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Role of Biotechnological Tools in Crop Production

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SUMMARY

Plant biotechnology is the potential tools to achieve sustainable agriculture, through the improvement of food production in terms of quantity, quality and safety, while preserving the environment. Biotechnology role to play in serving as forum to negotiate international instruments to ensure safety while facilitating international trade, promoting collaborative work and technology transfer, developing new technology.

INTRODUCTION

Biotechnology is considered the use of biological processes or organisms for the improvement in the characteristics of plants, animals, microorganism or food. Biotechnological tools have greatly contributed to the production and supply of improved quality seed and planting material to farmers in the round over the world. Varietal Identity and Purity: Cultivars are described using phenotypic Characteristics i.e. using characteristics resulting from the expression of genes. These characteristics may be either morphological or physiological. They may also be electrophoretic as in the case of Isozymes. Using Isozymes to visualize varietal identity and purity provides a good advantage to seed producers since it's an inexpensive and easy technique, analysis of other phenotypic characteristics. Isozymes electrophoresis results are unaffected by genotype- environment interactions. It attainable to differentiate varieties with accuracy, this system needs many markers, Isozymes polymorphism, and cultivars that area unit sufficiently uniform for these characteristics.

Tissue Culture Techniques

Multiplication of plant material under aseptic and controlled artificial conditions, also known as micro-propagation, has been used for decades to speed up the propagation process for several vegetative propagated crops. This is the case for fruit tress (e.g. banana, date palm), roots and tubers (e.g. potato, cassava), vegetables and ornamentals (e.g. roses, orchids). Somatic embryogenesis, a variation of micro-propagation embryos are directly regenerated instead of shoots and roots, several organization investigated the possibility with some crops to use somatic embryos that could be encapsulated with different chemical and biological compounds.

Diagnosis of Diseases

Two methods are mostly used for identification of diseases transmitted by planting material viz.

- **ELISA (Enzyme- Linked Immunosorbent Assay)** is a widely used technique based on an antibody –antigen reaction and used for diagnostic determination of the presence of specific molecules in samples.
- **PCR (Polymerase Chain Reaction)** is a technical procedure that amplifies and makes it possible to detect a specific piece of DNA. These two techniques are much more sensitive and reliable than conventional seed health assays on grow-out media and will ensure a much higher seed health level. However, for the time being, they are only operational for limited number of disease transmitted by seed or planting material. Moreover, the high sensitivity of these techniques in particular PCR techniques, may lead to false –positive results. As far as quarantine pests are concerned. Misuse of these techniques may leads to unnecessary troubles in the international seed trade. To avoid these actual problems, and increase real boon from these new technical processes.

Production of Haploids / Double Haploids

It is a viable tool to reform the new plants from pollen or ovules in in-vitro climate conditions. These plants, which contain only one copy of each chromosome, are called haploids, they are not viable. After applicable chemical treatment. It's potential to revive the conventional variety of chromosomes and to regenerate viable plants. These types of progenies are homozygous in nature in all characters and also known as double-haploids.

Such plants are of tremendous interest to plant breeders since they allow the development of pure line varieties or inbred parental lines much more quickly than through conventional breeding. Androgenesis (regeneration from pollen) has been with success used for crops like eggplants, pepper and wheat. Gynogenesis (regeneration from ovules) is used on barley doesn't need in vitro cultivation of ovules; development of haploids is obtained in vivo through interspecies crosses between barley and Hordeum bulbosum, a wild relative.

Marker-Assisted Breeding

Markers may be either phenotypic or genotypic, and marker-assisted breeding techniques DNA markers used in breeding programmes are Random Amplified Polymorphic DNA (RAPD), Amplified Fragment Length Polymorphism (AFLP), microsatellites, and Expressed Sequence Tags (ESTs). Each of these markers has a different set of advantages and limits. Cost and potential automations of the techniques are off specific importance for his or her adaptation. Use of molecular markers, in association with linkage maps and genomics, provides to plants breeders potential to make genetic advancement more sharp than by phenotypic selection. There are several applications for utilizations of deoxyribonucleic acid markers in breeding programmes. Enhancing knowledge of breeding material and systems, such as better understanding and more effective breeding of Quantitative Trait Loci (QTL); Rapid introgression or backcross breeding of simple characters ,as the number of backcrosses required can be reduced drastically if there are markers for the character to be introduced and for the genetic background of the recurrent parent; New goals not possible through ancient breeding, including pyramiding of disease resistance genes with indistinguishable phenotype.

Embryo Rescue

Breeders would like access to the most important potential genetic variability. In some cases variability available within a given species is not sufficient to answer a specific problem (e.g. resistance to some new disease). A solution available to breeders is interspecific hybridization (crossing plants from separate but related species). Embryos ensuing from such cross breeding seldom survive, due to incompatibilities between the embryo and the mother plant. Saving embryos is typically potential through their in vitro cultivation, which make it possible to isolate the interspecific embryos from the hostile mother plant environment. This technique has been used for the introduction of malady resistance into squash, lettuce, tomato, etc.

Protoplast Fusion

A fusion of protoplasts is another technique to allow interspecific hybridization between species that cannot through conventional breeding, even using in vitro embryo rescue. Protoplast is plant cells that have their outer walls removed through a chemical treatment. While it's tough or not possible to fuse plant cells, it is possible through various techniques (using either chemical or physical treatment) to merge protoplasts from different crops species or genera, then to regenerate an entire plant ensuing from the fusion method. This technique has been used to introduce traits such as male sterility into rapeseed or disease resistance in potato. Similarly to embryo rescue, this system can likely get replaced by transgenesis that could be a quicker; moreover, energid fusion is usually not effective on the far side the family level because of incompatibilities between 2 distant genomes creating it not possible to regenerate plants.

CONCLUSION

From the above article it is concluded that Biotechnological tools have great role in the production and supply of improved quality seed and planting material to farmers in the round over the world.

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