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A VALUABLE SUNFLOWER DWARF MUTANT

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SUMMARY

A dwarf mutant has been derived from M_2 gamma irradiated Morden population of sunflower (*Helianthus annuus* L.). The dwarf mutant has the height of 35 cm and the earliness of 65 days. This mutant has been selfed and forwarded to the M_3 and M_4 generations and it did not deviate significantly from the expected segregation ratio since it has the recessive monogenic character. Althogh the earliness and height showed a drastic reduction, the seed yield and oil content were on par with the parent Morden.

Key words: dwarf, gamma rays, mutant, sunflower

INTRODUCTION

A novel source of dwarfing genes was exploited in the ongoing mutation breeding program reported here. The recovery and the extensive use of such genes in plant breeding programs have been important for a better understanding of the genetic and physiological mechanisms implicated in plant growth and development (Chandler *et al.,* 1999; Zenewich *et al.,* 1991). The use of dwarfing genes in several programs of genetic improvement has given important contribution to agriculture *via* the development of new short-stature varieties resistant to lodging. Many cereal grains actually cultivated around the world incorporate in their genetic background different dwarfing genes (Borlaug, 1983). An extreme and severe dwarf mutant has been isolated and studied in sunflower by Jambhulkar (2002) and Cecconi *et al.* (2002) using gamma rays and gibberellic acid, respectively. However, the earlier attempts produced unsatisfactory results because of extreme/severe dwarf types with low yield.

Lodging and stalk breakage caused by excessive growth are known to be associated with yield reduction in sunflower. Therefore, development of dwarf and semi-dwarf varieties or hybrids is a major breeding objective. In India, Morden (Cereni-anka-66) is the only dwarf (66–110 cm) and early maturing variety available for cul-

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tivation. Worldwide, only three sources of reduced plant height in sunflower, DDR (90.3 cm), Donsky (65.5 cm), and Donskoi 47 (79.8 cm), have been reported so far (Miller and Hammond, 1991; Berretta de Berger and Miller, 1985 and Herring, 1985).

MATERIALS AND METHODS

Five dwarf mutants (one progeny row) arose from gamma irradiated Morden populations originally derived from a selfed single plant treated with 15 kR in the M_1 generation, selected at the Department of Oilseeds Farm, Tamil Nadu Agricultural University. All five plants were self-pollinated to obtain the M_3 generation. These five plants, grown in progeny row in the M_3 generation, were self-pollinated and forwarded to the M_4 generation. In the M_4 generation, the mutant remained true to type and the performance of earliness, seed yield per plant and oil content were compared with the parent variety Morden.

RESULTS AND DISCUSSION

Among the 182 plants of the original 15 kR mutant M_2 population, we recovered 7 dwarf plants with medium sized heads which were self-pollinated under paper bags. The segregation ratio was 3:1 ($0.1<p>0.5$) indicating that the mutation was recessive and controlled by a single gene. When considering morphological characters of dwarf Morden, the internode elongation is short and the number of leaves is halved. The leaf size and breadth is also $3/4^{th}$ of the base variety Morden (Figures 1 and 2). The remaining characters were almost identical to those in the original variety.

Table 1: Significant differences between dwarf and parent Morden

Character	Dwarf Morden	Morden
Days to first flower (days)	37	52
Plant height (cm)	35.7	110.5
Head diameter (cm)	11.32	13.11
100-seed weight (g)	5.46	5.66
Days to maturity (days)	65	83
Seed yield per plant (g)	19.38	21.30
Oil content (%)	37.18	34.16

The quantitative traits such as days to first flower, plant height and days to maturity showed a significant difference when compared with Morden. However, head diameter, 100-seed weight and seed yield per plant were on a par between the dwarf and normal types. The oil content was slightly higher in the dwarf than in the base variety. This dwarf type can be further exploited in breeding program to

Figure 1: Dwarf mutant derived from variety Morden

Figure 2: Dwarf mutant derived from variety Morden

Figure 3: Dwarf mutant derived from variety Morden, field view

develop varieties resistant to lodging and suitable for intercropping and short-season areas.

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UN MUTANTE ENANO DE GIRASOL VALIOSO

RESUMEN

Se derivó un mutante enano a partir de la generación M_2 de la población de girasol (*Helianthus annuus* L.) "Morden" irradiada con rayos gamma. El mutante enano tiene 35 cm de altura y una precocidad de 65 días. Este mutante se autofecundó y avanzó a las generaciones M_3 y M_4 y no se desvió significativamente de la segregación esperada para un carácter monogénico recesivo. Aunque se observó una drástica reducción de la altura y la precocidad, el rendimiento de semilla y el contenido de aceite son similares al parental "Morden".

NOUVEAU MUTANT NAIN DU TOURNESOL À VALEUR ÉLEVÉE

RÉSUMÉ

Un mutant nain a été obtenu au sein de la génération M_2 de la population "Morden" de tournesol (*Helianthus annuus* L.) soumise à une irradiation gamma. Le mutant nain a une hauteur de 35 cm et une précocité de floraison de 65 jours. Ce mutant a été autofécondé pour obtenir les générations M_3 et M_4, et les ségrégations observées ont été conformes à celles attendues sur la base d'un caractère monogénique récessif. La précocité et la taille du mutant sont modifiées très significativement par rapport à la forme sauvage; toutefois la production de graines et la teneur en huile sont conformes à celles de la population parentale "Morden".