 0.12	10.77 ± 0.20
Calcium	158.8 ± 0.20	186.37 ± 0.31	162.09 ± 0.06	189.68 ± 0.21
Beta carotene	34.64± 0.30	76.64 ± 0.16	118.7 ± 0.2	160.8 ± 0.23

Table:3 Chemical composition of drink mix powder; Values are mean ± SD[n=3].
Constant: Standard drink mix powder.
Treatment 1: Drink mix powderwith the incorporation of 5gms of carrot powder.
Treatment 2: Drink mix powder with the incorporation of 10gms of carrot powder.
Treatment 3: Drink mix powder with the incorporation of 15gms of carrot powder.

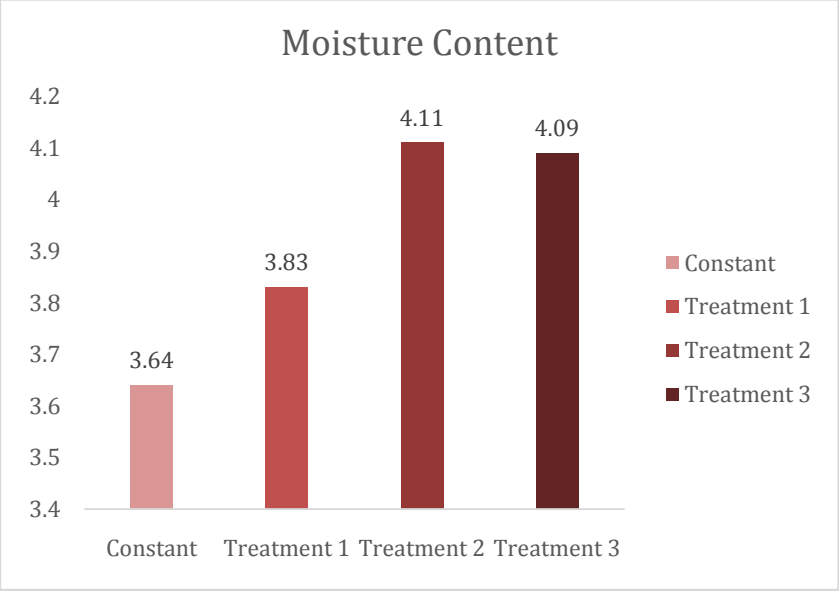

Fig 2: Moisture Content

The moisture content of the drink mix is presented in the Fig.2. The moisture content of the sample ranges from 3.64 to 4.11. The moisture content values for all the samples are constant (3.64 ± 0.51), treatment 1 (3.83 ± 1.60), treatment 2 (4.11 ± 0.41) and treatment 3 (4.09 ± 0.45) respectively.

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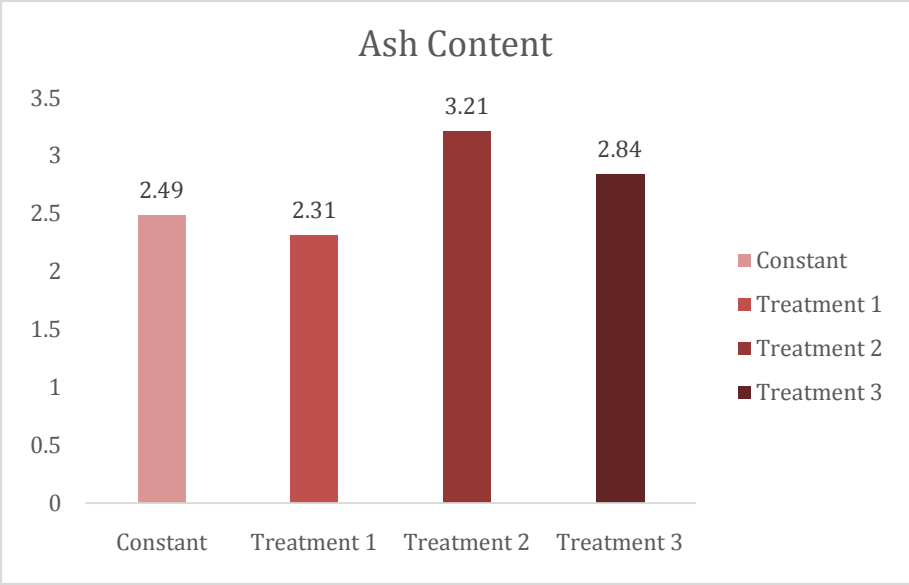

Fig 3: Ash content

The ash content of the drink mix powder is presented in the Fig.3. The ash content of the sample, treatment 2 is recorded as high as 3.21 whereas 2.31 is the least ash content observed in treatment 1.

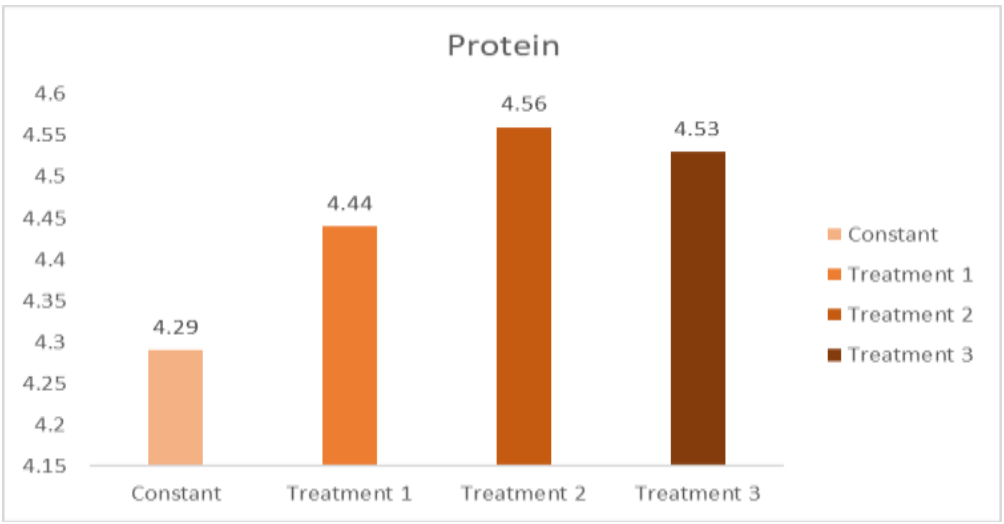

Fig 4: Protein

The protein content in the sample's constant, treatment 1, treatment 2 and treatment 3 are 4.29 ±0.02, 4.44 ±0.02, 4.56 ±0.41and 4.53 ±0.25 respectively. Protein value shows that treatment 2(4.56) has the high protein content followed by treatment 3(4.53), treatment 1 (4.44) and constant (4.29).

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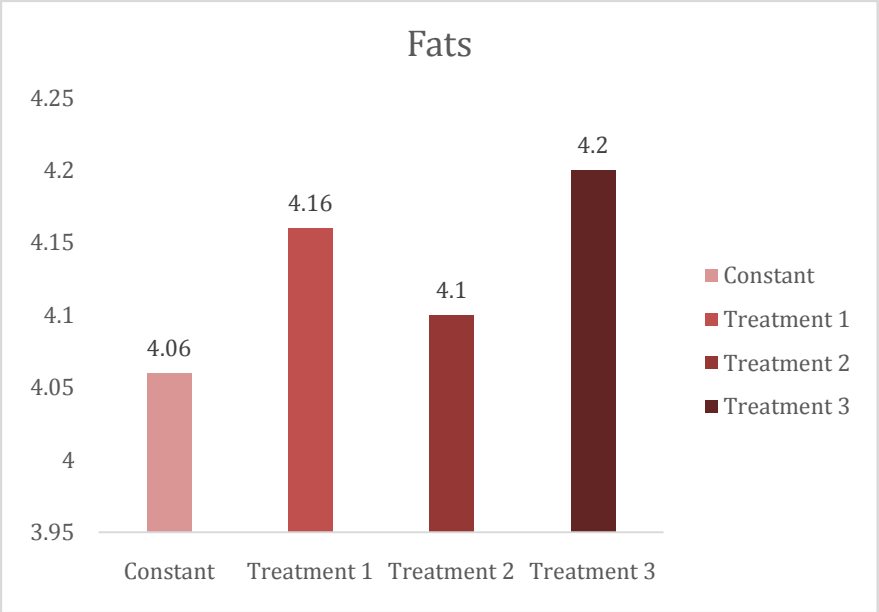

Fig 5: Fat

The fat content of the constant is 4.06 ±0.02, treatment 1 is 4.16±0.11, treatment 2 is 4.1±0.2 and treatment 3 is 4.2±0.1. There no much different in the fat content.

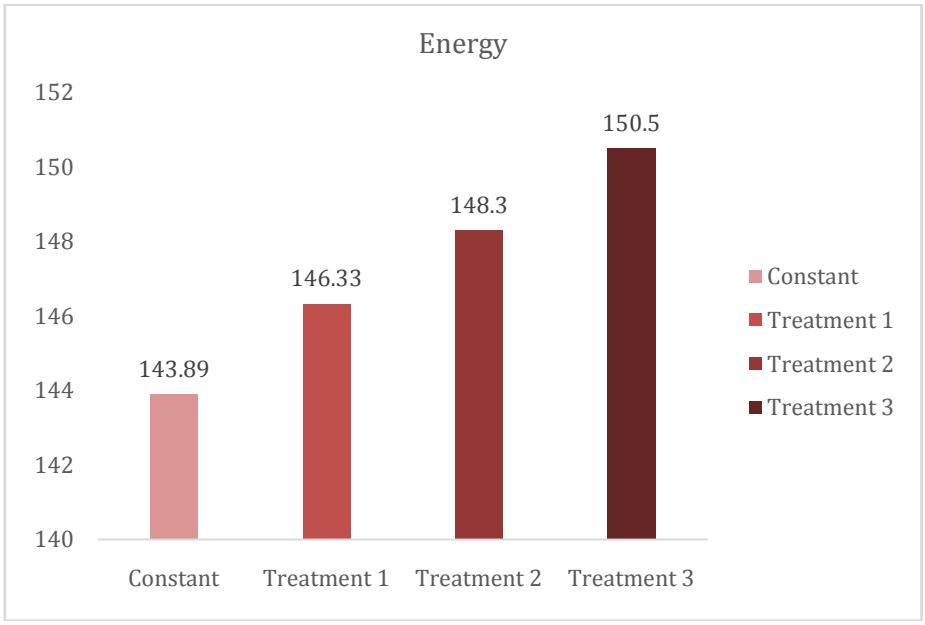

Fig 6: Energy

The energy of the sample ranges from 143.89 to 150.5. The energy in the samples has been increased gradually due to the increase in the jaggery powder and garden cress seeds in the composition.

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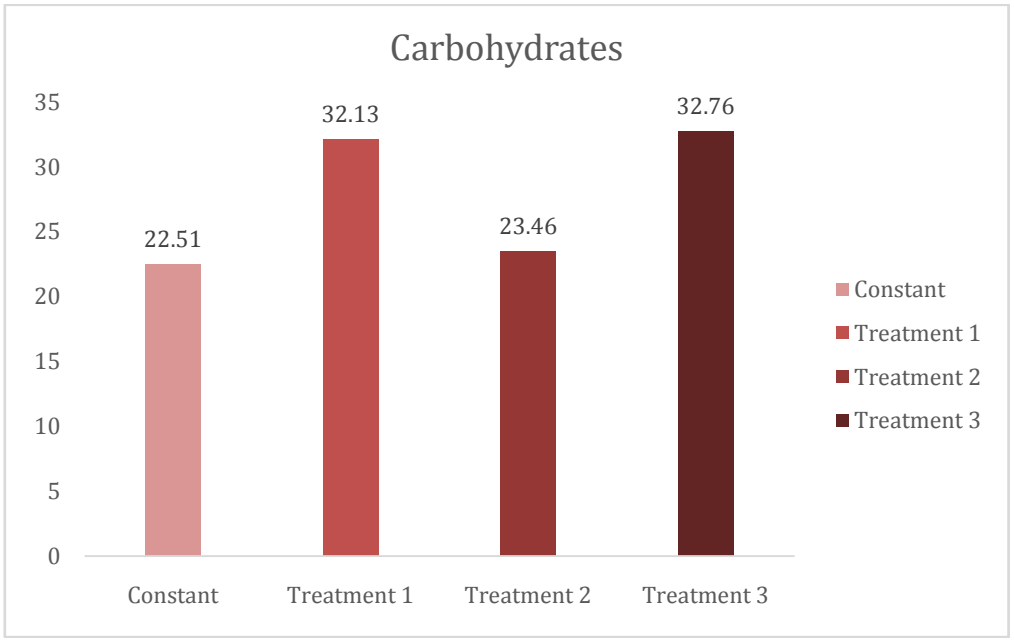

Fig 7: Carbohydrates

There is an increase in the carbohydrates content the treatment 3 shows the highest content (32.76) followed by treatment 1 (32.13), constant (22.51) and treatment 2 (23.46). The values of constant is 22.51 ± 0.17, treatment 1 32.13 ± 0.2, treatment 2 is 23.46 ±0.2 and treatment 3 is 32.76±0.51.

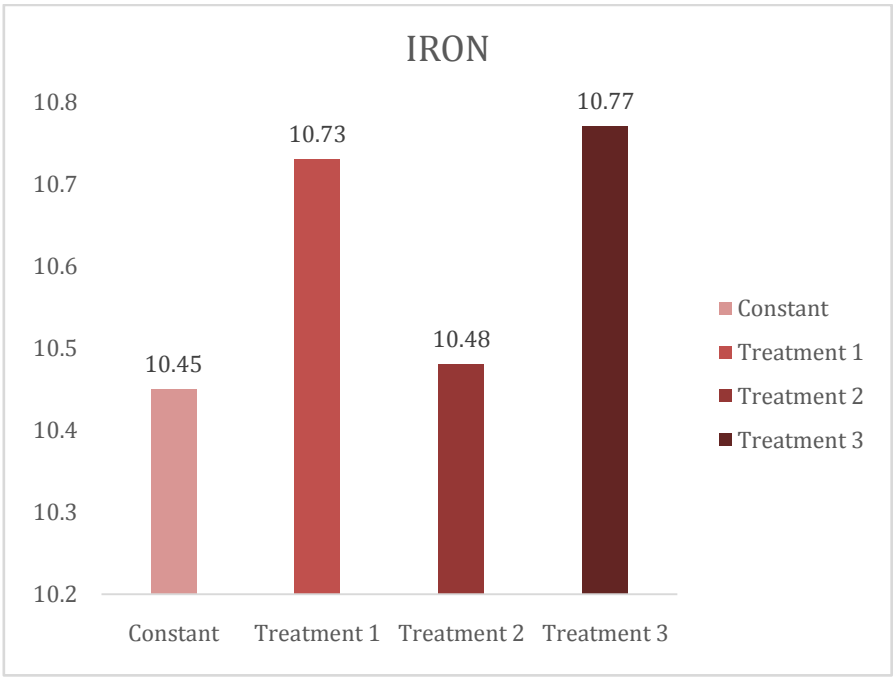

Fig 8: Iron

The iron content of the sample varies from the 10.45 to 10.77. The constant value is 10.45 ±0.2, treatment 1 is 10.73±0.22, treatment 2 is 10.48±0.12 and treatment 3 is 10.77±0.20.

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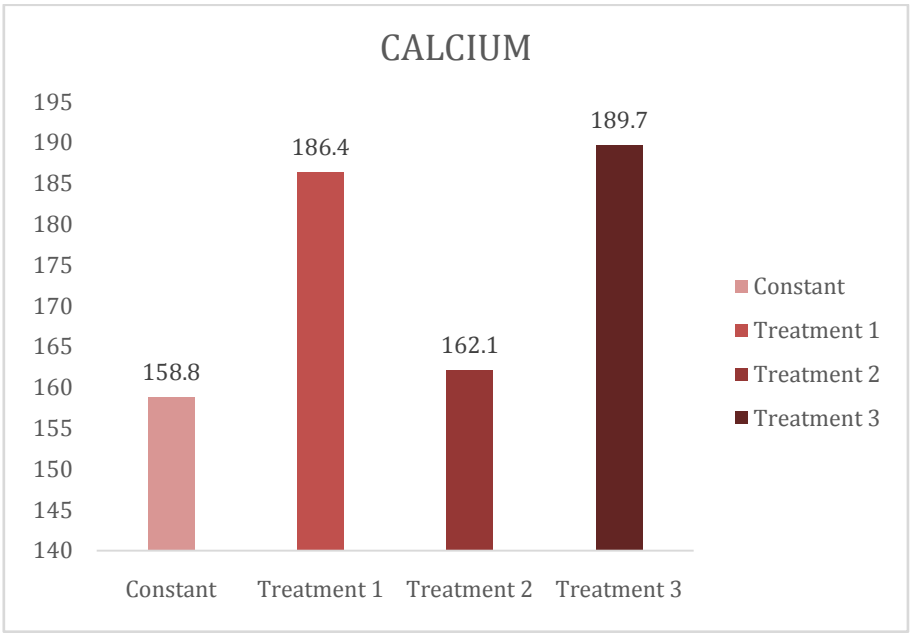

Fig 9: Calcium

The calcium content of the sample varies from the 10.45 to 10.77. The constant is 158.78±0.20, treatment 1 is 186.4±0.31, treatment 2 is 162.09±0.06 and treatment 3 is 189.68±0.21. In the treatment 1 and treatment 3 the calcium content has been increased due to the presence of milk powder.

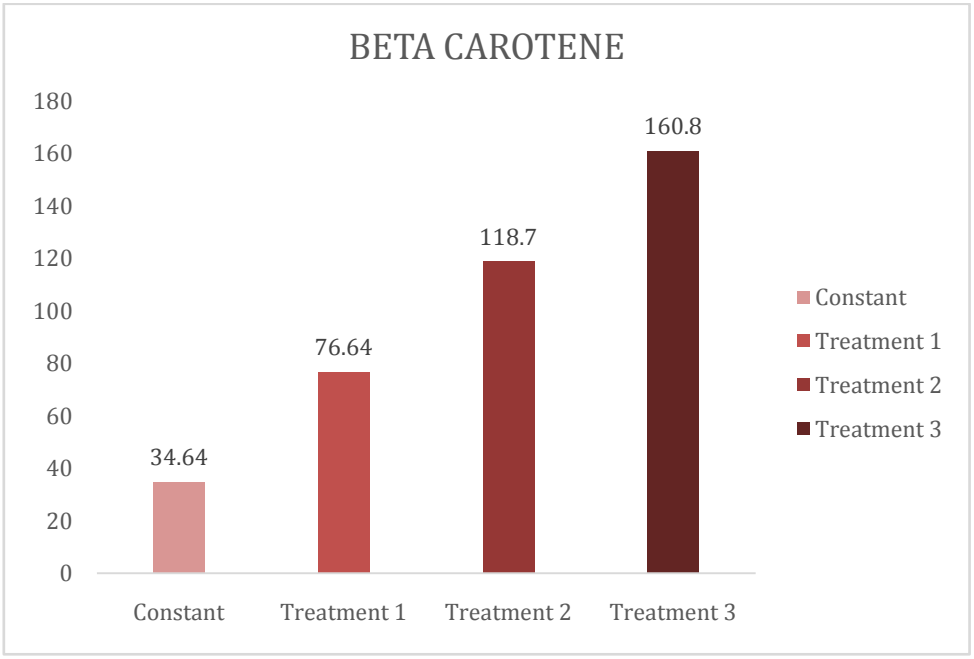

Fig 10: Beta Carotene

Beta carotene varies from 34.64 to 160.8. There is a vast difference in the increasing of beta carotene as the quantity of the carrot powder increases in the composition. The values of beta carotene in constant is 34.64±0.30, treatment 1 is 76.64±0.16, treatment 2 is 118.7±0.2 and treatment 3 is 160±0.23.

V. CONCLUSION

A good quality and nutritious drink mix powder can be produced from different proportions of carrot powder. By incorporating different ingredients such as garden cress seeds, carrot powder, jaggery powder and milk powder the nutritive composition of an drink mix can be enhanced. It could be concluded from the present discussion that the drink mix powder sample D scored high in sensory evaluation with 4.88 overall acceptability. As the composition of the carrot powder increased the beta carotene values has been increased the values varies from 34.64 to 160.8.

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