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Development and quality evaluation of low cost maize based supplementary food

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Five kinds of maize based supplementary foods were developed with incorporation of locally available nutritious greens, pulses and oilseeds. They were named as Zea-fort laddoo, Zea laddoo, Maize laddoo, Maize-fort laddoo and Forti-maize laddoo. Among all the products, Zea-fort laddoo had highest protein content of approx 15 per cent accompanied by Maize laddoo (12.37). Zea-fort laddoo was the most accepted supplementary food which was liked by approx 47 per cent of the panel members and none of them disliked it. The most accepted supplementary food namely "Zea-fort laddoo" worth around Rs.41.00 per kg and Rs. 4.10 per serving size of 100 grams, which could be produced and afforded even by poor rural families.

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INTRODUCTION

The diets of poor people in our rural areas and urban slums lack several nutrients. Lack of several nutrients in diet ultimately leads to malnutrition and the major victims of malnutrition are the preschool children, undoubtedly. It is a fact that there is quite a wide gap between the recommended dietary allowances (RDA) as set up by the Indian Council of Medical Research (1988), Hyderabad and the amount of energy actually supplied by the habitual diets of pre-schoolers.

How do we fill this gap? The answer, obviously, is to give a nutritious food supplement rich in energy and protein. Our effort is to add extra food to the home diet of a person so as to meet the RDIs for energy and protein. The following given figure illustrates this.

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Recommended dietary intakes of nutrients	
Nutrients supplied by home diet	Nutrients supplied by food supplement

This is the basic concept of food supplementation.

In India, supplementary feeding programme has been in operation for the past several years. Several nutritious recipes have been developed for supplementary feeding by the National Institute of Nutrition and Home Science Colleges in India, which are based on locally available foods like cereals and pulses. A supplement usually takes the form of ready-to-eat snack or dish and provides a substantial amount of energy and protein which is missing in the home diet.

A supplementary food based on a blend of roasted wheat flour (30 parts), green gram flour (20 parts), groundnut (8 parts) and sugar/jaggery (20 parts) has been developed by National Institute of Nutrition, Hyderabad. The food contains about 12.5 per cent proteins. A daily supplement of 80 g and the above food (providing 300 K cal and 10 g of proteins) has been found to bring about significant improvement in the growth rate of preschool children (*Swaminathan*, 1985).

Studies carried out by several workers have shown that a

daily supplement of about 30 g of procured legumes or roasted groundnut or processed protein foods based on blends of cereals, oil seed meals and legumes will help to overcome malnutrition among preschool children (Swaminathan, 1991).

A feeding trial conducted at Rajendra Agricultural University, Pusa, Samastipur (Bihar) on preschool children for six months showed remarkable increase in anthropometric measurements *i.e.* height, body weight and arm circumferences of children fed with quality protein maize as compared to children fed with normal maize (Singh and Jha, 2001).

Since maize being the staple cereal of khagaria district, therefore, with an assumption that development of supplementary food based on maize with incorporation of locally available nutritious materials might be proved as a long term preventive strategy to combat malnutrition, the present study was planned. Keeping all these points in view, the present investigation entitled development and quality evaluation of low cost maize based supplementary food has been planned to be carried out with the following objectives:

- To develop low cost supplementary food from locally available nutritious food materials.
- To assess the acceptability quality of the developed supplementary food and
- To determine the unit cost of the developed supplementary food.

METHODOLOGY

Processed maize was utilized as a major food ingredient for all the five kinds of supplementary food. Locally available green leafy vegetables together with pulses and legumes were utilized to develop cheap and nutritious food supplement for preschool children. A brief description regarding development of supplementary foods has been presented in Table A.

Table A. Details about supplementary foods

Sr. No.	Name of supplementary food	Ingredients	Quantity (g)	Method of preparation
1.	Zea-fort laddoo	Processed maize	50	Maize was treated with 1 per cent lime water and get boiled for 45 minutes. After 24 hours of treatment, maize was washed thoroughly with clean water, dried and roasted till the desired flavour. Pulses/ legumes/oil seeds were soaked in water for 6 to 8 hours, dried and roasted. Groundnut was roasted and dehusked. Green leafy vegetables were washed thoroughly, dried and powdered. All the processed food ingredients mixed together, milled to get flour and sieved thoroughly. One thread syrup of sugar /jaggery was made and sieved flour was mixed together with syrup and made into small balls while still hot.
		Roasted Bengal gram dhal	10	
		Roasted groundnut	5	
		Dried bathua leaves	5	
		Milk powder	5	
		Sugar	25	
2.	Zea-laddoo	Processed maize	50	
		Roasted bengal gram dhal	10	
		Dried spinach	5	
		Gingelly seeds	5	
		Milk powder	5	
		Sugar	25	
3.	Maize-laddoo	Roasted maize	50	
		Roasted moong dhal	20	
		Dried bathua leaves	5	
		Jaggery	25	
4.	Maize–fort laddoo	Processed maize	50	
		Roasted moong dhal	10	
		Roasted groundnut	5	
		Dried amarnath	5	
		Milk powder	5	
		Jaggery	25	
5.	Forti–maize laddoo	Processed maize	50	
		Roasted moong dhal	10	
		Dried bathua leaves	5	
		Gingelly seeds	10	
		Jaggery	25	

Nutritive value of all the supplementary foods was calculated on computation basis using 'Nutritive value of Indian foods' (Gopalan *et al.*, 1991).

For testing the acceptability quality of the developed supplementary foods, mothers of thirty preschool children were selected at random. A hedonic rating test was used to measure the degree of pleasurable and unpleasurable experience of the food products on a scale of 9 points from "like extremely" to "dislike extremely". Based on objectives of the study a pre-tested, structured, pre-coded interview schedule was designed for data collection.

Unit cost of each supplementary food was calculated using market price of each raw ingredients as well as other expenses occurred in the development of supplementary foods including fuel, labor cost etc.

OBSERVATIONS AND ASSESSMENT

The results obtained from the present investigation have been presented under following heads :

Nutritive value of the supplementary food:

Table 1 clearly highlighted nutrient contents in 100 grams of each of the supplementary food. Each of them was developed keeping in view that supplement must provide one third of a day's requirement of a preschool child. Among all product Zea-fort laddoo had maximum protein content of approx 15 per cent accompanied by maize laddoo (12.37). Nomenclature of the products justified emphasis on maize.

Sensory evaluation of the developed supplementary food:

It is evident form Table 2 that food product named "Zea – fort laddoo" was the most accepted supplementary food which was extremely liked by approximately 47 per cent of the panel members and none of them dislike it.

Unit cost determination of the supplementary foods:

Table 3 clearly highlighted that most accepted supplementary food namely zea – fort laddoo had price rupees 41.00 per kg, while maize laddoo had the lowest price of rupees

Table 1. Nutrient content in 100 g of supplementary foods

Sr. No.	Supplementary food	Nutrients				
		Energy (K Cal)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)
1.	Zea- fort laddoo	376.00	15.10	5.82	139.95	3.99
2.	Zea – laddoo	373.65	10.85	6.14	170.10	2.75
3.	Maize – laddoo	351.35	12.37	2.26	282.35	4.12
4.	Maize- fort laddoo	377.35	11.12	5.31	282.35	4.12
5.	Forti-maize laddoo	372.85	11.75	6.47	252.50	5.23

Table 2. Per cent acceptability of developed supplementary food

Sr. No.	Hedonic scale	Zea–fort laddoo	Zea laddoo	Maize laddoo	Maize –fort laddoo	Forti – maize laddoo
1.	Like extremely	46.66	16.66	16.66	20.00	13.33
2.	Like very much	23.33	23.33	13.33	20.00	23.33
3.	Like moderately	20.00	30.00	26.66	16.66	16.66
4.	Like slightly	10.00	23.33	23.33	16.66	30.00
5.	Neither like nor dislike	-	3.33	10.00	13.33	10.00
6.	Dislike slightly	-	3.33	6.66	6.66	3.33
7.	Dislike moderately	-	-	3.33	6.66	3.33
8.	Dislike very much	-	-	-	-	-
9.	Dislike extremely	-	-	-	-	-

Table 3. Unit cost of supplementary foods

Sr. No.	Supplementary foods	Price/portion size (Rs.)	Price/kg (Rs.)
1.	Zea- fort laddoo	4.10	41.00
2.	Zea laddoo	4.20	42.00
3.	Maize laddoo	3.35	33.50
4.	Maize – fort laddoo	4.05	40.50
5.	Forti-maize laddoo	3.45	34.50

33.50 per kg and Zea –laddoo had the highest price of rupees 42.00 per kg.

Conclusively, it might be said that out of five developed supplementary foods, Zea – fort laddoo had the highest protein contents, highest acceptability and medium price which could be afforded even by poor rural families for their children.

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