

Proso millet:

Importance and cultivation

Avinash Singode*, Rajendra R Chapke, Sangappa, Balakrishna Domathoti, P G Padmaja, Venkatesh B Bhat, V M Malathi, R Venkateswarlu, Seva Nayak Dheeravathu and C V Ratnavathi

ICAR- Indian Institute of Millets Research, Rajendranagar, Hyderabad, Telangana 500 030

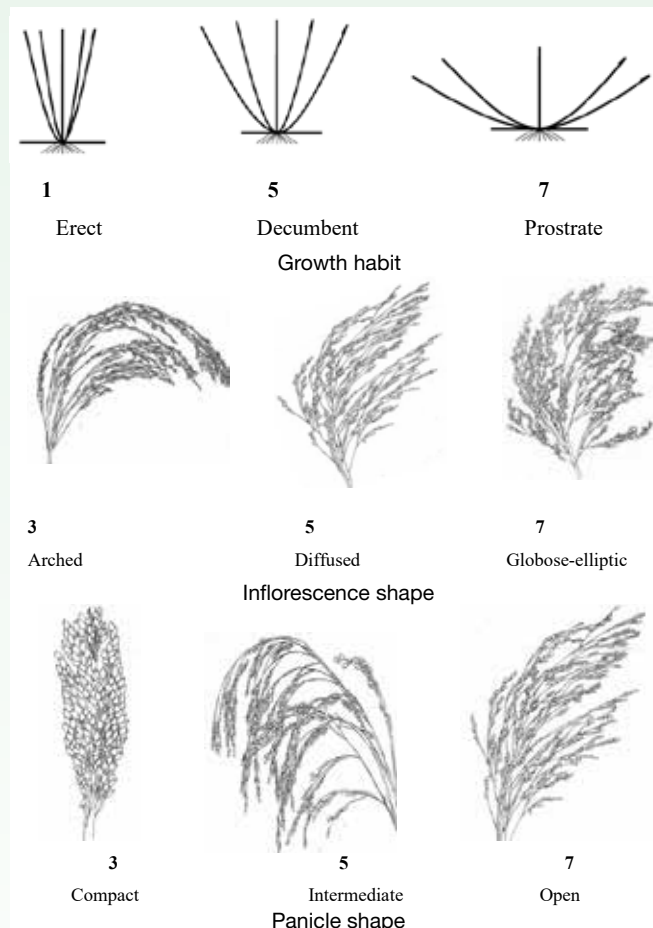
Proso millet is one of the oldest cultivated and among the first domesticated crops, mainly distributed in the semi-arid region of Asia (East Asia, West Asia, and South Asia) and Europe. It is used as bird feed in the US, but is used for human consumption in many parts of the world including Russia, China, Korea and India. It is rich in protein and starch. The probable reason of proso millet in the first league of domesticated crops is its short-duration, minimum crop management, resilience to abiotic stress and being nutritionally rich. These could be the important attributes that also made proso millet spread over Asia and Europe.

Keywords: Climate smart crop, Proso millet, Varieties

PROSO millet (*Panicum miliaceum*), is also commonly known as broomcorn millet, common millet, hog millet, kashfi millet, red millet and white millet. In India, it is known as chena (Hindi), baragu (Kannda), panivaragu (Tamil), variga (Telugu) etc. Archeobotanical studies indicate that proso millet was domesticated in China as early as 10000 years ago. As the human settled during Neolithic era, proso millet was cultivated. It is a warm climate crop with high water and nitrogen use efficiency. It matures in 60–75 days and has shallow root system which makes it suitable for any cropping system and intercropping. Proso millet produces 3–4 tillers, its plant type can be erect, decumbent or prostrate. The plant height reaches up to 100–120 cm. There are three types of panicles, viz. lateral, vertical-loose, and dense panicle. It produces small round seeds covered by a smooth and glossy hull. Its seeds may be cream, yellow, orange-red, or brown in colour. These traits help in identification of varieties of proso millet. Farmers can remember the growth habitat and inflorescence characters to identify the varieties.

Nutritional profile

Proso millet is rich in protein (13–17%) and carbohydrates (60–75%). In china, waxy type proso millet (100% amylopectin) are grown for making sticky rice and other cuisine. The recent study at ICAR-IIMR suggests that protein content in proso millet could be as high as 21% or even higher. It is a rich source of



plant-based protein and can be used for formulating new energy foods for sport-person etc. Proso millet is free from gluten which suits the patients with celiac diseases. The biological value of proso millet protein varies between 42–56, similar to bean and wheat flour.

Proso millet contains 156–230 mg phosphorus, 78–140 mg magnesium, 8.20 mg calcium, 0.80–5.20 mg iron and 1.40–2.60 mg zinc per 100 g of dehulled proso millet. It is also a rich source of trace elements, dietary fibre and vitamins. Proso millet grains contain components with healing benefits, which decrease the level of low-density lipoprotein cholesterol in the blood. The phenolic compounds like antioxidants and beta-glucans present in proso millet have many health benefits.

Proso millet cultivation

Proso millet can be cultivated in varied soils, light to deep black and sandy to clay. The soil must be well drained and must be well tilled. Its fertility can be maintained by applying farmyard manure at a rate of 4–10 tonnes/ha. Proso millet being a short duration crop, requires relatively less water and nutrients compared to other cereals. General fertilizer recommendations under irrigated condition are 40–60 kg nitrogen (N/ha), 30 kg phosphorus (P_2O_5 /ha) and 20 kg potassium (K_2O /ha). At the time of sowing, 50% of N and 100% of P and K may be applied as basal dose. The remaining half of N should be applied at the time of the first irrigation. It is recommended to use only half of the recommended dose, if the crop is grown under rainfed condition.

Proso millet can be sown in rainy season (*kharif*) soon after the onset of monsoon. In summer, February–March is the optimal time for sowing. Proso millet can be sown soon after the winter crop (*rabi*) harvest. The seeds can be sown using a drill/line sowing manually or even broadcasting. Recommended seed rate is 10 kg/ha for line sowing and 15 kg/ha for broadcasting. The distance between rows must be 22.5 cm and 10 cm between plants. After 15 days of germination, thinning can be done to maintain plant population and reduce intra-plant competition. There are no major pest and diseases in proso millet to cause huge economical damage, however shoot-fly could be a major insect pest.

As the water requirement is less, 2–3 light irrigations

may be given at pre-flowering, post flowering and grain filling stage. Harvesting is done when 80% of the panicles are dry in the entire field. With improved varieties and package of practices, proso millet has the potential to yield up to 20–23 quintals grains per hectare (q/ha) and 50–60 q/ha straw under irrigated conditions (Table 1). Under rainfed conditions, proso millet is expected to yield 10–15 q/ha grain and 30–40 q/ha fresh straw.

Table 1. Proso millet varieties released in India for commercial cultivation

Year of release	Crop	Variety	Released for State
2020	Proso millet	PMV 442 (GPUP 25)	Andhra Pradesh, Bihar, Karnataka, Tamil Nadu, Telangana and Puducherry
2018	Proso millet	DHPM-2769	Karnataka
2017	Proso millet	TNAU 202	Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Karnataka, Gujarat, Tamil Nadu and Bihar.

Post-harvest and processing

Proso millet panicles must be dried in sun for 2–3 days till the grains become brittle and hard. The grains must be threshed out from panicle mechanically. Like any other cereal, proso millet is vulnerable to storage pest. The pest infestation increases if the grains are dehulled. In the hills of Arunachal Pradesh, the grains are stored in huge bamboo granaries. These grains must be subjected to primary processing to remove the husk attached with the grains. Hulling removes husk from the grains. Grading and polishing can also be done (over-polishing leads to loss of nutrients from the grain). Minimum polishing is recommended to make the grain lustrous and attractive at the same time retaining nutritional value of proso millet grains. It is found that the shelf-life of the dehulled grains is about three months. Air-tight packaging enhances shelf-life of proso millet grains and flour. The grains must be kept in air-tight container to prevent from storage pest infestation. Millets in general are not the staple food these days. Value addition of millets will diversify the food platter.

SUMMARY

Proso millet cultivation can help farmers in arid and semi-arid regions of India. It can be cultivated as a sole crop or intercrop. Most of the fallow lands in summer can be brought into proso millet cultivation with limited irrigation, which will generate additional income if grown as an intercrop. Proso millet is a good source of plant-based protein and its value addition can enhance acceptance among consumers. The demand for millets has increased many folds, the market linkages are in incipient stage but sooner the market will face scarcity of raw material for making value added products. The major constraint of millet cultivation was yield, but with the availability of improved cultivars and practices, farmers can harvest profitable yields.

*Corresponding author's e-mail: avinash@millets.res.in



Proso millet panicle