Castanea spp. biodiversity conservation: collection and characterization of the genetic diversity of an endangered species

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Abstract Centuries of co-evolution between Castanea spp. biodiversity and human populations has resulted in the spread of rich and varied chestnut genetic diversity throughout most of the world, especially in mountainous and forested regions. Its plasticity and adaptability to different pedoclimates and the wide genetic variability of the species determined the spread of many different ecotypes and varieties in the wild. Throughout the centuries, man has used, selected and preserved these different genotypes, vegetatively propagating them by grafting, for many applications: fresh consumption, production of flour, animal nutrition, timber production, thereby actively contributing to the maintenance of the natural biodiversity of the species, and providing an excellent example of conservation horticulture. Nonetheless, currently the genetic variability of the species is critically endangered and hundreds of ecotypes and varieties are at risk of being lost due to a number of phytosanitary problems (gum blight, Chryphonectria parasitica; ink disease, Phyllostoma spp.; gall wasp, Dryocosmus kuriphilus), and because of the many years of decline and abandonment of chestnut cultivation, which resulted in the loss of the binomial male chestnut. Recently, several research and experimentation programmes have attempted to develop strategies for the conservation of chestnut biodiversity. The purpose of this paper is to give an overview of the status of biodiversity conservation of the species and to present the results of a 7 year project aimed at the individuation and study of genetic diversity and conservation of Castanea spp. germplasm.

Keywords Castanea · Chestnut · Conservation and horticulture · Ex situ conservation · Germplasm identification · Piedmont Region

Introduction

Fagaceae (Fagales) includes eight genera (Castanea, Castanopsis, Fagus, Lithocarpus, Nothofagus, Quercus, Trigonohalanis, Chrysolepis) and about 600-800 species. The genus Castanea is widespread in the Boreal Hemisphere (Fig. 1) and includes 12 or 13 species according to classification (Table 1). The natural distribution of the European chestnut (Castanea sativa) includes Europe and all of the Mediterranean countries. In Asia (China, Korea, Japan, Vietnam) C. crenata, C. mollissima, C. seguinii, C. henryi occur. In North America, C. dentata is found between Ontario and Maine, along the Appalachian Mountain Range into Georgia and Alabama (Camus 1929) and C. pumila is found in the southeastern states.