



## Conservation ex Situ for Food Security

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**Abstract :** The ex situ conservation ensures the existence of individual species of plants, being an essential tool for conserving plant diversity that guarantees the preservation over time under favorable conditions and with their original genetic characteristics, becoming the basis for food security source. Thus, the ex situ conservation has two methods to preserve plant genetic resources, conservation of the whole organism called field conservation and preservation of part of the body that manages the seed and in vitro conservation.

**Keywords:** Germplasm bank, in vitro conservation, plant genetic resources, ex situ conservation.

### Introduction

Latin America, especially Colombia, count with a variety of genetic resources for crop production, factors such as the replacement of local genotypes, colonization of new lands, changes in cultural techniques and application of agrochemicals are causing rapid and deep erosion of genetic resources. The need for increased food production directly or indirectly affects the potential use of species in the production of new materials. (Congress of Colombia, 2004).

Thus, it is spoken of plant genetic resources for food and agriculture that currently are threatened by many factors, among which are environmental, arising as a result of global development<sup>(1)</sup>. For this reason, it becomes to preserve by ex situ conservation, which arises as an alternative for situ conservation in order to conserve genetic resources<sup>(2)</sup>. This type of conservation is oriented to maintain different types of crops which are of great importance for feed human being for the purpose of conserving genetic diversity as part of biodiversity management<sup>(3)</sup>.

In this review, it does emphasis on ex situ conservation of seeds for food security where there are some categories such as field conservation and maintenance of the organism. The last one is classified in seed conservation and preservation in vitro, which ensure the species for food and agriculture<sup>(4)</sup>; for this review took into account national and international studies of ex situ conservation since 1986 and 2009, for that we used electronic data, personal communication with researchers at the University of Antioquia and other contacts to find different articles related to the topic. At the beginning we talk about the definition of concepts

of plant genetic resources, reasons to conserve these resources, the definition of ex situ conservation, preservation methods ex situ, to finally conclude with the situation of plant genetic resources in Colombia.

## Development

### Concept of Plant Genetic Vegetable Resource

All genetic variation in plant species is known as "plant genetic resources" which are considered of great importance because they provide to the man the raw material needed for new and better varieties of plants<sup>(5)</sup>. These resources are a great usufruct of human beings; therefore their loss is a major threat to farming systems, agricultural development and food security (Baths, *et.al.* sf). On the other hand, in the context of agriculture, plant genetic resource is understood "*as the genetic material of current or potential value, that interests man's needs*"<sup>(6)</sup>. According to the International Treaty on Plant Genetic Resources for Food and Agriculture these "*are resources to conserve species, which is by ex situ method*". In addition, the treaty classifies the species into four groups which are: "*Species that have or have had agricultural interests and species uses in a traditional way, and wildflower species that are crossed with other and wild species that are useful in agriculture*"<sup>(7)</sup>.

### Reasons to Preserve Plant Genetic Resources

Plant Genetic resources are the raw material to develop new varieties of plants and preserve existing ones, which are essential to meet nutritional needs of a population that is constantly growing<sup>(8)</sup>. These guarantee the mankind supply and are essential in the development of sustainable agriculture and food security. In addition, these resources must be retained in order to prevent agricultural varieties disappear due to factors that have arisen as a result of global development among which is the damage environmental; in the case of agricultural species for human livelihoods an increased susceptibility is acquired to pests and diseases<sup>(9)</sup>.

Moreover, these resources provide the necessary raw material that helps the farmer to modify their crops in response to global climate change and land degradation. Without access to a supply of new plant genetic material, there is little hope of covering the nutritional needs for future generations; i.e. in ensuring sustainable development by introducing elements that ensure the conservation of plant genetic resources. However, it should be noted that not only the environmental damage is the cause of the loss of plant genetic resources also the human activities that are carried out without any control, causing the reduction of species that are edible or have been domesticated by Man<sup>(10)</sup>.

### Ex Situ Conservation

According to the European Commission, (2006), the ex situ conservation, "*It is the conservation of the biological diversity components outside their natural habitats.*" Ex situ conservation involves sampling, transfer and storage of genetic material. This method reduces costs, enhances control and facilitates providing material for food security<sup>(11)</sup>. This method of conservation is recommended to keep individuals and gens of nature species that are disappearing<sup>(12)</sup>, with respect to gens, today handled what is known as seed banks, collections of tissues culture, germplasm, cryopreservation among others<sup>(13)</sup>.

### Ex Situ Conservation Methods

According to Martin (2001), ex situ conservation has two methods of preserving plant genetic resources, these are the conservation method of the whole organism also called conservation field and the conservation method of part of the body where there are the conservation seeds and in vitro tissue conservation. The conservation field is carried out mainly in species of seeds that cannot be preserved for long periods of time, and slow to reproduce; a disadvantage is that require space and constant workforce; also Seguel (2001) it runs the risk of pest infestation and disease, injuries caused by natural events and genetic loss.

On the other hand, seed conservation is the most used today, and is done through conservation in gene banks where the seeds remain long periods of time under favorable conditions such as relative humidity and temperature storage<sup>(14)</sup>. The storage of dried seeds at low temperatures is best suited to conserve plant germplasm<sup>(15)</sup>, this method is the cryopreservation which is to preserve the seeds at very low temperatures

(-196 °C to -150 °C, liquid nitrogen temperature), a condition that makes the cell activity, the metabolic and physical processes, cease<sup>(16)</sup>.

Conservation in vitro, is an alternative conservation for all species that cannot be preserved by seeds, this method avoids climatological and pathological problems, which offers the ease in making genetic exchange<sup>(17)</sup>.

### Status of Fitogenetic Resources in Colombia

Despite the great diversity of phylogenetic resources that have Colombia, knowledge and inventory of these is minimal<sup>(18)</sup>. Thus from 1994, an agreement on biodiversity between the Colombian Agricultural Institute (CAI) and the Colombian Corporation for Agricultural Research (CORPOICA), with the participation of the Ministry of Agriculture, they were established the different guidelines for conservation of genetic plant resources in accordance with international recommendations, through the National Genetic Resources Program CORPOICA<sup>(19)</sup>.

From this year, various government agencies and some of private character are involved in the preservation and multiplication of this vegetable germplasm. However, the criterion that has prevailed has been to keep the plant material in banks, to supply improvement needs, meet building programs or multiply materials found in risk extinction<sup>(20)</sup>. The Colombian Corporation for Agricultural Research (CORPOICA), responsible for coordinating the National Program for Plant Genetic Resources and Biotechnology (PNRGV), has a collection of 25,000 species. The International Center for Tropical Agriculture (CIAT), preserves about 53,000 species and there is also a Base Collection, whose duplicates are maintained in genbanks and international centers<sup>(21)</sup>.

From the foregoing, it can be said that 70% of plant genetic resources are managed by CORPOICA, which is a network of active banks of the various existing plant, located in the seed bank which it is in the Tibaitatá Research Center (Mosquera) and the remaining 30% are collections consist of germplasm bank (Estrella, Carvajal, 2001). The Colombian Agricultural Institute (ICA) manages the diversity of genetic resources in regard to plant species, especially those species that have high nutritional value in the country. These resources are preserved through genbanks, most of which handle ex situ conservation method, either by seed conservation or under in vitro conditions<sup>(22)</sup>.

### Conclusions

Finally can say that although Colombia has many phylogenetic resources and with different entities managing genbanks among which are CORPOICA, CIAT, CENICAFE, CENICAMA, COLTABACO, CONIF, SINCHI, Unipalma, ANTIOQUIA U., CALDAS U., NATIONAL OF BOGOTA, MEDELLIN AND PALMIRA U., the activities of characterization of these resources are low. It's worth to say that the use of these resources are very important mainly in traditional communities, indigenous and farmers being and constitute the mainstay of food security in our country<sup>(23)</sup>, resources they are preserved by the preservation method of the body that manages the seed and in vitro conservation.

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