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"Solidarity in a competing world — fair use of resources"

Genetic and Genomic Resources for Amaranth Breeding to Improve Income and Nutrition of Resource-Poor Farmers

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Abstract

Amaranthus species are used as grain and vegetable crops. As a C4 plant, amaranth is more tolerant to heat and drought than many other vegetables. The extraordinary nutritional properties of the plant – the seed and leaf protein of amaranth has a composition comparable to milk protein – make it a valuable addition to human diets, particularly in countries where the population has limited access to animal protein sources. Production of this high-value crop can increase the income and improve the livelihoods of resource-poor smallholder farmers. The broader use of amaranth is constrained by the lack of improved cultivars combining disease resistance with high market and eating quality. Little is known about the breeding potential and sustainable use of different *Amaranthus* species. AVRDC–The World Vegetable Center holds a diverse collection of 800 amaranth accessions and has started to mine this collection for genotypes with farmer- and consumer-desired traits for breeding. The most important traits sought are abiotic stress tolerance, disease and pest resistance, high nutrient and low antinutrient concentrations. Selected genotypes serve as founder lines for a multi-parent advanced generation intercross (MAGIC) population of genotypes displaying new trait combinations. The MAGIC population is an ideal genetic resource for research and breeding, with the final aim of developing new improved cultivars. In parallel, molecular markers for germplasm diversity analysis and for monitoring amaranth crosses have been developed. Rapid wilting of harvested shoots is a major obstacle for marketing vegetable amaranth. Tetraploid genotypes of this otherwise diploid crop have been generated and individuals with waxy leaves have been selected. Agronomic and nutritional properties as well as eating quality of slow wilting polyploid lines are currently being analysed and will be presented. This amaranth improvement initiative will accelerate variety development. Complementary research targeting variety uptake, marketing and consumption is currently planned with partners from developing countries in Africa. The combination of germplasm enhancement and breeding with nutritional and socioeconomic research to increase marketing and consumption of amaranth will maximise the potential of this crop for mitigating poverty and malnutrition.

Keywords: Amaranthus, genetic resources, nutrition, vegetable

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