EURAF
EUROPEAN AGROFORESTRY FEDERATION

2nd European Agroforestry Conference

Integrating Science and Policy to Promote Agroforestry in Practice

June 2014
Cottbus, Germany

ISBN: 978-972-97874-4-7

cover design: Luís Fonseca

Nutritive value of Quercus pyrenaica Willd browse species in NE of Portugal

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Introduction

Quercus pyrenaica Willd (pyrenean oak) occurs in a transition between the Mediterranean sclerophyllous and the temperate deciduous forest, being one of the most abundant and characteristic oak species in the Iberian Peninsula, due its economical and biological importance and by several services produced (timber, firewood, pastures, soil protection from erosion, nutrient and water cycling, wildlife habitat, increased biodiversity). Its distribution area covers about 600.000 ha in Spain; and 62.000 ha in Portugal, which represents about 95 % of its natural distribution area (Castaño-Santamaría et. al., 2013). On the other hand, pyrenean oak ecosystems are seen as strategic ecosystems for nature conservation to maintain resources in a sustainable and productive way (Gómez Sal 2000). Pyrenean oak is mainly found in the form of coppice-managed or young forests. The present study concerns the role of pyrenean oak woodlands in the diet of small ruminants; particularly the aim of this study was to assess the nutritive value of key browse species of pyrenean oak forests in Trás-os-Montes region (NE of Portugal).

Material

The study was to undertake at different mature stages the evolution of chemical composition and in vitro digestibility of shrub twigs and tree leaves. The browse species evaluated were *Cytisus scoparius* (L.) Link, *Cytisus striatus* (Hill) Rothm, *Cytisus multiflorus* (LHér.) *Genista falcata* Brot. and *Quercus pyrenaica* Willd. Tree samples were formed by foliage and shrub by mixed twigs from several specimens. Hand-samples of the different shrubs species were taken along the year seasons: beginning of March (early spring), beginning of May (late spring), July (summer), end of September (autumn) and December (winter). Pyrenean oak was sampled only during the leaf production periods: May (very young leaf), July (young leaf), August (mature leaf), September (leaf in early of senescence), and October (senescent leaf). Samples were dried (60 ºC 48h) and ground. Crude protein contents (CP) were evaluated and recorded following the methods of AOAC (1997). Neutral detergent fibre (NDF), acid detergent fibre (ADF) and sulphuric acid lignin fractions (ADL) were determined following the methods described by Soest and Wine (1967. In vitro organic

matter digestibility (IVOMD) was evaluated using the two-stage technique (Tilley and Terry 1963) modified by Marten and Barnes (1980).

Chemical composition and IVOMD were analysed by ANOVA (PROC GLM procedure) using the SAS (2001) software. Turkey´s test was used for subsequent pairwise comparisons ($P < 0.05$; $\alpha = 0.05$).

Results

Species varied widely in chemical composition (CP: 91.9-225.7 gkg^{-1}, NDF: 360.3-665.3 gkg^{-1}, ADF: 253.5-535.0 gkg^{-1}, ADL: 56.7-165.2 gkg^{-1}) and in vitro digestible organic matter (IVOMD: 41.73-70.39%) (Fig.1). CP and IVOMD were significantly increased in May in the case of *C. scoparius* and pyrenean oak, and although not significant, this trend were shown in the rest of shrubs. NDF, ADF and ADL levels were positively increased in September in the case of *C. scoparius*, and in July and October in the case of *Q. pyrenaica*.

Discussion

Pyrenean oak leaves presented a constant composition throughout the leaf cycle although this pattern changed in very young leaf stages (May) when leaves were not formed, while shrubs species showed the highest nutritive value in late spring (May) and the lowest values in autumn (September). The ligneous species present in this study are consumed by small ruminants grazing, particularly goats, in

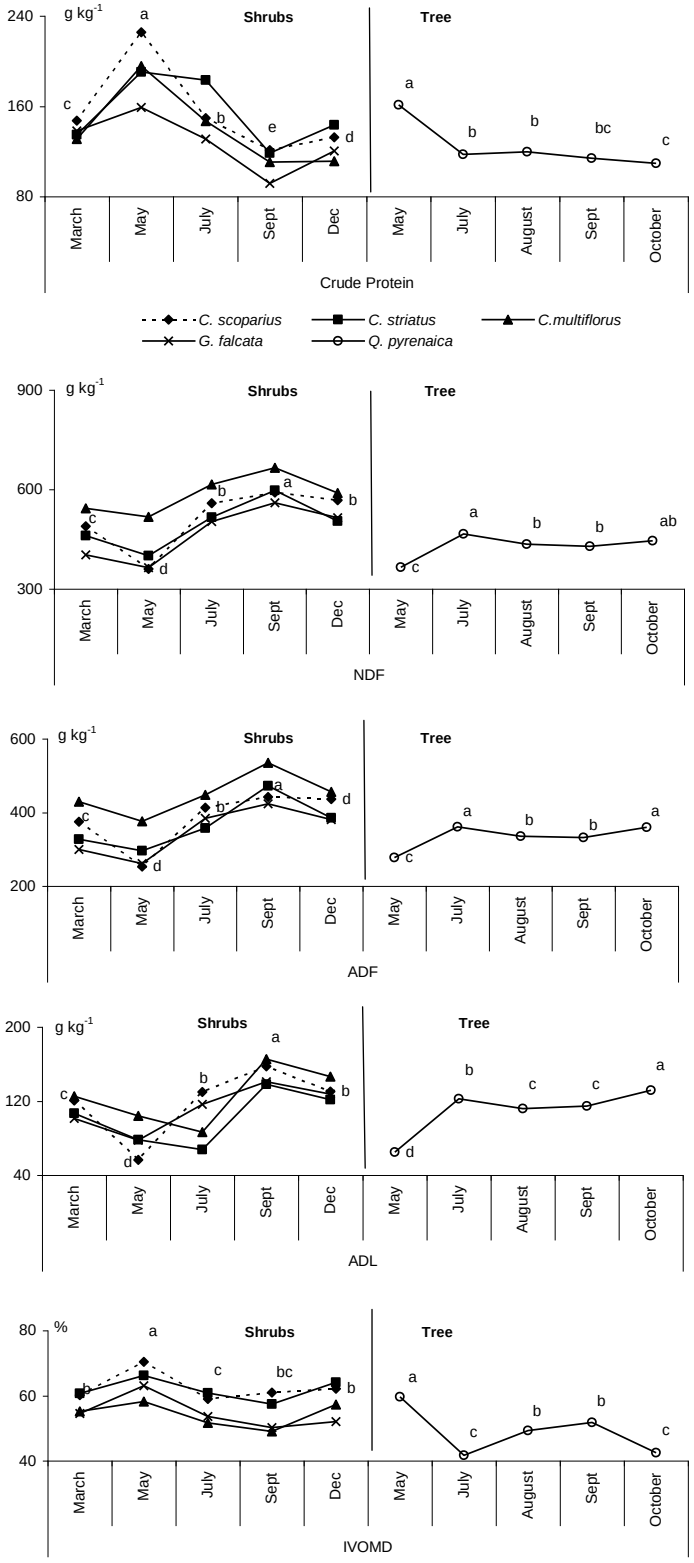

Fig 1. Dietary chemical composition (Crude protein content, NDF: neutral detergent fibre , ADF: acid detergent fibre, ADL: sulphuric acid lignin fractions) and In vitro organic matter digestibility (IVOMD) in different shrubs species and *Quercus pyrenaica* . Different letters indicate significant differences between seasons.

Mediterranean rangelands. According to Castro (2004), the consumption of leguminous shrubs such *C. scoparius*, *C. multiflorus* and *C. striatus* reaches in spring 38 %, in summer and autumn about 10 % and in winter 14 % of total goat's diets. Pyrenean oak consumption increases through the season, becoming very high in August - September, when the other resources become less abundant and with lower quality. The summer diet of goats contained about 25 % of leaves whereas it was only 2.5% in the diet of sheep (Castro et. al., 2004). The relative quality of browse resources assessed and their high consumption by extensive livestock animals, confirm the role of grazing in shrub encroachment control, as well as, in reducing the risk fire.

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