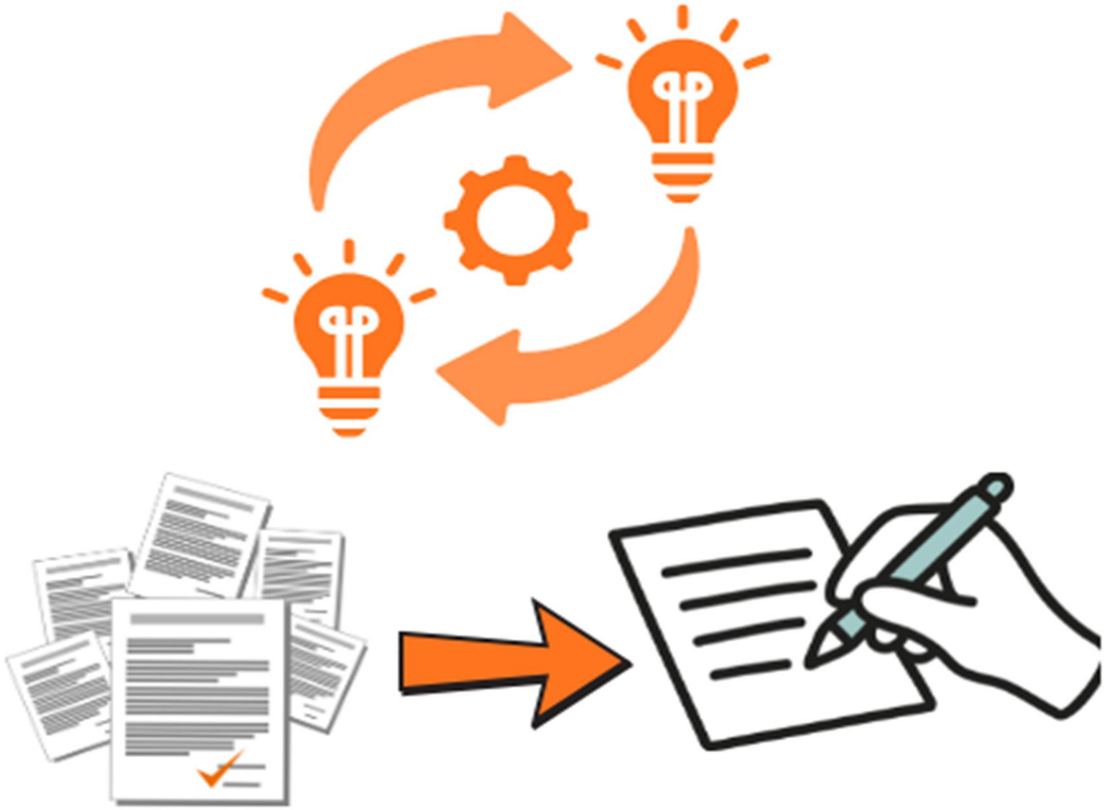
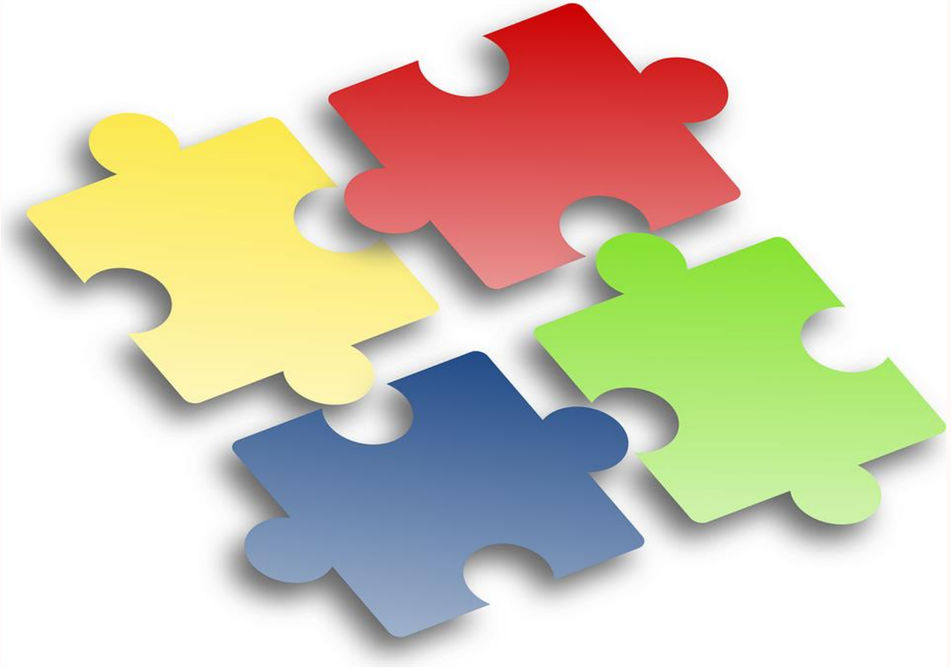
SCIENTIFIC ENGLISH
Chapter 01

presented by: Salem Rayane

Synthesis of scientific articles:



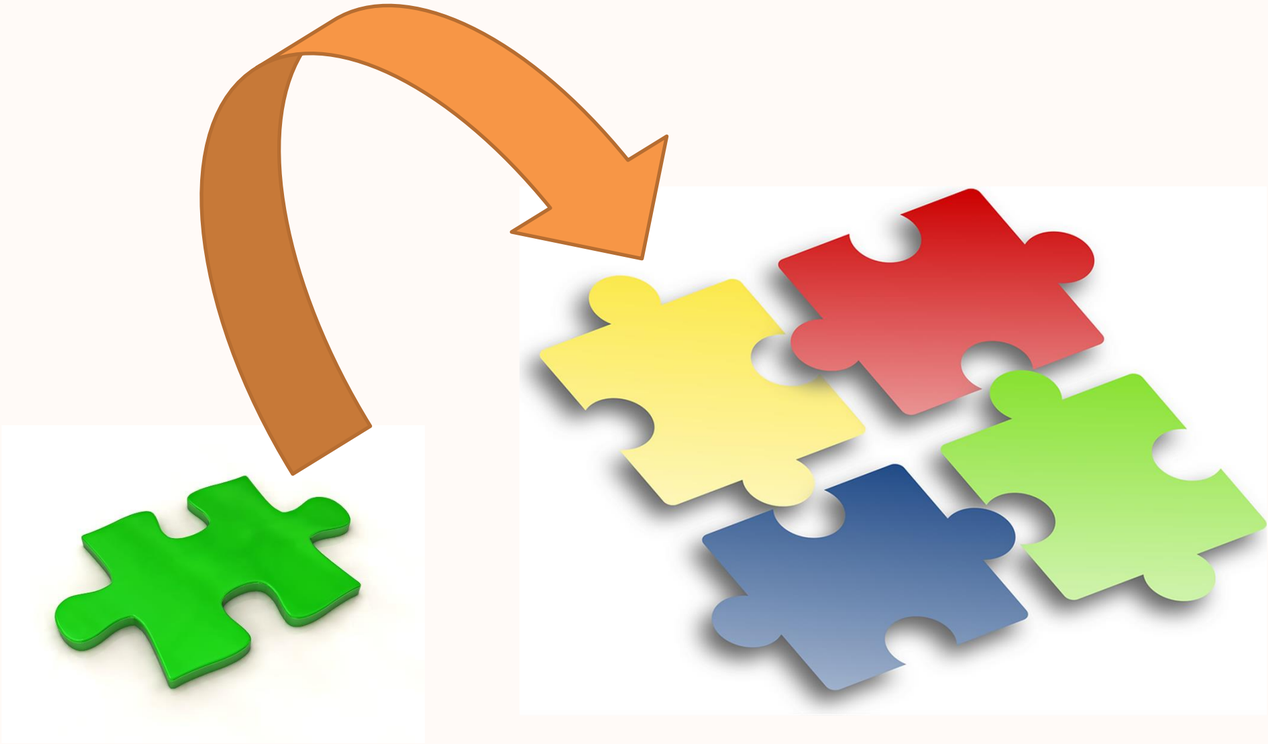
.....What is synthesis ?



Synthesis is like a puzzle

BE CAREFUL

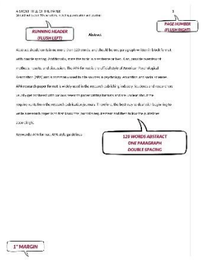
Make sure your sources fit!



Synthesis = research puzzle

Source 02

Source 01



Source 03

Your research paper

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Synthesis goes beyond….

Headline Token-based Discriminative Learning for Subheading Generation in News Article

Joonwon Jang
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Misuk Kim*
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Abstract

The news subheading summarizes an article's contents in several sentences to support the headline limited to solely conveying the main contents. So, it is necessary to generate compelling news subheadings in consideration of the structural characteristics of the news. In this paper, we propose a subheading generation model using topical headline information. We introduce a discriminative learning method that utilizes the prediction result of masked headline tokens. Experiments show that the proposed model is effective and outperforms the comparative models on three news datasets written in two languages. We also show that our model performs robustly on a small dataset and various masking ratios. Qualitative analysis and human evaluations also show that the overall quality of generated subheadings improved over the comparative models.

1 Introduction

The news headline summarizes the article to grab the attention and interest of the readers (Dor, 2003; Hamidou, 2009; Ecker et al., 2014). However, the headline is written in a brief form of short sentences with topic-related phrases (Yamada et al., 2021), making it hard for users to grasp the entire content of the news article from the headline alone. To tackle this problem, some news vendors provide a subheading compiled based right below the

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In this work, we propose a novel framework for generating compelling news subheadings by discriminating whether each token in the reconstructed headline is the same as the token in the original headline. Unlike previous approaches that use heuristically extracted topical information or positive and negative pairs, we utilize *headline* that fundamentally implies the topic of the entire article. We make full use of this indispensable object as

Summary of article

Comparing and contrasting

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Critiques of sources

Synthesis allows you to

Make your own point(s)

Add to the scholarly conversation

you need to identify the main conversation of a topic

PAY ATTENTION TO

Major themes

Strengths

weaknesses

Critical gaps

Mediterranean Botany
ISSNe 2603-9109
https://doi.org/10.5209/mbot.82996

ARTICLES

EDICIONES COMPLUTENSE

New insights about *Quercus faginea* (s.l.) taxonomic status in northern Africa

Abdeljalil Aissi

Received: 11 July 2022 / Accepted: 5 May 2023 / Published online: 12 June 2023

Abstract. The genus *Quercus* is known for its taxonomic complexity that is characterized by the abundant morphological diversity and phenomena of hybridization and introgression found in a number of its species. The number of taxa continues to change and evolve despite systematists' attempts to clarify and simplify it. The *Quercus faginea* s.l. complex represents one of the most conclusive and complex examples found in the North-Western Mediterranean and North Africa. Nevertheless, the systematics of this complex have undergone a remarkable evolution from the first Lamarckian taxa *Q. lusitanica* and *Q. faginea* to the present day, especially in the Iberian Peninsula, Tunisia, and Algeria, by virtue of the recognized taxa. To compare Moroccan taxa with those found in other regions, as well as update the taxonomic status of populations found in Morocco, data found in a corresponding bibliography was used for a critical and objective analysis. Although the taxonomic situation remains unresolved, the analysis found that there is a likely presence of the *faginea* variety in Morocco, while also anticipating the confirmation of a new morphological analysis that accounts for the stable criteria used for an infraspecific distinction. The rest of Morocco's stands seem to be represented by *Q. canariensis* and *Q. faginea* subsp. *broteroi*. Considering the uncertain existence of *maroccana*, further study of its distinct morphological and biogeographical peculiarity is required.

Keywords: morphological traits, infraspecific distinction, biogeographic peculiarity, *Q. faginea* subsp. *broteroi* f. *maroccana* (Braun-Blanq. & Maire) Villar.

How to cite: Aissi, A. 2023. New insights about *Quercus faginea* (s.l.) taxonomic status in northern Africa. Mediterr. Bot. 44, e82996. https://doi.org/10.5209/mbot.82996

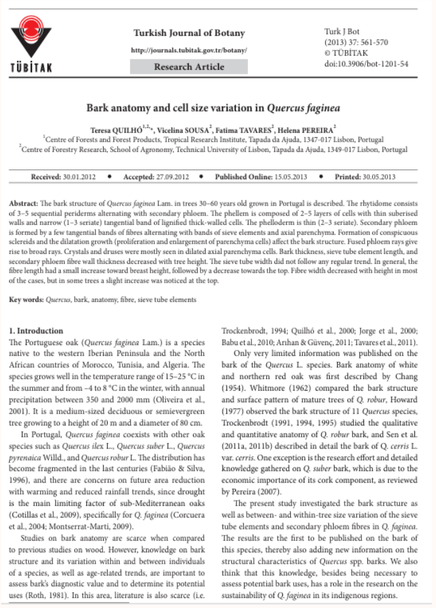
Introduction

The genus *Quercus* constitutes one of the most important and diverse components of the forest ecosystems of southwestern Europe and North Africa (Bussotti & Grossoni, 1998; Gil-Pelegrín *et al*., 2017; Vila-Viçosa *et al*., 2023). It has long been associated with great controversy, linked to the considerable genetic richness and intra- and interspecific hybridization, reflected in the high morphological variability disclosed by its taxa, as well as the numerous intermediate forms that result (Denk *et al*., 2017 and references therein). The number of taxa is still debated among botanists, as the definition of the biological concept of a *Quercus* species is still unclear due to hybridization between different taxa and species, in particular (Burger, 1975; Vila-Viçosa *et al*., 2022).

A key example is *Q. faginea* Lam. (s.l), a complex of Ibero-Maghrebian species (Iberian Peninsula, Morocco, Algeria, and Tunisia) which includes different forms and species; *Q. faginea* Lam. (s.s), *Q. canariensis* Willd., *Q. faginea* (Schwarz, 1964), before they were included in *Q. lusitanica* and *Q. pubescens* Willd., respectively.

The classification of this complex, otherwise known as *Q. lusitanica* (s.l.) (whose forms of the species sensu lato were included under *Q. lusitanica*) or *Q. faginea-mirbeckii* Villar, has continuously raised many problems since Lamarck (1783) described his *Q. faginea* Lam. as a different species from his *Q. lusitanica* Lam. (cf. Vázquez *et al*., 2018; Aissi *et al*., 2021). Despite this, there is a tendency towards simplification, especially in the Iberian Peninsula, since the separation of the two species *faginea* and *canariensis* (incl. *Q. lusitanica* var. *salzmanniana* Webb; *Q. salzmanniana* (Webb) Cout., Amaral Franco 1990, Vázquez *et al*., 2018) by Schwarz (1964), and the subdivision of *Q. faginea* into two subspecies (*faginea* & *broteroi*) by Amaral Franco (1990).

The same status is in force in Algeria since the recent taxonomic study (Aissi *et al*., 2021). On the latter, representative samples of the country's stands were selected and morphological analysis was carried out.



TÜBİTAK

Turkish Journal of Botany
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Research Article

Turk J Bot
(2013) 37: 561-570
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doi:10.3906/bot-1201-54

Bark anatomy and cell size variation in *Quercus faginea*

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Abstract: The bark structure of *Quercus faginea* Lam. in trees 30–60 years old grown in Portugal is described. The rhytidome consists of 3–5 sequential periderms alternating with secondary phloem. The phellem is composed of 2–5 layers of cells with thin suberised walls and narrow (1–3 seriate) tangential band of lignified thick-walled cells. The phelloderm is thin (2–3 seriate). Secondary phloem is formed by a few tangential bands of fibres alternating with bands of sieve elements and axial parenchyma. Formation of conspicuous sclereids and the dilatation growth (proliferation and enlargement of parenchyma cells) affect the bark structure. Fused phloem rays give rise to broad rays. Crystals and druses were mostly seen in dilated axial parenchyma cells. Bark thickness, sieve tube element length, and secondary phloem fibre wall thickness decreased with tree height. The sieve tube width did not follow any regular trend. In general, the fibre length had a small increase toward breast height, followed by a decrease towards the top. Fibre width decreased with height in most of the cases, but in some trees a slight increase was noticed at the top.

Key words: *Quercus*, bark, anatomy, fibre, sieve tube elements

1. Introduction

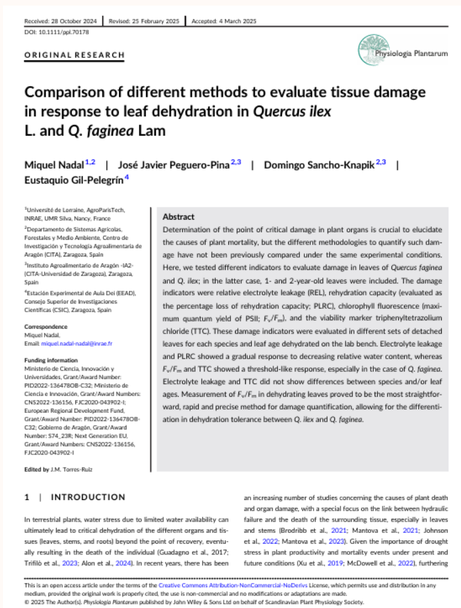
The Portuguese oak (*Quercus faginea* Lam.) is a species native to the western Iberian Peninsula and the North African countries of Morocco, Tunisia, and Algeria. The species grows well in the temperature range of 15–25 °C in the summer and from −4 to 8 °C in the winter, with annual precipitation between 350 and 2000 mm (Oliveira et al., 2001). It is a medium-sized deciduous or semievergreen tree growing to a height of 20 m and a diameter of 80 cm.

In Portugal, *Quercus faginea* coexists with other oak species such as *Quercus ilex* L., *Quercus suber* L., *Quercus pyrenaica* Willd., and *Quercus robur* L. The distribution has become fragmented in the last centuries (Fabião & Silva, 1996), and there are concerns on future area reduction with warming and reduced rainfall trends, since drought is the main limiting factor of sub-Mediterranean oaks (Cotillas et al., 2009), specifically for *Q. faginea* (Corcuera et al., 2004; Montserrat-Marti, 2009).

Studies on bark anatomy are scarce when compared to previous studies on wood. However, knowledge on bark structure and its variation within and between individuals of a species, as well as age-related trends, are important to assess bark's diagnostic value and to determine its potential uses (Roth, 1981). In this area, literature is also scarce (i.e. Trockenbrodt, 1994; Quilhó et al., 2000; Jorge et al., 2000; Rabu et al., 2010; Arıhan & Güvenç, 2011; Tavares et al., 2011).

Only very limited information was published on the bark of the *Quercus* L. species. Bark anatomy of white and northern red oak was first described by Chang (1954). Whitmore (1962) compared the bark structure and surface pattern of mature trees of *Q. robur*, Howard (1977) observed the bark structure of 11 *Quercus* species, Trockenbrodt (1991, 1994, 1995) studied the qualitative and quantitative anatomy of *Q. robur* bark, and Sen et al. (2011a, 2011b) described in detail the bark of *Q. cerris* L. var. *cerris*. One exception is the research effort and detailed knowledge gathered on *Q. suber* bark, which is due to the economic importance of its cork component, as reviewed by Pereira (2007).

The present study investigated the bark structure as well as between- and within-tree size variation of the sieve tube elements and secondary phloem fibres in *Q. faginea*. The results are the first to be published on the bark of this species, thereby also adding new information on the structural characteristics of *Quercus* spp. barks. We also think that this knowledge, besides being necessary to assess potential bark uses, has a role in the research on the sustainability of *Q. faginea* in its indigenous regions.



Received: 28 October 2024 | Revised: 25 February 2025 | Accepted: 4 March 2025
DOI: 10.1111/ppl.70178

ORIGINAL RESEARCH

Physiologia Plantarum

Comparison of different methods to evaluate tissue damage in response to leaf dehydration in *Quercus ilex* L. and *Q. faginea* Lam

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Funding information
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Edited by J.M. Torres-Ruiz

Abstract

Determination of the point of critical damage in plant organs is crucial to elucidate the causes of plant mortality, but the different methodologies to quantify such damage have not been previously compared under the same experimental conditions. Here, we tested different indicators to evaluate damage in leaves of *Quercus faginea* and *Q. ilex*; in the latter case, 1- and 2-year-old leaves were included. The damage indicators were relative electrolyte leakage (REL), rehydration capacity (evaluated as the percentage loss of rehydration capacity; PLRC), chlorophyll fluorescence (maximum quantum yield of PSII: F_v/F_m), and the viability marker triphenyltetrazolium chloride (TTC). These damage indicators were evaluated in different sets of detached leaves for each species and leaf age dehydrated on the lab bench. Electrolyte leakage and PLRC showed a gradual response to decreasing relative water content, whereas F_v/F_m and TTC showed a threshold-like response, especially in the case of *Q. faginea*. Electrolyte leakage and TTC did not show differences between species and/or leaf ages. Measurement of F_v/F_m in dehydrating leaves proved to be the most straightforward, rapid and precise method for damage quantification, allowing for the differentiation in dehydration tolerance between *Q. ilex* and *Q. faginea*.

1 | INTRODUCTION

In terrestrial plants, water stress due to limited water availability can ultimately lead to critical dehydration of the different organs and tissues (leaves, stems, and roots) beyond the point of recovery, eventually resulting in the death of the individual (Guadagno et al., 2017; Trifilò et al., 2023; Alon et al., 2024). In recent years, there has been an increasing number of studies concerning the causes of plant death and organ damage, with a special focus on the link between hydraulic failure and the death of the surrounding tissue, especially in leaves and stems (Brodribb et al., 2021; Mantova et al., 2021; Johnson et al., 2022; Mantova et al., 2023). Given the importance of drought stress in plant productivity and mortality events under present and future conditions (Xu et al., 2019; McDowell et al., 2022), furthering

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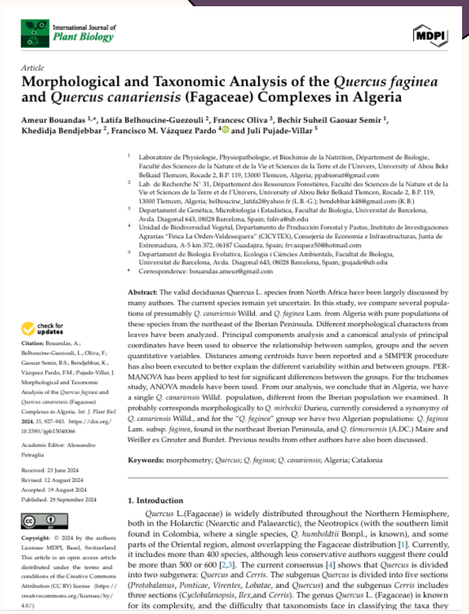

International Journal of *Plant Biology*

MDPI

Article

Morphological and Taxonomic Analysis of the *Quercus faginea* and *Quercus canariensis* (Fagaceae) Complexes in Algeria

Ameur Bouandas [1,*], Latifa Belhoucine-Guezouli [2], Francesc Oliva [3], Bechir Suheil Gaouar Semir [1], Khedidja Bendjebbar [2], Francisco M. Vázquez Pardo [4] and Juli Pujade-Villar [5]

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Abstract: The valid deciduous Quercus L. species from North Africa have been largely discussed by many authors. The current species remain yet uncertain. In this study, we compare several populations of presumably *Q. canariensis* Willd. and *Q. faginea* Lam. from Algeria with pure populations of these species from the northeast of the Iberian Peninsula. Different morphological characters from leaves have been analyzed. Principal components analysis and a canonical analysis of principal coordinates have been used to observe the relationship between samples, groups and the seven quantitative variables. Distances among centroids have been reported and a SIMPER procedure has also been executed to better explain the different variability within and between groups. PERMANOVA has been applied to test for significant differences between the groups. For the trichomes study, ANOVA models have been used. From our analysis, we conclude that in Algeria, we have a single *Q. canariensis* Willd. population, different from the Iberian population we examined. It probably corresponds morphologically to *Q. mirbeckii* Durieu, currently considered a synonymy of *Q. canariensis* Willd., and for the "*Q. faginea*" group we have two Algerian populations: *Q. faginea* Lam. subsp. *faginea*, found in the northeast Iberian Peninsula, and *Q. tlemcensis* (A.DC.) Maire and Weiller ex Greuter and Burdet. Previous results from other authors have also been discussed.

Keywords: morphometry; *Quercus*; *Q. faginea*; *Q. canariensis*; Algeria; Catalonia

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Citation: Bouandas, A.; Belhoucine-Guezouli, L.; Oliva, F.; Gaouar Semir, B.S.; Bendjebbar, K.; Vázquez Pardo, F.M.; Pujade-Villar, J. Morphological and Taxonomic Analysis of the *Quercus faginea* and *Quercus canariensis* (Fagaceae) Complexes in Algeria. *Int. J. Plant Biol.* **2024**, *15*, 927–943. https://doi.org/10.3390/ijpb15040066

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Quercus L.(Fagaceae) is widely distributed throughout the Northern Hemisphere, both in the Holarctic (Nearctic and Palaearctic), the Neotropics (with the southern limit found in Colombia, where a single species, *Q. humboldtii* Bonpl., is known), and some parts of the Oriental region, almost overlapping the Fagaceae distribution [1]. Currently, it includes more than 400 species, although less conservative authors suggest there could be more than 500 or 600 [2,3]. The current consensus [4] shows that *Quercus* is divided into two subgenera: *Quercus* and *Cerris*. The subgenus *Quercus* is divided into five sections (*Protobalanus*, *Ponticae*, *Virentes*, *Lobatae*, and *Quercus*) and the subgenus *Cerris* includes three sections (*Cyclobalanopsis*, *Ilex*,and *Cerris*). The genus *Quercus* L. (Fagaceae) is known for its complexity, and the difficulty that taxonomists face in classifying the taxa they

Quercus Faginea, classification, morphology

What are common themes? Sup-topics?

write notes as you read

Mediocre
research paper

Author 01: Lorem ipsum dolor sit amet, consectetuer adipiscing elit

Author 02: Lorem ipsum dolor sit amet, consectetuer adipiscing elit

Author 03: Lorem ipsum dolor sit amet, consectetuer adipiscing elit

Author 04: Lorem ipsum dolor sit amet, consectetuer adipiscing elit

synthesis
research paper

Idea 01: Taxonomic Classification and Hierarchy

Idea 02: Subspecies and Taxonomic Controversies

Idea 03: Hybridization and Genetic Introgression

Idea 04: Molecular Phylogenetics and Recent Advances

The leaves of Quercus faginea are highly variable in shape and size, typically deciduous or semi-deciduous.

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EDICIONES COMPLUTENSE
ARTICLES

New insights about *Quercus faginea* (s.l.) taxonomic status in northern Africa

Abdeldjalil Aissi

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Abstract. The genus *Quercus* is known for its taxonomic complexity that is characterized by the abundant morphological diversity and phenomena of hybridization and introgression found in a number of its species. The number of taxa continues to change and evolve despite systematists' attempts to clarify and simplify it. The *Quercus faginea* s.l. complex represents one of the most conclusive and complex examples found in the North-Western Mediterranean and North Africa. Nevertheless, the systematics of this complex have undergone a remarkable evolution from the first Lamarckian taxa *Q. lusitanica* and *Q. faginea* to the present day, especially in the Iberian Peninsula, Tunisia, and Algeria, by virtue of the recognized taxa. To compare Moroccan taxa with those found in other regions, as well as update the taxonomic status of populations found in Morocco, data found in a corresponding bibliography was used for a critical and objective analysis. Although the taxonomic situation remains unresolved, the analysis found that there is a likely presence of the *faginea* variety in Morocco, while also anticipating the confirmation of a new morphological analysis that accounts for the stable criteria used for an infraspecific distinction. The rest of Morocco's stands seem to be represented by *Q. canariensis* and *Q. faginea* subsp. *broteroi*. Considering the uncertain existence of *maroccana*, further study of its distinct morphological and biogeographical peculiarity is required.

Keywords: morphological traits, infraspecific distinction, biogeographic peculiarity, *Q. faginea* subsp. *broteroi* f. *maroccana* (Braun-Blanq. & Maire) Villar.

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Introduction

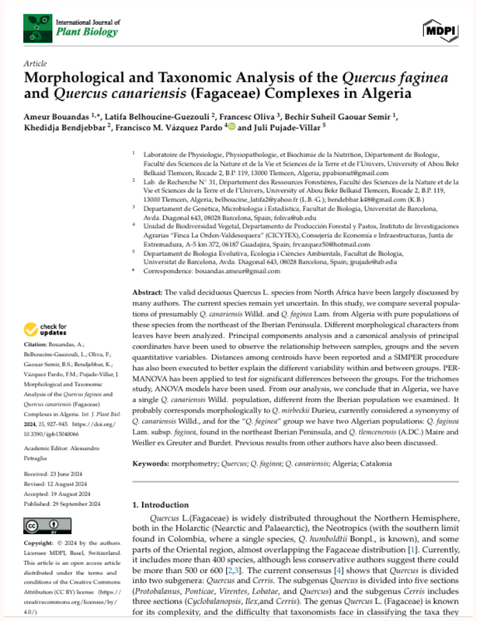
The genus *Quercus* constitutes one of the most important and diverse components of the forest ecosystems of southwestern Europe and North Africa (Bussotti & Grossoni, 1998; Gil-Pelegrín *et al*., 2017; Vila-Viçosa *et al*., 2023). It has long been associated with great controversy, linked to the considerable genetic richness and intra- and interspecific hybridization, reflected in the high morphological variability disclosed by its taxa, as well as the numerous intermediate forms that result (Denk *et al*., 2017 and references therein). The number of taxa is still debated among botanists, as the definition of the biological concept of a *Quercus* species is still unclear due to hybridization between different taxa and species, in particular (Burger, 1975; Vila-Viçosa *et al*., 2022).

A key example is *Q. faginea* Lam. (s.l), a complex of Ibero-Maghrebian species (Iberian Peninsula, Morocco, Algeria, and Tunisia) which includes different forms and species; *Q. faginea* Lam. (s.s), *Q. canariensis* Willd., respectively.

The classification of this complex, otherwise known as *Q. lusitanica* (s.l.) (whose forms of the species sensu lato were included under *Q. lusitanica*) or *Q. faginea-mirbeckii* Villar, has continuously raised many problems since Lamarck (1783) described his *Q. faginea* Lam. as a different species from his *Q. lusitanica* Lam. (cf. Vázquez *et al*., 2018; Aissi *et al*., 2021). Despite this, there is a tendency towards simplification, especially in the Iberian Peninsula, since the separation of the two species *faginea* and *canariensis* (incl. *Q. lusitanica* var. *salzmanniana* Webb; *Q. salzmanniana* (Webb) Cout., Amaral Franco 1990, Vázquez *et al*., 2018) by Schwarz (1964), and the subdivision of *Q. faginea* into two subspecies (*faginea* & *broteroi*) by Amaral Franco (1990).

The same status is in force in Algeria since the recent taxonomic study (Aissi *et al*., 2021). On the latter, representative samples of the country's stands were selected and morphological analysis was carried out.

Quercus species studies



International Journal of Plant Biology
MDPI

Article

Morphological and Taxonomic Analysis of the *Quercus faginea* and *Quercus canariensis* (Fagaceae) Complexes in Algeria

Ameur Bouandas [1,*], Latifa Belhoucine-Guezouli [2], Francese Oliva [3], Bechir Suheil Gaouar Semir [1], Khedidja Bendjebbar [2], Francisco M. Vázquez Pardo [4] and Juli Pujade-Villar [5]

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Morphology studies

Opposing viewpoint

Your research paper is unique

Your research paper

Your voice
+
Source 03
+
Source 01
+
Your voice
+
Your voice
+
Source 02

=

Demonstrates an understanding of the research topic

Explicitly connects to your own arguments

Synthesis matrix

	Source 01	Source 02	Source 03	Source 04	My thoughts
Main idea 01					
Main idea 02					
Main idea 03					
Main idea 04					
Contrary view					

My research question: Did the US government cover up a research program on UFOs in the early 2000s and how did it do this?

	Source 1 Art Bell	Source 2 Cooper, Blumenthal, Keene	Source 3 Paul Santorini	Source 4 Brig. Gen. Exon	Source 5 Cheryl Costa	My Thoughts
Main Idea 1: Funds were hidden in Defense Dept budgets	- Statements by Senate leaders (p. 15) - Funds hidden in massive DARPA budget (p. 12)	- $22 million hidden in $600 billion defense budget (1st paragraph) - Partly classified, supposedly ended in 2012 (4th-5th paragraphs)		- Navy and CIA testimony in Black Box case (4th paragraph) - DoD testimony to Congress (4th paragraph)	- memorandum on end of Project Blue Book (1st para) - CBS 60 Minutes expose data and gov. response with misleading comments (2nd & 3rd para)	
Main Idea 2: Advanced Aerospace Threat Identification Program was part of UFO research	- Population fails to explain the figures (p. 11) - Navy F/A-18F jets, Nimitz in 2004 (p. 14)	- govt officials have "videos of encounters between unknown objects and American military aircraft" (8th paragraph)	- sightings have risen in waves, to 11,868 nationwide in 2015 from 3,479 in 2001 (p. 45)	- Condon report shows 30% incidents unexplained (3rd paragraph)		- data on budgets show that several billion dollars over 5 years was funneled to UFO search project
Main Idea 3: Involvement and funding by Ralph Bigelow and Harry Reid			- Bigelow purchase of ghost ranch in 2001 (p. 44) - dark funding sources (p. 39) - Statements about materials from MIT scientists (p. 41)		- Congressional reports and summaries of Harry Reed's papers (2nd para) - Ted Stevens and Daniel Inouye participation in Project Blue Book (3rd para)	- most compelling information is based on dark funding sources. Pulling together all the evidence shows that…
Contrary View 1: Funding went to non-UFO areas				- Paradigm Research Group disclosure data (5th paragraph) - Declassifying of dark money program post-GW Bush (2nd and 3rd para)		- Need more information on Costa research and Mutual UFO Network

Gaps are fine

It means there is room for your voice

One source for a main idea is not enough support

Main idea

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EDICIONES COMPLUTENSE

New insights about *Quercus faginea* (s.l.) taxonomic status in northern Africa

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The classification of this complex, otherwise known as *Q. lusitanica* (s.l.) (whose forms of the species sensu lato were included under *Q. lusitanica*) or *Q. faginea-mirbeckii* Villar, has continuously raised many problems since Lamarck (1783) described his *Q. faginea* Lam. as a different species from his *Q. lusitanica* Lam. (cf. Vázquez *et al*., 2018; Aissi *et al*., 2021). Despite this, there is a tendency towards simplification, especially in the Iberian Peninsula, since the separation of the two species *faginea* and *canariensis* (incl. *Q. lusitanica* var. *salzmanniana* Webb; *Q. salzmanniana* (Webb) Cout., Amaral Franco 1990, Vázquez *et al*., 2018) by Schwarz (1964), and the subdivision of *Q. faginea* into two subspecies (*faginea* & *broteroi*) by Amaral Franco (1990).

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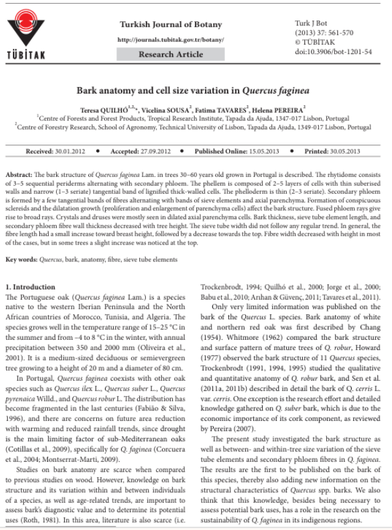

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TÜBİTAK

Bark anatomy and cell size variation in *Quercus faginea*

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Abstract: The bark structure of *Quercus faginea* Lam. in trees 30–60 years old grown in Portugal is described. The rhytidome consists of 3–5 sequential periderms alternating with secondary phloem. The phellem is composed of 2–5 layers of cells with thin suberised walls and narrow (1–3 seriate) tangential band of lignified thick-walled cells. The phelloderm is thin (2–3 seriate). Secondary phloem is formed by a few tangential bands of fibres alternating with bands of sieve elements and axial parenchyma. Formation of conspicuous sclereids and the dilatation growth (proliferation and enlargement of parenchyma cells) affect the bark structure. Fused phloem rays give rise to broad rays. Crystals and druses were mostly seen in dilated axial parenchyma cells. Bark thickness, sieve tube element length, and secondary phloem fibre wall thickness decreased with tree height. The sieve tube width did not follow any regular trend. In general, the fibre length had a small increase toward breast height, followed by a decrease towards the top. Fibre width decreased with height in most of the cases, but in some trees a slight increase was noticed at the top.

Key words: *Quercus*, bark, anatomy, fibre, sieve tube elements

1. Introduction

The Portuguese oak (*Quercus faginea* Lam.) is a species native to the western Iberian Peninsula and the North African countries of Morocco, Tunisia, and Algeria. The species grows well in the temperature range of 15–25 °C in the summer and from –4 to 8 °C in the winter, with annual precipitation between 350 and 2000 mm (Oliveira et al., 2001). It is a medium-sized deciduous or semievergreen tree growing to a height of 20 m and a diameter of 80 cm.

In Portugal, *Quercus faginea* coexists with other oak species such as *Quercus ilex* L., *Quercus suber* L., *Quercus pyrenaica* Willd., and *Quercus robur* L. The distribution has become fragmented in the last centuries (Fabião & Silva, 1996), and there are concerns on future area reduction with warming and reduced rainfall trends, since drought is the main limiting factor of sub-Mediterranean oaks (Cotillas et al., 2009), specifically for *Q. faginea* (Corcuera et al., 2004; Montserrat-Martí, 2009).

Studies on bark anatomy are scarce when compared to previous studies on wood. However, knowledge on bark structure and its variation within and between individuals of a species, as well as age-related trends, are important to assess bark's diagnostic value and to determine its potential uses (Roth, 1981). In this area, literature is also scarce (i.e. Trockenbrodt, 1994; Quilhó et al., 2000; Jorge et al., 2000; Babu et al., 2010; Arıhan & Güvenç, 2011; Tavares et al., 2011).

Only very limited information was published on the bark of the *Quercus* L. species. Bark anatomy of white and northern red oak was first described by Chang (1954). Whitmore (1962) compared the bark structure and surface pattern of mature trees of *Q. robur*, Howard (1977) observed the bark structure of 11 *Quercus* species, Trockenbrodt (1991, 1994, 1995) studied the qualitative and quantitative anatomy of *Q. robur* bark, and Sen et al. (2011a, 2011b) described in detail the bark of *Q. cerris* L. var. *cerris*. One exception is the research effort and detailed knowledge gathered on *Q. suber* bark, which is due to the economic importance of its cork component, as reviewed by Pereira (2007).

The present study investigated the bark structure as well as between- and within-tree size variation of the sieve tube elements and secondary phloem fibres in *Q. faginea*. The results are the first to be published on the bark of this species, thereby also adding new information on the structural characteristics of *Quercus* spp. barks. We also think that this knowledge, besides being necessary to assess potential bark uses, has a role in the research on the sustainability of *Q. faginea* in its indigenous regions.

At least 2 sources per main idea

MEANINGFUL RESEARCH

THANK YOU