Session E: Ex situ and in situ genetic recourses – protection and use by colleting practice – cultivation of new species

EPL 1: Domestication and sustainable production of wild crafted plants with special reference to the Chilean Maqui berry (*Aristotelia chilensis*)

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Abstract

The principle threats for sustainable production of wild collected medicinal plants are related to ecological factors, such as endemism, and botanical factors critical for survival, such as the collection of roots or barks or slow growing species. The sustainable way to produce raw material on a large scale would be species specific management of the wild resources that guarantees conservation of biodiversity, or bringing the species under cultivation. A checklist proposed by WHO, UICN and WWF (1993) indicates that domestication of any medicinal plant concerns plant selection and breeding, studies about propagation, cultivation techniques, plant protection, time of harvest, among others. The different domestication steps are illustrated for the Chilean maqui (*Aristotelia chilensis*), a wild tree whose fruits are demanded in increasing volumes by the international market because of its high antioxidant capacity. High yielding plants with good fruit quality have been selected from wild populations and accessions have been cultivated under different environmental conditions to select the most suitable genotypes for the establishment of commercial orchards.

Keywords: Maqui, selection, vigor, fruit load

Introduction

Maqui (*Aristotelia chilensis* Mol., Elaeocarpaceae) is a dioecious, wintergreen tree or shrub native to Chile and the Patagonian forests of West Argentina (Damascos and Prado, 2001; Rodríguez, 2005). It is one of the sacred plants for the indigenous Mapuche people, a symbol of goodwill and peaceful intention (de Mösbach, 1992). The Spanish conquerers already described maqui as a food and medicinal plant to treat diarrhea, sore throat, intestial tumors, fiever or wounds (Muñoz et al., 1981; Montes et al., 1987; Hoffmann et al., 1992; Silva et al., 1995). Recent studies showed antioxidant capacity, anti-inflammatory, antidiabetic, antimicrobial, and cardio protective effects together with gastro protective activities (Miranda-Rottmann et al., 2002; Araya et al., 2006; Céspedes et al., 2008; Avello et al., 2009; Céspedes et al., 2010a and b; Mølgaard et al., 2011; Rojo et al., 2012; Fuentes et al., 2013). The large health benefits triggered in recent years an increasing demand for its fruit, all coming from the wild collection.

According to Vogel et al. (2014) cutting fruit-bearing branches from wild trees or shrubs to retrieve maqui berries is a practice that removes the reproductive buds that are already induced, and so threatens the fruit production for the next year. Also, an overexploitation of the wild resources would promote the genetic erosion by preferring the most productive individuals for wild crafting. To cover the future demand of processing industry for maqui berries as a raw material, we propose the domestication of this species.

Materials and Methods

Screening of wild populations

Nine wild populations of *A. chilensis* with more than 30 females each, distributed in Chile between latitudes 34 and 41° S, were studied in 2007. Fruit samples were taken from different trees and evaluated for the following characteristics: anthocyanin concentrations determined by pH-differential spectrophotometry, fruit weight, portion of fleshy parts and number of seeds per fruit. In each population plants with highest anthocyanin concentrations in its fruit were identified and vegetatively propagated by rooting cuttings.

Evaluation of pre-selected clones

In 2009, 68 so selected female clones were randomly distributed in a plot in the Experimental Station of Universidad de Talca (35°S). Three years later (2012), 45 of them, with early fruit production, including individuals of all provenances, were established randomly with 3-5 replicates in an experimental design at five different sites, distributed over 700 km in farms located between Curicó and Río Negro (Chile). In the northernmost locations first fruit production could be evaluated already during the second year, whereas the earliest clones cultivated in the southern locations started to produce fruit in the third year. Anthocyanin and polyphenol concentrations together with fruit size and yield per plant were determined.

Results

Results obtained during the 2nd and 3rd growing season indicate that the selections 'Luna Nueva' and 'Morena' start fruit production one year earlier in Central Chile than in South Chile. 'Luna Nueva' is a small, compact bush with early and very high fruit load. Its berries have high polyphenol content. They are firmly adhered and do not fall when ripening. 'Morena' is a relatively vigorous plant with a high number of berries per inflorescence and a large fruit producing zone on the branches. Fruit removes easily. The selection 'Perla Negra' is a compact bush, little tolerant to draught, but well adapted to the climate of southern Chile, where plants start their abundant production during the 3rd growing season. Its fruit is big and has high polyphenol and anthocyanin concentration.

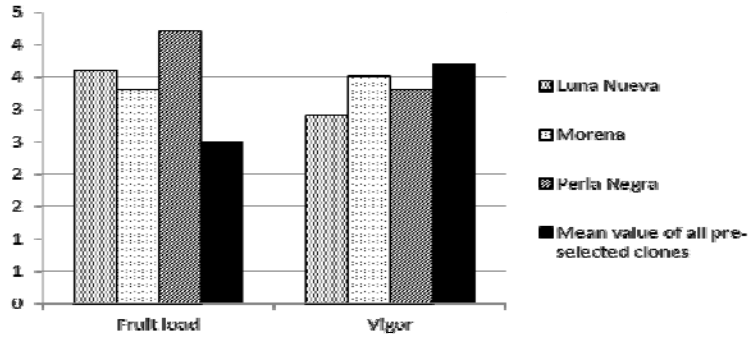

Fig. 1 Fruit load and vigor of three selected clones: 'Luna Nueva', 'Morena', and 'Perla Negra'. Scale ranging from 1 to 5 with 1 = very low and 5 = abundant fruit load / very vigorous growth

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