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DEVELOPMENT OF ALLOPLASMIC MALE-STERILE LINES OF CARROT BY PROTOPLAST FUSION

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Abstract: *The main method used in carrot breeding is F1-hybrid based on the application of cytoplasmic male sterility CMS. Cytoplasmic male sterility (CMS) is commercially utilized for hybrid seed production. Alloplasmics are created when the cytoplasm of one species is replaced by that of another species through backcrossing or bio techniques such as somatic hybridization. [4]*

Keywords: *Daucus carota, protoplast fusion, hybrid, cytoplasmic male sterility CMS, Aloplasmics*

Carrot is among the top-ten most economically important vegetable crops all over the world, in terms of both areas of production and market value.

Cytoplasmic male sterility (CMS) in carrot takes two basic forms: “brown anther” and “petaloid”. The plant trait cytoplasmic male sterility (CMS) is determined by the mitochondrial genome and is associated with a pollen sterility phenotype that can be suppressed or counteracted by nuclear genes known as restorer-of-fertility genes. [1]

CMS, caused by mutations in the mitochondrial genome, is found in higher plants and increases heterosis and improve genetic resources. Mitochondrial markers can be used to differentiate between the various types of CMS sources. Molecular markers that can predict the CMS status at an early developmental stage will be valuable tools in carrot breeding and seed production programs, as well as for basic studies of male sterility [2].

In carrot, F1 hybrids are valuable due to uniform maturity, high early and total yield, better curd quality with respect to curd compression and color as well as for resistance to insect pests, diseases and adverse weather conditions an efficient, reliable and established method of F1 seed production without infectivity by self-fertilized seeds from each parent is vital. Manual emasculation and pollination method in carrot is not useful at commercial level due to incompatible flower size and structure. So far hybrids in carrot have been developed using self-incompatibility (SI) system. In recent years, important heterosis has also been reported in hybrids developed using CMS system for yield, yield linked and quality traits [3].

Preparation of plant material:

- Hybrid seeds of Celery (Sienna F1, Mambo, Balena F1, Kelvin RZ), Cultivar (Tango)
- Fennel seeds (Dragon F1)

These seeds were ordered from Rijk Zwan Dutch company.

Celery seeds were sowed in the greenhouse 09.02.2022, and started to sprout at the beginning of March.

After forming real leaves, DNA of celery and fennel have been isolated to carry out the PCR (Polymerase chain reaction is a method, allowing scientists to take a very small sample of DNA and amplify it to a large enough amount to study in detail) which is followed by gel-electrophoresis (is a laboratory method used to separate mixtures of DNA according to molecular size, the molecules to be separated are pushed by an electrical field through a gel that contains small pores) to check the existing of CMS within their genomes using molecular markers.

Results and Discussion:

Depending on all literature resources, molecular markers can predict the CMS status at early developmental stage of plants.

In our experience, all plants (carrots, celery and fennel) have been used to extract DNA for setting up PCR, which followed by gel-electrophoresis to find the plant which carries the CMS within their genome (Fig.).

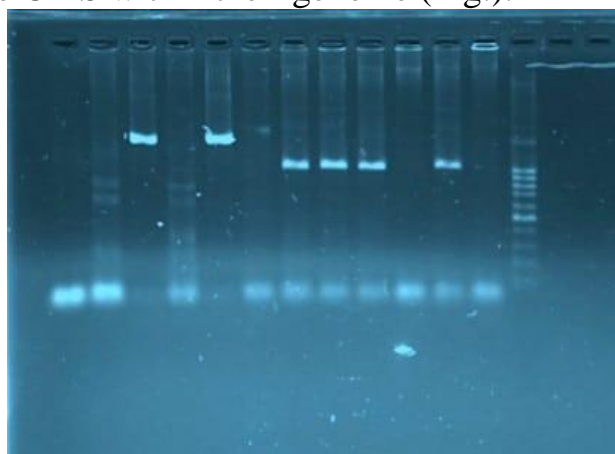


Fig. Gel-electrophoresis results for 12 accessions (5 varieties of carrot, 5 celery and 1 fennel) including negative control

The variety which has CMS trait will be used as a protoplast source material (Donor). Seedling will be used to produce callus culture from which protoplast are derived by producing suspension culture of callus, in the same way the protoplast of carrots obtained.

Protoplast fusion will be performed using the Gene Pulser Xcell electroporation system. To obtain alloplasmic protoplasts from which we can hopefully obtain mature carrot plants.

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**THE UNTOLD HISTORY OF WOMEN IN SCIENCE AND TECHNOLOGY:
SOFIA KOVALEVSKAYA**

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Abstract: *the article is dedicated to the memory of Sofia Kovalevskaya. The facts from the biography of Sofia Kovalevskaya and the main scientific achievements are given.*

Keywords: *Sofya Kovalevskaya, biography, science, mathematics, scientific activity.*

Being the first woman elected to the U.S. National Academy of Sciences in 1925, Florence Rena Sabin understood the challenges facing women as researchers and scientists. Human history has clearly demonstrated that intellect alone has rarely been enough to assure women a role in the process of investigating and explaining the natural world. Nevertheless a lot of women made significant contributions to various areas of science, including astronomy, physics, botany and genetics, biochemistry.

It is worth noticing the genre of scientific biography has become paradoxically attractive nowadays. On the one hand, it influences strongly on the public understanding of science; on the other hand, it covers a number of interesting topics relating to science, enhancing popularization of science in modern culture [1].

The work presents a scientist biography report devoted to Sofya Vasilyevna Kovalevskaya the outstanding Russian mathematician.