

## **Evaluation of the induction of *Silybum marianum* (L.) Gaertn polyploidization using colchicine and oryzalin and preliminary phenotypic observations**

Marcin Ożarowski<sup>1</sup>, Aleksandra Deja<sup>1</sup>, Anna Forycka<sup>2</sup>, Małgorzata Podwyszyńska<sup>3</sup>, Ryszard Słomski<sup>1</sup>

1) Department of Biotechnology, Institute of Natural Fibres and Medicinal Plants- National Research Institute, Wojska Polskiego 71b, Poznań, Poland; marcin.ozarowski@iwnirz.pl, malgorzata.gorska-pauksza@iwnirz.pl, ryszard.slomski@iwnirz.pl

2) Department of Breeding and Botany of Crops, Institute of Natural Fibres and Medicinal Plants - National Research Institute, Kolejowa 2, Plewiska near Poznań, Poland; anna.forycka@iwnirz.pl

3) Institute of Horticulture - National Research Institute, 96-100 Skierniewice, ul. Konstytucji 3 Maja 1/3. Poland; Malgorzata.Podwyszynska@inhort.pl

\* **Correspondence:** [marcin.ozarowski@iwnirz.pl](mailto:marcin.ozarowski@iwnirz.pl) (MO)

### Abstract

The progress in quality of the crop plants by obtaining more fertile varieties is an important task of world agriculture is possible thanks to work aimed at improving the adaptive capacity of plants in response to environmental changes. One of such interesting techniques used in agriculture are biological and biotechnological methods, leading to the induction of genomic mutations by chemical polyploidization using antimitotics.

The aim of the experiment is to develop an effective method of inducing polyploidy of *Silybum marianum* (milk thistle, SILMA variety IWNiRZ-PIB), which is an important medicinal plant of high economic, horticultural and pharmaceutical importance.

In our study, colchicine and oryzalin in various concentrations (0.01%, 0.1%, 0.5%, 1%, 3%) were tested. Seeds and young plants were soaking in solutions of antimitotics in different time periods (48 and 20 h for seeds and 20 and 120 min for young plants). Seed germination and plant survival were observed in terms of the type of antimitotic and its concentration, exposure time to antimitotics and plant material. Polyploidization were tested by using flow cytometry.

Results showed that 100% of plants soaked in colchicine and oryzalin (0.1% and 0.01%) survived after minutes, and 80% of plants soaked in colchicine (0.1%) and oryzalin (0.1%) for 60 and 120 minutes, respectively. However only 42% and 40% of seed sprouted after colchicine in concentrations at 0.5% and 1% respectively (100% in control group). The epidermal cells and stomata did not show any negative changes with a tendency to increase the number of stomata (digital and scanning microscopy). Cytometric analysis showed, that 21.52% of plants with an altered genome ( $2x + 4x$  and  $4x + 8x$  and  $2x + 4x + 8x$ ), including 17.72% of mixoploid plants - polyploid chimeras (sectoral and mericlinal plants) were obtained. The method using colchicine is more effective for seeds than for young plants (11:3).

This research was funded by the Ministry of Agriculture and Rural Development in Poland.

### Bibliography

Marcin Ożarowski, Aleksandra Deja, Anna Forycka, Ryszard Słomski. Increasing the value of plant raw materials by inducing genomic changes - past and prospects for the varietal progress of herbal plants. *Postępy Fitoterapii* (in Polish) 2023, no 3; in press