OBTAINMENT OF EMS-INDUCED MUTANTS IN ETHIOPIAN MUSTARD (*Brassica carinata* Braun)

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ABSTRACT

A mutagenesis programme was carried out in order to increase variability in seed quality components in Ethiopian mustard. Selected seeds of "C-101" line were treated with 1% (v/v) Ethyl Methane Sulfonate (EMS). These M1 seeds were sown and the M2 and M3 populations raised from these seeds were screened with Near Infrared Reflectance Spectroscopy (NIRS) to identify mutants with special fatty acid composition or glucosinolates content. Mutants detected with NIRS were confirmed with Gas Liquid Chromatography or Pd-Glucosinolate complex method respectively. Data obtained in the analysis of the M3 population are shown. These data show increase of variability in most of the traits analyzed. The most promising mutants obtained were low erucic, high oleic/low linoleic, low linolenic, low glucosinolates and high glucosinolates mutants.

INTRODUCTION

Ethiopian mustard (*Brassica carinata* Braun) is an allotetraploid species resulting from a naturally-occurring cross between *B. nigra* Koch and *B. oleracea* L. (U, 1935). This species, grown as an oilseed in the Indian subcontinent and Ethiopia, has recently been the subject of interest in other countries due to its high yield potential and drought tolerance (Fernández-Martínez and Domínguez, 1982; Fereres et al.,1983). Like other *Brassica* species, it is characterized by high erucic acid and glucosinolates.

Mutagenesis has been used successfully to develop mutants in many species. In *Brassica* species, mutants for fatty acids and glucosinolates have been obtained (Khalatkar and Indurkar, 1991, Auld et al., 1992). A plant breeding programme involving chemical mutagenesis was started in 1992 with the objective of obtaining *Brassica carinata* lines with low glucosinolates, low erucic, low linolenic and high oleic content. In this work, the results obtained in the M3 population are shown.

EXPERIMENTAL

A line of *Brassica carinata*, "C-101", characterized by yellow seeds, high yield and drought tolerance, was chosen to be treated with chemical mutagen. Seeds were

imbibed for 16 h in aerated water and then exposed to a solution of 1% (v/v) EMS for 2 h. After 10 h of washing in continuous flow of water, M1 seeds were sown. 1182 M2 plants were harvested plantwise. The M2 progeny was selfed and 10353 M3 plants were harvested.

The M2 and M3 populations were screened for glucosinolates content and fatty acid composition with a NIRS instrument (NIR Systems 6500, Servicio Centralizado NIRS, Universidad de Córdoba). After this screening, samples selected for interesting fatty acid profile were analyzed by Gas Liquid Chromatography, and samples selected for high or low glucosinolates content were confirmed with the Pd-Glucosinolate complex method. A total of 311 samples out of 10353 M3 samples screened were analyzed by GLC, and 127 M3 samples were analyzed by the Pd-Glucosinolate complex method.

Table 1 show the fatty acid profile and glucosinolates content of 27 plants analyzed of line "C-101". Tables 2 to 5 show the distribution of values obtained in the analysis by GLC and Pd-Glucosinolate method. In table 2, difference oleic-linoleic is represented instead of oleic values. Ten mutants were obtained with a positive oleic-linoleic pattern, with a maximum difference of 12.73%. For linolenic acid, 11 samples with less than 10% have been found. Specially promising are the low erucic and low glucosinolates mutants detected. For erucic acid, the lowest value obtained was 13.08%. Plants with lower erucic level will be probably obtained from this mutant with the use of half-seed analysis method. In the analysis of glucosinolates, low and high glucosinolates mutants were found.

Table 1. Values obtained in the analysis of 27 plants of *Brassica carinata* line "C-101"

Component	Min. Value	Max. Value	Mean
Palmitic acid	2.87	3.99	3.33
Stearic acid	0.65	1.05	0.84
Oleic acid	6.47	10.27	7.99
Linoleic acid	14.25	18.14	16.01
Linolenic acid	12.09	16.70	15.12
Gadoleic acid	6.48	10.18	7.77
Erucic acid	40.09	49.33	45.34
Oleic-linoleic	-13.04	-3.75	-8.70
Glucosinolates	121.41	190.16	158.08

Fatty acids are given as % Oil and glucosinolates as μmol/g dry matter

Table 2. Distribution of difference oleic-linoleic in 311 samples analyzed by GLC. First row show ranges and second row the number of plants found in each range.

< -20 %	-20 to -15%	-15 to -5%	-5 to 0%	0-5%	5-10%	10-15%
2	29	255	15	5	4	1

Table 3. Distribution of linolenic acid in 311 samples analyzed by GLC. First row show ranges and second row the number of plants found in each range.

7-10%	10-12%	12-17%	17-20%	20-23%
11	27	229	35	9

Table 4. Distribution of erucic acid in 311 samples analyzed by GLC. First row show ranges and second row the number of plants found in each range.

13-15%	15-20%	20-25%	25-30%	30-35%	35-40%	40-50%	>50%
2	2	3	12	32	68	183	9

Table 5. Distribution of glucosinolates in 127 samples analyzed by Pd-Glucosinolate complex method. First row show ranges and second row the number of plants found in each range.

75-90	90-110	110-130	130-200	200-230	230-250	250-270	>270
2	9	22	50	11	9	19	5

These results reveal the efficiency of mutagenesis for the improvement of nutritional characteristics of *Brassica* seeds. Likewise, this work could be carried out thanks to NIRS. This technique is fast, non destructive and allows to analyze several components simultaneously with a low cost and a good level of accuracy for screening purposes. Only 311 samples had to be analyzed by GLC and 127 by Pd-glucosinolate complex method out of 10353 to detect a substantial number of mutants for different traits.

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