

Nutrient Composition of Some Cereals and Pulses Based Recipes of Assam, India

P. Das*, P. Neog, P.D. Laishram and M. Gogoi

*Department of Food and Nutrition, College of Home Science, Assam Agricultural University,
Jorhat 785 013, Assam, India*

Telefax: 0376-2340011; E-mail: pranatidas@aau.ac.in

KEYWORDS Cereals. Pulses. Recipes. Nutrients. Assam

ABSTRACT The study was undertaken to analyse the nutrient composition of some cereals and pulses based recipes of Assam. The recipes were selected, standardized and prepared in the laboratory. The prepared recipes were subjected to analysis of proximate composition, calcium and iron using standard methods. Among the cereal recipes, it was found that *tel pitha* was rich in protein, fat, energy, calcium and iron contents. *Til pitha* had good amounts of mineral, crude fibre and energy. Among the pulses recipes, *masoor dailor bor* had high amounts expensed in as in basics of protein. The results showed that *kasu sak diya masoor dail* was high in both calcium and iron contents.

INTRODUCTION

The great variety of national dishes and dietary patterns that have sustained diverse populations throughout the world and over many years, clearly indicates that different combinations of food can lead to good nutritional status. These combinations may include foods from different groups like cereals and pulses, fruits and vegetables, milk and milk products, nuts and oilseeds, meat, fish and poultry etc. However, cereals and pulses play a predominant role in diets of developing countries. Cereals are the cheapest sources of food energy and contribute a high percentage of calories and proteins in the diets of Indian population. Pulses are considered as poor man's meat due to their high protein content ranging from 20 to 40% and this makes them important in human food from nutrition point of view (Mahajan and Chattopadhyay, 2000).

As in the rest of India, the north eastern state of Assam also has some typical methods of preparation for cereals and pulses. Rice is the staple for almost all sections of the Assamese community. Various types of ready to prepare and ready to eat snacks are a part of daily and festival foods of Assam. Some of these products are unique due to the use of glutinous rice and typical processing methods. Likewise, pulses also are commonly consumed in the form of *dal* and occasionally included in other preparations.

However, there are many preparations of *dal* with variation in the use of different ingredients. Although these preparations have been documented to some extent but they have not been analysed for their nutritive values. But to make a better choice, a good knowledge of the nutritional value of individual foods, as well as of meals and dishes locally available is of utmost importance. With these considerations in mind, the present study was undertaken with the purpose to determine the nutritional composition of some cereals and pulses based recipes commonly consumed in Assam.

METHODOLOGY

A list of cereals and pulses based recipes generally consumed in Assam was prepared. The information was collected from selected populations on commonly consumed preparations, methods of preparation and ingredients used. Some of the selected common preparations were standardized and prepared in the laboratory. General description of the recipes with ingredients, cooked weights and volumes are presented in Table 1 and 2. Except cooked plain rice and *poita-bhat*, other cereal based recipes are used as snack items. All *pithas* are dry type of snack items, whereas other items which are eaten with jaggery, curd/milk are somewhat porridge type of preparations. In case of pulse based recipes, except *masoor dailor bor* and *dailor boror tenga*, other pulse preparations are *dal* like preparations with various ingredients.

* Address all correspondence to: P. Das

Table 1: General description of some cereal based recipes commonly consumed in Assam, India

S. No.	Name of recipe	Ingredients used	Description of recipe	Cooked weight	Cooked vol./no.
1.	Plain rice	Rice – 100g Water – 180 ml	Rice cooked in pressure cooker	297 g	498 ml.
2.	Plain rice	Rice – 100 g Water – 320 ml	Rice cooked in an open pan	368 g	498 ml.
3.	Poita bhat	Rice – 100 g Water – 400 ml	Rice cooked. Kept with sufficient added water for overnight	650 g	650 ml.
4.	Chira jalpan I (Rice flakes with curd and jaggery)	Rice flakes – 50 g Curd – 35 g Jaggery – 25 g	Rice flakes from waxy paddy washed with water, squeezed out water, mixed with curd and jaggery	112 g	118 ml.
5.	Chira jalpan II (Rice flakes with curd and jaggery)	Rice flakes (from 50 g non-waxy rice) Curd – 50 g Jaggery – 20 g	Rice flakes from non-waxy paddy, washed with water, drained, mixed with curd and jaggery	140 g	125 ml.
6.	Komal chaular jalpan (Komal chaul with curd and jaggery)	Komal chaul – 50 g Komal chaul – 50 g 100 ml Curd – 50 g Jaggery – 20 g	Komal chaul, parboiled rice from waxy paddy can be consumed after soaking in water for some time. Soaked and drained Komal chaul mixed with curd and jaggery	160 g	150 ml.
7.	Bora chaular jalpan I (Waxy rice with curd and jaggery)	Waxy rice – 50 g Water – 60 ml Curd – 50 g Jaggery – 20 g	Waxy rice is kept soaking in water for 6 hrs. and then cooked. Mixed with curd and jaggery	160 g	150 ml.
8.	Bora chaular jalpan II (Waxy rice with milk and jaggery)	Waxy rice – 50 g Water – 60.0 ml Milk – 50.0 g Jaggery – 20.0 g	Waxy rice is kept soaking in water for 6 hrs. and then cooked. Mixed with milk and jaggery.	160 g	150 ml.
9.	Sandahguri jalpan (Sandahguri with milk and jaggery)	Sandahguri – 50 g Hot milk – 100 ml Jaggery – 20 g	Processing of sandahguri – Bora paddy boiled in water in two steps. Drained and sundried in two days. Dehusked, roasted and ground to powder. The powdered form is locally known as Sandahguri. Mixed with hot milk and jaggery	160 g	150 ml.
10.	Pat pitha	Rice flour – 75 g Jaggery – 20 g Water – 20 ml	Rice soaked in water, drained powdered. Made a dough with water and jaggery. Made balls, flattened in between two layers of banana leaves, roasted in a hot griddle with the banana leaves.	95 g	2 nos.
11.	Topa pitha	Rice flour – 75 g Jaggery – 40 g Water – 30 ml	Rice soaked in water, drained powdered, made pour batter with water and jaggery, deep fried in oil	127 g	9 nos.
12.	Til pitha	Rice flour – 200 g Jaggery – 135 g Gingelly – 100 g	Rice flour made out of soaked, drained waxy rice. Roasted cleaned gingelly seeds, coarse ground, mixed with jaggery. Spread a table-spoon of rice flour on hot tawa, filled with gingelly mixture and closed.	335 g	16 nos.
13.	Tel pitha	Rice flour (from waxy rice) – 100 g Gingelly seeds – 40 g Jaggery – 40 g Oil for frying – 50 g Water – 20 ml	Made dough with 10 g of water. Roasted gingelly, coarsed ground and mixed with grated jaggery. Made balls from the dough, filled with gingelly jaggery mix, closed, flattened and deep fried.	120 g	6 nos.

Table 2: General description of some pulse based recipes commonly consumed in Assam, India

S. No.	Name of recipe	Ingredients used	Description of recipe	Cooked weight	Cooked vol./no.
1.	<i>Outenga diya mati dail</i> (Blackgram dal with dilenia)	Blackgram dal-100g Blackgram dal-100g Green chilli – 5g Mustard oil – 15g Mustard seeds – 2.5 g Turmeric – 2.5g Salt – 10g	Dal soaked, pressure cooked, added crushed dilenia, further cooked for 5 minutes, seasoned with mustard seeds in hot oil.	535 g	550 ml
2.	<i>Mati dail aru amitar khar</i> (Blackgram dal with papaya and alkali)	Blackgram dal – 50 g Papaya – 150 g Banana peel – 20 g Ginger – 20 g Mustard oil – 20 g Mustard seeds – 5 g Salt – 10 g Sugar – 10 g Water – 750 ml.	Water – 750 ml. Dal soaked, pressure cooked with papaya, seasoned with mustard seeds and crushed ginger, added alkali made out of dry banana peel	505 g	473 ml.
3.	<i>Bilahi diya mati dail</i> (Blackgram dal with tomatoes)	Blackgram dal – 100g Tomatoes – 90 g Green chilli – 5 g Mustard oil – 15 g Mustard seeds – 5 g Turmeric – 5 g Salt – 10 g Sugar – 10 g Water – 600 ml	Dal soaked, pressure cooked, seasoned with mustard seeds and tomatoes	505 g	473 ml.
4.	<i>Masoor dailar bor</i> (Lentil dal pakora)	Lentil dal – 100 g Onions – 40 g Green chilli – 5 g Salt – 10 g Mustard oil – 50 g	Dal soaked, drained, ground to paste, added chopped onions, salt and fried a small amount at a time	212 g 10 nos.	
5.	<i>Dailar boror tenga</i> (Lentil dal pakora in ferns and tomato gravy)	Lentil dal – 100 g; Ferns – 125 g Tomatoes – 50 g Mustard oil – 50 g Mustard seeds – 5 g; Turmeric – 5 g Lemon juice – 15 g Salt & sugar-10g each Water – 750 ml.	Dal soaked, drained, ground to paste, added salt and turmeric. Fried as pakoras. Prepared gravy with fern and tomatoes, seasoned with mustard seeds in hot oil.	555	520 ml.
6.	<i>Kharisa diya masoor dail</i> (Lentil dal with bamboo shoot)	Lentil dal – 50 g Bamboo shoots – 30 g Fenugreek seeds – 5 g Mustard oil – 15 g Green chilli – 5 g Turmeric – 5 g Salt – 10 g Water – 600 ml.	Dal pressure cooked, seasoned with grated bamboo shoot and fenugreek seeds in hot oil.	515 g	483 ml.
7.	<i>Kasu sak diya masoor dail</i> (Lentil dal with colocasia leaves)	Lentil dal – 50 g Colocasia leaves-100g Mustard oil – 15 g Bl.pap. powder – 5 g Bay leaf – 5 g Salt – 10 g Sugar – 10 g Water – 800 ml.	Dal pressure cooked with chopped colocasia leaves, seasoned with garlic and black pepper powder fried in hot oil.	560 g	525 ml.

Table 2: Contd...

S. No.	Name of recipe	Ingredients used	Description of recipe	Cooked weight	Cooked vol./no.
8.	<i>Masoor dail aru dhekiar tenga</i> (Lentil dal with ferns, tomatoes and lemon juice)	Lentil dal – 100 g Tomatoes – 40 g Ferns – 50 g Green chilli – 5 g M. oil – 15 g M. seeds – 5 g Lemon juice – 15 g Turmeric – 5 g Salt – 10 g Sugar – 10 g Water – 650 ml.	Dal pressure cooked with ferns and tomatoes, seasoned with mustard seeds in hot oil, added lemon juice	540 g	506 ml.
9.	<i>Sajina pat diya rahar dail</i> (Red gram with drumstick leaves)	Redgram dal – 50 g Drumstick leaves – 50g M. oil – 15 g Onions – 25 g Green chilli – 5 g Turmeric – 5 g Salt – 10 g Sugar – 10 g Water – 750 ml.	Dal pressure cooked with drumstick leaves, seasoned with onions fried in hot oil.	540 g	512 ml.
10.	<i>Kaldil aru rahar dail</i> (Redgram dal with plantain flower)	Redgram dal – 100 g Plantain flower 250 g Ghee – 15 g Cumin seeds – 10 g Bl.pep.powd. – 10 g Turmeric – 5 g Bay leaf – 5 g Salt – 10 g Sugar – 10 g Water – 700 ml.	Dal pressure cooked with chopped plantain flower, seasoned with garlic and black pepper powder in hot oil.	590 g	553 ml.

The prepared recipes were homogenized in a blender and subjected to analysis of proximate composition, calcium (AOAC, 1990) and iron (Wong, 1928). Carbohydrate was calculated by differential method and energy was calculated by multiplication method.

RESULTS AND DISCUSSION

Nutrient Composition of Cereal Based

Recipes: The nutrient compositions of cereal based traditional products on fresh weight basis are shown in Table 3. The highest moisture content was found in *poita bhat* (84.9 ± 0.02 g/100 g) and lowest (23.6 ± 0.03 g/100 g) in *til pitha*. Protein and fat contents were found to be highest in *tel pitha*. Comparatively high protein (12.2 ± 1.94 g/100 g) and fat contents (30.7 ± 1.05 g/100 g) may be due to the inclusion of gingelly seeds and oil used for deep frying. Findings suggests that jaggery and fat add calorie density and palatability in the diet (Gopaldas, 1988). The lowest protein (1.7 ± 0.41 g/100 g) and fat

contents (0.1 ± 0.01 g/100 g) was found in *poita bhat*. The mineral content of *poita bhat* was also the minimum (0.1 ± 0.01 mg/100g) among recipes analysed. These findings may be of importance because since ages Assamese farmers have considered *poita bhat* to be the best source of energy for them while working in the field. The mineral content was maximum in *chira jalpan II* (4.8 ± 0.11 mg/100 g). The amounts of crude fibre in the preparations ranged from 0.2 ± 0.00 g/100 g in *poita bhat* to 2.2 ± 0.41 g/100 g in *til pitha*. However, similar amounts (0.2 g/100g) of crude fibre was also found in plain rice (both pressure cooked and open pan cooked), *pat pitha* and *topa pitha* (Table 3). The carbohydrate content was highest (65.6 ± 0.21 g/100g) in *pat pitha* and lowest (12.9 ± 0.14 g/100 g) in *poita bhat*. The energy value when calculated was found to be lowest in *poita bhat* (59.3 ± 0.91 Kcal) and highest in *tel pitha* (420.1 ± 1.03 Kcal). The high energy value is due to high amounts of gingelly seeds and jaggery which are energy dense foods. The calcium content was maximum in *tel pitha*

Table 3: Nutrient composition of cereal based recipes commonly consumed in Assam, India (per 100 g as in basis)

S. No.	Name of the recipe	Moisture (g)	Protein (g)	Fat (g)	Minerals (g)	Crude fibre (g)	Carbo hydrate (g)	Energy (kcal)	Ca (mg)	Fe (mg)
1.	Plain rice	71.4±0.18	3.1±0.17	0.2±0.01	0.6±0.01	0.2±0.01	24.5±0.09	112.2±1.16	16.0± 1.20	0.3±0.01
2.	Plain rice	71.1±0.40	3.0±0.02	0.2±0.05	0.5±0.01	0.2±0.02	25.0±0.10	113.8±1.63	16.0± 1.00	0.3±0.06
3.	Poita bhat	84.9±0.02	1.7±0.41	0.1±0.01	0.1±0.01	0.2±0.00	12.9±0.14	59.3±0.91	12.0± 2.12	0.06±0.01
4.	Chira	55.8±0.28	3.4±0.19	2.2±0.01	2.1±0.12	0.4±0.10	36.1±0.11	178.0±0.83	96.2±12.4	2.3±1.01
	<i>jalpan I</i> (Rice flakes with curd and jaggery)									
5.	Chira	55.8±0.01	7.8±0.2	4.9±0.1	4.8±0.11	0.9±0.02	25.8±0.12	178.5±0.52	74.0±10.11	2.09±0.03
	<i>jalpan II</i> (Rice flakes with curd and jaggery)									
6.	Komal	70.0±0.03	8.3±0.68	2.5±0.07	1.1±0.20	0.3±0.00	17.8±0.06	126.9±0.17	106.0± 2.37	6.0±0.14
	<i>chaular</i>									
	<i>jalpan</i> (komal chaul with curd and jaggery)									
7.	Bora	65.1±0.23	10.2±0.14	3.7±0.36	0.8±0.07	0.5±0.01	19.7±0.12	152.9±0.06	102.0± 0.11	3.1±0.37
	<i>chaular</i>									
	<i>jalpan I</i> (waxy rice with curd and jaggery)									
8.	Bora chaular	60.5±0.04	8.2±0.21	3.5±0.20	0.8±0.01	0.7±0.10	26.3±0.09	169.5±0.15	173.0± 6.51	3.1±0.01
	<i>jalpan II</i> (waxy rice with milk and jaggery)									
9.	Sandahguri	47.9±0.10	8.3±0.13	4.5±0.11	0.8±0.01	0.7±0.03	37.8±0.10	224.9±0.03	158.0±13.25	5.2±0.02
	<i>jalpan</i> (Sandahguri with hot milk and jaggery)									
10.	Pat pitha	28.7±0.07	4.5±0.07	0.2±0.01	0.8±0.02	0.2±0.03	65.6±0.21	282.2±0.21	48.1± 7.01	6.9±0.07
11.	Topa pitha	32.5±0.06	5.0±0.01	4.7±0.23	1.0±0.09	0.2±0.01	56.6±0.13	289.0±1.70	36.1± 1.01	6.0±0.07
12.	Til pitha	23.6±0.03	7.5±0.75	20.4±1.47	4.2±0.05	2.2±0.41	42.1±0.91	382.0±1.01	280.0±15.06	7.4±0.15
13.	Tel pitha	30.0±0.16	12.2±1.94	30.7±1.05	1.8±0.34	1.4±0.27	23.9±1.02	420.7±1.03	536.1±12.31	9.4±2.41

Table 4: Nutrient composition of cereal based food items commonly consumed in Assam, India (per 100g dry weight basis)

S. No.	Name of the recipe	Protein (g)	Fat (g)	Minerals (g)	Crude fibre (g)	Carbo-hydrate (g)	Energy (Kcal)	Calcium (mg)	Fe (mg)
1.	Plain rice	10.8±0.59	1.4±0.07	4.2±0.07	1.4±0.07	82.2±37.28	384.7±3.97	55.9±4.19	1.0±0.03
2.	Plain rice	11.1±0.07	0.7±0.18	1.8±0.04	0.7±0.07	85.7±0.34	393.5±5.64	59.5±3.72	1.12±0.14
3.	Poita bhat	11.3±2.73	0.7±0.06	0.7±0.06	1.3±0.00	85.6±0.93	393.3±6.04	79.5±14.04	0.4±0.07
4.	Chira	7.8±0.43	4.9±0.02	4.8±0.27	0.9±0.23	81.6±0.25	401.7±2.53	217.6±28.05	5.1±2.24
	<i>jalpan I</i> (rice flakes with curd and jaggery)								
5.	Chira	17.6±0.05	11.1±0.02	11.0±0.25	2.0±0.04	58.3±0.27	403.5±1.17	167.4±22.87	4.73±0.07
	<i>jalpan II</i> (rice flakes with curd and jaggery)								
6.	Komal	27.6±2.26	8.3±0.23	3.6±0.65	1.0±0.00	59.5±0.20	423.1±0.17	353.3±7.89	20.0±0.47
	<i>chaular jalpan</i> (Komal chaul with curd and jaggery)								
7.	Bora	29.2±0.40	10.6±1.03	2.3±0.20	1.4±0.03	56.5±0.34	438.2±0.05	292.3±0.32	8.8±1.05
	<i>chaular jalpan I</i> (waxy rice with curd and jaggery)								
8.	Bora <i>chaular jalpan II</i>	20.7±0.53	8.9±0.51	2.0±0.02	1.5±0.21	67.0±0.16	430.9±0.25	438.0±18.05	7.8±0.02
	(waxy rice with milk and jaggery)								
9.	<i>Sandahguri jalpan</i> (Sandahguri with hot milk and jaggery)	17.3±0.27	9.4±0.23	1.6±0.02	1.4±0.06	70.3±18.59	435.0±1.21	329.2±27.61	10.8±2.61
10.	<i>Pat pitha</i>	6.4±0.09	0.3±0.02	1.2±0.03	0.3±0.04	91.8±0.56	395.5±1.87	67.5±9.84	9.8±0.09
11.	<i>Topa pitha</i>	7.0±0.01	7.4±0.36	1.5±0.14	0.3±0.02	83.8±0.19	429.8±0.57	53.4±1.49	8.9±0.10
12.	<i>Til pitha</i>	11.0±1.09	29.4±2.12	6.0±0.07	3.1±0.58	50.5±1.09	510.6±1.21	336.1±18.08	8.8±2.26
13.	<i>Tel pitha</i>	17.4±2.77	43.8±1.49	2.6±0.49	2.0±0.38	34.2±1.46	600.6±1.47	765.8±17.58	13.4±3.44

Table 5: Nutrient composition of pulse based recipes commonly consumed in Assam, India (per 100g as is basis)

S. No.	Name of the recipe	Moisture (g)	Protein (g)	Fat (g)	Minerals (g)	Crude fibre (g)	Carbo hydrate (g)	Energy (kcal)	Ca (mg)	Fe (mg)
1.	Outenga diya mati dail (Blackgram dal with dilenia)	81.4±0.50	3.8±0.66	2.3±0.03	0.8±0.03	0.2±0.01	11.5±0.04	82.0±2.37	28.6±3.71	0.8±0.43
2.	Mati dail aru amitar khar (Blackgram dal with papaya and alkali)	80.2±1.02	4.0±0.14	2.0±0.01	1.0±0.06	0.2±0.03	12.6±0.93	84.0±0.91	29.7±2.00	0.6±0.03
3.	Bilahi diya mati dail (Blackgram dal with tomatoes)	80.2±0.91	4.0±0.10	3.2±0.09	1.0±0.02	0.2±0.12	11.4±2.3	90.0±1.35	44.6±1.62	0.8±0.40
4.	Masoor dailar bor (Lentil dal pakora)	53.0±0.21	9.0±0.27	5.4±0.10	0.8±0.01	0.2±0.01	31.6±0.11	211.0±1.16	33.0±3.11	1.4±0.20
5.	Dailar boror tenga (Lentil dal pakora in fens and tomato gravy)	82.0±0.02	3.7±0.19	2.2±1.10	0.8±0.04	0.2±0.01	11.1±1.02	79.0±1.21	59.4±7.90	1.5±0.18
6.	Kharisa diya masoor dail (Lentil dal with bamboo shoot)	81.0±0.34	4.1±0.17	2.5±0.12	1.0±0.09	0.4±0.15	11.0±0.36	83.0±0.29	19.0±2.50	1.4±0.49
7.	Kasu sak diya masoor dail (Lentil dal with colocasia leaves)	82.2±0.03	3.9±0.36	2.0±0.13	0.6±0.03	0.2±0.02	11.1±0.32	78.0±0.19	71.2±8.22	2.2±0.10
8.	Masoor dail aru dhekiar tenga (Lentil dal with fens, tomatoes and lemon juice)	81.5±0.11	3.9±0.49	2.0±0.51	0.8±0.02	0.2±0.03	11.6±0.09	80.0±0.35	46.3±2.28	1.5±0.26
9.	Sajina pat diya rahar dail (Red gram dal with drumstick leaves)	81.7±0.01	3.6±0.18	2.7±0.06	1.0±0.16	0.2±0.00	10.8±0.18	82.0±0.03	49.4±0.16	0.4±0.06
10.	Kaldil aru rahar dail (Redgram dal with plantain flower)	83.0±0.02	3.5±0.07	2.0±0.03	0.8±0.02	0.4±0.02	10.3±0.02	73.0±1.04	51.0±1.12	0.5±0.01

(536.1±12.31 mg/100 g) and minimum (12.0±2.12 mg/100 g) in *poita bhat*. The iron content of the analysed recipes was highest in *tel pitha* (9.4±2.41 mg/100 g) and lowest in *poita bhat* (0.06±0.01 mg/100 g).

The data on nutrient compositions of cereal based recipes on dry weight basis are presented in Table 4. The protein content of the recipes was highest in *bora chaular jalpan-I* (29.2±0.40 g/100 g) and lowest in *pat pitha* (6.4±0.09 g/100 g). *Tel pitha* had the maximum fat content (43.8±1.49 g/100 g) and *pat pitha* had the minimum amounts of fat (0.3±0.02 g/100 g). The mineral contents of the recipes ranged from 0.7±0.06 g/100g in *poita bhat* to 11.0±0.25 g/100g in *chira jalpan II*. Crude fibre content ranged from 0.3 g/100g in *pat pitha* and *topa pitha* to 3.1±0.58 g/100 g in *til pitha*. The carbohydrate content was maximum in *pat pitha* (91.8 ± 0.56 g/100 g) and minimum in *tel pitha* (34.2 ± 1.46 g/100 g). The energy content was highest in *tel pitha* (600.6±1.47 Kcal) and lowest (384.6±3.97 Kcal) in *plain rice bora chaular jalpan-II*. The calcium content of the recipes varied widely. It ranged from 53.4±1.49 mg/100 g in *topa pitha* to 765.8±17.58 mg/100 g in *tel pitha*. With regards to the iron content, it ranged from 0.4±0.07 mg/100 g in *poita bhat* to 20.0 ± 0.47 mg/100 g in *komal chaular jalpan*.

Nutrient Composition of Pulses Based Recipes: The results on fresh weight basis are presented in Table 5. The moisture content of the pulse recipes ranged from 53.0±0.21 g/100 g to 83.0±0.02 g/100 g. The highest moisture was in *kaldil aru rahar dail* whereas *masoor dailar bor* had the lowest.

Earlier studies showed that the protein content in legume seeds is governed by the genotype and the environment conditions under which they are grown. The different cultivars vary in their protein content; the magnitude of variation is between 10 to 15 per cent (Salunkhe et al. 1985). But in the present study variation in nutrients were due to the ingredients used and the type of preparations. The highest protein content (9.0±0.27 g/100g) was observed in *masoor dailar bor* and the lowest (3.5±0.07 g/100g) was found in *kaldil aru rahar dail*. *Masoor dailar bor* contained the highest amount of fat (5.4±0.10 g/100g). A similar amount of fat (2.0 g/100g) was found in *mati dail aru amitar khar*, *kasu sak diya masoor dail*, *masoor dail aru dhekiar tenga* and *kaldil aru rahar dail*.

The results of the analysis revealed that the mineral content of the pulses recipes ranged from 0.6±0.03 g/100g to 1.0±0.02 g/100g. Mineral content of 1.0 g/100g was found in *mati dail aru amitar khar*, *bilahi diya mati dail*, *kharisa diya masoor dail* and *sajina pat diya rahar dail*. The crude fibre content of the recipes were found to be comparable with most of the recipes containing 0.2 g/100g. The amounts of crude fibre ranged from 0.2±0.00 g/100 g to 0.4±0.15 g/100 g. *Masoor dailar bor* was found to contain the maximum (31.6±0.11 g/100g) of carbohydrate whereas *kaldil aru rahar dail* had the minimum (10.3±0.02 g/100g) content of carbohydrate. *Masoor dailar bor* had the highest energy content (211.0±1.16 Kcal) whereas *kaldil aru rahar dail* had the least (73.0±1.04 Kcal). The high amount of energy was due to the high amounts of protein and fat contents of the recipes.

The results of the analysis showed that the highest amount of calcium was found in *kasu sak diya masoor dail* (71.2±8.22 mg/100 g). The lowest amount of 19.0±2.50 mg/100g was found in the preparation of *kharisa diya masoor dail*. The maximum iron content was found in *kasu sak diya masoor dail* (2.2±0.10 mg/100g) whereas the minimum amount was found in *sajina pat diya rahar dail* (0.4±0.06 mg/100g).

The data on nutrient composition of pulse based food items on dry weight basis are presented in Table 6. The protein content of the pulse recipes ranged from 19.1±0.57 g/100 g in *masoor dailar bor* to 22.0±2.03 g/100 g in *kasu sak diya masoor dail*. The fat content of the recipes was highest in *bilahi diya mati dail* (16.2±0.46 g/100 g) and lowest in *mati dail aru amitar khar* (10.1±0.05 g/100 g). The mineral contents of the recipes was maximum in *sajina pat diya rahar dail* (5.5±0.00 g/100 g) and minimum in *masoor dailar bor* (1.7±0.02 g/100 g). Crude fibre was maximum in *kaldil aru rahar dail* (2.4±0.12 g/100 g) and minimum in *masoor dailar bor* (0.4±0.02 g/100 g). The carbohydrate contents ranged from 57.2±11.54 g/100g in *bilahi diya mati dail* to 67.2±0.23 g/100g in *masoor dailar bor*. *Bilahi diya mati dail* had the highest amounts of energy 456.0±6.84 Kcal whereas its amount was minimum in *mati dail aru amitar khar* (426.0±4.61 Kcal). The calcium content ranged from 70.0±6.59 mg/100g in *masoor dailar bor* to 400.0±46.18 mg/100g in *kasu sak diya masoor dail*. Iron content of the

Table 6: Nutrient composition of pulse based recipes commonly consumed in Assam, India (per 100g dry weight basis)

S. No.	Name of the recipe	Protein (g)	Fat (g)	Minerals (g)	Crude fibre (g)	Carbo-hydrate (g)	Energy (Kca)	Calcium (mg)	Iron (mg)
1.	Outenga diya mati dai(Blackgram dal with dilenia)	20.4±3.54	12.4±0.16	4.3±0.16	1.1±0.06	61.7±0.21	440.0±12.72	154.0±19.98	4.1±2.20
2.	Mati dai aru amitar khar (Blackgram dal with papaya and alkali)	20.2±0.71	10.1±0.05	5.1±0.306	1.0±0.15	63.5±4.68	426.0±4.61	150.0±10.10	3.1±0.15
3.	Bilahi diya mati dai (Blackgram dal with tomatoes)	20.3±0.51	16.2±0.46	5.1±0.10	1.0±0.6	57.2±11.54	456.0±6.84	225.0±8.17	3.9±1.95
4.	Masoor dailar bor (Lentil dal pakora)	19.1±0.57	11.5±0.21	1.7±0.02	0.4±0.02	67.2±0.23	449.0±2.49	70.0±6.59	3.0±0.43
5.	Dailar boror tenga (Lentil dal pakora in ferns and tomato gravy)	21.5±1.10	12.2±6.09	4.4±0.22	1.1±0.06	60.4±5.55	437.0±6.69	330.0±43.89	8.5±1.02
6.	Kharisa diya masoor dai (Lentil dal with bamboo shoot)	21.1±0.87	12.8±0.61	5.1±0.46	2.1±0.79	59.0±1.93	435.0±1.52	100.0±13.16	7.1±2.48
7.	Kasu sak diya masoor dai (Lentil dal with colocasia leaves)	22.0±2.03	11.2±0.73	3.4±0.17	1.4±0.4	61.5±1.77	435.0±1.06	400.0±46.18	12.1±0.55
8.	Masoor dai aru dhekiar tenga(Lentil dal with ferns, tomatoes and lemon juice)	21.0±2.64	11.0±2.81	4.3±0.64	1.1±0.16	62.4±0.48	433.0±1.89	250.0±1.23	8.3±1.44
9.	Sajina pat diya rahar dai (Red gram dal with drumstick leaves)	19.8±0.99	14.6±0.32	5.5±0.00	1.3±0.03	58.4±0.97	444.0±0.16	270.0±0.87	2.3±0.35
10.	Kaldil aru rahar dai (Redgram dal with plantain flower)	20.4±0.41	12.0±0.18	4.7±0.12	2.4±0.12	60.3±0.12	431.0±6.14	300.0±6.59	3.2±0.06

recipes was highest in *kasu sak diya masoor dail* (12.1 ± 0.55 mg/100g) and lowest in *sajina pat diya rahar dail* (2.3 ± 0.35 mg/100g).

The results of the nutritional estimation of the selected traditional recipes of Assam revealed that they had a fairly good nutritive value. Most of the cereal based snack items had fair amounts of energy, calcium and iron. Preparation of pulses with a variety of combinations is a very good practice which should be further encouraged. The need is to generate awareness amongst the people about the potential of the local food resources to fulfill the demand for basic nutrients required for health.

REFERENCES

- AOAC : *Official Methods of Analysis*. Association of Official Analytical Chemist. Washington, DC, USA (1990).
- Gopaldas, T.: Simple traditional methods for reducing dietary bulk of cereal based diets in rural homes. *Proc. Nutr. Soc. Indian* **34**: 73-84 (1988).
- Mahajan, P.V. and Chattopadhyay, P.K.: Development of a chemically leavened cereal – legume based instant mix (*Dhokla*). *J. Food Sci. Technol.* **37(5)**: 459-464 (2000).
- Salunkhe, B.K., Chavan, J.K. and Kadan S.S.: *Post Harvest Biotechnology of Cereals*. CRC Press, Boca Raton, pp. 29-52: 125 (1985).
- Wong, S.Y.: Colorimetric determination of iron and hemoglobin in blood. *J. Biol. Chem.*, **77**: 409-12 (1928).