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An insight into organoleptic analysis of a novel product developed from lotus stem

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Abstract
Lotus stem is an indigenous vegetable confined to selective cuisines of South East Asia. It is a nutritionally balanced food. Lotus stem is low in fat, low in sugar and high in protein, minerals and vitamins. Exploration of the nutritional and therapeutic profile of lotus stem is a popular topic of scientific research. Lotus stem has been proven to exhibit anti-microbial, antipyretic, anti-viral and anti-fungal activity.

The consumption of lotus stem is recommended in to enhance the physiology and biochemistry of the individual. The benefits of lotus stem are unexplored by majority of the culinary populations of the world. Lotus stem in addition to its nutritional benefits is an extremely versatile ingredient. Its mild sweet flavor renders it suitable to be incorporated in various recipes.

An edible product using lotus stem was developed. The product is a traditional, jaggery-based dessert using lotus stem as the main ingredient. The product thus developed was organoleptically assessed in comparison with conventional rice flakes payasam. This was achieved by a thorough sensory evaluation procedure involving 49 semi-trained panelists. The panelists also answered a detailed questionnaire based on several non-invasive and invasive sensory parameters. The non-invasive section of the questionnaire ascertained the awareness of the nutritional benefits of lotus stem among panelists. The invasive section of the questionnaire focused on determining product acceptability, product VFM and its commercial marketability.

Future prospects include developing more innovative recipes from lotus stem for commercial marketing and also assessing the role of lotus stem in the therapeutic management of various lifestyle diseases.

Keywords: Lotus stem, novel product development, organoleptic analysis, sensory evaluation

Introduction

Food is considered as the vital force that forms the basis of sustenance of life. Food apart from nourishing the body, serves a holistic role in balancing the physiological and psychological voids, thus elevating the overall psyche of the individual. Thus, consumption and assimilation of food is one of the most vital foundations to good health and wellness. Modern lifestyles combined with hectic schedules have taken a toll on the quality of nutrition via the diet. Erratic schedules, competitive work environments and increased stress to meet deadlines have further diminished the time dedicated to consumption of food. This unfavorable attitude towards food has compromised the health and wellness of populations around the world and has increased the proportion of individuals suffering from various lifestyle diseases and other complications. Thus, the quality of life of individuals all over has deteriorated due to diseases induced by lifestyle patterns.

To somewhat address this problem; a new trend has evolved in the field of food science and technology that is the development of convenience foods. Convenience foods as the name suggests are food products developed which are poised on the fulcrum of consumer convenience. These foods promise to greatly reduce the time required in procuring, processing and preparation of foods. Innovative foods labeled ready to eat, ready to cook, instant foods are all prominent examples of convenience foods. Due to this manufacturing initiative, consumers do not have to skip meals, as these foods can be easily consumed on the go.

However, as humans are psychosocial and highly intellectual, there is a cognitive and emotional association with food. Food is only aptly consumed when it precisely appeals to all the senses- sight, smell, taste, touch and also auditory. Thus, innovative products promising maximum consumer convenience are rendered useless if they do not meet the criteria of organoleptic acceptability. Thus, Sensory Evaluation, the science of measurement and quantification of organoleptic acceptability using the senses is the one of foundations of product development.

Sensory Evaluation

Organoleptic analysis (or sensory evaluation) is a scientific discipline that applies the principles of experimental designs and statistical analysis to the use of human senses (sight, smell, taste, touch and hearing) for the purpose of evaluating consumer products.

This is especially relevant as the human system's sensory output has 4 important characteristics:

1. Each sense is governed by specific biochemical activities and is capable of individual action.
2. There is a synergistic effect of one or more senses in which case the biochemical effect is more sophisticated.
3. The response to the stimulus by the sense is mediated through nervous transmission and is based on previous neural input i.e. memory.
4. Sensory evaluation has many applications where the input

governs both positive and negative responses.

Quality is the ultimate criteria for the desirability of any food product to the consumer. Sensory quality, as ascertained by the techniques of sensory evaluation, is a parameter of great importance to both the processor and the consumer. To the processor since it attracts consumers and the consumers since it satisfies the aesthetic and gustatory sense.

Sensory quality is a combination of different sensors of perception coming onto play in choosing and rating a food; which are as follows.

1. Appearance- which can be judged by the eye; for example parameters like color, size, shape, uniformity and absence of defects are of first importance in food selection.
2. Kinesthetics, the next important attribute concerns texture and consistency.
3. Flavor, which embraces the sense of taste, smell and feelings. Odor assessment is done by sniffing food before putting it in the mouth. In –the mouth assessment of flavor is done by putting food into the mouth and assessing the combinations of sensation.
4. After taste measurements is done with sensations perceived after food is swallowed or rinsed in the mouth. The important considerations being that independent judgement in an atmosphere of relaxed concentration and free from any distraction should be possible.

Trained panel evaluations are used to detect and describe organoleptic characteristics of food products. Sensory evaluation is basically used for:

1. Ingredients processing or packaging evaluation.
2. Shelf-life testing.
3. Competitive comparisions.
4. Research applications.

A quality test panelist must meet certain requirements before he participates in a sensory evaluation exercise:

1. No consumption of tobacco or food 2-3 hours before sensory evaluation is carried out.
2. Good health.
3. Absence of taste-blindness
4. High degree of personal integrity.
5. Average sensitivity.
6. Intellectual curiousity and interest in sensory evaluation process.

Assessment of organoleptic acceptability of lotus stem payasam

For this study, a dessert using lotus stem was developed (lotus stem payasam) as the product for evaluation. This jaggery-based dessert aimed to be low-calorie, highly nutritive dessert which elevates the natural flavour and biochemical benefits of lotus stem.In order to project the organoleptic appeal and acceptability of the nutritive lotus stem product, sensory evaluation was carried out with a semi-trained panel. A panel comprising of 49 panelists (biostatistically significant number of panelists) were chosen for evaluation.

Panelists were to answer a detailed questionnaire based on both non-invasive and invasive parameters. Non-invasive parameters assessed the generall awreness of the consumer wrt the various nutritonal qualities of lotus stem, its incorporation into desserts and the acceptability of the idea of a dessert being made from lotus stem. In the invasive section of the questionnaire, panelists graded the samples based on various sensory attributes. It also focused on the marketability of the product, its value for money, consumer preferences for product consumption and the overall acceptability of the lotus stem payasam.

For this study, a comparative sensory evaluation between 2 samples was carried out; i.e. between lotuses stem payasam and rice flakes payasam.

Samples were presented in the following order to the panelists:

Fig 1: Rice flakes payasam

Fig 2: Lotus stem payasam

The data obtained from the questionnaires was evaluated using bio-statistical principles to ascertain the acceptability of the product. Also, the marketability of the product developed was ascertained using the parameter of Value for Money or VFM.

Data analysis

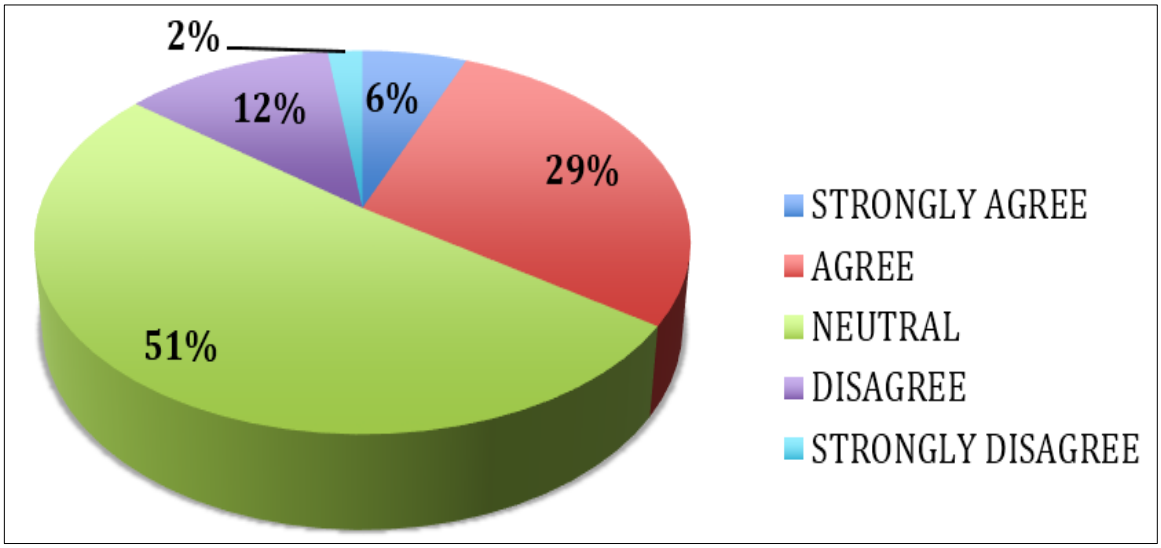

Fig 3: Panelist opinions on whether consumption of lotus stem is an integral part of Indian cuisine

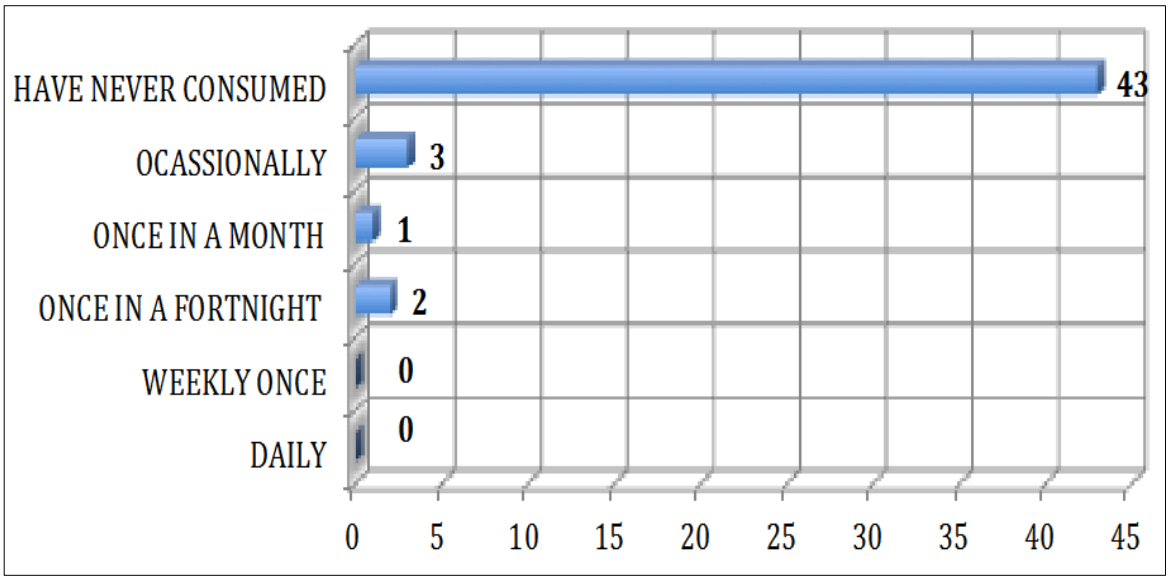

Fig 4: Panelist opinions on how frequently they consume lotus stem

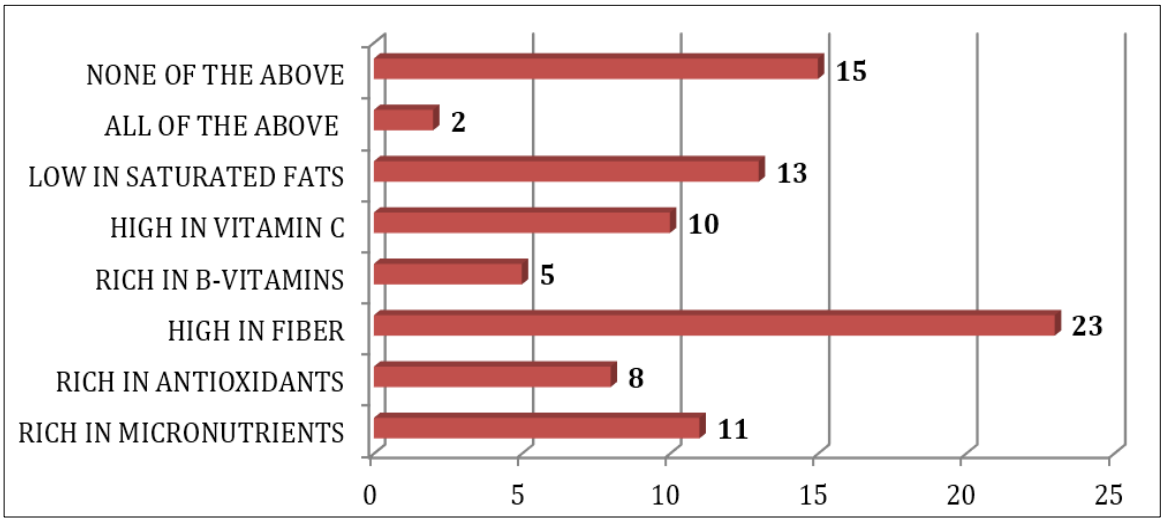

Fig 5: Awareness about the nutritional qualities of lotus stem among panelists

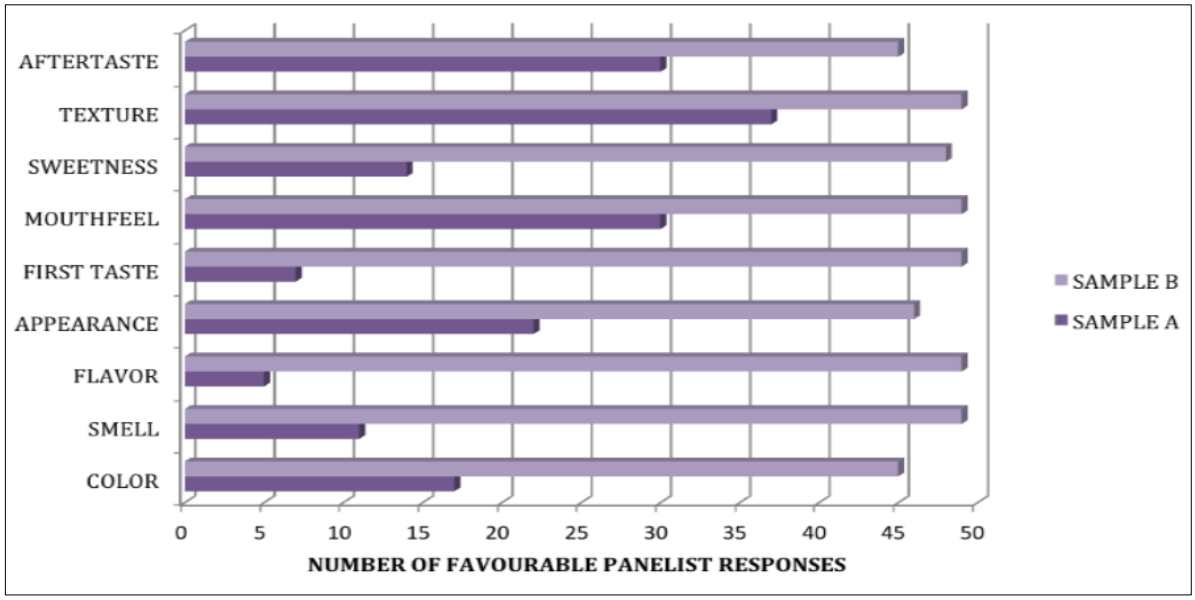

Fig 6: Panelist scores on the invasive parameters of both the samples

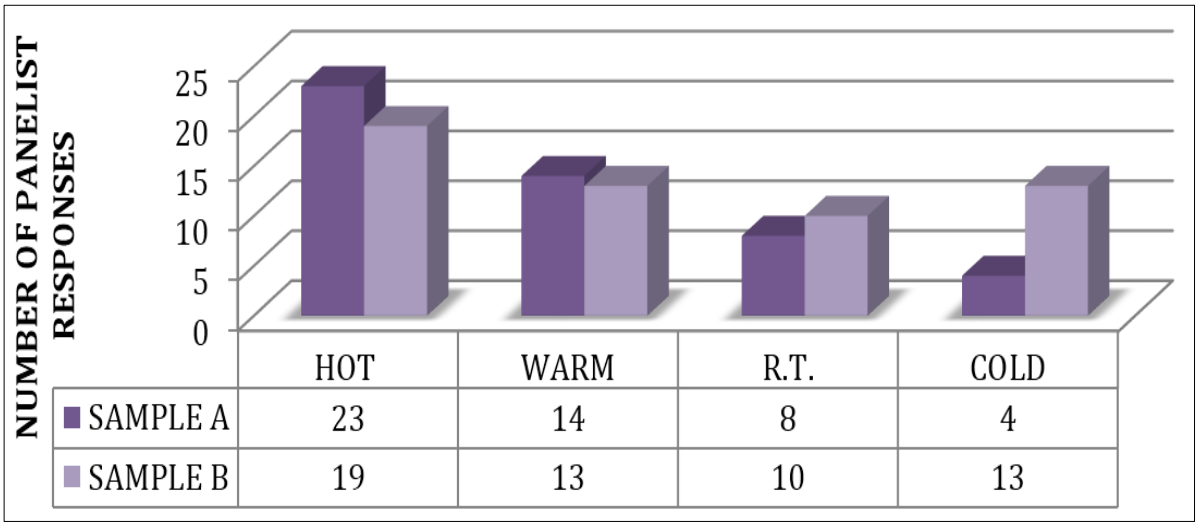

Fig 7: Panelist opinions on what temperature range would they prefer to consume both samples: (R.T=room temperature)

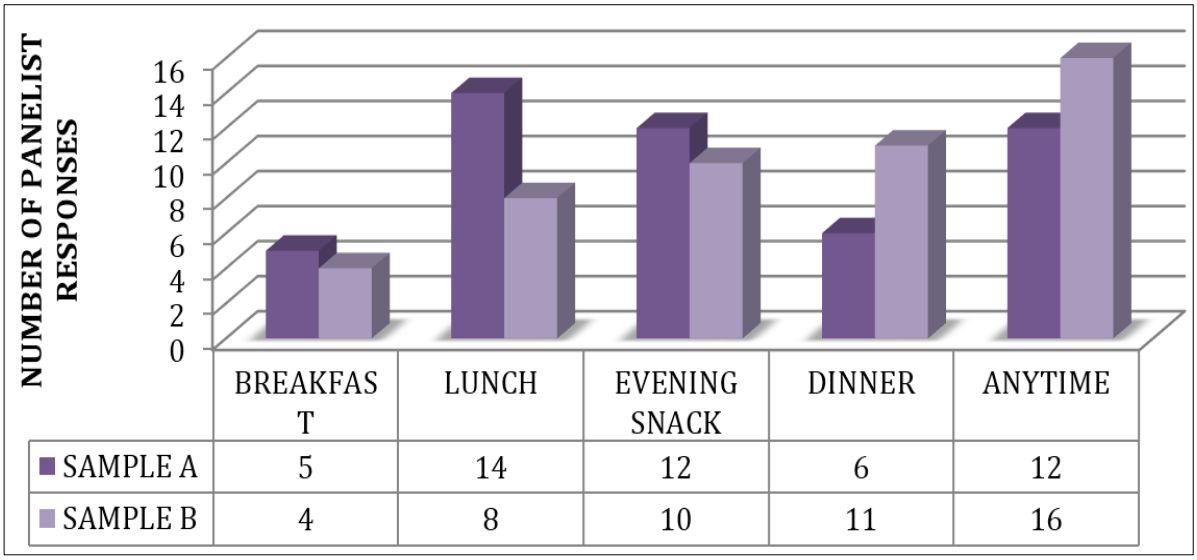

Fig 8: Panelist opinions on with what meal of the day will they prefer to consume both samples

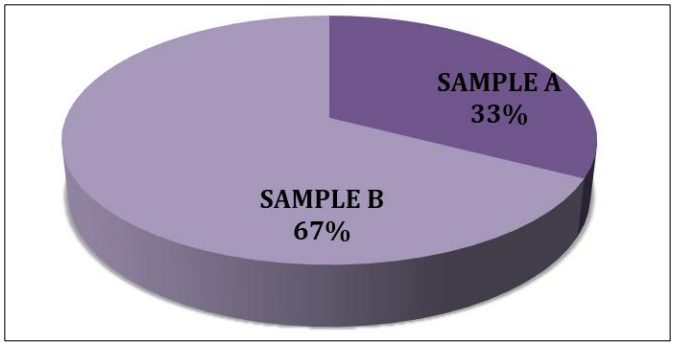

Fig 9: Panelist opinions on which sample they prefer to be marketed

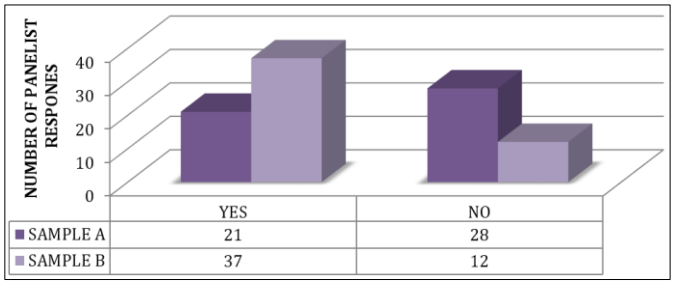

Fig 10: Panelist opinions on whether they would purchase if the samples were commercially available

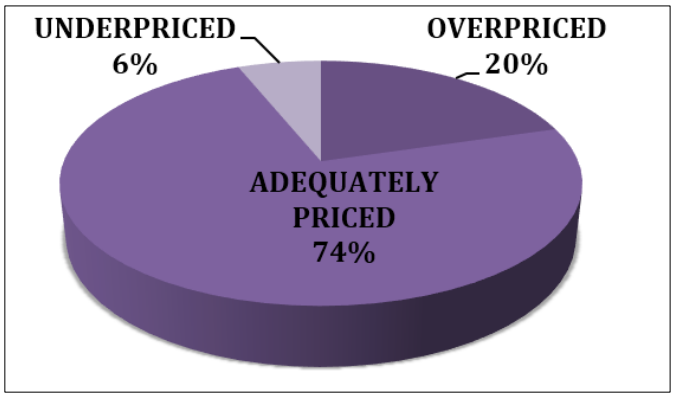

Fig 11: Panelist opinions on the pricing (Rs. 45 for 250g) of the products:

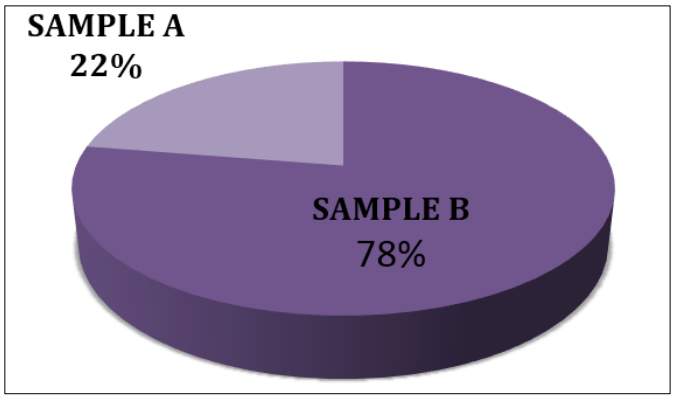

Fig 12: Panelist opinions on their overall preference between the two samples

Key findings of the Sensory evaluation procedure

- Around 35% of panelists agreed that consumption of lotus stem is an integral part of Indian cuisine.
- Around 88% of panelists had never consumed lotus stem before.
- 30% of panelists were completely unaware of any of the nutritional qualities of lotus stem.
- When the invasive parameters of both samples were compared, Sample B obtained higher ratings, thus was rendered more organoleptically favourable wrt Sample A.
- 46% of panelists preferred sample a hot while 39% panelists preferred sample B hot.
- 67% of the panelists preferred Sample B to be marketed.
- 43 % of panelists preferred to purchase Sample A if available while 76% of panelists preferred to purchase sample B if commercially available.
- 74% Panelists ascertained that the pricing of the products is appropriate.
- 78% of panelists overall preferred Sample B to Sample A.

Conclusion

The trends of results of sensory evaluation confirm that there is minimum awareness about the health benefits of consumption of lotus stem. It is evident that consumption of lotus stem among a small proportion of people is basically because of their cultural food habits. Consumption of lotus stem is a matter of chance, but not by choice, as determined by the detailed analysis of the questionnaires.

The sensory evaluation involving the semi-trained panelists exhibited high organoleptic acceptability for the product developed from lotus stem. Also, VFM aspects of the product were evaluated, and the product developed ascertained high VFM.

Lotus stem shows promise as one of those foods whose regular consumption enhances psychosomatic wellbeing in addition to preventing diseases. Manufacturers thus need to exploit the dual benefits of versatility and balanced nutrition of lotus stem and try to incorporate lotus stem in their existing products or develop innovative products. Lotus stem could also be used as a neutral-tasting food fortifier with no direct threat to consumer health and safety.

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