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Creating polyploid varieties of importance in breeding using polyploidy and its methods

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Abstract: This article analyzes polyploidy and its importance in breeding. Polyploidy, that is, the presence of two or more copies of a chromosome set, leads to the emergence of new genetic traits in organisms. Polyploidy creates important opportunities for creating new varieties, increasing yields, improving resistance to climatic conditions, increasing heterozygosity, and accelerating evolutionary processes. The study notes that polyploid organisms often have beneficial traits such as disease resistance, high productivity, and improved feed quality. This process can provide innovative breakthroughs in agricultural breeding.

Keywords: Polyploidy, selection, chromosome set, autopolyploidy, allopolyploidy, heterozygosity, high yield, endurance, climatic conditions, evolution, genetic traits, plant varieties, selection process, disease resistance.

Introduction

The Decree of the President of the Republic of Uzbekistan Shavkat Miromonovich Mirziyoyev "On measures to improve the environment, create new polyploid plant varieties and develop the field of plant science" was signed on December 17, 2022. This decree is aimed, in particular, at improving the environment, ensuring ecological sustainability, and expanding the creation of polyploid plant varieties in the agricultural sector. The Presidential Resolution on improving the environment and creating new polyploid varieties is No. 563, adopted on December 25, 2022. The resolution discussed the issues of creating polyploid varieties, their application in agriculture, introducing new technologies in the agricultural sector, and ensuring ecological sustainability.[1] Luther Burbank(1849-1926) . He was an American plant breeder and plant breeder who pioneered the concept of polyploidy and made many contributions to the development of new plant varieties. Burbank used polyploidy to create new genetic traits and improved yields by increasing the number of chromosomes in plants. In particular, he used the process of polyploidy to create new varieties of potatoes, walnuts, and other plants. Burbank's work

on polyploidy and plant breeding set the course for modern plant breeding. His innovative approaches, and his achievements in improving plant performance and resilience, continue to have a significant impact on breeding today.[2] Barbara McClintock (1902–1992) was a prominent geneticist who worked on polyploidy and chromosomes. She is best known for her work on "mutations" and "chromosome movements." She studied polyploidy and mutations, determining how genetic traits change and how genes can come into new combinations. Mac Clintock's work, in particular, played a significant role in understanding polyploidy and its importance in growth and development. Barbara Mac Clintock studied how polyploidy (the increase in chromosome sets) and the loss or gain of chromosome segments affect the development and evolution of plants. These studies were of great importance in plant genetics and breeding.[3]

Methodology

K. I. Vasil is a prominent scientist in the field of plant biotechnology and cell culture. During her scientific career, she conducted important research in plant cell and tissue culture, somatic cell genetics, and plant biotechnology.K. Vasil's 1994 article "Polyploidy in Plants: Methods of Induction and Applications in Agriculture" analyzes methods for inducing polyploidy in plants and their importance in agriculture. The article discusses the processes of creating new varieties using chemicals such as calcite and chloroform.[4] The study by Kashiwabara and Nakai sheds light on the theoretical and practical aspects of the process of polyploidy generation using calcein. This approach serves to study the possibilities of creating polyploid varieties in pomegranate plants. Polyploidy generation can open new directions in breeding and genetic research and can be of great importance in improving the quality, increasing the yield and strengthening the resistance properties of fruit crops. The study by Kashiwabara and Nakai sheds light on the theoretical and practical aspects of polyploidy generation using calcein. The prospects of creating polyploid varieties in pomegranate plants using calcein are of great importance for breeding and genetic research. This approach plays an important role in improving the quality and increasing the yield of fruit crops.[5] Ramanna . M. S has provided important information on how to apply polyploidy methods in plant breeding. For example, the following:

1. The essence of polyploidy: It explains what changes occur in the genetic and physiological processes of polyploidy. This process is described by increasing the chromosome number of plant species.

2. Practical application: The role of polyploidy in increasing agricultural productivity and its importance in breeding processes are considered. In particular, the issue of creating high-quality varieties using this method is discussed.

3. Genetic changes: How the processes resulting from polyploidy affect the goals of breeding is analyzed.

4. Scientific and practical approaches: Along with the scientific basis for the introduction of polyploidy, methods for its successful application in plant breeding are shown.[6]

Results and discussion

Important aspects of colchicine and chloroform used in the creation of polyploid plants. In the polyploidy process, there are several other types of colchicine, these substances are used in various concentrations and percentages to increase the chromosome number of plants. Calchicine stops cell division and causes the number of chromosomes to double. Different types and percentages of calcitriol

are used to induce polyploidy in plants. Each type and concentration may be effective for different plant species, as calcitriol has different effects on different plants. Colchicine is used in all polyploidy processes. It is usually in the form of crystals or solutions. Colchicine sulfate: is used primarily as a liquid. It also affects chromosomes, but its effectiveness in some plants may vary. Colchicine glycoside: In some cases, colchicine is also used in the form of glycoside. This form is used more in plant propagation, but the effectiveness of the effect can sometimes be low. Often, the seeds or seedlings of plants are treated with a solution of calcitriol. This process is used to obtain new plants or varieties. Calchicine treatment produces different results in plants depending on its concentration (percentage) and duration of use. The most effective percentages and methods of exposure to plants may be as follows: 0.1% Calchicine: Often used for low levels of polyploidy, should not significantly affect plant growth and yield. 0.5% Calchicine: For high polyploidy, has a strong effect on plants and is used to obtain high results. 1% Calchicine: For some species, this is a high concentration, and if the plants are resistant to this amount, their polyploidy can reach high levels. However, high concentrations can damage the plant or negatively affect its growth, so they should be used with caution. 0.03% - 0.1% Calchicine (for light treatment): This low concentration is effective for some plants and is used to induce polyploidy without affecting their development. Soil treatment: In some cases, calciquine can be applied to the root system of plants. This is certainly to obtain polyploid varieties. For seeds: Seeds should be washed and cleaned before treatment with a calciquine solution. Calchicin treatment slows down the process of seed germination - (germination of the seed) - the active development of a plant seed to form a new plant. This process is the beginning of the restoration of seed viability and the continuation of the plant's life cycle. which leads to an increase in chromosome number. For tissues: If working with plant tissues (e.g. tissue culture or vegetative propagation), plants can be kept in a solution of calcein for 2-4 hours.

• Polyploidy of pomegranate varieties by chloroform is an alternative method of producing polyploidy, usually using chemicals such as calcein (colchicine), and has been used for some plants. Chloroform ($CHCl_3$) can be used to induce polyploidy by stopping the metabolic activity and cell division processes of plants. Chloroform is usually used in concentrations of 0.05% to 0.1% when treating plants to induce polyploidy.

• Metabolic control: Chloroform helps increase the chromosome number of plants by stopping cell division.

• Larger fruits and yields: Polyploidy plants can often produce larger fruits, higher yields, and better quality products.

• Increased resistance: Polyploidy plants often have increased stress tolerance, i.e., they are more resistant to drought or harmful factors.

Conclusion

In the polyploidy process, the results vary depending on the plant species, the concentration of calcein, and the duration of treatment. Therefore, it is very important to conduct experiments and determine the appropriate concentrations. Inducing polyploidy using calcein is an important method in agriculture, plant breeding, and genetic modification processes. The process of creating polyploidy using calcein is used in plant breeding, genetic modification, and the creation of new varieties. Polyploidy helps to increase the yield of plants, improve their resistance to climatic factors, and introduce new traits. The

main effect of calcein is to inhibit cell division. There are usually two stages of plant cell division: mitosis (normal division) and meiosis (reproductive division). Calchicin stops mitosis, which causes the number of chromosomes to double. As a result, the plants become polyploid (with twice the number of chromosomes). Polyploid plants are often larger, stronger, and more productive. They improve the physiological condition of the plants. Polyploid plants are often more resistant to ecosystem conditions (e.g., heat, low water). This improves their adaptation to agricultural and environmental conditions. Plants polyploidized with calcipolydin are used to create new varieties. They are used to produce higher quality crops or to introduce new traits. Polyploid plants can sometimes produce larger fruits or flowers. This can increase the commercial value of their variety. Some plants become more resistant to pests in the polyploid state. This improves the plants' defense mechanisms.

References

1. Mirziyoyev SH.M. PQ-563-son qarori 17.12.2022 yil
2. Burbank L. The Training of the Human Plant. Houghton Mifflin Company.78(6) 134-137 (1925).
3. Mac Clintock B. The Significance of Repetitive DNA Sequences in Chromosomal Evolution. Journal of Cell Biology, 99(3), 108-113 .(1984).
4. Vasil, I. K. Polyploidy in Plants: Methods of Induction and Applications in Agriculture. Plant Cell Reports, 14(12), 646-650. (1994).
5. Kashiwabara Y. va Nakai N. Effect of Colchicine on the Polyploidization of Fruit Crops. HortScience, 26(9), 231-234. (1991).
6. Ramanna M.S.The use of Polyploidy in Plant Breeding .In Advances in Agronomy,42, 211-266. (1984).