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The in vitro culture of vegetable cells and tissues as alternative In the conservation of plant genetic resources

Abstract

Through in vitro cell and tissue culture technics, we can induce the obtaining and production of somatic embryos, process that has been very successful, both to rescue, and massively multiply various socioeconomically important plants, in addition to supporting various schemes for the genetic improvement of plant species.Somatic embryos obtained in vitro can be encapsulated, and labeled as synthetic or artificial seeds, and their mass production can be scaled using bioreactors. Somatic embryogenesis has been successfully explored in various plant species such as: including woody or forest species, ornamental, solanacea, rubiceae, agaves and now grasses including legumes, and fossil plants such as cycas. In vitro conservation proposes the encapsulation of somatic embryos with the combination of sodium alginate and calcium chloride, incorporating cryoprotective, such as trehalose, glycerol, sorbitol, dimethylsulfoxide (DMSO) to avoid damage during its freezing with Liquid Nitrogen at -1960 C (cryoconservation), and seek to recover its viability successfully after storage. Other conservation strategies that have been explored using as explants: corms, apex's and stem buds, have been dehydration, tissue vitrification, or minimal growth by adding growth inhibitors, as well as light and temperature control.

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José Luis Rodríguez de la O
Plant Sciences departament, AutonomusChapingo University, Mexico

Correspondence: José Luis Rodríguez de la O, Plant Sciences departamento, AutonomusChapingo University 56230. Mexico, Email jrguez@correo.chaingo.mx, jlro8@msn.com

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Introduction

Given the incidence of countless adverse factors on the biology of our planet that shows climate change and its enormous consequences on the biodiversity of both plants and animals, the effects on plant cover, makes many plant species endangered, either threatened or under special protection. Plant biotechnology, and particularly the use of in vitro culture of plant cells and tissues, an excellent complementary strategy has been for germplasm (seeds) banks for the conservation of important plant genetic resources, ensuring in the short, medium and long term to perpetuate asexually the genetic basis of various plant species many of them valuable and endemic from countries that have valuable diversity, and that in the future will be indispensable for agricultural production, and the food security of future generations.[1] Through in vitro cell culture we can induce the production of somatic embryos, a process that has been very successful, both to rescue, and massively multiply various socioeconomically important plants, in addition to supporting various schemes for the genetic improvement of plant species.Somatic embryos obtained in vitro can be encapsulated, and labeled as synthetic or artificial seeds, and their mass production can be scaled using bioreactors.[2] Somatic embryogenesis has been successfully explored in various plant species such as: including woody or forest species, ornamental, solanacea, rubiaceae, agaves and now grasses including legumes, and fossil plants such as cycas. Invitro conservation proposes the encapsulation of somatic embryos with the combination of sodium alginate and calcium chloride, incorporating cryoprotective, such as trehalose, glycerol, sorbitol, DMSO to avoid damage during its freezing with Liquid Nitrogen at -1960 C (cryoconservation), and seek to recover its viability successfully after storage.[3] Other conservation strategies that have been explored using as explants: corms, apex's and stem buds, have been dehydration, tissue vitrification, or minimal growth by adding growth inhibitors, as well as light and temperature control. The different conservation strategies include different conditions, according to the species, they can be stored and recovered later, monitoring their health, and integrity of their genetic base. In vitro conservation strategies prioritize those valuable plant species that are currently endangered or threatened, maintaining as its ultimate purpose the establishment of an in vitro germplasm bank. in vitro.

The description and conservation of plant resources, begins since Vavilov, (1887-1943), mentions in his work of recognition of the "geographical centers of genetic diversity", highlighting the importance of the exploration, collection, use and conservation of valuable genetic material has increasingly been recognized as an overriding need to safeguard the natural source of hereditary variation and genetic improvement of plant species. During centuries of evolution, man has depended basically on plants as an original source of food and energy, currently one in 8 plant species in the world is endangered, in rainforests 60,000 plants are on track to disappear due to the effects of deforestation, and by rapidly increasing the population, as well as other activities , associated with increasing the increasingly extreme environmental conditions fostered by climate change, it is necessary to jointly implement different conservation techniques and the sustainable management of different agronomic practices, which allow the rescue, storage, and protection of the genetic base concentrated in the main centers of origin of many countries that have strategic or valuable plant genetic resources.

The study and conservation of plant genetic resources has been carried out in a multidisciplinary form through the banks of germplasm Rublo.[4] It should be noted that the conservation or storage in situ, ex situ and in vitro, is intended to conserve, the highest possible genetic integrity of the resources, useful as a source of the genetic variability of the selected populations, so that the germplasm banks that tend to adequately preserve this integrity will be the most efficient to achieve the aforementioned purpose.Within conventional species

conservation methods, commonly used germplasm banks for sexually reproductive plants have been highlighted, these methods have high maintenance costs including cooling various seeds, although these conditions are limited to preserve some recalcitrant species as the effect of cold for prolonged periods causes them to lose their viability , subsequently difficult to germinate, so it depends on strategically having an efficient method of conservation with the use of living collections in reserve areas established naturally in the field, because they often occupy large areas of land, the risk involved in maintaining germplasm in the field by natural disasters such as fires and in many cases the presence of pests and diseases, which sometimes involves storing or transmitting various pathogens as well.

The use of biotechnology through in vitro culture of plant cells and tissues, allows through different strategies the storage and conservation of explants in clonal or asexual form of elite or genetic base species of plants.[5] Outstanding as sources of resistance towards biotic and abiotic factors all under aseptic conditions establishing with different strategies of conservation either: short, middle and long-term (cryopreservation) methods, aseptically seeking, to maintain unalterable genetic characteristics, in vitro conservation methods, to seek that the plant species or stored plant genetic resources maintain their genetic stability in an unchanged manner.[6] There for the protocols in vitro, should be well directed to ensure a high percentage of recovery and evidence to achieve their subsequent massive proliferation of plants. Although in vitro strategies extensively discuss the genetic stability or importance of genetic variability or possible damage to plants regenerated from cell culture, it is therefore required that methodologies be conducive to efficiently maintaining the absolute genetic basis, thus the in vitro production of somatic embryos, can prove as an excellent way for the production of synthetic or artificial seeds or as a strategy in the conservation of elite plants, i.e. plant species with outstanding genetic basis, since encapsulated embryos, can be deshydrated, or vitrified as well as frozen (cryopreserved) could maintain their genetic base in asexual or clonal form, or if they are to promote the controlled genetic variability , however in some plant species it is very difficult to find or promote the embryogenic responses in vitro.[7]

Conclusion

The different conservation strategies include different conditions, according to the species, they can be stored and recovered later, monitoring their cleaning, and integrity of their genetic base. In vitro conservation strategies prioritize those valuable crops or plant species that are currently endangered or threatened, maintaining as its ultimate purpose the establishment of an in vitro germplasm bank in vitro. This ensures the production and availability of food for future generations on our planet

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Conflicts of interest

Authors declare no conflict of interest exists.

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