



# Exploitation of Unmarketable Potatoes for the Preparation of Instant Custard Powder with Different Flavours and Their Sensory Evaluation

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## Abstract

Ready to use instant custard powder (ICP) was prepared by mixing potato starch and flour with powdered milk, sugar and dry fruits (cashews, almonds and resins). A total of four flavours, viz. butterscotch, cardamom, vanilla and orange, were tried, out of which orange was inferred to be the best. Grade D potatoes were procured from the market. The potato starch was prepared by crushing the potato slices in excess of water to make slurry which was sieved so that the settled starch can be obtained which was washed and dried in oven at 45° centigrade and ground into fine powder. The potato flour was prepared by drying the slices of potatoes in oven to bring down its moisture level to 3–4%. This was followed by the grinding of the dried slices. The custard was prepared by mixing the potato starch and potato flour in a given amount of milk and hot water, and dry fruits were added. The sensory evaluation was done with a panel of 20 members, and orange flavour was judged the best of all the four samples. The cost analysis was done, and it came out to be Rs 7/per packet.

## Keywords

Potatoes · Instant custard powder · Quality · Economics

## 23.1 Introduction

Potato (*Solanum tuberosum* L.) is one the pioneer tuber crops of the world, especially in Europe and America, and the most important commercial vegetable crop harvested in India. Production of potato has achieved greater heights in recent years.

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In India, the growth has expanded over an area of 1.91 million hectares with a total yearly production of 41.5 million tonnes comprising 5–10% of D-grade potatoes. It is rich in good quality protein and carbohydrates and is available in India throughout the year and is a good supplement of the cereal diets. However, 10% of the total produced is used as seed, and 10–15% is wasted during harvest and post-harvest operations due to absence of sufficient cold storage facilities. At farm level total produce includes grade A (tuber size 50–75 mm) and D-grade (tuber <25 mm) potatoes. Unmarketable potatoes die to their small size (<25 cm) and are difficult to handle and fetch low price to the growers which can be processed to get better remunerative advantage. The current research work focuses on how unmarketable potatoes can be utilized more beneficially for the preparation of instant custard powder (ICP) after preparation of potato flour and starch.

This research work has its basis in one most extensively researched field in food industry which is to find the ways to utilize the methods, approaches and processes to prepare food products in an efficient way, which take into account the following objectives:

- Renewability of by products
- Reducing the wastage during production
- Reutilization of unused or unconsumed produce

Our research work primarily focuses on the third point of the above-mentioned objectives, i.e., reutilization of in-used or unconsumed produces.

Awoyale et al. (2015) worked on evaluation of the nutritive value of custard powder prepared from high-quality yellow cassava starch enriched with partially defatted soya bean flour of varying proportions of 5%, 10%, 20% and 30%. Their approximate composition, pigment (carotenoid) content and pasting (sticking) property were observed. Okoye et al. (2008) did a research in which they prepared soya fortified custard and checked for its nutrient composition and sensory acceptability. The incorporation of soya protein isolates in custard powder was done to increase its protein content and its nutrient composition with study of its sensory quality. It was observed that fortifying custard powder with protein from some economical source like soya bean increases its nutritional value but alters sensory and functional property. Increase in the content of isolate leads to increase in dispensability, packed bulk density, swelling power, viscosity and solubility index.

Alimi et al. (2016) studied the engineering properties of composite corn-banana custard flour products developed by involving and further utilizing native, heat moisture-treated or annealed banana starch as a percentage (15%, 25% or 35%) of the composite was determined. Big oval granules of banana starch lead to occupying empty spaces in the matrix resulting in more compact composite of the corn flour structure and, in turn, higher bulk density with increasing level of inclusion. It led to significant reduction in the swelling capacity of the corn flour samples with gelling and boiling points getting diversified.

Awoyale et al. (2015) studied the effect of storage on the chemical composition and microbiological activity followed by sensory properties of cassava starch-based custard powder. The use of yellow-fleshed cassava root starch was implied in this study. The production of custard powder had poor nutritional value especially protein. Therefore, fortification with high-quality animal protein product like whole egg powder might improve its protein quality and quantity. The interaction of these constituents formulated some changes in the product during storage, and one or more food characteristics reached an undesirable state. After storage, the moisture content and microbiological load also increased. All the sensory attributes were accepted at the end of storage, except taste and colour, with carotene contents decreasing significantly.

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## 23.2 Material and Methods

### 23.2.1 Requirements

1. Potatoes
2. 3% NaCl solution and 0.05% ascorbic acid solution
3. 0.2% KMS solution
4. Distilled water
5. Milk powder
6. Milk
7. Dry fruits
8. Powdered sugar

### 23.2.2 Methodology

1. **Raw material:** Grade D potatoes were procured from the market. All the potatoes were washed thoroughly and peeled with the help of stainless steel peeler. The potatoes were then cut into small pieces of sizes 1–2 mm thick using hand-operated stainless steel slicer.
2. **For preparation of potato flour:**
  - The cut slices were put into 3% NaCl and 0.05% ascorbic acid solution to prevent browning caused by polyphenol oxidase.
  - These slices were then blanched at 80–85 °C for 3 min for flour preparation.
  - The blanched slices were cooled under tap water and then treated with 0.2% KMS for 15 min to prevent non-enzymatic browning.
  - Slices were then dried in mechanical drier at three stages, viz. 70 °C for 2 h, 65 °C for 4 h and finally 60 °C, and brought down moisture content to 3–4%.
  - The dried slices were cured for equalization of moisture in tin container followed by grinding to a fine powder to make potato flour.
3. **For extraction of potato starch:**
  - Slices were blanched at 80–85° for 1 min and then crushed in excess water (5 times) in a grinder (4–6 min) to make fine slurry.

- Slurry was sieved through muslin cloth and filtrate was allowed to settle in tub.
  - Supernatant was discarded and settled starch was washed with fresh water 2–3 times to remove all impurities and to get clear starch.
  - Starch was dried in oven at 40–45 °C. Before complete drying, it was made into fine powder and then packed in polythene bag and labelled.
4. **For preparation of instant custard powder:**
- Starch and flour obtained were used for instant custard powder preparation.
  - Recipe for the formulation of ready to use custard powder was worked out by mixing potato starch and flour with powdered milk and dry fruits, and different flavours were obtained by mixing ICP with different flavouring powders.
  - The best recipe was selected on the basis of the higher sensory score on 5-point hedonic scale.

A. Methodology pertaining to preparation of custard from powder is given below:

Instant Custard Powder (100grams)



Make a paste with 50mL water



Add paste to 60mL milk



Stir for 2–3 min while heating and add all the flavouring agents. Cooling of custard is done by refrigerating it for few hours which is followed by serving it chilled in plates.

Composition of the Raw Material Used:

- Potato flour—5 g (per sample)
- Potato starch—2 g (per sample)
- Milk powder—1 g (per sample)
- Flavour—0.75 g (per sample)
- Sugar—2.5 g (per sample)

### 23.2.3 Sensory Evaluation

- The prepared four samples of different flavours were evaluated for sensory qualities on the basis of colour, consistency, flavour and overall acceptability by a panel of 20 judges on a five-point hedonic scale.
- Finally, the best sample was obtained on the basis of sensory evaluation score.
- Costing of ICP was calculated by taking into consideration various inputs like raw material, labour, electricity, processing cost, packaging and other changes.

For calculating the sale price of the product, 10% profit margin was added to the cost of instant powder.

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## 23.3 Results and Discussion

A total of four flavours of instant potato custard was prepared, out of which orange was best as mentioned below:

### Sample A (Cardamom):

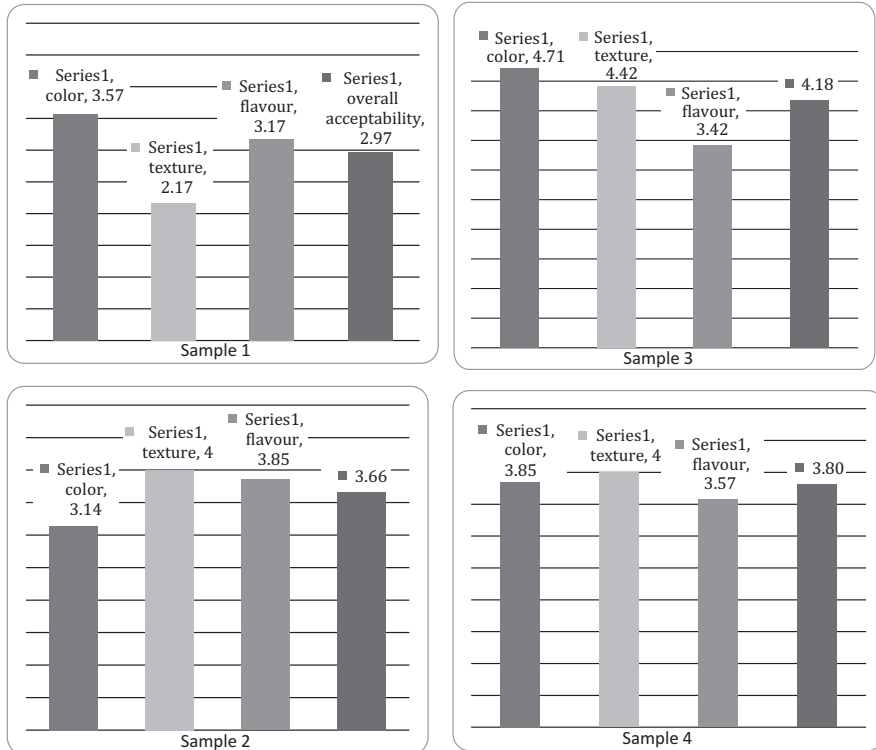
- A. The colour was judged best in the case of cardamom flavour. Average score was 4.11.
- B. Flavour was a bit more in the sample but was acceptable. Average score was 3.55.
- C. Consistency was fine but could have been thicker, which can be done by addition of more starch. Average score was 3.61.
- D. The sample's overall acceptability was fair. Average score was 3.55.

### Sample B (Butterscotch):

- A. The colour was widely accepted by most of the judges and was scored very well. Average score was 4.22.
- B. Flavour was poor as the quantity of flavouring agent was more; hence it left an aftertaste. Average score was 2.88.
- C. Consistency was rated the best out of the all samples. Average score was 3.77.
- D. Overall acceptability was good in the butterscotch sample. Average score was 3.77.

### Sample C (Vanilla):

- A. Colour was very good and creamier white. Average score was 3.77.
- B. Flavour was overcooked and hence was rated fair. Average score was 3.66.
- C. Consistency was not up to the mark and could have been thicker by addition of thickening agent. Average score was 3.55.
- D. Overall acceptance was good. Average score was 3.77.



**Fig. 23.1** Graphical representation of overall preference of various samples

#### Sample D (Orange):

- A. Orange has rated the best sample in terms of flavour. Average score was 4.22.
- B. Consistency was dilute and could have been thickened by the addition of more starch. Average score was 3.52.
- C. Colour was poor as no artificial colour was added; hence it was creamish white which should have been orange. Average score was 3.11.
- D. Its overall acceptance was very good. Average score was 4 (Fig. 23.1).

### 23.4 Conclusion

The instant custard powder was successfully prepared by using grade D potatoes. Various flavours were prepared, and their sensory evaluation was conducted on the basis of various sensory attributes, namely, flavour, colour, consistency and overall acceptability with a panel of 20 members, and orange flavour was voted the best out of all the samples. The cost analysis was done and it came out to be Rs 7/per packet. This research can be extremely useful in utilizing the grade D potatoes and is an economical source of nutrition. This product has a wide scope as custards are in high demand in the market.

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## References

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