Agroforest Syst (2011) 82:105–110
DOI 10.1007/s10457-010-9344-5

Observations on 3-dimensional crown growth of Stone pine

Peter Surový · Nuno Ribeiro · João Santos Pereira

Received: 31 October 2009 / Accepted: 29 July 2010 / Published online: 29 August 2010

Abstract In this work we wish to demonstrate the possibility of a reconstruction of the 3D growth of the Stone pine (*Pinus pinea L*) crown. The crowns of two samples were digitized in segments corresponding with individual years, which allowed us to reconstruct length-growth and 3D shape over the last 5 years. Due to the low sample amount, we limited ourselves to observations and methodology-descriptions instead of overall conclusions. We were able to observe diminished height-growth in year 2006, which is the year after a severe drought. However, this was not observed in the total length-growth of the crown. It is possible to see that the growth of 2006 is not dominant at the top of the crown, as it would have been in normal years. The year of the drought, 2005, is visible in the annual rings, but the shoot length of 2005 is not visibly lower than expected.

P. Surový (✉) · N. Ribeiro
Universidade de Évora, Apartado 94,
Mitra, Evora, Portugal
e-mail: psurovy@uevora.pt

N. Ribeiro
e-mail: nribeiro@uevora.pt

P. Surový · J. S. Pereira
ISA, Tapada da Ajuda, 1349-017 Lisbon, Portugal

J. S. Pereira
e-mail: jspereira@isa.utl.pt

Keywords *Pinus pinea* · 3D digitization · Crown architecture

Introduction

The Stone pine is grown in pure stands with the aim of producing pine nuts and wood, or it is grown in mixed agro-silvo-pastoral stands, with oak (Quercus suber, Quercus ilex) as a faster growing species, offering shade for cattle. Opinions differ regarding the positive or negative influence of Stone pine on the growth and production of oak.

In species with fixed growth and strong epinastic control such as Stone pine, the observed growth is based on two climatic years, one in which the buds are formed and the year in which the primary growth occurs. Therefore the growth rates depend on the average climatic conditions over 2 years, instead of the conditions of the year in which it occurs (Oliver and Larson 1996).

The architecture of plants has for a long time been the subject of research (Barthélemy and Caraglio 2007—review article). Crown architecture, as a specific sub-area of plant architecture, has been also intensively studied to evaluate the reappearance of geometrical structures or to analyze carbon allocation: Halle 1978, Prusinkiewicz et al. 1996, Lanner 1989 and others. Possibilities exist to model, simulate and visualize the growth of aerial parts of plants using functional-structural models (Kurth 1994).