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北京市海淀区中关村南大街12号 12 Zhongguancun South Street, Haidian District, Beijing 100081, China
Tel.: +86-10-82105939 Fax: +86-10-82105939 E-mail: cssc@caas.cn Website: www.7icsc.com.cn

Fast-track approach to breeding high-iron pearl millet cultivars

Mahalingam Govindaraj[1], Kedar N Rai[1], Wolfgang H Pfeiffer[2] and Aanand Kanatti[1]

[1] International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, 502 324, Telangana, India. m.govindaraj@cgiar.org
[2] HarvestPlus, International Center for Tropical Agriculture (CIAT), A.A. 6713, Cali, Colombia

Pearl millet [*Pennisetum glaucum* (L.) R. Br.], is an important food and nutritional security cereal, grown on more than 28 million ha in some of the most marginal dryland environments in the arid and semi-arid tropical regions of Africa and Asia (largely India). The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), in alliance with the HarvestPlus, has undertaken biofortification research to develop high-iron cultivars of this crop. As a fast-track approach, high-iron open-pollinated varieties (OPVs) and hybrid parents identified from the mainstream breeding program; which did not include Fe density as a target trait, have been used to breed cultivars with enhanced iron (Fe) density. For instance, exploitation of intra-population variability in ICTP 8203, a high-Fe commercial OPV in India, led to the development of its higher-Fe version, released at All India level as Dhanashakti, which had 71 mg kg^{-1} Fe density (9% higher than ICTP 8203). It also had 11% higher grain yield. Dhanashakti has now been adopted by 60,000 farmers. Intra-population improvement for Fe density in three other OPVs has led to similar results. Two high-Fe hybrids (ICMH 1201 and ICMH 1301) were developed by crossing high-Fe hybrid parents identified from the mainstream breeding program, which have the Fe density similar to that of Dhanashakti but 33-38% higher grain yield. ICMH 1201 is being commercialized using Truthfully Labeled Seed by a seed company, reaching 35,000 farmers in 2014. ICMH 1201, ICMH 1301, along with several other high-Fe hybrids, are at advanced testing stage in the national and state trials. Further, within-line selection in the parental lines of hybrid ICMH 1201 produced sub-hybrids that had significant variability among them, with some sub-hybrids having 7-12% higher Fe density and 4-8% higher grain yield than ICMH 1201.

Key words: Pearl millet; Biofortification; Iron; Zinc

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