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DEVELOPMENT OF SUGAR REDUCED “OATS BREAKFAST CRUNCHES”

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ABSTRACT - High sugar intakes are associated with obesity, insulin resistance, diabetes mellitus type 2, dental caries, and fatty liver (WHO, 2003). Sugar has major part to play in the sensory properties of confectionery products, Such as cookies, biscuits. Reducing sugar in these products is a huge challenge to a food industry. In sweet products sugar is responsible for sweetness, while fat contributes to the texture, mouth feel, flavour, and aroma of food. Baking can reduce sugar or reduce sucrose. Texture and fat in the food matrix plays an important role in sugar- reduction studies because both highly influence the sweet taste perception. Fat plays a critical role in the Perception of sweet taste, in emulsions with higher fat content sugar is reduced. Gitlin and Ellis et al, 2012; Severson, 2016 (How Breakfast Got it's crunch) Since Indian diet need less sugar, it is necessary to develop the reducing sugar product. to prepare “Oats Breakfast Crunches” Betts et al, 2014. It also contains Almond Butter for the extra flavour Cranberry, Coconut, Oats was used McFarlin et al., 2016 (Consumption of a high-fat breakfast on consecutive days). The crunches was analysed for its physical, biochemical and sensory properties. The quality of crunches was determined on the basis of its physiochemical characteristics such as Energy (140.76 Kcal), Ash content (2.75%), Moisture Content (6.9%), Carbohydrate content (71.15g), Protein content (19.2%), Fat content (15.22g), Sugar (4.88g), along with organoleptic analysis including sensory attribute like colour, flavour, texture, taste and overall acceptability. Microbiological testing and shelf life studies were also carried out and suitable packaging for the product was also identified. Oats Breakfast Crunches is a sugar reduction product it's a free alternative to those who are suffering from Diabetes mellitus type 2 or Diabetic ketoacidosis. It is a good source of Protein and for less sugar.

Keywords - Functional food, Sugar reduction, High blood glucose level, Diabetes mellitus.

I. INTRODUCTION

A modified food that claims to improve health or well-being by providing benefit beyond that of the traditional nutrients it contains. Functional foods may

include such items as cereals, fruits, nuts, beverages that are fortified with vitamins, some herbs and Nutraceuticals.

Diabetes has become more common in where food is plentiful. Excess sugar consumption can lead to obesity, cardiovascular disease, and other health problems. However, its relationship with type 2 diabetes is still complex. Type 2 Diabetes: Sugar consumption will not directly cause either type. However, eating too much can cause weight gain. Obesity is a risk factor for type 2 diabetes. Direct mechanisms of sugar that lead to diabetes involve a sugar called fructose. The liver absorbs fructose without regulating the intake, potentially leading to a build-up of liver fats, and decrease in insulin sensitivity. Diabetes Direct mechanisms of sugar that lead to diabetes involve a sugar called fructose. The liver absorbs fructose without regulating the intake, potentially leading to a build-up of liver fats, and decrease in insulin sensitivity.

Oat (*Avena sativa* L.) is an important forage crop of hilly areas spread over in the hills. Oats are rich in fibre content with 32.88-34.82 percentage of fibre on dry matter basis due to which it is included in human diet too. Oat has quick regeneration and tillering capacity and presents a food palatable fodder Taylor et al., (2017) children consume half of the daily sugar quota at breakfast. Oat fodder is quite nutritive containing, on an average, 7.6 percentage crude protein at 50% flowering stage and about 14.6 percent at very early stage of growth. Oat ranks sixth in world cereal production.

Cranberry is product from the berry fruit of a North American green shrub. Cranberries are used different purposes and different benefits. It is useful in food as well as in herbal medicine. *Vaccinium macrocarpon* is the Latin name of the Crain berry plant. Cranberry fruit contains large amount of antioxidants than it compared to other fruits and vegetables like spinach, broccoli and apples. Cahill et al. (2013)

Desiccated coconut is the grated and dehydrated coconut meat, which is mainly used in the bakery and confectionery industries. The codex Alimentations standard for various grades of desiccated coconut

contains three size classifications: extra fine, fine and medium. Desiccated coconut processing includes selection of, nuts, husking, shelling, removing the test, washing, heating, disintegrating, drying, sieving and packaging.

Almond butter is a food paste made from grinding almonds into a nut butter. Almond butter may be “crunchy” or “smooth” and is generally “stir” Richardson et al., 2009. (It is recommended that almond butter be refrigerated once opened to prevent spoilage and oil separation Almond butter is made from almonds so it contains healthy fats, protein and minerals and it can easily be part of a healthy diet. It is a great source of monounsaturated fat Protein Alasalvar & Shahidi et al., 2009 Almond Board of California. (2007a). Guidelines for validation of blanching processes [Online]: www.almonds.com/consumers/about-almonds/global-almondusage (Accessed 02/12/2015) fibre which are essential for heart health. Monounsaturated fats are associated with lowering the risk of heart disease. Eating almonds offers antioxidant action from vitamin E and helps lowering cholesterol.

II. METHODOLOGIES

2.1. Materials

Name of Ingredients	Amount
Oat Flour	128g
Oats	64g
Almond Butter	2tbsp
Baking Soda	2.5g
Powdered Sugar	6g
Vanilla Extract	2 drops
Milk	50ml
Salt	0.5g
Dried Cranberry	10g
Desiccated Coconut	10g

Table No. 1:- List of Ingredients

1.2 METHOD

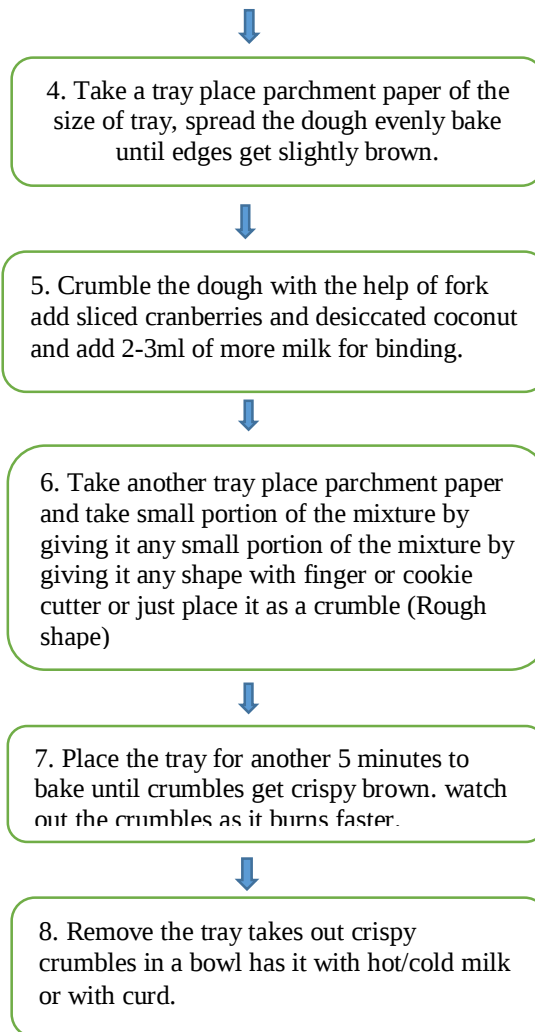
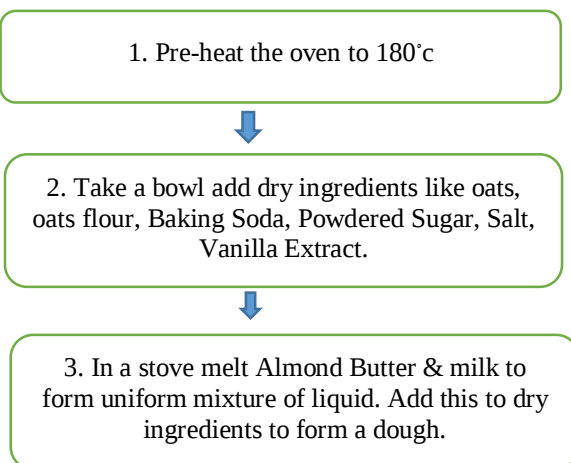


Fig No - 1 Flowchart depicting method of preparation

1.3 PRODUCT FORMULATION TRIALS



Fig No - 2 Flattened Dough



Fig No - 3 In Process Crunches



Fig No - 4 Crispy Crunches

III. PROXIMATE EVALUATION OF THE PRODUCT

Using different methods carried out proximate analysis of the product.

3.1. Evaluation of Ash Content

Ash content of the product was evaluated by using Muffle Furnace. The sample was weighed and incinerated to remove the carbon molecules from the product and ignited at 550°C in the muffle furnace.

3.2. Evaluation of Fat Content

Fat content of the product was evaluated by using the Soxhlet method. Crude fat was determined using the Soxhlet extractor and petroleum ether as a solvent. Method described in A.O.A.C Manual.

3.3. Evaluation of Moisture Content

Using Oven Drying Method i.e. the conventional method evaluated moisture content of the product.

The sample was weighed and treated at 100°C for 3 hours in the Hot Air Oven.

3.4. Evaluation of Protein Content

The protein content of the product was evaluated by using Biuret method. Method described in A.O.A.C Manual.

3.5. Evaluation of Carbohydrate Content

Carbohydrate content was determined by using weight difference method subtracting the sum of the values of moisture, protein, fat and ash from 100.

3.6. Evaluation of Energy Content

Energy content was determined by multiplying the crude proteins, crude carbohydrates and crude fats by water factors 4,4 and 9 respectively.

3.7. Evaluation of Crude Fibre

Crude fibre was evaluated by acid-alkali hydrolysis method. Method described in A.O.A.C Manual.

3.8. Evaluation of Reducing Sugars

The reduced sugar content was determined by Dinitro Salicylic Acid (DNS) Method. Method described in A.O.A.C Manual.

IV. MICROBIAL EVALUATION OF THE PRODUCT

Using Total Plate Count Method did the determination of microbial count. The samples were prepared using serial dilution method. The sample was spread on the Nutrient agar plate and Sabouraud's agar plate for the bacterial count and fungal count respectively.

V. SENSORY EVALUATION OF THE PRODUCT

Using 9-point Hedonic Scale for various parameters such appearance colour, taste, odour, consistency and its overall acceptability using 30 untrained panellists did the sensory evaluation of the product.

VI. SHELF LIFE STUDIES OF THE PRODUCT

The shelf life study was carried out at refrigerated conditions and room temperature.

VII. RESULTS

7.1. Evaluation of proximate Analysis

Parameters	Results (per 100g)
Energy	140.76Kcal
Carbohydrates	71.15g
Protein	19.2g
Moisture	6.9%
Ash	2.75%
Fat	15.22g
Dietary Fiber	4.36g
Sugar	4.8%

Table No:- 2 Result of Proximate Analysis

7.2. Evaluation of Microbial Analysis

The microbial load of the sample on both the Nutrient Agar and Sabouraud's Agar was found to be less than 30CFU/ml.

7.3. Evaluation of sensory Analysis.

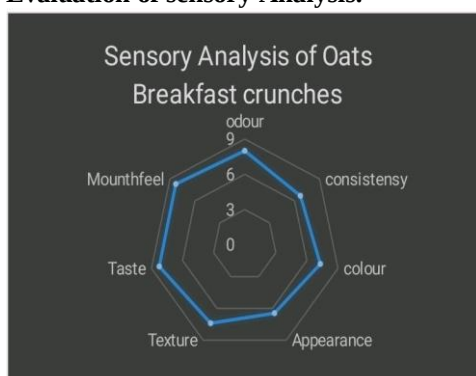


Fig. 5: Sensory evaluation result (Radar Diagram)

VIII. FOOD LABELLING AND PACKAGING

8.1. Packaging Material

Plastic stand-up pouches is a type of flexible packaging which is able to stand erect on its bottom for display, storage and use. Stand up zip-lock pouches have become the ideal flexible packaging medium. Stand up pouches elegantly maximize shelf space over traditional packaging. Such as boxes and cartons and since the pouches are shipped flat before filling, they also minimize costs of freight and warehousing [FSSAI packaging guideline set al., 2018](#) (Rules regulations and guidelines of packaging according to FSSAI) Stand up pouches are best suited for packaging dry goods. Zip-Lock stand up pouches are best suited for packaging dry goods. Zip-lock up pouch acts as a good oxygen, moisture, UV Barrier and a food grade non-toxicated and leak proof.



Fig. 6: Zip-lock Stand up Transparent pouch

IX. LABELLING

A product label is the only way of communicating with each and every consumer. Certain information is mandatory on food label as per the regulatory requirement of the country. As per labelling norms in India (FSSAI FSSR) and globally [Guidelines Nutrition Labelling 16 08 20 18](#), a food label should include the following key features:-

- Name of the food product
- List of the ingredients
- Nutritional information
- Specific claims
- Net weight or volume]
- Batch or lot identification
- Manufacturing date
- Best before date
- Cost of the product (Inclusive of all taxes)
- Storage conditions
- Directions to use
- Veg or Non-veg logo
- FSSAI logo
- Name and address of manufacturer
- Warnings, allergen information

Label for Sugar Reduced "Oats Breakfast Crunches" was done as per the requirements specified in FSSAI and FSSR.

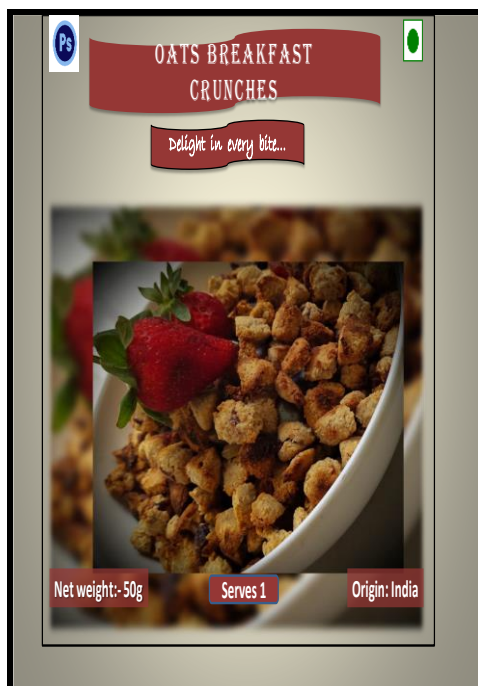


Fig. 7: Front Label

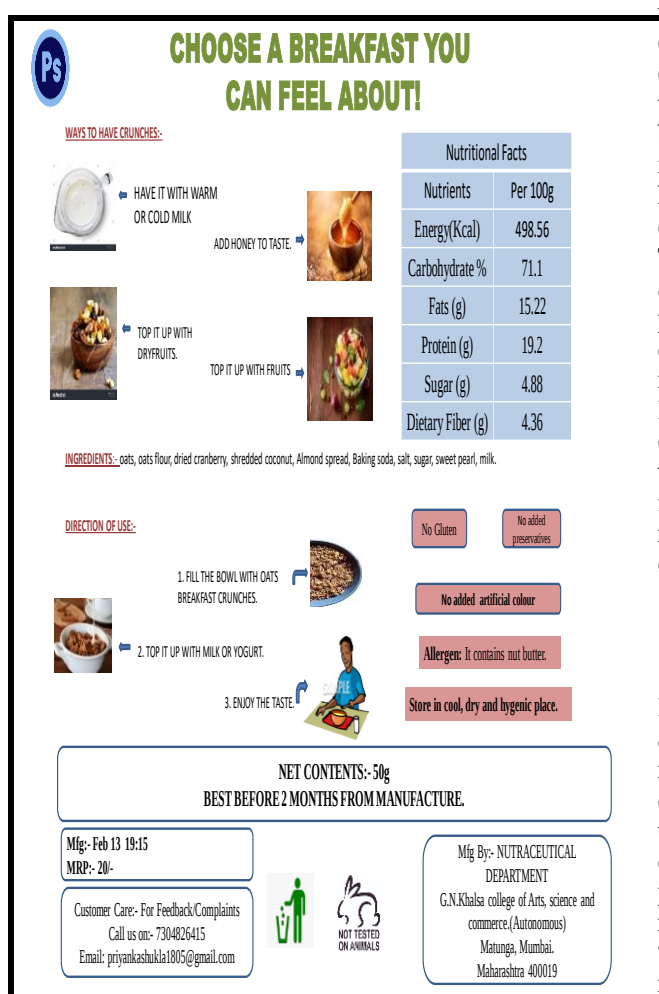


Fig. No 8: Back Label

X. CONCLUSION

The product “Oats Breakfast Crunches” was formulated analysed and studied in product Development, by using traditional ingredients, a functional food was prepared and it was studied for different proximate analysis. The product provides 4.88% of sugar content which is 20-23% sugar reduction from products available in market product contains 7-8% sugar. Oats Breakfast Crunches” are not available in Indian market. Kellogg’s serves 50g for Rs. 89/- which is high in cost for 50g of breakfast cereal. Reduced sugar products are available in the market such as corn flakes, sugar free cereals. But, oats breakfast crunches is sugar reducing cereal, vegetarian, good source of protein and has shelf-life of 2 months. The percentage of sugar has been compared to other products.

XI. ACKNOWLEDGEMENT

I would take this opportunity to express my sincere gratitude to the people who helped me during the completion of the product. Apart from my efforts, the success of this research depends largely on the encouragement and guidance of many. I highly obliged to my parents who encouraged me to make unique packaging and helped me in sensory while baking or making the products, use to give more new ideas and suggestions. And my friends helped me in handling of instruments which were provided by college. Equinox laboratory helped me in testing’s. The protocols I searched myself took help of internet access. Certain data, equipment, reagents were provided by G.N. Khalsa college of arts, science & commerce. Idea of developing crunches I took from mummy worked on traditional foods. Nevertheless, I’m grateful to all my friends, parents for their continuous help and backing me at every step of my work. Their simple little acts of assistance were the foundation of this Research. Working on this research has proved to be an enlightening and has opened up horizons in careers and lives.

XII. FUTURE PROSPECTS

I intend to perform on texture and shape or appearance analysis in future along with some minerals, vitamins as it contains cranberry and coconut intend to get more nutritional facts. Intend to perform on agglomeration. Need to work computer control of processing of product. All these process in need to work out. It can also launch in market. To be get patent a technical information of “Oats Breakfast Crunches” about this invention must be disclosed to the public in a patent application.



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