

Finger Millet: The Grain of Goodness

Swagata Thakur

M.Sc. Scholar, Plant Pathology, ICAR-Indian Agricultural Research Institute

ARTICLE ID: 92

Introduction

The agricultural transformation towards a more productive system has been done through productivity-enhancing technologies and a significant expansion in the use of natural resources. This trend also led to forgoing crop diversification which is important for the sustainability of the system. Most developing nations are currently seeing a decline in the acreage and output of conventional crops. Despite this, traditional crops continue to play an important role in many rural households' dietary needs and incomes in many regions of the world. Minor coarse grains are one such traditional category of cereal crops. Among the small millets, Finger millet (*Eleusine coracana*), commonly known as *Ragi* or *Mandua* is a nutritionally important coarse cereal and a traditional crop widely grown under varied agro-climatic regions, especially in semi-arid areas of African and Asian countries and plays the key role in the livelihood of small-holder farmers in these regions. It is one of the most significant small millets in the tropics (12 percent of global millet area) and is grown as grain and fodder crops in over 25 nations across Africa and Asia. Finger millet is a member of the Poaceae (Graminae) family and Chloridoideae subfamily and is commonly grown as a rainfed crop on marginal soils even with inadequate management methods. The name 'Finger millet' has been derived from the shape of its panicles, as spikes look like fingers and thumb.

Centre of Origin and Genetic background

Finger millet belongs to the grass genus *Eleusine*, which includes nine annual and four perennial species native to Africa except for the New World species *E. tristachya*. Finger millet is originally native to Ethiopia and was introduced to India around 4000 years ago. Cultivated finger millet (*Eleusine coracana*) is a significant subsistence crop in regions of Africa and South Asia which is further divided into two subspecies *africana* and *coracana*. There are two races in the subspecies *africana*: *africana* and *spontanea*, and four races in the subspecies *coracana*: *elongata*, *plana*, *compacta*, and *vulgaris*. Races *vulgaris*, *elongata*, *plana*, and *compacta* evolved from race *coracana*. The cultivated *E. coracana* is an



allotetraploid with the chromosomal number of $2n=4x=36$ (genome constitution AABB) and a total genome size of 1,593 Mb. It has morphological similarities to both *E. indica* ($2n=18$) and *E. africana* ($2n=36$).

Favourable Environmental Conditions

Finger millet is a largely self-pollinating crop with a little proportion (1%) of wind-mediated cross-pollination. Finger millet is more adaptable to a wide range of environmental and climatic conditions than most other tropical cereals, thrives at greater elevations (up to 2,300 meters above mean sea level), and withstands salinity better than most of the cereals. This resilience of the crop to hot and dry climates or CO₂-deficient conditions may be due to its C₄ nature. The wild varieties thrive with rainfall as low as 300 mm per year, whereas the cultivated ones require 500-1000 mm of rainfall.

Production and productivity of Finger Millet

Millions of poor people rely on finger millet crop as a staple meal, and it is commonly farmed in semi-arid parts of Eastern and Southern Africa, as well as in South Asia. Finger millet is also known by various local names in different parts of the World and in India; it is commonly called as Ragi, Mandua or Nachani and other names in different languages/regions. Uganda, Ethiopia, India, Nepal, and China are the world's top finger millet-producing countries. The yearly global output of finger millet is estimated at around 3.7 million tonnes from a total area of about 6.1 million hectares with a productivity of 600 kg/ha. It is the most important small millet in the tropics covering 12% of the global millet area. In India, ragi stands first in importance amongst small millets. The crop constitutes about 81% of the minor millets produced in our country. Finger millet is grown on 1.00 million hectares in India, with a total yield of 1.76 million tonnes and average productivity of 1747 kg per ha. It comes in third place among millets, behind pearl millet and sorghum, and sixth place among Indian cereals, behind rice, wheat, maize, sorghum, and bajra. In India, the area under finger millet cultivation is declining, as is the production, although productivity has grown with time due to the introduction of newly improved varieties. Karnataka, Tamil Nadu, Uttarakhand, Maharashtra, Andhra Pradesh, Odisha, Jharkhand, Gujarat, West Bengal, Bihar and Chhattisgarh are the major finger millet-growing states. The major millet growing states are listed below along with area and production.

Table: Statewise Area, Production and Productivity of Finger Millet**Source: Selected State-Wise Area, Production and Productivity of Ragi in India (2020-**

State/UT	Area('000ha)	Production (000Tonnes)	Yield(Kg/ha)
Andhra Pradesh	33(2.85%)	39.5(1.98%)	1197
Gujarat	10.47 (0.90%)	12.62 (0.63%)	1205
Karnataka	785 (67.71%)	1369.83 (68.55%)	1745
Odisha	41.31 (3.56%)	32.88(1.65%)	796
Tamil Nadu	82.92 (7.15%)	288.64 (14.44%)	3481
Uttarakhand	89 (7.68%)	129.85 (6.50%)	1459
West Bengal	6.03 (0.52%)	6.47 (0.32%)	1073
All India	1159.4 (100%)	1998.36 (100%)	1724

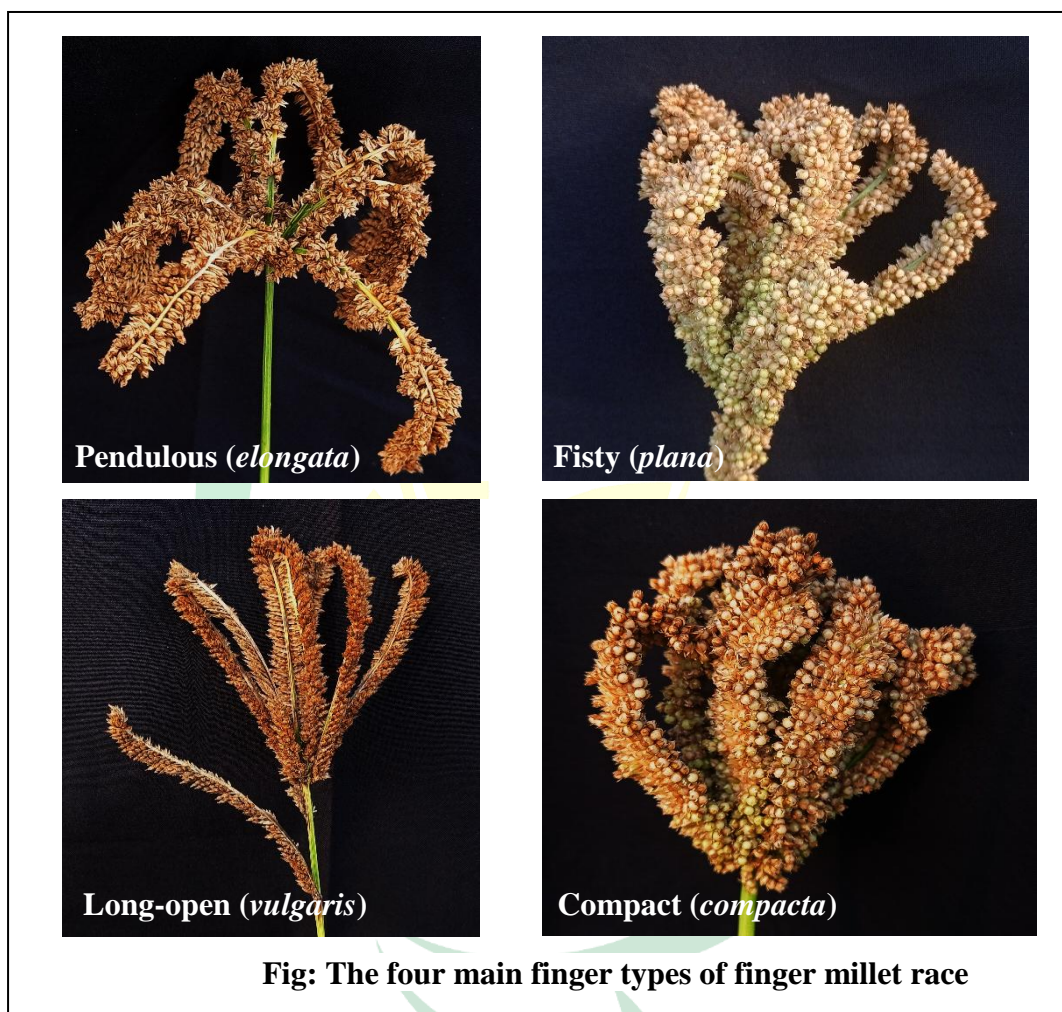
2021)**Morpho-physiological characteristics of finger millet**

Finger millet is a robust, tufted, tillering annual herbaceous grass, that grows to a height of 30-150 cm in average and can reach up to 170 cm. Maturation generally takes 75-160 days. The stem is erect or slightly kneeed.

The leaves are small, linear, distichous and grassy, with many tillers and nodal branches. The leaf blades are firmly keeled, and tough to break and are 220-500 mm long and 6-10 mm wide. The leaves and culms are typical green in colour and have a prominent flattened appearance. It has a thick root system. The leaf sheaths are open and glabrous with ciliate edges. Only little portions of internodes are revealed since the leaf sheath envelops the whole stem. Internodes are not of the same length, and at the base, they are quite short.

The inflorescence is a panicle with 4-19 finger-like spikes organized in a bird's foot pattern that, when developed, resembles a fist, so the name finger millet. Spikes can be open or closed, digitate or sub-digitate. The spikes can be seen with up to 70 alternating spikelets of 5-8 mm length and 3-4 mm breadth, each containing 4 to 7 tiny seeds. Finger millet may be divided into five races based on inflorescence morphology. The race *coracana* has 5 to 20 well-developed central spikes. The spikes are straight and thin, with a

length of up to 11 cm. Inflorescences of the race *vulgaris* have incurved or straight spikes. The *compacta* race (Cockscomb finger millet) possesses incurved spikes with lower finger branches. The *plana* race has enormous spikelets organized in two equal rows along the rachis, giving the head a ribbonlike appearance, while the *elongata* race has long, narrow spikes that are incurved at maturity and can reach lengths of up to 24 cm.



Eleusine grains are unique in that the pericarp is not attached to the testa below and can be readily removed. The grains are round or oval in form and range in colour from light brown to reddish brown to dark brown and white.

Importance and nutritional value

Finger millet is regarded as wonderful millet due to its exceptional storage quality and strong nutritional and therapeutic values. These attributes make the finger millet a potential food security crop for future. With the increased awareness of proper nutrition and a healthy

lifestyle, the higher income sectors of society is also attracted towards millets and have increased consumption of finger millet. It is rich in protein and carbohydrates as well as minerals such as iron and calcium. Finger millet has 40 times extra calcium of rice and maize, 10 times than that of wheat, and three times of milk. The grains are high in protein (7.3%), dietary fiber (3.6%), minerals (2.7%) such as calcium (344 mg/100 g), phosphorus (283 mg/100 g), and iron (3.9 mg/100 g), as well as phytates, phenolics, and amino acids (tryptophan, cystine, and methionine), all of which are very essential for human health and growth. Low glycaemic index of finger millet leads to a decrease in the rate of glucose absorption and consequently lower insulin demand. Regular use of finger millet has a number of health advantages, including hypocholesterolemic, hypoglycemic, and anti-ulcerative properties. The nutritional quality of finger millet grain makes it an ideal food for expectant women, lactating mothers, children, the sick, and diabetics. Finger millet grains may be used to make a variety of items. In India, it is used to prepare a wide range of food products including vermicelli noodles, sweet mixes, soups and papads. Over 75% of the total grain production of finger millet is utilised in the preparation of traditional foods such as keelsa, dosa, idli, porridge, roti, papad, and others. It is also used to make bhakhari, ambil, and papad in Maharashtra's Konkan area as well as Goa. Malted finger millet (sprouted seeds) as a food is nutritious, easily digested, and is recommended particularly for infants and the elderly persons. Its stover contains up to 61 per cent total digestible nutrients. The dual purpose (grain and dry fodder) nature of the crop and high multiplication rate of finger millet makes it one of the ideal crops for use as a staple food crop and as an indispensable crop component in mixed crop-livestock system of farming prevalent in semi-arid tropics.

So, this is the call of time to increase the area under cultivation of finger millet and to commercialize the crop to its fullest both in public and private ventures for our benefit of health as well as to increase farmers' income.