Value Added Products from Millets

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Major cereals, coarse cereals and millets

Rice

Wheat

Maize

Sorghum

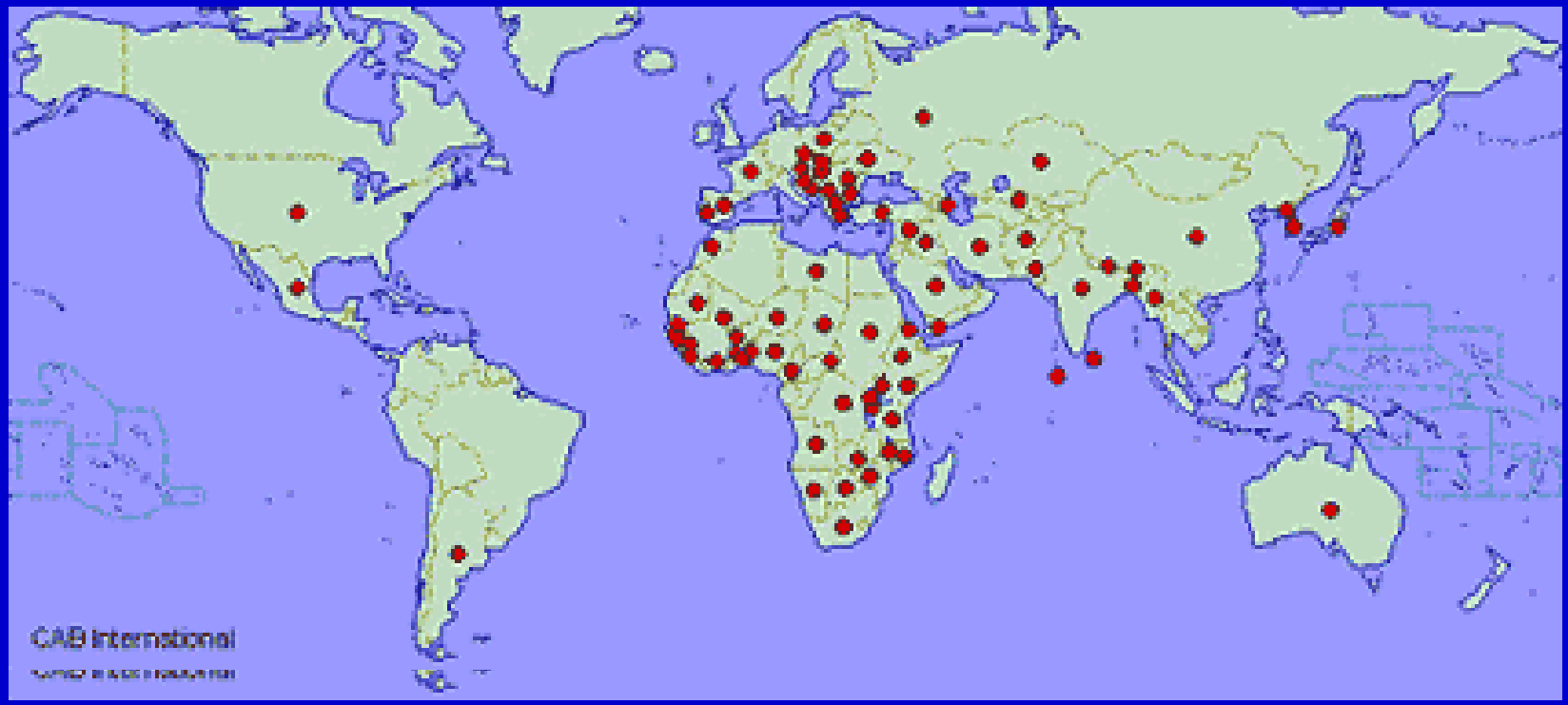
Millets

- Pearl millet
- Small millets
  1. Finger millet
  2. Foxtail millet
  3. Little millet
  4. Proso millet
  5. Barnyard millet
  6. Kodo millet

Pseudo-cereals

1. Grain Amaranthus
2. Buck wheat
3. Quinoa

Fonio, Teff, Job's tears



Millet growing areas in world

India, China, Myanmar, Korea and almost all African countries viz., Ethiopia, Namibia, Tanzania, Uganda, Zimbabwe etc.

35 million tons; 34 million hectares

Nutritional composition of millets compared to major cereals (g/100g)

	Moisture	Protein	Fat	Dietary Fiber	Carbo-hydrates	Minerals	Calcium (mg)	Iron (mg)
Rice	13.7	6.8	0.5	1.5	76.9	0.6	10	0.7
Wheat	12.8	11.8	1.5	12.9	71.2	1.5	41	5.3
Maize	14.9	11.1	3.6	10.5	66.2	1.5	10	2.3
Pearl millet	12.4	11.6	5.0	12.0	67.5	2.3	42	8.0
Finger millet	13.1	7.3	1.3	19.8	66.8	2.7	344	5.0
Foxtail Millet	11.2	12.3	4.3	14.0	60.9	3.3	31	2.8
Little millet	11.5	7.7	4.7	12.2	67.0	1.5	17	9.3
Barnyard millet	11.1	6.2	2.2	13.7	65.5	4.4	20	5.0
Kodo millet	11.4	8.3	1.4	15.0	65.9	2.6	27	0.5

Nutritional significance

Finger millet

1. Good amount of sulphur amino acids like tryptophan, cystine and methionine
2. Richest source of calcium among cereals
3. High amount of dietary fiber
4. Rich in polyphenols – gallic, ferulic p-hydroxy benzoic, procatechuic and p-coumeric acids
5. Good antioxidant activity
6. Hypoglycemic, hypocholesterolemic and anti-ulcerative properties, inhibit aldol reductase activity

Foxtail millet

1. Contains ferulic and p-coumeric acids
2. Good antioxidant potential
3. Contains carotenes and tocopherols
4. Accumulates gama aminobutyric acid on germination, GABA regulates cardiovascular functions

Little millet

1. Good Source of iron
2. Highest soluble p-coumeric acid among the millets
3. Iron chelating activity is high compared to other millets

Proso millet

1. High content of total carotenoids
2. Good source of tocopherols
3. Exhibits antioxidant activity

Kodo millet

1. Comparatively high in lysine, (3.0-3.5g/100g)
2. Contains phenolics, tannins
3. Good antioxidant potential, highest DPPH quenching activity among millets
4. Hypoglycemic nature
5. Reduces cholesterol levels

Barnyard millet

1. Contains antioxidant compounds
2. Contains serotonin derivative---anti-inflammatory activity
3. Flavonoid-luteolin and tricin-cancer preventive

Constraints

- Lack of awareness
- Lack of suitable milling machineries
- Non availability of ready-to-use products on the shelf
- Food habits
- Organoleptic characteristics
- High fat content, mostly in bran and germ
- Low shelf stability of flour /semolina due to high oxidative & hydrolytic rancidity
- Lack of suitable processing technologies

Processing methods

Traditional Methods

1. Dehusking, milling
2. Malting
3. Fermentation
4. Popping

Contemporary methods

1. Refining
2. Husk free malt flour
3. Polishing/decortication
4. Improved popping process
5. Flaking
6. Extrusion cooking
7. Drum drying
8. Baking

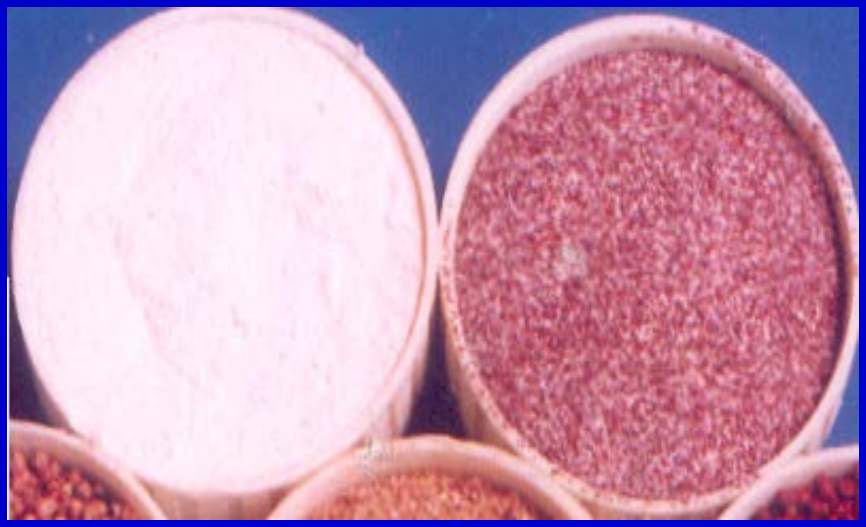
Traditional products

Roti
Stiff porridge
Thin porridge
Cooked grains
Sweet and savory products
Popped products

Newer products

Refined flour
Husk free malt flour
Parboiled grains
Popped products
Expanded products
Extruded products
Drum dried products
Flakes
Health foods and beverages
Bakery products
Semolina and composite flour
Noodles
Papads

Except for finger millet- All the millets need to be dehusked
Dehusked millet can be cooked like rice or can be milled to prepare flour and can be used in various traditional products
Generally these grains are polished to remove the bran portion



Refining

Parboiling

Flakes


Expanded product


Health bars
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Products from foxtail millet


Extruded product


Popped product

NOODLES

- Ragi-wheat blend based noodles marketed, mostly in southern states,
- Good market potential exists, due to the health benefits - high DF, Ca and non-gluten nature and cost benefits,
- Preparation of 100% ragi noodles feasible


Decorticated ragi


Ragi papad


Soup mix from little millet


Muruku from ragi ready mix

Seed coat based biscuits

- 3 times higher calcium and dietary fiber than control sample

- Based on finger millet malt
- Contains about 14% protein compared to 8-9% of the market sample
- Contains about 500 mg/100g of calcium (almost of 1/3rd of the RDA) from the natural source

Malted ragi based beverage

Malted weaning food

- Milk based weaning food
- Cereal based weaning food

The product can be fortified with added vitamins and minerals and flavored with natural fruit and vegetables

Provides adequate nutrition to the child

Malt based infant food

Minimum requirement of Infant food

Protein	1.8-4.5 g
Fat	3.3-6.0 g
Carbohydrates	7-14 g
Calcium	80 mg
Linoleic acid	0.5-1.2 g
Energy	65 k cal/100ml

Enteral food (~18% finger millet)

2.5 kcal/ml

Ready-to-eat snack mix

Millets, grain amaranthus, sorghum, legumes

All the grains popped and powdered

The ready mix could be shaped into burfi or laddu form or could be mixed with milk before consumption

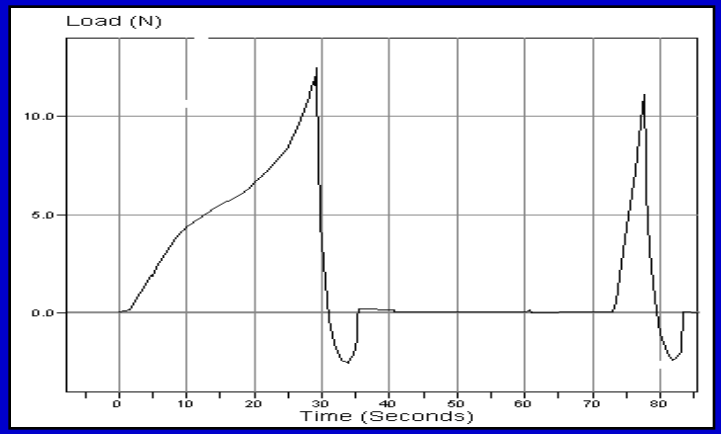
Calcium rich ready-to-use product

As a natural mineral and fiber source in different cuisines;
(in masala mixes, as chat mix, as a spread, in bakery and other food products)

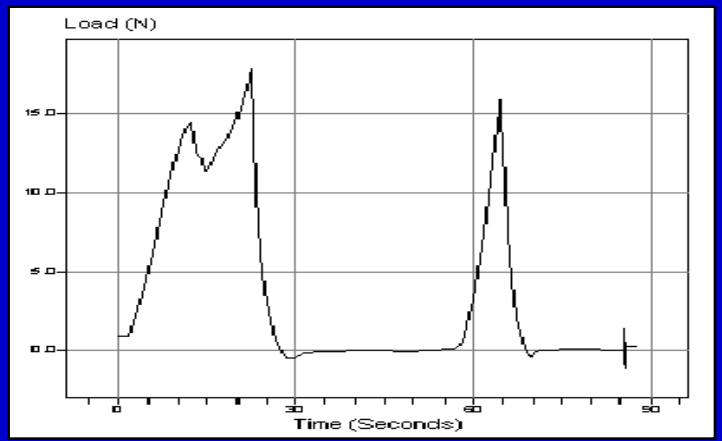
890 mg of calcium

Calcium 70% of RDA

Convenience flour from finger millet



Parameter	convenience flour (B)	traditional method (A)
Colour (ΔE)	69.21	64.1
Firmness (N)	15	12.4
Springiness (mm)	2.8	3.0
Chewiness (Nmm)	5.7	4.3

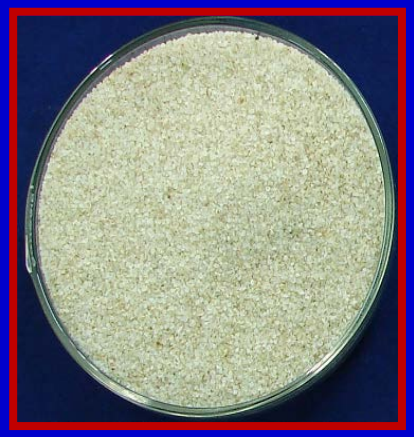


Husk free flour from millets

Multi millet semolina

- ✓ Combination of different millet semolina
- ✓ Combined health benefits
- ✓ Highly nutritious

Foxtail millet coarse & fine semolina



Little millet coarse & fine semolina

Kodo millet coarse & fine semolina

Proso millet coarse & fine semolina

Upma mix

Idli mix

Sweet mix

THANK YOU