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ORGANOLEPTIC, PROXIMAL ANALYSIS & SHELF LIFE DETECTION OF OATS BASED CHOCOLATE

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Abstract*:* The purpose of the research is to develop and analyze the product developed from Indian Gooseberry and Grapes that are very rich in antioxidants and provide many positive impact on athlete's body. The objectives of the study involves development of Nutritious Bar, study its nutritional composition, sensory evaluation and shelf life analysis. The nutritious bar was formulated in three different variations taking the ingredients in three different concentration, T1(4g Indian Gooseberry and 400mg Grapes), T2(6g Indian Gooseberry and 500mg Grapes) and T3(8g Indian Gooseberry and 600mg Grapes). Acceptability of the product was evaluated by 20 trained panelists using composite score card.

Result: The result showed that the product formulated in three different variations from which sample T2 has the highest acceptability regarding all five attributes.

Conclusion: The present outcome leads to development of value added product rich in iron and Vitamin C which is beneficial for the sports person. Iron helps in oxygen transports through different body parts in combination with oxygen(haemoglobin), helps in energy

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metabolism and also maintain balance of acid- base in body that which is an important part in body of an athlete.

Keywords: *Indian gooseberry, Antioxidants, Metabolism, Fatique, and Oxidative stress*

1. INTRODUCTION

Nutrition is the foundation for every sports. Food that an athlete eats has a direct and massive impact on sports performance. Athlete is a one competes in many discipline that include strength , speed , or endurance (**Maughan, 2012) [10] .** Sports performance is the ability by which participation in sports is measured. Performance has distinct aspects, these includes: Mental control, Neuromuscular factor, Coaching and External support.

Indian gooseberry botanically known as "*Phyllanthus emblica*" and "*Emblica officinalis*" also called "AMLA". Traditionally, used for medicine including it's leaves, seeds and fruits. Amla is a wonderful source of Vitamin C and polyphenols, help to support and strengthen the immune functioning. It builds a defence mechanism against bacteria and virus in the body and also keeps check on oxidative stress and prevent oxidation of vitamin C. Amla plays a very important role as it increases the blood count and haemoglobin level in the body, which in turn helps in regulation of key nutrients to all body organ.

Grapes, botanically known as "Vitis vinifera" grown and cultivated in variety of soil and weather condition, belong to family Vitaceae. Grapes contain flavonoids, resveratrol, anthocyanins, which reduce the atherosclerosis, includes oxidation inhibition of Low Density Lipoprotein & effects on cellular redox state. **(Dohadwala et al, 2009) [3].** Grapes contain different phtyochemicals that helps in prevention of cancer, like breast cancer, colon cancer and prostate cancer. Due to chronic inflammation and oxidative stress, there is a development

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of cancers. Grapes contain high amount of water that can help to make digestive system work properly and efficiently.

Oats, scientifically known as "*Avena sativa*" are a cereal commonly consumed in the form of rolled oats or oat meal. Oats are rich in Fiber and Carbohydrates, but also high in Fat and Protein than other grains. Oats are rich in Fiber and Carbohydrates, but also high in Fat and Protein than other grains. Oats helps in lowering the total cholestrol and LDL – cholesterol and ratio of total of total HDL – cholesterol. **(Maboodurrahman et al, 2015) [11]**

Dark Chocolate is a type of chocolate that containes cocoa butter without milk, cocoa and less in sugar. Dark chocolate is categorized on the basis of their taste and content of cocoa present; Semi - sweet, Bitter – sweet & Sweet dark chocolate. Dark chocolate is a rich source of minerals, like zinc and magnesium and also contain Flavonoid, an anti-oxidant that neutralize the free radical. Dark chocolate is rich in cocoa, containing large concentration of catechins, apicathecins, flavonoids and procyanidins and also the nitrogenous compound of cocoa include methylxanthinestheobromine and caffeine. **(Mabooddurranhman et al, 2015) [11]**

Pistachios, small tree of cashew family and its edible seeds grown in warm or temperate climates. Natural source of anti-oxidants (Luetin, Beta-carotene and Tocopherol) which fight against free-radical helping muscle to recover faster an intense game or a workout session.

Almond are the edible seeds of *Prunus duleis*, more commonly called the almond tree. Almond comprises essential nutrients and a source of Protein. Salted almonds with the fluids to enhance Rehydration, providing a source of protein for Muscle Repair and Building, source of Vitamin E for the immune systems.

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Honey is sweet in taste, produced by bees collecting nectar. It is a liquid, thick and viscous substance. Honey is good for heath than sugar and also act as glue for sticking the bar together.

2. Materials & methods:

1. Procurement of grapes and Indian Gooseberry

Grapes were procured from cold stores of different areas of NCR in month of October and November. Indian Gooseberry powder was prepared. Oats, Pista, Almond, Honey and Dark chocolate were procured from market.

2. Cleaning and washing of Grapes

Firstly, the grapes were taken and cleaned properly with warm water so to remove all the extraneous and unwanted substance persent on the outer layer of the grape after which dry the grapes using clean and dry cloth. Squeeze out the pulp from the grape for further processing.

3. Development of Nutritious Energy Bar

Nutritious Energy Bar was developed incorporating Indian Gooseberry and Grape under varied concentration. One standard energy bar was developed for sensory evaluation.

Standard : 50g oats, 25g almond, 25g pistachio, 20g honey and 30g dark chocolate.

Sample 1 (T1) : 4g Indian Gooseberry and 400 mg grapes, 46g oats, 25g almond, 25g pistachio, 20g honey and 30g dark chocolate.

Sample 2 (T2) : 6g Indian Gooseberry and 500 mg grapes, 44g oats, 25g almond, 25g pistachio, 20g honey and 30g dark chocolate.

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Sample 3 (T3) : 8g Indian Gooseberry and 600 mg grapes, 42g oats, 25g almond, 25g pistachio, 20g honey and 30g dark chocolate.

Materials:

- Oats
- Indian gooseberry
- Grapes
- Almond
- Pistachios
- Honey
- Dark chocolate

Weigh oats, pistachio and almond accurately.

↓

Grind the weighed ingredients into coarse texture.

↓

Add honey into grinder and again grind them all together.

↓

Now, add Indian gooseberry powder of desired concentration.

↓

Add required grape amount to the mix.

↓

Heat the dark chocolate, through double jacketed bowl.

↓

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Shape the grinded mix into bars, and allow them to set in refrigerator for 1 hour.

Figure 1: Flowchart of the process.

Proximal analysis methods:

A. DETERMINATION OF CARBOHYDRATES

The energy was calculated;

APPARATUS : 100 mg sample, hot water bath, distilled water, anthrone reagent and colorimeter.

PROCEDURE **:** take 100mg sample of oat chocolate in test tube and keep for 3 hours in hot water bath for hydrolysis. Add 1000ml distilled water during centrifugation. Now, weigh 0.5 ml & 1.0 ml of the test tube sample and add anthrone reagent and heat for 20 minutes. After which, measure the optical density using colorimeter at 480nm.

B. DETERMINATION PROTEIN : It was done by IS:7219 method.

C. DETERMINATION OF ASH: It was done by AOAC(931.04) method.

D. DETERMINATION OF MOISTURE: It was done by AOAC(13.002) method.

E. DETERMINATION OF FAT: It was done by AOAC method.

F. DETERMINATION OF IRON: It was done by AAS method.

Shelf life detection methods:

A. Test for TPC: Determination of TPC of the most accepted sample T2 was determined through IS 5402 method.

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B. Test for Yeast and Mould: Determination of yeast & mould of the most accepted sample T2 was determined through IS 5403 method.

C. Test for Salmonella: Determination of salmonella of the most accepted sample T2 was determined through IS 5887 method.

Statistical Analysis method:

A. Mean : Mean is defined as the sum of values of sample and the sample taken.

B. Standard Deviation: standard deviation means a number that tells about how measurements of a group are spreaded out with respect to the average (mean) or expected value.

Low = very close (average)

More = spreaded out

The symbol of standard deviation is **σ**

C. One Way ANOVA Test –it is a statistical process that tells about the variance. It is a very useful in comparing of means of two or more which helps a researcher to built different results and prediction.

3. Result & Discussion: For Overall Acceptability of the developed product composite score card was used. Result as are follows;

TABLE 1: *Acceptability of attributes within the samples.*

PARAMETER	Composite Scoring with Mean & Std. deviation			ANNOVA
	Sample T1	**Sample T2**	**Sample T3**	
TASTE (20)	18.30±.733	19.35±.489	17.50±.513	<0.01

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COLOR (20)	18.05±.605	19.55±.510	17.49±.510	<0.01
FLAVOUR (20)	18.35±.489	19.05±..686	17.64±.587	<0.01
TEXTURE (20)	18.45±.945	19.25±.639	17.90±.788	<0.01
OVERALL ACCEPTABILITY (20)	18.55±.510	19.35±.489	18.10±.308	<0.01

Table 1 represents that the taste attributes of sample T2 had the highest mean value19.35±.489 followed by sample T118.90±.641 and T3 17.50±.513respectively. The result shows that Sample T2 has the highest acceptability with respect to taste compared to sample T1 and T3. There was significant difference between the samples as concluded by one way ANOVA ($p < 0.01$).

The color of the sample T2 had the highest mean value 19.55±.510 followed by sample T1 18.05±.605 T3 17.49±.510 respectively. The result shows that Sample T2 has the highest acceptability with respect to colour compared to sample T1 and T3. There was significant difference between the samples as concluded by one way ANOVA ($p < 0.01$).

The Flavor of the sample T2 has the highest mean value of 18.80±.768 followed by sample T1 18.55±.605 T3 17.90±.788 respectively. The result shows that Sample T2 has the highest acceptability with respect to flavour compared to sample T1 and T3. There was significant difference between the samples as concluded by one way ANOVA ($p < 0.01$).

The texture of the sample T2 has the highest mean value of 19.25±.639 followed by sample T1 18.45±.945 and T3 17.90±.788 respectively. The result shows that Sample T2 has the

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highest acceptability with respect to texture compared to sample T1 and T3. There was significant difference between the samples as concluded by one way ANOVA ($p < 0.01$).

The overall acceptability of the sample T2 has the highest mean value of 19.35±.489 followed by sample T1 18.55±.510 and T3 18.10±.308 respectively. The result shows that Sample T2 has the highest acceptability with respect to overall acceptability. There was significant difference between the samples as concluded by one way ANOVA ($p < 0.01$).

Table 2: Proximal Analysis of the developed and most accepted product.

Parameter	Values
TOTAL ENERGY	839.25 Kcal
TOTAL FAT • SATURATED FAT • PUFA • MUFA	 23.685 11.07 15.795
PROTEIN	34.08
CRUDE FIBER	20.835
TOTAL CARBOHYDRATE	61.995
SUGAR	45.57
SODIUM	513 mg
CALCIUM	87 mg
VITAMIN A	58.5 IU
IRON	27 mg
CHOLESTROL	0.0 mg

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VITAMIN C	2.175 mg
TOTAL ASH	5.85 %
TOTAL MOISTURE	8.475 %

Table 2 revealed the proximal analysis of most accepted product i.e. T2 the energy was found 839.25 kcal, Saturated fat 23.6g, MUFA 11.1g and PUFA 15.79g , protein was recorded 34.08g , 20.835g of crude fiber, 61.995g of carbohydrates, 45.57g of sugar, 513mg of sodium, 87mg of calcium, 58.5 IU of Vitamin A, 2.175mg of Vitamin C, 5.85% of total ash and 8.475% of total moisture per 150g of sample The iron was found 27mg / 150gm which is near by the daily iron required by an athlete . Also contain good amount of Vitamin C which plays many vital role during exercise.

Table 3: Microbial load of the most accepted product (T2)

PARAMETR	**30° C**				**35° C**			
DAYS	**7th**	**15th**	**30th**	**45th**	**7th**	**15th**	**30th**	**45th**
SPS (cfu)	700	890	1086	1250	816	998	1190	1309
YEAST &MOULD (cfu)	5	6	8	10	5	7	9	10.5
COLIFORM	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab
SALMONELLA	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab
ACIDITY	2.48%	2.46%	2.45%	2.44%	2.48%	2.46%	2.45%	2.44%
TASTE	**A**greeable							

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Table 3 depicted that the shelf life of most acceptable product was recorded at different temperature in different days (45 days) , at 30° C the highest value of SPC was found in 45 days 1250 cfu/g whweras at 35 C the highest value count was 1309 cfu/g in 45 days which is highest as compare to 30 C but the product was safe in both the temperature for one month.The YMC count of the product the highest value found at 35 C 10.5 cfu/g in 45 days whereas less count was found at 30 C 10 cfu/g but the product was safe in both the temperature for one month.The salmonella and coliform count were absent during one month. So the product was safe for consumption and good quality for one month.

4. Conclusion:

The present research was conducted for the development of value based product named Oats based Chocolate using Indian Gooseberry and Grapes in variation with different concentration to know its acceptance, nutritive value and shelf like for further use. Chocolate was formulated by incorporating Indian gooseberry powder by evaluating its given dosage in researches. After which, three variation were developed using different concentration of Indian gooseberry powder and Grapes. Sample T0 was made and taken as standard sample without adding Indian gooseberry and Grapes. Sample T1 was developed with incorporating 4 g Indian gooseberry powder of and 400mg grapes, sample T2 was developed with incorporating 6g Indian gooseberry powder of and 500mg grapes, and sample T3 was developed with incorporating 8g Indian gooseberry powder of and 600mg grapes. The developed sample were further taken for sensory evaluation, proximal analysis and shelf life for one month.

From the composite Score card, it was concluded that among the developed samples the overall acceptability of sample T2(oats based chocolate with 6g Indian Gooseberry and

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500mg Grapes) was highest as compared to other samples i.e. sample T1(oats based chocolate with 4g Indian Gooseberry and 400mg Grapes) and sample T3 (oats based chocolate with 8g Indian Gooseberry and 600mg Grapes). Sample T2 was the highest in acceptance regarding all attributes using composite score card.

The proximal analysis of most accepted Sample T2 was 839.25 kcal of energy, Saturated fat 23.6g, MUFA 11.1g and PUFA 15.79g , 34.08g of protein, 20.835g of crude fiber, 61.995g of carbohydrates, 45.57g of sugar, 513mg of sodium, 87mg of calcium, 58.5 IU of Vitamin A, 2.175mg of Vitamin C, 5.85% of total ash and 8.475% of total moisture per 150g of sample The iron content of the most accepted sample T2 comes out to be 27mg / 150gm which is near by the daily iron required by an athlete The present outcome leads to development of value added product rich in iron and Vitamin C which is beneficial for the sports person. Iron helps in oxygen transports through different body parts in combination with oxygen(haemoglobin), helps in energy metabolism and also maintain balance of acid- base in body that which is an important part in body of an athlete. Vitamin C helps in reduction of free radicals which in turn reduces the oxidative stress and increase time of fatique, normalize metabolism and also decreases the accumulation fats which result in maitainence of weight in sports.

Shelf life of the developed product most accepted sample was analyzed which comes out to be.1 month from the date of manufacturing.

Also, the study will serve as a base for intervention studies to create scientific tool, knowledge and evidence that help to conduct future researches.

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Conflict of interest: The author declares no conflicts of interest.

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