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Development and Quality Evaluation of Energy Ball Sing Oats and Pumpkin Seed

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Abstract

Energy balls are a nutritious snack option, ideal for breakfast or mid-day consumption, composed of dry fruits, seeds, and dietary fiber. They serve as a source of slowly digesting carbohydrates, micro- and macronutrients, with energy primarily derived from carbohydrates like jaggery powder and dry dates powder containing fructose, glucose, and dextrose. The primary ingredients, pumpkin seeds, and oats are packed with health benefits. Pumpkin seeds provide dietary fiber, plant-based omega-3 fatty acids, proteins, and essential minerals, such as magnesium, zinc, and iron. These nutrients contribute to cholesterol reduction and lower the risk of cardiovascular diseases. Chia seeds enhance the nutritional profile with additional fiber and plant-based proteins. Oats add to the energy balls' value by supplying proteins, unsaturated fatty acids, soluble and insoluble fibers, and bioactive compounds like vitamin E, folates, and selenium. Unlike other cereals, oats are consumed as whole grains, retaining their nutrient density and offering unique starch properties due to amylose and amylopectin chain interactions. Pumpkin seed flour, an emerging ingredient in food innovation, surpasses oat flour in protein and fiber content, making it a valuable addition to cereal bars. Its use promotes environmental sustainability by reducing agricultural waste while enhancing nutritional diversity in food products. The rising demand for eco-friendly and health-focused snacks underscores the potential of energy balls as a functional and sustainable food solution, aligning with global trends in product innovation and waste minimization.

Keywords: Energy ball, oats, pumpkin seeds, millet, almond, jaggery

INTRODUCTION

Energy balls are a nutritious option for breakfast or mid-day snacks, packed with dry fruits, seeds, and dietary fiber. They provide a steady source of carbohydrates, including sugars like fructose, glucose, and dextrose from ingredients like jaggery powder and dry dates powder. The base of these energy balls includes pumpkin seeds and oats, both offering significant nutritional value. Pumpkin seeds are rich in dietary fiber, plant-based omega-3 fatty acids, protein, and essential minerals, such as magnesium, zinc, calcium, and iron. Their fiber helps lower cholesterol, reducing heart disease risks, while omega-3s support heart health. Chia seeds further boost the fiber and protein content, enhancing the balls' overall nutritional profile. Oats are a nutrient-dense food, providing proteins, unsaturated fats, and both soluble and insoluble dietary fiber. They are also a rich source of vitamins, minerals, and bioactive compounds. Oats stand out due to their unique starch properties and high protein content, offering a distinct nutritional advantage over other cereals. With their health benefits and versatility, both pumpkin seeds and oats contribute to the energy balls' popularity as a wholesome, energy-boosting snack [1, 2].

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OBJECTIVES

- To formulate and prepare energy balls using oats and pumpkin seeds.

- To study the physico-chemical properties and sensory attributes of the developed energy balls.
- To conduct a survey on consumer acceptance of oats and pumpkin seeds energy balls.

MATERIALS AND METHODS

This chapter deals with the description of various materials and methods used to accomplish the experimental work done to attain the desired objectives of the study entitled "Development and quality evaluation of energy ball using oats and pumpkin seed" were carried out in the Department of Food process engineering, Vaugh School of Agriculture Engineering and Technology, Sam Higginbottom Institute of Agriculture, Technology and Sciences. The methodology adopted has been described under the following heading [3].

Work Plan

Every research study is based on an experimental plan, Table 1 shows the basic experimental structure which was followed to conduct this study.

Table 1. Experimental plan.

Product	**1**	**Energy ball**
Ingredients	6	Oats, pumpkin seeds, finger millet, jaggery, almonds, cocoa powder.
Treatment	5	T_0, T_1, T_2, T_3, T_4
Physicochemical- properties	6	Moisture, carbohydrates, protein, fat, dietary fiber, ash content.
Sensory analysis	1	9 points hedonic scale.
Packaging	1	HDPE.
Consumer acceptance	1	Offline survey through questionnaire.

Procurement of Raw Material

Oats, cocoa powder, finger millets, pumpkin seeds, and jaggery were obtained from the local market of Khan Chauraha Prayagraj (Uttar Pradesh). The fresh oats and pumpkin seeds were taken from the market. Other materials butter paper and LDPE polyethylene were also purchased from the local (Prayagraj) Market. Preparation of flow chart of energy ball (Figure 1).

SELECTION OF RAW MATERIALS GRINDING

↓

ADDITION AND MIXING OF JAGGERY COOLING

↓

SHAPE FORMATION OF ENERGY BALLS LEAVE THE BALLS INTACT FOR 30 MINUTES

↓

PACKAGING STORAGE OF PACKAGED PRODUCTS IN DARK AND COLD ROOMS

Figure 1. Flow chart of energy ball.

Materials

The materials required to be adopted in the present dissertation are as follows (Table 2).

Table 2. Formulation table.

OATS	**100 g**	**45 g**	**40 g**	**35 g**	**30 g**
Pumpkin seeds	0 g	15 g	15 g	15 g	15 g
Finger millet	0 g	5 g	10 g	15 g	20 g
Almonds	0 g	10 g	10 g	10 g	10 g
Jaggery	0 g	15 g	15 g	15 g	15 g
Cocoa powder	0 g	10 g	10 g	10 g	10 g

Equipment Required

Equipment used for the study were weighing balance electric balance, tong, soxhlet apparatus, Kjeldahl apparatus, mixer, hand sealing machine, baking oven, and desiccators. Equipment that was employed during the study is given below:

Figure 2. Electronic weighing balance.

Electronic Weighing Balance

It is designed to measure small mass in range. An electronic balance as shown in Figure 2 (Model No. LCB4A) 3.1 was used to weigh the orange peel required for the preparation of powder form. The maximum limit of the weighing machine was 500 gm [4].

Grinder

A simple mixer grinder (Model REX 500) as shown in Figure 3 was used for used for grinding orange peel. It consists of a base motor on which a jar is placed which contains blades for grinding. The dry orange peel to be ground was placed in the jar and the blades in the jar were run using an electric motor [5].

Figure 3. Grinder.

Baking Oven

A baking oven (Figure 4) was used for baking the prepared fortified cookies, baking was carried out at 150°C for 20 minutes [6].

Heat Sealing Machine

A heat-sealing machine as shown in Figure 5 was used to seal products and other thermoplastic materials using heat. This type of machine utilizes an upper and lower sealing element to fuse the material simultaneously from both sides. The purpose of impulse sealing is to enhance the bonding between two layers of film, resulting in a faster and more efficient seal, particularly for thicker materials or those that are more challenging to seal manually [6].

Figure 4. Baking oven.

Figure 5. Heat sealing machine.

Physico-Chemical Analysis

Determination of protein content by Kjeldahl method.

Principle

Protein was determined by the Kjeldahl apparatus method. The Sample was oxidized in the presence of concentrated 95–98% sulphuric acid and nitrogenous compounds in the sample were converted into ammonium sulfate. Potassium sulfate, cupric sulfate, and selenium dioxide were added to the digestion mixture as a catalyst. Ammonia was liberated by adding an excess of alkali and was quantitatively distilled into a measured volume of standard hydrochloric or sulphuric acid. The acid not neutralized by ammonia was backtitrated with standard alkali.

Procedure

Two gm of the sample was weighed and dropped into the digestion flask. 2 gm catalyst (cupric sulfate + potassium sulfate + selenium dioxide) ratio 5:3:1 and 20 ml of concentrated 95–98 % sulphuric acid was poured into the volumetric flask and was then heated in an inclined position over a heating mantle. It boiled vigorously until the solution becomes clear.

The digested solution was cooled and then 100 ml of distilled water was added to avoid complex formation. Without agitating sodium hydroxide was poured to make the solution strongly alkaline. The flask was then connected to the distillation assembly and the distillate was captured in 0.1 N HCl (hydrochloric acid). The heating continued till the initial volume of acid was doubled. Now assembly was opened and the condenser and delivery tube were washed in the receiver.

When all the washing was drained into the beaker two or three drops of methyl red indicator were added and titrated with sodium hydroxide solution [7].

Calculation

$$\text{Nitrogen } \% = \frac{14 \text{ x } (S - B) \text{ x } N}{1000} \tag{1}$$

$$\text{Protein } \% = N_2 \% \text{ x Empirical Factor } (6.25) \tag{2}$$

where,
S = Sample Titrate Reading
B = Blank Titrated Reading
N = Normally the standard acid (Eq. (l))

DETERMINATION OF FAT CONTENT BY SOXHLET METHOD

Principle

The fat in food represents, besides fat-free (triglycerides) other materials, such as phospholipids, starch, essential oils, fat-soluble pigments, vitamins, etc. The hexane soluble material in food was extracted from moisture free sample using a Soxhlet apparatus for 5–6 hours. The fat evaporated, and the residue was weighed to a constant weight.

Procedure

The source material containing the target compound was placed inside a thimble, which was then loaded into the main chamber of the Soxhlet extractor. Petroleum ether, used as the extraction solvent, was added to a distillation flask positioned on a heating element. The Soxhlet extractor was mounted on top of the flask. A reflux condenser was positioned atop the extractor. The solvent was heated to its boiling point, causing the vapor to rise through the distillation arm and enter the chamber containing the thimble with the solid material. The condenser facilitated the cooling of the solvent vapor, allowing it to condense and flow back into the chamber with the solid materials.

The chamber holding the solid materials gradually filled with the warm solvent, causing some of the desired compounds to dissolve. Once the Soxhlet chamber was nearly full, the solvent was siphoned off and returned to the distillation flask. The thimble prevented the swift movement of the solvent from carrying any solid material into the distillation pot. With each cycle, a portion of the non-volatile compound dissolved into the solvent. After several cycles, the desired compound became concentrated in the distillation flask. The advantage of this system is that rather than passing multiple portions of warm solvent through the sample, only a single batch of solvent was repeatedly recycled [7].

After the extraction, the solvent was typically removed using a rotary evaporator, leaving behind the extracted compound. The insoluble portion of the solid, which remained in the thimble, was generally discarded.

Calculation

$$\text{Fat } (\%) = \frac{W_1 \times W_2}{S} \times 100 \tag{3}$$

where,
W_1 = Quantity of sample taken for test (g)
W_2 = Weight of receptacle (g)
S = Weight of receptacle after has been extracted (g)

DETERMINATION OF MOISTURE CONTENT BY HOT AIR OVEN

Procedure

Samples of approximately 5 gm were placed in a pre-dried Petri dish in a hot air oven. The operating temperature was 110°C for 2 hours. The samples were then taken out of the oven, cooled in desiccators, and weighed using an electronic balance having sensitivity to dry orange peel. I repeated this process until the last two observations did not do the same and noted the observation in a notebook.

The calculation of moisture content was carried out with this formula:

$$\text{MOISTURE CONTENT } (\%) = \frac{W_1 \times W_2}{100} \times 100 \tag{3}$$

where,
W_1 = Initial moisture weight of the sample.
W_2 = Final moisture weight of the sample.
W = Weight of Petri dish.

Determination of ash content by Muffle furnace (by Ranganna, 1986) Procedure:
5 g of the sample was weighed

It was taken in a clean, dried, and pre-weighed crucible.

The sample was ignited in the dish with the flame of a suitable burner for about one minute prior to keeping it in the muffle furnace.

After ignition, the sample was kept in a Muffle furnace at 550-600°C until the grey ash results.

Then it was cooled in desiccators and weighed.

The process was repeated till constant weight was obtained 7.

The final weight of the ash content as shown was noted to calculate Equation (5).

Calculation

$$\text{Ash } \%(\%) = \frac{W_1 - W_2}{W_1} \times 10 \tag{5}$$

where,
W2 = Final weight of dish + Ash.
W1 = Weight of dish + sample.
Total carbohydrate:

Carbohydrates will be calculated by different methods as follows.

Carbohydrates = 100 – % (Moisture + crude fat + crude protein + ash + crude fiber) (Ranganna, 2005).

Materials Used for Packaging

The dried sample first cooled completely and then sealed in HDPE to keep out of moisture. The material used for packing mango leather was HDPE (high-density polyethylene). The dried product was packed at room temperature after cooling the product and stored at room temperature away from direct sunlight.

HDPE

HDPE has superior mechanical and physical properties and a higher heat distortion temperature. The major outlets are paper-like films of high molecular weight, woven sacks, blow molded containers, and injection-molded containers like crates for transport and material handling. HDPE plastic has several properties that make it ideal as a packaging and manufacturing product. It is stronger than standard polyethylene, acts as an effective barrier against moisture, and remains solid at room temperature. It resists insects, rot, and other chemicals. HDPE creates no harmful emissions during its production or during its use by the consumer. Also, HDPE leaks no toxic chemicals into the soil or water [8].

Sensory Analysis

Sensory evaluation of orange peel cookies was done by a panel of five judges using a nine-point Hedonic scale. The panel of judges graded the codes of the samples, and the format of evaluation is given in Tables 3 and 4.

Table 3. Sensory evaluation chart (9-point Hedonic scale).

Sample	Color	Appearance	Taste	Texture	Flavor	Overall acceptability
T_0	6	5	4	7	9	Like extremely
T_1	8	7	8	9	6	Like Slightly
T_2	7	8	6	5	7	Like very much
T_3	9	9	5	8	8	Like moderately
T4	6	7	6	5	7	Like Slightly

Table 4. Hedonic Sensory Score.

Score	Hedonic Rating
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.

RESULTS AND DISCUSSION

The experiments were conducted for research work on the “development and quality evaluation of energy ball using oats and pumpkin seeds”. This chapter deals with the results obtained from work done on Energy balls by incorporating oats and pumpkin seeds and other materials in various proportions, i.e., (T_0, T_1, T_2, T_3 & T_4). Studies on physico-chemical analysis (i.e., moisture content, fat, protein, and ash content) and sensory properties which were determined for development of oats and pumpkin seeds. Incorporated energy balls were influenced by packaging material, storage of environmental conditions and chemical constituents of dried oats and pumpkin seeds and energy balls were packed in LDPE bags and stored at room temperature. This chapter presents the results obtained from the analysis conducted during the study. The findings are discussed in detail and are organized sequentially as follows. Physico-chemical, microbial, and sensory attributes are shown in Tables 5 & 6 and in Figure 7.

Effects of Moisture Content (%) of Oats and Pumpkin Seeds Energy Balls

The percent of moisture content scored for sample T_0 be 12.85 percent, similarly samples T_1, T_2, T_3 and T_4 shows the increase in the moisture content in the sample. Table 5 shows significant change during the mixed amount of oats and pumpkin seeds powder. T_3 and T_4 treatment sample increase their moisture content as compared to others because of the proportion of oats and pumpkin seeds powder and other materials. The moisture content of energy balls increased with the increase of oats and pumpkin seeds mixed with other materials. The moisture content is also increasing during a decrease in oats and pumpkin seeds. Similar results were obtained by researchers who incorporated wheat flour in the preparation of the energy balls and found increased moisture content of the refined wheat flour and oats-based energy balls (Table 5 & Figure 8).

Table 5. Average Physico-chemical characteristics of oats and pumpkin seed-based energy balls.

Parameter	**Score/Value Based on Mean Value of Different Parameters of Treatment**					**C.D. Value at 0.5%**
Treatments	***T0***	***T1***	***T2***	***T3***	***T4***	
Physico-Chemical Analysis						
Moisture %	12.86	12.91	13.15	13.32	13.34	13.12
Ash %	2.93	3.02	3.12	3.26	3.45	3.16
Protein %	13.58	13.86	14.58	14.86	15.28	14.43
Fat %	12.85	13.24	13.56	13.64	13.81	13.42
Total Carbohydrates %	5.61	5.92	5.51	6.12	6.18	5.87
Sensory Attributes						
Color and appearance	7.96	8.3	8	8.7	8.1	8.21
Flavor	8.6	8.7	8.4	8.8	8.6	8.62
Body and texture	8.3	8.2	8.5	8.7	8.4	8.42
Taste	7.9	8	8.1	8.6	8.4	8.20
Overall acceptability	7.7	8.2	7.9	8.7	8.2	8.14

Table 6. Chemical analysis of oats and pumpkin seeds-based energy balls.

Treatments	**Moisture Content (%)**	**Fat Content (%)**	**Protein Content (%)**	**Carbohydrate Content (%)**	**Ash Content (%)**
T_0	2.26	12.55	13.08	1.3	2.83
T_1	2.51	13.04	13.86	1.35	2.82
T_2	2.65	13.06	13.98	1.55	2.92
T_3	2.82	13.14	14.46	1.85	3.16
T_4	3.14	13.2	14.88	2.04	3.25

Chemical analysis of oats and pumpkin seeds-based energy balls.

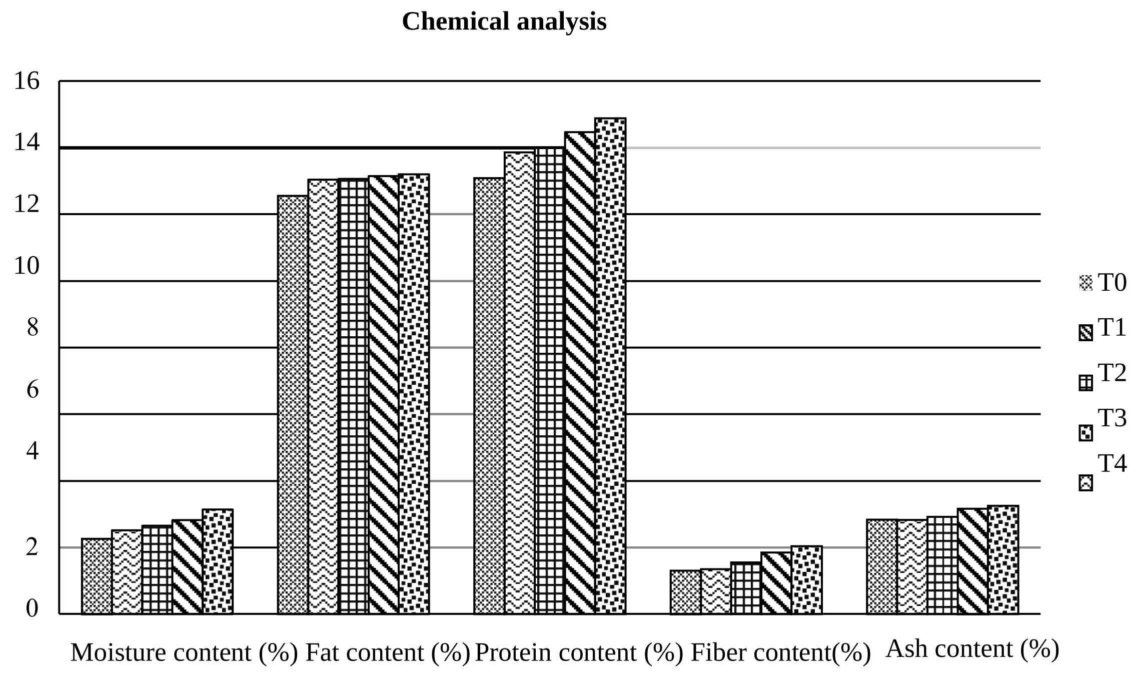

Figure 7. Graphical representation of chemical analysis of oats and pumpkin seeds-based energy balls.

Table 7. Moisture content (%) of oats and pumpkin seeds-based energy balls.

Treatments	**Moisture Content (%)**
T_0	12.86
T_1	12.91
T_2	13.15
T_3	13.32
T_4	13.34
Mean	13.12

Effects of Fat Content of Oats and Pumpkin Seeds Energy Balls

The percent fat score for T_0 be 12.85 % on packaging. T_1 scored 13.24 percent, similarly the fat content of sample T_2, T_3 and T_4 increase during as well as using oats and pumpkin seeds. The result of the present study showed that the fat content of prepared energy balls. There was a significant decrease in fat content during the increase in moisture content may be due to activity of lipase enzyme which split off the fat into free fatty acids and glycerol in the presence of catalysts like moisture, light, and heat (Table 7 and Figure 9).

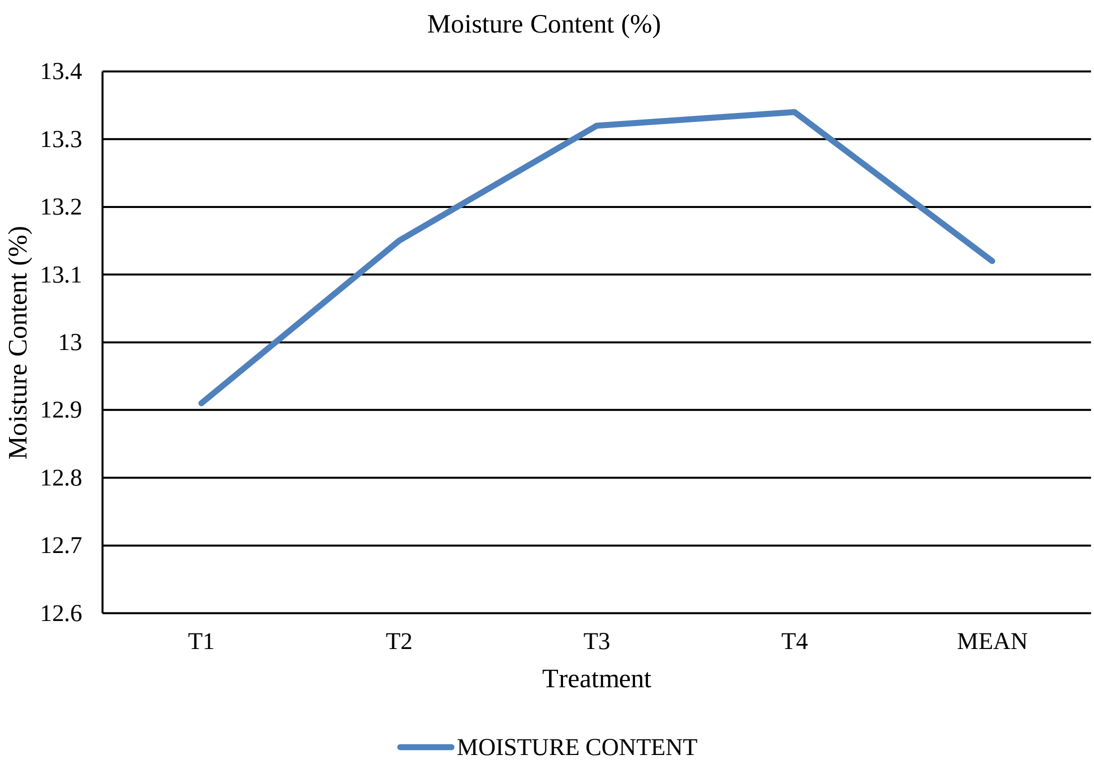

Figure 8. Moisture content (%) of oats and pumpkin seeds-based energy balls.

Table 8. Fat content (%) of oats and pumpkin seeds-based energy balls.

Treatments	**Fat Content (%)**
T_0	12.85
T_1	13.24
T_2	13.56
T_3	13.64
T_4	13.81
Mean	13.42

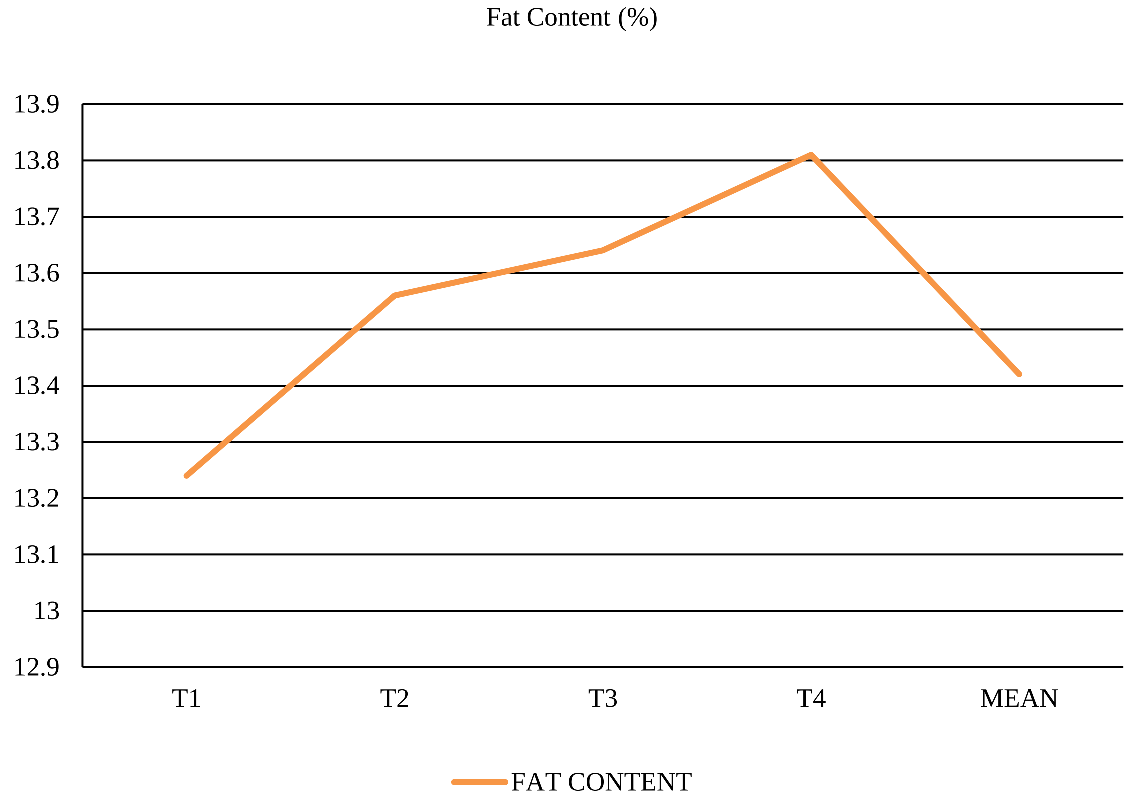

Figure 9. Fat content (%) of oats and pumpkin seeds-based energy balls.

Effects on the Protein Content of Oats and Pumpkin Seeds Energy Balls

Table 8 shows the effect of different treatments and the percent protein content of the sample (T_0, T_1, T_2, T_3 and T_4) on the packaging. The data indicated that there was a slight increase in protein content of samples. The protein content of sample T_4 was higher than sample T_3. Similarly, protein content of T_3 was higher than T_2 and T_2 were higher than T_1; it is due to the adding of oats and pumpkin seeds with other material. Therefore, it can be concluded that the treatment had a significant effect on the protein content of the T0, T1, T2, T3, and T4 samples (Table 9 & Figures 10 and 11).

Table 9. Protein content (%) of oats and pumpkin seeds-based energy balls.

Treatments	**Protein Content (%)**
T_0	13.58
T_1	13.86
T_2	14.58
T_3	14.86
T_4	15.28
Mean	14.43

The Effect Carbohydrate Content of Oats and Pumpkin Seeds Energy Balls

The data presented in Table 10 indicate that the average carbohydrate content of different samples T_0, T_1, T_2, T_3, and T_4 of oats and pumpkin seeds incorporated energy balls was found to be 5.61, 5.92, 5.51, 6.12 and 6.18%, respectively on 0 days. The mean carbohydrate content of the energy balls increased with the increase in the amount of oats and pumpkin seeds and other materials. A slight decrease or variation in the carbohydrate content of the Energy balls was observed because of pectin, starch, cellulose, and other carbohydrate denature after a long storage; similar results were also reported [9].

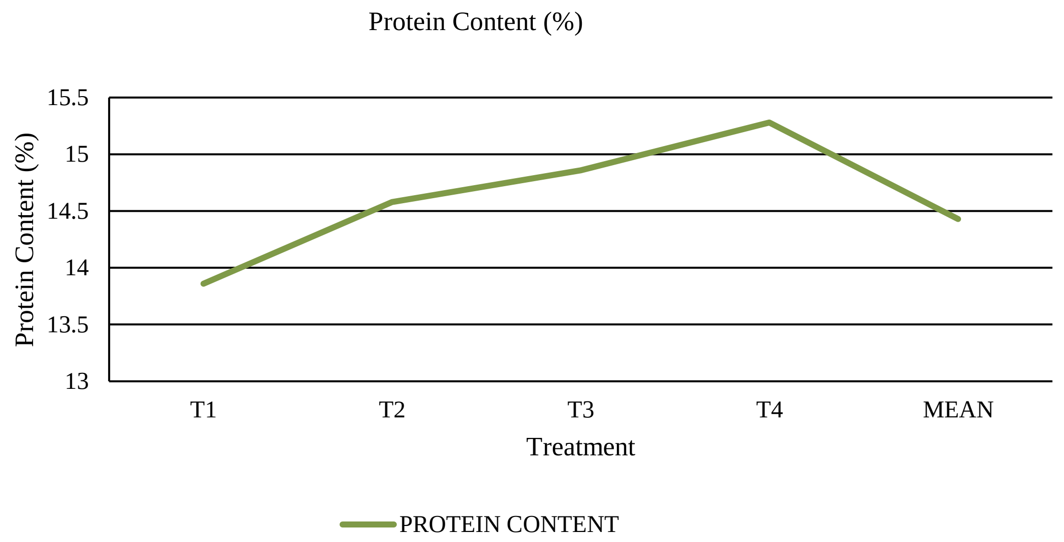

Figure 10. Protein content (%) of Oats and pumpkin seeds-based energy balls.

Table 10. Carbohydrate content (%) of oats and pumpkin seeds-based energy balls.

Treatments	**Carbohydrate Content (%)**
T_0	5.61
T_1	5.92
T_2	5.51
T_3	6.12
T_4	6.18
Mean	5.87

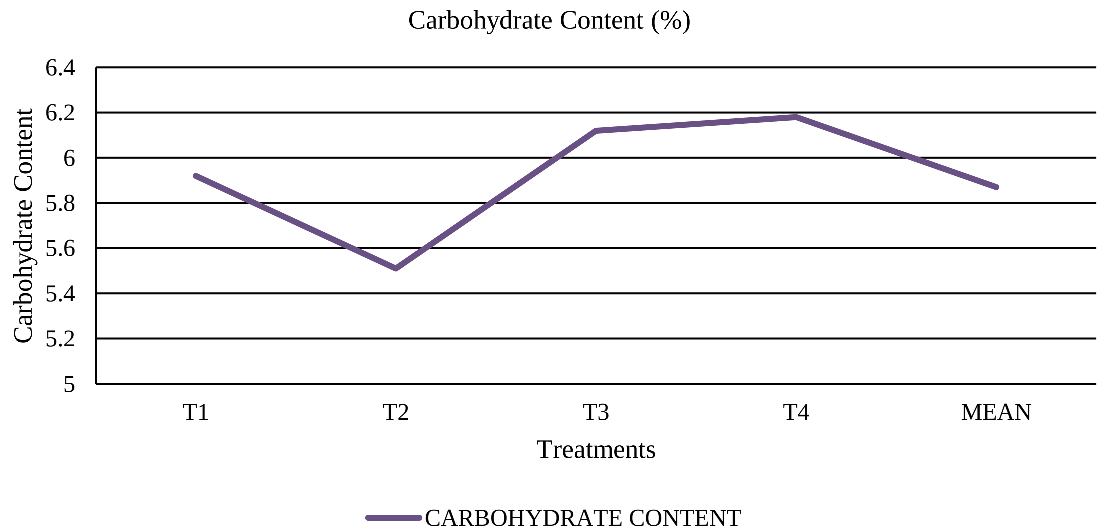

Figure 11. Carbohydrate content (%) of oats and pumpkin seeds-based energy balls.

Ash Content

The percentage mean ash content for to be 3.16% on the packaging. T_4 is the highest scored 3.45% than other treatments, similarly the Ash content of samples T_1, T_2, $T_{3,}$ and T_0 increases during as well as using oats and pumpkin seeds. The results of the current study indicated that the ash content of the prepared energy balls decreased significantly. This reduction in ashes may be attributed to an increase in moisture content, which could be due to the activity of lipase enzymes. These enzymes break down fats into free fatty acids and glycerol in the presence of catalysts, such as moisture, light, and heat, as shown in Table 11 and Figure 12 [10].

Table 11. Ash content (%) of oats and pumpkin seeds-based energy balls.

Treatments	**Ash Content (%)**
T_0	2.93
T_1	3.02
T_2	3.12
T_3	3.26
T_4	3.45
Mean	3.16

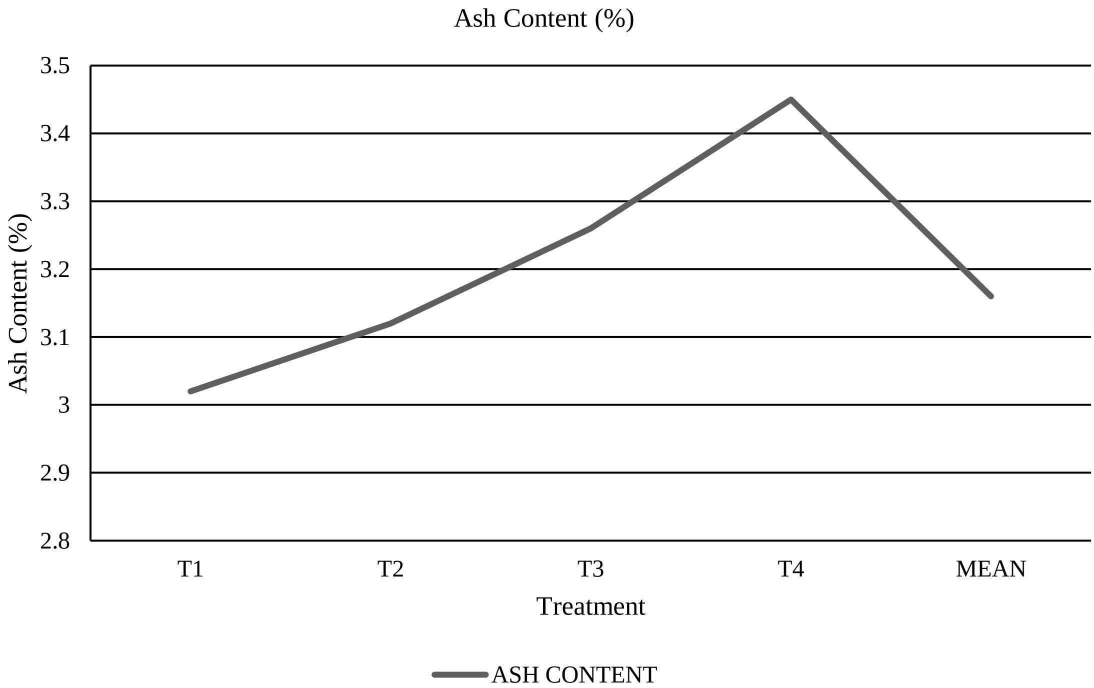

Figure 12. Ash content (%) of oats and pumpkin seeds-based energy balls.

Sensory Evaluation

Sensory attributes including color, aroma, taste, and overall acceptability are determined by Hedonic rating tastes as recommended by Hedonic rating taste is used for evaluation of sensory characteristics. This test is used to judge acceptance by consumers. The color of sample T_3 was more attractive than sample T_1, sample $T_{4,}$ and sample T_2. The taste was almost the same. Flavor and overall acceptability were higher of sample T_3 as compared to the other sample during the 0 days [4].

The data presented in Table 9 indicate that the average rating for color, taste, flavor, texture, appearance, and overall acceptability of oats and pumpkin seeds energy balls was found 8.70, 8.80, 8.60, 8.7, and 8.70, respectively.

From the ANOVA Table A.6. The calculated F value for the treatment exceeds the tabulated value at the 5 percent probability level. Therefore, it can be concluded that the significant effect of sensory analysis (color, taste, flavor, texture, appearance, and overall acceptability) of samples T_1, T_2, $T_{3,}$ and T_4 is observed as shown in Table 12 & Figure 13.

Table 12. Sensory evaluation.

Product	Color	Taste	Flavor	Texture	Appearance	Overall Acceptability
T_0	7.96	8.6	8.3	7.9	7.7	7.92
T_1	8.3	8.7	8.2	8	8.2	8.22
T_2	8	8.4	8.5	8.1	7.9	8.1
T_3	8.7	8.8	8.7	8.6	8.7	8.7
T_4	8.1	8.6	8.4	8.4	8.2	8.26

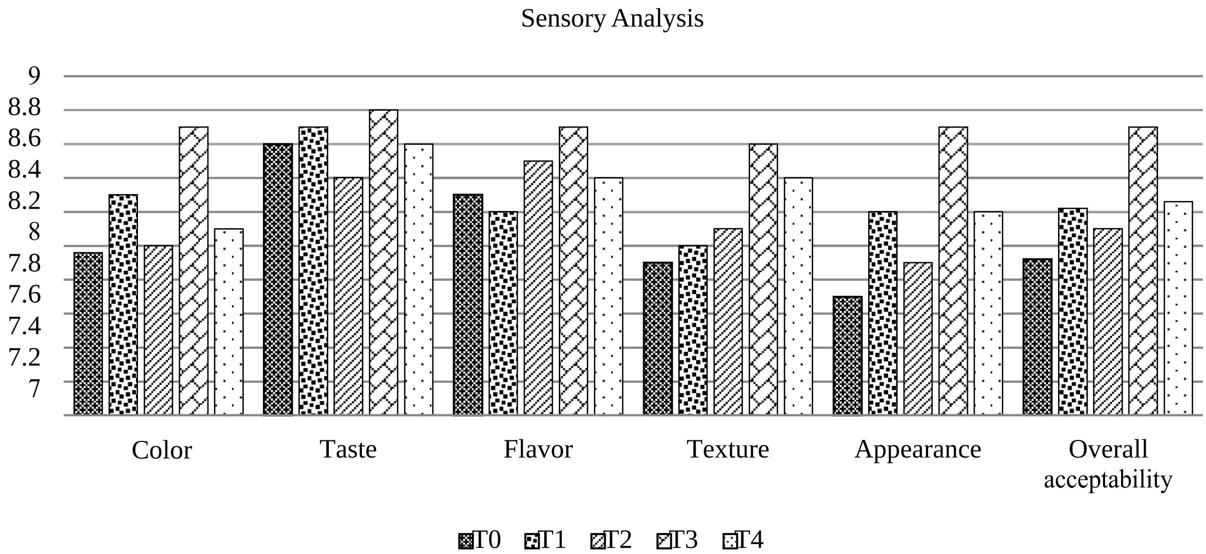

Figure 13. Sensory scores of oats and pumpkin seeds energy balls.

SUMMARY AND CONCLUSIONS

Summary and conclusion used to accomplish the experimental work done to attain the desired objectives of the study entitled, "*Development and quality evaluation of energy ball using oats and pumpkin seed*" in the Department of Food Process Engineering, Vaugh Institute of Agricultural Engineering and Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj.

Oats and pumpkin seeds were incorporated with different ingredients and in different proportions respectively for making of the energy balls. It was observed that the treatment T_3 was the best energy ball by sensory method but the T_4 treatment composition had the highest nutritional value for all treatment samples. The products with the highest nutritional values, such as fat content in the experimental sample were found 13.81%, Moisture content 13.28%, ash content 3.45%, protein content 15.28%, and carbohydrate content 6.18% samples. The nutritional value of the control sample minimum and highest nutritional values was found in $T_{4.}$

The cookie samples were stored at ambient temperature for 30 days in LDPE packaging. Various sensory attributes, including color, flavor, taste, texture, and overall acceptability, were assessed during this period. During the shelf-life study finally samples 90:10 and sample 80:20 were found significantly difference in their taste flavor, and color change to store for a period of up to 30 days of shelf-life study Sample 90:10 was found more satisfactory as compared to other samples.

Fiber is crucial for human health, with high-fiber diets linked to the prevention, reduction, and management of various conditions, including constipation, high blood pressure, morning sickness, and digestive disorders. The results obtained are quite satisfactory regarding the Nutritional values as well. Despite the storage conditions during the shelf-life study, the proteins, vitamins, and minerals in the prepared cookies retained significant values [6, 7].

CONCLUSIONS

Energy balls are one of the most popular instant energy foods. In the present dissertation, the utilization of oats and pumpkin seeds along with jaggery is done powder was considered as byproducts. The Jaggery is used considering the health aspects, acts as a digestive agent, helps in boosting the energy levels helps to clean respiratory tracts, and lungs, food pipe stomach and intestine So along with the health aspect, the oats and pumpkin seeds incorporated energy balls using the jaggery and other ingredients were satisfactorily prepared at the considerably low cost.

Energy balls enriched with oats and pumpkin seeds were prepared in the laboratory in the food processing and food engineering. It was prepared by mixing the ingredients and manually making spherical balls of it. Various studies were carried out in physics chemical analysis (i.e. moisture, fiber, ash, protein, and carbohydrate) and sensory properties, which were determined for the development of oats and pumpkin-based energy balls were influenced by packaging material and storage environmental conditions. Out of 5 samples (T0, T1, T2, T3, and T4) T3 is the most liked sample among all. According to sensory quality attributes energy ball.

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