

Millet in Daily Life Style

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2017

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Published by

University of Agricultural Sciences, GKVK, Bangalore

Financed by

Karnataka State Department of Agriculture, Karnataka

Designed & Printed by



9901556099

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Gandhi Krishi Vignana Kendra

Bengaluru-560 065



FOREWORD

Karnataka is the largest millet producer in India. Finger millets occupies 70% of the millet production. Versatile Small Millets like foxtail millet, barnyard millet, proso millet and little millet would fit into diverse agro-eco system. The promotion of the millets started as early as 1969 with an inception of All India Coordinated Small Millets implemented projects, subsequently, it became All India Coordinated Research Project on Small Millets in a year 1986 established at UAS, Bangalore. Ever since the research on implement of finger millets given due importance by the University. The contributions of Dr. Ragi Lakshmanaiah in developing the Indaf-Series Ragi varieties made a remarkable contribution in the cultivation and production of ragi (finger millet) in the State of Karnataka and other states too. These Climate Smart Crops and resilient too fit for low rainfall area. Small millet crops are view as important for health and wellness of people and can help in preventing many kinds of diseases related for modern lifestyle including obesity and diabetic mellitus part of the light of food change have begun selling millets and millets based products on their shelves as food. Small millets can be further processed towards various form such as flakes quick food for cereals, ready to eat snacks, supplementary food, extrusion cooking, malt based products, weaning foods more importantly health book.

The importance of regular food use as a nutrient dense millet for achieving a holistic for nutritional security is widely recognized. The abundant nutrient status and their utility in multi facets for the wellness of human being is recognized and value addition is becoming order of the day for effective utilization. The book being brought out by the learned nutritionists of UAS, Bangalore is of timely concern. The book attempted to include recipes of more than 75 products which is a worth documenting and the beneficial to consumers who use the knowledge as and when required. It is interesting to know that most of the recipes are developed

by the UAS, Bangalore in the interest of creating market value for the millets through value addition process. Of the millets, the finger millets products are in the large numbers however other millets are also been given an importance for value addition equally. An attempt of this kind hopefully on reaching the consumer end will create demand for millets and as such the growers would get reasonably better prices for their produce.

The content of the book is presented in order, easy to understand and photographs are illustrated appropriately. It is hoped that the book will be used to the students of nutrition, consumers and general public.

I am happy to note that the Karnataka State Department of Agriculture has come forward to extend the financial support to publish this useful document for the cause of promotion of literature agriculture science and food security. I appreciate their concern. I congratulate the authors and wish them all the best.

11th April, 2017
Bengaluru



(H. Shivanna)
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FOREWORD

Millets are the oldest human food and were the first domesticated food grains. Though its use has diminished, it ranks as the sixth most important food grain in the world; sustaining more than 1/3 of the world's poor population. Since 1970 they have been gaining popularity in developed countries as a nutritious, gluten free, non-acid forming, least allergenic and most digestible with slow and sustained glucose release. This has attracted the developed countries with increasing incidence of diabetes, obesity, cardiovascular disease, etc. In addition, they are rich in iron, magnesium, phosphorus and potassium. Traditionally they were used for processing into gruel, dumpling, roti etc.

Modern life with an increasingly sophisticated communication indirectly also influence one's diet. Generally, fast food tastes delicious, but contains a lot of saturated fat, and low in fiber because very few vegetables and fresh fruits. The market for semi-processed/cooked and ready to eat foods is rising rapidly with a growth rate of 20% with rapid urbanization.

The challenge is to identify hypoglycemic, non-cholesterogenic staples of the region, which are also farmer friendly, climate resistant and promote their use in demand driven life style. At this juncture, the millets of course the age-old cereal crops standup first on the list being naturally nutraceutical.

With diversity in life style and food presentation calls for products with elite touch, bio-friendly, packable, extended shelf life and advanced technology that is globally attractive.

The market for semi-processed/cooked and ready to eat foods is rising rapidly with a growth rate of 20%. The market for Pasta, Noodles, Khakharas, Kurkure, Sweets and Peda, Spicy snack mixture etc. growing at an average annual rate of 9.2% in India. With the changing life styles of

the Indian the demand for semi-processed cooked/ready to eat food will go up steadily, increasing. Indian food industry is migrating with "Made in India" tag is becoming fast moving consumer goods finding prime rate in the retail chains.

Millet is a delicious grain whose consistency varies depending upon cooking method; it can be creamy like mashed potatoes or fluffy like rice. Additionally, since millet does not contain gluten, it is a wonderful grain alternative for people who are gluten sensitive. When such nutria rich minor grains form the major share (Greater than 70%), the meal would be not only delicious but also healthy.

An attempt to achieve them through specially designed products developed for promoting the consumption of millets through daily food is the need of the hour to fight against various metabolic disorders and ensure food security. This book on "Millet in Daily Life Style" Wish to fulfill the mode of utilizing the "Healthy Nutri-Cereals" to suite different life style.

The minor millets include 6 main grain crops which are finger millet (rati in Tamil vernacular or Eleusinecoracana), kodo millet (varagu or Paspalumscrobiculatum), little millet (smaai or panicumsumatrense), foxtail millet (tenai or setaria italic), proso millet (panivaragu or Panicummiliaceum) and barnyard millet (kudiraivali or Echinochloafrumentacea).

April 2017
Bengaluru

Sd/-
N. R. Gangadharappa
Director of Research

**"SIRI DHANYA MILLETS & RAGI with Glazy Health Gift of
NUTRACEUTICALS by Nature to HUMAN KIND – Conserve, Process
& Consume in MULTY LIFE STYLE for your HEALTH"**



ACKNOWLEDGMENTS

This Book on "Millet in Daily Life Style" is the outcome of research carried out by scientists with an intention to bring back the traditional crops. By doing so, the intention is to gradually guard against the wide spreading metabolic disorders due to change in "Life style" thereby "Food Eating Style" affecting health of the consumers from Birth to Geriatric.

Authors are grateful to The Directorates of Research, Extension, Education, of University of Agriculture Sciences, Bengaluru for all the encouragement extended from "Seeds to Product Development, Standardization, and Technology Transfer" to the Interested Tribal NGO's, Millet Farmers and entrepreneurs. Acknowledgment is also to the ICAR support extended through projects namely INSIMP and COEM. We also acknowledge the enthusiastic FSN students who joined hands in processing & testing for acceptability of the products.

The team is grateful to the Hon. Vice Chancellor Dr. H. Shivanna. University of Agriculture Sciences. GKVK. Bengaluru for the creative enthusiasm initiated & support extended for bringing out this book on varied form of utilizing millets at domestic & Industrial level, aimed at promoting "Millets & thereby Community Health"

It is our responsibility to extend our gratitude to KSDA, GOK for the Motivation given to bring the "Millet in Daily Life Style" in the form of a Book let, especially to serve as the source of information for the benefit of public.

April 2017
Bengaluru

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Millet in Daily Life Style

INTRODUCTION



1

Millet is a term used for a wide range of cereals that describes seeds from taxonomically divergent species of grass. They are grown in marginal agricultural areas where the major cereals fail to produce substantial yields.

Millets are the first cultivated crop and staple food in Central Asia, Eastern Asia, Europe, China, India and some parts of Africa since ancient days. The exact origin of millet is not known. Research reveals that millet was most likely cultivated simultaneously in Asia and Africa over 7000 years ago. It has been a staple in India and Africa for thousands of years.

In the Old Testament, millet was used as a grain for making bread. Chinese archeologists found a 4000-year-old bowl containing long noodles made from millet. The earliest written record of millet, “Fan Shen Chih Shu” 2800 BC, gives detailed instructions for growing and storing the grain. There is even evidence that millet was eaten and grown in the Stone Age in Switzerland.

Millets are world’s sixth most important cereal. Millets are grown extensively in India. There are wide ranges of millets & major types are pearl millet (*Pennisetum Glaucum*), Proso or White millet (*Panicummitiaceum*) and finger millet (*Eleusinecoracana*), Foxtail millet (*Setaria italic*). Others are Barnyard millet (*Echinochlore spp.*), Kodo millet (*Paspolum Scrobiculatum*), Guinea millet (*Brochiaradeflexa*) and Brown top millet (*Urochloa Romosa*).

In India, millet utilization is limited for domestic use as dumpling and roti. Ragi is the only millet used as malted, popped flour, beverage, sweets and in selected baked products. In some of the western countries

selected fermented products, namely gruel, paste, spreads and drinks are made from millets using specific fermentable microorganisms.

World Health Organization predicts that developing countries will bear the brunt of the epidemic of Non-communicable Disorders (NCD) in the 21st century. Nearly 70% of the current cases of diabetes occur in low- and middle income countries. With an estimated 50.8 million people living with diabetes, India has the world's largest diabetes population, followed by China with 43.2 million. The largest age group currently affected by diabetes is between 40-59 years. By 2030 this “record” is expected to move to the 60-79 age group with some 196 million cases. The World Health Organization (WHO) predicted net losses in national income from diabetes and cardiovascular disease is 336.6 billion in India, between 2005 and 2015.

Modern life with an increasingly sophisticated communication indirectly also influence one's diet. Generally, fast food tastes delicious, but contains a lot of saturated fat, and low in fiber because very few vegetables and fresh fruits. The market for semi-processed/cooked and ready to eat foods is rising rapidly with a growth rate of 20% with rapid urbanization.

The challenge is to identify hypoglycemic, non-cholesterogenic staples of the region, which are also farmer friendly, climate resistant and promote their use in demand driven life style. At this juncture, the millets of course the age-old cereal crops standup first on the list being naturally nutraceutical. Millets naturally being rich in beneficial carbohydrate with specific profile, minerals and healthy lipid profiles have great potential as base material for future life style Ready to eat foods – “FIT for All”.

Scientific studies have revealed that grain millet fibers exhibit three categories of dietary fibers. They are Insoluble fibers, soluble fibers and resistant starch.

Insoluble fibers: Are non-digestible and therefore don't raise blood glucose. They grab onto liquid as they travel down the gastrointestinal tract, which in turn pushes food through the gastrointestinal tract. Hence, their role in producing bulkier and softer bowel movements, and preventing colon and rectal cancer is established.

Soluble fibers: Are fermented by bacteria in the large intestine and produce a small amount of glucose. The way that soluble fibers can lower blood glucose and cholesterol (minimally) is by binding on to them during digestion and increasing the amount excreted.

Resistant Starch: Resist digestion until they reach the large intestine. In the large intestine, resistant starches initiate bacteria to produce fatty acids. The fatty acids provide several health benefits, one of which is lowering glucose after eating. Foods that contain large amounts of resistant starch are legumes-cooked and cooked potatoes, pasta, rice, oats and minor millets.

The prominent Health benefits as documented under various studies at Himalayan foot hill tribe's dependent on these climate resistant minor millets are: Millets are alkaline & digest gradually. Millet hydrates colon & prevents constipation. The lignans present in millets in the presence of intestinal friendly microflora act as prebiotic feeding microflora in inner large intestine, there by prevent entry of unwanted microbes & there by prevent hormone dependent cancers.

Serotonin promoting nature of millet starch keeps mind & mood calm, relieve stress. Millets said to have smart carbohydrates with distinct fibers, has low glycemic index, maintains low glycemic load & there by Low blood sugar when consumed as daily food.

Magnesium in millet help reduce the effect of migraines & niacin (Vitamin-B3) help in reducing triglycerides, bad cholesterol & there by prevent CVD & ageing. Millets also exhibit antioxidant activity as documented in various scientific studies. It is a blessing grain for those allergic to gluten as they are gluten free.

Millets with all the above properties exhibit remedial solution against problems of stress and restore feeling of well being, peace and relaxation due to their role in steady release of 'serotonin' a neurotransmitter. Today time has achieved to name millets as "Miracle Grains or Wonder Grains" which has evidential proof of ancestral longevity in Healthy Life as early as in 7000 B.C.

Generally, husk, which is non-edible, amounts to 15-20% of the kernel, whereas bran, which is edible & usually glossy in appearance, is about 5% of the millets. They are good sources of Phosphorous & iron also. The millets protein though ranges between 7 to 12 % has well

balanced amino acid profile & good source of methionine, cysteine & lysine. The fat content 1-5% & richer in omega fatty acids essential for healthy heart maintenance. Overall Millets contribute towards a balanced daily diet/meal by ensuring not only by quantity but also by nutritionally quality meal.

MILLET PROCESS BEHAVIOR



2

Millets can blend well with common staples without any pronounced off flavors. They have potential to occupy as staples in life style suitable RTE foods, RTU foods, mixes, etc, and there by render the lifestyle junk products ‘non-junk’ foods. Millets combined with regional legumes, oilseeds sprouted over 24 hours with 1.0 cm sprout length could be even served as millets salad, Millet-sprout-knitted could be sliced & processed as popular kababs there by make non junk foods.

There is wide scope for processing millets (all ranges) into breakfast flakes, pellets, RTE foods, staple convenience foods, nutritional convenience foods, snacks and accessories, bio-tools on dining table (edible spoons/plate/ straw/strips). Introducing Indian Agri-Foods in global lifestyles fit for all age aspiration was the objective in developing selected millet products, which in turn extend sustainable price for both farmer & producers. These products were developed using millets as the major grains, added on with pulses, soya, peanut, grain amaranth, fenugreek seed etc.

Urbanization, changed lifestyle, race, age specific Nutritional status, attested immunity, socioeconomic status, sedentary living, changing food patterns are contributing to increased risk of ‘Non-communicable Disorders’ namely Diabetes, Obesity, CVD, Overweight, stress and hypertension etc. These are the chief reasons as per the WHO, likely to raise the diabetic population size by 2025. Therefore, the challenge is to identify hypoglycemic, non-cholesterogenic staples of the region and promote their use and thereby this cultivation. Now, the millets of course the age-old cereal crops standup first on the list being naturally nutraceutical. Millets with all the above properties exhibit remedial

solution against problems of stress and restore feeling of well-being, peace and relaxation due to their role in steady release of ‘serotonin’ a neurotransmitter. The lifestyle products for all ages from millets also contribute phytochemicals, phytoestrogens, antioxidants, etc., which can combat NCD’s like diabetes, CVD, osteoporosis, overweight, obesity, mental stress, etc.

Millet is a delicious grain whose consistency varies depending upon cooking method; it can be creamy like mashed potatoes or fluffy like rice. Additionally, since millet does not contain gluten, it is a wonderful grain alternative for people who are gluten-sensitive. When such nutria rich minor grains form the major share (Greater than 70%) of a pasta the meal would be not only delicious but also healthy.

Millet is one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purposes. India is the largest producer of many kinds of millets called coarse cereals. India accounts for 40% of global millet production, the total production as per a 2005 statistics is 98,10,000 MT per annum. Rajasthan, Uttar Pradesh, Gujarat, Maharashtra, Tamil Nadu and Haryana are the major States contribute the production. Based on a five-year average (1999 - 2003), India ranks 1st and 11th place in top global consumption and per-capita consumption of millets respectively.

Millets of India

1. **Pearl millet** (*Pennisetum glaucum*)
(Hindi: Bajra, Tamil: Kambu,
Telugu: Gantilu, Kannada: Sajje)



2. **Foxtail millet** (*Setaria italica*) (Hindi: Kangni; Tamil: Tenai; Telugu: Korra; Kannada: Navane; Malayalam: Thina)



<p>3. Proso millet, (<i>Panicummiliaceum</i>) (Hindi: Barri; Tamil: Panivaragu; Telugu: Varigulu; Kannada: Baragu)</p>	
<p>4. Finger millet (<i>Eleusinecoracana</i>) (Hindi: Mandua; Tamil: Kelvargu; Telugu: Ragulu; Kannada: Ragi; Malayalam: Koovarugu)</p>	
<p>5. Indian barnyard millet (<i>Echinochloafrumentacea</i>) (Hindi: Jhangora; Tamil: Kuthiravaali; Telugu: Odalu) Sawa millet</p>	
<p>6. Kodo millet (<i>Paspalumscrobiculatum</i>) (Hindi: Kodra; Tamil: Varagu; Telugu: Arikelu; Kannada: Harka)</p>	
<p>7. Little millet (<i>Panicumsumatrense</i>) (Hindi: Kutki; Tamil: Samai; Telugu: Sama; Kannada: Same; Malayalam: Chama)</p>	
<p>8. Sorghum (Hindi: Jowar; Tamil: Cholam; Telugu: Jonna; Kannada: Jola; Malayalam: Cholum)</p>	

Whole Grain Millets



Grain Millets Rice



MILLETS POWER OF HEALTH



3

Indian scenario on health status in particular the non-communicable disorders like CVD which was 9 million in year 2000 is likely to rise to 18 by 2026; Hypertension was 118m in 2000 is likely to rise to 214m ; and Largest number of people with diabetes mellitus that is 57m in 2025 (ICMR2007). At this juncture, it is essential to bring in protective daily food with safe.

Milletts are good source of some very important nutrients, including manganese, phosphorus, and magnesium. Heart-Protective Properties. The phosphorus provided by millet plays a role in the structure of every cell in the body. In addition to its role in forming the mineral matrix of bone, phosphorus is an essential component of numerous other life-critical compounds including *adenosine triphosphate* or ATP, the molecule that is the energy currency of the body. Phosphorus is an important component of nucleic acids, the building blocks of the genetic code. In addition, the metabolism of lipids (fats) relies on phosphorus, and phosphorus is an essential component of lipid-containing structures such as cell membranes and nervous system structures. Millet and other whole grains are a rich source of magnesium, a mineral that acts as a co-factor for more than 300 enzymes, including enzymes involved in the body's use of glucose and insulin secretion.

Milletts can render solution to combat Alzheimer & Dementia. They form part of a healthy diet seems to play a role along with vegetables, fish, nuts and olive oil seems to be protective. They play a role in lowering the sugar, saturated fats & can reduce the risk of developing AD, as well as having many other health benefits.

With this it is clear that millets are minor in physical size but are very large in “NUTRITION” supply and can enter into daily health food sector in combination with local pulses, oilseeds, suitable for all age groups namely school meal, adolescent snacks, youth food styles, adult daily meals, supplementary foods/beverages, restaurant services, RTE-sector, domestic & global market.

Specialty of Millets in context to Health

- Millets are alkaline and digests smoothly & slowly.
- Millets will hydrate food & colon, prevent constipation.
- Millets act as a prebiotic feeding microflora in your inner ecosystem.
- The serotonin production capacity of millet is calming to moods, it acts as stress reliever.
- Millets constitute fiber and low simple sugars. Because of this, it has relatively low glycemic index and has been shown to produce lower blood sugar levels than wheat or rice.
- Magnesium in millet can help reduce the effects of migraines and heart attacks.
- Niacin (vitamin B3) in millet help lower cholesterol.
- Millet consumption decreases triglycerides and C-reactive protein there by useful in preventing cardiovascular disease.
- Millets have high antioxidant activity
- Millet is gluten-free and non-allergenic. A great grain for sensitive individuals.

Millets can blend well with common staples without any pronounced off flavors. They have potential to occupy as staples in life style suitable RTE foods, RTU foods, mixes, etc, and there by render the lifestyle junk products on ‘non-junk’ foods. There is wide scope for processing millets (all ranges) into breakfast flakes, pellets, RTE foods, staple convenience foods, nutritional convenience foods, snacks and accessories, bio-tools on dining table (edible spoons/plate/straw/strips). Keeping the above

as criteria various products were developed using millets as the major grains, added on with pulses, soya, peanut, grain amaranth, fenugreek seed, Green leafy powders, etc.

Benefits of Millets over Quinoa & Oats

The Nutri millets are rich in all most all nutrients on par with quinoa & oats. Advantages are millets can be milled into whole grain flour and can be used in various forms which can not be done with quinoa & Oats. They can be sprouted & malted, converted into supplementary beverages without affecting the pH of the drink. Most of the popular millets are free from negative effects of fiber. Infact they are easy to process into whole grain flour even at domestic level & adoptable at small scale industries. When pearled & used as rice, they are more feasible, soft, blend with spice & flavours easily. Above all nutri millets are grown in many parts of India for human consumption & are easily accessible. They are adoptable as alternative to any other staple cereal for all age group. Cost of production & market prices are affordable.

Where as Quinoa & Oats are not extensively cultivated, they are cultivated mainly for animal feed. Cost of grains are higher. Often they need to be de-branned to prevent side effects as the bran contains chemical compounds called saponins, which have a bitter taste and serve as a natural pesticide. Ingesting saponins creates tiny holes in small intestine, prevent body from properly absorbing all the nutrients, and allow food particles to enter bloodstream. This is the basis of Leaky Gut Syndrome, which is linked to myriad autoimmune disorders. Lectins- proteins of proteins found in quinoa and, like saponins, are basically built in pesticides purported to cause gastrointestinal distress. Lectins bind with the lining of the small intestine and damage it by creating tiny holes that allow lectins and other food particles and toxins to get into the bloodstream. This means that lectins can bind with other parts of the body, including organs, which the immune system may misidentify as foreign invader and launch an attack. lectins have been linked to such disorders as IBS, Crohn's, Thyroiditis, Multiple Sclerosis, and Colitis. Too much of quinoa & oat meal intake may lead to Intestinal blockage – eating too much oatmeal that is undercooked or raw may create an intestinal blockage and severe constipation.

Nutrients Composition

Grains	Protein (Gms.)	Total EAA	Fibre (Gms.)	Iron (Mg.)	Calcium (Mg.)	Thiamine (Mg.)	Ribo- flavin	Niacin	Folate	Mag- nesium	Zinc	Pota- ssium	Allergy / Negative reactions
Milletts (In General)	10.6	1.205	17.0	6.0	11.0-23.0	0.84	0.58	9.4	170	228	3.4	17.4	None
Quinoa	22.3	1.259	10.0	15.7	102	0.34	0.67	5.0	83	357	5.6	10.0	Saponins & Lectins
Oats	7.5	1.704	5.9	7.4	32.0	1.19	0.22	1.5	87	276	6.2	19.6	Insoluble fibers

QUALITY STANDARDS APPLICABLE TO MILLET FLOUR



4

ARS 469 (2012) (English): Millet flour

The millet from which the flour is obtained shall be suitably decorticated and of sound quality, free from sand, have characteristic odour and flavour complying with ARS 463 and WD-ARS 857:2012.

Millet flour shall be safe and suitable for human consumption. Millet flour shall be free from abnormal flavours, odours, and living insects.

Millet flour shall be free from filth (impurities of animal origins, including dead insects) in amounts which may represent a hazard to human health.

Using a standard sieve complying with ISO 3310-1, not less than 100 per cent of the product shall pass through a sieve the dimension of the mesh of which is: diameter of 500µm for 'fine' flour and diameter of 630µm for 'medium' flour.

The most prominent millet of Karnataka, India & that, which has recently reached global market, is RAGI the staple of Karnataka has also been rendered special attention to MAKE IT FIT INTO LIFE STYLE of all age group & society with varied national & international representatives in Karnataka.

Ragi is a major millet of India. Indian and “World Wide Health Conscious Consumers” are eager to use it irrespective of color. As already being aware that the color is the specialty of the staple food grain that extends benefits, that prevent, combat & help manage the three major health problems of the world i.e; Diabetes, CVD & tumors.

The millet flour shall comply with the following requirements

Parameter	Pearl Millet	Finger/ proso millet	Test method
Moisture content, % max, m/m	14.0	14.0	ISO 711/ISO 712
Total ash content, % max.	1.2	4.2	ISO 2171
Acid insoluble ash, % max.	0.40	0.40	ISO 5985
Protein content, % min. (N x 5.7)	8.0	6.8	ISO 1871
Crude fat, % max	5.0	2	ISO 11085, ISO 5986
Fibre content, % max.	1.8	3.0	ISO 5498
Calcium % as CaO, min.	0.02	0.10	ISO 6490-1
Tannin content, % m/m max.	0.3		ISO 9648
Total Aflatoxin (AFB ₁ +AFB ₂ +AFG ₁ +AFG ₂), ppb max	10		ISO 16050
Aflatoxin B ₁ only, ppb max	5		
Fumonisin, ppm max	2		

Microbial limits should be as Follows

Sl. No.	Micro-organism(s)	Requirements	Method of test
1	Total plate count, cfu/g	10 ⁵	ISO 4833
2	<i>Staphylococcus aureus</i> cfu/g max	absent	ISO 6888
3	<i>Escherichia coli</i> , cfu/g, max.	absent	ISO 7251
4	<i>Salmonella</i> , per 25g, max.	absent	ISO 6579
5	<i>Coliforms</i> g (per 100 g)	absent	ISO 4832
6	<i>Bacillus cereus</i> , per 25g, max.	absent	ISO 7932
7	Yeasts and moulds, cfu/g, max.	10 ⁴	ISO 21527-2
8	<i>Vibrio cholerae</i>	absent	ISO/TS 21872

Finger millet contains about 5–8% protein, 1–2% fat, 65–75% carbohydrates, 15–20% dietary fiber and 2.5–3.5% minerals. It has the highest calcium content i.e., 344 mg/100g among all cereals. Ragi also has some good number of Essential Amino Acids (EAA) namely Valine, Methionine, Isoleucine, Threonine and Tryptophan that are essential for human body. Valine is essential for repair of tissues, muscle coordination and metabolism; Isoleucine is for ensuring blood formation, keeping a check on blood sugar levels; threonine helps maintain protein levels in the body; tryptophan act as natural relaxant and help fight anxiety, depression and insomnia; methionine help promote growth of healthy skin and hair.

Nutritionally is well recognized because of its high content of calcium (0.38% or 344mg per 100gm), dietary fiber (18%) and phenolic compounds (0.3–3%) which are in turn endorsed by human research & recognized for their health beneficial effects, such as anti-diabetic, anti-tumorigenic, effects, antioxidant and antimicrobial properties.

It was for the dark glazy seed coat, it was looked down by the developed and rich countries. But for this, there are no studies that declare ‘Ragi to have any negative impact on human beings’ because of its seed coat. Instead, in India it has been endorsed as “Ragi Undava Rogi Alla” attributing to all metabolic benefits contributed by the grain when consumed along with seed coat since ages. This justify that seed coat is safe, contributes to nutritional benefits of rendering slow digestion with sustained energy release.

Ragi - Polyphenols are “life span essentials” due to their role in maintaining body functions and health throughout the adult and later phases of life have attracted adoption of ragi as life style products both at domestic & global level.

Nearly 60% of the polyphenols of the millet are concentrated in the seed coat tissue which accounts for about 12% of the seed mass.

Processing technologies such as decortication, soaking, germination, and fermentation, puffing and cooking of the millet are known to reduce the levels of tannins and phenols and thereby increase the bioavailability of proteins, starch and minerals. Decortication of the millet reduces the total polyphenol content of millet by 74.7%.

A comparison of nutritional components of millets and “big” cereals (per 100g)

Grain type		Protein(g) (Nx6.25)	Fat (g)	Ash (g)	Crude fibre (g)	Carbs (g)	Energy (keal)
Small millets	Common millet (Proso)	12.5	3.5	3.1	5.2	63.8	364
	Foxtail millet	11.2	4	3.3	6.7	63.2	351
	Barnyard millet	11	3.9	4.5	13.6	55	300
	Kodo millet	9.8	3.6	3.3	5.2	66.6	353
	Little millet	9.7	5.2	5.4	7.6	60.9	329
	Finger millet	7.7	1.5	2.6	3.6	72.6	336
Large millets	Pearl millet	11.8	4.8	2.2	2.3	67	363
	Sorghum	10.4	3.1	1.6	2	70.7	329
Com- parable grains	Wheat	11.6	2	1.6	2	71	348
	Maize	9.2	4.6	1.2	2.8	73	358
	Rice (brown)	7.9	2.7	1.3	1	76	362

Source: FAO 1995; HULSE. Laing & Pearson.1980; U. S. National Research Council; NAS.1982; USDA/HNIS 1984.

The major Ragi producing states are Karnataka, Orissa, Uttar Pradesh and Tamil Nadu in India. The total area under Ragi cultivation was around 16.41 lakh hectares in India in 1999–2000 and its production was around 24.8 lakh tones in 2001–02, which accounts for 1% of total food grain production in India.

A comparison of nutritional components of millets and “big” cereals (per 100g)

Grain type		Ca (mg)	Fe (mg)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)
Small millets	Common millet (PROSO)	8	2.9	0.41	0.28	4.5
	Foxtail millet	31	2.8	0.59	0.11	3.2
	Barnyard millet	22	18.6	0.33	0.1	4.2
	Kodo millet	35	107	0.15	0.09	2
	Little millet	17	9.3	0.3	0.09	3.2
	Finger millet	350	3.9	0.42	0.19	1.1
Large millets	Pearl millet	42	11	0.38	0.21	2.8
	Sorghum	25	5.4	0.38	0.15	4.3
Comparable grains	Wheat	30	3.5	0.41	0.1	5.1
	Maize	26	2.7	0.38	0.2	3.6
	Rice (brown)	33	1.8	0.41	0.04	4.3

Source: FAO 1995; Hulse, Laing and Pearson, 1980; U.S. National Research Council/NAS, 1982; USDA/HNIS 1984

Several varieties of Ragi have been released by Karnataka Agriculture University. Government of Karnataka also provides subsidy on hybrid and other improved seeds. These have helped in improving the productivity of Ragi In Karnataka.

The Ragi yield ranges from 3 to 12 quintals for transplanting and 3 to 8 quintals for broadcasting. The average cost of cultivation of Ragi through transplanting in one acre is around Rs. 700 to Rs. 800 and Rs. 1400 to Rs. 1500, if opportunity cost of family labour is considered.

However, the benefit from Ragi crop is around Rs. 900 to 1300 from one acre.

The major importers of Ragi along with other millets are developed countries – European countries, Japan, Switzerland and Canada. The primary use of imported Ragi is in preparing Ragi based products, mainly malts – either Mixed malts, blended with other commodities or Ragi malt. International trade in millet is controlled by a few specialized trading companies

Global approach with improved nutritional awareness is a challenge to the food industries to develop new “Whole RAGI” food products with special health enhancing characteristics. The dietary fiber and polyphenols in finger millet are known to offer several health benefits such as ant diabetic, antioxidant, hypocholesterolemic, antimicrobial effects and protection from diet related chronic diseases to its regular consumers.

Any attempt to extend high-tech touch to ragi to fit into life style products like soup, baked products, extruded RTC/RTE, flaking, pasta, breakfast cereal, etc., therefore will be ideal and healthy only when the ragi grain wholesomeness is maintained. Same is brought to the awareness of the consumers through right labeling. This new era generation is “Health Conscious” and is ready to accept the “Glazy dark natural colour of ragi” rendered by the nature as a “Health Gift Polyphenol” than grain polished and refined flour from ragi.

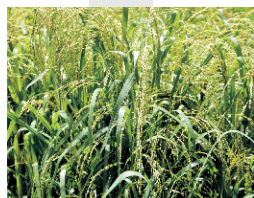
The present urge is also consciously for whole grain consumption. Cereal and millet fibers exhibit remedial property against stress & restore feeling of well being, peace & relaxation due to their role in steady release of Serotonin a neuro- transmitter in addition to phytochemicals, phytoestrogens, trace minerals and antioxidants. Baking process promote partial gelatinization & formation of resistant starch & increase sustained carbohydrate digestion.

Ragi based products

Karnataka, which accounts for 64 per cent of the total production of *ragi* in India, is the centre of the grain's autobiography. For centuries, *ragi* was synonymous with health for people in the southern parts of the state, especially the rural *kannadiga* communities. They cherished *ragirotis* and *muddes* (*ragi* balls that are meant to be gobbled without chewing).

BENGALURU the capital of Karnataka having been declared as “WORLD’s NUMBER ONE RANK CITY” based on the speed of technology growth & Commercial advancement; it is apt for moving forward these Healthy grains in Healthy life style fit for all.

MILLET AND RAGI PRODUCTS



5

Sl. No.	Name
Millets Products	
1	Millet Soup mix (All 6 millets) individually
2	RTE pasta/Noodles (Millets)
3	Millets Vermicelli
4	Ragi Pasta Chewda
5	Ragi pumpkin Khakhra
6	Foxtail millet Khakhra
7	Millet Bio-spoon
8	Edible Millet straw
9	Fox millet stuffed holige
10	Foxtail millet sweet RTE sticks
11	Foxtail millet peda
12	Pearl millet (Bajra) spicy Kadubu
13	Pearl millet sweet steamed kadubu
14	Sorghum Khakhra
15	Little millet steamed marbles
16	Ready to eat Nutri noodles
17	Multi Millet Paddu
18	Samai-methi pancake
19	Millet peda

Sl. No.	Name
20	Varagu/Kodo Millet pulav
21	Instant proso millet dosa mix
22	Instant little millet dosa mix
23	Instant kodo millet dosa mix
24	Instant foxtail millet dosa mix
25	Instant foxtail millet dosa mix
26	Instant multy millet dosa mix
27	Millet navane/sajje bisibele bath
28	Millet pongal
29	Millet paddu
30	Millet masala rotti
31	Millet Talipattu
32	Navane green dosa
33	Millet fried rice
34	Foxtail millet porridge (Navane)
35	Navane Burfi
36	Navane Kabab
37	Millet navane upma
38	Millet rusk
39	Millet Soup Sticks
40	Millet pizza
41	Millet coconut Cookies
42	Millet melting moments
43	Millet nutrings
44	Millet masala biscuits
45	Millet nippattu
46	Millet masala doughnut
47	Millet tawa bread

Sl. No.	Name
48	Millet Chacolate brownies
49	Millet sunshine cake
50	Millet masala cake
51	Millet Fruit cake
Ragi Products	
52	Ragi Malt Mix
53	Ragi Composite flour
54	Ragi popped Energy mix
55	Ragi Vermecilli
56	Millet Chutney powder
57	Ragi bran chutney powder
58	Ragi/Millet's Nuggets
59	Ragi Adai
60	Ragi Noodles
61	Ragi papad
62	Ragi Thatte Idli
63	Ragi Dose
64	Ragi Dhokla
65	Ragi Nuchinunde (Ragi Soji Product)
66	Ragi Sweet Kadubu (Steamed)
67	Ragi Halwa
68	Ragi peda
69	Ragi Mysorepaak
70	Ragi Chewda
71	Ragi Khara Mixture
Green Ragi (Milky stage pods)	
72	Green ragi usali
73	Green ragi soup
74	Green ragi porridge
75	Green ragi dosa

RECIPES



6

1. Millet Soup Mix (all Millets in the same style)

Ingredients	Quantity in grams
Sprouted Millet flour	60
Wheat flour refined	40
Dehydrated Greenchilli slice	3
Carrot gratings	6
Tomato powder	8
Mint leaves dry	3
Curry leaves dry	3
Sugar powder	15
Salt	5
Pepper powder	3



Method of Preparation

- Sprout millets after treating with calcium (sunna) and pinch of turmeric to protect against fungus.
- Dry the sprouted grains and powder into fine floured.
- Blend it with other ingredients as mentioned.
- Store in clean containers/packaging.
- Prepare soup by boiling 120 ml of water, add 20 g of soup mix gradually, stirring continuously until it becomes viscous. Remove from fire and serve hot. One serving of 120 ml soup provides 1.5 g protein, 1.3 g of fiber, 10.5 mg calcium, 0.9 mg Iron and other nutrients. Evaluation of soup by expert panel of judges revealed that taste and overall acceptability scored excellent that is 9.0 on nine point hedonic scale. Though soup carried the separate color of millets, the appearance, scored well due to added vegetables. Mix could be stored in food grade poly covers sealed for one month and was equally acceptable as per sensory scores (8.5 to 9.00) on 9 point hedonic scale.

2. Ready to Eat Pasta (Millets)

Ingredients	Quantity in grams
Millet flour	100
Wheat flour	35
Egg white or SMP	30
Cashew nut	25
Sugar	60
Fat	30
Water to make the dough	



Method of Preparation

- Mix millet and wheat flour. Rub in fat. Add sugar powder, Blend in cashew nut powder. Blend in egg white after beating. Use water if needed and knead into a smooth dough.
- Press out (extrude) the pasta into desired designs and dry at 150°C for 10-12 minutes. Cool and store in containers.
- When required, place pasta in a bowl and add simmering water to cover the pasta. Leave it covered for 2-3 minutes, pasta is ready to eat. Spices can be varied as per interest.

3. Vermicelli

Follow the same formula as per pasta. Press out as Vermicelli, dry in drier at 80-120° F or sun/air only.

When required, boil it in water, drain off water, season before eating.



4. Ragi Pasta Chewda

Ingredients	Quantity in grams
Ragi flour	60
Wheat flour	20
Soybean flour	10
Peanut flour	5
Urad flour	5
Salt	For taste
Water to make the dough	



Method of Preparation

- Blend all the dry ingredients. Using water partially cook the flour. Knead the partially gelatinized dough with additional water into a soft dough. Extrude the dough into thick pasta/vermicelli. Dry it in sun/air/in oven at 80-100°F, heat and store in dry containers.

- Take dry pasta or vermicelli, soak in simmering water for 2 minutes, remove and season with onion, chilli, coriander and curry leaves, add lemon and grated coconut, eat fresh as such

Or

- Toast the oven dried pasta/vermicelli. Season with oil, peanut, chilli powder, salt, sugar, grated copra. Allow it in the hot pan for some time or place it in micro oven for 2-3 minutes. Eat as chewda.

Note

- Cashew nut/Raisin also could be used in place of peanut.
- If required add simmering water until it is covered for 2-3 minutes, hot RTE noodles is ready.

5. Ragi Pumpkin Khakhra

Khakhra is one of the popular vegetarian roasted thin cracker brand or snack from the Gujarathi cuisine served during breakfast or snack time. It is tailor made according to taste of the customer. However, its exploration is possible with regional crop ragi and other millets. It is nutritionally enriched with incorporation of vegetables, green leafy vegetables, roots, fruit pulp and presented both as hot and sweet in taste.



Ingredients	Quantity in grams
Ragi flour	60
Wheat flour	30
Soy flour	5
Peanut flour	5
Yellow pumpkin paste	100
Oil	5
Salt	Taste
Jeera (crushed)	2

Method of Preparation

- Mix all the dry flours. Add pumpkin paste and knead in to a smooth dough. Add oil and knead again. Keep the dough covered for 15 minutes.
- Take about 15-20 g of dough, roll into very thin circular sheets and keep aside for 5-10 minutes.
- Roast both sides on hot griddle pressing continuously and roasting to prevent blowing up. When crisp take it out, allow to cool and pack it up safely. The khakhra thus made have long shelf life can be eaten as such.
- They are rich in fiber, calcium, B-carotene and no fat.
- They can also be eaten with any type of vegetables, dhal, curries, chutneys, salads.
- They can also be used as edible plates or bowls (bio plates/bowls) to serve bhelpuri / chat / spiced rice / etc. when made into circles of 2” diameter they can be served with masala chat / salad.
- The junk foods (like chats) get fortified and become healthy foods/snacks.

6. Foxtail Millet Khakhra (Setaria Italica)

Ingredients	Quantity in grams
Foxtail millet flour	60
Wheat flour	30
Soy flour	5
Peanut flour	5
Jeera (Crushed)	2
Oil	5
Salt	To taste
Water for kneading	



Method of Preparation

- Mix all the dry ingredients.
- Using water knead into a soft dough and add oil, knead again until the dough is non-sticky and uniform.
- Rest the dough for 10-15 minutes.
- Make it into 20g piece, roll into thin roti, and spread it on paper/sheets for 10 minutes.
- Roast on moderately hot griddle by continuously pressing and rotting to prevent blowing up. Roast both the sides until golden brown.
- Remove from pan and cool it, pack it and store. Use directly when required.

7. Millet Bio-spoons

Ingredients	Quantity in grams
Millet flour (any variety)	60
Wheat flour	30
Soy flours/Ured flour	5
Peanut flour	5
Jeera + Pepper	2
Oil	5
Salt	For taste



Method of Preparation

- Blend all the raw materials uniformly. Using required amount of water knead into a soft dough. Rest the dough for 10-15 minutes. Knead in oil, rest for 2-3 minutes. Roll into thin sheets, cut into spoon strips, arrange on a non-stick tray. Bake in micro oven for 2 minutes. Take it out, pack and store. Use the edible spoons for chats, poories, salads, custards, porridge, etc.

- When required they can be used as spoons to eat noodles, snacks, bhelpuri, salads, ice-creams etc. A bite of them can be eaten in between to add taste and texture. When used in this form, millet edible spoons (Bio spoons) because of dietary fiber and essential nutrients, will make the foods non-junk. It will help reduce post snack work load of washing spoons. Millets in spoon and soup straw form will have high tech touch with health. Storage at room temperature for 15 days, remains crisp and crunchy.

8. Edible Millet Straws

Paper or plastic straw is used generally for sipping juice, soup etc. and is thrown off after use. Further a customer wishes to have some crunchy snack in between sipping of juice and soup.



At this juncture ‘Edible Millet Straws’ are an asset as they are made up of millet and fortified suitably with nutrients. Straw is spicy and tasty; it is edible, A bite in between soup, salad or juice it self can serve as healthy and tasty snack. This snack is rich in fiber, protein, essential fatty acids and overall low in fat. Therefore, it serves as a media of non-junk and healthy supplement. It can be packed in cluster similar to straws, stored and sold. It is a bio edible straw which will not add to wastage in food sector. With the millets of India can have global touch.

Ingredients	Quantity in grams
Millet flour (any millet)	60
Wheat flour	30
Soy flour	10
Jeera	1
Mint leaf powder	1
Oil	5
Salt	To taste

Method of Preparation

- Blend all the raw materials and knead it into a smooth dough.
- Add oil and knead it until glossy.
- Allow it to rest for 10-15 minutes.
- Roll the dough into very thin sheet.
- Roll using greased steel or iron rod of straw size.
- Remove the sticks, arrange in tray and microven for 2 minutes.
- Cool and pack.
- Straws are ready for use when needed.
- Take care not to bend while baking and cooling.
- Product has long shelf life and remains crisp at room temperature for minimum 15 days.

9. Foxtail Millet Suffed Holige

The South Indian festive sweet ‘Holige’ is popularly know to be made from ‘Dhal and Jaggery’, stuffed, rolled and roasted with oil on hot griddle.



Foxtail millet stuffed holige is unique. Millet and Jaggery stuff is the sweet processed filling with specific syrup strength, the hot filling is placed between two layers of maida sheets, scaled, edges are pressed and is deep fat fried not roasted on griddle.

Ingredients	Quantity in grams
Stuffing	
Foxtail millet flour (any other millet also)	60
Jaggery powder	40
Cardamom	For aroma
Grated fresh coconut / nuts	5
Sheeting:	
Refined flour	50
Foxtail millet flour	50
Oil for frying	For frying

Method of Preparation

- Grate coconut.
- Powder jaggery, heat it until thread consistency is achieved.
- Add millet flour and cardamom continue stirring, add grated coconut and continue stirring, remove from fire and make it into balls of 25g each keep aside.
- Knead refined flour and foxtail flour with required amount of water, into a soft dough and rest for 10 to 15 minutes.
- Take 20g of the kneaded dough, roll into a sheet and place one ball of sweet stuff, cover it with the rolled sheet pulled over from all sides. Press, role into flat sheet.
- Fry it in moderately hot oil until brown.
- Serve hot or cold with or without ghee.
- Product in food grade plastic pouches has one week storage life at room temperature.

10. Foxtail Millet Sweet Sticks

Ingredients	Quantity in grams
Stuffing	
Foxtail millet flour	60
Jaggery/sugar	40
Cardamom	1
Copra grated	5
Cashew nut chopped	10
Sheeting:	
Foxtail millet flour	60
Refined flour	40
Oil	For frying

Method of Preparation

- Knead the flour mix with water into a soft dough and rest it for 10-15 minutes.
- Prepare stuffing as in 'Holige' and make into rolled slices from 30 g each and rest it to set.
- Knead the plain dough, roll into large thin sheet.

- Cut it into rectangular shapes measuring 5x2”.
- Fill them with rolled stuffing.
- Seal the edges firmly, deep fry until brown and crisp.
- Serve hot or cold.
- This can be a ready millet energy bar.
- Remains acceptable for 10-12 days at room temperature when packed in food grade poly pouches.

11. Foxtail Millet Peda

‘Peda’ is familiar as a total dairy sweet, rich in milk protein, fat and sugar. Very popular sweet used for exchanging good will.

Foxtail flour can also be an ingredient part of peda to make peda rich in dietary fiber to make peda more healthy, go global, and value for the drought crop minor millets.



Ingredients	Quantity in grams
Khoa	100
Sugar powder	100
Foxtail flour roasted or Foxtail millet malt	100
Cashew nut for decoration	
Color as desired (kesar or chocolate)	

Method of Preparation

- Use a double wall boiling vessel to warm up khoa. Stir in sugar powder and roasted foxtail flour along with flavor-cum-color.
- Continue blending on low flame.
- Remove from fire.
- Cool it to room temperature.
- Take 10-15 g portions, roll them into balls, press between palm.
- Place a piece of cashew nut on top.
- Allow it to set and cool.
- Pack in clean containers.
- Foxtail peda is ready to eat.
- Yield for 300g of mix is 20 peda.

12. Pearlmillet (Bajra) Spicy Kadabu

Ingredients	Quantity in grams
Millet flour	200
Mixed vegetable (chopped carrot, shepu, methi)	100
Onion chopped	25
Garam masala	1 tsp
Chilli powder	¼ tsp
Mustard	For seasoning
Salt	For taste
Oil	For seasoning

Method of Preparation

- Heat oil and add mustard, chopped onion fry a little.
- Add chopped vegetables and stir.
- Add salt and masala.
- Blend well.
- Add 1 cup of water and allow to boil.
- Blend in flour and remove from fire.
- Knead well.
- Make into balls or rolls of 30g each.
- Steam like idli for 5 minutes.
- Serve hot or cold with any chutney or sauce.

It gives 286 calories and 3.1 g of dietary fiber. Also contributes essential minerals zinc which promotes and activates insulin required for carbohydrate metabolism. It can be a healthy complete breakfast or a snack.



13. Pearl Millet (Bajra) Sweet Kadabu

Ingredients	Quantity in grams
Pearl millet flour	200
Water	70-80
Stuffing:	
Grated coconut	120
Jaggery	100
Cardamom	For aroma
Cashew nut	25

Method of Preparation

- Boil water add flour, stir and cook partially.
- Remove from fire.
- Knead into smooth dough and make portions of 30g each.
- Roll into thin round circles, place 20 g of the sweet filling.
- Fold over the rolled dough on top of the filling mold it into desired shape.
- Steam it like idli and serve hot with ghee.

14. Sorghum Khakra

Ingredients	Quantity in grams
Sorghum flour	60
Wheat flour	30
Soy flour	10
Salt	For taste
Jeera (Cumin)	2
Oil	5
Water	For kneading

Method of Preparation

- Mix all the dry ingredients.
- Knead into a soft dough using water.
- Add oil and knead again.

- Rest the dough for 10-15 minutes.
- Divide into 20 g portion, roll than into thin sheets, rest for 5-10 minutes.
- Roast on hot griddle, pressing and rotating continuously with the help of cloth until roti is crisp.
- Remove from griddle.
- Cool and pack.
- Use it as needed.

Note: Same dough rolled into small circles of 5 cms diameter and roasted can be used as snack when served with spicy salad on top of each. (Similar to panipoorie).

15. Little Millet Steamed Marbles

Ingredients	Quantity in grams
For dough:	
Little millet flour	85
Soy flour or Chama flour	15
Jeera (cumin)	2
Green chilli chopped	3 Nos.
Chopped onion	1 Small
Water	For dough
Seasoning:	
Onion (chopped)	25
Green chillies (chopped)	3
Curry leaves	A few
Coriander leaves	5
Lemon	½
Coconut gratings	1 Tbs
Oil	1 Tbs
Salt	For taste



Method of Preparation

- Boil $\frac{1}{2}$ cup water.
- Add spices and salt.
- While boiling stir in mixed flour.
- Cook partially.
- Remove from fire and cool it.
- Knead into soft dough.
- Make into small marbles, steam then without pressure.
- Season with all the season ingredients, squeeze lemon, add salt blend lightly, add chopped coriander leaves and coconut gratings.
- Serve the seasoned little millet marbles hot with mint or tomato chilli sauce.

Note: Same dough can be rolled into rod shapes, steam and serve with hot soup to dip, eat and sip.

16. Ready To Eat Nutri Noodles

Ingredients	Quantity in grams
Ragi flour	150
Egg white / SMP	1 (15 g)
Soy flour	15
Skimmed milk powder	15
Salt	4
Baking soda	0.5
Baking powder	0.5
CMC	2.5

Oil	5
Pepper and garlic paste	2.5
Yeast	2.5

Method of Preparation

- Blend all the ingredients raw, add egg white beaten, incorporate activated yeast; use water and knead into soft dough.
- Allow to ferment for 10-15 minutes or until it doubles.
- Take small portions of the dough and extrude, microwave for 5-7 minutes.
- Cool and pack.
- RTE noodles ready can be used by rehydrating with boiling water poured to cover the noodles for 2-3 minutes add desired spices and eat.



Note: In place of water for making dough, you can use paste of any fruit, fruit peel, greenleafy vegetables, etc. They will contribute additional nutrients and taste.

17. Multi Millet Paddu

Ingredients	Quantity
Millets (Samai, varagu, thinai, Kuthiraivali)	2 cups ($\frac{1}{2}$ Cup each)
Urad dhal	$\frac{1}{2}$ Cup
Fenugreek seeds	1 or 2 Tsp
Salt	As required
For seasoning:	
Mustard seeds	1 Tsp
Urad dal	$\frac{1}{2}$ Tsp
Onion	1 or 2 (Finely chopped)
Carrot	1 small (Grated)
Green chilli	1 or 2 Finely chopped

Curry leaves	1 Stick
Salt	To taste
Oil	To cook ($\frac{1}{2}$ tsp for each hole)

Method of Preparation

Wash and soak all the four millets, urad dhal and fenugreek seeds in water in nearly 3 to 4 hours.

Grind everything together to fine paste. Transfer it to a separate container; add salt and mix well. Allow to ferment for nearly 8 to 10 hours or overnight.



Heat oil in a kadai; add mustard seeds and uraddhal. After it crackles, add chopped onions, green chillies, grated carrot, salt and curry leaves. Fry till onions become translucent. Once it is done; add the seasoning mixture into the batter. Give it a mix. Heat the paddy pan; add 1 to 2 tsp oil or ghee into each hole. Pour batter in all the holes and close the pan with a lid; allow to cook in medium flame. Turn on the other side using a tooth prick or a stick. Allow to cook till the other side turns golden brown.

Remove from pan and serve hot with any spicy chutney.

18. Samai-Methy-Pancake

Ingredients	Quantity
Little millet	1 Cup
Rice flour	$\frac{1}{4}$ th Cup
Mint leaves	$\frac{1}{4}$ th Cup
Coriander leaves	$\frac{1}{4}$ th Cup
Curry leaves	A few
Green chillies	For taste
Black pepper	A few
Salt	For taste

Method of Preparation

Oil to spread dough on a plastic sheet and to make pancakes. Cook little millet in pressure cooker just like rice by adding for one cup of samai add 2 to 2¼ cup of water. Wash mint, curry leaves, coriander leaves, green chilly, salt, pepper and cumin seeds grind coarsely without adding water, add cooked samai rice and grind into a smooth paste. Transfer into a wide mouthed vessel.

Add rice flour, amaranth seeds and amaranth flour. Chopped methy also & add salt for taste. Knead into a slightly tight dough. Divide equally into a big palm sized balls. Heat a tawa on a stove over a medium flame.

Take a banana leaf or a clean & dry plastic sheet. Smear oil over banana leaf, Spread dough by patting as a pancake. Transfer the pancake gently on to hot oiled tawa. Cook well on both sides & serve hot.

19. Millet Peda

Ingredients	Quantity
Millet fine flour roasted or Millet malt	½ Kg
Soft white khoya	½ Kg
Sugar powdered	2 ½ Cups (300 gms)
Cardamom powder	½ Tsp
Cardamom seeds semi crushed	1 Tsp
Slivered or crushed pistachios	1 Tsp

Method of Preparation

Grate khoya with a steel (not iron) grater. Add powdered sugar and mix well. Put mixture in a large heavy or nonstick pan. Heat first on high flame for few minutes. Then add the millet flour & continue on slow fire with continuous stirring till done. When the mixture becomes, thick add cardamom. Mix well, and take off fire. Allow to cool slightly. Shape into pedas with palms into patty rounds.



20. Varagu/Kodo Millet Pulav

Ingredients	Qty.
Varagu/ Kodo millet rice	1 Cup
Water	1 ½ Cups
Grated Carrot, finely chopped beans, green peas	1 Cup
Onion chopped	1
Ginger garlic paste	1 Tsp
Green chilli	2 to 3
Mint leaves chopped	1 Tbs
Salt - As needed	As needed
To Seasoning	
Oil	3 Tbs
Cinnamon	1 Piece
Bay leaf	1

Method of Preparation

Heat oil/ ghee. In medium flame, add cinnamon, bayleaf, add onion and stir. Add ginger garlic paste. Fry on medium flame for 2-3 minutes. Add the chopped vegetables. Fry in medium flame for about 2 mins., add salt for taste. Add washed, drained millet to it and mix well. Let it dry. Add water as mentioned, mix well and pressure cook for a whistle in medium or low flame or in low flame possible for 12 mins. Open & serve hot.

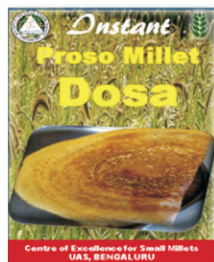


21. Instant Proso Millet Dosa Mix

Ingredients	Quantity in grams
Proso millet flour	70
Urad dhal flour	25
Beaten rice flour	05
Dry Yeast	02

Method of Preparation

- Mix one cup of Millet dosa mix with two cups of warm water mix it well without lumps. Set aside for 40 minutes.
- Keep griddle on stove, smear oil on hot griddle and make dosa.
- Serve hot with chutney.



22. Instant Little Millet Dosa Mix

Ingredients	Quantity in grams
Little millet flour	70
Urad dhal flour	25
Beaten rice flour	05
Dry Yeast	02

Method of Preparation

- Mix one cup of Millet dosa mix with two cups of warm water mix it well without lumps. Set aside for 40 minutes.
- Keep thawa on stove, smear oil on hot thawa and make dosa.
- Serve hot with chutney.

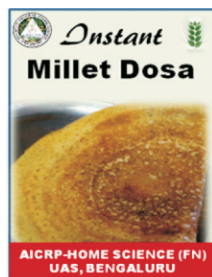


23. Instant Kodo Millet Dosa Mix

Ingredients	Quantity in grams
Kodo millet flour	70
Urad dhal flour	25
Beaten rice flour	05
Dry yeast	02

Method of Preparation

- Mix one cup of Millet dosa mix with two cups of warm water mix it well without lumps. Set aside for 40 minutes.
- Keep thawa on stove, smear oil on hot thawa and make dosa.
- Serve hot with chutney.



24. Instant Foxtail Millet Dosa Mix

Ingredients	Quantity in grams
Foxtail millet flour	70
Urad dhal flour	25
Beaten rice flour	05
Dry Yeast	02

Method of Preparation

- Mix one cup of Millet dosa mix with two cups of warm water mix it well without lumps. Set aside for 40 minutes.
- Keep thawa on stove, smear oil on hot thawa and make dosa.
- Serve hot with chutney.



25. Instant Barnyard Millet Dosa Mix

Ingredients	Quantity in grams
Foxtail millet flour	70
Urad dhal flour	25
Beaten rice flour	05
Dry Yeast	02

Method of Preparation

- Mix one cup of Millet dosa mix with two cups of warm water mix it well without lumps. Set aside for 40 minutes.
- Keep thawa on stove, smear oil on hot thawa and make dosa.
- Serve hot with chutney.

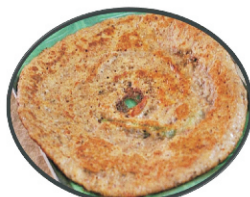


26. Instant Multi Millet Dosa Mix

Ingredients	Quantity in grams
Multi millet flour	70
Urad dhal flour	25
Beaten rice flour	05
Dry Yeast	02

Method of Preparation

- Mix one cup of Millet dosa mix with two cups of warm water mix it well without lumps. Set aside for 40 minutes.
- Keep thawa on stove, smear oil on hot thawa and make dosa.
- Serve hot with chutney.



27. Millet Navane/sajje Bisibele Bath

Ingredients	Quantity in grams
Millet Rice	250.0
Redgramdhal	125.0
Vegetables Chopped (Beans, Carrot, Green peas, Capsicum)	75.0
Tomato	50.0
Onion	25.0
Cashew nut	10.0
Grated Coconut	30.0
Red Chillie dry	4 Nos
Bengal gram &Urad Dhal	5.0 Each
Cumminseeds	2.5
Cinnamon	A small piece
Clove	2-3 Nos
Salt	For taste
Oil	For seasoning
Lemon or Tamarind Juice	1 Tbs

Method of Preparation

Cook rice & dhal with 4-times water. Cook all the chopped vegetables, add to rice and continue cooking on slow flame. Roast all the spices & powder it. Add the spice powder to cooked rice, dhal & vegetable mix and continue cooking for 5-10 minutes. Heat an other pan, add oil, add all the seasoning ingredients, add chopped onion, fry until brown. Then add it to cooked rice mix. Fry the cashew nut add to the cooked blend along with grated coconut, mix well. Serve hot bisibelebath.

28. Millet Pongal

Ingredients	Quantity in grams
Millet rice (Any of them)	200.0
Greengram dhal	100.0
Cashew nut	15.0
Green chillies	3 Nos
Cummin seeds	5.0
Curry leaves	A few
Mustard seeds	For seasoning
Salt	For taste
Oil	For Seasoning

Method of Preparation

Roast green gram dhal slightly. Blend with rice & wash. Add 1:2½ times water and cook. (Pressure cook until 2-3 whistles). Heat a pan, add oil, add the entire seasoning ingredients one after the other, keep stirring. Add salt, stir. Add cooked dhal & rice.

Blend. Fry cashew nut in one teaspoon of ghee & add it to cooked Pongal. If desired add grated coconut also & serve hot.



29. Millet Paddu

Ingredients	Quantity in grams
Millet (Any)	250.0
Urad dhal	60.0
Fenugreek seeds	10.0
Salt	For taste
Seasoning:	
Onion finely chopped	50.0
Carrot grated	50.0
Green chillies(Chopped)	5.0
Curry leaves	For seasoning
Oil	For seasoning

Method of Preparation

Wash and soak millet, urad dhal and fenugreek seeds in water for 4 hours. Grind together into fine paste. Place it in vessel, add salt and allow to ferment for 8-10 hours. Heat oil and season with all other ingredients. Add to the fermented batter, mix well. Heat Paddutava, smear oil, pour batter, cover with a lid for 2 minutes, remove and turn the paddu on to other side, cook again with few drops of oil. When turns golden brown remove & serve hot with any chutney.

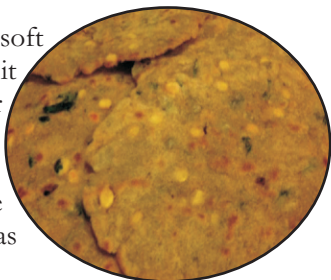


30. Millet Masala Rotti (Navane)

Ingredients	Quantity in grams
Whole grain millet flour	150.0
Ragi flour	150.0
Chopped Shepu greens	30.0
Grated Carrot	30.0
Chilli powder	10.0
Cummin seeds	5.0
Salt	For taste
Oil	For roasting

Method of Preparation

Mix all the ingredients. Knead into soft dough by adding water if required. Make it into desired portion; roll on a plank. Smear oil on hot tawa, transfer the rolled roti on to hot tawa, roast, turn on to other side, smear oil. Roast until golden brown. Serve hot or cold. It can be a snack easy to pack as lunch for children.



- Can vary in choice of greens, vegetables. If desired can also add 50.0gms of any legume flour & blend to enrich with protein & make it a complete food.

31. Millet Talipattu

Ingredients	Quantity in grams
Whole grain millet flour	100.0
Rice flour	100.0
Chopped onion	25.0
Chopped coriander leaves	5.0
Chopped curry leaves	5.0
Chilli powder	5.0
Salt	For taste
Oil	For roasting

Method of Preparation

Mix all the ingredients, knead with little water into a soft dough. Portion the dough into desired amount, roll it on a greased banana leaf, transfer it to hot greased tawa, roast, turn on to other side. Roast again. Remove & serve with chutney as desired.

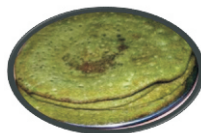


32. Navane greens dosa

Ingredients	Quantity in grams
Whole grain navane	100.0
Desired greens chopped	150.0
Coconut grated	25.0
Cummin seeds	5.0
Salt	For taste
Oil	For roasting

Method of Preparation

Soak the grains for 4-6 hours. Remove water, blend with all other ingredients and grind it into fine paste. Allow to ferment for 6 hours. Make dosa on hot tawa. Eat as such or any taster.



33. Millet Fried Rice

Ingredients	Quantity
Millat rice / rice	1 Kg
Oil	10 Tsp
Ginger	2" Pc
Garlic	1 Whole
Green chillies	10
Tomato sauce	½ Cup
Soya sauce	½ CupVnegar
Vinegar	2 Tblsp

(While cooking add 2 measure of water to 1 measure of millet and cook it in a cooker till one whistle. Cool it for 15 minutes and stir slowly).

Method of Preparation

- Crush ginger, green chillies, and garlic coarsely.
- Take oil in a pan & fry this mixture.
- Add soya sauce, tomato sauce & Vinegar to this stirring.
- Add millet rice to this and fry thoroughly (for 10 min).
- Finally add salt and mix.
- Cool it and store it in a clean container.

34. Foxtail Millet Porridge (Navane Payasa)

Ingredients	Quantity
Foxtail millet	¼ Kg
Greengram dhal	50 Gms
Jaggery powder	¼ Kg
Poppy seeds	1 Tsp
Cardamom	4-5
Cashew nut, raisins	2 Tsp
Ghee	1 Tbs

Method of Preparation

- Make rava (powder coarsely) of foxmillet.
- Roast the greengram dhal on a low flame and powder it.
- Fry poppy seeds and powder it.
- Now mix all the ingredients thoroughly.
- Add cashews & raisins roasted in ghee to this.
- Add cardamom powder.
- Mix well and store it in a clean & air tight container.

Add 5 cups of water to 1 cup of the mixture and stir without lumps. Cook it for 10-15 minutes. Then serve hot.

Its rich in fibre and slowly reducing carbohydrates.

35. Navane burfi

Ingredients	Quantity
Navane	½ Cup
Ground nuts	½ Cup
Jaggery	1 Cup
Grated dry coconut	1 Tbs
Cardamom powder	¼ Tbs
Ghee	½ Tbs

Method of Preparation

Dry roast navane and grind into a fine powder. Heat jaggery in a pan, when it melts and forms a syrup of single thread, add navane flour, roasted groundnuts and all other ingredients. Mix well and transfer the mixture into a greased plate. When it cools, cut into desired shapes.

36. Navane kabab

Ingredients	Quantity
Navane	½ Cup
Boiled potato	2 Big
Boiled raw banana	1
Red chill powder	2 Tsp
Coriander seeds powder	2 tsp
Cumin powder	½ Tsp
Garam masala powder	½ Tsp
Oil for frying and salt to taste	

Method of Preparation

Pressure cook navane with 4 cups of water, mix with boiled and mashed potato and raw banana and other ingredients. Divide this mixture into balls, flatten slightly and deep fry.

37. Millet Navaneuppma

Ingredients	Quantity in grams
Navanesoji	100.0 (1-Cup)
Ground nuts	20.0
Urad dhal	2.0
Onion Chopped	50.0
Green Chillies	2.0
Curry leaves	1.0
Coriander leaves Chopped	5.0
Grated Coconut	15.0
Oil	20.0 ML
Lemon juice	5.0 ML

Method of Preparation

Roast navanesoji and keep aside. Heat a vessel, add oil. When heated add mustard, urad dhal & groundnuts. Roast slightly. Add onion, green chillies & curry leaves. Fry by stirring. Then add 2 and half cups of water allow to boil. When it starts boiling add roasted soji, keep stirring. When cooked, remove from fire add lemon juice, chopped coriander & grated coconut, blend , serve hot.



Nutrient Content Per 100 g

Millets	Protein (gm)	Energy (K. cal.)	Fat (gm)	CHO (gm)	Fiber (gm)	Calcium (mg)	Phos- phorous (mg)	Iron (mg)	B carotene (mg)	No. per 100g
Foxtail millet Khakhra	13.23	460	6.09	64.12	6.39	59.5	416	3.82	-	5-6
Foxtail millet flour straw	13.21	460	6.09	64.12	6.39	59.6	416	3.82	-	12-15
Foxtail millet flour spoon	13.21	460	6.09	64.12	6.39	59.6	416	3.82	-	8
Fortail millet holige	7.48	351	2.58	74.40	4.8	50.6	190	2.74	-	3
Foxtail millet peda	10.76	381	10.05	61.93	2.67	329.0	301	0.93	-	6
Pearlmillet steamed kadabu	12.73	384	5.22	71.38	1.75	135.4	440	10.67	2752	4

Nutrient Content Per 100 g

Millets	Protein (gm)	Energy (K. cal.)	Fat (gm)	CHO (gm)	Fiber (gm)	Calcium (mg)	Phos- phorous (mg)	Iron (mg)	B carotene (mg)	No. per 100g
Sorghum khakhra	12.09	337	4.65	71.28	2.73	55.9	375	4.6	-	5
Ragi Pumpkin khakhra	13.23	374	4.29	70.72	3.75	247.0	412	4.48	-	5-6
Ragi pasta chewda	12.63	357	6.09	63.68	3.47	245.0	328	4.04	-	5 Tbs
Millets soup mix	9.85	304	2.02	62.34	1.81	50.36	-	4.43	-	500 ml soup
RTE nutria millets	10.30	353	16.63	60.90	3.25	29.76	172	2.74	-	1 serving

Whole Grain Millet Baked Products

38. Millet Rusk

Ingredients	Quantity in grams
Wheat flour	350
Millet flour	150
Salt	10
Yeast	15
Custard Powder	10
Sugar	125
Fat	70
Milk Powder	10
Ohma + Jeera	10
Water	300 Ml

Method of Preparation

- Mix all the ingredients.
- Knead to a smooth dough & allow it to raise for 45 minutes.
- Weigh 200 gms dough each & make round balls roll in to 7 to 8 inches.
- Place it on a greased tray 2.3 inches apart.
- Keep it for final proofing for 15 minutes.
- Bake at 420° F heat for 15-20 minutes.
- Cool it thoroughly and slice it uniformly like that of Rusk Shape.
- Arrange it in baking trays.
- Again bake at 300° F till it becomes crisp.

39. Millet Soup Sticks

Ingredients	Quantity in grams
Wheat flour	175
Millet flour	75
Milk powder	10
Sugar	25
Yeast	10
Salt	5
Ohma + Jeera	5
Water	75 Ml
Fat	100

Method of Preparation

Sieve the flour with milk powder, add ohma + jeera seeds. Rub the $\frac{3}{4}$ fat to the above & add the ferment (yeast) to the flour & make soft dough Knead the remaining fat. Keep for fermentation under damp cloth for 30 minutes. Make small balls and roll to stick sizes 6.8 inch long. Place in a greased baking tray and proof for 30 minutes. Bake at 400° F for about 20 minutes.

40. Pizza

Ingredients	Qty. in grams	Ingredients	Quantity
Millet flour	60	Tomato	3 Nos
Wheat flour	140	Cheese	4 Pkts
Fat	30	Chillies	4 or 5
Salt	10	Onions	2 Big
Yeast	5	Coriander and Curry leaves	One bundle (small)
Sugar	5		
Milk	40 ml	Salt	To taste
Water	40 ml	Capsicum or Mushroom	1 No. (Option)
Oil	30 ml		

Method of Preparation

1. Sieve the flour twice.
2. Disintegrate yeast in luke warm water with little sugar.
3. Dissolve salt in the remaining water mix with flour roughly.
4. Beat the egg.
5. Add the beaten egg in flour and knead to smooth and soft dough.
6. Knead in vanaspati.
7. Rest the dough for 40 minutes.
8. Roll the dough to ½” thickness and place in the greased and dusted trays and dock with a fork.
9. Pour the filling on it and scatter the grated cheese on it.
10. Rest it for 15-20 minutes to have a good body to the pizza.
11. Bake the pizzas at 450° F for 25 to 30 min.
12. Serve hot.

41. Coconut Cookies

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Maida	40	Millet flour	20
Coconut powder	30	Vanaspati	60
Sugar	30	Flavour	Few drops
Grain sugar	1 Tsp	Cherry	5 Nos. (for topping)

Method of Preparation

1. Mix all the ingredients in a clean bowl and knead till they are soft and smooth (except cherries).
2. Make round small balls from the dough and arrange 1/2” apart on the baking sheets.
3. Cut each cherry in to eight part and press on each part of the cookies.
4. Bake at 275° F for 15 to 20 min.

42. Millet Melting Moments

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Small millet flour	50	Sugar	90
Wheat flour	100	Egg	½ No.
Baking powder	¼ Tsp	Vanilla	Few drops
Bakery vanaspati	120	Corn flakes or coconut powder	50

Note: In place of egg, 20 gms milk powder can be used

Method of Preparation

1. Sieve the flour and baking powder twice.
2. Cream, vanaspati and sugar till light and fluffy.
3. Beat the egg with vanilla and add to the creamed mixture.
4. Fold in the maida with a fork.
5. Wet hands with water and divide the mixture into small pieces and coat it with coconut powder.
6. Place in the tray & bake at 275° F for 15 to 20 min.

43. Millet Nutrings

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Wheat flour	170	Millet flour	70
Vanaspati	120	Eggs	2 Nos.
Almond flavour	Few drops	Milk	To mix
Peanut Powder	50	Sugar	120

Method of Preparation

1. Sieve the flour twice.
2. Rub vanaspati into the flour till you feel that maida is in the form of bread crumb consistency.
3. Mix in sugar and yellow of the egg.
4. Add milk and knead it to soft and smooth dough.
5. Roll the dough to 1/8" thickness and cut with medium size dough nut cutter.
6. Coat with egg white and topped with chopped nuts or coconut powder or peanut powder and arrange it on the baking trays.
7. Bake at 320°F for about 10 to 15 min.

44. Millet Masal Biscuit

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Wheat flour	175	Millet flour	75
Vanaspati	125	Salt	7.5
Green masala	100	Milk powder	10
Sugar	15		

Method of Preparation

1. Sieve flour.
2. Rub in fat and then add sugar and salt dissolved in water.
3. Mix the masala and knead it to a soft dough.
4. Make small balls, place it on baking tray and press with palm and prick it with fork.
5. Bake at 320° F for 10-15 min.

45. Millet Nippattu

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Millet flour	300	Salt	12.5
Maida	350	Gingelly seeds	50
Oil	200	Peanut	75
Sugar	50	Fried bengal gram	25
Masala: green chillies, coriander & curry leaves, ginger-chopped fine 150gm			

Method of Preparation

Follow the same procedure as masala biscuits. with oil on palm, pat the dough as poorie size in the baking tray it self and press it. Bake at 175°C for 15-20 min.

46. Millet Masala Doughnut

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Wheat flour	700	Water	150
Yeast	30	Sugar	50
Milk powder	40	Salt	25
Vanaspatti	150	Green masala	300
Eggs	4 Nos.	Oil for frying	
Millet flour	300		
Green Masala Onions, Coriander leaves, Curry leaves, Green chillies, Ginger			

Method of Preparation

1. Sieve the flour with baking powder and milk powder twice.
2. Dissolve yeast in 100ml luke warm water.
3. Rub half of the fat in flour, add sugar and mix.
4. Add eggs and ferment to the flour, sugar and saltwater, knead to a smooth dough with remaining fat.
5. Rest the dough for 30 minutes. Add green masala and roll the dough to 1/4" thickness, cut with doughnut cutter. Again rest for 15 minutes.
6. Gradually deep fry the doughnut till they acquire golden brown colour.

47. Millet Tawa Bread

The above dough of millet Masala doughnut can be used. Take small round ball dough and shape it to roti/roll like Chapathis. Put it on tawa and fry it like chapathi.

48. Millet Chocolate Brownies

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Wheat flour	400	Sugar	600
Fat	540	Eggs	380 Gms or 10 Nos.
Water	230 Ml	Vanilla essence	Few drops
Soda	6	Baking powder	6
Cashew nut	300	Milk powder	60
Salt	A pinch	Cocoa powder	90
Millet flour	200		

Method of Preparation

1. Cream fat and sugar till light and fluffy with soda and cocoa.
2. Sieve the flour with the baking powder and salt twice.
3. Beat the egg to a thick froth and add gradually to the mixture.
4. In the water add colour and flavour mix alternatively with flour.
5. Distribute the cashew nut uniformly in the batter.
6. Bake at 360°C about 15-20 minutes.

49. Millet Sunshine Cake

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Part-1		Part-2	
Wheat flour	140	Maida flour	280
Millet flour	60	Baking powder	15
Milk powder	30	Water	200 Ml
Vanaspati	450	Lemon essence	½ Tsp
Sugar	575	Pineapple essence	¼ Tsp
Salt	5	Millet flour	120
Eggs	10 Nos.		
Vanilla essence	Few drops		

Method of Preparation

Part – 1

1. Cream all the ingredients on the 1st part till light and fluffy.
2. Add egg in portions 3 to 4 times and continue the mixing .

Part-2

1. Add colour and flavour to the water.
2. Add water and maida alternatively to the part 1, mix well.
3. Pour the cake batter in to the greased paper lined cake tins.
4. Bake 350°F for 20-25 min.

50. Millet Masala Cake

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Wheat flour	210	Sugar	50
Millet flour	90	Corn flour	100
Margarine	200	Salt	7.5
Milk powder	50	Curds	200 Ml
Egg	5 Nos.	Vanilla	10 Drops
Baking powder	15		

Vegetables: Cabbage-100gms, Capsicum-25gms, Ginger-10gms, Jeera-1tsp, Coriander leaves-1 bunch, Mint-1 bunch, Carrot-100gms, Green chillies-25gms, Garlic-10 pod, Pepper-1tsp.

Method of Preparation

1. Cream fat and sugar till light & fluffy.
2. Add beaten egg with flavour to the mixture & cream.
3. Add corn flour and salt while craming.
4. Mix sieved flour+Milk powder + baking powder.
5. Then add chopped vegetables, jeera powder pepper powder.
6. Fold the above mixture at the end with curds and mix it well.
7. Put the batter into a greased baking tray.
8. Bake at 350°C for about 40-45 min.

51. Millet Fruit Cake

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Wheat flour	100	Dry fruits	250
Sugar	100	Millet flour	100
Butter / Margarine	100	Cherries	7.5
Eggs	2 Nos.	Truit fruits	200 Ml
Vanilla	Few drops	Peel (orange)	10 Drops
Salt	A pinch	Cashewnut	50
Baking powder	¼ Tsp	Lemon rind	½ Tsp
Coffee powder	1 Tsp	Lemon juice	½ Tsp
Mixed spices	¼ Tsp	Mixed spices	½ Tsp
Caramel Dry fruits	1 Tsp		

Method of Preparation

1. Clean and chop the fruits.
2. Mix lemon rind and lemon juice and mixed spices to the chopped fruits.
3. Soak the fruits overnight.
4. Cream butter and sugar.
5. Beat the eggs with vanilla.
6. Add the beaten egg to the creamed mixture little by little beating all the times.
7. Sieve the flour, salt and BP twice.
8. Mix fruit and flour together.
9. Add fruit and flour mixture to the cream gradually and mix with pallate knife.
10. Add caramel and coffee powder and mix well.
11. Line the cake tin with grease proof paper and put the mixture in the prepared tin.
12. Bake at 300°F for 1 hour.
13. Leave at least over night in the tin before cutting.

Ragi Products

52. Ragi malt Process method

Clean ragi. Soak in clean water for 10-12 hours. Drain off water. Tie up the soaked ragi in a clean cotton cloth or keep soaked ragi in clean steel or food grade drums covered for germination. Keep for sprouting for two days in dark place. The sprouted ragi is then sun dried or dry it in hot air drier at 80°C for 8-10 hours.

Roast the dried sprouted ragi in a hot griddle or mechanized roaster at 110-115° C. When pleasant aroma develops on roasting, transfer to trays, allow to cool. Then mill it into fine flour (100-120 Mesh micron particle size), sieve & separate bran. Use the fine malt for ragi malt beverage mix.

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Ragi	71.0	Greengram	14.5
Wheat	14.5	Cardamum	For flavour

(**Nutrients:** Calories-360.0; Protein-9.0gm; Fat-1.5gm; Calcium-193mg; Iron-5.2mg)

Preparing malt beverage

Mix one cup of milk with one cup of water and boil on medium flame. Blend 2 teaspoon of malt mix in a cup with ½ cup water and add to boiling milk with continuous stirring. Add sugar or sweetener as desired, boil for 2-3 minutes & serve hot.

In place of cardamom any other suitable flavours like Kesar; Chacolate; Coffee flavor can also be used to create variety.



53. Ragi Composite Flour Processing

Clean the ragi before milling. Wash ragi with water, dry it and mill it into 60-80 mesh flour. Store in food grade container & use. This flour is generally used for various products in Indian style such as dumpling, rotti, kadubu, laddu, ambli, etc.

The same daily flour can be made nutria rich by adding regional legumes, oilseeds, other grains. This combined flour is called as composite flour & can be used for multiple traditional & lifestyle products. It will provide higher quantity & quality protein, fiber, minerals vitamins.



Raw materials	% age	Raw materials	% age
Ragi	72.0	Groundnut seeds	3.0
Soya dhal	10.0	Amaranth/Rajgira	3.0
Green gram whole	10.0	Ragi germinated	2.0

54. Ragi popped energy mix

Raw materials	% age	Raw materials	% age
Ragi	40.0	Cardamum	0.72
Soya dhal	7.2	Ragi germinated	2.0
Desiccated Copra	16.0	Sugar powder	34.2



(**Nutrients:** Calories-344.0; Protein-9.1gm; Fat-13.0gm; Calcium-203mg; Iron-4.3mg)

Method of Preparation

Clean ragi. Sprinkle & rub in water or butter milk at the rate of 1/4th cup per cup of grain. Keep it in closed container for 4 hours. Heat iron kadai (175-200° C), Sprinkle one handful of moist ragi on hot kadai, using a thick cotton cloth cover the grains & allow to pop. Immediately transfer the popped ragi to a tray & use it further for other products. Popping can also be done in machine specifically designed as rolling vessels.

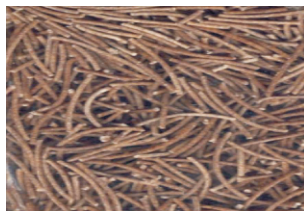
Apart from energy mix popped ragi can be used to make grain bar, burphy, laddu, Chewda, sprinkled on buns, pizza, rolls, burgers also.

55. Ragi Vermicelli

Ingredients	Quantity in grams
Whole grain ragi flour	120.0
Wheat flour (Whole grain)	60.0
Defatted soy flour (Any other legume flour can be used in place of this with Ground nut @ 1: 0.25 ratio.	20.0
Oil	5.0

Method of Preparation

Blend all the three flour, along with oil and water mix well into soft dough. Extrude into vermicelli, dry it in sun light or air, If possible dry in hot air drier at 80° C . Cool & pack. Use when required.



While cooking, roast the vermicelli, add to boiling water, strain water after 2 minutes, season with spice & vegetables desired before serving.

It can be used as spicy upma, sweet porridge, as filler to burgers, sandwich, rolls, patties, pizza, etc; which makes them non-junk while adding taste & style to serving.

Every 100.0 gm of vermicelli will give 5.0 gm of protein, 37.0 gm of carbohydrate, 215 calories of energy slowly released, 123 mg of calcium and 2.6 mg of iron.

56. Millet Chutney Powder

Ingredients	Quantity in grams
Millets/Ragi sprouted, dried	150.0
Greengram whole	30.0
Groundnut	20.0
Fenugreek seeds	4.0
Cummin seeds	4.0
Garlic	4.0
Red chilli dry	15.0
Dried curry leaves	4.0
Turmeric powder	2.0
Jaggery	10.0
Salt	For taste

Novel Technologies

Ingredients
Ragi, Greengram, Groundnut, Garlic, Jeera, Redchilli, Fenugreek seeds, Curry leaves, Termeric, Salt and Jaggery



Nutrient composition (Computed (g%))

Moisture - 12.0, Protein - 15.80, Fat - 05.37, Minerals - 03.40, Fiber - 05.97, Carbohydrate - 68.20, Calories - 220.0, Calcium (mg) - 555.6, Phosphorus (mg) - 353.6, Iron (mg) - 04.83

Ragi Chutney Powder



Method of Preparation

Roast all the ingredients except 5.0 gms of sprouted millets. Blend all together along with spices, salt, jaggery & raw sprouted grain. Make into powder, cool & store in clean container. Use with any meal. Also use as bread/pizza/burger spread to make maida products also healthy.

57. Ragi bran chutney powder (Fiber & protein rich)

Ingredients	Quantity in grams
Ragi Bran (Left over on seaving Malt)	500.0
Ground nut-roasted	80.0
Roasted Bengal gram	55.0
Desiccated Coconut Powder	30.0
Ginger dry powdered	5.0
Fenugreek seeds-roasted	40.0
Cumin seeds	5.0
Red chilli -roasted	15.0
Curry leaves roasted	10.0
Tamarind-roasted	10.0
Jaggery	20.0
Turmeric	10.0
Salt	For taste

Ragi Bran Instant Chutney Mix

"RAGI BRAN INSTANT CHUTNEY MIX" comprising oilseeds, pulse, Fenugreek seed, desiccated copra, selected spices which are also medicinal, & essential taste ingredients could serve as a supplement when used at the rate of 1-Tablespoon per meal/breakfast. Conversion of ragi bran into this product will bring back nearly Rs. 250.00 to 300.00 per Kg along with provision of Dietary fibre & phytonutrients.

OR

SALT

Computed Value

Instant Chutney Mix (g)	Protein (g)	Fiber (g)
100.00 g. of mix	8.64	46.15
1 table spoon/15 g	1.30	6.92

It can be stored at room temperature in Glass air tight food grade bottles or sealed in food grade poly packs. It is highly nutritious & per report required & no per consumer evaluation. It should be used as a supplement to the diet.

"RAGI BRAN+PEANUT INSTANT CHUTNEY MIX"

"RAGI BRAN+FLAXSEED INSTANT CHUTNEY MIX"

Method of Preparation

All the ingredients are blended together & powdered into slightly coarse powder. Cool & pack in safe container. Use it as any other chutney powder. It gives 8.64 gms of protein & 46.15 gms of fiber per 100.0 gms of chutney powder.

58. Ragi/millets Nuggets

Ingredients	Quantity in grams
Ragi/whole grain millet flour (any)	60.0
Whole soy flour	10.0
Skimmed Milk powder	20.0
Salt	For taste
Calcium propionate	0.004
Dry yeast	4.0
Sugar	2.5

Ragi Nuggets

Ingredients

Ragi, Soya, Skimmilk powder, Sugar, Salt and Need based additives



Nutrient composition (Computed [g%])	
Moisture	10.5
Protein	22.1
Fat	2.9
Minerals	4.0
Fiber	4.71
Carbohydrate	64.5
Calories	372.6
Calcium (mg)	55.9
Phosphorus (mg)	504.48
Iron (mg)	4.57

'Ragi nuggets & millets nutry nuggets: Nuggets with suitable blend of legumes, oilseeds, SMP & need based additives, Blending, steamed for respective time, expressed as nuggets & dehydrated. Stored in air tight packing & containers.

Method of Preparation

Take 2 table spoon of warm water, dissolve sugar in it. Then mix the dry yeast, allow it to froth for 2-4 minutes. Mix all other flours & calcium propionate.

Add the yeast froth, mix & knead into a soft dough. Make it into small balls/ extrude into portions, place it in a tray, microwave for 2.0 minutes. Take it out, cool & store. Nuggets are ready. When required take required amount of nuggets, rehydrate in hot water, squeeze out extra water, use it for curry, pulav, etc. It is tasty & Healthy. Millets in life style nuggets make your food healthy.

59. Ragi Adai

Ingredients	Quantity
Ragi Flour	250 Gms
Water	1 Cup / 250 Ml
Onion	1 Finely chopped
Green Chilli	2 Chopped
Curry leaves	1 Spring
Mustard Seeds/ Kaduku	1 Tsp
Curd	3 Tsp
Oil	1 Tsp
Salt	To taste

Method of Preparation

Heat oil in a kadai. Add mustard, curry leaves, green chilli, onions, salt and fry till light golden. Pour in water and curd and bring it to a boil. Add in ragi flour slowly while mixing constantly to avoid lumps. Mix well so that it gets incorporated and comes together. Transfer this to a bowl and allow it to cool down. Now take a small ball out of this and spread it over a oiled plastic sheet. This will prevent it from sticking. Heat a tawa and put this adai carefully over it and cook for 1 min on one side. Flip over and cook on other side too.

60. Ragi Noodles

Ingredients	Qty. in grams	Ingredients	Qty. in grams
Ragi flour	100	Water	70 ml (As required)
Wheat flour refined	60	Salt	3

Method of Preparation

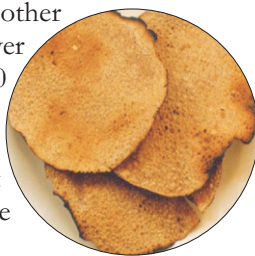
Sieve refined wheat flour (control) and ragi flour blends in a BS 60 mesh sieve, steam for five minutes, cool and sieve again, Fill the flour in the mixing compartment of the pasta-making machine and blend with water and salt for 30 minutes and extrude. Steam the noodles for 5 Minutes. Allow to temper in room temperature for 8 hours. Dry in a cabinet drier at 60° C for 6 hours.

61. Ragi Pappad

Ingredients	Quantity
Ragi flour	100.0
Urad dhal flour	50.0
Sago flour	50.0
Red chillie powder	10.0
Cummin seed powder	2.0
Salt	10.0
Pepper powder	2.0
Cooking soda	2.0
Oil	10.0 (ML)
Water	As much required for kneading

Method of Preparation

Blend all the flours using a sieve. Add all other ingredients. Knead into a dough using water. Cover it in a clean muslin cloth & keep aside for 30 minutes. Knead well again, portion into small balls of 10-12 gms. Roll into small thin sheets/circles, dry them in sun or hot air drier at 80°C. Cool & pack in air tight containers. The yield of pappad is 30.



100gm of pappad yield 10.2 gms of protein, 6.5gms of fat; 36.0gms of carbohydrate; 164 calories; 16.2 mg of calcium & 3.0mg of iron. Pappad can be blended with seasonal Green leafy vegetable paste to make it nutritious.

62. Ragi Thatte Idli

Ingredients	Qty. in grams	Ingredients	Quantity
Ragi	75.0	Salt	For taste
Parboiled rice	25.0	Water	400.0 ML
Urad dhal	25.0		

Method of Preparation

Soak ragi, rice, urad dhal for 6-8 hours or overnight in water. Next day drain water, grind into fine paste. Ferment overnight. Add salt & mix well. Smear oil to idli pan, pour the batter, steam in idli steamer. Serve idli with chutney & sambar of your interest. Same batter blended with chopped onion, chilli, coriander leaves can be made into paddu also.

63. Ragi Dose

Ingredients	Qty. in grams
Ragi flour	75.0
Parboiled rice	25.0
Urad dhal	25.0
Salt	For taste
Water	As much required
Onion Chopped fine	100.0
Coriander leaves finely chopped	10.0
Green chilli chopped	10.0
Oil	For roasting

Method of Preparation

Soak dhal & rice overnight. Drain off water & grind into fine paste. Add ragi flour, blend well. Ferment overnight; mix & make into thin batter. Add all finely chopped onion, coriander leaves, chillies along with salt. Heat tava, smear with oil, pour & spread the batter into thin circle/sheet, roast both the sides, serve hot ragi dosa.

64. Ragi Dhokla

Ingredients	Quantity in grams
Ragi flour	50.0
Bengal gram dhal	50.0
Ginger & green chilli paste	5.0
Turmeric powder	1.0
Sour Curds	50.0
For decorating:	
Red chilli powder	2.5
Coriander leaves chopped	5.0
Curry leaves chopped	5.0
Grated Coconut	5.0
Seasoning: Mustard	2.0
Asafoetida (Ingu)	Pinch
Oil	For seasoning

Method of Preparation

Soak dhal for 2 hours. Grind to a thick and slightly coarse paste. Blend in ragi flour; salt; curds; ginger garlic paste & turmeric powder. Pour the thick batter into a greased cooker container & steam immediately. Take it out & allow to cool. Cut it into cubes, season with oil, mustard, cummin seeds & asafetida. Decorate it with chopped leaves & coconut grated. Serve hot if desired with mint chutney.

65. Ragi Nuchchinunde

Ingredients	Quantity in grams
Ragi sprouted fresh	75.0
Green gram dhal	75.0
Methi greens	100.0
Green chillies chopped	10.0
Ginger grated	5.0
Onion Chopped	125.0
Coconut grated	40.0
Salt	For taste

Method of Preparation

Soak dhal for about an hour & grind coarsely. Grind coarsely the sprouted ragi also. Mix the two paste along with all other ingredients. Take small portions, give the desired shape, Steam in idli stand for 10-15 minutes. Serve hot with any chutney.

66. Ragi Sweet Kadubu

Ingredients	Qty. in grams
Ragi flour	50.0
Rice flour	50.0
Stuffing: Jaggery	100.0
Coconut gratings	50.0
Roasted Sesame	10.0
Roasted Poppy seeds	10.0

Method of Preparation

Boil water, add the flour, cook for 10.0 minutes, take it out & cool. Make small portions, roll into thin sheets, place mixed stuffing on the rolled sheet, close the sides, steam for 15 minutes. Serve hot with ghee.

If the same is made with wheat flour in place of rice flour it can be blended with cold water, follow the same method but fry instead of steaming. It can become Ragi Karjikai.

67. Ragi Halwa

Ingredients	Qty. in grams
Ragi	100.0
Jaggery	100.0
Cardamom powder	1 pinch
Ghee	25.0

Method of Preparation

Soak ragi for about 5-6 hours; grind into a fine paste. (If desired use ragi 75.0 gms & wheat 25.0 gms). Extract the milk from the ground ragi paste.

Allow to settle for some time & drain of excess top thin water. Add 1 glass of clean water, jaggery & start boiling with continuous stirring on medium flame. When half boiled/cooked (Starts frothing / forming gel) add ghee little by little with continuous stirring. Cook till it leaves the sides. Transfer to a greased plate & allow to cool for 10-15 minutes. Cut into desired shape, decorate with cashewnut, raisins, badam, coconut powder, popped grain amaranth etc. & serve.

68. Ragi Peda

Ingredients	Quantity in grams
Ragi fine malt powder	60.0
Khoa	100.0
Sugar powder	60.0
Raisins	10.0
Cashew nuts	10.0

Method of Preparation

Blend in khoa and sugar powder; blend together the fine ragi malt by continuous soothing. Make small portions, roll them in to round balls, flatten the ball to give peda shape, place one cashew nut & raisin on top, press a little. Allow to set, pack and serve when required.

69. Ragi Mysore Paak

Ingredients	Quantity in grams
Fine ragi flour	40.0
Besan Flour	60.0
Dalda	100.0
Sugar	120.0

Method of Preparation

Boil sugar with little water and develop into a syrup of drop consistency. Add Blended flour, continue stirring for flour to get cooked, continue until a double thread consistence is formed. Now add dalda little at a time, continue stirring. When all the dalda is blended, a fried aroma develops. Blend gives the appearance of a lump, transfer it to a greased plate, allow to set. Cut into shapes. Ragi mysore paak is ready to pack & eat.

70. Ragi Chewda

Ingredients	Quantity in grams
Ragi	100.0
Ground nuts	25.0
Roasted Bengal gram	25.0
Red chillies dry	5.0
Dry copra	25.0
Curry leaves	5.0
Mustard	For seasoning
Oil	For seasoning
Salt	For taste
Chilli powder	5.0
Turmeric powder	1.0
Garlic slices	5.0

Method of Preparation

Sprinkle & rub-in buttermilk on to ragi and keep it tied up for about 30 minutes.

Heat the roasting griddle. Take small quantities of treated ragi, sprinkle it on hot pan, place a dry cloth and rotate continuously for ragi to pop. Keep aside all the popped ragi. Roast ground nuts, rub & remove the skin. Take a frying pan, add oil for seasoning, add mustard, red chilli, garlic slices, turmeric and stir well. Add roasted Bengal gram, ground nut,

dry copra slices, curry leaves. Stir until golden brown and crispiness is achieved. Add salt, Chilli powder and blend in popped ragi, remove from fire, cool and pack. Use ragi chewda as snack when desired.

71. Ragi Khara Mixture

Ingredients	Quantity in grams
Ragi flour	50.0
Besan flour	40.0
Black gram flour	10.0
Salt	For taste
Chilli powder	For taste
Oil	For frying

Method of Preparation

Mix all the three types of flour; add salt, add 1 Table spoon of hot oil and rub into the flour. Use required amount of water, knead into a dough. Grease the chakli extruder, press the dough through the extruder directly onto hot oil, fry and remove. The ragi mixture is ready to be used as desired.



Green Ragi (milky Stage Pods)

Ragi in its milky stage that is 14 weeks after sowing yields milky juicy green fresh grain. This is called as “Kachakki” in Karnataka and is in practice to enjoy it in selected way especially by directly roasting on burning red coal and is eaten similar to maize/corn.

At this stage it has easily digestible carbohydrate and also rich in vitamins–C. In villages generally it is toasted on open fire, rubbed to separate the grain, to this jaggary, cardamom powder, grated coconut is added before eating.

**Nutrient content of Milky stage ragi and regular ragi grain
(Per 100.0 gm)**

Nutrients	Ragi Milky stage	Ragi dry grain
Moisture (%)	52.0	13.0
Protein gms	7.0	7.3
Fat gms	1.5	1.3
Minerals Gms	3.0	2.7
Fiber gms	3.0	3.6
Carbohydrate gms	85.5	85.0
Calories K cals	340	358
Calcium mg	305	344
Phosphorous mg	128	283
Iron mg	1.5	3.9
Magnesium mg	292	137
Zinc mg	-	2.3
Vitamin-C mg	9.5	-

72. Green Ragi Usali

Ingredients	Quantity in gms.
Green ragi	100.0
Onion chopped	50.0
Green chilli chopped	5.0
Grated fresh ginger	1 Tsp
Coriander chopped	2 Tsp
Mustard	$\frac{1}{4}^{\text{th}}$ tsp
Jeera	$\frac{1}{4}^{\text{th}}$ tsp
Turmeric powder	Pinch
Salt	For taste
Lemon	Half
Oil	1 Table spoon

Method of Preparation

Steam the ragi pods (Thene). Take a Kadai, season with oil, mustard, jeera, turmeric, chopped chillies and onion. Add salt and blend. Add cooked green ragi, squeeze lemon, add grated coconut and serve hot.

73. Green Ragi Soup

Ingredients	Quantity in gms.
Green ragi	50.0
Grated carrot	50.0
Tur Dhal	50.0
Lemon	Half
Pepper powder	For taste
Salt	For Taste

Method of Preparation

Mix all the three grains, add about 5 cups of water (500 ml) and cook soft. Beat the cooked grains, strain the liquid with a filter. To this add salt and pepper powder. Serve hot. If desired add 3-4 pieces of fried bread chunks.

74. Green Ragi Porrodge

Ingredients	Quantity in gms.
Green ragi crushed	50.0
Milk	500 Ml
Ghee	15.0
Sugar/Jaggary	50.0
Cardamom powder	5.0
Cashew nut & raisins	10.0

Method of Preparation

Roast the green ragi with little ghee, crush it coarsely. Add it to milk and boil on medium flame until grains are soft. Add sugar / Jaggary, cardamom powder, cashew nut and raisins. Serve hot or cold as desired.

75. Green Ragi Dosa

Ingredients	Quantity in gms.
Green ragi	100.0
Rice	30.0
Black gram dhal	20.0
Salt	Taste
Oil	To roast dosa

Method of Preparation

Soak rice & Dhal for 6-8 hours (Over night). Grind all the three into a smooth paste. Add salt, ferment the batter over night. Next day make dosa as usual serve with chutney.

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