

Mutation induction in chrysanthemums by gamma-rays treatment of rooted cuttings

W. GUZEWSKI and S. MUSZYŃSKI

Institute of Genetics and Plant Breeding, Warsaw Agricultural University

(Received: July 10, 1977)

Abstract

Rooted cuttings of two *Chrysanthemum hortorum* cultivars, yellow flowered Luyona and purplish-red flowered Woking, were irradiated with following dosages of ^{60}Co gamma-rays: 1.5; 2.0; 2.5; 3.0 kR. Among the MV_2 plants six clones from the cultivar Woking showed mutational changes, and two of them were selected as possible new cultivars. No mutants were obtained from the cultivar Luyona.

INTRODUCTION

Induced mutations play important role in plant breeding, especially in breeding of ornamental plants. Chrysanthemums, being polyploid and vegetatively propagated, offer an example of plant species which is rather difficult to improve by conventional methods. Therefore successful application of mutational methods could enhance the breeding of chrysanthemums to a great extent. Several promising mutants were induced in chrysanthemums as far (Broertjes 1966; Satory 1975; Sheehan 1959).

To check the possibility of mutational improvement in chrysanthemums, the experiments described below were performed at the Institute of Genetics and Plant Breeding.

MATERIALS AND METHODS

Two cultivars of garden chrysanthemums (*Chrysanthemum hortorum* Bailey), yellow flowered Luyona and purplish-red flowered Woking were chosen for the experiments. Rooted scions were given the irradiation treatments, as the preliminary trials with unrooted scions gave poor results. Following dosages of ^{60}Co gamma rays were applied: 1.5 kR; 2.0 kR; 2.5 kR for both cultivars, and additionally 3.0 kR for cv. Luy-

ona. The treatment was performed at the Radiobiological Laboratory, Institute of Plant Breeding and Acclimatization in Radzików.

During the irradiation treatment, the roots of the scions were protected with lead bricks. Each sample included 50 scions, with the controls counting 100 scions each. Immediately after the treatment, the scions were planted individually into pots and placed in a greenhouse. After a month, the height of all the plants was measured and the number of branches was counted.

After measurements were done, the cuttings were decapitated, all side branches appearing were cut off and planted separately, giving the MV_2 generation. Rooted cuttings forming the MV_2 generation, amounting about 200 in number for each treatment in the cultivar Woking and about 150 for each treatment in the cultivar Luyona, were potted in October, wintered, cut off at 15 cm height at the end of March, and planted into field in June. In October all the plants were placed again in a greenhouse, where they flowered during November–December.

Among the MV_2 plants all morphologically changed individuals were selected, and propagated as clons to check the stability of induced changes.

RESULTS AND DISCUSSION

The irradiation treatment caused growth reduction in the cv. Woking, the degree of growth reduction being similar for all the dosages applied, as compared to the controls (Table 1). Unexpectedly, the treatment caused growth stimulation in the cv. Luyona, which is hard to explain, because the dosages seem to be too high to induce stimulation. There were no differences noticed in the number of branches formed by the irradiated scions.

The morphological changes observed in the MV_2 generation included modifications in the colour, shape and structure of the flowers. Besides those effects, the plants of the cv. Luyona showed considerable growth depression after the dosages of 2.5 kR and 3.0 kR, and almost all plants from both treatments died.

All morphologically changed plants (47 for cv. Woking and 52 for cv. Luyona) as well as a certain number of randomly chosen control plants were selected for overwintering.

During the next years the morphologically changed plants, selected in the MV_2 generation, were propagated and maintained as clons to observe the stability of induced changes, as well as to determine their decorative value.

No clons obtained from the cv. Luyona showed improved features in comparison with the original variety, and thus they were discarded.

Table 1

Plant height and number of branches formed by gamma irradiated chrysanthemum cuttings, after one month following the treatment

| Gamma rays dose (kR) | Number of plants observed | Mean plant height (cm) | Mean number of branches |
|----------------------|---------------------------|------------------------|-------------------------|
| cv. Woking | | | |
| 0 | 100 | 38.8 | 3.5 |
| 1.5 | 50 | 24.0 | 2.8 |
| 2.0 | 50 | 23.7 | 3.0 |
| 2.5 | 50 | 20.5 | 2.4 |
| cv. Luyona | | | |
| 0 | 100 | 20.2 | 2.8 |
| 1.5 | 50 | 30.2 | 2.9 |
| 2.0 | 50 | 33.3 | 2.9 |
| 2.5 | 50 | 34.1 | 2.9 |
| 3.0 | 50 | 31.1 | 2.9 |

Six clons obtained from the cv. Woking were genetically stable under clonal propagation and showed considerable improvements of certain characters, as flower colour, stronger growth, disease resistance, and more upright type of growth. The best two from the six clons are included into preliminary variety trials, and they are considered as new cultivars, obtained by mutation breeding methods.

REFERENCES

- Broertjes C., 1966. Mutation breeding of chrysanthemums. *Euphytica* 15: 156—162.
- Satory M., 1975. Chrysanthemenzüchtung mit Hilfe künstlicher Mutationsauslösung. *Gartenwelt* 20: 433—435.
- Sheehan T. J., 1959. Plant improvement with gamma radiation. *Florida Agric. Exp. Sta. Annual Report* 1959: 130—131.

Address of the authors: Institute of Genetics and Plant Breeding, Warsaw Agricultural University, ul. Nowoursynowska 166, 02-766 Warsaw, Poland.

Indukowanie mutacji u złoćieni promieniami gamma

Streszczenie

Ukorzenione sadzonki dwu odmian złoćieni, żółtokwitnącej odmiany Luyona oraz purpurowo-czerwonej odmiany Woking, poddano działaniu promieni gamma w dawkach: 1,5; 2,0; 2,5; 3,0 kR. Wielkość próby wynosiła 50 szt. sadzonek w po-

szczególnych dawkach, oraz po 100 szt. sadzonek wzorcowych. Bezpośrednio po zabiegu sadzonki te posadzono do doniczek w szklarni. Po miesiącu zmierzono wysokość roślin, sadzonki przycięto, a pojawiające się pędy boczne odcinano i sadzonekowano jako pokolenie mutacyjne wegetatywne drugie (MV_2). Dane dotyczące wysokości sadzonek oraz liczby wytworzonych pędów bocznych przytoczono w tabeli 1. Przez kilka lat obserwowano klony otrzymane z rozmnożenia roślin zmienionych, jakie wyselekcjonowano w pokoleniu MV_2 . Jedynie sześć klonów odmiany Woking miało zmiany korzystne w porównaniu do wzorca. Były to zmiany barwy kwiatów, intensywności i formy wzrostu oraz odporności na choroby. Dwa najlepsze mutanty włączono do wstępnych doświadczeń porównawczych, jako nowe odmiany, uzyskane metodami mutacyjnymi.