EARLY FLOWERING INDUCED MUTATIONS IN BRASSICA NAPUS CV. WESTAR

S.P. LANDGE and A.S. KHALATKAR
Department of Botany, Nagpur University Campus, NAGPUR440 010, INDIA

ABSTRACT

Cultivation of Brassica napus cv Westar, a '00' quality crop takes more than 165 days due to short winter days, hence does not fit in the crop cycle of Indian agroclimate. Therefore, induced mutation programme was undertaken. Physiologically uniform and genetically pure 150 seeds were treated with different concentrations of mutagens. Ethyl methane sulfonate (EMS), Sodium azide (SA) and Gamma radiations were used as the mutagen Dry and 6 & 12h pre-soaked seeds were treated with EMS and SA. Gamma irradiation was carried out only with dry seeds. M1 generation was screened for early flowering and other morphological variants. M1 plants were harvested on individual plant basis. M2 plant progenies were also screened for early flowering mutations. A single early flowering variant was isolated in 12h water pre-soaked 6h 0.06% SA treatment. Some of the early flowering M2 mutants out of this progeny were selected and used for growing M3 generation. Progeny of these seeds flowered in 48 days in contrast to 75 days of the control. Since, this mutant is characterised by '00' it seems to hold good potential for cultivation of quality rapeseed mustard in subtropics.

INTRODUCTION

In South Asian countries Brassica based industry is eagerly awaiting a breakthrough in the form of development of '00' material. This will enable them to have a low erucic acid oil (LEAR) and meal with low glucosinolate. One of the options is to introgress the '00' B. juncea or to adopt already existing '00' cultivar of B. napus. However, B. napus is a long duration crop and does not fit in the Indian crop cycle. For successful growth and better yields Brassicas with shorter maturity are best suited, hence investigations were planned on induced mutations for early flowering and maturity in B. napus.

EXPERIMENTAL

Brassica napus cv. Westar seeds were obtained from Agriculture Canada Research Station, Saskatoon, Canada. Genetically pure and physiologically uniform 150 seeds in each treatment were exposed to different concentrations of ethylmethane sulfonate (EMS), sodium azide (SA) and gamma radiations. Dry, 6 and 12h pre-soaked seeds were used for EMS and SA treatments, while gamma irradiation was carried out only with dry seeds. Each treatment was replicated at least thrice. Treated seeds were used to grow M1 generation, which was screened for early flowering and other morphological variants. M1 plants upon maturity were harvested on individual plant basis. These seeds were utilized to grow M2 generation, which was screened for early flowering and maturity mutations. Mutations obtained in M2 generation were harvested on individual plant basis and seeds were sown to grow M3 generation. True

breeding nature of the mutant was confirmed in M3. Seeds obtained in M2 and M3 generations were screened for erucic acid on GLC (Thies, 1971), glucosinolate by Testape (Mc Gregor and Downey, 1975) and oil content on NMR.

Of EMS, SA and gamma radiations, an early flowering mutation was isolated only in 12h water pre-soaked 6h 0.06% SA treatment; therefore only data on this treatment is discussed. Data on morphological parameters are presented in Table 1. Control Westar had a height of 126 cm at maturity. In M1 generation of 12h water pre-soaked 6h 0.06% SA treatment, the average height was similar to control. However, the early flowering mutant in M2 was 110 cms, while it was 109 cms in M3. Westar control had 5 branches. With SA treatment the branches increased to 12 in M1 generation. However, the early flowering mutant had 6 branches which reduced further to 3 in M3. Westar control flowered in 75.2 days, while on an average M1 generation flowered in 73 days. Early flowering mutant in M2 flowered in 61.2 days while its M3 progeny flowered between 41 to 56 days. On an average, the M3 mutants flowered in 48.7 days.

TABLE 1. Data on the effect of Sodium azide treatment on morphological parameters in Brassica napus

Treatments	Height (cm)	Branches	Flowering (days)	Maturity (days)	Total siliqua	Seeds/ siliqua
Control	126	5	75.2	169	146.1	25.9
M1 generation*	126	12	73.0	165	355.0	24.0
M2 generation	116	6	61.2	140	183.3	28.4
M3 generation	109	3	48.7	99	112.7	30.7

* 12h water pre-soaked 6h 0.06% SA treatment

TABLE 2. Data on quality parameters in control and mutants

Treatments	100 seed weight (g)	Glucosinolate	Erucic acid %	Oil content %
Control	0.46	(-) level	0	36.7
M2 generation*	0.48	(-) level	-	-
M3 generation	0.50	(-) level	0	32.14

* 12h water pre-soaked 6h 0.06% SA treatment

Westar control matured in 169 days, while with SA treatment the M1 generation matured four days earlier. Maturity drastically lowered to 140 days in M2 and 99 days in M3. However in M3 there were plants maturing in 95 to 106 days. B. napus has been bred for earliness by Shiga (1970) and Wahiduzzaman (1987), however, present report is unique

in demonstrating successful induction of mutation for significant earliness and maturity. Westar control had 146 silqua. The number of siliqua increased to 355 with SA treatment in M1 generation. However, in the early flowering mutant these reduced to 183 in M2 and 112 in M3. Enhancement in the number of siliqua in M1 generation could be attributed to larger number of branches and reduction in M2 and M3 to smaller number of branches. The control had 25.9 seeds/siliqua. These reduced to 24 in M1 generation, while the seeds/siliqua enhanced to 28 and 30 in M2 and M3, respectively. This can be attributed to better conversion of ovules into seeds with early flowering.

The data on quality parameters are presented in Table 2. Weight of 100 seeds of Westar control was 0.46 g. This improved to 0.48 and 0.50 g in M2 and M3 generations, respectively. The control had (-) level (30 µ mol/g of deoiled cake) of glucosinolate. Same level was observed in early flowering M2 and M3 mutants. Erucic acid was absent in Westar control and same level was observed in M2 and M3 early flowering mutants. In Nagpur agroclimate, B. napus cv. Westar had 36.7 % oil. The oil content reduced to 32.1% in early flowering mutant. However, due to intact '00' characteristic with significant earliness, this mutant can make available a quality rapeseed mustard for wide Indian agroclimate and to the breeders for further lowering the flowering and maturity duration in existing cultivars.

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