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## Organoleptic evaluation of recipes based on maize flour

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### ABSTRACT

Eight recipes were prepared namely, *gruel*, *methi roti*, *palak poori*, pancake, mixed vegetable *pakoda*, *namkeen para* and tacos using maize flour as a main ingredient and supplemented with other ingredients *viz.*, Bengal gram flour, milk and milk products, green leafy and other vegetables. These products were organoleptically evaluated using nine point hedonic scale. Sensory evaluation revealed highest score for overall acceptability of pancake ( $8.6 \pm 0.4$ ) and lowest for *methi roti* ( $7.3 \pm 0.64$ ). Supplementation of cereal with pulse, green leafy vegetables and little bit of milk and milk products improved the protein quality of the products e.g. *methi roti* with curd had highest NDpCal% of 9.5.

**Key words :** Maize flour, Supplementation, Organoleptic evaluation, Maize flour

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### INTRODUCTION

Maize (*Zea mays*) is universal crop grown in the developed and developing countries. It is the third most important cereal crop of the world next to wheat and paddy. It is one of the staple foods for the people of Punjab, U.P. and Rajasthan in India. Roasted and steamed maize grains, maize *chapati* with *sarson ka saag* are popular and commonly consumed among Punjabi families. The nutritional inadequacies of the maize are also well known, supplementation with protein rich sources and preparation of acceptable products would not only improve nutritional value of maize but would also provide a variety. Hence, the present study was undertaken to develop nutritious recipes based on maize flour by supplementing Bengal gram flour, milk and milk products and vegetables.

### MATERIALS AND METHODS

#### Selection of products:

Eight products namely, plain *roti*, *gruel*, *methi roti*, *palak poori*, pancake, mixed vegetable *pakoda*, *Namkeen para* and tacos were selected for the purpose (Table 1).

#### Procurement:

Maize flour and other ingredients used for

supplementation like wheat flour, Bengal gram flour, green leafy vegetables like spinach and fenugreek and other vegetables, milk and its products were also bought from the local market.

#### Development of products:

Seven products using maize flour as basic ingredient and supplemented with legumes, vegetables and milk and milk products were developed (Table 1).

#### Preparation of plain *roti*:

Dough was made using 200 g of maize flour with 165 ml of luke warm water. The dough was divided into five equal sized balls and shaped into *rotis* on rolling board and roasted on hot griddle till both the sides were done. Each *roti* weighed 55g.

#### Preparation of *gruel*:

One small maize *roti* (35g) was crushed and mixed with 75 ml of hot milk and seven g of sugar.

#### Preparation of *Methi Roti*:

150 g of maize flour, 50 g of Bengal gram flour, 100 g of fenugreek leaves and 75 ml of water were used for the preparation of dough. The dough was divided into five

**Table 1 : Basic composition of maize flour based products**

Sr. No.	Name of the product	Grain flours (g)				Vegetables (g)		Milk and its products (g)
		M.F.	B.F.	W.F.	R.W.F.	G.L.V.	O.V.	
1.	Gruel	40	-	-	-	-	-	80 ml milk
2.	<i>Methi roti</i> *	150	50	-	-	100	-	-
3.	<i>Palak poori</i> *	150	-	150	-	150	-	-
4.	Pancake*	100	100	-	-	-	105	100 g curd
5.	Mix veg. <i>Pakoda</i> *	100	100	-	-	-	360	-
6.	<i>Namkeen para</i> *	100	50	-	50	-	-	-
7.	Tacos*	150	-	75	-	-	275	150 g <i>paneer</i>

\* Oil was used for frying

M.F. - Maize flour, B.F. - Bengal gram flour, W.F. - Wheat flour  
R.W.F. - Refined wheat flour, GLV - Green leafy vegetables, O.V. - Other vegetables

equal sized balls and *roti* was prepared.

### Preparation of *Palak Poori*:

Equal amount of maize flour, wheat flour and spinach (150g each) were mixed with 50 ml of water and 30 ml of oil for the preparation of dough. Then 17 equal sized balls from the dough were made and shaped into *pooris* which were fried till golden brown.

### Preparation of *Namkeen Para*:

Maize flour (100g), wheat flour (50g), Bengal gram flour (50g) and refined wheat flour (50g) were mixed with salt and *ajwain*. Twenty five grams of oil and 100 ml of water were added to form hard dough which were kept aside for ten minutes. Then dough was rolled into ½ cm thickness and cut with knife in shape of diamonds and then these were fried till golden brown at slow fire.

### Preparation of *mixed vegetable pakoda*:

Equal amount of maize flour and Bengal gram flour (100g each) were used to prepare a thick batter in which chopped potatoes, onion and cauliflower were added in equal amount (120g each) along with spices. The *pakodas* were deep fried till golden brown.

### Preparation of *pancakes*:

Equal amount of maize flour, Bengal gram flour and curd (100g each) were used in which grated vegetables like carrots, onion, capsicum (35g each) were added along with spices. The prepared batter was kept aside for 10 minutes. Then *pancakes* were prepared on greased non-stick pan till light brown and crisp.

### Preparation of *tacos*:

Maize flour (150g) and wheat flour (75g) were mixed and rubbed with 15 g of oil and kneaded into a dough with 110 ml of water and kept aside. Grated cottage cheese

(150g) and vegetables like peas, chopped tomatoes and onions, grated carrots (425g) were mixed with spices to be used as filling. Then small balls of dough was flattened and folded with the help of a steel spoon to give it a shape and then fried. After frying, mixture was filled in it.

### Organoleptic evaluation:

A panel of ten judges consisting of faculty and senior students of Department of Food and Nutrition evaluated the prepared products on various parameters like colour, appearance, flavour, texture, taste and overall acceptability by using nine-point hedonic scale (Srilakshmi, 2005).

### Evaluation of protein quality:

Net dietary calorie per cent (NDpCal%), a method of evaluation of protein quality was calculated on the basis of their “chemical score” and “protein calorie percentage.” (Miller and Payne, 1961)

## RESULTS AND DISCUSSION

Khalil and Chughtai (1984) observed when wheat and maize breads supplemented with mixture of peanut-chickpea flour, the protein content of wheat and maize blends increased by 20-61%. Significant increase ( $p = 0.05$ ) in other proximate constituents as well as K, Ca, P, Fe, Zn and Cu levels and lysine were observed. Human metabolic studies have shown that replacement of part of maize in vegetarian diet by wheat brings marked improvement in the overall nutritive value of cereal mixture (Chadha, 1987). Ferial and Pangborn (1983) studied that since corn was deficient in lysine and tryptophan it could be enriched with milk solids, soybean, oilseeds flour, sorghum, germinated corn, potatoes and even cheese. Hence, the maize products were prepared by supplementing Bengal gram flour, wheat flour, green leafy vegetables, milk and its products.

**Table 2 : Sensory evaluation of maize flour based products on dry weight basis (per 100 g)**

Sr. No.	Product	Colour	Appearance	Aroma	Texture	Taste	Overall acceptability
1.	Plain <i>roti</i>	7.8±0.40	8.0±0.45	7.6±0.49	7.7±0.46	8.0±0.45	7.9±0.3
2.	Gruel	7.4±0.49	7.2±0.60	7.2±0.60	7.5±0.67	7.6±0.66	7.6±0.49
3.	<i>Methi roti</i>	7.4±0.66	7.3±0.64	7.5±0.81	7.0±0.77	7.4±0.66	7.3±0.64
4.	<i>Palak poori</i>	7.7±0.46	7.8±0.60	7.3±0.46	7.8±0.40	7.9±0.54	7.85±0.32
5.	Pancake	8.4±0.49	8.3±0.46	8.1±0.30	8.5±0.50	8.7±0.46	8.6±0.49
6.	Mix. veg. <i>Pakoda</i>	7.9±0.30	8.1±0.54	7.8±0.60	8.1±0.54	8.5±0.50	8.1±0.54
7.	<i>Namkeen Para</i>	8.1±0.30	8.2±0.40	7.9±0.54	8±0.45	8.1±0.54	8.2±0.40
8.	Tacos	7.8±0.40	7.9±0.54	7.9±0.30	7.7±0.46	7.9±0.70	8.1±0.54

Values are mean ± S.D.

The results of sensory evaluation of maize flour based products on dry weight basis are given in Table 2. In organoleptic evaluation of maize based recipes, first parameter to be evaluated was 'colour'. In the eight recipes, it ranged from 7.4 ± 0.49 to 8.4 ± 0.49. The lowest score was observed in case of gruel *i.e.* 7.4 ± 0.49 and *methi roti* 7.4 ± 0.66 and highest being for pancake *i.e.* 8.4 ± 0.49.

The score for the parameter 'appearance' ranged from 7.2 ± 0.60 to 8.3 ± 0.46. The lowest score was of *methi roti* and highest score was in case of pancake. In case of parameter 'aroma', the scores were found to be in range of 7.2 ± 0.60 to 8.1 ± 0.30, lowest values being for gruel and highest for pancake.

As per the texture, the scores varied from 7.0 ± 0.77 to 8.5 ± 0.50. The highest score was obtained by pancake and least score by *methi roti*. In case of parameter 'taste', scores were observed to be in the range of 7.4 ± 0.66 to 8.7 ± 0.46, highest for pancake and least liking was observed for *methi roti*. Overall acceptability scores of the maize based recipes ranged from 7.3 ± 0.64 to 8.6 ± 0.41 where *methi roti* achieved least score and pancake was found to be highly acceptable with maximum score. However, it was observed that none of the parameters earned overall average score below 7 points that means these products were liked very much according to the

nine point hedonic scale.

The scores of *methi roti* were found to be lowest, the reason being the *roti* was not smeared with 'ghee'. Had it been fried like pancake on the griddle, the scores for each parameter would have been higher. Gruel is the kind of product which is suitable for children and older people. Therefore, it earned comparatively low scores but still its overall acceptability score was more than seven. Rest of the products were fried, shallow or deep which has improved their acceptability scores. But nutritionally these recipes are better than the plain *roti*. One plus point in case of *namkeen para* is that it can be stored for longer period which can be used as snack for children or adults alike.

### Protein quality of products:

Protein quality of products was measured by calculating chemical score and total energy content and expressed as Net dietary protein calorie per cent (NDpCal%). Table 3 represents the protein quality of products. The NDpCal% of maize based recipes ranged from 5 to 9.5 per cent, lowest being for plain *roti* and highest for *methi roti* with curd. NDpCal% of *methi roti* was improved due to the addition of curd whereas addition of milk increased the NDpCal% of gruel to 8.5 as compared to the plain *roti*. It was observed that

**Table 3 : Protein, calories, amino acid and NDpCal % of the recipes**

Sr. No.	Recipe	N(g)	Calories	Amino acid	NDpCal%
1.	Plain <i>roti</i>	1.77	342	0.35	5.0
2.	Gruel	1.26	230	0.41	8.5
3(a).	<i>Methi roti</i> w/o curd	4.52	809	1.18	8.5
3(b).	<i>Methi roti</i>	6.88	973	2.17	9.5
4.	<i>Palak poori</i>	6.04	2008	1.21	3.2
5.	Pancake	5.71	1296	2.08	7.5
6.	Mix veg. <i>Pakoda</i>	6.13	1646	2.14	1.5
7.	<i>Namkeen para</i>	4.31	1197	1.17	5
8.	Tacos	11.4	2456	4.28	8

supplementation of Bengal gram flour and green leafy vegetables (*methi roti*), milk and milk products (gruel, pancake and tacos) did make a significant improvement in protein quality of maize flour based recipes.

### Conclusion:

Undoubtedly when supplementation with pulses, milk or milk products and vegetables especially green leafy vegetables is done, the maize flour based products were improved nutritionally in addition to improvement in taste and texture. Besides, a variety can be added in the daily diet of maize eaters.

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