Broomcorn millet is not only a traditional grain for cooking, but also has potential applications in the modern food industry. Research on millet nutritional biscuits evaluated biscuit quality from the perspectives of protein networks, tribology, and in vitro digestion. Biscuits made from different millet raw materials showed differences in protein network connectivity and porosity. In some samples, the protein network area reached 45.12%, while the lowest porosity was 10.33%, indicating that varietal differences directly affect the structure and digestive properties of baked products (Hu et al., 2025).

Research on cakes fortified with fermented millet bran dietary fiber also demonstrates practical value. After adding fermented millet dietary fiber, the total phenolic content of the product reached 0.46 mg GAE/g, the DPPH radical scavenging rate reached 66.84%, and the $ABTS^+$ scavenging rate reached 87.01%, while predicted glucose release was reduced (Xiao et al., 2023). Millet and its by-products can therefore serve not only as basic raw materials for gluten-free foods, but also as ingredients with enhanced antioxidant and low-glycemic potential through fermentation and dietary fiber enrichment.

Metabolic reprogramming induced by saline-alkali stress has clear agricultural application directions. First, saline-alkali tolerant millet can be used to develop specialty grain crops for saline-alkali land. Second, high phenolic acid, high flavonoid, and high protein resources can be screened to establish functional quality breeding indicators. Third, processing technologies such as germination, fermentation, baking, and extrusion can be combined to improve the added value of millet products. In this way, broomcorn millet is no longer just a "survival crop" grown on saline-alkali land, but can become a characteristic crop connecting saline-alkali land management, nutritional health, and the functional food industry.

6 Agricultural and Ecological Applications of Proso Millet

6.1 Improvement of saline-alkali soils

The value of proso millet in saline-alkali soils is not only reflected in its own tolerance to saline environments, but also in its ability to improve the soil ecological environment. Salt-tolerant cultivation helps promote root-mediated soil stabilization, organic matter input, and rhizosphere microecological activation. In broomcorn millet, salt stress induces the enrichment of specific beneficial microorganisms and changes the structure of microbial communities related to nutrient cycling, indicating that this crop can promote the biological functions of saline-alkali soils toward a more productive state (Yuan et al., 2023).

This does not mean that proso millet alone can "restore" all saline-alkali soils. Instead, it shows that the crop is suitable as a biological synergistic factor within integrated land improvement strategies. These strategies usually also include drainage systems, water management, organic amendments, and microbial inoculants. Compared with highly salt-sensitive crops, proso millet can maintain root activity for a longer time, thereby creating favorable conditions for rhizosphere-driven soil improvement.

6.2 Sustainable crop production on marginal lands

The key to agricultural production on marginal lands is not achieving the highest yield in a single season, but maintaining stable returns under conditions of low water, low fertilizer input, climate fluctuations, and poor soil quality. Proso millet fits well within this production logic. It can generally grow under marginal soil and low-input conditions, with a growth period of about 65-75 days or 70-90 days. It requires relatively low amounts of water and fertilizer and shows strong adaptability to drought, poor soils, and climate variability (Nandini et al., 2025).

A long-term crop rotation experiment conducted in northeastern Colorado, USA, from 1995 to 2016 analyzed the relationship between water use and yield in proso millet. Nielsen and Vigil (2017) used multi-year dryland farming data to establish a water-limited yield model and identified environmental factors causing deviations between actual millet yield and theoretical water-based yield. Proso millet should not be regarded as a "low-yield substitute crop," but rather as a short-season crop suitable for dryland rotation systems, improving water use efficiency and reducing production risks.