

## SUPPLEMENTATION OF TRADITIONAL PAKISTANI FOODS WITH VEGETABLE PROTEINS

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(Received January 6, 1993; revised October 26, 1993)

Supplementation of traditional foods with 5% (w/w basis) low fibre detoxified mustard seed meal improved nutritive value of Pakistani dishes. Fortified dishes were readily acceptable to the consumers.

**Key words:** Traditional foods, Vegetable protein.

### Introduction

Rural population of Pakistan, which forms more than 70% of the total inhabitants of this country, is still taking traditional foods, most of which consist of nutritionally imbalanced diets [1]. Some of the commonly consumed dishes have been chemically analysed to assess nutritional qualities of these [2], and efforts have been made to fortify these with low fibre detoxified mustard seed meal prepared by the method of Shah *et al.*, [3]. Mustard seed meal is a product left after the extraction of oil from mustard seeds and has a limited use [4]. The meal contains as high as 46 crude protein [5-6]. Amino acid profile of the protein from mustard seed meal is comparable with animal protein and is better than that of most other vegetable proteins [7-8]. It has been reported that detoxified mustard seed meal has no adverse effect of vital organs of rats [1]. In the present investigations fortified traditional foods were chemically analysed for their nutritional value and also evaluated for their organoleptic acceptance.

### Materials and Methods

**Foods.** The following popular foods were selected: Lassi (butter milk), Gahrar (sweetened butter milk), Sattu (roasted barley flour), Shooshia (sweetened mango chutney), Suji Halwa (semolina pudding), Rao Ki Kheer (rice pudding in sugar cane juice), Dabras (linseed, starch, green gram flour and chick pea flour; after roasting in butter oil; are mixed with sugar and nuts, and are made into round balls), Poki (chutney of dried leafy vegetables), Saag (green leafy vegetable preparation), Basey Roti (a bread left over night and used in breakfast), Methee Roti (sweetened bread), and Makai Ki Roti (maize bread). The ingredients included in these foods are reported in Tables 1 and 2.

**Methods of sample preparation.** Methods for the preparation of traditional foods in rural areas were almost similar to those practiced in Pakistan. However, minor changes do occur due to variation in habits and local conditions.

**Preparation of meal.** Low fibre detoxified mustard seed

TABLE 1. LIST OF INGREDIENTS USED IN THE PREPARATION OF VARIOUS TRADITIONAL FOODS (Gm.).

Foods	Dahi	Shaker	Sattu	Mango	Salt	Chillies	Semolina	Butter	Rao	Rice
Lassi	250	—	—	—	—	—	—	—	—	—
Gahrar	250	25	—	—	—	—	—	—	—	—
Sattu	—	100	100	—	—	—	—	—	—	—
Shooshia	—	75	—	250	2	2	—	—	—	—
Suji Halwa	—	60	—	—	—	—	60	30	—	—
Rao Ki Kheer	—	—	—	—	—	—	—	—	2*	250

\* Litre

TABLE 2. LIST OF INGREDIENTS USED IN THE PREPARATION OF VARIOUS TRADITIONAL FOODS (Gm.).

Foods	Ingredients																						
	Lin-seed flour	Wheat flour	Green gram flour	Maize flour	Sugar	Starch	Raisins	Jeggery	Almond	Nuts	Chickpea flour	Fenugreek	Coriander leaves	Mustard leaves	Spinach	Ginger	Garlic	Green chillies	Butter	Semolina	Chillies	Salt	
Alai Dabra	20	40	—	—	—	—	2	30	40	—	—	—	—	—	—	—	—	—	40	—	—	—	—
Nishasta Dabra	—	—	—	—	60	32	—	—	—	40	—	—	—	—	—	—	—	—	45	32	—	—	—
Mungi Dabra	—	—	64	—	60	—	—	—	—	40	—	—	—	—	—	—	—	—	45	—	—	—	—
Basin Dabra	—	—	—	—	60	—	—	—	—	40	64	—	—	—	—	—	—	—	45	—	—	—	—
Poki	—	—	—	—	—	—	—	—	—	—	—	100	100	—	—	—	—	—	45	—	5	7	—
Saag	—	90	—	—	—	—	—	—	—	—	—	—	—	2*	375	3	3	30	—	—	20	30	—
Basey Roti	—	90	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.5
Meethee Roti	—	90	—	—	—	—	—	40	—	—	—	—	—	—	—	—	—	—	100	—	—	—	0.5
Makai Ki Roti	—	—	—	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.5

\* Kilogram

meal (LFDM) was prepared as reported by Shah *et al.* [9]. Fibre was reduced by steaming the seeds for 15 mins followed by drying at 80°-90° for an hour and then passing through rollers to crack the hulls. The crushed meals were first screw pressed, and phytic acid reduced from 2.90 to 0.52% and allyliso-thiosynate were reduced to non-detectable limits by employing Lopez and Moreno [10] and Wetter and Youngs [11] methods respectively.

**Fortification.** Low-fibre (4.96%) detoxified mustard seed meal (LFDM) was added to the traditional foods at the rate of 5% (w/w basis). The protein, phytic acid and allyliso-thiocyanate contents of the detoxified meal were 46.41%, 0.52% and below detectable level respectively [5].

**Physico-chemical analysis** The control as well as the supplemented foods were analysed for protein [12] fat [13] ash and fibre contents [14]. Carbohydrates were calculated by difference and calories were computed by applying multiplication factors to the estimated protein, carbohydrates and fat values.

Organoleptic evaluation of the prepared food products

was carried out by following the sensory evaluation method of Krum [15]. The foods were served to a panel of eight judges for subjective analysis.

## Results and Discussion

**Fortification of various food products with low fibre detoxified mustard seed meal (LFDM).** Incorporation of the detoxified meal into poultry rations and rat diets had shown that upto 60% of animal proteins can be replaced by LFDM without any adverse effect [8]. The quality of the meal was further improved when its fibre contents were reduced from 10.91 to 4.64 and phytic acid from 1.81 to 0.54% [5]. The LFDM was incorporated at the level of 5% in various traditional Pakistani foods. Proximate composition of these foods was carried out after preparation (Table 3).

**Improvement in quality and quantity of protein on fortification with mustard seed meal.** Increase in the protein contents of various food products ranged from 9.05 to 194.23%. The maximum increase of 194.23% was observed in "Shooshia", whereas it was minimum (i.e. 9.05%) in "Makai Ki

TABLE 3. PROXIMATE COMPOSITION OF VARIOUS UNFORTIFIED (A) & FORTIFIED (B) FOODS (DRY MATTER BASIS).

Food		Protein (%)	Increase in protein (%)	Lipids (%)	Ash (%)	Fibre (%)	Carbohydrates (%)	Calories/100gm samples
Lassi	A	28.94 (±0.08)	-	6.98 (±0.14)	7.75 (±0.31)	-	54.00 (±1.32)	394.58
	B	38.24 (±0.14)	32.14	4.17 (±0.08)	7.35 (±0.08)	2.70 (±0.08)	50.85 (±0.94)	393.93
Gahrar	A	12.15 (±0.20)	-	17.87 (±0.81)	3.46 (±0.62)	-	66.52 (±2.36)	475.51
	B	18.54 (±0.18)	52.59	14.65 (±0.24)	3.17 (±0.18)	1.04 (±0.10)	62.88 (±1.82)	457.53
Suttu	A	2.25 (±0.03)	-	-	0.26 (±0.30)	0.37 (±0.02)	33.97 (±0.32)	144.88
	B	4.68 (±0.18)	108.12	0.19 (±0.22)	0.86 (±0.11)	0.78 (±0.08)	37.13 (±0.20)	168.95
Shooshia	A	3.81 (±0.06)	-	0.35 (±0.10)	3.56 (±0.03)	4.70 (±0.09)	87.58 (±0.48)	368.71
	B	11.21 (±0.10)	194.23	0.63 (±0.06)	4.13 (±0.06)	4.72 (±0.16)	80.41 (±1.48)	372.15
Suji Halwa	A	3.81 (±0.10)	-	25.90 (±0.14)	0.22 (±0.10)	0.20 (±0.04)	69.78 (±0.44)	527.46
	B	6.91 (±0.14)	81.37	24.00 (±0.18)	0.74 (±0.21)	0.65 (±0.17)	68.19 (±1.28)	516.40
Rao Ki Kheer	A	6.17 (±0.08)	-	0.41 (±0.04)	0.78 (±0.02)	0.63 (±0.04)	94.15 (±0.46)	392.88
	B	9.44 (±0.12)	53.00	0.62 (±0.14)	1.81 (±0.16)	1.21 (±0.12)	88.00 (±0.72)	395.34
Alsi Dabra	A	4.74 (±0.10)	-	23.48 (±0.20)	2.88 (±0.04)	3.53 (±0.30)	65.37 (±0.84)	491.76
	B	6.72 (±0.08)	41.77	22.05 (±0.10)	3.13 (±0.18)	3.61 (±0.20)	64.56 (±0.96)	487.62
Nishasta Dabra	A	3.28 (±0.05)	-	24.48 (±0.30)	0.54 (±0.01)	0.88 (±0.10)	70.82 (±0.56)	516.72
	B	5.09 (±0.24)	55.18	23.52 (±0.16)	0.82 (±0.11)	1.09 (±0.08)	69.84 (±0.88)	511.40
Mungi Dabra	A	7.49 (±0.20)	-	23.33 (±0.28)	1.68 (±0.03)	1.75 (±0.14)	65.75 (±0.83)	502.93
	B	9.12 (±0.07)	21.76	22.33 (±0.12)	1.92 (±0.06)	1.90 (±0.10)	65.02 (±0.68)	497.53
Basin	A	8.69 (±0.20)	-	22.91 (±0.20)	0.38 (±0.12)	0.84 (±0.10)	67.18 (±0.73)	509.67
	B	10.29 (±0.18)	18.41	21.93 (±0.10)	0.73 (±0.09)	1.10 (±0.18)	66.38 (±1.08)	504.05
Poki	A	8.14 (±0.32)	-	39.88 (±0.90)	22.71 (±0.20)	14.71 (±0.80)	141.56 (±2.50)	296.99
	B	9.80 (±0.18)	20.39	38.59 (±0.17)	21.94 (±0.12)	14.24 (±0.08)	16.27 (±1.00)	315.24
Saag	A	6.88 (±0.02)	-	21.44 (±0.20)	2.50 (±0.05)	7.96 (±0.09)	66.81 (±1.54)	465.27
	B	13.95 (±0.09)	21.00	17.55 (±0.21)	3.34 (±0.18)	7.37 (±0.12)	63.41 (±1.38)	467.39
Basey Roti	A	13.35 (±0.18)	-	0.84 (±0.06)	1.94 (±0.10)	2.19 (±0.12)	81.69 (±0.53)	387.72
	B	15.18 (±0.06)	13.70	0.91 (±0.19)	2.24 (±0.13)	2.36 (±0.15)	79.69 (±1.14)	387.67
Meethee Roti	A	7.16 (±0.22)	-	8.88 (±0.40)	2.31 (±0.06)	0.08 (±0.04)	80.85 (±0.82)	431.96
	B	9.29 (±0.12)	29.75	8.46 (±0.21)	2.58 (±0.10)	1.05 (±0.12)	78.95 (±0.98)	419.10
Makai Ki Roti	A	12.26 (±0.38)	-	5.83 (±0.32)	1.79 (±0.03)	1.87 (±0.05)	78.01 (±1.08)	413.55
	B	13.37 (±0.20)	9.05	5.56 (±0.30)	2.14 (±0.10)	2.07 (±0.10)	76.27 (±1.16)	408.06

A = Unfortified. B = Fortified. Values in parentheses are S.D.s for respective mean values.

TABLE 4. ORGANOLEPTIC EVALUATION OF UNFORTIFIED (A) AND FORTIFIED (B) FOODS.

Food	*	Colour (0-10)*	Texture (0-10)	Flavour (0-10)	Taste (0-10)	Appearance (0-10)	Acceptability (%)**	Remarks
Lassi	A	8.2 (±0.24)***	8.4 (±0.4)	7.6 (±0.14)	7.4 (±0.14)	7.4 (±1.14)	80.8	Excellent
	B	5.2 (±0.12)	7.4 (±0.28)	3.8 (±0.08)	4.0 (±0.22)	7.4 (±0.18)	55.6	Fair
Gahrar	A	7.8 (±0.20)	8.0 (±0.10)	7.6 (±0.42)	7.8 (±0.08)	6.8 (±0.28)	76.0	Very good
	B	6.8 (±0.04)	5.8 (±0.08)	7.8 (±0.32)	7.2 (±0.10)	7.4 (±0.18)	75.6	Very good
Sattu	A	7.8 (±0.42)	7.6 (±0.22)	7.8 (±0.12)	7.4 (±0.12)	8.0 (±0.82)	77.2	Very good
	B	7.4 (±0.18)	7.6 (±0.18)	7.0 (±0.06)	7.4 (±0.18)	7.6 (±0.12)	74.0	Very good
Shooshia	A	7.8 (±0.40)	7.6 (±0.40)	7.6 (±0.14)	7.0 (±0.08)	7.4 (±0.02)	74.8	Very good
	B	7.4 (0.82)	7.0 (±0.06)	6.4 (±0.10)	5.8 (±0.12)	7.0 (±0.30)	67.2	Good
Suji Halwa	A	7.4 (±0.44)	7.6 (±0.16)	7.8 (±0.06)	7.8 (±0.24)	7.6 (±0.20)	76.4	Very good
	B	7.2 (±0.18)	7.4 (±0.14)	7.6 (±0.12)	7.8 (±0.20)	7.4 (±0.12)	74.8	Very good
Rao Ki Kheer	A	7.8 (±0.08)	7.6 (±0.20)	7.8 (±0.08)	7.4 (±0.06)	7.6 (±0.14)	76.0	Very good
	B	5.8 (±0.26)	6.4 (±0.10)	6.0 (±0.12)	6.6 (±0.08)	7.8 (±0.08)	63.6	Good
Alsi Dabra	A	7.0 (±0.12)	7.2 (±0.16)	7.8 (±0.10)	7.6 (±0.12)	7.4 (±0.10)	74.0	Very good
	B	7.4 (±0.22)	7.2 (±0.14)	7.0 (±0.22)	7.4 (±0.14)	7.0 (±0.19)	72.0	Very good
Nishasta Dabra	A	7.2 (±0.30)	7.8 (±0.22)	7.6 (±0.28)	7.6 (±0.22)	7.2 (±0.20)	74.3	Very good
	B	7.4 (±0.10)	7.0 (±0.6)	7.0 (±0.14)	7.2 (±0.32)	7.0 (±0.18)	71.2	Very good
Mungi Dabra	A	7.2 (±0.28)	6.8 (±0.08)	7.8 (±0.09)	7.6 (±0.08)	7.0 (±0.06)	72.8	Very good
	B	7.2 (±0.14)	7.0 (±0.18)	7.2 (±0.14)	7.0 (±0.04)	6.8 (±0.04)	70.4	Very good
Basin Dabra	A	7.4 (±0.08)	7.2 (±0.20)	7.0 (±0.18)	7.8 (±0.16)	7.0 (±0.06)	72.8	Very good
	B	7.2 (±0.14)	7.0 (0.24)	6.6 (±0.36)	7.8 (±0.06)	6.6 (±0.08)	68.8	Good
Poki	A	6.8 (±0.20)	5.6 (±0.30)	7.0 (±0.10)	6.8 (±0.20)	6.8 (±0.12)	66.0	Good
	B	6.8 (±1.00)	6.0 (±0.04)	6.8 (±0.14)	7.0 (±0.14)	7.0 (±0.12)	67.2	Good
Saag	A	5.8 (±0.84)	5.0 (±0.14)	6.2 (±0.26)	6.0 (±0.16)	6.4 (±0.20)	59.6	Fair
	B	6.0 (±0.70)	6.0 (±0.18)	6.2 (±0.12)	6.0 (±0.04)	6.6 (±0.02)	61.6	Good
Baisey Roti	A	8.2 (±0.64)	8.4 (±0.14)	6.8 (±0.20)	6.8 (±0.18)	7.4 (±0.08)	75.2	Very good
	B	6.4 (±0.78)	5.8 (±0.11)	6.6 (±0.16)	6.0 (±0.24)	7.2 (±0.14)	62.4	Good
Meethee Roti	A	7.8 (±0.10)	7.4 (±0.08)	7.0 (±0.10)	8.0 (±0.18)	7.6 (±0.16)	75.6	Very good
	B	7.0 (±0.18)	6.8 (±0.16)	6.6 (±0.08)	6.0 (±0.04)	7.2 (±0.12)	68.0	Good
Makai Ki Roti	A	7.8 (±0.20)	5.6 (±0.06)	7.6 (±0.12)	7.4 (±0.28)	7.8 (±0.22)	72.4	Very good
	B	7.6 (±0.14)	5.8 (±0.22)	7.0 (±0.20)	7.2 (±0.06)	7.0 (±0.24)	69.2	Good

A: Unfortified, B: Fortified; \* Average of eight judgements; \*\* Average % acceptability of five parameters (colour, texture, flavour, taste and appearance); \*\*\* Values in parentheses are S.D. s for respective mean values.

Rooti" (Table 3). It is evident that foods having low protein contents showed the maximum increase on fortification with LFDM (Table 3). The foods containing maize, pulses and leaves showed comparatively lesser increase in protein, on fortification, than those which had low protein contents (Shooshia and Sattu). In view of the balanced profile of LFDM [7] and its high biological value [1], the quality as well as quantity of the protein in the LFDM fortified foodstuff may be improved (Table 3).

*Organoleptic quality of detoxified mustard seed supplemented foods.* Consumer acceptance of the fortified food products is reported in Table 4. On the basis of organoleptic evaluation these foods can be grouped into four categories. The first category is comprised of the foods for which the overall acceptability was above 80% (excellent).

The second category (very good) with 70-79% acceptability,

include Gahrar, Sattu, Suji Halwa, Alsi, Nishasta and Mungi Dabras and unfortified Shooshia, Rao Ki Kheer Basin Dabra and "Roti". The third category (good) included foods for which the acceptability ranged from 60 to 69%. The food products which fell in this category were: fortified Shooshia, Rao Ki Kheer, Basin Dabra, Poki, supplemented Saag and Rotis. The fourth and the last category (fair), the acceptability of which was observed to be less than 60%, included fortified Lassi and unfortified Saag. Improvement in the acceptability of fortified Saag appears to be due to its palatability. The products were divided into these groups on the basis of organoleptic acceptability. Although the amount of LFDM was the same in all the products, variation in the amount and number of ingredients, level of moisture content and preparation techniques affected acceptability of the final product. It is obvious from the subjective tests that all the foods, after

fortification with LFDM, were readily acceptable.

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