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Research Article

Development and Quality Evaluation of 'Instant Sweet Potato Porridge': A Novel Instant Product Development

Priya Darshane*

Lokamanya Tilak International Research Centre for Fundamental Research in Ayurved and Yoga, Pune, India

ABSTRACT

The present study was undertaken to ensure availability of maximum nutrients to all the sections of population by making the product ready to cook and making it cost effective at the same time gluten free. The cost reduction was achieved by replacing milk with water in this dessert. Other nutrients present in this instant product like red pumpkin, skim milk powder, sweet potato etc. make this product nutrient dense. During product development, sweet potato and pumpkin were dehydrated and the flour of sweet potato and dehydrated pumpkin shreds were used (blend: 16% sweet potato and 8% pumpkin) to make the product instant in order to reduce cooking time. The developed product was vacuum packed in LDPE and shelf life studies were carried out for 60 days. As per the results of analytical and microbial studies, it was concluded that the product was shelf stable can be promoted for commercial application.

Keywords: Instant; Dehydrated sweet potato; Vacuum packing

INTRODUCTION

The term "convenience food" is used for a very heterogeneous group of foods which vary in composition, shape, size, method of preparation and processing, and even with regard to their functions in the diet. Convenience foods can be defined as those products in which all or a significant portion of their preparation has been transferred from the consumer's kitchen to the processing plant. The major emphasis in this definition is on the quantum of convenience which should be significant and should provide adequate savings in time and labour in the consumer's kitchen [1].

All over the world during the last two decades, the convenience food market has witnessed breath-taking changes in quality and quantity of products available and the packaging and technology employed for their processing [2]. Instant mixes belong to this category. These products are produced by blending various ingredients in required proportions along with suitable GRAS (Generally Recognized As Safe) preservatives Control of granularity, moisture and adequate mixing are essential for product acceptability and shelf life. Heating at 60°C in a cabinet dryer has been found to be useful in controlling infestations as well as caking and lumping [3].

Among the various instant mixes, gulab-jamun mix is the most popular and has the highest sales. In addition, instant vada mix, dosa mix, upma mix, cake mix, jalebi mix etc. are also available in the market with good sale status [1,4].

Some instant mixes are based on dehydrated products. Depending on the dehydration conditions employed and nature of the product mix, these can be reconstituted in around 6 minutes to 20 minutes in boiling water. Reducing the time of reconstitution/cooking to less than 2 minutes has remained the desired goal of the technologists in this field [2].

Recently, 'no-time' cooking curried dhals and khichadi which adding hot water, have been developed by Defence Food Research Laboratory, Mysore and these have been highly liked in consumer acceptance trials. This breakthrough in instantisation has been possible by combining conditioning, flaking and drying techniques. Instant kheer mixes based on roasted semolina, dehydrated rice, wheat and vermicelli have also been developed; but these have not caught the attention of industry. Also these products are very costly due to large investment and drying cost.

Taking into consideration all these above mentioned important points as well as keeping in view the nutrient availability and cost reduction, the product "Instant Sweet Potato Porridge" was designed and successfully developed [1].

OBJECTIVE BEHIND THE STUDY

To develop a convenience food in the form of "Instant Sweet Potato Porridge"-A dessert that will provide maximum nutrients in one serve besides saving cooking time of the consumer as well as

Correspondence to: Priya Darshane, Lokamanya Tilak International Research Centre for Fundamental Research in Ayurved and Yoga, Pune, India, Tel: 7350069140; E-mail: priyaisha.darshane@gmail.com

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to make this product available to lower section of the society. The additional benefit is the product under study is gluten free.

Control variable (operational definition)

Effect of blanching time and temperature: Sufficient blanching time (7 minutes-8 minutes) and temperature (80°C) for the inactivation of enzymes such as peroxidase and catalase to avoid discolouration of the product is very important to obtain a product of excellent quality.

Extraneous variable (operational definition)

Effect of long dehydration on sweet potato colour: Long time of dehydration mainly results in product discolouration and declined product quality. Due to mechanical defects in cabinet dryer, dehydration of sweet potato took a long time of around 10 hours and resulted in slight browning but the problem was controlled by sprinkling a preservative.

MATERIALS AND METHODS

The raw materials like sweet potato (purple variety), red pumpkin, skimmed milk powder, dairy whitener, CMC and other materials like sugar, flavour (rose essence) and cardamom were procured from the local wholesale market in Pune (Maharashtra).

Pre-treatments

Sweet potatoes and red pumpkin were washed thoroughly to clean the surface and blanched in hot water at 80°C for 8 minutes-10 minutes. Blanching time was standardized by conducting enzyme inactivation test- peroxidase test as per standard AOAC procedure (2000).

Next sweet potatoes and pumpkins were shredded into thin short shreds using SS shredder and spread uniformly on dehydration trays in a thin layer for uniform and quick dehydration. Both were dehydrated in a cabinet dryer at 55°C-60°C for 5 hours to 6 hours. Dehydrated sweet potato shreds were ground into coarse flour and sifted from 10 mesh sieve for efficient mixing.

Experimental trials

Five trials were conducted by mixing all the ingredients in different percentages to get the best results of shortened cooking time and maximum nutrition. In every trial all ingredients like dehydrated sweet potato flour, dehydrated pumpkin shreds, SMP, diary whitener, powdered sugar, flavours, preservative (0.2% Calcium propionate) and CMC (0.2%) were mixed together thoroughly in varying proportions and cooked using varying amounts of water and blends of water and milk in some trials. Cooking time was noted. The best trial was selected from sensory evaluation by 20 semi-trained panellists and was further used for bulk production (Table 1).

Chemical characteristics

Moisture, ash content, crude fat and protein content of the product were estimated by standard AOAC methods (2000). Carbohydrate content was determined by difference method. Microbial analysis of the product (Total Plate Count) at an interval of 15 days to 60 days was conducted using Potato Dextrose Agar.

Sensory evaluation

The product was evaluated for overall acceptability (colour, flavour, taste, consistency, mouth-feel etc.) and was carried out as per 5 points Hedonic scale with the help of 20 semi-trained judges.

Cost economics

The cost of the product was calculated taking into consideration the cost of raw materials as well as other factors like marketing costs, taxation (VAT) etc. and was expressed as Rs. 1 Kg of the product.

RESULTS AND DISCUSSION

Proximate composition of raw materials

Skimmed milk powder had highest ash, protein and energy content while sweet potato flour contained higher carbohydrates (Table 2).

Proximate composition of the product

The fat content, protein content and carbohydrate content of the product were desirable and acceptable. The carbohydrate content of the product was decreased and total sugars were increased by 60th day (Table 3).

Microbial analysis of the product

The data presented in the (Table 4) reveals the influence of packaging material and storage period on the microbial content of the product. The TPC on the zero day was almost nil and was within acceptable range till 60th day. Hence it can be concluded that the product exhibited excellent shelf stability.

Sensory characteristics of the product

The sensory evaluation of the product was carried out by a panel of

Table 1: Treatment details.

Ingredients	T1	T2	T3	T4			T5	
	(Dehydrated sweet potato shreds)	(Dehydrated roasted sweet potato shreds)	(Dehydrated sweet potato flour)	I	II	III	I	II
Dehydrated sweet potato flour (g)	26	26	27	27	27	27	27	27
Dehydrated pumpkin shreds (g)	13	13	13	14	14	14	14	14
SMP (g)	20	20	20	20	20	40	20	40
Dairy whitener (g)	-	-	-	-	-	-	-	40
CMC (g)	0.6	0.6	0.8	0.8	0.8	0.8	0.8	0.8
Powdered sugar (g)	40	40	40	40	40	40	40	40
Rose essence (g)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Cardamom powder (g)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Milk (ml)	300	500	600	200	150	-	300	-

Table 2: Proximate composition of raw materials.

Raw materials	Dehydrated sweet potatoes (%)	Dehydrated pumpkin (%)	Skimmed milk powder (%)
Moisture	4.8	4.95	4.5
Protein	6.9	6.1	37
Fat	1.2	1.8	1.9
Carbohydrates	86.1	86.55	53.48
Ash	1	0.6	3.12
Energy	382.8	386.8	478

Means of three independent observations

Table 3: Proximate composition of the final product during storage days.

Storage-days	0 day	15th day	30th day	45th day	60th day	SE:+/-	CD at 5%
Moisture (%)	6.33%	6.32%	6.36%	6.34%	6.34%	0.04	0.12
Ash (%)	2.48%	2.43%	2.46%	2.47%	2.44%	0.05	0.15
Fat (gm)	2.83	2.82	2.86	2.9	2.83	0.08	0.24
Protein (gm)	22.5	24.7	27.68	28.9	28.98	2.5	7.5
Total sugars (gm)	69.36	69.93	70.01	71	71.63	2.27	6.81
CHO (gm)	65.86	63.73	63.64	59.4	59.41	2.2	6.6
Energy (kCal)	181	187	200	201	198	-	-

Means of three independent observations

Table 4: Proximate composition of the final product during storage days.

Storage Days	CFU/ml (TPC)
0	0
15	1×10^8
30	1.45×10^8
45	3×10^8
60	3.7×10^8

Means of three independent observations

Table 5: Sensory characteristics of the product.

Trial	Colour	Taste	Flavour	Consistency	Mouth-feel	Overall Acceptability
T5 (II)	3.7	4	3.8	3.7	4	3.9

Means of ratings of 20 panel members using 5 point hedonic scale

Table 6: Changes in the organoleptic properties of the product during storage period.

Sensory Parameters	0 day	15th day	30th day	45th day	60th day	Mean of means
Colour	3.17	3.81	4.12	4.13	4.6	3.96
Texture	3.95	4.21	4.89	4.86	4.61	4.7
Flavour and taste	3.48	4.19	4.62	4.12	4.69	4.62
Appearance	3.86	3.81	4.13	4.14	4.2	4.02
Overall Acceptability	3.97	4.27	4.32	4.44	4.43	4.76
Mean of means	3.68	4.05	4.57	4.69	4.06	-

Means of ratings of 20 panel members using 5 point hedonic scale

twenty semi-trained judges using five point Hedonic scale, (Table 5). The sensory attributes that were taken into consideration include: Colour, taste, flavour, appearance, consistency, mouth-feel and overall acceptability. The values are the means of ten readings. Among the various trials, trial II from T5 had highest overall acceptability and time required for cooking was also less (6 minutes). During storage period, all the parameters were enhanced as shown by sensory evaluation. Flavour was found to be enhanced. (Table 6).

Cost economics

The calculated cost of the product is Rs. 20/100 g of the product and thus Rs. 200/Kg. Net weight of one pack of the product is 200 gm and thus the cost per pack is Rs. 40. As compared to other instant mixes available in the market, the present product is cheaper. Most of the instant mixes are of Rs. 60 and above. Example: Milkmaid's instant firni mix (Rs. 98), Nestlé's instant kulfi mix (Rs. 68), Gits instant kheer mix (Rs. 62) etc. Hence the product fulfils its objective of cost reduction.

CONCLUSION

A novel convenience food, enriched with proteins and vitamin A from milk powder and red pumpkin respectively, was successfully produced. Dehydrated sweet potato flour and dehydrated red pumpkin shreds made this product time saver. In the product, milk was replaced with water but still the mouth-feel of the product was rich and creamy due to addition of SMP and dairy whitener. The goodness of sweet potato and red pumpkin along with SMP and

sugar makes this product suitable for infant food as well as geriatric food with few exceptions like diabetics and lactose intolerant who cannot consume this product. Addition of pumpkin resulted in better colour and flavour of the product. During the storage period, organoleptic attributes of the product were enhanced.

There is scope in the future to fortify the product with vitamins like vitamin A, vitamin C etc. and minerals like Fe etc. and can be promoted as a nutrient dense product during fasts as well. This product provides better nutrient supplement to the diets of the children who are otherwise devoid of proper nutrition.

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