

# Preparation and quality evaluation of indigenous gluten-free sweet dumpling (*Modak*) enriched with *Asparagus racemosus*

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■ **Abstract** : Pregnant women require ensuring that their diet provides sufficient nutrients and energy for the foetus to develop and grow appropriately. Her diet needs to be balanced and nutritious - this involves the right balance of proteins, carbohydrates, and fats, and consuming an ample variety vegetables, and fruits. In present study an attempt was made to prepare an indigenous sweet snack, including modification and formulation of gluten free steamed dumpling (rice based steamed *Modak*). *Modak* is enriched with asparagus powder to propose a healthy snack for conceiving and lactating women as it promotes mammary secretion and helps in maintenance of foetal growth. Experimental modak stuffing includes fresh coconut, jaggery, *anardana* powder, asparagus powder and poppy seeds. For variable samples  $S_0$ ,  $S_1$ ,  $S_2$  and  $S_3$  (*Asparagus* powder at the rate of 0, 5, 10, 15%, respectively) sensory evaluation was carried out and ANOVA was applied to study the variance and to know the consumer preference, at the same time physicochemical, shelf life study and textural properties of resultant samples were analyzed. Based on sensory score it was concluded that 5% level fortification was accepted by consumer.

■ **Key words** : Gluten free steamed dumpling, *Asparagus racemosus*, ANOVA, Textural analysis

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Pregnancy is a challenging physiological state. In India, it is observed that diets of women from the low socio-economic groups are essentially similar during prepregnant, pregnant and lactating periods. Consequently, there is widespread maternal malnutrition leading to high prevalence of low birth weight infants and very high maternal mortality. Additional foods are required to improve weight gain in pregnancy (10-12 kg) and birth weight of infants (about 3 kg). It is hence important to ensure provision of extra food and healthcare to pregnant and lactating women. She can derive maximum amount of energy (about 60%) from rice, wheat and millets. Cooking oil is a concentrated source

of both energy and polyunsaturated fatty acids. A pregnant women need to consume about 350 extra calories per day, which translates to one additional meal.

Superior quality protein is derived from milk, fish, meat, poultry and eggs. However, a proper blend of cereals, pulses and nuts also provides adequate proteins (NIN, Hyderabad).

Mineral and vitamin needs are met by consuming a variety of seasonal vegetables particularly green leafy vegetables, milk and fresh fruits. Folic acid, taken throughout the pregnancy, reduces the risk of congenital malformations and increases the birth weight. Green leafy vegetables, legumes, nuts and liver are good sources

of folic acid. 500 mg folic acid supplementation is advised for women for avoiding deformities and anomalies in child. Calcium is essential, both during pregnancy and lactation, for proper formation of bones and teeth of the offspring and for secretion of breast-milk rich in calcium and also to prevent osteoporosis in the mother.

Shatavari *i.e.* *Asparagus* possesses nutraceutical properties which contains high folate content in asparagus aids in reducing the danger of low birth weight and birth defects during pregnancy. Folate is essential for the growth of the foetus, it is very beneficial for breastfeeding mothers (USDA, 2012). It contains important minerals like Calcium and zinc and vitamins B. The major active constituents of *Asparagus racemosus* are steroidal saponins. Isoflavones, asparagine, racemosol, polysaccharides, mucilage, vitamins A, B1, B2, C, E, Mg, P, Ca, Fe, and folic acid (Rakesh *et al.*, 2016). In present research an attempt was made to formulate nutritious snack for pregnant and lactating women, which will add value to the diet and also will benefit in required secretions.

## METHODOLOGY

All the ingredients were purchased from local market Aurangabad. Materials used for steamed *modak* are rice flour, jaggery, fresh grated coconut, dry fruits, *anardana*, asparagus powder (*Asparagus racemosus*), poppy seeds, and water.

### Preparation of steamed modak:

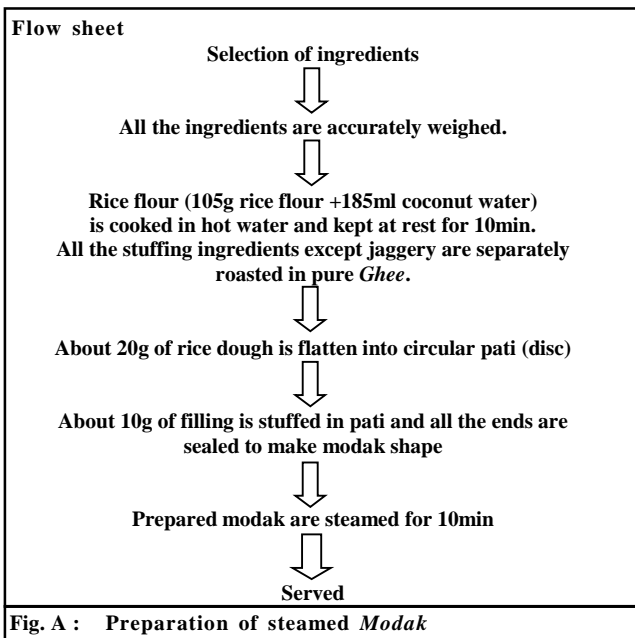
Steamed modak were prepared by traditional method. Conventional formula is value added with *Anardana*. In present study  $S_0$  represents control sample. Subsequent samples are enriched with Asparagus powder as a variable of 5, 10, and 15% of fresh grated coconut. Samples are designated as  $S_1$ ,  $S_2$ , and  $S_3$ , respectively (Fig. A).

### Proximate analysis:

Moisture (Mettler Toledo HE53 Digital moisture analyzer), ash, protein, fat and dietary fibre were determined as per the AOAC (2012) method. Total carbohydrate = 100 – (fat + fibre + ash + protein). Energy (kcal) = 4.0 x protein (g) + 4.0 x carbohydrate (g) + 9.0 x fat (g)

### Texture:

Texture of steamed modak is analyzed using



Brookfield CT3 texture analyzer.

### Statistical analysis:

One way ANOVA has just one independent variable. The Null hypothesis ( $H_0$ ) for organoleptic analysis of all 4 samples shows no significant difference. In general if the p-value associated with the F is smaller than 0.01 then  $H_0$  is rejected and alternative hypothesis is supported. In present hypothesis  $H_0$  is rejected.

### Organoleptic quality of steamed modak:

Organoleptic evaluation was done by 9 point hedonic scale for various parameters which decides the consumer acceptance. The results of organoleptic analysis showed significant changes in perceptions. Distinct flavor of *Asparagus* is prominent in  $S_3$  sample. Nutritional enrichment in  $S_1$  doesn't much affect flavor of the product (Table A).

Table A : Sensory evaluation score					
Parameters	Sample	$S_0$	$S_1$	$S_2$	$S_3$
Colour		8	8	8	8
Texture		8	8	8	8
Flavour		9	8.5	8	7
Aroma		8.5	8	7.5	6
Mouth feel		9	8	7	6.5
Appearance		8	8	8	8
Overall acceptability		9	8.5	7.5	6

$S_0$ = Control;  $S_1$ =5%;  $S_2$ =10%;  $S_3$ =15%

Sensory analysis $S_1$ at room temperature	Day 0	Day 1	Day2	Day3
Colour	Bright White	Pale	Pale	Brown
Aroma	Plea sent	Ok	Obnoxious	NA
Taste	Good	Good	Sour	Objectionable
Texture	Soft	Chewy	Hard	Rubbery
Sensory analysis $S_1$ refrigeration temperature 5°C				
Colour	Bright White	Opaque	Opaque	Slight Brown
Aroma	Pleasant	Good	Good	Ok
Taste	Good	Good	Good	Ok
Texture	Soft	Slightly Hard	Hard	Hard

### Shelf life:

Shelf life of product is studied for 3 days at room temperature and Refrigeration Temperature 5°C (Table B).

## RESULTS AND DISCUSSION

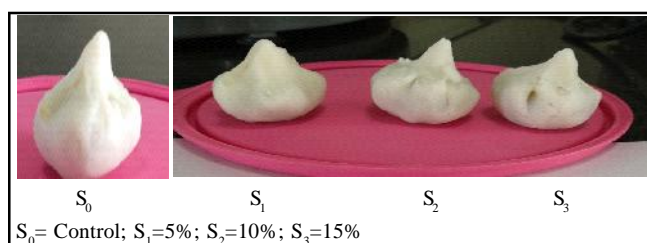
The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Proximate Analysis :

Table 1 shows the moisture content, fat, ash, and carbohydrate and energy values for raw material of *Modak*.

### Sensory analysis :

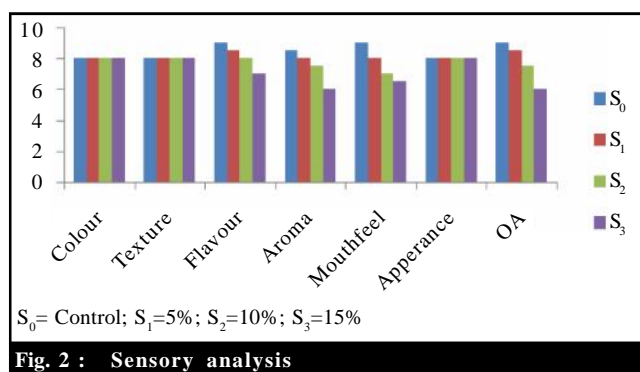
From Table A, comparing all the samples it is



$S_0$  = Control;  $S_1$  = 5%;  $S_2$  = 10%;  $S_3$  = 15%

**Fig. 1 : Photograph of Modak**

concluded there is no significant difference in colour, appearance and texture. Mouth feel, flavor and overall acceptability shows variations with respect to % of asparagus fortification. From above data  $S_1$  is most acceptable sample, because increase in asparagus %, bitterness is proportionally increased (Fig. 2).



**Fig. 2 : Sensory analysis**

### Textural analysis :

Fig. 3 shows texture of selected sample is analyzed by Brookfield CT3 texture analyzer using compression force (load). For modak TA17 probe was used. Trigger load applied is 5g at the speed of 5mm/s. Springiness of experimental sample is 0.15mm; value represents elasticity of rice covering. Sample shows resilience

**Table 1 : Proximate analysis of raw material of Modak**

Sample	Moisture (%)	Ash (%)	Fat (%)	Protein (%)	Fibre (%)
Rice flour	10.8±0.01	0.38±0.06	0.90±0.00	6.90±0.05	0.20±0.01
Asparagus powder	4.40±0.02	10.2±0.05	0.12±0.03	2.20±0.04	2.10±0.06
Anardana	1.95±0.01	11.6±0.00	1.00±0.04	1.70±0.06	4.20±0.01
Poppy seeds	3.99±0.00	5.80±0.01	29.90±0.05	19.76±0.00	25.03±0.00
Fresh coconut	36.3±0.03	1.03±0.02	40.60±0.06	2.08±0.01	9.01±0.00
Cashew nut	2.80±0.04	1.01±0.00	40.22±0.00	15.69±0.03	2.08±0.01
Almond	2.55±0.00	1.06±0.00	51.02±0.05	14.99±0.03	12.66±0.00

Source: Srilakshmi (2003)

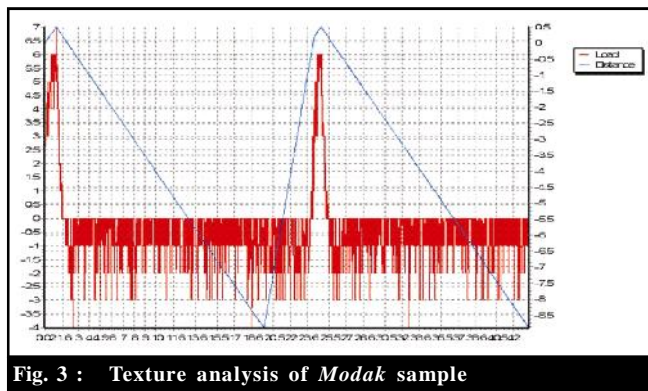


Fig. 3 : Texture analysis of Modak sample

(recovery from deformation) of 0.27. Stickiness is indicated as gumminess of -19.0g; gelatinized rice starch shows stickiness. Hardness is measured as deformation of hardness (0.48mm).

### Shelf life study :

On day 2 room temperature sample was spoiled as it turns slimy and fermented, whereas on day 3<sup>rd</sup> refrigerated sample was acceptable.

### Statistical analysis (ANOVA) :

Organoleptic quality of 5% fortified Modak sample shows at least one significant difference amongst the groups. For present experimentation flavor, mouth feel and overall acceptability is different as compared to S0 specifically due to slight bitter after taste of asparagus powder. Here, Values for one way ANOVA are - F cal 7.928571, p=0.00060\*\*, H<sub>0</sub> is rejected (p<0.01)

### Conclusion:

In the present study Gluten free rice steamed

Modak fortified with asparagus powder were studied for its proximate, textural, shelf life as well as sensory analysis. Statistical Analysis ANOVA shows no significant variations in organoleptic preference and hence product can be easily incorporated in the diet .It is observed that 5% fortification was suitable for described product, it is also concluded that it could be a functional food for pregnant as well as lactating women.

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