Strawberry tree biophysical units' ecology to design provenance regions in Portugal using GIS tools

Ribeiro, M.M.[1,2], Quinta-Nova L.[1,3], Roque N.[1], Ricardo A.[1,4]

[1] Polytechnic Institute of Castelo Branco, School of Agriculture, Dep. Natural Resources and Sustainable Development, 6001-909 Castelo Branco. Portugal. Email: **mataide@ipcb.pt**
[2]Forest Research Center, School of Agriculture, University of Lisbon. Portugal.
[3] Research Center for Natural Resources, Environment and Society, Castelo Branco. Portugal
[4] Instituto Nacional de Investigação Agrária e Veterinária, Laboratório de Biologia Molecular. Av. da República, Quinta do Marquês, 2784-159, Oeiras. Portugal.

OBJECTIVES

Biophysical characterization of the sampled strawberry tree stands using GIS tools

Sampling of 30 plants of 15 populations

Diversity estimates

Relation between the biophysical factors and the genetic diversity

Will biophysical factors and genetic survey help in provenance regions design ?

INTRODUCTION

The strawberry tree (*Arbutus unedo* L.) has potential to be a successfully businesslike culture in Portugal and southern Europe, where it is well adapted to climate and soils. In Portugal this species has been used by local populations for fruit consumption and spirit production, but remains largely a neglected crop. It has different possible commercial uses, since processed and fresh fruit production to ornamental, pharmaceutical and chemical applications, due to the phenolic acids and terpenoid compounds with strong antioxidant activity, vitamin C and tannin content. In addition, due to its pioneer status, it is valuable for land recovery and desertification avoidance, besides being fire resistant. Currently, the demand for improved plants has strongly increased.

MATERIAL AND METHODS

Under the project ARBUTUS (PTDC/AGR-FOR/3746/2012*, Arbutus unedo* plants and products quality improvement for the agro-forestry sector) 30 trees were selected, in 15 natural populations distributed throughout the country (Fig. 1). The stands were ecologically characterized locally, using bioclimatology, lithology, topography, soil type, vegetation and wildfires records, as biophysical units. The data processed was the digital elevation model, the soil maps, the annual burnt areas since 1975, and the phytosociological and biogeographical maps (Fig. 2). In parallel, the climatological data were collected (1981-2010) from various weather stations and bioclimatological indices maps, constructed by Monteiro-Henriques (2010), in order to calculate bioclimatic indices, using geostatistical tools. An exploratory multivariate statistical approach was performed with the collected information: principal component analysis (PCA) and hierarchical cluster analysis (HCA) (Fig. 3). The obtained information will be used for the provenance regions design in order to select plus trees and for tree species genetic improvement purposes, besides forest tree conservation programs design.

Code	Stand	Region
BV	Barranco do Velho Serra do Caldeirão	Sotavento Algarvio
HP	Herdade da Parra	Silves
M	Monchique	Barlavento S. Monchique
EC	Espinhaço do Cão	Barrocal Algarvio
A	Mata do Solitário	S. Arrábida
SM	S. São Mamede	S. São Mamede
AV	Alvoco da Serra e Vide	Guarda
PS	Pampilhosa da Serra	Coimbra
ON	Oleiros Norte,	Castelo Branco
SF	Sertã – Figueiredo	
G	S. Gardunha	Serra da Gardunha
V	Viseu	Viseu
B	Bragança	Bragança
CH	Chaves	Vila Real
PG	Mata de Albergaria	Peneda-Gerês

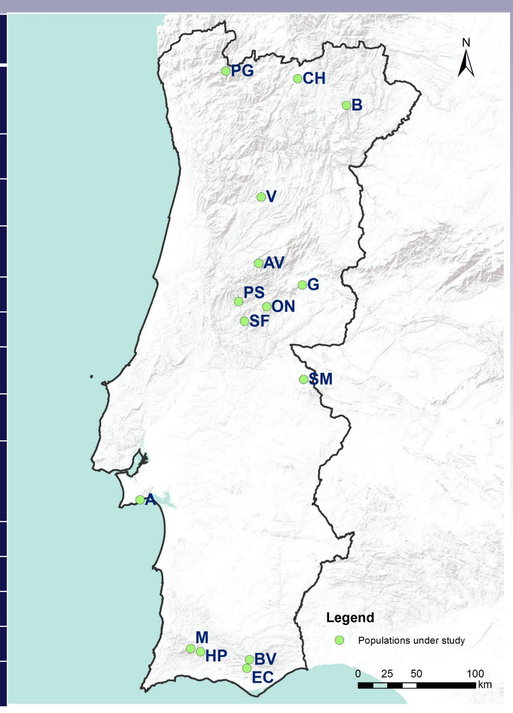
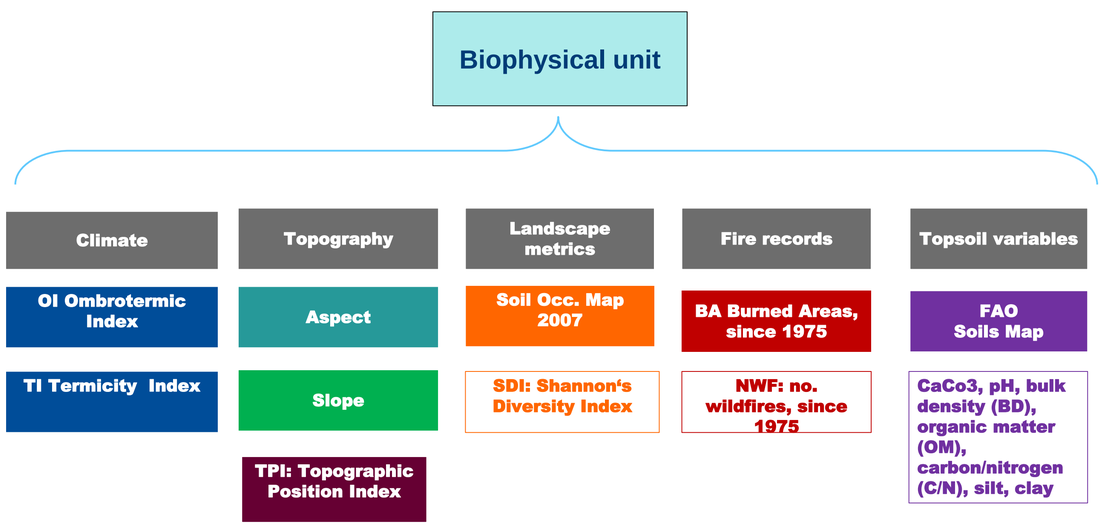
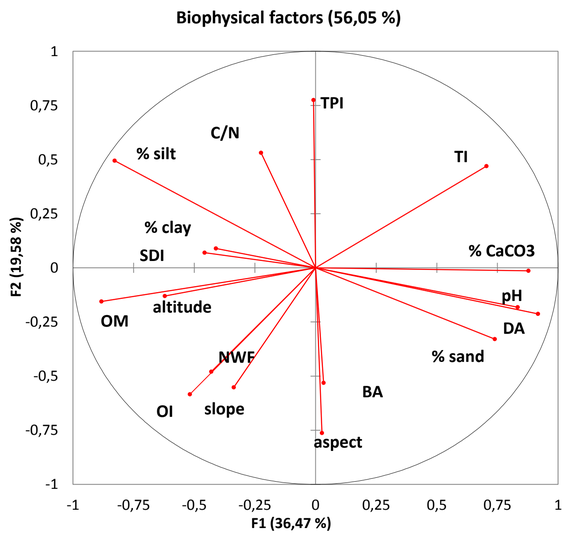


Fig. 1. Location of the 15 strawberry tree stands.



RESULTS



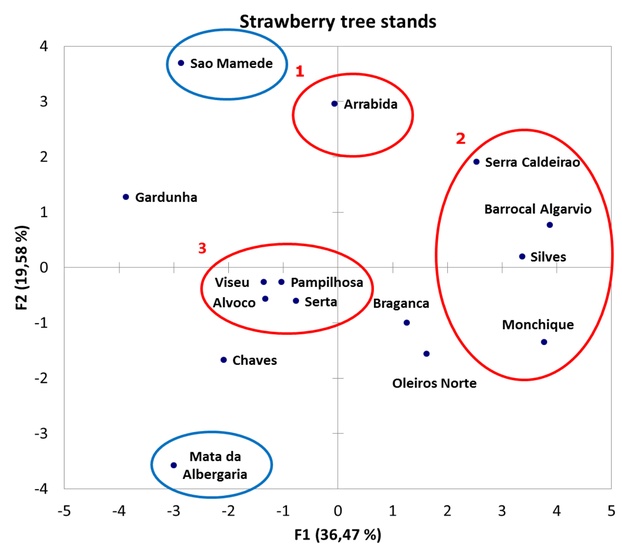


Fig 3. Principal component analysis (PCA) performed with the biophysical factors. Blue circles point at putative outliers. The total of the variance explained with F1 and F2 is 56,05%.

CONCLUSIONS

Cluster 1 (Arrábida) → explained by a high ratio C/N in the soil and high values of TPI and termicity index values.

Cluster 2 (Algarve) → High values of termicity index, and low values of ombrothermic index. Presence of $CaCO_3$ in soil.

Cluster 3 (interior Center) → high quantity of OM in soil and high values of small size material in soil (silt and clay). This stands have intermediate values of SDI.

References: Monteiro-Henriques, Tiago. 2010. Landscape and phytosociology of the Paiva River's hydrographical basin. Ph.D. thesis. Instituto Superior de Agronomia, Universidade Técnica de Lisboa. Lisbon.

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR
GOVERNO DE PORTUGAL
MINISTÉRIO DA AGRICULTURA, DO MAR, DO AMBIENTE E DO ORDENAMENTO DO TERRITÓRIO
iniav
cernas
Instituto Politécnico de Castelo Branco
Escola Superior Agrária