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Recombinant DNA Technology

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Abstract

Recombinant DNA technology is a biotechnological procedure that allows scientists to manipulate DNA for practical purposes, because the genes of an organism are changed and its DNA is recombined during the process. Recombinant DNA technology offers the potential to create genetically modified plants with desirable features such as higher biotic and abiotic stress tolerance in plants, as well as improved flexibility for better survival. In comparison to natural recombination or traditional breeding methods, recombinant DNA technology allows for faster, cheaper, and more accurate insertion of specific features from many sources into the plant genome. In this article we will discuss about multiple steps, tools and other specific procedure followed in the recombinant DNA technology, which is used for producing artificial DNA to generate the desired product.

Introduction

The merging of two (or more) DNAs of different origins to form a new (and novel) DNA molecule is referred to as recombinant DNA technology. This DNA is transported to a host organism, usually a bacteria, where it can multiply with the help of the host's machinery. This process of inserting a foreign DNA in a host is also referred as Gene Cloning. Recombinant DNA technology is a genetic engineering technique that involves identifying, isolating, and inserting a gene of interest into a vector such as a plasmid or bacteriophage to create a recombinant DNA molecule, followed by the production of large quantities of the gene fragment or product encoded by that gene. Recombinant DNA technique uses a genetically modified vector to change the phenotypic of an organism (host). This cloning vector is injected into the organism's genome. In essence, the procedure entails inserting a foreign piece of DNA into the genome that includes the gene of interest. The introduced gene is known as a recombinant gene, and the procedure is known as recombinant DNA technology.

In fact, the use of genetic engineering and recombinant DNA technologies has resulted in the emergence of new species known as genetically modified organisms (GMOs) or living modified organisms (LMO) (Vashishth and Tehri, 2015).

The first recombinant DNA molecules were generated in 1973 by Paul Berg, Herbert Boyer, Annie Chang, and Stanley Cohen of Stanford University and University of California San Francisco (Begna, 2020).

Mechanism

Recombinant DNA technology involves the selection of the desired gene for administration into the host followed by a selection of the perfect vector with which

the gene has to be integrated and hence the recombinant DNA is formed. This recombinant DNA then has to be introduced into the host. And at last, it has to be maintained in the host and carried forward to the offspring. Various steps involved in this process are as follows.

- Isolation of DNA
- Fragmentation of DNA
- Amplification of Gene of Interest
- Insertion of recombinant DNA into the host.

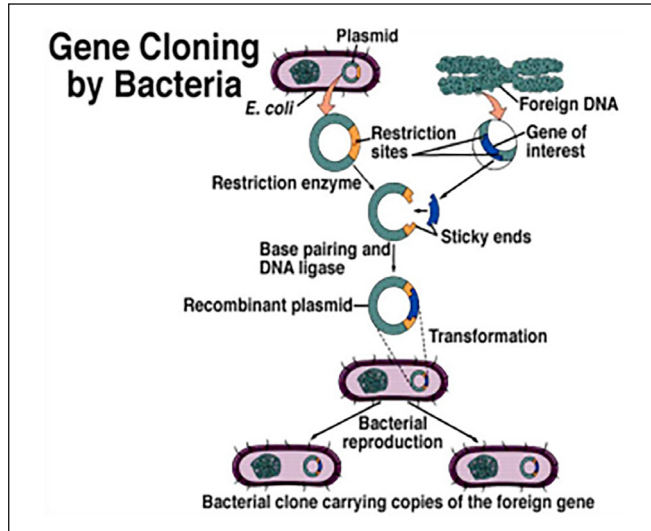


Figure 1: Representative diagram depicting the process Recombinant DNA technology explained by (Vashishth and Tehri, 2015)

Application

- Food and agriculture: Recombinant DNA technology has a wide range of applications, including the development of novel enzymes that are suited for certain food processing conditions.

- Health and disease: Recombinant DNA technology has wide spectrum of applications in treating diseases and improving health conditions. Describe the important breakthroughs of recombinant DNA technology for the improvement of human health.

- Gene therapy: Gene therapy is an advanced technique with therapeutic potential in health services.
- Development of vaccines and recombinant hormones: Recombinant DNA technology plays a vital role in developing vaccines and recombinant hormones (FSH).

Conclusion

Recombinant DNA technology is a significant advancement in science that has made life considerably easier for humans. The importance of recombinant DNA technology in cleaning up the environment (phytoremediation and microbial remediation) and improving plant resistance to many adverse circumstances (drought, pests, and salt etc.), several existing issues in commercial agriculture can be mitigated by genetically modified crops. The current market trends project is one of the world's most inventive and fast-growing industries, benefiting not only growers but also consumers and major country economies.

References

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