Madras Agric.J.,2025; https://doi.org/10.29321/MAJ.10.901254

RESEARCH ARTICLE

Innovative Approach in Snack Development: Preparation of Rice -Potato Based Rizo Crisp

Sai Gudekar

Department of Food Technology, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth

Received: 19 Aug 2025

Revised: 27 Oct 2025

Accepted: 03 Dec 2025

ABSTRACT

There's growing customer interest in new, healthier snack choices, so we need to look into making them with local grains and root crops. This research focuses on developing and refining Rizo Crisp, a rice-and-potato snack. It has cumin, salt, and chilli powder for flavour. The goal was to find the right mix of ingredients and cooking steps to get a snack that tastes good, is nutritious, and has good qualities. Three different recipes (T1, T2, T3) were made, each with different amounts of rice, potato, and seasonings. The best recipe (T2: 60% rice, 30% potato) was cooked by extrusion and then deep-fried. Lab tests showed that 100g of the final product has 517 calories, 5.4g of protein, 29.2g of fat, 56.1g of carbs, and 2g of fibre. Taste tests showed that T2 had the best ratings for texture, taste, and overall liking. In short, Rizo Crisp—especially the T2 version—is a successful new snack that could do well, as it uses rice and potato well.

Keywords: *Extruded snack, Rice, Potato, Sensory evaluation, Optimization, Proximate composition*

INTRODUCTION

The global snack food market is continually evolving, driven by rising demand for novel, convenient, and healthier products. Extruded puffed snacks, such as corn puffs and rice crisps, remain highly popular due to their light texture, crispiness, and convenience. Starch-based materials, particularly from cereals and tubers, are the primary ingredients for such products, with their functional properties dictating the final product quality. Rice is a standard base for extruded snacks due to its excellent expansion properties, while potato contributes to binding and can enhance crispness. The physicochemical transformations of starch during extrusion, such as gelatinization and degradation, are well documented and critically influence texture and structure. Recent research has also explored the impact of specific process parameters, such as screw speed and barrel temperature, on the attributes of extruded snacks. The originality of this work lies in the development of a hybrid starch system combining rice and potato flours in a "Kurkure"-type geometry. Honestly, while both ingredients have been studied individually, their combination in an extruded, spiral-shaped snack infused with spices like cumin and chilli before frying is not widely reported. This study systematically investigates the effect of blend ratio and processing conditions on the expansion, oil uptake, texture, and sensory properties of the novel Rizo Crisp, thereby contributing to the field of composite starch snack development.

MATERIAL AND METHODS

Raw Materials

Commercial-grade rice flour, fresh potatoes (boiled, mashed, and dried), powdered cumin seeds, red chilli

*Corresponding author mail: saigudekar04@gmail.com

Table 1. Initial formulations for Rizo Crisp (g/100g batch).

Parameter	T1	T2	T3
Ingredient			
Rice flour	90	60	50
Potato	-	30	40
Cumin seeds	6	4	5
Red chilli powder	2	2	2.5
Salt	2	4	2.5

powder, salt, and sunflower oil were procured for the study.

Experimental Design and Formulation

We developed three initial formulations (T1, T2, T3) with varying ingredient proportions, as detailed in Table 1. Based on preliminary trials, formulation T2 was selected as the optimized final product for detailed analysis (Table 2).

Production Process

The production process involved the following steps:

1. Weighing and pre-treatment of raw materials;
2. Blending of rice flour, potato mash, and spices (cumin, chilli, salt);
3. Hydration and mixing to achieve a uniform dough;
4. Shaping using a screw extruder fitted with a die to form the characteristic curly shapes;
5. Deep-frying in a controlled fryer at 165°C until the moisture content is reduced to approximately 1.5-2%;
6. De-oiling and cooling to ambient temperature; and
7. Packaging in food-grade LDPE pouches.

Table 2. Optimized final formulation (T2) for Rizo Crisp (g/100g batch).

Parameter	T2
Ingredient	
Rice flour	60
Potato	30
Cumin seeds	4
Red chilli powder	2
Salt	4

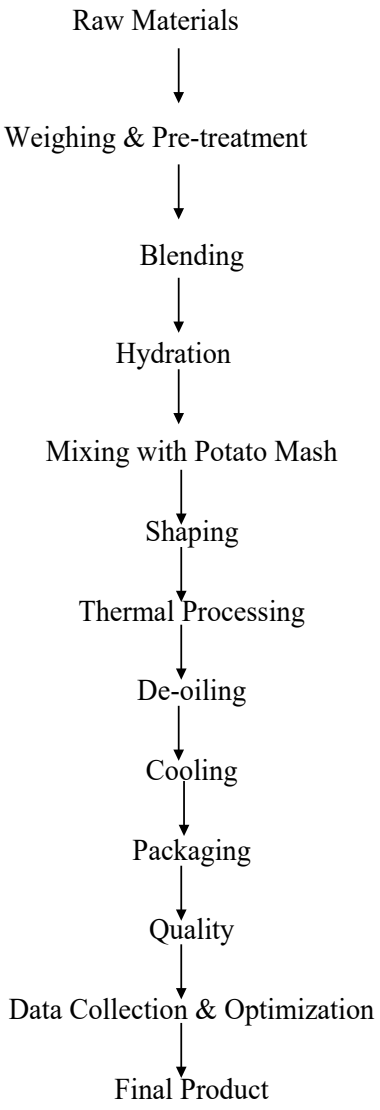

Figure 1: Flow process chart for the preparation of Rizo Crisp.

Physicochemical and Nutritional Analysis

We analyzed the optimized product (T2) for its proximate composition. Moisture, ash, fat, protein, and carbohydrate content were determined using standard

laboratory methods. The energy values are calculated. Furthermore, physicochemical properties , including expansion ratio and oil uptake, were measured.

Sensory Evaluation

The three formulations (T1, T2, T3) were evaluated sensory by a panel of untrained judges. Attributes including colour & appearance, texture, taste, flavour, and overall acceptability were scored using a 9-point hedonic scale (1 = dislike , 9 = like).

Statistical Analysis

Sensory data were analyzed using one-way Analysis of Variance (ANOVA). Post-hoc tests were conducted to identify significant differences between treatment means where applicable ($p<0.05$).

RESULTS AND DISCUSSION

Proximate Composition

The proximate composition of the optimized Rizo Crisp (T2) is presented in Table 3. The product provided 517 kcal per 100g, with 5.4g protein, 29.2g fat, and 56.1g carbohydrates. The dietary fibre content was 2g, and the ash content was 4.3g. The fat content is attributed to the deep-frying process, which is characteristic of this snack category. The formulation successfully produced a palatable snack with a balanced macronutrient profile.

Sensory Evaluation

The mean sensory scores for all treatments are summarized in Table 5. Statistical analysis (Table 3) revealed significant differences ($p<0.05$) among the treatments for all attributes.

Treatment T2 consistently received the highest scores for texture (8), taste (7.5), flavour (7.5), and overall acceptability (7). The balanced rice-to-potato ratio (60:30) in T2 likely contributed to its superior texture, providing optimal expansion and crispness without excessive hardness or oiliness. In contrast, T3, with a higher potato content, received the lowest scores for texture and overall acceptability, suggesting that excessive potato can lead to a denser, less appealing product. T1, while acceptable, scored lower on flavour, indicating that the seasoning level in T2 was more optimal.

These findings are consistent with the literature on composite snacks, where ingredient ratios significantly affect sensory perception and texture. The high overall acceptability of T2 demonstrates that the optimized formulation successfully balances the functional properties of both starches with the sensory appeal of the spice blend.

Table 3. Statistical analysis (ANOVA) of sensory data.

Attribute	Treatment Means			F-value	p-value	Significant Differences
	T1	T2	T3			
Colour	6	7	8	217.67	<0.0001	T3 > T2 > T1
Texture	7	8	5	450.00	<0.0001	T2 > T1 > T3
Taste	7	7.50	6	112.50	<0.0001	T2 > T1 > T3
Flavour	6	7.50	6	187.50	<0.0001	T2 > T1 = T3
Overall Acceptability	6.50	7	5	112.00	<0.0001	T2 > T1 > T3

Table 4. Proximate composition of Rizo Crisp (T2) per 100g.

Chemical Parameters	RIZO CRISP
Energy	517 kcal
Carbohydrate	56.1g
Fat	29.2g
Protein	5.4g
Ash	4.3g
Fibre	2g
Moisture	3g

Table 5: Mean sensory scores of different Rizo Crisp formulations.

Sample	Colour and appearance	Texture	Taste	Flavour	Overall Acceptability
TO(Control Sample)	8	8	8	8	8
T1	6	7	7	6	6.5
T2	7	8	7.5	7.5	7
T3	8	5	6	6	5

Process Optimization

Observations during processing indicated that a moisture content of 14% and a frying temperature of 165°C were optimal for the T2 formulation. At this combination, expansion was highest, and oil uptake was moderate. This aligns with studies on extruded snacks, where moisture content and thermal energy input are critical determinants of expansion and final product quality.

Conclusion

Our study successfully developed a novel extruded snack, Rizo Crisp, from a blend of rice and potato flour. The optimized formulation (T2) demonstrated a desirable nutritional profile and was the most sensorial accepted variant. The hybrid starch system proved effective in creating a product with excellent crispness and expansion. The integration of spices directly into the dough ensured uniform flavour distribution. This product showcases significant potential as a commercial snack, offering a new option in the competitive extruded snack market. Future work could focus on shelf-life stability, alternative cooking methods like baking to reduce fat content, and detailed microstructural analysis.

ACKNOWLEDGEMENT

We express our sincere gratitude to the faculty and staff of the Department of Food Technology for their support and guidance throughout this research project. We also thank the sensory panellists for their participation and valuable feedback.

REFERENCES

Anchondo-Trejo A., et al., Development of a Third Generation Snack of Rice Starch, Molecules, **26(1)**, 54 (2021) https://doi.org/10.3390/molecules26010054

Xu J., et al., Functional Food Based on Potato, Foods, **12(11)**, 2145 (2023) https://doi.org/10.3390/foods12112145

Lisiecka K., et al., Structure and Texture Characteristics of Novel Snacks, Materials, **16(4)**, 1541 (2023) https://doi.org/10.3390/ma16041541

Qiu J., et al., Research Progress on the Physicochemical Properties of Starch-Based Foods by Extrusion Processing, Foods, **13(22)**, 3677 (2024)https://doi.org/10.3390/foods13223677

Jacquet A., et al., Impact of Operating Parameters and Fat Addition on Texture and Physicochemical Attributes of Extruded Snacks , Foods , **14 (8)**, 1307 (2025) https://doi.org/10.3390/foods14081307