Little Millet: An Indigenous Grain

Biswa Sankar Das[1*], Susanta Sekhar Choudhery[2], Pulaka Ranjan Nayak[3]

Department of Seed science, Odisha Millets Mission, Odisha
Watershed Support Services and Activities Network, Hyderabad, India
*Corresponding Author

Received:- 11 April 2023/ Revised:- 18 April 2023/ Accepted:- 25 April 2023/ Published: 30-04-2023
Copyright @ 2023 International Journal of Environmental and Agriculture Research
This is an Open-Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (https://creativecommons.org/licenses/by-nc/4.0) which permits unrestricted Non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract— *Little millet is a small seeded cereal grain defined very familiar due to its climate resilient smart crop with encouraging for its essential elements composition and nutritional benefits such as Low calorie content with high fiber helps in weight loss, High Protein content helps for muscle growth, Rich in antioxidants and minerals which improves immunity. Little millet have abundance of calcium, iron, zinc, dietary fiber up to 38.0 %, Protein 10-11 % with polyphenol content provides them an edge over staple cereal crop. This article covers Data in a strategic manner, History and Origin, Taxonomy, Crop management with Indigenous to Improved Practices, Weeds and management, Processing techniques and Value addition process techniques. Millets are a small seeded cereal crop have been playing as a staple food in many parts of world. These are of many different types which all have unique characters, unique traits, unique health benefits, Wherever Little millet is a millet type has been used across many parts of world like, China, East Asia, India and Malaysia, where as it is native to India and called as "Indian Millet". The Species name is based on a Specimen collected from Sumatra (Indonesia) (deWet etal.1983) . it is used to make many more value added food products, fermented foods, healthy foods, which are stores in large supermarkets throughout the country and it's widely used as a Alternative to Rice replacement*.

Keywords— Crop management, Little millet, Processing, Traits, Weeds.

I. INTRODUCTION

The Scientific name of Little millet is "Panicum sumatrense" is a species of millet in the family "Poaceae". Little millet is an annual herbaceous plant that is cultivated as a cereal crop in the Arid to Semi- arid regions of Asia, East Asia, India. It is a tetraplod and Self-pollinated species that most likely descended from Indian peninsula (Weber and Fuller, 2007) . There are two races of Little millet "Panicum sumatrense" and "Panicum milicare" (House et al.2000) .

Little millet is grown throughout India up to altitude of 2100m.Although the Origin of Little millet is not clearly evidenced much favors for Indian origin because Endemic nature to India.

1.1 Taxonomic Rank:

- Kingdom – Plantae
- Clade - Tracheophytes
- Clade - Angiosperms
- Clade - Commelinirs
- Order - Poales
- Family - Poaceae
- Genus – Panicum
- Species – P.sumatrense

II. HISTORY

History: Little millet (Panicum sumatrense) (Roth.ex Roem & Schult) is all so known as "Miliare". It is widely cultivated as a cereal across India, Neapal, and western Myanmar. It is particularly important in Eastern ghats of india. where it forms an important part of tribal agriculture practice.

2.1 Origin, Domestication and Botanical Description:

Little millet (Panicum sumatrense) was originated in Indian peninsula (Weber and Fuller 2007) . The genus Panicum has two species which usually reported as Tetraploid in nature with 2n (Diploid chromosome set) is 36 (Hamoudetal: 1994: Moulik, 1997), although Chen and Renvoize (2006) report a hexaploid nature of Panicum sumatrense with 2n=54 chromosome number. Panicum sumatrense is a domesticated species of Little millet cultivated mainly in India and usually reported as tetraploid with 2n = 36, distributed in India, Nepal, Pakistan, Srilanka, Eastern Indonesia, Western Myanmar. There are two races of Little millet, namely "nana" and "robusta" (House et al; 2000), in the "nana" have constitute a height of 60 -70cm., the inflorescence is 14-15cm., erect, open and highly branched. The branches sometimes droop at maturity. Plants in the race "robusta" have constitute 120 -190 cm. of plant height (tall), the inflorescence is 20-45cm. long, opening compact, and highly branched. It is primarily a self-pollinated crop that grown throughout India in a altitude of 2100meter.

2.2 Growing Regions in India:

The Little millet growing states in India are Odisha, Gujarat, Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, Tamil Nadu, over an area of 2.34 lakh ha with total production of about 1.27 lakh tones with productivity 544 kg / ha during the year 2015 -16 (IIMR Research Bulletin) . As a result of the multi – prolonged approach, Little millet is cultivated over an area of 3837 hector, with total production about 21.20 tonnes, with productivity 511 kg / ha during kharif 2021-22 of Odisha.

TABLE 1
LOCAL NAMES OF LITTLE MILLET

Language	Local name
Hindi	Kutki, Thoda Bajara
Bengali	Sama
Kannada	Same
Gujarati	Gajro, Kuri
Telugue	Samalu
Tamil	Samai
Marathi	Gajro
Odiya	Suan, Guruje suan

TABLE 2
STATE WISE VARIETIES OF LITTLE MILLET

Sl.no	State	Varieties
1	Odisha	OLM -203, OLM-208, OLM-217
2	Madhya Pradesh	JK – 4, JK- 8, JK -36
3	Andhra Pradesh	Olm-203, JK -8
4	Tamil Nadu	Paiyur 2, TNAU 63, CO-3, OLM -203, CO-4, K-1, OLM -20

2.3 Climate Requirement:

Little millet originated in south-east Asia and is now a days it is grown throughout india, particularly in Madhya Pradesh, Odisha, Jharkhand, Andhra Pradesh, Tamil Nadu and Uttar Pradesh in mostly kharif season.

In the temperate zones of Asia: China, East Asia, also in tropic continent of India, Indo china, Malaysia are major crop grown area which can withstand both drought and water logging situations as it is known as climate resilient crop. it can be cultivated up to 2000 meter above sea level. So, it have concluded that, Little millet is best for tropical and sub-tropical regions with a long growing season.

2.4 Soil:

The best soil for Little millet are alluvial, loamy, sandy soil with good drainage capacity, less water holding capacity, deep loamy fertile soil rich in organic matter are preferred for best growth.it can also withstand salinity and alakanity to some extent. As in other small millets are cultivated in rusticated to tribal areas with marginal lands. Little millet is a drought tolerant crop that can grow in various soils in a PH range 5.5 to 6.5, with good source organic matter is preferred the best soil and retains the adequate moisture content.

2.5 Temperature:

Little millet requires a minimum temperature of 20* C and it prefers a range of 25*C to 30*C. It can tolerate temperature up to 35*C, but higher temperature may reduce crop yield.

2.6 Rainfall:

Little millet requires a minimum rainfall of 750 -800 mm (30 -32 inches) in annually, with a consistent water supply throughout the growing season. Drought conditions can severely impacts on crop yields.

2.7 Season:

- Odisha – Middle of June
- Tamil Nadu – June and September –October
- Karnataka, Madhya Pradesh and South Bihar – Last week of June to first week of July

III. PACKAGE OF PRACTICES

- Seed rate:
  - 8 kg / ha for line sowing
  - 12 kg / ha for broadcasting
- Spacing: 20 -22.5 cm between rows and 10 cm between plants within a row
- Manures and Bio-fertilizer:
  - Manures is needed Five tons of farm yard manure per one hector during 2-3 weeks before sowing.
  - Bio –fertilizer: Seed inoculation with Agrobacterium radiobacter and Aspergillus awamori improves production and quality of seed yield.

IV. GROWING PRACTICES

Basically the farmers used the landraces in tribal areas in where it cultivated, or the local seeds available. There are four types of sowing methods adopted by farmers in respect to their indigenous cultivation practice.

4.1 Broadcasting:

Seeds are immediately sown in the field during the first phase of sowing time. This approach is frequently used because it is simple and does not call for a specialized mechanism. The average seed rate is 15 kg / ha, or slight more than that due to the mind setup of farmers to maintain proper plant population.

4.2 Line sowing:

This is a better than the broadcasting in where the crops and weeds are easily distinguish, which also facilitates weed management. When using this technique the lines should be 22.5 – 25 cm. distance. The average seed rate is 8kg / ha.

4.3 Row by Row drilling:

Using a direct seed drill, seeds are drilled directly in to unrented soil. The average seed rate is 8 kg / ha.

4.4 Transplanting:

The seedlings are raised in nursery beds with appropriate specification. At the age of 25 days old seedlings should be transplant in main field with spacing of 22.5cm x 10cm (R x P), or 25cm x 10cm (R x P) according to season specific. The required seed rate is 10 kg / ha.

V. CROPPING MODEL

It constitutes the Cropping system and the Cropping sequence as preferred by the farmer.

5.1 Cropping system:

A cropping system refers to the type of crops grown in a combined approach and practices used for growing them. Cropping systems have been traditionally structured to maximize crop yields.

- For Odisha – Little millet + Black gram (2:1) row ratio
- For Madhy Pradesh – Little millet + Sesamum / Pigeon pea (2:1) row ratio

5.2 Cropping sequence

A cropping sequence refers to growing two crops in the same field, one after the other in the same year.

- For Odisha – Little millet (short duration) – Horse gram / Black gram, or Green gram.
- For South Bihar – Little millet – Niger

VI. CROP CARE MANAGEMENT

6.1 Water management

Little millet is majorly a rainfed crop, drought tolerance, climate resilient crop that does best where there is an average rain fall less than 1000 mm (750 -800 mm) of annually to complete the crop cycle. Where as in irrigated condition it requires the first irrigation at 25 -30 Days after transplanting, and second irrigation at 45 – 50 Days after transplanting.

6.2 Manure and Fertilizer management:

6.2.1 Manure management

A well decomposed farm yard manure of 5 tones / ha requires before sowing / transplanting as a basal dose.

6.2.2 Fertilizer management

On the basis of soil structure and soil profile a recommended dose of fertilizer in the form of N: P2O5: K2O requires for good production,

For Andhra Pradesh: 20: 20: 0 kg / ha

For Bihar & Odisha: 20: 10: 0 kg / ha

For Other states: 20: 20: 0 kg / ha

VII. WEEDS AND THEIR MANAGEMENT

7.1 Important weeds

Among grassy weeds, Echinochola colonum, Echinochola crusgulli, Dactyloctenium acgypticum, Elusine indica are the major weeds found in little millet crop field.

7.2 Weed Control

Two inter –cultivation and one hand weeding in line sown crop and two hand weeding in broadcasted crop are necessary for effective weed control. In transplanted crop field three times of mechanical weeding by use cycle weeder is most effective for better crop yield.

VIII. MAJOR DISEASE AND THEIR MANAGEMENT

TABLE 4

Common name & Scientific name	Casual organism	Nature of Damage	Management
Grain smut (Macalpino mycessharmae)	Ustilago paradoxa	The Ovary is converted in to smut sorus	Adopting resistant cultivars (OLM-208, CO2), Seed treatment with Carbendazim (contact fungicide) @2gm /kg, Delayed sowing
Brown spot (Seedling blight or Leaf blight)	Helmintho sporium	Appearance of brown to Dark brown spot on leaf lamina especially found in older plants. Under high humidity condition fungus lesion formation seen	Seed treatment with contact fungicide (Carbendazim) @ 2gm / kg seed

IX. MAJOR PEST AND THEIR MANAGEMENT

TABLE 5

Common name & Scientific name	Casual organism	Nature of Damage	Management
Shoot fly	Atherigonia pulla	It affect on centrally shoot which shows the dead heart formation, Damaged tillers are all so formed	Using higher seed rate Using fish trap Using carbofuron 3G @1.5 Kg / ha Spraying quinolphos @2ml / lit effectively reduced shoot fly infection

X. HARVEST AND HARVESTING TIME

Kharif season crop: September to October

Basically the harvesting procedure at crop maturity stage is followed by single harvest either the panicle, or the entire plant body is harvested.

XI. THRESHING

Threshing in Little millet refers to separating the grains from plants stem to panicles and chaffs. It can be done manually by beating the plants with a stick, or using a machine such as thresher.

XII. YIELD

The Yield of Little millet depends on various factors such as soil fertility, soil moisture content, cultivar used, weather condition and crop care management. the optimum yield will 12 -15 qt / ha (5.0 – 6.5 qt / acre) .

XIII. STORAGE

For Grain Purpose: After threshing the produce (seed) will thoroughly dry to a moisture level up to 10 -15 % and stored in gunny bags which will maintain its self-life up to two years. No fungal contamination will seen.

For Seed Purposes: Once cleaned, free from other inert materials, it is recommended to store at moisture content level 10 -12 % to prevent spoilage and insect infection. The seeds should be stored in a dry and cool place in a container of gunny bags, earthen pots in order to prevent rancid, or attracting pests. Sealed containers, or gunny bags are the good storage choice for a longer period up to two years will be a good quality of seeds. It is essential to store the seeds in a place free from moisture, as this can cause the seeds to spoil. In some Indigenous seed storage practice the cleaned and well maintained seed materials are mixed with dried neem leaf and pongamia leaf for to prevent seed borne diseases for a longer period.

XIV. PROCESSING

Similar to other millets, Little millet is also required to undergo certain basic steps of primary processing operations such as cleaning, grading, and separation where in removal of unwanted materials like stones, soil particles, stalks, chaffs and grains of other crops. These operations are also important for adding value to the produce from the point of view of getting better returns from sailing.

14.1 Milling

The milling process of Little millet have so many process steps. Like other grains processing it involves three primary tasks:

- Size Grading
- Density Grading

14.2 Hulling Grading (referred to as de husking)

An eccentric or vibrating grader is used to achieve size grading and a destoner is used for density grading and an impact to share huller is used for hulling.

XV. IMPORTANT VALUE ADDITION PROCESS

15.1 Roasting

Customary roasting of grains is utilized to improve Flavor, test, yet different advantages incorporate decrease of antinutritional properties.

15.2 Malting

Malted millet is said to be nutritionally superior to un malted one. The complete process of malting mainly includes four stages viz. soaking, germination, roasting and milling, where the most desired physcio –chemical changes occurs during soaking and germination stages (swami et al.2013) .

Malting is the process of steeping germinating and drying grains to convert it into malt in where germination and sprouting involves a number of enzymes to produce the changes from seed to seedlings. The malt producer stops this stages of the process when the required enzymes are optimal.

XVI. HEALTH BENEFITS OF LITTLE MILLET

- Low calorie content and high fiber content which helps in weight loss.
- High protein content for muscle growth.
- Rich in antioxidants and minerals which improves immunity.
- Loaded with B-vitamins, which helps in metabolism and energy production.
- Helps in reducing cholesterol level.
- Little millet is rich in Magnesium which helps to improve heart health.
- It also rich in Niacin which helps lowers the cholesterol level.
- Little millet contains Phosphorus which is important for weight loss, tissue repair and energy production after strenuous workout.
- It helps detoxify the body.

XVII. CONCLUSION

The Little millet having its high enrich high fiber, high protein and rich source of antioxidants have been provided many more medical advantages and additionally it is similarly wealthy in sugar, energy and sustenance making significant element of dietary and wholesome adjusted food sources. Little millet is also a climate resilient, smart crop in rainfed agro ecosystem contributing a major livelihood supports to the farming communities. Little millet farming can be a lucrative and sustainable agricultural venture for farmers. It has a high nutritional values and rich in essential elements making a valuable addition to

the diet of humans. It has a high demand in the market, both domestically and internationally, making it a viable option for harmers looking to sell their produces.

REFERENCES

[1] Padulosi, S., Bhag Mal, B., Ravi, S., Gowda, J., Gowda, K.T.K., Shanhakumar, G., Yenagi, N. and Dutta, M. (2009) .

[2] Food security and climate Change: role of plant genetic resources of minor millets. Indian J.Plant Genetic Resources, 22(1) : 1-16.

[3] AICRPSM, 2017. Annual progress Report:2016-17, AICRP on Small Millets, 2. Agronomy, Bengaluru, pp.10, available at: http://www.aicrpsm.res.in/Downloads/Reports/2-Agronomy-report.pdf(accessed on:21 December, 2019) .