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A study on formulation, development, analysis, production and marketing of product 'lycosnacks'

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Abstract
Training of small scale unit on a particular product was carried out on lab scale to gain an experience about large scale industry. The product 'Lycosnack' was designed, developed, produced and marketed as a part of the study. The product is a snack made with the ingredients like tomato puree, rice flour and various others. The study was carried out with an objective to develop and standardize the recipe and processing technology of preparation, to quantify the physico-chemical properties, to undertake the storage characteristics, to assess techno- economic feasibility and to measure the marketing feasibility of the product. The product was effectively formulated after understanding the need of consumers, produced on a large scale and marketed as a part of the study.

Keywords: Lycosnacks, storage, consumers, marketing, tomato

1. Introduction
Most often snack food does not provide adequate nutrient quantities needed by the body [1]. This may be due to their composition or due to the production process they went through. Whatever is responsible for the poor content, it is necessary to ensure that every food consumed by an individual contains required nutrient in adequate amount. This is specially due to the fact that many people now work outside their homes and are becoming more dependent on snack for the supply of part of their daily nutritional requirement. Therefore it is necessary to produce highly acceptable snack with high nutritional quality that could be useful in nutritional programs to combat malnutrition and nutrient deficiency. As a product that is consumed on such wide scale, it would be important to enhance its nutritional value [2].
After conducting the market survey, the light came upon the fact that the people mostly prefer the food products that has high quality in the cities [3]. Whereas consumers from the rural areas do not show interest to buy the branded and costly products. Also the consumption patterns of the consumers according to different age groups was noticed [4]. The children are mostly attracted towards the products like biscuits, chocolate, snacks, etc due to its color, texture, taste and flavour which fulfill the children's likes i.e.salty, crispy, sweet, tangy etc. so in order to fulfilled their demands a processed product that have such type of features was to be made from natural substances, cereals, pulses, herbs, fruits etc. that will be healthy for the children and for the different aged groups [5].
Snacks come in a variety of forms including packaged snacks foods and other processed foods well as items made from fresh ingredients at home. Traditionally, snacks are prepared from ingredients commonly available in the home[6].A ready-to-eat nutritious snack was developed by blending the rice flour, refined wheat flour with tomato puree and other ingredients with an objective to develop and standardize the recipe and processing technology of preparation of snacks, to quantify the physicochemical properties of product, to undertake storage characteristic of product, to assess techno-economic feasibility of lycopene enriched multigrain snacks, to measure the marketing feasibility and assess profit loss sheet of preparation of product and to study the sensory characteristic of lycopene enriched snacks [7].
Multigrain snacks are good potential in market and having well market demand [8]. The multigrain snacks are palatable, spicy in taste and nutritionally rich as well as wholesome [9]. With this background, the present study was planned with the aim of utilizing nutritious tomato puree and rice flour for the preparation of delicious and nutritionally balanced lycopene fortified multigrain snacks [10].

2. Materials and methods
Materials
Tomato, Refined wheat flour, Rice flour, carom seeds, chilli powder, chaat masala.

2.1 Preparation of lycosnacks
For the preparation and production of 'Lycosnack', all the standardized equipments were used. The production was undertaken on a laboratory scale assuring the proper availability of the materials and equipments. The methodology adopted for the preparation of the product is as follows:
Refined wheat flour and rice flour were sieved properly with a sieve [0.2 micron]. Tomatoes were blanched on the other hand. All the ingredients were accurately weighed. Then boiled tomatoes were grind [Jaipan appliances] to a paste of thick consistency. Mix all the flour, chili powder, salt and chaat masala. Add tomato paste in the above mixture and make a dough. The dough is divided into small portions by making balls of dough. Small portion of dough are rolled out and cut into definite shape. Frying was performed at

170°C for 5 min until the brownish red color appeared.
Trials were taken in order to optimize the formulation of the ingredients. The formulation of the product was finalized based on the results of sensory analysis. Table 1 shows the different trials of the formulations undertaken for the study. Figure 1 shows the flowchart for the preparation of the product

Table 1: Table showing the different trials conducted during the study

Sample No.	Description	Problems encountered
Sample 1	25 gm tomato paste, 100gm refined wheat flour and 100 gm rice flour was added in the snacks.	Dull in color and loose texture.
Sample 2	70 gm tomato paste, 100gm refined wheat flour and 100 gm rice flour was added to the snacks.	Texture was not so good
Sample 3	50 gm tomato paste, 100gm rice flour and 100gm refined flour was added to the snacks.	Good in taste, colour, texture.

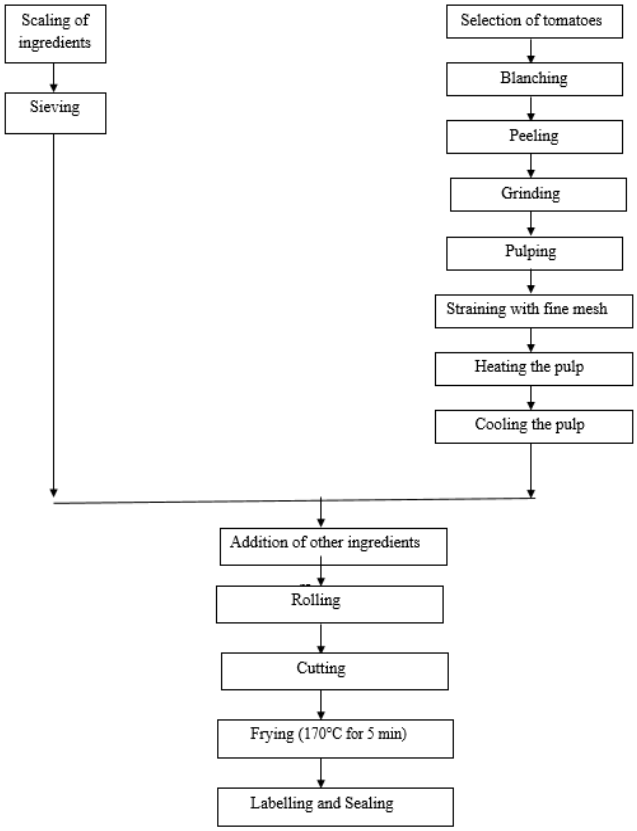

Fig 1: Process for preparation of '*Lycosnack*'

3. Analysis of product

3.1 Sensory analysis

The trials conducted were subjected to sensory analysis for the optimization of the final formulation of the product. Sensory evaluation is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses (sight, smell, taste, touch, hearing) for the purposes of evaluating consumer product. Sensory evaluation is done with the help of panel members. The panel members judge the product with the help of 9 point hedonic scale which is as follows. Table 2 shows the scores of 9 point hedonic scale.

Table 2: Scores of 9 point hedonic scale

9	**Like extremely**
8	Like very much
7	Like moderately
6	Like slightly
5	Neither like nor dislike
4	Dislike slightly
3	Dislike moderately
2	Dislike very much
1	Dislike extremely

3.2 Proximate analysis

The proximate analysis of the samples was carried out to determine the following parameters:

1. Dry Matter and Moisture content
2. Total Ash and Organic matter
3. Ether extract/fat
4. Protein

During the analysis, all measures were taken in triplicates

1. Dry matter and moisture content

5g of each sample were taken in a pre-weighed petri dish/aluminum tray. The dish was placed in hot air oven at 70 ± 2^0C for 48 hours for pea peel the drying was repeated until a constant weight was obtained. The loss in moisture content after drying was estimated and DM was calculated as follows: [11]

$$\textbf{Dry matter (\%)} = \frac{\text{Weight of dish with dried sample-Weight of empty dish}}{\text{Weight of dish with fresh sample-Weight of empty dish}} \times 100$$

$$\textbf{Moisture Content (\%)} = 100\text{-Dry matter (\%)}$$

2. Total ash and organic matter

5 g of each oven dried sample were taken in pre-weighed silica crucible. After charring the sample on heater, the crucible was kept in muffle furnace for ignition at 550°C for 2-3 h. The crucible was removed on cooling and kept in a desiccator and weighed again to find out weight of ash. The ash content was calculated as given below: [12]

$$\textbf{Total Ash (\%)} = \frac{\text{Weight of crucible With ash after cooling - Weight of empty crucible}}{\text{Weight of crucible with Ash before burning - Weight of empty crucible}} \times 100$$

$$\textbf{Organic matter (\%)} = 100\text{- Total ash (\%)}$$

3. Ether extract/fat

10 g of sample was taken in a cellulose thimble and extracted for 6-8 hrs with petroleum ether in Soxhlet's extraction apparatus attached to a pre weighed oil flask. The oil flask was removed and after evaporating excess of ether, it was dried overnight in hot air oven (70 ± 2^0C). The flask was cooled in a desiccator and weighed to a constant weight. This difference between the two weights gave the amount of ether extract in the sample [13].

$$\textbf{Ether extract (\%)} = \frac{\text{Wt of oil flask with ether extract} - \text{Wt of empty oil flask}}{\text{Wt. of sample on dry basis}} X100$$

4. Protein

The protein nitrogen in 1 gm of each dried samples were

taken in Kjeldhal flask and digested with 20-30 ml concentrated H2SO4 and 2-3 g of digestion mixture till the solution became colorless. After digestion, the contents were cooled and volume was made to 100 ml. 10ml of aliquot was distilled in Kjeldhal distillation apparatus after adding 10-15 ml of 40% NaOH solution. About 60-75 ml of distillate was collected into an Erlenmeyer flask containing 10 ml of 2% boric acid indicator solution. The distillate was then titrated against standard N/100 H2SO4 solution and the end point was recorded when the colour changed to slight pinkish. Volume of N/100 H2SO4 solution used in titration was recorded. Crude protein was calculated by multiplying the value of the deduced nitrogen by the factor 6.25mg [14].

3.3 Statistical analysis

Every measures were performed in triplicates and the values were reported in Mean ±Standard deviation. Graph pad prism 8.0 by applying one way ANOVA was used to test the significance. Differences in the mean values were analyzed using the least significant differences (LSD) test with a significance level of 0.05 and a confidence interval of 95% (P<0.05).

4. Results and discussions

4.1: Sensory analysis

The trials conducted were subjected to sensory analysis for the optimization of the final formulation of the product.

Table 1 shows the different trials conducted in order to finalize the formulation of the product. The three trials were given to panelists for sensory evaluation. The panelists judged the samples on the grounds of color, taste, texture, crispiness and overall acceptability and reported the unbiased results. The results were documented and records were maintained. The results showed that the trial 3 was highly acceptable by the panelists so the formulation of the said trail was considered to be final and this formulation was finalized for the further production works. Figure 2 shows the results of the sensory analysis conducted.

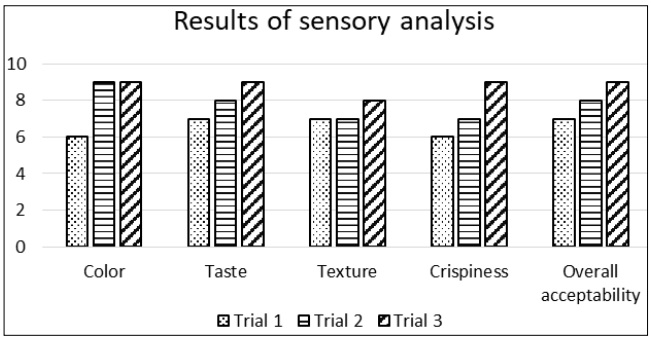

Fig 2: Results of sensory analysis

4.2: Proximate analysis of the product

The proximate analysis of the food product was carried out in the laboratories. The parameters of the product determined are moisture content, dry matter, total ash, organic matter, fat and protein. The results of the analysis carried out are given in the table 3. The results are expressed in the form of Mean ± SD (%) of the triplicates. The moisture content of the product was reported to be 4±0.05^{a}, dry matter was found to be 96±0.07^{b}, Total ash of the product was 2.9±0.06^{b} whereas the content of organic matter In the sample is found to be 97.1±0.03^{a}.The fat and protein Content of the sample was reported to be 18.7±0.07^{b} and 11±0.04^{a}.

The results of the proximate analysis of product is shown in the table 3 given below:

Table 3: Results of proximate analysis of the product

Sr. No.	Parameters	Mean ± SD (%)
1.	Moisture content	4±0.05^{a}
2.	Dry matter	96±0.07^{b}
3.	Total Ash	2.9±0.06^{b}
4.	Organic matter	97.1±0.03^{a}
3.	Fat	18.7±0.07^{b}
4.	Protein	11±0.04^{a}

Table represents Mean ± Standard deviation (%) of triplicates (n=3) and values followed by the same letter in the same column are not significantly different (P<0.05)

5. Post-production works

5.1: Packaging

For the packaging of multigrain snacks LDPE materials is used due to the following advantages:

Polyethylene has an excellent moisture barrier, grease and oil resistant properties. It is highly flexible, low in cost as well as heat sealable. It is light in weight as well as tasteless and odorless. It has good barrier properties for WVTR but poor barrier for OTR. It is resistant to most of the solvent, oil and grease but becomes sticky when oil constituents are packed in it [15].

5.2: Labelling

Labelling is the most important part of packaging and it must satisfy FSSAI rules. While fulfilment of laws the label must attract the consumer and should provide them the convenience to use and should provide all the information regarding the nutritive quality and usefulness of the product. So we designed above label which includes the attractive image of Snacks and the manufacturing and best before dates. Simultaneously we included the things like precaution, uses for convenience of the customer [16].

While preparing the labels, possible care was taken to follow labelling laws with following headers-

a) Logo b) Name of the product c) Ingredients d) Manufacture's address e) Net Weight (when packed)
f) Maximum. Retail Price (MRP) g) Best before

5.3 Marketing

According to American Marketing Association, marketing is an organization function and set of processes for creating, communication and delivering value to customer and for managing customer relationship in ways that benefit the organization and its stake holders. Marketing research involves conducting research to support marketing activities, and the statistical interpretation of data into information. This information is then used by managers to plan marketing activities, gauge the nature of a firm's marketing environment and attain information from suppliers. The price of the product was decided as 10 Rs for 50 gm of product. The marketing was carried out at different places and college campus. The record keeping and profit estimation procedures were carried out on a regular basis [17].

6. Quality control

6.1 Quality Control Aspects

Quality control is essential in all the food processing plant. It may be defined as maintenance of quality at a level and tolerance acceptable to the buyer while minimizing the cost for vendor. Quality control is important step in production planning. The specific responsibility of quality control is to ensure that the system used to produce a standard product with acceptable quality in respect to nutrition, purity and wholesomeness and palatability. Quality is defined as composite of those characteristics that differentiate individual units of product and have significance in determining degree of acceptability of that unit by buyer. Quality control is defined as maintenance of quality at certain level and tolerance acceptable to the buyer while minimizing the cost for production [18].

Principles of Quality Control

a) Raw material control
b) Process control
c) Finished product inspection

a) Raw material control

Before buying raw materials in bulk, food manufacture generally examine buying sample to make sure that it fulfills the factory's specifications. Raw materials examined for different parameters and it varies with nature and type of ingredients.

b) Process control

All treatments given during processing are standardized, ingredients used in correct amounts, accurate method of preparation and mixing are employed, and checks are made on the containers used to make sure that they are sound. Satisfactory hygienic conditions are also maintained during processing.

c) Inspection of finished product

It is carried out to determine to what extent the desired quality specifications have been achieved. Some tests are performed to check certain properties which are related to palatability and acceptability of product. GMP, HACCP are also important aspects of quality control. Storage and transportation of finished food shall be under controlled condition so that it will protect food against physical, chemical and microbiological contamination as well as deterioration of food.

2. HACCP Plan

HACCP Stands for Hazard Analysis Critical Control Point. It is an internationally recognized system for reducing the risk of safety hazard in the food. Hazard analysis and critical control point (HACCP) system has been recognized by the codex Alimentarius Commission as a tool to ensure the safety of food. HACCP is a scientifically based protocol that is applied directly to the food procurement, production, and distribution process. HACCP system controls hazardous elements in the food system such as contaminants, pathogenic microorganisms, physical objects (glass, metal and bone), chemicals (toxins, heavy metals and pesticide residues), and raw materials, processing conditions, use directions for the consumers or storage conditions. So HACCP consists of plan and system [19, 20].

HACCP Principle Applied For Quality Control

- Conduct hazard analysis
- Determine critical control point
- Establish critical limit
- Establish monitoring procedure
- Establish corrective action
- Establish verification procedure
- Establish record keeping and documentation procedure.

7. Conclusion

Lycopene Enriched snacks having balanced nutritional value of different nutrients such as protein, fat, dietary fibre etc. The chemical analysis of lycopene fortified multigrain snacks confirms that the presence of large amount of protein, fat, ash and moisture (4%), gives higher nutritional value. From the present study the conclusion drawn are Multigrain snack enriched lycopene were economically available rich source of protein, carbohydrate. For the fortification of tomato and multigrain flour, the chemical compositions of multigrain tomato snacks were increased. Moreover, the snack was highly acceptable by the consumers of all aged groups. Enriched snacks with the addition of tomato puree with a tangy taste was highly accepted by the consumers.

8. References

1. Vogele AC. Effect of environmental factors upon the color of the tomato and the watermelon. Plant Physiol. 1937; 12:929-955.
2. Rodriguez-Amaya DB, Kimura M. Carotenoids in foods. In Harvestplus Handbook for Carotenoid Analysis; IFPRI and CIAT: Washington, DC, USA, 2004, 2-7.
3. Scordino M, Di Mauro A, Passerini A, Maccarone E. Selective recovery of anthocyanins and hydroxycinnamates from a by-product of citrus processing. J Agric. Food Chem. 2005; 53:651-0658.
4. Rodriguez-Amaya DB. A Guide to Carotenoid Analysis in Foods; ILSI Press: Washington, D.C., USA, 2001, 1-45.
5. Rao AV, Argawal S. Role of lycopene as antioxidant carotenoid in the prevention of chronic diseases: A review. Nutr. Res. 1999; 19:305-323.
6. Focus on Pigments. World spends more than $50 M on lycopene red. Focus Pigm, 2007, 4:3-4.
7. Ajila CM, Naidu KA, Bhat SG, Prasada Rao UJS. Bioactive compounds and antioxidant potential of mango peel extract. Food Chem, 2007, 105:982-988.
8. Abdalla AEM, Darwish SM, Ayad EHE, El-Hamahmy RM. Egyptian mango by-product 2: Antioxidant and antimicrobial activities of extract and oil from mango seed kernel. Food Chem. 2007; 103:1141-1152.
9. Correia RTP, Mccue P, Magalhães MMA, Macêdo, GR, Shetty K. Phenolic antioxidant enrichment of soy flour supplemented guava waste by rizhopus oligosporus-mediated solid-state bioprocessing. J Food Biochem, 2004, 28.
10. Amin I, Mukhrizah O. Antioxidant capacity of methanolic and water extracts prepared from food-processing by-products. J Sci. Food Agric. 2006; 86:778-784.
11. Thongsombat W, Sirichote A, Chanthachum S. The production of guava juice fortified with dietary fiber. Songklanakarin J Sci. Technol. 2007; 29:187-196.

12. Ranganna. Handbook of analysis and Quality Control for Fruit and Vegetable Products. Tata Mc-Graw-Hill Education, India, 1986.
13. Shalini Sehgal. Laboratory manual of food analysis. IK International publishing house Pvt ltd, 2016.
14. Nielsen S. Introduction to the Chemical Analysis of Foods Jones and Barlett Publishers, Boston, 1994.
15. Procter A, Meullenet JF. Sampling and Sample preparation. In: Food Analysis, 2 Edition. Aspen publication, Gaithersberg Maryland, 1998.
16. Kauppinenn-Raisanen H. Strategic use of colour in brand packaging. Applied Linguistics. 2014; 32(4):369-388.
17. Hernandez LP. Cognitive tools for successful branding. Applied Linguistics, 32(4):369-388.
18. Singh S. Current research and development: Impact of color on marketing. Management decisions, 44(6):783-789.
19. Levin MA, Kalal TT. Improving Product Reliability: Strategies and Implementation, John Wiley and Sons Ltd, Chiester, 2003.
20. Hutt Peter. Barton and Merrill Richard. Public health and healthy public: a communitarian perspective on privatization and the FDA; Food and drug law, pp 6-14.
21. Klaus G Grunert. Food quality and safety: consumer perception and demand, European Review of agricultural Economics, 32(3):369-391.