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A new species of *Quercus* L. (Fagaceae) from NW Spain

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Abstract

Penas A., Llamas F., Perez-Morales C., and Acedo C. 1997. A new species of *Quercus* L. (Fagaceae) from NW Spain Bot. Helv. 107: 75–82.

It is a deciduous species with a very restricted area, only known from a few localities of León and Palencia provinces (NW Spain). The hybrids it forms with *Q. pyrenaica* and *Q. petraea* are also described. A key of identification for the Iberian species of *Quercus* is offered.

Introduction

The taxonomical significance of trichomes in the genus *Quercus* has been scientifically demonstrated and there are many reports about this in the literature. The indumentum type is a very good differential character among closely related taxa in the genus (cf. Sáenz de Rivas 1968, 1969, 1975, Sáenz de Rivas & Rivas-Martínez 1971, Olsson 1976, Kissling 1977, Hardin 1976 & 1979, Safou & Saint-Martin 1989, Penas & al. 1994, Llamas & al. 1995).

During our former studies on the genus, differences in the presence/absence and type of trichomes among the Iberian species of *Quercus* have been observed, and some populations mixed with *Quercus pyrenaica* having earlier foliation and a particular combination of trichomes that do not deal with any of the known Iberian *Quercus* have been detected (Table 1). This characteristic, together with other morphological characters such as indumentum density, the lobes, colour and thickness of the leaves, as well as tree size leads us to describe a new species named *Quercus pauciradiata*, taking the species concept proposed by Stebbins & Pérez de la Vega 1989, when they speak about the speciation model in *Quercus*.

For the arrangement of the species in the genus, we have followed Amaral Franco 1990, with some modifications from Rivas-Martínez & Sáenz 1991.

***Quercus pauciradiata* A. Penas, F. Llamas, C. Pérez-Morales & C. Acedo, sp. nov.**

Holotypus: **Spain, León:** Llamas de Rueda (30TUN2622), Turkey oak woodland on oligocene conglomerates, 920 m.a.s.l, 17-6-1993, Leg. *F. Llamas, C. Pérez-Morales & C. Acedo*, LEB 43002. (Fig. 1).

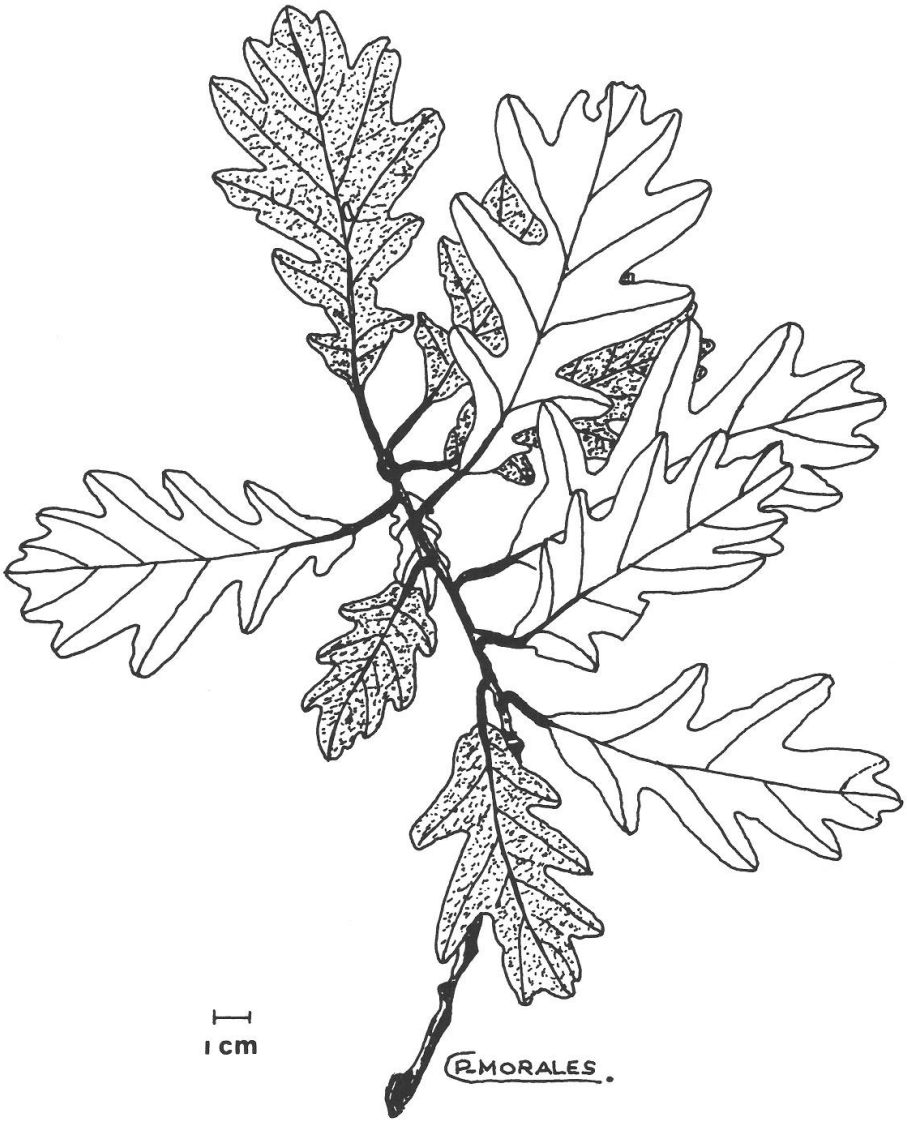


Fig. 1. Leaved twig of *Quercus pauciradiata* from the holotypes.

Diagnosis

Arbor caducifolia, foliis a lobulatis ad pinnatifidis, aliquantum viridibus superiore facie et glaucis inferiore facie, subglabribus. Indumento inferioris faciei pilis fasciculatis-stipitatis cum latis parietibus, stipe 8–20 μm et 2–4 radius 150–300 μm, pilis simplicibus-uniseriatis in lamina et pilis simplicibus in nerviis.

Description

Deciduous tree up to 10 m, with wide canopy and fissured bark. Twigs with both simple and bulbous hairs, abundant when young and more scarce when mature.

Leaves 7–11 × 4–7 cm, membranose, marcescent, from lobate to pinnatifid, light green on the adaxial surface and glaucous on the abaxial surface, with 4–7 pairs of secondary veins. Up to two sinual veins in the basal part of the leaf blade. The petiole, 1–2 cm long, is channelled and has an indumentum formed by fasciculate hairs similar to those on the blade and bulbous hairs becoming lost with the age.

Tab. 1. Trichome types present in the mature leaves of *Quercus* spp. of the Iberian Peninsula: adaxial/abaxial surface. − = absent, (+) = rare, + = present.

Taxon	Trichome types									
	Simple uniseriate	Bulbous	Rosulate	Solitary	Fasciculate sessile	Fasciculate stipe short	Fasciculate stipe long	Multiradiate	Stellate	Fused-stellate
Subgen. *Quercus*										
Q. robur	+/+	+/−	−/−	+/+	−/−	−/−	−/−	−/−	−/−	−/−
Q. petraea	+/+	+/−	−/−	+/+	−/+	−/−	−/−	−/−	+/+	−/−
Q. pyrenaica	+/+	+/−	−/−	+/+	−/−	−/−	+/+	−/−	−/−	−/−
Q. humilis (=*Q. pubescens*)	+/+	+/−	−/−	+/+	−/−	+/+	−/−	+/−	−/−	−/−
Q. subpyrenaica	+/+	+/−	−/−	+/+	−/−	+/+	−/−	−/+	−/−	−/−
Q. pauciradiata	+/+	+/−	−/−	+/+	−/−	+/+	−/−	−/−	−/−	−/−
Q. canariensis	−/+	−/−	−/−	+/+	−/−	−/−	+/+	−/−	−/−	−/−
Q. faginea	−/+	(+)/−	−/−	+/+	−/−	−/−	−/−	+/+	+/+	−/−
Q. broteroi	−/+	(+)/−	−/−	+/+	−/−	−/−	−/−	+/+	+/+	−/−
Q. lusitanica	−/+	(+)/−	−/−	+/+	−/−	−/−	−/−	+/+	+/+	−/−
Subgen. *Sclerophyllodrys*										
Q. coccifera	−/−	−/−	−/−	−/−	−/−	−/−	−/−	−/−	−/−	+/+
Q. ilex	−/−	−/−	−/−	−/+	−/−	−/−	−/−	−/−	−/−	+/+
Q. rotundifolia	−/+	+/−	−/−	−/+	−/−	−/−	−/−	−/−	−/−	+/+
Subgen. *Cerris*										
Q. suber	−/−	−/−	−/−	+/+	−/−	−/−	−/−	−/−	−/−	+/+
Subgen. *Erythrobalanus*										
Q. rubra	+/+	+/−	+/+	+/+	−/−	−/−	−/+	−/−	−/−	−/−

The indumentum is formed by several hair types forming an exclusive combination for this taxon. These are thick walled fasciculate hairs, with a stipe of 8–20 μm and 2–4 rays having a length between 150 and 300 μm (Fig. 2). They are all over the leaf blade, but are more abundant on the abaxial surface and when the leaves are young, many of them being lost when the leaf is mature. Beside them, on the abaxial surface, also appear simple-uniseriate hairs uniformly distributed on the blade and simple hairs on the veins. On the adaxial surface there are also scarce simple hairs and bulbous hairs.

The male catkins have been not observed, so we suspect it can be an androsterile.

Habitat: It grows on hill slopes, on Oligocene conglomerates compacted with limestone and covered with siliceous materials (Fig. 5).

Biogeography: Sector Leonés, province Carpetano-Ibérico-Leonesa.

Bioclimate: Mediterranean pluvistational oceanic, upper supramediterraneous, upper subhumid.

Phytosociological behaviour: Festuco heterophyllae-Querceto pyrenaicae S. faciation with *Q. pauciradiata*.

The most similar species to this new taxon are *Quercus pyrenaica*, *Quercus humilis* (=*Q. pubescens*), *Quercus robur* and *Quercus petraea* (that is to say, all the deciduous species living on the Cantabrian range or near it).

Q. pauciradiata can be differentiated from *Q. pyrenaica* because has earlier foliation, fasciculate hairs with a short stipe (8–20 μm against 40–60 μm) (Table 1) with 2–4 much shorter rays (150–300 μm against 500–1000 μm) (Fig. 3) and being very abundant the trichomes with 2 and 3 rays (in *Q. pyrenaica* 4–8 rays). On the other hand, the leaves are thin and glabrescent in *Q. pauciradiata*, and thich and densely pubescent in *Q. pyrenaica*. From *Quercus humilis* by the ray length 150–300 μm against 350 μm. The rays are thin walled and collapsed when dry in *Q. humilis*. From *Quercus petraea* because it is a little tree having fasciculate-stipitate hairs, and by lacking stellate hairs (Fig. 4) on the blade and sessile fasciculate hairs on the insertion of the secondary veins (Table 2). From *Quercus robur* by their fasciculate-stipitate hairs and because it is a little tree.

Hybrids

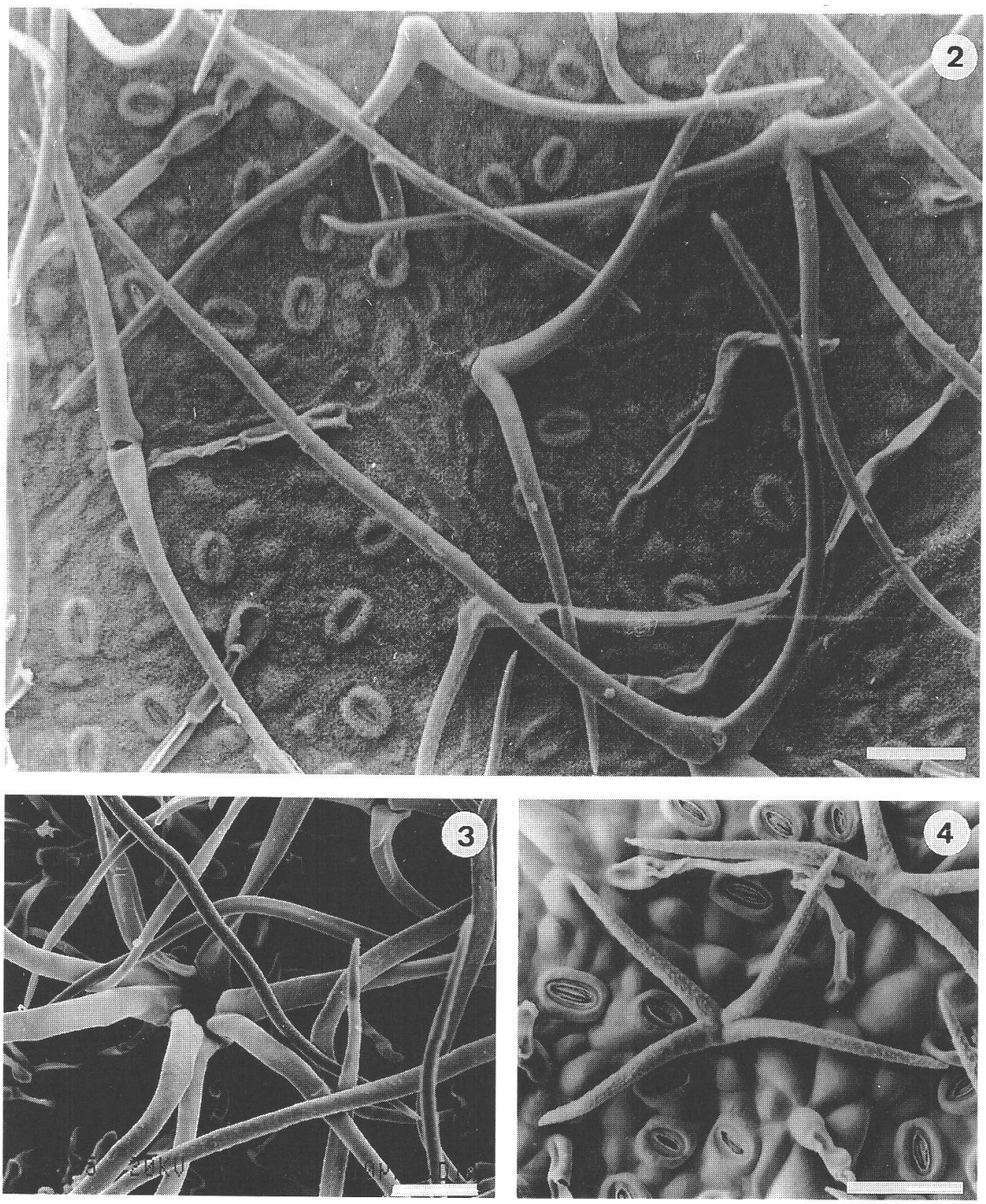
Quercus × *rotensis A. Penas, F. Llamas, C. Pérez-Morales & C. Acedo, nothosp. nov.* = Q. pauciradiata × pyrenaica

Holotypus: **Spain, León:** Llamas de Rueda (30TUN2622), Turkey oak woodland on oligocene conglomerates, 920 m.a.s.l, 15-9-1995, Leg. *F. Llamas & C. Acedo*, LEB 49252. Isotypus: LEB 53648.

Intermedia inter parentales mostrat in facie inferiore tricomata fasciculata-stipitata utrorumque parentum.

Tab. 2. Hair lenght in the Iberian deciduous species of *Quercus*.

	Stipe lenght	Ray lenght
Q. pauciradiata	8–20 μm	150–300 μm
Q. petraea	–	60–120 μm
Q. pyrenaica	40–60 μm	500–1000 μm
Q. humilis	15 μm	ca. 350 μm



Figs. 2–4. Trichomes on the abaxial surface of leaves of *Quercus* spp.: 1. *Q. pauciradiata*. 2. *Q. pyrenaica*. 3. *Q. petraea*. (Scale bars = 20 μm).

Diagnosis: Intermediate between the parents, it presents the indumentum on the abaxial surface having at the same time the fasciculate-stipitate trichomes of both progenitors (2–3 short rays and 4–8 long rays) (Table 3).

Pollen analysis: It has up to 35–39% of sterile pollen grains belonging to two morphological types: little, empty and bad developed, or bigger than the fertile but lacking nuclei. The fertile pollen grains have a higher size variation than the pure species.

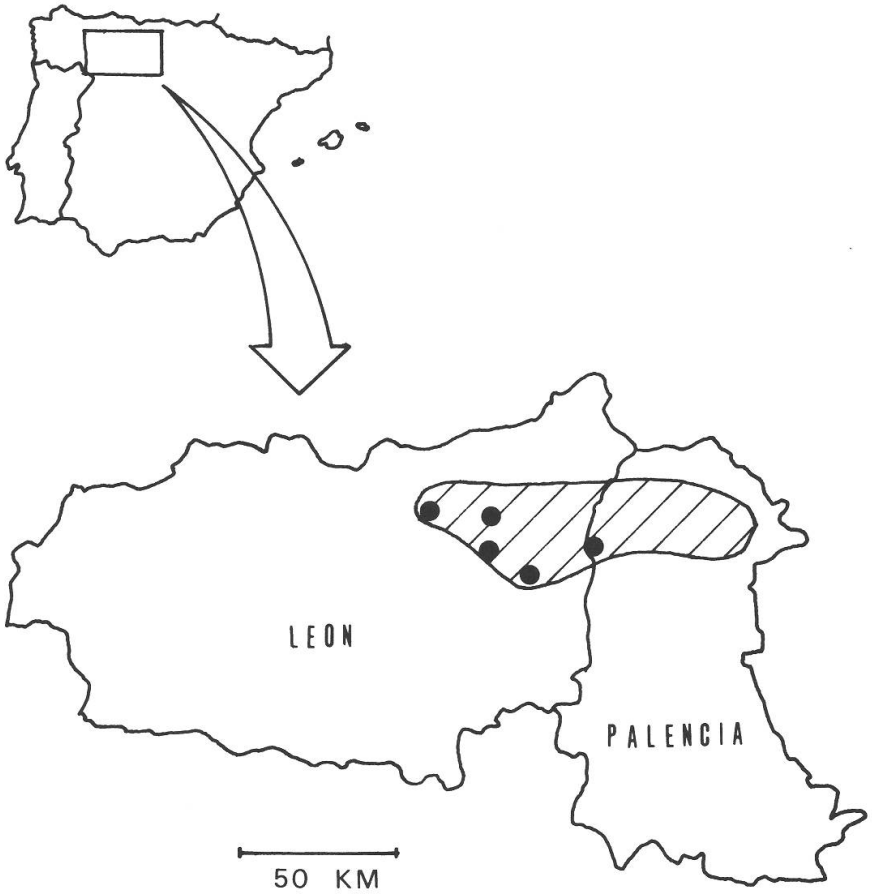


Fig. 5. General distribution of *Quercus pauciradiata* and its hybrids (stripped area) and localization of the cited specimens (dots).

Studied Material:

Spain, León: Llamas de Rueda (30TUN22), 22-V-1992, Turkey oak woodland, 1000 m.a.s.l. Leg.: *A. Penas & F. Llamas*. LEB 52778. id. 22-VIII-1992, Leg.: *A. Penas, F. Llamas, C. Pérez Morales & C. Acedo*. LEB 50941. Vegaquemada (30TUN1044) 9-VI-1993, Turkey oak woodland on calcareous marls, 1010 m.a.s.l. Leg.: *F. Llamas, C. Pérez Morales & C. Acedo*. LEB 53179. La Espina, Palencia province border (30TUN4438) 17-VI-1993, Turkey oak woodland, m.a.s.l. Leg.: *F. Llamas, C. Pérez Morales & C. Acedo*. LEB 53184. Pardavé (30TTN94) 31-V-1993, 1120 m.a.s.l. Leg.: *A. Penas, F. Llamas, C. Pérez Morales & C. Acedo*. LEB 53180. id. 1140 m.a.s.l. LEB 53198. **Palencia:** Prox. Guardo: Ermita del Cristo del Amparo (30TUN4738), 17-VI-1993, Turkey oak woodland, 1100 m.a.s.l. Leg.: *F. Llamas, C. Pérez Morales & C. Acedo*. LEB 53185.

Quercus × *arrimatensis A. Penas, F. Llamas, C. Pérez-Morales & C. Acedo, nothosp. nov.* = *Q. pauciradiata* × *petraea*

Holotypus: **Spain, León:** San Bartolomé de Rueda (30TUN1733), 1010 m.a.s.l, 31-5-1993, Leg. *A. Penas, F. Llamas, C. Pérez-Morales & C. Acedo*, LEB 53200.

Tab. 3. Trichome types present in the adult leaves of the hybrids of *Quercus pauciradiata*: adaxial/abaxial surface, − = absent, (+) = rare, + = present.

	Sessile fasciculate	Short stipe fasciculate	Long stipe fasciculate	Stellate
Q. pauciradiata × *Q. pyrenaica*	−/−	+/+	+/+	−/−
Q. pauciradiata × *Q. petraea*	−/+	+/+	−/−	(+)/+

Intermedia inter parentales, mostrat in inferiore facie simul pilos fasciculatos-stipitatos proprios Querci pauciradiatae, pilos stellatos quattuor radiorum in lamina et pilos fasciculatos sesiles in axilis nerviorum secundariorum cum principale proprios Querci petraea.

Diagnosis: Intermediate between both parentals, it presents the indumentum of the abaxial surface both short fasciculate-stipitate hairs like *Q. pauciradiata*, and stellate hairs with four rays on the blade and sessile fasciculate hairs on the insertion of the secondary veins like *Q. petraea* (Table 3).

Resumé

Une nouvelle espèce du genre *Quercus* (Fagaceae) est décrite: *Q. pauciradiata* A. Penas, F. Llamas, C. Pérez-Morales & C. Acedo. C'est une espèce à feuilles caduques avec une aire de distribution très reduite, elle est connue seulement de quelques localitées des provinces de León et Palencia (NO de l'Espagne). Les hybrides qu'il forme avec *Q. pyrenaica* et *Q. petraea* sont aussi décrits. On apporte une clé d'identification pour les espèces Iberiques du genre *Quercus*.

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Key to the iberian species of the genus *Quercus*

1. Perennial and coriaceous leaves 2
1. Deciduous or semi-deciduous leaves, coriaceous or submembranose 5
2. Mature leaves glabrous or subglabrous ..... *Q. coccifera*
2. Mature leaves pubescent at least on the abaxial surface 3
3. Fused-stellate hairs with rays shortly united at the base (less than 30 μm) 4
3. Fused-stellate hairs with rays united on a bigger extent (at least 30 μm) ..... *Q. suber*
4. Fused-stellate hairs with 8–10 rays. Indumentum dense covering all the epidermis ..... *Q. rotundifolia*
4. Fused-stellate hairs with 6–8 rays. Indumentum less dense (some epidermal areas can be seen) ..... *Q. ilex*
5. Rosulate hairs on the abaxial surface of the leaf ..... *Q. rubra*
5. Rosulate hairs on the abaxial surface of the leaf absent 6
6. With stellate or fasciculate hairs on the blade 7
6. Without stellate or fasciculate hairs on the blade ..... *Q. robur*
7. Without multiradiate hairs 8
7. With multiradiate hairs 12
8. With fasciculate hairs not stipitate only on the union of the secondary veins. Stellate hairs all over the blade ..... *Q. petraea*
8. With fasciculate estipitate hairs on the abaxial surface 9
9. Fasciculate hairs yellowish brown falling forming flocks ..... *Q. canariensis*
9. Fasciculate hairs no as above 10
10. Fasciculate hairs with thin walled rays (collapsed when dry and ribbon like) ... *Q. humilis*
10. Fasciculate hairs with thick walled rays (not collapsed when dry) 11
11. Mature leaves subglabrous. Fasciculate hairs with short stipe (8–20 μm) and 2–4 rays of 150–300 μm of length ..... *Q. pauciradiata*
11. Mature leaves with the abaxial surface densely pubescent. Fasciculate hairs with long stipe (40–60 μm) and 4–8 rays of 0.5–1 mm of length ..... *Q. pyrenaica*
12. With fasciculate hairs ..... *Q. subpyrenaica*
12. Without fasciculate hairs 13
13. With multiradiate thick walled hairs (not collapsed when dried) 14
13. With multiradiate thin walled hairs (collapsed when dried) ..... *Q. broteroi*
14. Stellate and multiradiate hairs with thick rays ..... *Q. faginea*
14. Stellate and multiradiate hairs with thin rays ..... *Q. lusitanica*