DEVELOPMENT AND STANDARDIZATION OF PINEAPPLE AND COCONUT ENERGY BITES.

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Abstract:

In order to create a healthy and convenient snack option, this study developed and standardized pineapple and coconut energy bites. The formulation was made withnatural ingredients like dried pineapple, shredded coconut, oats, honey, and nutsin order to balance taste, texture, and nutritional value. Several batches were madein order to optimize the ingredient ratios and ensure consistency in flavour and texture. Sensory evaluations were carried out in order to assess consumer acceptability, and nutritional analyses were done in order to confirm the health benefits. The finished product showed high acceptability scores and a favorablenutritional profile rich in fiber, vitamins, and healthy fats. These energy bites area viable alternative to traditional snacks, providing a quick energy boost. In orderto improve the product's commercial viability, more research may be done on shelf-life stability and prospective market placement

Keywords: Pineapple, Coconut, Energy Bites, Snack Development, Standardization, Nutritional Analysis.

Introduction:

Consumers in the present period are witnessing a dramatic shift in their eating habits, prioritizing health-conscious options without sacrificing convenience or taste. This paradigm shift has sparked the creation of novel snackchoices that combine the pleasures of food with nutritional value. The most popular of these are energy bites, which are praised for their small size, portability, and capacity to provide a quick hit of nutrients and energy with each mouthful (Tirabassietal.,n.d.). This study explores the world of energy bites, concentrating on the combination of two powerful tropical ingredients: coconut and pineapple (Qiu etal., 2021). These ingredients offer a multitude of health benefits that are in line with modern dietary choices, in addition to contributing a unique flavour character reminiscent of the drenched islands.

Healthy snack options that deliver long-lasting energy without sacrificing flavour have become more and more popular in recent years. Because of their ease, vitamin richness, and adaptability, energy bites—also referred to as energyballs or power balls—have become a well-liked option for people who are health-conscious. Usually

composed of a combination of healthful foods, these bite- sized snacks provide a well-balanced mix of proteins, carbs, and good fats.

In order to create and standardize this recipe, a rigorous selection of ingredients is made, making sure they not only work well together but also support key nutritional objectives including sustained energy, satiety, and critical micronutrients. The goal is to produce a snack that is satisfying and nutritional, fitting a variety of dietary requirements, such as vegetarian and gluten-free diets.

The snack market has changed dramatically on a global scale, mirroring broader developments in wellness and health. Consumers of today are more sophisticated and discriminating (Benito-Ostolaza et al., 2021). They look for snacks that improve their general health in addition to being convenient. In answer to this need, energy bites offer a healthy substitute for conventional snacksthat are packed full of sugar, chemicals, and preservatives. Energy bites are popular because they provide nutritious value from natural ingredients and can satiate cravings. This trend is best represented by the natural sweetness and abundance of vitamins, minerals, and good fats found in pineappleand coconut, which were selected for their intrinsic tastes and health-promoting qualities (Neufeld et al., 2022).

Health benefits of pineapple and coconut energy bites:

A well-balanced energy source is produced by the interaction of natural sugars (from pineapple and honey), healthy fats (from coconut and almond butter), and carbohydrates (from oats and jaggery). Vitamins and enzymes are provided by pineapple, fibre and healthy fats are added by coconut, complex carbohydrates and fibre are provided by oats, protein and lipids are provided by almond butter, antioxidants and sweetness are provided by honey, and minerals are provided by jaggery-free coconut. Oats, coconut, and pineapple's bromelain, together with the fibre in them, aid in gut health and digestion. Numerous components have antioxidants and anti-inflammatory properties that assist the body fight against inflammation and oxidative stress.

Materials & Methods:

The primary ingredients used in this study included dried pineapple, desiccated coconut, oats, honey, almond butter, and jaggery powder. These ingredients were chosen for their nutritional benefits, availability, and sourced from local markets.

Table 1: Different ratios of formulation of Pineapple and coconut energy bites

Ingredients	Sample 1	Sample 2	Sample 3
Pineapple	25g	20g	15g
Shredded Coconut	20g	30g	25g
Oats	25g	20g	30g
Honey	5g	10g	5g
Almond Butter	5g	5g	5g
Jaggery Powder	20g	15g	20g

Procedure:

Ready the pineapple:

Finely chop and peel the pineapple if it's fresh. Pineapple in a can should be well-drained before being chopped finely.

Combine Dry Ingredients:

Combine the shredded coconut, jaggery powder, and rolled oats in a big bowl. Depending on the texture and sweetness you want, adjust the amounts.

Stir in the wet ingredients.

Blend the dry mixture with honey and almond butter. Honey provides moisture and flavour, while nut butter serves as a binder.

Include Pineapple

To the mixture, add the pineapple, cut finely. Ensure that all the components are well combined and dispersed. The pineapple will naturally sweeten and impart a fruity flavour.

Shape the Bits:

Using your hands, roll tiny amounts of the mixture into balls the size of a mouthful. To avoid stickiness, you can wet your hands slightly with water if the mixture is too sticky.

Unwind:

After the energy bites are made, place them on a parchment paper-lined bakingsheet. To help them set, chill in the refrigerator for a minimum of half an hour.

Retail:

After refrigerated and solid, place the energy bits in a sealed container. For extended storage, you can freeze them or keep them in the refrigerator for upto a week.

Physio-chemical Analysis:

Acidity:

To layout the procedure for calculating the acidity in the given fruit. Hydrolysis of sample dissociates hydrogen ions from the solute. These hydrogenions react with the sodium hydroxide and increase the pH to 8.3 which corresponds the stoichiometric neutralization of carbonic acid to bicarbonates. This neutralization end point is indicated by the colour change from colourless to pink. Sodium hydroxide solution (0.1N): Dissolve 4g NaOH in distilled water and dilute to 1000 ml with it. Phenolphthalein indicator (1%) Dissolve 1 g phenolphthalein in 100 ml distilled water (or) Use readymade solution. Procedure: Bring down the temperature of the sample to room temperature without thawing. Fill the burette with0.1 N-NaOH solution and note down the initial reading. Measure I g of sample. Take it in a clean conical flask. Dilute to 100 ml with distilled water. Add 2-3 drops phenolphthalein indicator solution. Titrate against the 0.1 N NaOH solution till the pink colour persists for 30 seconds. Note down the final reading, take down the volume of 0.1 N NaOH consumed as V. Repeat the procedure for three trials. Obtain the average. volume from three trials. Substitute the values in the formula and calculate the acidity. Formula: (v1-v2) *c/s V1-initial reading of burette V2-final reading after the colour change C-critical acid equivalent (0.64) S-weight of the sample 7

Brix:

To determine the concentration of sugar in given sample using brix refractometer. Refractometer is the instrument works by the principle of light refraction. Light refraction is the "bending" effect that liquid has on light passing through it. As the concentration of dissolved sugars increases, the "bending" effect also increases. Using carefully aligned prisms and mirrors; the refractometer measures the refracted angle of light as

it passes through the sample. This refracted angle equates to a sugar concentration in Degrees Brix ("Brix). One "Brix represents 1 gram of sugar in 100 grams of solution. Procedure: Hand Refractometer OP. Bring down the temperature of sample to the room temperature if the sample is frozen. Clean the prism of refractometer with tissue paper. Calibrate the refractometer as per SOP. Grind the required amount of sample using Mixer or mortar & pestle .Place 1 or 2 drops of sample on the prism. Close the day light plates. Observe the reading through the eye piece. Note down the brix value. Clean the prism with distilled water and wipe it with tissue paper. Digital PacketRefractometer Bring down the temperature of sample to the roost temperature if the sample is frozen clean the prism of tribemates with those paper. Calibrate therefractometer as per SOP. Grind the required amount of sample using Mixer or mortar & pestle.1 or 2 drops of sample on the prism Swachh on the button. Observe the reading. Note down the bris Valar. Clean the prism with distilled water.

pH:

To determine the pH of given sample, pH denotes the measurement of total hydrogen ion concentration. When the pH electrode is inserted into the given sample, the hydrogen ions present in it moves towards the glass electrode thereby replacing some metal ions in glass electrode. This in turn produces the tiny voltage which is carried through the silver wire to the amplifier. This amplifier converts the voltage measurements into pH value. Greater the hydrogen ion concentration, lesser will be the Ph. Procedure: 8 Switch "ON" the pH meter 20 minutes before of using. Wipe the electrode with tissue paper. Calibrate the pH meter as per calibration SOP. Bring down the temperature of the sample to room temperature without thawing Grind the required amount of sample using blender or mortar & pestle. Transfer the content into the beaker. Then insert the electrodeinto the sample. Wait for 2-3 mins till the word "Ready" is notified on the display. Note down the pH value. Clean the electrode with distilled water and wipe it withtissue paper.

Proximate analysis:

Determining the Proximate Content: the AOAC method was used to measure the proximate content, which includes the water content, ash, fat, protein, and crude fibre content. The different approach was used to determine the total carbohydratecontent.

Moisture content:

To determine the moisture content in food sample by hot air oven method. Watercontent or moisture content is measured by using various methods like direct measurement,

indirect measurement and empirical measurement. In most cases, a direct method is used where moisture content is determined by removing the moisture -through hearing and then measuring the weight loss. Determination of the loss in weight on drying a food sample under specific condition-this helps estimate the moisturecontent present. Procedure: - Measure the weight of an empty petri plate. Take those sample and slice it thinly into three Pices place the sample in the petri plateand weigh it and note the value. Then place the petri plate into a hot air oven which is maintained at 105°C for 2 hrs. Cool the sample in desiccator for 5-10 mins. Weigh the Petri plate and repeat the process of drying, cooling and weighing. Note the difference between the consecutive weighing record and the constant weight. Formula: Moisture Content % = (Initial weight) - (Final weight)/(Initial wight) ×100

Ash content:

Determination the amount of ash content: A specific cup containing up to two grams of sample was placed in the furnace and burned for three hours at 650°C. Then, before being weighed, the ash was allowed to cool. The following formula was used to determine the ash content: Ash content (%) Total weight: starting weight multiplied by 100% Sample weight

Fat content:

Determination the fat content: The mashed kernel was added to the timble after being weighed to a maximum of two grams. Timble was placed into the flask Soxhlet and the extraction process for the fat content was carried out for six hours. A fat flask with a known weight serves as a reservoir in this technique. Subsequently, the timble is removed, and the fat flask is filled with distilled petroleum ether before being placed in an oven set to a temperature of between 103 and 105°C for an hour. The fat flask was weighed after chilling in a desiccator for roughly thirty minutes. This process was repeated until a consistent weight was achieved. The formula used to compute the amount of fat was fat content(%).Final weight: 100% of initial weight Weight of sample.

Protein content:

Determination the amount of protein Two grams of mashed corn kernel samples was weighed and added to the Kjeldahl flask. Thirty millilitres of concentrated sulfuric acid (HSO4) and ten grams of selenium were added. After that, the sample was destroyed by boiling the flask in an acidic chamber until the solutionturned a distinct green colour. The liquid is then allowed to cool and is then diluted with aqueduct. The liquid was then moved to a boiling flask, which was topped off with 120 millilitres of 30% NaOH solution. Distillation was then carried out until a volume of 75 ml of distillate was achieved. After that, the distillate was titrated using a millilitre of 0.5 N NaOH solution. The sample and the blank were completed in the same methods. The following formula was usedto determine the protein content: (b-a) x N x 0.014 x 5.95 x 100% = protein content (%) Weight of sample 10.

Carbohydrate content:

The total carbohydrate was calculated using the difference method, dividing 100% by water content, protein content, ash content, and fat content. Carbohydrates (%) 100%(water content protein content fat content +ash content).

Results and Discussions

Sensory evaluation:

The sensory evaluation is a procedure that compares the three samples to the control to ascertain the taste, flavour, appearance, consistency, and general acceptability.

It is possible to compute the sample mean values and take into account themajority value of the sample while developing new products. Sample 2 may be chosen for additional processing based on the results of the sensory evaluation.

The finished product can be identified through sensory assessment, which is followed by physiochemical analysis. in order to ascertain the nutritional value

The table 2 provided appears to be a sensory evaluation of three different samples based on various attributes. Let's break down and analyze the content:

The table assesses three samples (Sample 1, Sample 2, Sample 3) across six sensory attributes: Color, Flavor, Consistency, Taste, Appearance, and Overall acceptability. Each attribute is rated on a scale from 1 to 10, with

10 being the highest score indicating the most favorable evaluation.

Table 2: Sensory evaluation

Sensory attributes	control	Sample 1	Sample 2	Sample 3
Color	9	8	9	8
Flavor	8	7	8	7
Consistency	9	8	9	8
Taste	8	7	9	8
Appearance	9	7	8	8
Overall acceptability	9	7	9	8

1. In Color Sample 1: 9, Sample 2: 8, Sample 3: 9. Sample 1 and Sample 3 have the highest color rating of 9, indicating they are perceived as visually appealing.

2. In Flavor Sample 1: 8, Sample 2: 7, Sample 3: 8. Sample 1 and Sample 3 are again rated highest for flavor, with a score of 8, suggesting they have a more intense or preferred flavor profile compared to Sample 2.

3. In Consistency, Sample 1: 9, Sample 2: 8, Sample 3: 9, Sample 1 and Sample 3 rate highest in consistency, indicating they have a uniform texture or thickness.

4. In Taste, Sample 1: 8, Sample 2: 7, Sample 3: 9. Sample 3 stands out with the highest taste rating of 9, indicating it is most flavorful or enjoyable in taste compared to the other samples.

In Appearance, Sample 1: 9, Sample 2: 7, Sample 3: 8. Sample 1 receives the highest appearance rating of 9, suggesting it is the most visually attractive.

5. In Overall Acceptability, Sample 1: 9, Sample 2: 7, Sample 3: 8, Sample 1 again leads with the highest overall acceptability rating of 9, indicating it is the most favored sample across all attributes evaluated.

The table:3 shows low ash content ensures purity. Optimal moisture levels maintain freshness, Minimal fat content for a lighter treat. Surprisingly the protein content supports a satisfying snack with minimum amount of carbohydrates**.**

Nutrition	Control	Sample
Moisture	32%	15.8%
Ash	2%	13%
pH	3.8%	4.7%
Total Solids	32%	42%
Fat	1.40%	3.2%
Protein	3.2%	4.12%
Carbohydrates	18%	49%

The above table shows which is acceptable by all age groups. It is ensuring a richer flavor profile and texture. These measurements guarantee a higher quality product that stands out in taste and performance.

Nutritional analysis verified that the finished product was healthy, and quality control procedures made sure that every batch complied with safety regulations.

Sample 1: consistently ranks high across most attributes, particularly in color, consistency, appearance, taste, and overall acceptability.

Sample 3: also performs well, especially in taste and consistency, though slightly lower in overall acceptability compared to Sample 1.

Sample 2: consistently scores lower than Samples 1 and 3 across all attributes evaluated.

This analysis provides a clear picture of how each sample is perceived across different sensory attributes, helping to identify strengths and potential areas for improvement in product development or quality control processes.

Conclusion:

The creation of innovative snack substitutes like energy bites has been fueledby the shift in consumer eating patterns toward healthier, more convenient options. This study looked into how energy bites made with pineapple and coconut—two foods well-known for their distinct flavours and nutritional value—were made and standardized. Our findings indicate that a delightful and nutritious snack can be made by mixing desiccated coconut and dried pineapple with oats, honey, almond butter, and jaggery powder. While coconut delivers easily digestible fats and energy, pineapple offers digestive advantages, immunological support, and antioxidant qualities. After conducting several sensory evaluations, it became clear that the ideal combination of flavor and texture appeals to contemporary customers looking for healthier snack options.

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