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Development and Organoleptic Evaluation of Value-Added Extruded Millet Puffs

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Abstract: The present study was undertaken to evolve food products containing millets in various combinations and find their acceptability and nutritive value of standard and most acceptable food products. Sensory evaluation of these recipes was done by a selected panel of 20 judges using a 5-point Hedonic Scale. Millet puff samples made by using a combination Jowar with rice grain and corn grain were also most acceptable as they scored 4.2 ± 0.26, 4.4 ± 0.29 and 4.7 ± 0.2 respectively.

Keywords- Millets, Hedonic scale, millet puffs, Sensory Evaluation.

I. Introduction

Millets are an important food crop at a global level with a significant economic impact on developing countries. Millet-based foods are considered potential prebiotics and probiotics with prospective health benefits.(Nithiyanantham S et al., 2019).

Extrusion cooking is a HTST process, it brings the inactivation of raw enzymes, lowers the microorganism level from the finished product, deactivation naturally occurring toxic substances, denaturation of protein, modification of lipids, and gelatinization of starch. (Shelar GA et al., 2019). Extruded products have less moisture content, longer shelf life, are nutritionally rich, and are microbiologically safe (Choton S et al., 2020).

A twin-screw extruder has a pair of screws that are either intermeshing or non-intermeshing. The set of screws in the twin-screw extruder can be either co-rotating or counter-rotating. The twin-screw extruder is more commonly used in the food industry because of its wide range of operating conditions and its ability to make a wide range of food products (Jae Gu B et al., 2017).

II. Methodology

The methodology consists of the information related to the research design and methodological steps used for the present investigation.

Procurement of jowar grain, pearl millet (bajra)grain, kodo millet (Kodra, Araka) grain, rice grain and corn grain

Jowar grain, pearl millet (bajra) grain, kodo millet (Kodra, Araka) grain, rice grain and corn grain were procured from sector 32 market, Chandigarh.

Preparation and mixing of jowar grain with rice grain and corn grain, pearl millet (bajra) grain with rice grain and corn grain, kodo millet (Kodra, Araka) grain with rice grain and corn grain (Fig 2.2)

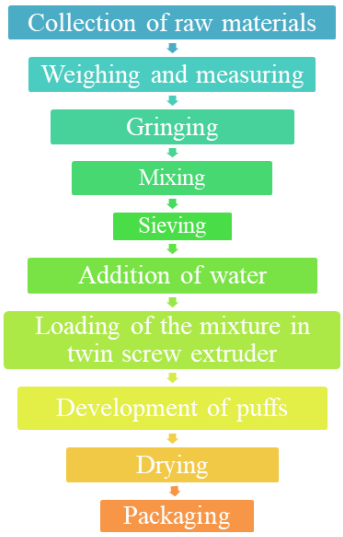

Figure 2.1 Development of Millet Puffs using Twin Screw Extruder

The different types of millet flours were used in the preparation of extruded millet puffs. The ingredients were collected, weighed, coarsely grinded and mixed in different proportions such as, 150 grams of jowar grain was added in 200 grams of rice grain and

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150 grams of corn grain, similarly 150 grams of pearl millet (bajra) grain was added in 200 grams of rice grain and 150 grams of corn grain, and 100 grams of kodo millet (Kodra, Araka) grain was added in rice grain and 150 grams of corn grain. The combined mixtures were sieved through a mesh sieve to obtain a fine powder. Water was added in the three flour mixtures in various quantities to obtain a desired consistency for the development of puffs. In the first mixture i.e., for jowar puffs 40 ml of water was added, in the second mixture i.e., for bajra puffs 40 ml of water was added whereas for the third mixture i.e., for kodo puffs 40 ml of water was added. All the three mixtures added in the twin screw extruder machine simultaneously which resulted in the formation of a puffs. After the puffs were made, they were kept in three different trays and were placed in a tray dryer for about one hour. The puff samples were cooled, packed and stored in a cool and dry place.

Standardization and development of millet based extruded food products

Standardization of extruded food products involves ensuring consistent quality, taste, and nutritional value across batches.

The selected recipes were prepared at home under clean environment. Jowar grain, pearl millet (bajra) grain, kodo millet (Kodra, Araka) grain, rice grain and corn grain were utilised for development of various food products (jowar puffs, bajra puffs and kodo puffs). The products were developed as per the details given below.

A Cheese Bajra puffs

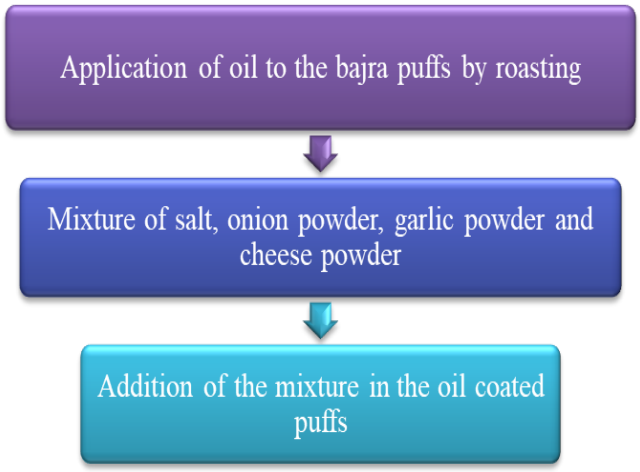
Preparations of grain mix for Bajra Puffs

A formulation was prepared by mixing pearl millet (bajra) grain, with rice grain and corn grain. A combination of the mixed grains is depicted in Table 2.2 A

Table 2.2 A Proportion of Bajra Puffs

SNO.	INGREDIENTS	SAMPLE 1
1.	Bajra Grain	30%
2.	Rice Grain	40%
3.	Corn Grain	30%

III. Method



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Cheese Bajra Puffs

B *Cheese Kodo puffs*

Preparations of grain mix for Kodo Puffs

A formulation was prepared by mixing, kodo millet (Kodra, Araka) grain with rice grain and corn grain. A combination of the mixed grains is depicted in Table 2.2 B.

Table 2.2 B Proportion of Kodo Puffs

SNO.	INGREDIENTS	SAMPLE 1
1.	Kodo Grain	30%
2.	Rice Grain	40%
3.	Corn Grain	30%

Method

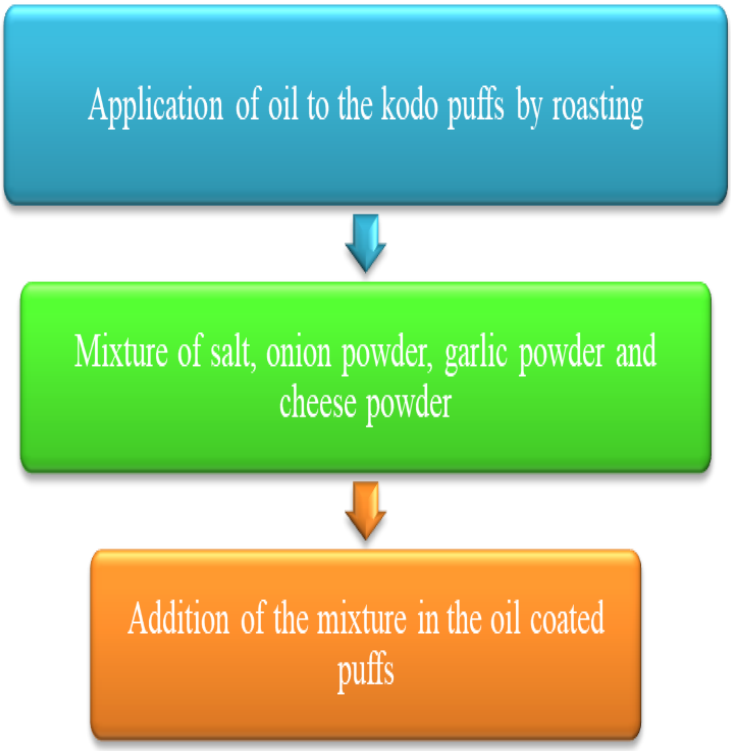

Figure 2.2 B Preparation of Cheese Kodo Puffs

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Cheese Kodo Puffs

C *Cheese Jowar puffs*

Preparations of grain mix for Jowar Puffs

A formulation was prepared by mixing Jowar with rice grain and corn grain. A combination of the mixed grains is depicted in Table 3.3.2 C.

Table 2.2 C Proportion of Jowar Puffs

SNO.	INGREDIENTS	SAMPLE 1
1.	Jowar Grain	30%
2.	Rice Grain	40%
3.	Corn Grain	30%

Method

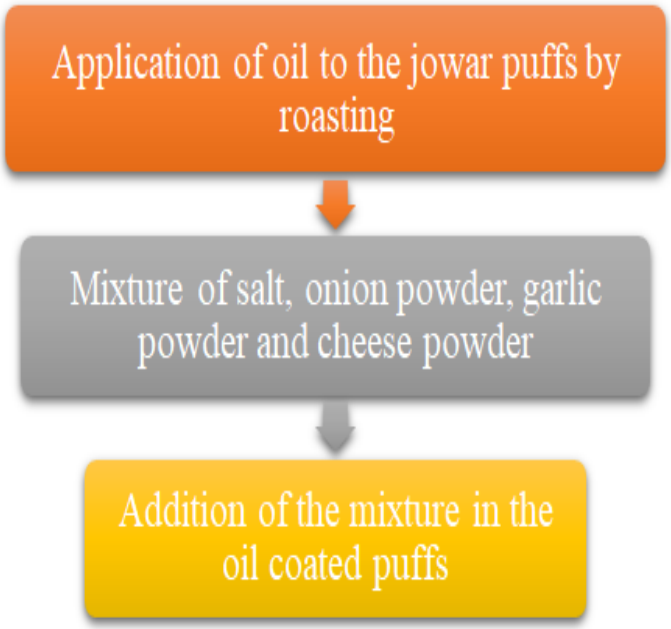

Figure 2.2 C Preparation of Cheese Jowar Puffs

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Cheese Jowar Puffs

Sensory evaluation of millet based extruded food products

The sensory qualities of millet puffs were evaluated by the panel of judges selected by using a hedonic scale for the ensuring the acceptability of the products. Evaluation for organoleptic scoring was on the basis of Colour, Odour, Texture, Taste, General acceptability.

For evaluating the samples based on sensory qualities a five-point hedonic scale typically ranging from "dislike" to "like very much," with three intermediate points indicating varying degrees “neither like”, “like slightly” and “like moderately” was provided to the judges who were asked to assign a number corresponding to their level of liking for each sample, helping to quantify overall preferences consistently.

IV. Results

Mean scores and pictorial representation for colour, odour, texture, taste and general acceptability of (Cheese Bajra puffs, Cheese Kodo puffs, Cheese Jowar puffs) were presented in Table 3.1 A and Figure 3.1 A. Mean scores of overall acceptability for Sample 1 were lying in between the category of “Like moderately”, Sample 2 and Sample 3 were lying in between the category of “Like moderately to Like very much” by the panellists. Mean scores for colour, odour, texture, taste and general acceptability for Sample 1 scored 3.25 ± 0.24, 4.05 ± 0.26, 3.65 ± 0.25, 4.25 ± 0.27 and 4.2 ± 0.26, Sample 2 scored 3.2 ± 0.18, 4.25 ± 0.27, 3.85 ± 0.32, 4.35 ± 0.25 and 4.4 ± 0.29, Sample 3 scored 3.85 ± 0.25, 4.45 ± 0.26, 4.35 ± 0.25, 4.55 ± 0.26 and 4.55 ± 0.26 at 5% level of significance respectively.

Table 3.1 **A Mean Scores of Sensory Evaluation for Millet Puffs** (*Cheese Bajra puffs, Cheese Kodo puffs, Cheese Jowar puffs*)

Sample	Colour	Odor	Texture	Taste	General Acceptability
Sample 1 (B:R:C::30:40:30)	3.25 ± 0.24	4.05 ± 0.26	3.65 ± 0.25	4.25 ± 0.27	4.2 ± 0.26
Sample 2 (K:R:C::30:40:30)	3.2 ± 0.18	4.25 ± 0.27	3.85 ± 0.32	4.35 ± 0.25	4.4 ± 0.29
Sample 3 (J:R:C::30:40:30)	3.85 ± 0.25	4.45 ± 0.26	4.35 ± 0.25	4.55 ± 0.26	4.7 ± 0.2

B: Bajra, R: Rice grain, C: Corn grain, K: Kodo, R: Rice grain, C: Corn grain, J: Jowar, R: Rice grain, C: Corn grain

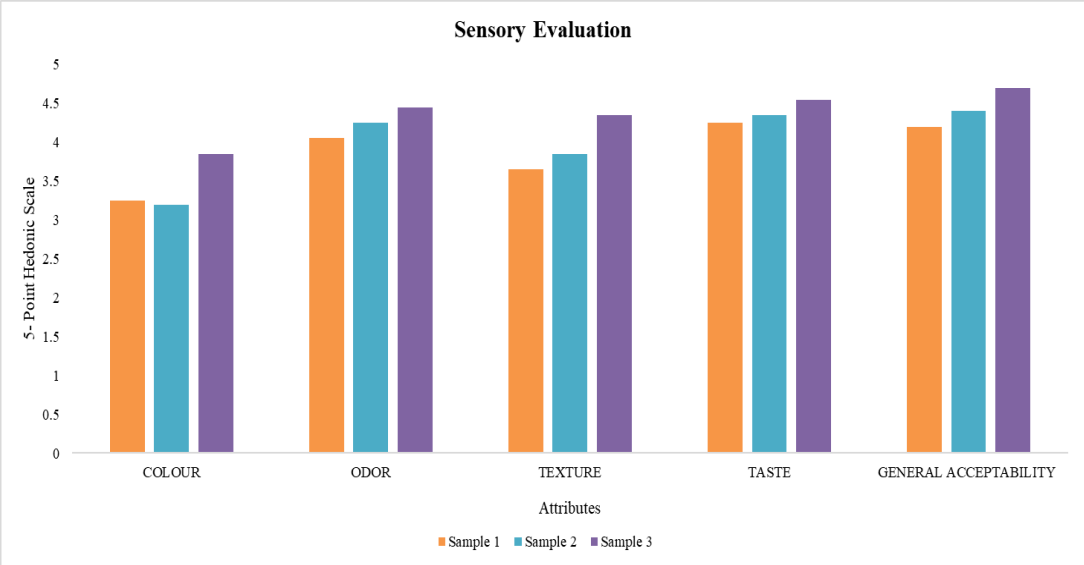

Figure 3.1 A Mean score of sensory evaluation for Millet puffs **(*Cheese Bajra puffs, Cheese Kodo puffs, Cheese Jowar puffs*)**

V. Conclusion

The combination of millets jowar grain with rice grain and corn grain, pearl millet (bajra) grain with rice grain and corn grain, kodo millet (Kodra, Araka) grain with rice grain and corn grain were used to make millet puffs. The acceptability of millet puffs ranged from 4.2 to 4.7 revealing that the recipes were lying in between the category of ‘Like moderately to Like very much’. Overall acceptability of Cheese Bajra puffs ranged 4.2, Cheese Kodo puffs ranged 4.4 and Cheese jowar puffs ranged 4.7 respectively on 5- point Hedonic scale. Results revealed that sensory scores exhibited a steady increase in each sample of millet puffs.

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