**HEALTH BENIFITS AND NUTRITIONAL CHARACTERSTICS OF FINGER MILLET (RAGI)**

Eleusine coracana(Scientific name) is also know as finger millet or ragi. In Indiadue to its production ranks sixth after wheat,maize, rice,sorghum,and bajra has variety of names in India,.Crabgrass is often referred to by different names, such as Mandua/Mangal in Hindi, ragi in kannada,telgu and hindi, Mandia (Oriya), Kezhvaragu in Tamil, Taidalu in Telangana etc .

Millet is an annual seed grain and belongs to the grass family (Poaceae).In high altitude regions of Africa and Asia, where it is grown for its seeds there height varies from 30 to 150cm. The seeds are eaten in a variety of forms including unleavened bread made from ground flour. The seed colour are brown ,white,and dark brown.Variety of alcoholic beverages and porridge are also produced from the seeds of millet. Finger millet was harvested about 5,000 years ago from a subspecies residing in the highlands from Uganda to Ethiopia . At that time, domesticated finger millet was also harvested in the lowlands of Africa.

1. **NUTRITIONAL CONTENT IN FINGER MILLET**

From 5 to 3.5% minerals for all grains and millet, millet has the highest levels of calcium (344 mg%) and potassium (408 mg%). The grain is low in fat (1.3%) and contains mostly unsaturated fats.100 grams of finger millet contain an average of about 336 kcal of energy.

However, millet also contains phytates (0.48%), polyphenols, tannins (0.61%), trypsin inhibitory factors and dietary fiber, which were once considered “antinutrients” due to their metal chelating and inhibitory effects on enzymes (Thompson 1993), these however today still today are referred to as nutraceuticals.Because it is a non-glutinous millet, it is safe for people with gluten allergies and celiac disease.It does not form acids and is therefore easily digestible. Millet is rich in amino acids (tryptophan, threonine, valine, isoleucine and methionine).

**3. CULTIVATION (FARMING) OF FINGER MILLET**

Finger millet was domesticated about 5,000 years ago from a wild subspecies that lived in the highlands from Ethiopia to Uganda. At that time, domesticated finger millet was also cultivated in the lowlands of Africa.

**SOIL**

Can be grown in a variety of soils from rich loam to poor, flat upland soils with good organic matter. Chernozem with good drainage can also be considered for cultivation, as this cultivation is reasonably sustainable in waterlogged conditions. Finger millet grows best in soil with a pH of 4.5-8 Soils with water retention problems should not be used for growing crabgrass.

**LAND PREPARATION**

1) Cultivation pattern: When cultivating crabgrass, crop rotation is of great importance. It provides high yields, minimizes the use of chemical fertilizers and helps maintain soil fertility. In northern India, a crop rotation of millet with chickpeas, barley,tobacco,mustard and flaxseed is commonly used.

2) Intercropping: In Punjab soya and millets are mixed in a weight ratio of 90:100 and sowing is also done. Finger millet + soybeans in Kharif and oats in Rabi are an ideal and profitable cropping sequence for the northern highlands.

For rain-fertilized crops, plow the main field deeply 2-3 times to keep moisture in the soil. Before sowing, a post-processing with the cultivator and the multi-tine hoe must be carried out in order to prepare a smooth seedbed. Small soil smoothing operations must be carried out before sowing, which will allow better conservation of moisture on the spot.In Uttaranchal, where frequent plowing is difficult, effective turning and digging of the soil, removing perennial weeds, and to drain excess rainwater inward slopingwith shalow drain are made.

SOOWING

• SOOWING TIME

In areas of high rainfall, it can be grown as a transplant in well-drained soil. It can be grown in both rainy and irrigated conditions. It is grown in all growing weather in different regions of the country. More than 90% of the area is in rainy condition and farmed during kharif season.In Uttarakhand it usually grows in June.

• SPACING

Yields above or below the optimal population decrease the yield. For optimal storage, use a spacing of 25 x 15 cm (25 cm between rows and 15 cm between plants).

• SOOWING DEPTH

Seeds should not be sown deeper than 3-4 cm.

• METHOD OF SOWING

Sowing can be done manually by:

1) Line sowing

2) Drilling

3) Transplantation of field

4) Broadcasting

SEEDS

• Seed Rate

For higher yield, a crop stand of 1.6 to 2 lakhs per acre and a seed rate of 4 kg/acre are optimal for sowing in the main field. Ensure optimal crop coverage in the field by closing gaps and performing thinning work in the field.20–27 days after sowing, when the plants have already been planted in the field, when thinning out, it is necessary to remove the excess seedlings. If the plant population is not uniform, fill in the gaps with 20-25 day old seedlings as well.

• Seed treatment

Soak the seeds in water (1 liter of water per kilogram of seeds) for 6 hours. Remove the water and tie the seeds closely in a damp bag for two days. Remove the seeds from the wet bag after two days, they will show signs of germination. Dry them in the shade for two days. Use these seeds for sowing.Preferably the seeds are treated with Azospirillum brasilense (N-fixing bacteria) and Aspergillus awamori (P-solving fungus) at a rate of 25 g/kg seeds. If chemical seed treatment is to be carried out, chemical seed treatment should be completed first, and then proceed to biochemical seed treatment before sowing seeds. Apply all fungicides from below

Name and amount of fungicide/insecticide (rate per kg seed)

1) Thiram 4gm

2) Captan 4g

3) carbendazim 2 g

TRANSPLANTATION IN THE FIELD

Field transplant In areas with sufficient humidity, the method of transplanting is used. It gives a higher yield than no-till cultivation. Transplanted plants do not lie down in heavy rain.

• Sowing Method: Sow seeds in May-June in a well prepared nursery. To get enough seedlings to replant 1 hectare of land, you need about 2 kg of seeds. For transplanting, use seedlings that are three to four weeks old. Before harvesting the seedlings, the nursery should be watered. Prepare slurry of 2 sachets of 300g/acre of Azospirillum inoculants in 40 litters of water and dip the root portion of the cutting in the solution for 15-30 minutes and transplant. Two seedlings/hills are transplanted 25x8 cm or 25x10 cm apart and to a depth of 2-3 cm. On the third day after transplanting, the field should be watered. If it does not rain in time, the transplanted field should be watered regularly until the seedlings are well established.

**FERTILIZER**

Apply 5 to 10 tons of well-rotted cow manure or manure a month before sowing. Finger millet responds well to fertilizer utilisation , especially nitrogen and phosphate fertilizers. Do a soil test to find out the exact fertilizer needs of your soil. If soil test values ​​are not available, use the 60:30:20 N: P: K ratio for rain plants. When sowing, use the full amount of P and K and half the amount of N. The left half of the N dose should be applied two or three times (30 and 50 days after sowing) depending on moisture availability control of herbs

WEED CONTROL

In the initial stages of cultivation, weeding is necessary for good plant growth and yield. When working in rows, 2-3 operations of cultivating catch crops and weeding are required with one hand.For effective weed control use a pre-emergence herbicide such as Oxyfluorfen at 1.25kg/AC or Isoproturon at 400g/AC. For effective weed control, post-emergence spray with 2-4-D sodium salt at a rate of 250g/acre about 20-25 days after planting.

IRRIGATION

Irrigation is not required as crabgrass is rainy weather crop.But during the tillering and flowering phase, when there is no rain for a long time, irrigation is necessary for good plant growth and harvests. The furrows and heaps prepared for irrigation are used for both irrigation and drainage.

This crop cannot withstand in waterlogged condition, therefor care should be taken for complete removal of excess water.

No. of Irrigation Irrigation Interval

1st irrigation Immediately after sowing

2nd irrigation. On 3rd day after sowing

3rd irrigation On 7th day after sowing

4th irrigation On 12th day of sowing

5th irrigation On 18 th day of sowing

**PROTECTION OF PLANTS**

• Pest and their control

**1)** **Army Worm and Owl Worm**: appear at the beginning of the cultivation phase. Cut off the base of the caterpillar plant at the beginning of cultivation. They are active day and night, hiding in crevices and under rocks. They are cyclic

Control: To prevent worm eggs, release the parasitoid Trichogramma on the 3rd floor once a week. Uninterrupted weeks, if symptoms are noted apply malathion 5% at 10kg/week or chinalphos 1.5% at 250ml/week. Remove weeds and stubble after harvest.

**2) Aphids:** Present throughout the growing season. They can be observed at the mid-spiral and at the tips. When infested with aphids, yellowing of the leaves can be observed. Aphid nymphs are round in shape and reddish-brown in color. Adults are yellow with green legs. Control

: If an infestation is observed, control by spraying Methyldemeton 25EC at 80ml/acre or Dimethoate 30EC at 200ml/acre mixed in 100L of water.

**3) White stem borer:** The larvae is located in the bottom part of the stem and cause degradation They grow on the roots and if the infestation is severe, the central shoots dry out and turn yellowish. The larva is milky white with a yellowish head, while the adults are dark brown-white on the forewings. Control

: If infestation is observed, spray Carabaryl 50WP at 1kg/acre or Dimethoate 30 EC at 200ml in 100L of water

**4) Ear head bug:** The adult animals infest the cultures in the milk stage. They feed on the emerging cobs of corn and form paillettes of silky cobwebs. The eggs are glossy white and lie in clusters with orange hairs. The caterpillars are brown with a yellow stripe and fine hairs. Adults are brownish in color with fibrous forewings and yellowish hind wings.

Control: Light traps should be set up during the day to attract adult moths. Place a pheromone trap at a distance of 5/hectare from flower to panicle stage.In case of heavy infestation, spray 400 ml malathion or 600 g carbaryl in 100 l water per hectare.

**5) Grass hopper:** The adults and nymphs feed on leaves. Nymphs are whitish in color with lines while adults are greenish-brown in color with lines on the body.

Inspection: After harvest, remove all plant debris and ensure proper hygiene and cleanliness in the field. In the summer, also plow after harvest so that the eggs in the soil are exposed to the sun and then destroyed. In dry and wet conditions, use Entomophthora grylli to control locusts. If infestation is observed, spray Carbaryl 50 WP@600 g/acre.

**6) Leaf folders:** The leaf folds lengthwise and the larva stays inside. They rub against the leaves and then white spots are observed on the leaves. The female lays 200 eggs on both sides of the leaf. The eggs are yellowish white. The larva is greenish yellow with a brown or black head. The pupae are dark brown and are located in the folded leaf, while the adults are whitish-yellow or golden yellow.

Control: crop rotation with non-cereal crops. Keep the pitch and the area around the pitch clean. Avoid closer spacing when planting. Collect and destroyed infected leaf and plant parts away from fields. Spray Chlorpyriphos@2.5ml or Quinalphos@2.5ml or Acephate@1gm or Carbaryl@1gm or Cartap Hydrochloride@2gm/Ltr.

**Diseases and their control**

Blast: If the infestation is severe, the plant appears infested or burned, and deposits from the crop are visible. This happened mainly during the kharif season in all stages of growth. If downy mildew occurs during the rearing phase or during the ear development phase, a significant drop in yield can be observed.

Control: Breeds cultivars resistant to late blight. Before sowing, treat the seeds with a carbendazim-type fungicide at a dose of 2 g/kg.If the infestation is severe, the entire plant will turn yellow. Infected plants produce more nodal branches and unproductive shoots.

Control: If symptoms are observed, uproot and remove the infected plant and destroy outside the field. Take Methyl demeton @ 25EC 200ml/Acro-Spray. If necessary, spray the second spray every 20 days.

**HARVESTING**

Plants typically mature in 120–135 days, this time may vary depending on strain usage. The harevesting is two way procedure The cobs are produced with a sickle and the straw is removed close to the ground. The earmuffs are bought and then dried in the sun for three to four days. After a sufficient drying period, the threshing begins.In some area the complete plant, including the brambles, is harvested , dug up and dried in the sun for two to three days, and then threshed.

**POST HARVEST**

Finger millet malt is a traditional process used in India and used in the preparation of baby formula and the thickening of milk, conveniently called ragi malt, and used in the preparation of milk beverages. In some parts of the country, the grain is also used to make a fermented drink or beer.

**4. FINGER MILLET PRODUCTION (COUNTRY/STATE)**

Finger millet, also called Ragi, is grown in Africa, India, Nepal and many Asian countries. It is important millet that is widely grown in different parts of India and Africa.

In India, ragi (cranberry) is mainly grown and consumed in Karnataka and to a lesser extent in Andhra Pradesh, Tamil Nadu, Odisha, Maharashtra, Uttarakhand and Goa.

Important for small farmers as it can be used in catch crop systems (with corn, sorghum and/or legumes) to generate additional income. Produces reasonable yields in low-input farming systems. It can survive in poor soil. Countries producing finger millet include:

* 1. India
	2. China
	3. Mali
	4. Burkina fas
	5. sudan
	6. ethiopia
	7. chad
	8. sengea

9.Nigeria

10.niger

**5. HEALTH BENEFITS OF FINGER MILLETS**

Finger Millet is a rich source of natural calcium, which strengthen bones in growing children and the elderly. Excessive use of millet is good for bone health, prevents problem like osteoporosis, and may decrease the chances of fractures.

Facors like polyphenols,phylates, and tannis acts as antioxidants and play important role in health, aging and metabolic diseases.

The phytochemicals in finger millet help to slow down the digestive process.Helps control blood sugar levels in diabetics. The millet finger diet controls diabetics because it has more fiber than wheat and rice. The study also found that a whole millet had a lower glycemic response; H. a reduced capacity to raise blood sugar levels. This is due to the presence of property of finger millet flour that reduce starch digestibility and absorption.

Due to its high nutritional content, ragi flour is recommended as food for young children, especially in southern India.

Millet is an excellent source of natural iron and its consumption helps treat anemia. Ragi foods are very suitable for pregnant women and the elderly due to their high calcium and iron content.

Consuming crabgrass naturally helps to relax the body. It has a positive effect on anxiety, depression and insomnia. It is also useful for migraines.

Green Ragi (millet) is recommended for high blood pressure, liver disease, asthma and heart failure. Green ragi is also recommended for breastfeeding mothers with milk deficiency.

Regular consumption of crabgrass can help prevent malnutrition, degenerative diseases and premature skin aging.

Ragi is also a rich source of iron. 100 g Ragi contain 3.2 mg iron. Since iron deficiency in the body causes anemia, adding ragi foods to the diet helps cure anemia Millet is therefore an exceptionally nutritious grain and very conducive to maintaining good health. Therefore, attention has been drawn to their potential role as functional foods. Millet can be consumed in various forms and dishes. Ragi dosa, rice, porridge, upma, cakes and biscuits are favourable millet (ragi) dishes.

Daily consumption of raga in controlled portions helps improve the transmission of nerve impulses, activate memory centers in the brain and relax the mind by increasing levels of the amino acid tryptophan. Because tryptophan balances levels of the neurotransmitter serotonin, ragi helps treat anxiety and insomnia, boosts mood, and promotes sound sleep.

IBS refers to Irritable Bowel Syndrome, a common bowel disorder that causes excruciating pain as well as abnormal bowel movements, diarrhea, bloating, and constipation.

Ragi is packed with beneficial fiber in greater amounts than many other grains like wheat, barley, and oats. Eating foods high in fiber has a positive effect on intestinal peristalsis, regulates stool volume and promotes the optimal passage of food and other substances through the intestine. So, eating an oatmeal ragi meal for breakfast stimulates a healthy metabolism, relieves symptoms of irritable bowel syndrome, and even helps prevent the risk of colon cancer.

**6) DISADVANTAGES OF FINGER MILLETS**

Its high consumption and amount of oxalic acid in the body is directly proptional to eac other. Therefore kidney stones (urolithiasis) patient are advice to reduce its intake. Millet is gaining popularity due to its many benefits, but the nutritionist points out that the phytic acid it contains can reduce the absorption of other nutrients. Also, it can be uncomfortable for some people's gut health. Anupama Menon is on the way to incorporating millet into her diet.

The glycosides contained in Ragi can easily be converted to thiocyanate by enzymes when ingested. This thiocyanate has been linked to goiter in a population that regularly consumes millet and cassava. Consuming Ragi is believed to negatively affect thyroid and pancreas function. Therefore, it can stunt growth. Ragi can also cause pathological changes in the liver.

Excessive consumption of Ragi foods can increase potassium levels in the body. This can lead to problems like tingling, nausea, and chest pain.