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Muniyappan et al., 2026 KS-5004

Popular article ISSN:2583-4150

SEED PELLETING – A TOOL TO SECURE THE NUTRITIONAL QUALITY OF PEARL MILLET

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Received: May 01, 2026*; Accepted: May 20*, 2026

Introduction

Millets are important rainfed crops predominantly cultivated by subsistence farmers and constitute a significant component of the diet of rural and tribal populations, particularly in the semi-arid tropics. The crops are well adapted to marginal lands, low rainfall conditions, and poor soil fertility, making them highly suitable for climate-resilient agriculture. Millets are recognized for their nutritional richness, drought tolerance, and contribution to food and fodder security. Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is one of the most important millet crops due to its adaptability to drought-prone and resource-poor environments. It is widely cultivated in arid and semi-arid regions of India and Africa. A major constraint in pearl millet cultivation is the very small seed size, which creates difficulty in precision sowing. This often results in the use of excess seed rates, uneven plant spacing, and the need for thinning operations, thereby increasing labour requirements and cost of cultivation. Seed pelleting offers a practical solution to these problems by increasing the size, weight, and uniformity of seeds, thereby facilitating easy handling and precise placement during sowing.

Seed pelleting is a seed quality enhancement technique in which small, round, or irregularly shaped seeds are coated with inert materials and adhesives to form nearly spherical pellets containing single seeds. Pelleted seeds enable the incorporation of beneficial substances such as nutrients, biofertilizers, pesticides, growth regulators, and protectants. These materials can stimulate seed germination, enrich the rhizosphere, protect seedlings from stress, and support early seedling vigour. Thus, pelleting technology not only improves seed handling characteristics but also enhances germination, seedling growth, and crop establishment under adverse environments. Therefore, pelleting of small-seeded crops like pearl millet can reduce the cost of cultivation and contribute to higher productivity under rainfed farming systems.

Seeds of pearl millet- CO7 were obtained from Department of millets, Tamil Nadu Agricultural University, Coimbatore. The laboratory experiments were carried out at the Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore. Before treatment, seeds are mechanical grading can be done with a cleaner cum grader, which will remove the undersized, immature, chaffy seeds and manually off coloured seeds also removed. Then collect the seeds from middle screen size should be 4/64" round perforated sieves. The seeds graded were subjected to physical quality of moisture content and physiological seed quality analysis and the following observations were recorded.

Physiological quality parameters

According to the protocol of (ISTA, 2019), The treated seeds were tested for physiological seed quality parameters, such as germination (%), root length (cm), shoot length (cm) and dry matter (g 10 seedlings) and seed vigour index (Abdul-Baki and Anderson, 1973).

Seed pelleting Procedure:

Seed pelleting was carried out by adopting the standard dry powder coating method. A known quantity of seeds was placed in a rotating pelleting container, and a measured quantity of gum acacia solution (5%) was used as an adhesive. The adhesive was sprinkled uniformly over the seeds while gently rotating the container to ensure even coating. Subsequently, the required quantity of pelleting material (TNAU pelleting powder/filler material) was added gradually in small portions. Alternate application of adhesive and filler material was continued until the desired pellet size and uniform spherical shape were obtained (Fig. 1). After completion of pelleting, the coated seeds were shade dried at room temperature to reduce excess surface moisture and to stabilize the pellet coating.

Gum acacia @ 5% + TNAU pelleting mixture **Pelleted seeds** **Non pelleted seeds**

Fig: 1 Pelleting materials and pelleted seeds

In the cultivation of modern crop varieties, adoption of appropriate crop management strategies together with eco-friendly techniques plays a vital role in maximizing seed yield and improving seed quality. The use of organic nutrient sources in comparison with sole reliance on inorganic fertilizers has gained increasing importance in sustainable agriculture. Organic inputs improve soil health, enhance microbial activity, and promote balanced nutrient availability, thereby contributing to the production of high-quality seeds and increased productivity. Application of macro- and micronutrients through soil fertilization combined with foliar nutrition can further improve seed potential, resulting in better yield and reduced cost of cultivation (Akanbi et al., 2007). Hence, organic nutrient sources such as vermicompost and humus, along with inorganic nutrient sources such as TNAU pelleting mixture, were evaluated through seed pelleting, soil application, and foliar spray using recommended doses under field conditions.

Seed quality was evaluated through physiological parameters such as germination percentage, root length, shoot length, seedling dry matter production, and vigour index. Graded seeds exhibited higher germination percentage, indicating that seed size has a strong influence on seed vigour and viability. In the present investigation, pelleted seeds recorded the highest germination (91%), whereas non-pelleted seeds showed lower germination (86%) (Fig. 2). The increased germination observed in pelleted seeds may be attributed to better seed size uniformity, improved moisture absorption, and enhanced physiological activity during germination. Similar findings were reported by Suruthi et al. (2019) in barnyard millet. The higher germination percentage in larger or pelleted seeds may also be due to greater food reserves and increased activity of hydrolytic and redox enzymes, which help convert complex reserve materials into simple soluble sugars required for embryo growth (Ganiger et al., 2011). In addition, the pelleting materials may create a favourable micro-environment around the seed, facilitating rapid imbibition and activation of metabolic processes.

Pelleted seeds recorded a maximum root and shoot length of 5.4 & 6.1 cm compared with 4.9 & 5.6 cm in untreated seeds. This may be due to the presence of adequate nutrient reserves in mature seeds along with the beneficial effects of pelleting materials that support early root elongation. A vigorous root system is essential for better water and nutrient uptake, especially under moisture stress conditions. Similar results were reported by Ankaiah et al. (2013) in chickpea.

Seedling dry matter production is an important indicator of seedling vigour. The highest seedling dry matter production (0.032 g per 10 seedlings) was recorded in pelleted seeds, whereas non-pelleted seeds recorded 0.028 g per 10 seedlings (Fig. 3). Dry matter accumulation in seedlings is an indicator of both physical and physiological vigour. Higher dry matter production in pelleted seeds indicates stronger seedling growth and better biomass accumulation. Pelleted seeds also recorded the highest vigour index (1046) compared with non-pelleted seeds. Seed vigour represents the ability of seeds to perform well under a wide range of field conditions. The higher vigour associated with pelleted seeds may be attributed to uniform seed size, better nutrient reserves, enhanced enzyme activity, improved hormonal balance, and protection from adverse biotic and abiotic conditions. Therefore, use of optimum sieve size for grading, followed by seed pelleting with suitable organic and inorganic materials, can help save a large quantity of quality seeds without substantial additional investment. This technology can be highly beneficial in meeting farmers' demand for quality seed, ensuring better crop establishment, and enhancing productivity under rainfed farming systems.

Pelleted seeds **Non pelleted seeds**

Fig. 2: Effect of pelleting on germination percentage

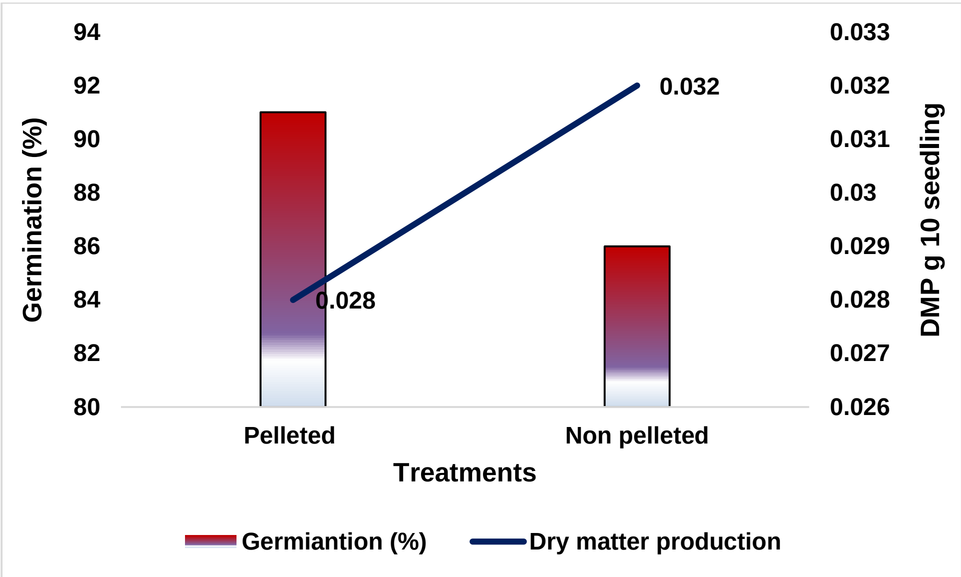

Fig: 3 Effect of pelleting on germination and dry matter production

Conclusion

Seed pelleting is an eco-friendly seed enhancement technique that protects seeds from soil-borne microbial pathogens after sowing. Pelleting improves the physical characteristics of small seeds, making them suitable for easy handling, precision sowing, and better field establishment. During storage, pelleted seeds are capable of maintaining their nutritional and physiological quality with minimal deterioration of active constituents present in the seed. Further, pelleted seeds can be fortified with essential nutrients, protectants, and other beneficial materials that support rapid germination and early seedling growth. The improved availability of nutrients and enhanced seed vigour result in healthy and robust seedlings. Seed pelleting also promotes uniform germination and synchronized seedling emergence under field conditions, which ultimately contributes to better crop stand establishment and higher productivity. Therefore, seed pelleting can be recommended as an effective and sustainable technology for improving the seed quality and cultivation performance of pearl millet.

References

Abdul-Baki, A.A. and Baker, J.E. (1973). Changes in cellular organelles or membranes related to vigour loss in seed. Seed Science and Technology, 1, pp.89–125.

Akanbi, W., Adebayo, T., Togun, O., Adeyeye, A. and Olaniran, O. (2007). The use of compost extract as foliar spray nutrient source and botanical insecticide in *Telfairia occidentalis*. World Journal of Agricultural Sciences, 3(5), pp.642–652.

Ankaiah, R., Bharathi, M., Varma, V.S., Kumari, K.K., Durga, K.K. and Rani, C.V.D. (2013). Effect of seed size on seedling vigor in groundnut (*Arachis hypogaea* L.). Madras Agricultural Journal, 100(4–6), pp.324–327.

Ganiger, B., Gowda, B., Lokesh, K., Lokesh, G., Hiremath, U. and Harish, M. (2011). Standardization of sieve size for seed grading in soybean. Karnataka Journal of Agricultural Sciences, 24(2), pp.245–248.

ISTA (2019). International Rules for Seed Testing. Bassersdorf, Switzerland: International Seed Testing Association. Available at: http://www.seedtest.org.

Suruthi, S., Sujatha, K. and Menaka, C. (2019). Size grading standardization of sieve size for grading of barnyard millet (*Echinochloa frumentacea* L.) MDU-1. Journal of Applied and Natural Science, 11(2), pp.524–527.