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Registration of Zero Erucic Acid Ethiopian Mustard Genetic Stock 25X-1

The Ethiopian mustard (Brassica carinata A. Braun) genetic stock 25X-1 (Reg. no. GS-12, PI 613128) was developed at the Institute for Sustainable Agriculture (CSIC) in Córdoba, Spain, and released in 1998. This genetic stock was selected among progeny from interspecific crosses of selected lines of Ethiopian mustard, rapeseed (B. napus L.) and Indian mustard [B. juncea (L.) Czern.], and is characterized by seed oil with essentially no erucic acid (mean ± SD of 0.8 ± 0.2 g kg⁻¹).

A breeding program was initiated in 1986 to develop a zero-erucic Ethiopian mustard (1). The parent lines used to develop 25X-1 were the B. napus cultivar Duplo, a spring cultivar of German origin with low glucosinolate content and no erucic acid (2), the B. juncea line Zem-1, with seed oil free of erucic acid (3), and the B. carinata line C-101, with a high erucic acid content, developed from a line provided by Dr. Paul F. Knowles, University of California at Davis, CA. 25X-1 originated from an F₁ plant selected within a population from crosses between BC₁F₂ plants derived from the crosses C-101/Duplo/C-101 and C-101/Zem-1/C-101, respectively. A total of 40 BC₁F₂(C-101/Duplo/C-101)//BC₁F₂(C-101/Zem-1/C-101) crosses were made in 1991. F₁ seed from each cross was sown in the field in 1992 in 3-m long rows with 1-m spacing between rows, at a seeding rate of 40 seeds m⁻¹. F₁ plants were grown under isolation by covering plants with nylon mesh cages. Seed from a total of 507 F₁ plants was harvested. F₂ seed from each of the harvested F₁ plants was bulked and analyzed for the fatty acid composition of the seed oil. Fatty acid analyses consisted of preliminary screening for erucic acid content using near-infrared reflectance spectroscopy (NIRS) (4) followed by gas-liquid chromatography analyses of selected samples (5). Forty-five of 507 analyzed F₁ phenotypes produced less than 2% erucic acid, which is usually considered as the practical upper limit for the absence of erucic acid (6). From these 45 plants, F₂ lines were developed. Only one of them was maintained in subsequent generations. F₃ seed of an individual F₂ plant was sown and individual F₃ plants were harvested. Seed samples of each of the F₃ phenotypes were analyzed to confirm the absence of erucic acid. F₄ seed of one individual F₃ plant was sown. Individual F₄ plants were harvested and their seed analyzed to confirm the absence of erucic acid. A similar procedure was followed in the F₅. Finally, F₆ seed from an individual plant was harvested and containing 53 ± 5 g kg⁻¹ (±SD) of palmitic acid, 28 ± 5 g kg⁻¹ of stearic acid, 329 ± 35 g kg⁻¹ of oleic acid, 164 ± 24 g kg⁻¹ of linoleic acid, 2 ± 0.2 g kg⁻¹ of eicosenoic acid, and 0.8 ± 0.2 g kg⁻¹ of erucic acid. This compared with 44 ± 7 g kg⁻¹ of palmitic acid, 143 ± 10 g kg⁻¹ of stearic acid, 118 ± 12 g kg⁻¹ of oleic acid, 10 ± 2 g kg⁻¹ of linoleic acid, 118 ± 12 g kg⁻¹ of linoleic acid, 391 ± 20 g kg⁻¹ of eicosenoic acid, and 391 ± 20 g kg⁻¹ of erucic acid for C-101. 25X-1 is yellow seeded, with a thousand-seed weight of 3.8 g, a seed oil content of 303 g kg⁻¹, glucosinolate content of 121.4 μmol g⁻¹, determined on a bulk sample from plants grown in 1997 and compared with a thousand-seed weight of 3.9 ± 0.4 g, seed oil content of 355 ± 41 g kg⁻¹ and total seed glucosinolate content of 127.1 ± 15.2 μmol g⁻¹ for C-101.

Other zero-erucic Ethiopian mustard germplasm has been reported (7,8), but the genetic stock 25X-1 is essentially zero-erucic Ethiopian mustard newly released. This genetic stock will be useful as a source of zero erucic acid in Ethiopian mustard. Seed of this stock will be maintained by the authors and small amounts of seed are available upon request. Appropriate acknowledgment of the developers is requested when this mutant germplasm contributes to research programs or the development of new germplasm.

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References and Notes
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