High-Iron Mungbean Recipes for North India

Kiran Bains
Ray-Yu Yang
S. Shanmugasundaram
AVRDC—the World Vegetable Center is an international not-for-profit organization committed to ensuring the world’s food security through research, development, and training.

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P.O. Box 42, Shanhua, Tainan, Taiwan 741, ROC
tel: +886-6-583-7801
fax: +886-6-583-0009
e-mail: avrdcbox@netra.avrdc.org.tw
www: http://www.avrdc.org


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AVRDC
The World Vegetable Center
Dr. Kiran Bains preparing a high-iron mungbean recipe
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>3</td>
</tr>
<tr>
<td>Terms</td>
<td>4</td>
</tr>
<tr>
<td>Dhuli Mung Dhal</td>
<td>6</td>
</tr>
<tr>
<td>Sabat Mung Dhal</td>
<td>8</td>
</tr>
<tr>
<td>Parantha</td>
<td>10</td>
</tr>
<tr>
<td>Mung Dhal Khichri</td>
<td>12</td>
</tr>
<tr>
<td>Mung Spinach Saag</td>
<td>14</td>
</tr>
<tr>
<td>Mung Amaranth Saag</td>
<td>16</td>
</tr>
<tr>
<td>Mungbean Sprout Salad</td>
<td>18</td>
</tr>
<tr>
<td>Sprouted Mungbean Pulao</td>
<td>20</td>
</tr>
<tr>
<td>Mung Sprout - Mint Raita</td>
<td>22</td>
</tr>
<tr>
<td>Dahi Bhalla</td>
<td>24</td>
</tr>
<tr>
<td>Mung Spinach Pakoda</td>
<td>26</td>
</tr>
<tr>
<td>Mung Namkeen</td>
<td>28</td>
</tr>
<tr>
<td>Poha</td>
<td>30</td>
</tr>
<tr>
<td>References</td>
<td>32</td>
</tr>
<tr>
<td>Appendix I: U.S. Recommendations for Nutrient Intakes</td>
<td>33</td>
</tr>
<tr>
<td>Appendix II: Conversion Factors for Measures</td>
<td>34</td>
</tr>
</tbody>
</table>
Mungbean is an important source of protein and iron in Indian diets.
Mungbean is widely grown and consumed in India. The pulse is an excellent source of protein (20%) and a fair source of iron (4–7 mg per 100 g), but the presence of phytate and tannin in mungbean reduces its iron bioavailability significantly. This loss of nutritional value is critical since iron deficiency anemia is the major micronutrient deficiency problem in India, affecting more than 320 million people. Estimates are that 40–80% of pregnant women, 60–70% of children, and 50% of adolescent girls in India suffer from anemia. Vijayalakshmi et al. (2003) have shown that a food-based approach using improved mungbean recipes is a sustainable way to reduce this nutritional disorder. The bioavailability of iron from mungbean may be enhanced through sprouting (AVRDC, 1994) or by cooking it with vegetables such as tomato and cabbage (AVRDC, 1998). Vegetables exerting iron bioavailability-enhancing effects were further reported by Yang et al. (2002). Subramanian and Yang (1998) have prepared improved mungbean/vegetable recipes for South India. These recipes were developed with an emphasis on simple cooking methods, locally available and inexpensive ingredients, and consumer acceptability.

Although India has achieved self-sufficiency in cereal food grains during the past two decades, there has been a reduction in the production of pulses such as mungbeans. This reduction has resulted in a decline in pulse consumption especially among poor families. The rice-wheat cropping system in the Indo-Gangetic Plains of India is primarily responsible for the enhanced cereal production in India; however, this cropping system has resulted in a number of problems, including a degradation of soils and increased dependence on chemical fertilizers and pesticides. To overcome these problems, diversification of the system by introducing fast maturing mungbean varieties between two cereal crops or instead of the rice crop has been proposed. The Department for International Development-sponsored project, “Improving income and nutrition by incorporating mungbean in cereal fallows in Indo-Gangetic Plains of South Asia” successfully incorporated short duration mungbean varieties in the rice-wheat cropping system. Such crop diversification enables the farmers to improve their household income and at the same time ensure nutritional security and enrich their soils.

The high-iron recipes developed in this book were prepared to suit the palate of North Indians. The selected ingredients are inexpensive and easily accessible to rural families as well as the urban poor. The iron bioavailability of mungbean has been substantially improved to 7.2–11.3% through cooking practices such as soaking, pressure-cooking, fermenting, sprouting, and using iron- and vitamin C-rich vegetables as ingredients. Iron content of each recipe was determined by the atomic absorption method. Iron bioavailability was measured with the in vitro digestion/dialysis method described by AVRDC (1995). The other micronutrient values were referred from the Food Composition Table listed in Huang et al. (1992). The sensory qualities such as flavor and appearance were given due importance in preparing the recipes. By popularizing these recipes among the target population, the iron status of millions of vulnerable families in India can be substantially improved.
## Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amaranth</td>
<td><em>Amaranthus viridis</em>, a high-iron leafy vegetable</td>
</tr>
<tr>
<td>Coriander</td>
<td><em>Coriandrum sativum</em>, a high-iron leafy herb</td>
</tr>
<tr>
<td>Cumin</td>
<td><em>Cuminum cyminum</em>, a spice used in the form of seeds</td>
</tr>
<tr>
<td>Curd</td>
<td>Milk cultured with <em>Lactobacillus</em> species; yogurt</td>
</tr>
<tr>
<td>Dahi bhalla</td>
<td>Fermented and fried ball of mungbean in curd</td>
</tr>
<tr>
<td>Dhal</td>
<td>Preparations made of split dehulled or whole pulse (see next page)</td>
</tr>
<tr>
<td>Dhuli mung dhal</td>
<td>Cooked dehusked and split mungbean</td>
</tr>
<tr>
<td>Fenugreek</td>
<td><em>Trigonella foenum-graecum</em>, a locally available leafy vegetable also known as Greek hay</td>
</tr>
<tr>
<td>Garam masala</td>
<td>Powdered mixture of Indian condiments and spices</td>
</tr>
<tr>
<td>Ghee</td>
<td>Melted butter</td>
</tr>
<tr>
<td>Iron bioavailability</td>
<td>Iron available to the human body</td>
</tr>
<tr>
<td>Khichri</td>
<td>A combination of rice and legume</td>
</tr>
<tr>
<td>Mint chutney</td>
<td>Mint leaves ground into thin paste</td>
</tr>
<tr>
<td>Mung dhal</td>
<td>Split dehulled mungbean</td>
</tr>
<tr>
<td>Mungbean</td>
<td>Green gram, <em>Vigna radiata</em> var. <em>radiata</em></td>
</tr>
<tr>
<td>Mustard</td>
<td><em>Brassica juncea</em>, an herb used in the form of seeds</td>
</tr>
<tr>
<td>Namkeen</td>
<td>Fried and crispy snack prepared from legumes</td>
</tr>
<tr>
<td>Pakoda</td>
<td>Fried snack prepared from vegetables coated with legume flour paste</td>
</tr>
<tr>
<td>Parantha</td>
<td>Pancake</td>
</tr>
<tr>
<td>Poha</td>
<td>Dish prepared from rice flakes and vegetables</td>
</tr>
<tr>
<td>Pulao</td>
<td>Rice cooked with vegetables</td>
</tr>
<tr>
<td>Raita</td>
<td>Fermented curd with vegetables and spices</td>
</tr>
<tr>
<td>Saag</td>
<td>A preparation of leafy vegetables</td>
</tr>
<tr>
<td>Sabat</td>
<td>Whole</td>
</tr>
<tr>
<td>Turmeric powder</td>
<td>Spice ground from the root of <em>Curcuma longa</em> that gives yellow color to food</td>
</tr>
<tr>
<td>Tawa</td>
<td>Iron pan to make pancakes</td>
</tr>
</tbody>
</table>
Mungbean is commonly sold in three forms: whole mungbean, split dehulled mungbean called mung (or mungbean) dhal, and split dehulled mungbean sold with hulls. Many of the recipes in this book contain mung dhal, which calls for split mungbean with the hulls removed. Some recipes in this book call for mungbean sprouts, which are produced from whole mungbean.

Several of the recipes call for pressure cooking mungbean dhal. When this initial cooking is complete, other ingredients are sometimes added to the same pot and the mix is cooked altogether. Note that pressure is used only for the initial cooking and that subsequent cooking with the combined ingredients does not require pressure unless otherwise indicated.

You will also notice that metric measures are used, but that teaspoon and tablespoon conversions are often supplied in parentheses for convenience. If you wish to convert grams to ounces, you’ll find a simple conversion table in Appendix II.
This is the most popular dish in North India—made more nutritious by adding tomato and coriander leaves.
Dhuli Mung Dhal

Ingredients:

- Mung dhal: 100 g
- Tomato: 75 g
- Onion: 50 g
- Garlic: 3 to 4 cloves
- Oil/ghee: 20 g
- Coriander leaves: 10 g (1 tbsp)
- Cumin seeds: ¼ tsp
- Turmeric powder: ½ tsp
- Salt, to taste
- Red chillies, to taste
- Garam masala, to taste

Nutrient composition:

- Energy: 570 kcal
- Protein: 26 g
- Calcium: 200 mg
- Iron: 5.29 mg (bioavailability 10.20%)
- Phosphorus: 611 mg
- β-carotene: 0.90 mg (150 µg RE)
- Thiamine: 0.69 mg
- Riboflavin: 0.27 mg
- Niacin: 2.55 mg
- Ascorbic acid: 35 mg

Preparation:

1. Wash the mungbean dhal and cook it in a pressure cooker with chopped garlic, turmeric powder, red chillies, salt, and 2½ cups of water for 5 minutes.
2. Fry finely chopped onion in oil/ghee until the onion turns golden brown.
3. Add cumin seeds and sauté for a few seconds.
4. Add chopped/pureed tomatoes. Cook until tomatoes are done and mixture leaves the sides of the pan.
5. Add garam masala to dhal and garnish it with finely chopped coriander leaves.

Serves three
A delicious preparation that goes well with wheat chapaties, salad and pickle.
Sabat Mung Dhal

**Ingredients:**

- Mung dhal : 100 g
- Tomato : 75 g
- Onion : 50 g
- Garlic : 4 to 5 cloves
- Oil/ghee : 20 g
- Cumin seeds : ¼ tsp
- Turmeric powder : ½ tsp
- Coriander leaves : 10 g (1 tbsp)
- Salt, to taste
- Red chillies, to taste
- Garam masala, to taste

**Nutrient composition:**

- Energy : 584 kcal
- Protein : 26 g
- Calcium : 151 mg
- Iron : 4.79 mg (bioavailability 8.15%)
- Phosphorus : 481 mg
- β-carotene : 0.90 mg (150 µg RE)
- Thiamine : 0.70 mg
- Riboflavin : 0.30 mg
- Niacin : 3.0 mg
- Ascorbic acid : 35 mg

**Preparation:**

1. Wash the mungbean dhal and cook it in a pressure cooker with chopped garlic, turmeric powder, red chillies, salt, and 4 cups of water for 5 minutes.
2. Fry finely chopped onion in oil/ghee until the onion turns golden brown.
3. Add cumin seeds and sauté for a few seconds.
4. Add chopped/pureed tomatoes. Cook until tomatoes are done and mixture leaves the sides of the pan.
5. Add garam masala to dhal and garnish it with finely chopped coriander leaves.

Serves three
A wholesome breakfast meal in combination with butter and curd
Parantha

Ingredients:

- Mung dhal flour : 50 g
- Wheat flour : 100 g
- Spinach/fenugreek leaves : 50 g
- Onion : 50 g
- Oil/ghee : 20 g
- Cumin seeds : 5 g
- Salt, to taste
- Chilli powder, to taste

Nutrient composition:

- Energy : 730 kcal
- Protein : 26 g
- Calcium : 166 mg
- Iron : 8.27 mg (bioavailability 11.32%)
- Phosphorus : 563 mg
- β-carotene : 1.40 mg (233 µg RE)
- Thiamine : 0.82 mg
- Riboflavin : 0.41 mg
- Niacin : 6.00 mg
- Ascorbic acid : 15 mg

Preparation:

1. Roast the cumin seeds.
2. Finely chop the spinach/fenugreek leaves and onion.
3. Make a dough by mixing together wheat flour, mung dhal flour, spinach/fenugreek leaves, onion, and remaining dry ingredients.
4. Form into round balls.
5. Roast parantha on tawa, applying oil on both sides.

Serves three
A light, but nutritious and complete meal, best suited for young children and the elderly.
**Mung Dhal Khichri**

**Ingredients:**
- Mung dhal : 50 g
- Rice : 100 g
- Cauliflower/radish leaves : 100 g
- Onion : 50 g
- Tomato : 50 g
- Green chillies : 2 to 4 fruits
- Oil/ghee : 20 g
- Cumin seeds : ½ tsp
- Salt, to taste

**Nutrient composition:**
- Energy : 838 kcal
- Protein : 26 g
- Calcium : 743 mg
- Iron : 8.04 mg (bioavailability 9.16%)
- Phosphorus : 513 mg
- β-carotene : 1.39 mg (232 µg RE)
- Thiamine : 0.62 mg
- Riboflavin : 0.60 mg
- Niacin : 8.89 mg
- Ascorbic acid : 131 mg

**Preparation:**

1. Sauté onion in oil/ghee until golden brown in a pressure cooker.
2. Add cumin seeds and finely chopped tomatoes and green chillies.
3. Cook until tomatoes are done and the mixture leaves the sides of the cooker.
4. Wash rice and mung dhal.
5. Wash and chop cauliflower/radish leaves.
6. Add rice, mung dhal, chopped cauliflower/radish leaves, and water (4 cups) to the above mixture in a pressure cooker and cook for 15 minutes.

Serves three
An iron-rich dish that can be served in any season
Mung Spinach Saag

Ingredients:

- Mung dhal : 75 g
- Spinach : 300 g
- Onion : 60 g
- Tomato : 75 g
- Green chillies : 2 to 4 fruits
- Garlic : 4 to 5 cloves
- Ginger paste : 1 tbsp
- Cumin seeds : ¼ tsp
- Oil/ghee : 20 g
- Salt, to taste

Nutrient composition:

- Energy : 567 kcal
- Protein : 26 g
- Calcium : 373 mg
- Iron : 8.04 mg (bioavailability 11.31%) 
- Phosphorus : 423 mg
- β-carotene : 8.5 mg (1418 µg RE)
- Thiamine : 0.75 mg
- Riboflavin : 1.10 mg
- Niacin : 5.84 mg
- Ascorbic acid : 131 mg

Preparation:

1. Clean and wash mung dhal and spinach leaves.
2. Finely chop the spinach leaves, garlic, and green chillies.
3. Pressure cook mung dhal with spinach, garlic, green chillies, ginger paste, salt, and water (1 cup) for 10 minutes.
4. Blend the saag into paste manually or by using electric blender.
5. Fry finely chopped onions in oil/ghee until golden brown.
6. Add cumin seeds and chopped/pureed tomatoes. Cook until tomatoes are done and the mixture leaves the sides of the pan.
7. Add saag to this mixture and cook for few more minutes.

Serves three
An iron-rich, tasty dish during summer; add some butter to make it even more delicious.
Mung Amaranth Saag

Ingredients:

Mung dhal : 50 g
Amaranth : 200 g
Onion : 50 g
Tomato : 50 g
Green chillies : 2 to 4 fruits
Garlic : 3 to 4 cloves
Ginger : 1 tbsp (paste)
Cumin seeds : ¼ tsp
Oil/ghee : 20 g
Salt, to taste

Nutrient composition:

Energy : 491 kcal
Protein : 22 g
Calcium : 511 mg
Iron : 10.73 mg
Phosphorus : 433 mg
β-carotene : 16.89 mg (2815 µg RE)
Thiamine : 0.44 mg
Riboflavin : 0.79 mg
Niacin : 3.89 mg
Ascorbic acid : 92 mg

Preparation:

1. Clean and wash mung dhal and amaranth leaves.
2. Finely chop the amaranth leaves, garlic, and green chillies.
3. Pressure cook mung dhal with amaranth, garlic, chillies, ginger paste, salt, and water (1 cup) for 10 minutes.
4. Blend the saag into paste manually or by using electric blender.
5. Fry finely chopped onions in oil/ghee until golden brown.
6. Add cumin seeds and chopped/pureed tomatoes. Cook until tomatoes are done and the mixture leaves the sides of the pan.
7. Add saag to this mixture and cook for a few more minutes.

Serves three
A delicious way to enjoy fresh vegetables during summer
Mungbean Sprout Salad

Ingredients:

- Mungbean : 100 g (250 g sprouts)
- Tomato : 50 g
- Onion : 50 g
- Cucumber : 100 g
- Green chillies : 2 to 3 fruits
- Coriander leaves : 10 g (1 tbsp)
- Lemon juice : 15 ml (1 tbsp)
- Black pepper, to taste
- Salt, to taste

Nutrient composition:

- Energy : 433 kcal
- Protein : 28 g
- Calcium : 249 mg
- Iron : 6.32 mg (bioavailability 10.66%)
- Phosphorus : 427 mg
- β-carotene : 0.77 mg (130 µg RE)
- Thiamine : 0.70 mg
- Riboflavin : 0.52 mg
- Niacin : 2.82 mg
- Ascorbic acid : 125 mg

Preparation:

1. Soak mungbeans in water for 12 hours, then drain the water and tie the mungbeans in muslin cloth.
2. Sprinkle water on the cloth to keep it moist until sprouts appear (at least 24 hours in summer and 36 hours in winter).
3. Steam sprouts in the pressure cooker with ½ cup of water for 5 minutes.
4. Finely chop onion, green chillies, and coriander leaves. Dice tomatoes and cucumber.
5. Add sprouts to the vegetables and sprinkle lemon juice, salt, and pepper over the mixture. Toss well.

Serves three
A complete meal along with curd
**Sprouted Mungbean Pulao**

**Ingredients:**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mungbean</td>
<td>100 g</td>
</tr>
<tr>
<td>Rice</td>
<td>200 g</td>
</tr>
<tr>
<td>Tomato</td>
<td>100 g</td>
</tr>
<tr>
<td>Onion</td>
<td>75 g</td>
</tr>
<tr>
<td>Oil/ghee</td>
<td>20 g</td>
</tr>
<tr>
<td>Cumin seeds</td>
<td>½ tsp</td>
</tr>
</tbody>
</table>

**Nutrient composition:**

- **Energy**: 1845 kcal
- **Protein**: 39 g
- **Calcium**: 222 mg
- **Iron**: 7.34 mg (bioavailability 8.82%)
- **Phosphorus**: 711 mg
- **β-carotene**: 0.59 mg (98 µg RE)
- **Thiamine**: 0.75 mg
- **Riboflavin**: 0.45 mg
- **Niacin**: 4.77 mg
- **Ascorbic acid**: 76 mg

*Serves three*

**Preparation:**

1. Sauté the onions and cumin seeds in the oil/ghee.
2. Clean and wash rice.
3. Boil 2½ cups of water. Add rice and salt in water and cook in closed pan for 10 minutes.
4. Add mungbean sprouts, diced tomato, sautéed onions and cumin seeds to the half-cooked rice. Cook for another 5 minutes under low heat.
Mint leaves and mung sprouts add refreshing flavors and more nutrition to this curd.
Mung Sprout – Mint Raita

Ingredients:

- Mung sprouts : 300 g
- Curd : 400 g
- Mint leaves : 30 g
- Green chillies : 2 to 3 fruits
- Cumin seed powder : ½ tsp
- Black pepper : ¼ tsp
- Salt, to taste

Nutrient composition:

- Energy : 602 kcal
- Protein : 39 g
- Calcium : 794 mg
- Iron : 10.51 mg (bioavailability 7.18%) 
- Phosphorus : 737 mg
- β-carotene : 1.64 mg (273 µg RE)
- Thiamine : 0.78 mg
- Riboflavin : 1.18 mg
- Niacin : 2.78 mg
- Ascorbic acid : 66 mg

Preparation:

1. Make curd by adding the culture of *Lactobacillus* species to lukewarm milk and keeping it undisturbed for 6–8 hours for curdling.
2. Churn the curd into smooth consistency by adding a little water or milk in it.
3. Wash, clean, and chop the mint leaves and green chillies.
4. Roast cumin seeds and grind them.
5. Mix the steamed sprouts, mint leaves, chillies, cumin powder, and black pepper in the curd. Add salt to taste.

Serves three
Fermented mung balls in curd is a delicious, cool and savory dish.
Dahi Bhalla

Ingredients:

Mung dhal : 100 g  
Curd : 400 g  
Onion : 50 g  
Tomato : 50 g  
Coriander leaves : 10 g (1 tbsp)  
Cumin seeds : ½ tsp  
Oil/ghee, for frying  
Red chillies, to taste  
Salt, to taste

Nutrient composition:

Energy : 707 kcal  
Protein : 38 g  
Calcium : 782 mg  
Iron : 6.26 mg  
(bioavailability 9.55%)  
Phosphorus : 745 mg  
β-carotene : 0.77 mg (128 µg RE)  
Thiamine : 0.86 mg  
Riboflavin : 0.95 mg  
Niacin : 2.93 mg  
Ascorbic acid : 37 mg

Preparation:

Serves three

1. Soak mung dhal overnight (6–8 hours) in water.
2. Grind dhal in electric blender or with pestle and mortar into a fine but thick paste. Ferment for 6–8 hours.
3. Add a pinch of salt in the paste, form into balls, and deep fry until the bhallas turn golden brown.
4. Soak bhallas in lukewarm water for one hour.
5. Churn the curd into fine consistency by adding a small amount of water or milk to it.
6. Add finely chopped onion, tomato, coriander leaves, salt, red chillies, and powdered cumin seeds to the curd.
7. Squeeze water from bhallas by pressing them softly between the palms of the hands.
8. Add bhallas to the curd and keep refrigerated until time of serving.
A delicious and nutritious snack with tea for any season of the year
Mung Spinach Pakoda

Ingredients:

- Mung dhal : 100 g
- Spinach : 100 g
- Tamarind chutney : 4 tbsp
- Mint chutney : 4 tbsp
- Oil/ghee, for frying
- Salt, to taste
- Red chillies, to taste
- Garam masala, to taste

Nutrient composition:

- Energy : 651 kcal
- Protein : 28 g
- Calcium : 270 mg
- Iron : 12.06 mg
- Phosphorus : 391 mg
- β-carotene : 3.83 mg (638 µg RE)
- Thiamine : 0.58 mg
- Riboflavin : 0.52 mg
- Niacin : 2.69 mg
- Ascorbic acid : 34 mg

Preparation:

1. Soak mung dhal overnight (6–8 hours) in water.
2. Grind the soaked dhal in electric blender or with pestle and mortar into a fine paste.
3. Clean and chop spinach leaves.
4. Add spinach, salt, red chillies, and garam masala to the dhal paste.
5. Make balls using above mixture and deep fry in oil/ghee.
6. Serve hot with tamarind and mint chutneys.

Serves three
A nutritious snack liked by everyone, but especially by children
Mung Namkeen

Ingredients:

- Mung dhal : 100 g
- Onion : 50 g
- Tomato : 50 g
- Coriander leaves : 10 g (1 tbsp)
- Green chillies : 2 to 3 fruits
- Oil/Ghee : 20 g
- Lemon juice : 15 ml (1 tbsp)
- Salt, to taste

Nutrient composition:

- Energy : 608 kcal
- Protein : 26 g
- Calcium : 193 mg
- Iron : 5.49 mg (bioavailability 10.42%)
- Phosphorus : 374 mg
- β-carotene : 0.77 mg (128 µg RE)
- Thiamine : 0.67 mg
- Riboflavin : 0.31 mg
- Niacin : 2.54 mg
- Ascorbic acid : 37 mg

Preparation:

1. Soak mung dhal overnight (6–8 hours) in water.
2. Drain water and spread dhal on absorbent paper for 30 minutes.
3. Heat the oil/ghee and fry dhal under low heat until crisp. Add salt.
4. Rub dhal on absorbent paper to remove excess oil.
5. Cool and store in an airtight container to maintain crispness.
6. Serve with finely chopped onion, coriander leaves, and diced tomatoes. Sprinkle lemon juice over the mixture and toss well.

Serves three
A wholesome meal for breakfast or a delicious snack with tea
Poha

**Ingredients:**

- Mungbean : 50 g (125 g sprouts)
- Rice flakes : 100 g
- Cabbage : 100 g
- Onion : 50 g
- Potato : 50 g
- Coriander leaves : 10 g (1 tbsp)
- Oil/ghee : 20 g
- Tamarind chutney : 50 g
- Turmeric powder : 1 tsp
- Mustard seeds : 1 tsp
- Salt, to taste
- Red chillies, to taste

**Preparation:**

1. Put rice flakes in a sieve and wash under tap water.
2. Boil potatoes and cut into small pieces.
3. Chop cabbage, onions, and coriander leaves.
4. Fry onion in oil/ghee until golden brown.
5. Add potatoes, cabbage, steamed mung sprouts, chopped coriander leaves, turmeric powder, mustard seeds, red chillies, and salt. Cook for 2–3 minutes.
6. Add tamarind chutney and mix well.

**Nutrient composition:**

- Energy : 859 kcal
- Protein : 23 g
- Calcium : 198 mg
- Iron : 8.08 mg (bioavailability 10.70%)
- Phosphorus : 524 mg
- β-carotene : 0.77 mg (128 µg RE)
- Thiamine : 0.64 mg
- Riboflavin : 0.34 mg
- Niacin : 6.47 mg
- Ascorbic acid : 171 mg

**Serves three**
References


## Appendix I: U.S. Recommendations for Nutrient Intakes

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>Weight (kg)</th>
<th>Height (cm)</th>
<th>Protein (g)</th>
<th>Vit A (RE mg)</th>
<th>Vit E (mg αTE)</th>
<th>Vit K (µg)</th>
<th>Thiamine (mg)</th>
<th>Riboflavin (mg)</th>
<th>Niacin (mg NE)</th>
<th>Folate (µg)</th>
<th>Vitamin B6 (µg)</th>
<th>Folate (µg)</th>
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*RE = µg retinol equivalent; αTE = α-tocopherol; nc = no change*

### Appendix II: Conversion Factors for Measures

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