

**Supplementary information 1.** Characteristics of soybean mutants (Daneshian et al. 2009; Ebrahimi Monfared & DelKhosh 2010; Mobasser et al. 2010; Jamali et al. 2011).

|   |   | <b>Mutant-4<br/>(M-4)</b>   | <b>Mutant-7<br/>(M-7)</b>   | <b>Mutant-9<br/>(M-9)</b>   |
|---|---|---|---|---|
|   | <b>A. Breeding characteristics</b>        |   |   |   |
| 1 | Reg. No.; LC No.                          | N/A   | N/A   | N/A   |
| 2 | Origin                                    | Iran  | Iran  | Iran  |
| 3 | Pedigree                                  | cv. Williams (US) <sup>†</sup>  | cv. Clark (US) <sup>†</sup>   | cv. Clark (US) <sup>†</sup>   |
| 4 | Breeding method                           | Genetic mutation<br>through high gamma<br>irradiation of seeds<br>(150, 200, & 250 Gy) <sup>†</sup> | Genetic mutation<br>through high gamma<br>irradiation of seeds<br>(150, 200, & 250 Gy) <sup>†</sup> | Genetic mutation<br>through high gamma<br>irradiation of seeds<br>(150, 200, & 250 Gy) <sup>†</sup> |
| 5 | Year of selecting/initiating              | Late 90s & early 2000s <sup>†</sup>   | Late 90s & early 2000s <sup>†</sup>   | Late 90s & early 2000s <sup>†</sup>   |
| 6 | Year of releasing/registering/introducing | Mid 2000s <sup>†</sup>  | Mid 2000s <sup>†</sup>  | Mid 2000s <sup>†</sup>  |
| 7 | Breeder                                   | 1- SPII (Karaj);<br>2- NSTRI (Karaj) <sup>†</sup>   | 1- SPII (Karaj);<br>2- NSTRI (Karaj) <sup>†</sup>   | 1- SPII (Karaj);<br>2- NSTRI (Karaj) <sup>†</sup>   |

continued →

Supplementary information 1. (continued)

|    |   | <b>Mutant-4<br/>(M-4)</b>                       | <b>Mutant-7<br/>(M-7)</b>          | <b>Mutant-9<br/>(M-9)</b>          |
|----|---|---|------------------------------------|------------------------------------|
|    | <b>B. Botanical characteristics</b>                                       |   |                                    |                                    |
| 8  | Plant height (cm)   | 103 to 110 <sup>‡</sup>                         | 90 to 102                          | 108 to 110                         |
| 9  | Soybean pod (cm)  | 4.00 <sup>‡</sup>                               | 4.20 <sup>‡</sup>                  | 4.20 <sup>‡</sup>                  |
| 10 | Stem form   | Unbranched; branchless <sup>‡</sup>             | Branched                           | Unbranched; branchless             |
| 11 | Leaf form   | Ovate <sup>‡</sup>                              | Pointed ovate                      | Pointed ovate                      |
| 12 | Seed form   | Nearly round <sup>‡</sup>                       | Nearly round <sup>‡</sup>          | Nearly round <sup>‡</sup>          |
| 13 | Flower color  | Whitish pink                                    | Purple                             | Purple                             |
| 14 | Trichome color of shoot (stem, leaf & pod)                                | Golden <sup>‡</sup>                             | Golden                             | Golden                             |
| 15 | Plant color in pubescence   | Yellowish brown; tan <sup>‡</sup>               | Yellowish brown; tan <sup>‡</sup>  | Yellowish brown; tan               |
| 16 | Pod color in pubescence   | Light brown <sup>‡</sup>                        | Dark brown                         | Dark brown                         |
| 17 | Seed color in pubescence  | Light yellow<br>with a black hilum <sup>‡</sup> | Light yellow<br>with a black hilum | Light yellow<br>with a black hilum |
|    | <b>C. Cultivating characteristics</b>                                     |   |                                    |                                    |
| 18 | Soybean maturity group  | MG III  | MG II                              | MG III                             |
| 19 | Maturity period   | Mid-maturing <sup>‡</sup>                       | Early-maturing                     | Early-maturing                     |
| 20 | Growth period; cultivation to Full physiological maturity of the seed (d) | 117 to 119 <sup>‡</sup>                         | 109 to 110                         | 108 to 110                         |
| 21 | Photoperiod   | Day-neutral                                     | Day-neutral                        | Day-neutral                        |
| 22 | Plant growth type   | Indeterminate                                   | Indeterminate                      | Indeterminate                      |

continued →

Supplementary information 1. (continued)

|    |   | <b>Mutant-4<br/>(M-4)</b>                                   | <b>Mutant-7<br/>(M-7)</b>  | <b>Mutant-9<br/>(M-9)</b>   |
|----|---|---|--|---|
| 23 | Adaptation to biotic stresses                   | N/A   | Moderately tolerant  | Moderately tolerant   |
| 24 | Adaptation to abiotic/environmental stresses    | N/A   | Moderately tolerant to drought   | Moderately tolerant to drought  |
| 25 | Adaptation to lodging                           | Tolerant <sup>†</sup>                                       | Tolerant   | Tolerant  |
| 26 | Adaptation to shattering                        | Tolerant <sup>‡</sup>                                       | Tolerant   | Tolerant  |
| 27 | Seed yield per unit area (kg ha <sup>-1</sup> ) | N/A   | 2500 to 3000   | 2500 to 3000  |
| 28 | Thousand seed weight (g)                        | N/A   | 130  | N/A   |
| 29 | Soybean seed oil (%)                            | N/A   | 21   | N/A   |
| 30 | Soybean seed protein (%)                        | N/A   | 37   | N/A   |
| 31 | Cultivation climate and region (Iran)           | Pioneer farmers<br>in some<br>temperate regions             | Cool temperate to temperate;<br>including: Isfahan,<br>Chahar-Mahal Bakhtiari,<br>Khorasan, Kordistan,<br>& Loristan | Cool temperate to temperate;<br>including:<br>Chahar-Mahal Bakhtiari,<br>& Loristan |
| 32 | Usage   | Grain (oil; protein;<br>poultry & stock feed:<br>meal/cake) | Grain (oil; protein;<br>poultry & stock feed:<br>meal/cake)  | Grain (oil; protein;<br>poultry & stock feed:<br>meal/cake)                         |

Reg. No.: registration number; LC. No.: license number; US: United States; SPII: Seed and Plant Improvement Institute; NSTRI: Nuclear Science and Technology Research Institute; cv.: cultivar; MG: maturity group; N/A: not available.

<sup>†</sup> Personal communication with reseachers of Maize and Forage Crops Research Department, and Oilseed Crops Research Department in Seed and Plant Improvement Institute.

<sup>‡</sup> Personal observation in greenhouse condition.