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Impact of flavour additions on organoleptic properties of tapioca chips

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Abstract
This study evaluated the sensory characteristics of flavoured tapioca chips developed as a value-added snack product. Sensory analysis by trained panelists revealed that the addition of flavouring agents significantly improved key attributes such as flavour and crispiness, resulting in high overall acceptability. The findings highlight the potential of flavoured tapioca chips as a promising snack with enhanced sensory appeal.

Keywords: Tapioca, chips, flavours, cassava

Introduction

Flavour plays a crucial role in the development, production and marketing of chips, as consumers consistently seek products that retain their freshness in appearance, aroma and taste over time. Flavour imparting substances enhance both the sensory quality and shelf life of food products. Deep fried foods have gained widespread popularity due to their distinctive flavor and crispy texture, as reflected in the multibillion-dollar global market for such products. Oil quality plays a vital role in both the functional and sensory attributes of food products, as it not only carries, enhances and releases the flavour of other ingredients but also interacts with them to develop the desired texture and mouthfeel of fried foods (Giese, 1996). The sensorial attributes of fried products, such as flavour, colour and crispness, are largely determined by the raw materials used, the frying medium and the specific frying conditions employed.

Chips are the most frequently produced value-added product made from cassava. Fried cassava chips available in the online market are often too hard and difficult to bite, making them distinctly different from potato and banana chips, which results in poor product sustainability and lower prices. Research conducted at ICAR-Central Tuber Crops Research Institute (ICAR-CTCRI), Sreekaryam, Kerala, has shown that excellent quality cassava chips can be produced by soaking cassava slices in an acetic acid-brine solution for one hour, followed by parboiling for five minutes, surface drying, and deep frying in oil. This process helps remove excess starch and sugar from the cassava slices, resulting in light yellow, crispy chips with a soft mouthfeel and good texture.

Health Benefits of Tapioca

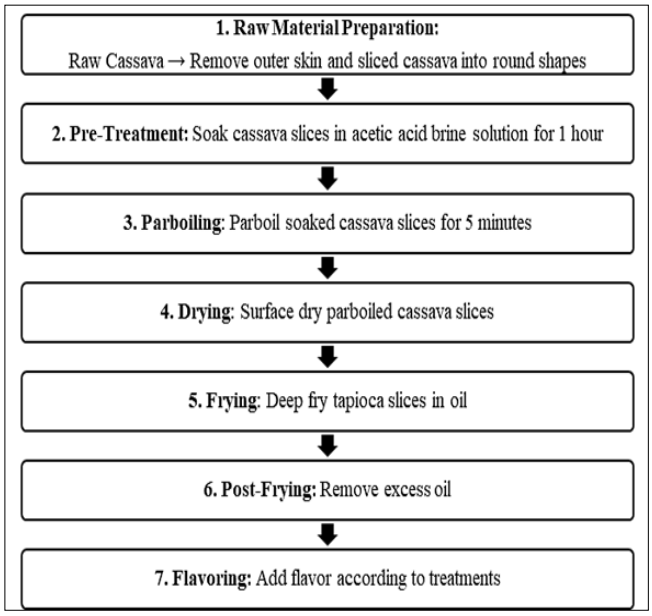
Tapioca offers several health benefits: it's gluten-free, rich in fiber supporting digestion and gut health, a good energy source due to its high carbohydrate content, and aids in weight management by promoting satiety. It also supports bone health with minerals like calcium and phosphorus and is naturally low in fat and cholesterol. Tapioca is relatively rich in ascorbic acid and contains significant amounts of thiamine, riboflavin, and niacin. Processing its roots by boiling or soaking in an acid brine solution reduces cyanide levels (Lamptey *et al*., 2008).

Materials and Methods

1. Ingredients

Tapioca tubers, water, acetic acid brine solution, salt, oil for frying and flavours

2. Preparation of tapioca chips



3. Treatment details

S. No.	Treatment	Flavour combinations	Ratio
1	T_1	Coriander powder + Saindhav salt + black pepper	1.5:1:2
2	T_2	Red chilli + oregano	3:1

3	T_3	Red chilli powder + Saindhav salt	3:1
4	T_4	Aamchur powder + Pudina powder + Red chilli powder	1:1:2
5	T_5	Black pepper + Saindhav salt	3:1
6	T_6	Aamchur powder + Red chilli powder + Saindhav salt	1:2:0.5

4. Score card for Organoleptic evaluation

Organoleptic score	Scale (Rating)
9	Liked extremely (LE)
8	Liked very much (LVM)
7	Liked moderately (LM)
6	Liked slightly (LS)
5	Neither liked nor disliked (NLND)
4	Disliked slightly (DS)
3	Disliked moderately (DM)
2	Disliked very much (DVM)
1	Disliked extremely (DE)

5. Sensory Evaluation

1. Trained panelists or consumer participants were enlisted to evaluate the chips' quality and sensory attributes.
2. The sensory attributes evaluated included taste, aroma, texture, colour and overall acceptability.
3. Participants rated each attribute using a 9-point hedonic scale based on predefined criteria.
4. Statistical analysis using a Completely Randomized Design (CRD) was conducted to compare sensory scores across different flavour formulations.

Results and Discussion

Table 1: Score of sensory attributes

Sr. No.	Treatment	Colour	Flavour	Texture (crispness)
1	T_1	6.54	6.50	6.82
2	T_2	7.57	7.46	7.18
3	T_3	6.93	7.14	7.11
4	T_4	7.43	7.21	7.04
5	T_5	7.21	7.29	6.96
6	T_6	7.57	6.86	6.82

Table 2: Statistical analysis of Overall acceptability

Sr. No.	Treatment	Overall acceptability
1	T_1	6.63
2	T_2	7.41
3	T_3	7.07
4	T_4	7.24
5	T_5	7.16
6	T_6	7.09
Mean		7.10
S.E.m (±)		0.017
C. D. @ 1%		0.076

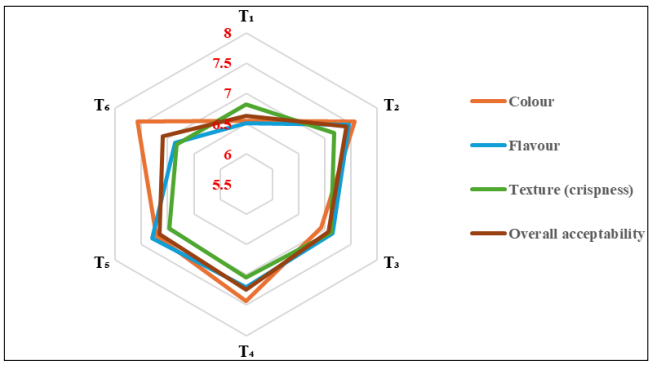


Fig 1: Profile assessment of organoleptic properties of tapioca chips.

The results of this investigation show that the addition of flavouring agents to tapioca chips significantly enhances their sensory qualities, particularly in terms of flavour, colour and texture (crispiness). The flavoured variants were generally rated higher in overall acceptability. The sensory panel noted that the enhanced colour and appealing aroma contributed positively to the overall impression of the chips. Crispiness a key texture attribute was consistently rated as satisfactory across all flavoured samples. The findings indicate a strong potential for consumer acceptance of flavoured tapioca chips as a novel and appealing snack product. The flavour combination Red chilli and oregano (T_2) recorded maximum score (7.41) for overall acceptability.

Conclusion

This study demonstrates that flavoured tapioca chips have strong potential as an appealing snack option. The addition of seasoning combinations significantly improved the chips' sensory qualities, particularly in flavour and crispiness. Among the tested formulations, the red chilli and oregano combination (T_2) recorded the highest overall acceptability score (7.41) indicating strong consumer preference. These findings support the development of innovative, flavour enhanced tapioca-based snacks that cater to evolving consumer tastes.

Future scope

Further research may focus on identifying the preferred flavour profiles, shelf-life stability and optimizing processing conditions for commercial production.

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