

DEVELOPMENT OF VALUE ADDED PRODUCTS FROM BANANA PEEL

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ABSTRACT

By products of fruits and vegetables are causing great concern to food processors and the humans residing in that locale. Moreover the nutrition and health potential of these products have not been recognized. Banana peel is a huge waste generated in the Chip making industries. It is being utilized by a small section of the population as a vegetable. But mostly they are discarded or given to cattle. An attempt was made to standardize three value added products namely, Ready to cook curry mix, instant soup mix and sauce. Various formulations of ingredients were tried out and evaluated by a sensory panel. The ratings were highly acceptable and advised for scaling up.

KEYWORDS: Banana Peel, Sauce, Ready To Cook Curry Mix, Instant Soup Mix, Sensory Evaluation

Fruit wastes, which are highly perishable, is a problem to the processing industries and pollution monitoring agencies. Suitable methods to utilize them for the conversion into value-added products would be useful for developing healthy foods. By-products recovery from fruit wastes can also improve the overall economics of processing units. Besides this, the problem of environmental pollution also can be reduced considerably.

Despite the nutritional, economic and medicinal importance of banana peel, they still remain neglected. Not much work has been done to develop banana peel based processed foods. In this context, the present investigation on 'Development of value added products from banana peel was selected with the objective of developing value added products from banana peel and to evaluate their organoleptic, functional, nutritional and shelf life qualities.

METHODOLOGY

The methodology of the study is discussed herewith

Selection and Collection of Raw Material

Banana peel of cv nendran was utilized for the study. Nendran is a popular variety in Kerala. It is not only relished as a fruit but also has got wide applications in the processing industry, thus it ranks first in commercial value among all varieties. Banana chips is a flourishing cottage industry in Kerala. The characteristic flavor of banana chips fried in coconut oil is an exotic identity among the commercial food products of Kerala. Surplus amount of the peel of nendran is generated as waste from the banana chips industry which is found to have application only as cattle

feed. Fresh peels of nendran were collected from a chips making unit at East fort, Trivandrum.

Standardization and Product Development

Three banana peel based dishes were identified for standardization namely, Instant soup mix (ISM), Ready to cook (RTC) curry mix and sauce.

In the recipe verification the selected recipes were reviewed for ingredients and quantity. The selected recipes were standardized to ensure consistency in the quality and quantity of product. Each recipe was prepared three times. Each time the yield and acceptability of the products were noted for bringing about any changes.

Standardization of Instant Soup Mix

Fresh peels were subjected to various preliminary processing to standardize blanching time, pre treatment media, immersion time and formulation. 5 formulations were dehydrated at 65 degree Celsius and powdered. They were then mixed thoroughly to form instant soup mix.

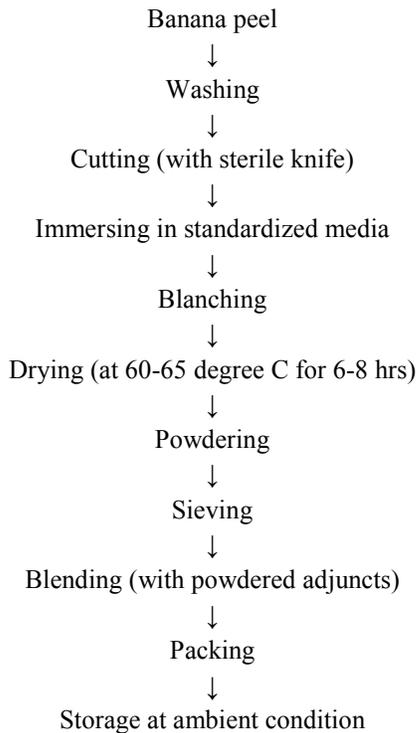
Soup was prepared by boiling 200ml of water and adding the soup mix as a paste and simmering for 1 min. The 5 treatments were prepared and subjected to sensory evaluation. The cooked weight of products were noted.

Standardization of Ready to Cook Curry Mix

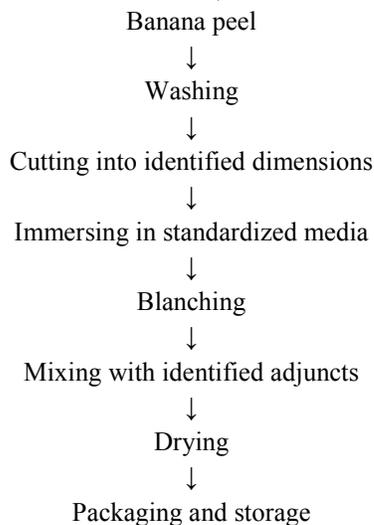
Dimensions of vegetable slices and proportion of adjuncts of the curry mixes standardized after evaluation by a sensory panel. Similarly the reconstitution time cooking time were also standardized by sensory evaluation.

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Processing of banana peel based soup mix (Flow chart)



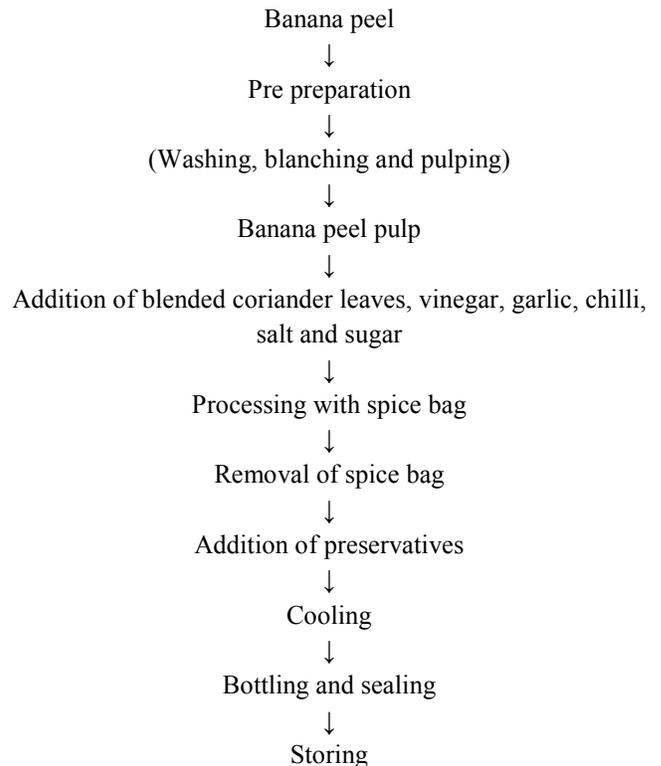
Preparation of banana peel based RTC product (Flow chart)



Standardization of Sauce

The peel slices were blanched for 5 min (standardized in experiment) and immersed in standardized pre treatment media. Five formulations were fixed and evaluated by a sensory panel. The optimum cooking time of the product was also assessed.

Processing of banana peel based Sauce (Flow chart)



Packaging and Storage

The standardized banana peel based Instant soup mix and Ready to cook curry mix were stored in laminated pouches and the sauce was stored in glass bottles kept in ambient conditions. The shelf life was assessed at periodic intervals for 3 months.

Cost of Developed Products

Costs of the developed products of the mixes were analyzed based on input cost; ie cost of different ingredients used for the preparation of the product, with cost of packaging materials and over head charges (10 per cent of the cost of products were added as overhead charges for fuel and labour, to the total input cost)

RESULTS

Overall Visual Quality (OVQ)

Scores of the sensory panel was used to screen out the best treatments. Blanching time of 5 min was assessed as the best among 5 treatments (CD-18.07).The best pre treatment media identified was T5 (citric acid 0.5% and salt 3%).Overall visual quality scored of banana peel soaked for 10 min obtained the highest scores. Formulation S1 comprising of banana peel flour, onion powder, corn flour,

citric acid, capsicum powder, coriander leaves powder, white pepper powder, ginger powder, garlic powder and salt, obtained the highest scored from the sensory panel.(proportion in gram being 5:4:1.5:0.5:0.25:0.25:0.5:0.25:0.25:2) .

Standardization of Ready to Cook Curry Mix

Banana peel slices with 1x1 cm dimension obtained the highest rating for overall visual quality. Formulation S1 obtained the highest scores for sensory qualities with respect to appearance, colour, flavor, texture, taste and overall acceptability, The formulation comprised of banana peel, crushed red chilly, garlic, cumin, turmeric powder and curry leaves in the ratio 1000:30:50:10:20:50 (g)

The reconstitution time and cooking time was also optimized through evaluation of 5 treatments. Twenty min of reconstitution time and 7 min of cooking time was thus selected.

Standardization of Banana Peel Based Sauce

Formulation S5 comprising of banana peel, coriander leaves, garlic, vinegar, red chilly and spice in the proportion (100:50:5:2.5:2.5:5g) was adjudged the best by the sensory panel.(mean rank value for Overall acceptability – 36.3).The cooking time identified as optimum was 6min.

Shell Life Studies

Moisture Levels

The evaluations of products in their respective packaging were conducted periodically for 3 months. Moisture content of soup mix was seen to increase from 4.4% to 4.8% while moisture content of curry mix was found to increase from 5.4 to 5.8 %.Finally for sauce the moisture level increased from 72.7% to 72.7%.

Microbial Profile

During the storage period no bacterial colonies were found to appear in the developed soup mix and curry mix packed in laminated pouches. But in the case of sauce, two bacterial colonies were seen in 10^{-5} dilution during the third month.However, this was within permissible limits. No other pathogenic organisms could be detected in the developed products.

Sensory Attributes

Changes in sensory attributes namely appearance, colour, texture and the taste of all the 3 products were negligible over the 3 months of storage.

Cost of Developed Product

In order to realize the economic feasibility of the developed banana peel products, the cost of the products were worked out by taking individual cost of the ingredients used and adding 10 per cent over head charge. The costs of 1 kg packets of products were thus calculated.

Table 1: Cost of the banana peel based products

Name of the product	Cost of the finished product/kg (Rs)	Cost of the finished Product/pack
Instant soup mix	33.00	5.5/14.5 g
RTC curry mix	28.00	4.6/100 g
Sauce	80.00	16/200 ml

DISCUSSION

Utilisation of by products of processing industry has become the need of the hour. Moreover they are reservoirs of nutrients and bio active components.

Peel of vegetables and fruits are of the most important part that helps in protecting the body from diseases, getting rid of the free radicals, as they contain vitamins and minerals which are antioxidant, in addition to phenols. Studies have proved the existence of vitamin C, E, and B6 in banana peels, especially vitamin C that can act as an antioxidant. Banana peel represents about 40% of total weight of the fresh fruit (Anhwange et al., 2008). The total amount of phenolic compounds in banana peel has been ranged from 0.90 to 3.0 g/100 g dry weight and galocatechin is identified at a concentration of 160 mg/100 g dry weight; Someya et al. (2002). Other phytochemicals such as anthocyanin, delphinidin, cyaniding; Seymour, and catecholamines have been identified (Kanazawa and Sakakibara, 2000) in ripe banana pulp and peel. Recent studies demonstrated that banana peel generally includes higher phenolic compounds than those of banana pulps; Kondo et al. (2005) and Sulaiman et al. (2011). Subagio et al. (1996) identified carotenoids such as β -carotene, α -carotene and different xanthophylls in the range of 300–400 μ g lutein equivalents/100 g. of banana peels. Gonzalez-Montelongo et al. (2010) studied the extraction conditions that produce maximum antioxidant activity (Acetone: water (1:1), 25 °C, 120 min). Moreover, the number of extraction steps,

temperature and time, have been reported as the most effective factors associated with antioxidant properties of banana peel, respectively. According to the study by Someya et al. (2002) total phenolics are more abundant in peel (907 mg/100 g dry wt.) than in pulp (232 mg/100 g dry wt.) in *Musa cavendish*. There are several studies showing the antimicrobial activity of banana peel. Ighodaro evaluated antibacterial activity of banana peel extract (*M. paradisiaca*) against human pathogenic bacteria and found that banana peel extract showed inhibition against *S. aureus*, *Escherichia coli*, and *Proteus mirabilis*. Chabuck et al studied antimicrobial activity on clinical isolates of two Gram-positive (*S. aureus* and *Streptococcus pyogenes*), four Gram-negative (*Enterobacter aerogenes*, *Klebsiella pneumoniae*, *E. coli*, and *Moraxella catarrhalis*), and one yeast (*Candida albicans*).

Development of convenience foods to suit the urban consumer has been the focus of the processing industry, the world over. The convenience foods market is driven by busy lifestyles and ageing population. It includes a range of processed foods that has longer shelf life and are easy to use. The major attributes that consumers look for in convenience foods are ease of use, packaging, nutritional value, safety, variety and product appeal. (market insights.com). Thus three products suiting the Indian consumer was standardized, namely instant soup mix, ready to cook curry mix and sauce. Here the added attraction was the cheap raw material, which is proved to have many health benefits

The various formulations were evaluated by a panel of ten members for its appearance, taste, texture, flavor and overall acceptability. This approach is the apt method to evaluate food products, as rightly stated by Lawless and Heymann (2010) that, Sensory science is the study of the reactions of the five senses, these are sight, hearing, smell, taste and touch. It helps to know the characteristics of physical matter. The mean values of 9 point hedonic scale decided on the most acceptable formulation.

Next, the shelf life evaluation was conducted with respect to moisture, microbial profile and sensory characteristics. The results were all meeting requirements of FSSAI standards. This proves its scope for commercialization. The computed cost of the products also is found to suit the common man's purse.

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