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Vegetative and efflorescence characterization of carob tree (*Ceratonia siliqua* L.) from the Province of Sefrou, the Middle Atlas of Morocco

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Abstract

The present study used vegetative and floral characteristics to investigate three Moroccan carob populations from different sites of Sefrou province (Middle Atlas, Morocco). The presence of basal rejections in the carob tree indicates that the tree is not regularly pruned by farmers. The average circumference of these rejections is greater at Sekoura M Daz where conditions are more beneficial as shown in leaf characteristics (14.5 cm long, 10.9 cm wide, 7 leaflets and 4.12 cm long petiole), by comparison to Kandar Sidi Khiar. The leaf length and width, and petiole length are most discriminatory. However, the variation of these parameters would then be largely genotypically explained and secondly would be in relation to the provenance. The sex ratio is greater than one, showing that grafting both male and female trees in male and low carob bean-yield is absent. The percentage of developed fruit varies from 17.1 to 21.8%. In addition, place conditions would not explain the highly significant differences in floral and fruiting quantitative parameters studied.

Keywords: Vegetative characterisation; Efflorescence; Carob tree; *Ceratonia siliqua*; Sefrou; Morocco.

Introduction

The carob tree (*Ceratonia siliqua* L., *Fabaceae*) has an increasingly socio-economic and ecological interest in the world (Tous *et al.*, 1996; Battle & Tous, 1997). Originally from the Middle East and the Southwestern Asia, its distribution currently covers the five continents, particularly under the Mediterranean climate (Northern Africa, Middle East, Southern Europe, Canary Islands and more recently in Australia, Southern Africa, the USA, India and Southern America) (Tous *et al.*, 1996; Battle & Tous, 1997; Yousif & Alghzawi, 2000).

Several morphometric studies of tree, leave, fruit and/or seed have been led in carob tree from the principal Mediterranean productive areas to characterise the carob cultivars and/or intra-specific categories (Coit, 1967; Orphanos & Papaconstantinou, 1969; Casanova *et al.*, 1987; Albanell *et al.*, 1988, 1996; Caja *et al.*, 1988; Crescimano *et al.*, 1988; Ouchkif, 1988; Russo & Polignano, 1996; Gharnit *et al.*, 2001, 2003, 2004, 2005, 2006a, 2006b, 2010; Gharnit, 2003; Barracosa & Graça, 2006; Naghmouchi *et al.*, 2009; Sidina *et al.*, 2009; El Batal *et al.*, 2011; El Kahkahi *et al.*, 2014; Hasib & El Batal, 2014). More recent genetic, chemical, biological and *in vitro* culture studies are also established in

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