

***Quercus rotundifolia* Lam. and its forms in Extremadura, Spain**

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A total of eight ecotypes of Quercus rotundifolia occurring in Extremadura, Spain, are described. The differences between them are based on the external morphological characteristics of the fruits. Also included is a key to the identification of the different forms and a description of each one, including its distribution within the region.

Key words: Quercus rotundifolia, ecotype, acorn, cupule, form, Extremadura, distribution

Because of the large interest in keeping pigs in Extremadura, Spain, the dehesa ecosystem is based on making use of the fruits of local trees. During 1988, a project was carried out to identify the most notable characteristics of the fruits of the oaks. Initially the project was only de-

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Quercus rotundifolia as seen in southern France.

signed to make an illustrated catalogue of the fruits to show their shape, size, color and weight. However, ecotypes were detected that clearly defined different types of trees.

According to the data obtained through fieldwork, the morphological characters studied in the laboratory, and the literature consulted, the existence of a group of ecotypes was discovered, which are perfectly differentiated by the external morphology of their fruits.

The main part of this work concerns the infraspecific taxa of *Quercus rotundifolia* Lam. in Extremadura, and shows the characteristics which differentiate them and their distribution. A key to distinguish the different taxa is also included.

Methodology

The method of study was based on the collection of material in Extremadura according to the National Forestry Inventory in Extremadura and aerial photographs (1984) existing in the Agricultural Research Service. Collections were made between April 1988 and June 1990. Some specimens of f. *pilosella* were collected between 1995 and 1997. Branches bearing leaves and inflorescences were collected from 10-25 trees at each locality. This material was pressed, dried, and then studied in the laboratory. Data on leaf morphology and stem and flower characteristics were recorded. Whole fruits (cupule and acorn) were collected and weighed fresh and dry after 24 hours at 100°C, and data on their weight and morphology were recorded. Tables of the characters were made from the data and a description was made for each of the variants found. These were then compared with descriptions in the literature.

Results

The official description of the species includes the following.

Q. rotundifolia Lam., *Encycl.* 1: 723 (1785)

Q. ballota Desf., *Observ. Phys.* 38: 375, pl. 1 (1791).

Q. ilex L. subsp. *ballota* (Desf.) Samp., Bol. Soc. Brot. 24: 102 (1908-1909).

Q. ilex subsp. *smilax* (L.) C. Vicioso., Rev. Gén. Quercus España 166 (1950).

Q. ilex sensu Brotero, Fl. Lusit. 2: 33 (1804); B. Gomes, Cond. Florest. Port. 60 (1876); Laguna, Fl. Forest. Esp. 1: 252 (1883); P. Coutinho, Bol. Soc. Brot, 6: 94 (1888).

Q. ilex subsp. *rotundifolia* (Lam.) O. Schwarz ex Tab. Morais, Bol. Soc. Brot. Ser. 2, 14: 122 (1940).

Tree to 20 m tall with an erect, cylindrical trunk, grey bark, broken into small plates and a broad, rounded head, often modified by pruning. Young shoots densely stellate-tomentose. Buds small, ovoid, obtuse with oval scales, brownish tomentose. Stipules caducous. (Vicioso, 1950; Schwarz, O., 1964. *Quercus* L. in Tutin et al., 1969; Valdés, 1987). Leaves 1-5 x 1.5-3.5 cm, petiole 3-14 mm, coriaceous, persistent, pale green when young, grey-hairy on both sides; adult leaves with upper surface green, glabrous, white-tomentose beneath, very variable in shape even on the same tree; ovate-lanceolate, elliptic, somewhat orbicular, ovate-rounded, acute or obtuse at the apex, rounded to cuneate or attenuate at the base, entire or dentate, sometimes slightly mucronate; juvenile leaves usually with spiny teeth on their margins. Secondary veins in 5-8 pairs. Male flowers in dense or somewhat lax yellow catkins, 3-6 cm long with a tomentose rachis, and hairy, lanceolate-acute bracts; perianth with 3-5 broad, obtuse lobes, stamens with mucronate

anthers. Female flowers solitary or in clusters of up to 4, on pubescent pedicels, perianth with 6 hairy lobes. Stigmas commonly 3, occasionally 4. (Maire, 1961).

Fruits solitary or clustered, sessile or on a tomentose peduncle to 1.5 cm; cupules grey, tomentose, hemispherical or somewhat attenuate at the base, 0.5-2.5 cm across, more or less covering part of the acorn; scales adpressed, flat or slightly thickened, ovate-triangular, obtuse, narrowed to the base on the proximal part of the cupule where they are lanceolate to somewhat acute. Acorns very variable, ovoid, ovoid-oblong, oblong-cylindric, or subglobose, 11-50 mm long, 12-22 mm diam. With a tomentose endocarp and weighing 0.2-8 g when mature and dry. Flowering February to May, fruits maturing from October to November the same year.

General distribution: It is distributed from Portugal and Spain to southern France, and North Africa.

Peninsular distribution - The Iberian Peninsula is where it finds its ecological optimum and it occurs over all the territory. It is generally the dominant tree in forests less than 1,000 m in elevation. It is also found in parts of the South of France and in some parts of the Cordillera Cantabrica, the Pyrenees and Cataluña.

Distribution in Extremadura - In

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Extremadura it is widely distributed, but is absent from some parts of the North and South where it is replaced by *Q. pyrenaica* Willd. in the highest and coldest areas; elsewhere it occurs in the shady and acidic zones in the Sierra de San Pedro and Jerez de los Caballeros with *Q. suber* L. It is threatened by deforestation in La Serena, Tierra de Barros, Llanos de Cáceres and Vegas del Guadiana. Sometimes it appears mixed with some individuals of *Q. coccifera* L. in calcareous areas, and very locally with *Q. faginea* L., mainly in south and central Badajoz (Tentudía, Jerez de los Caballeros and Tierra de Barros), and south and central Cáceres (Villuercas, Monfragüe and Alcántara).

Forms of *Q. rotundifolia*

Based on the data collected, eight forms or taxa of *Quercus rotundifolia* were identified. They are listed below:

- f. *rotundifolia*
- f. *brevicupulata*
- f. *avellaniformis*
- f. *expansa*
- f. *crassicupulata*
- f. *calcyna*
- f. *macrocarpa*
- f. *pilosella*

The following key was developed to

differentiate among these eight taxa. It is based entirely on characteristics of the fruit.

1. Pericarp pubescent in the apical 1/3 f. *pilosella*
1. Pericarp glabrous or only pubescent at the acute apex 2
2. Acorns less than 15 mm long, not or hardly exserted from the cupule f. *avellaniformis*
2. Acorns more than 20 mm long, clearly exserted from the cupule 3
3. Cupules less than 16 mm long 4
3. Cupules more than 16 mm long 6
4. Cupules less than 8 mm long, cup-shaped, floral peduncles short, less than 0.5 mm.....f. *brevicupulata*
4. Cupules more than 10 mm long, hemispherical, peduncles of variable length, sometimes more than 1 cm 5
5. Acorns at least 3 times as long as broad, cupules somewhat thickened and hazelnut-shaped, with a small ring in the lower part f. *crassicupulata*
5. Acorns less than 3 times as long as wide, very variable in shape, cupules hemispherical, truncate, rounded or somewhat acute at the base, without a ring in the lower part f. *rotundifolia*
6. Cupule broad, bell-shaped, thickened and folded at the margin which resembles a ringf. *expansa*
6. Cupule broad or narrow, sometimes

bell-shaped but with the margin smooth,
not thickened 7

7. Acorns up to 37 mm long and 15 mm
across, with cupules covering at least 2/
3 of their length, turbinate at the base
..... f. *calcyna*

7. Acorns more than 39 mm long and 19
mm across, with hemispherical cupules
truncate or somewhat rounded at the
base and covering at most 1/3 of the
length of the acorn f. *macrocarpa*

Descriptions follow of the various
forms mentioned in the diagnostic key.
Synonyms are included for each of the
forms recognized, as well as drawings to
show differentiating characters useful to
separate one form from another.

Q. rotundifolia* Lam. f. *rotundifolia

Q. ballota var. *parviflora* Colmeiro & E.
Boutelou, Exam. Encin. 10 (1854).

Q. ballota var. *obovatifolia* Colmeiro &
E. Boutelou, Exam. Encin. 10 (1854).

Q. ballota var. *grandifolia* Colmeiro &
E. Boutelou, Exam. Encin. 10 (1854).

Q. ballota var. *mascula* Colmeiro & E.
Boutelou, Exam. Encin. 10 (1854).

Q. ilex f. *oleifolia* Laguna, Fl. For. Esp.,
1: 255 (1883).

Q. ilex f. *microcarpa* Laguna, Fl. For.
Esp., 1: 257 (1883).

Q. ilex var. *ballota* f. *vulgaris* Cout., Bol.
Soc. Brot. 6: 94 (1888).

Q. ilex var. *ballota* f. *oleoides* Cout., Bol.
Soc. Brot. 6: 94 (1888).

Q. ilex var. *ballota* f. *macrophylla* Maire,
Fl. De L'Afrique du Nord. 7: 123 (1961).

Q. ilex var. *ballota* f. *microphylla* Maire,
Fl. De L'Afrique du Nord. 7: 123 (1961).



Foliage and fruit of Q. rotundifolia f. rotundifolia.

Q. ilex var. *ballota* f. *laurifolia* Maire, Fl.
De L'Afrique du Nord. 7: 123 (1961).

Q. ilex var. *ballota* f. *latifolia* Maire, Fl.
De L'Afrique du Nord. 7: 122 (1961).

Q. ilex var. *ballota* f. *coutinhoi* Maire,
Fl. De L'Afrique du Nord. 7: 123 (1961).

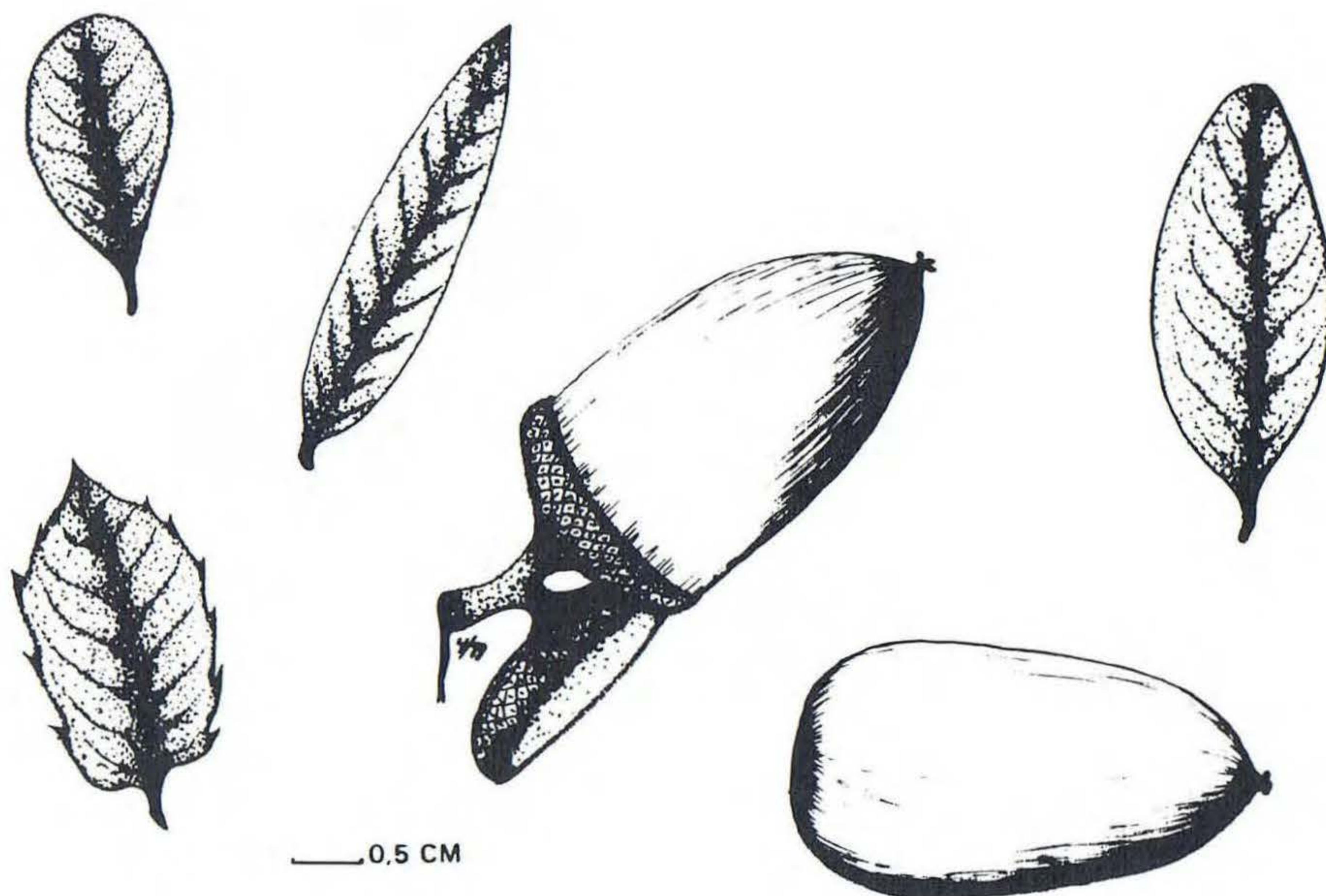
Q. ilex var. *ballota* f. *pendula* Maire, Fl.
De L'Afrique du Nord. 7: 123 (1961).

Trees of very variable size and shape,
hairiness of leaves, and in the habitats
in which they are found. Cupules 9-15
mm long, hemispherical, somewhat cup-
shaped, truncate or rounded at the base,
1 or 2 on each peduncle, bracts triangu-
lar-acute at the base, becoming linear
towards the base of the cupule, flat, to-

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Foliage and fruit of Q. rotundifolia f. brevicupulata.

mentose. Leaves very variable in shape and size on the same tree. Acorns variable, 30-40 (45) mm long, 12-17 (20) mm across, 1/4-2/3 covered by the cupule. Weight 1.5-5 g when mature and dry. (Vicioso, 1950; Maire, 1961).

Distribution in Extremadura - Its distribution is the same as that given for the species. It is the form widely distributed and it is indifferent to soil and ecological conditions, occurring in the

higher zones, planes, in sunny and shady sites on steep slopes etc.

Q. rotundifolia* Lam. f. *brevicupulata (Laguna) F.M. Vázquez, *Semillas de Quercus: Biología, Ecología y Manejo*, 83, 1998.

basionym: *Q. ilex* f. *brevicupulata* Laguna, *Fl. For. Esp.* 1, 256 (1883)

Q. ilex subsp. *smilax* C. Vicioso var. *brevicupulata* (Laguna) C. Vicioso, *Rev.*

Gen. Quercus España
172 (1950).

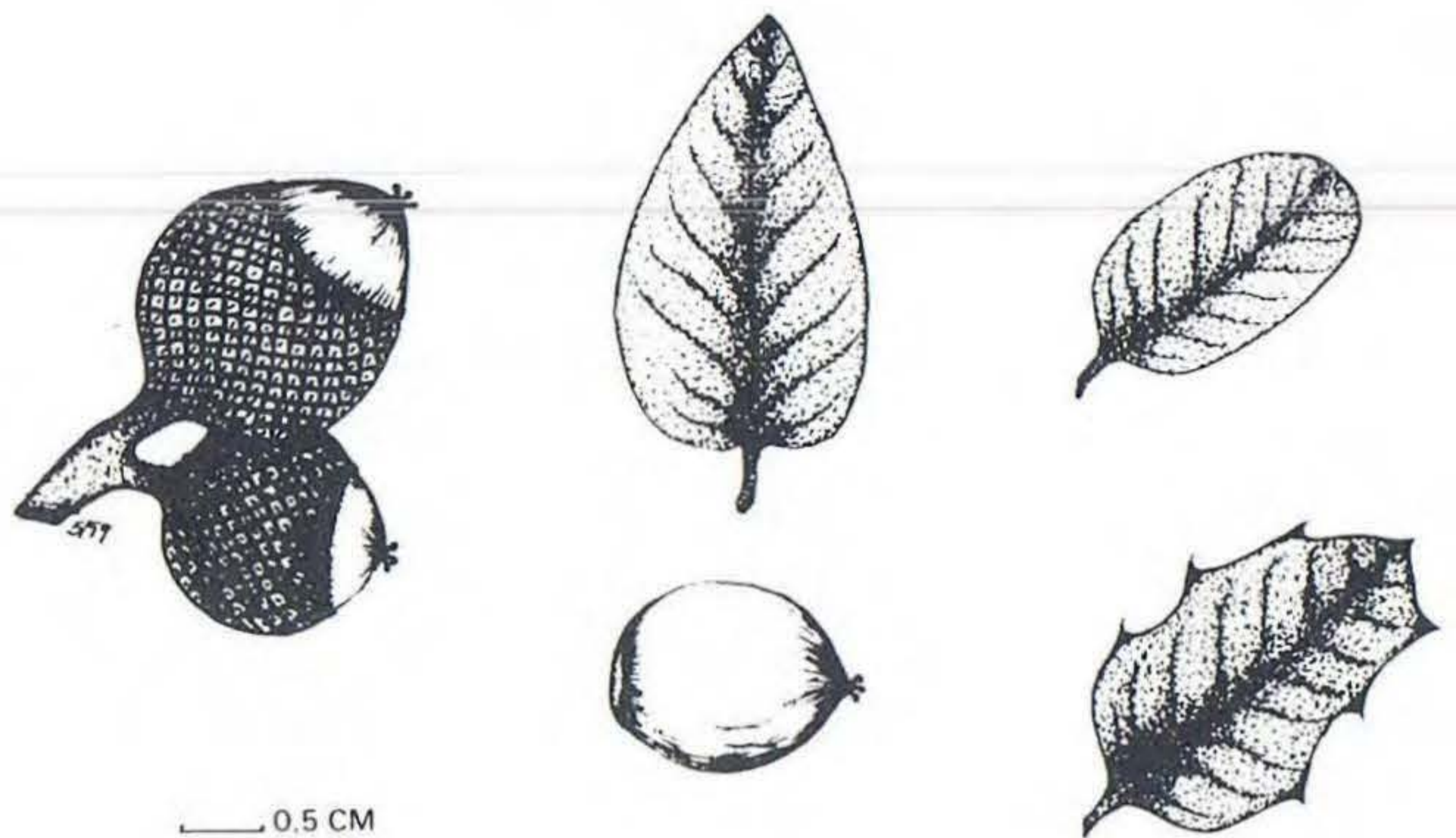
Tree of variable size found in many different habitats. Cupule cup-shaped, very broad, with an erect margin, without a ring, (15) 17-19 (21) x (5.0) 6.5-7.0 mm, on a short peduncle no more than 0.5 mm or sessile, with flat scales not thickened as in *f. macrocarpa*,

closely adpressed, tomentose, triangular-acute. The cupule only covering the base of the acorn. Leaves oval to elliptic or orbicular, not useful for identification. The leaves can be spiny when juvenile, but then only weakly (Laguna, 1883). Acorns oblong, truncate at the base, 28-30 (34) x (15) 16-18 mm pale brown when dry (C. Vicioso, 1950). Weight 2-5 g when mature and dry.

Distribution in Extremadura - It is very widely distributed in the region, but still has not been found north of the area of Sierra de San Pedro and of Villuercas, or in the small areas of forest which are still present in Llerena and Tierra de Barros.

Q. rotundifolia* Lam. f. *avellaniformis (Colmeiro & E. Boutelou) F.M. Vázquez, *Semillas de Quercus: Biología, Ecología y Manejo*, 83, (1998).

basionym: *Q. avellaniformis* Colmeiro & E. Boutelou, *Exam. Enc.* 9 (1854)



Foliage and fruit of *Q. rotundifolia* f. *avellaniformis*.

Q. ilex var. *avellaniformis* (Colmeiro & E. Boutelou) Cout., *Bol. Soc. Brot.* 6, 95 (1888).

Large to small tree with thick bark and tomentose shoots; cupules (12) 13-14.5 (16) x 14.5-15.5 mm, peduncles 8-15 mm, bearing 1 or 2 fruits. Scales lanceolate, acute and adpressed, very tomentose. Cupule hemispherical, somewhat narrowed to the base where the scales are smaller and less tomentose (Colmeiro & Boutelou, 1854). Leaves weakly hairy when young, ovate, varying to subelliptic, entire, subobtuse, but juvenile leaves can be acute and spiny. Veins very prominent on the undersurface of the leaf. Acorn shaped like a hazel nut, very small, 12-14 (16) x (8.5) 9.5-10.5 mm, with a very sweet taste, almost completely covered by the cupule and difficult to extract from it (C. Vicioso, 1950). Weight

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0.2-0.5 g when mature and dry.

Distribution in Extremadura - Very locally distributed. It has only been possible to find specimens in the South of Badajoz, always in places very close to Sierra Morena and in zones with a very high tree density. We agree with Coutinho (1888) in the distribution South of the Peninsula.

***Q. rotundifolia* Lam. f. *expansa* (Poir.)**
F.M. Vázquez, Semillas de Quercus: Biología, Ecología y Manejo, 83, (1998).
basonym: *Q. expansa* Poir., Encycl. Bot. Suppl. 2, 216 (1811)
Q. ilex f. *expansa* (Poir.) Laguna, Fl. For.

Esp. 1: 256 (1883)

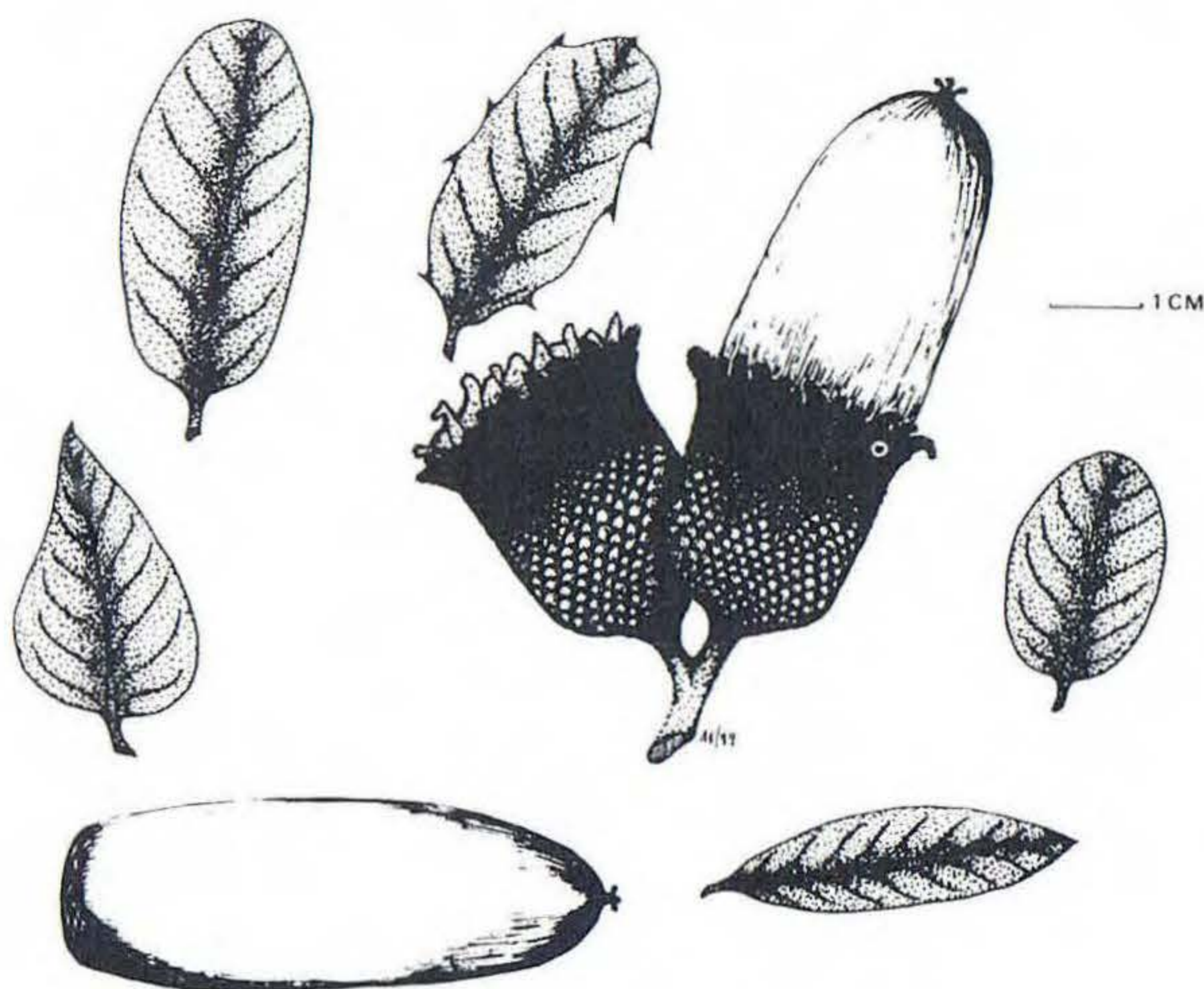
Q. ilex var. *expansa* (Poir.) A. Camus, Monogr. II, 57 (1939)

Q. ilex subsp. *smilax* C. Vicioso var. *expansa* (Poir.) C. Vicioso, Rev. Gen. Quercus España 171 (1950).

Trees differ from other forms in their cupules 16.5-20 x 18-19 (22) mm; broad and bell-shaped, the margin covered in folds giving it a more or less prominent ring-shaped appearance. Pedicels more than 1.5 mm long, of medium hairiness, with scales ovate-triangular but somewhat lanceolate towards the base of the cupule, always obtuse. Fruits in groups of 2-3 on the peduncle (Laguna, 1883).

The leaves show the general characteristics of the species and are very variable. Both ovate spiny and entire leaves are found in the juvenile and adult states. Acorns 33-40 x 14-16.5 mm, ovoid-cylindrical, slightly truncate at the base, 1/2 covered by the cupule, very sweet tasting. Weight 2.5-5.0 g when mature and dry (Vicioso, 1950).

Distribution in Extremadura - Examples have been found mainly



Foliage and fruit of *Q. rotundifolia* f. *expansa*.

in the valleys of the Guadiana river and in some places close to Ciudad Real. It is a very localized plant with a distribution concentrated in the central forested zones in Extremadura.

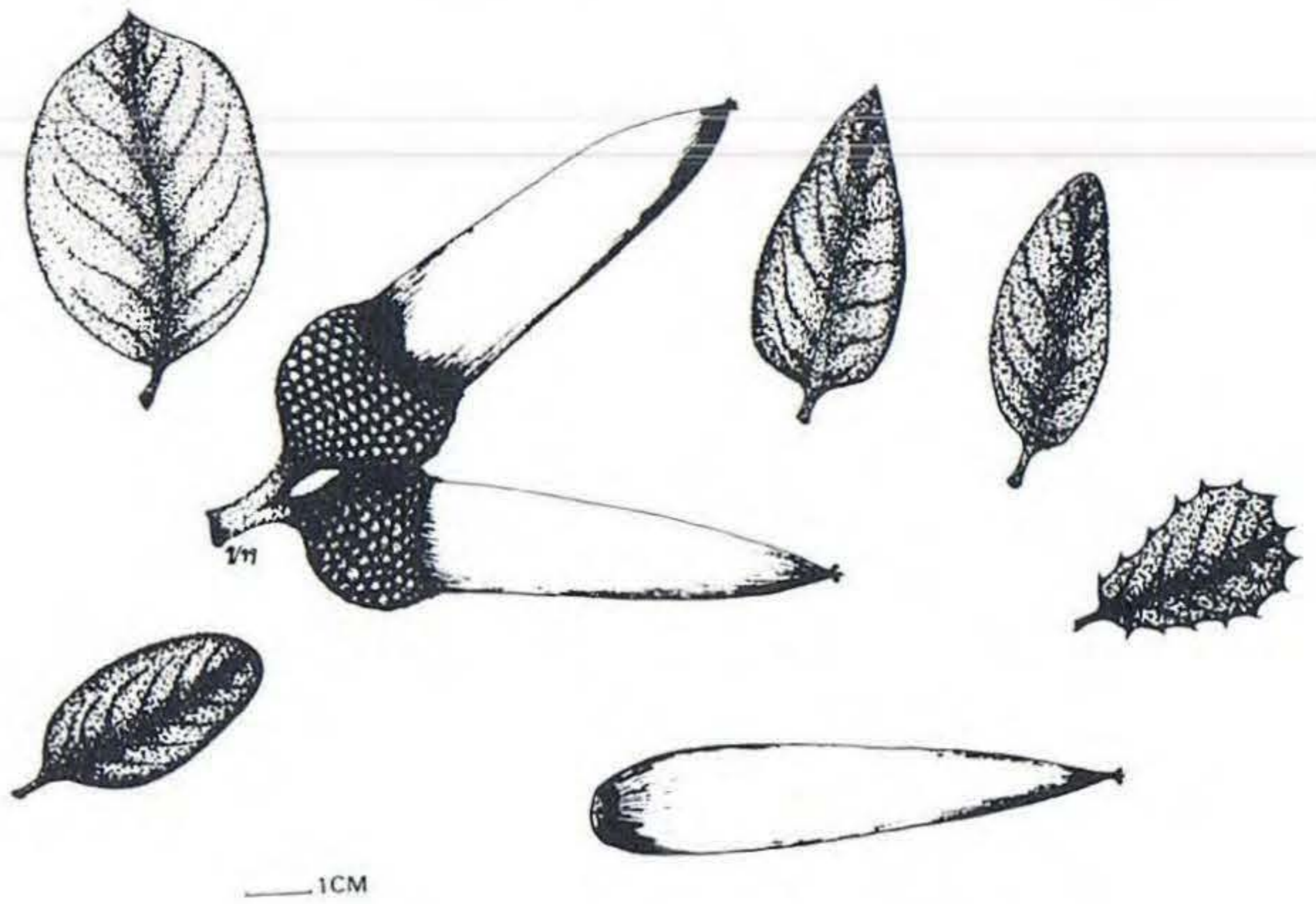
Q. rotundifolia Lam. f. *crassicupulata* (Cout.) F.M. Vázquez, Semillas de Quercus: Biología, Ecología y Manejo, 83, (1998).

basionym: *Q. ilex* L. var. *ballota* f. *crassicupulata*

Cout., Bol. Soc. Brot. 6, 95 (1888).

Q. rotundifolia f. *dolichocarpa* P. Silva, Broteira XII (XXXIX) Fasc. II 76-80 (1943)

As described by Pereira Coutinho (1888), this form has very large, thick fruits. It is also distinguished by its triangular-acute bracts, which are very adpressed and flat, but at the margin of the cupule they are lanceolate and obtuse, always tomentose. The shape of the cupule is somewhat angled, slightly hazel-nut shaped with a small ring in the basal part where the scales curve slightly inwards. The cupule is (10) 12-16 mm long and 12-14 (17) mm across and covers 1/5-1/6 of the acorn (Coutinho, 1888). The leaves, as in forms described above, are not useful for identification but show peculiarities in their variability such as: juvenile leaves spiny, mucronate, mature leaves lanceolate. Acorns oblong-lanceolate, attenuate at the base, very slen-



Foliage and fruit of *Q. rotundifolia* f. *crassicupulata*.

der, (9) 10-11.5 x 32-37 (44) mm, more than 3 times as long as broad, ochre-coloured and of sweet taste, weight 1.5-3.5 g when mature and dry.

Distribution in Extremadura - It is distributed mainly in the central western part of the Autonomous Community, characteristically in densely wooded areas. Some individuals have been found in the Sierra de San Pedro, on the border with Portugal, and the center of Cáceres province.

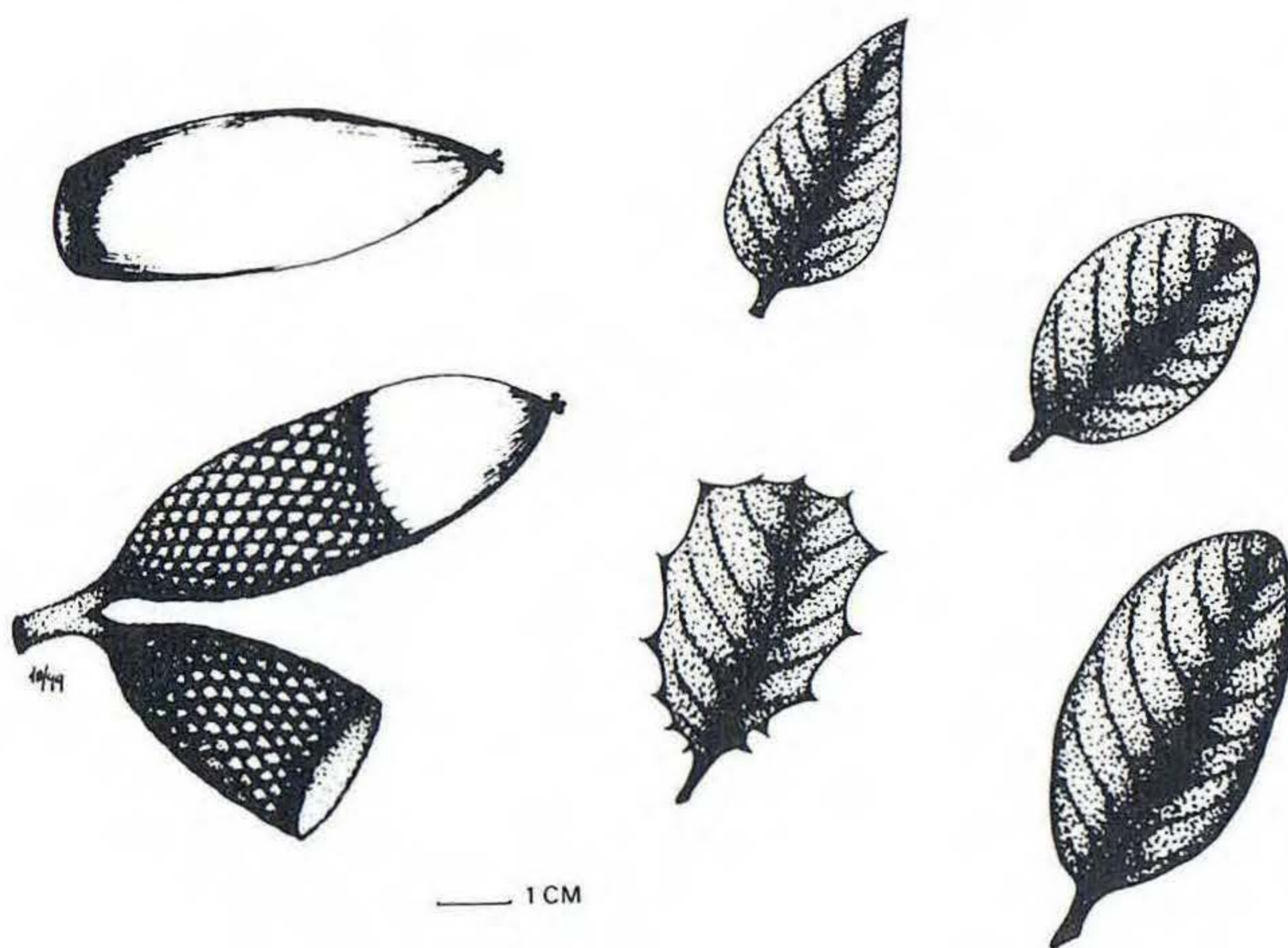
Q. rotundifolia Lam. f. *calcyna* (Poir.) F.M. Vázquez et al., comb. et stat. nov. basionym: *Q. calcyna* Poir., Encycl. Bot. Suppl. 2, 216 (1811).

Q. ilex L. subsp. *smilax* (L.) C. Vicioso var. *dolichocalyx* C. Vicioso, Rev. Gen. Quercus España 170 (1950).

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diverse grades of hairiness of the scales. Pedicels 3-4 mm long. The leaves do not have distinguishing characters, but show diverse shapes found in other forms (C. Vicioso, 1950). Acorns ovoid-elliptic, obtuse at the base, with a sweet taste and with weight 3.5-6 g when mature and dry.

Distribution in Extremadura

Foliage and fruit of *Q. rotundifolia* f. *calcyna*.

Q. rotundifolia Lam. f. *dolichocalyx* (C. Vicioso) F.M. Vázquez, Espárrago, Jaraquemada & López-Marques, Descr.

Q. rotundifolia Extremadura 13 (1992).
Q. ilex L. f. *calycina* (Poir.) Laguna, Fl. For. Esp. 1: 256 (1883) nom. illeg.

Tree with the same external morphological characteristics as f. *rotundifolia*. It differs in its cylindrical cupules 17-25 (27) x 15-19 (23) mm, which cover at least 2/3 of the length of the acorn, with ovate-triangular, closely adpressed scales; those of the margin are slightly lanceolate-acute. Towards the base, irregularities sometimes appear associated with

- It is found in almost all the territory, more frequently in areas of extensive and dense oak forests, as it occurs in the Sierra de San Pedro, Villuercas, Sierra Morena and on the border with Portugal.

Q. rotundifolia Lam. f. *macrocarpa* (Cout.) F.M. Vázquez, Semillas de Quercus: Biología, Ecología y Manejo, 83, (1998).

basionym: *Q. ilex* L. var. *ballota* f. *macrocarpa* Cout., Bol. Soc. Brot. 6, 95 (1888)

Q. ilex subsp. *smilax* var. *macrocarpa* (Cout.) C. Vicioso, Rev. Gen. Quercus

España 169 (1954).

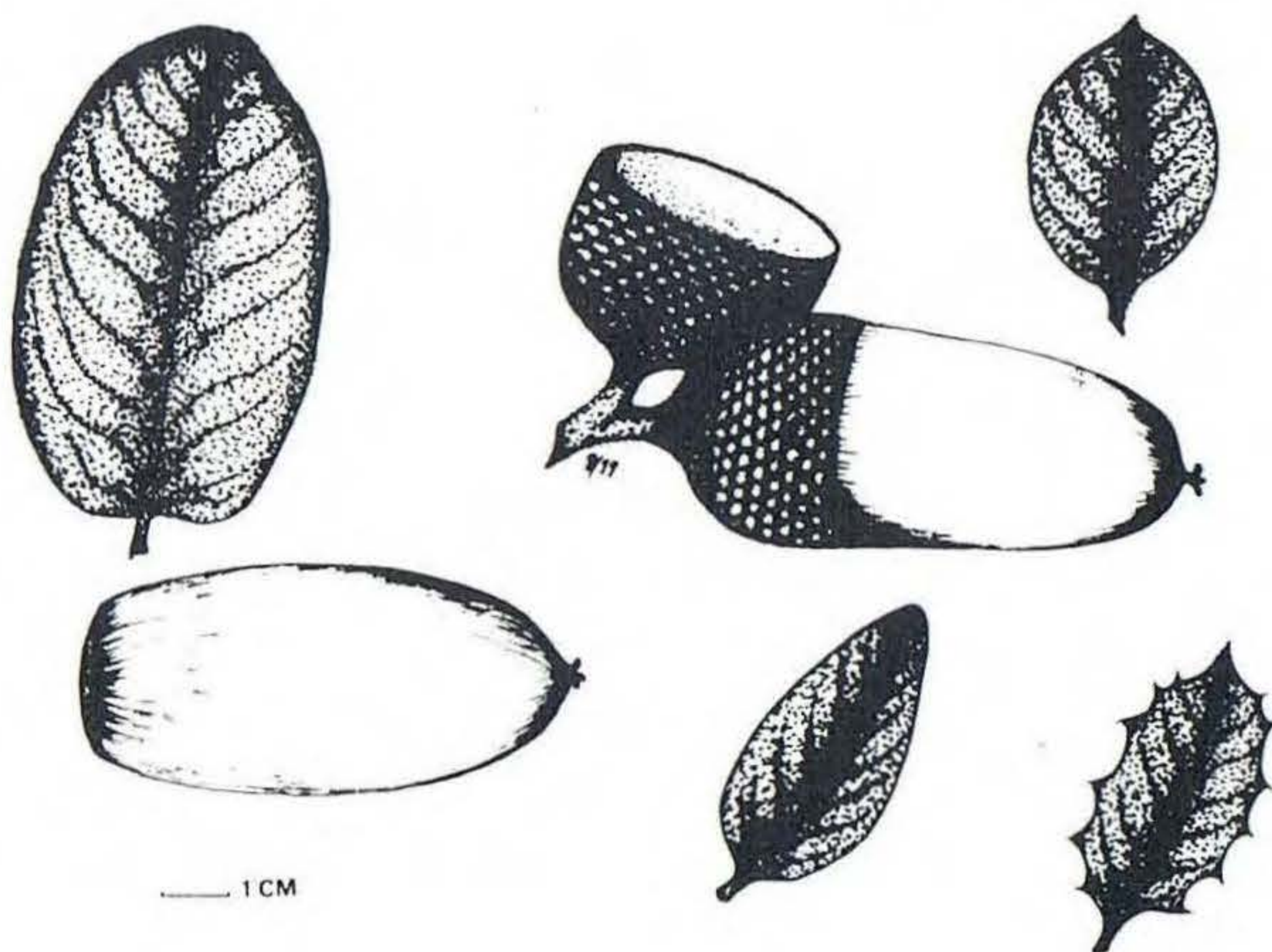
This is distinguished from other forms by its large cupules and acorns. However, between this taxon and *f. rotundifolia* there is a continuous range of ecotypes and more than one different taxon in a normal representation of frequency. We could refer to all of these as *f. rotundifolia*. This form, *f. macrocarpa*, corresponds to those individuals at one extreme of the range. We have considered it as a different taxon because of the high frequency of individuals that show very clearly the characteristic dimensions of the fruits and cupules.

Within the same variation between extremes come the small fruits and small cupules of *Q. ilex f. microcarpa* Laguna (here regarded as a synonym of *Q. rotundifolia f. rotundifolia*) which is the same as *Q. ballota* var. *obovatifolia* Colmeiro & E. Boutelou. This form is characterized by its oval leaves and its small fruits and is found only in areas south of Badajoz in the same places as *f. avellaniformis*, which was also described by Colmeiro and Boutelou. It is possible that *Q. ilex f. microcarpa* Laguna and *Q. ballota* var. *obovatifolia* Colmeiro & E. Boutelou are no more than crosses between *f. rotundifolia* and *f. avellaniformis* because

their fruits are intermediate between one and the other, but closer to those of the latter. Regarding their leaves, even though the majority are oval in shape, on the same tree we can find variations, with some more oblong and some more orbicular.

After these considerations, we can say that this taxon has a hemispherical-cylindrical cupule of 16-20 x 22-26 mm. It has triangular-acute scales, except the ones on the margin which are very weakly lanceolate, strongly adpressed and flat, even when sometimes they are thicker, and ash-grey in colour, with a long pedicel of 0.5 to more than 1.0 cm in length and with a internal diameter of 19-22 mm (Coutinho, 1888). Generally the leaves are not constant in shape, even though they are oval in shape, rounded, with exception of the ones exposed to sun,

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Foliage and fruit of *Q. rotundifolia f. macrocarpa*.

Quercus rotundifolia . . .

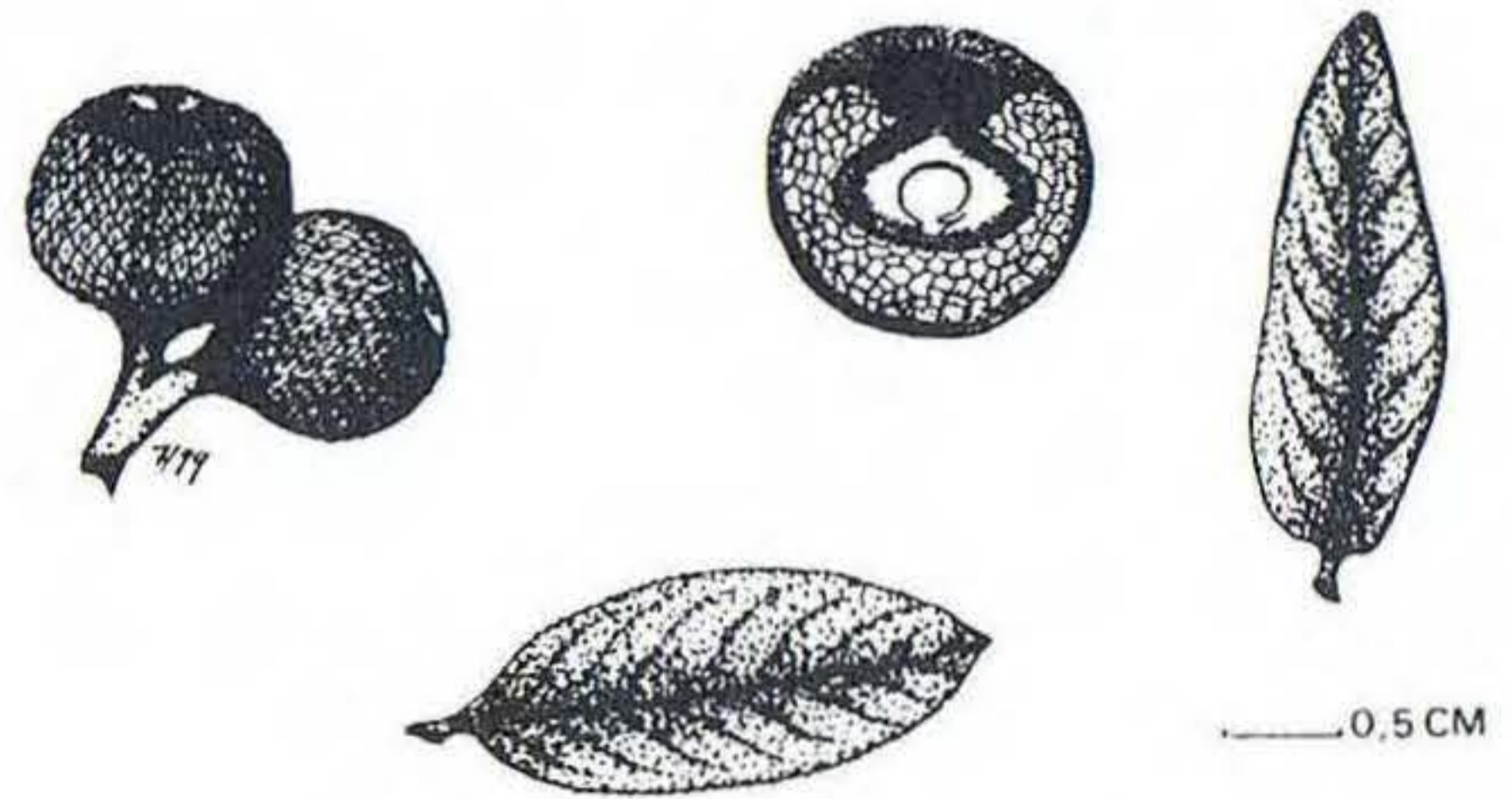
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which are slightly lanceolate and weakly mucronate (C. Vicioso, 1950). For this taxon the acorns are a very important taxonomic character. Their dimensions range between 38-50 x 19-22 mm, with an ovoid-cylindrical shape, a sweet taste and a weight which varies between 6-8 g when they are mature and dry.

Distribution in Extremadura - This form was described for the Portuguese Flora by Coutinho (1939) from material from the border with the south of Extremadura. Groups of examples have been found only in two places; one in the south of Badajoz and the other in the region of La Serena. We also believe that there is a continuous distribution between these two zones.

***Q. rotundifolia* Lam. f. *pilosella* F.M. Vázquez**, Semillas de Quercus: Biología, Ecología y Manejo, 84, (1998).

This form differs from the others mentioned in the pubescent pericarp. Small trees to 6 m tall; leaves small, entire or with spiny margins, stellate-pubescent on the abaxial and adaxial surfaces. Cupule 10-12 mm long, subspherical, rounded at the base, with a short peduncle up to 6 mm, 1-3 on each peduncle; bracts triangular, flat, tomentose. Acorns 20-37(-40) mm long, 8-12(-15) mm across, 1/3-1/2 covered by the cupule. Weight 1.2-4 g



Sterile form of Q. rotundifolia originally described as Q. ballota var. mascula Colmeiro & E. Boutelou, here regarded as a synonym of Q. rotundifolia f. rotundifolia.

when mature and dry.

Distribution in Extremadura - This is the typical taxon of the south and east forest of Badajoz province. It can be found in closed forest, with low levels of human disturbance or with an equilibrium between man and medium (forest). It grows in mountainous areas with indifferent soils, at moderate altitudes (500-700 m) and rainfall (400-800 mm/year).

Discussion

From the start of this project, we found no consistent differences among the various taxa in their leaves, scales, pedicels, bark morphology or canopy. Some of the taxa were described, based on these characters, and so the different variants and forms based on descriptions of foliar morphology have not been taken into account, even though we

found these possible taxa. It has been proved in the material sampled that leaf morphology varies according to the phenotypic variability of the genotype due to environmental variation such as the exposure to light, rainfall, kind of soil, substrate, etc.

We realize that the classification we propose is artificial and forced, because the genus *Quercus* in the Iberian Peninsula has a very wide ecological range. It is found from 1500 - 1300 m to sea level in all parts; consequently it is adapted to every microclimate. In addition, as stated by E.F. Galiano in *Flora Andalucia Occidental* (vol. 1, p. 160), "The genus *Quercus* shows a very large variability in many of its characters, particularly those of the leaves and fruits, because of the ease of introgressive hybridization between several of the species." Because of this, every one of the forms we have identified could be regarded as a cross between different species that occupy different localities. As a result of introgression between individuals, small differentiating characters in some examples would not be true genetic variants, but would have been produced by crossing processes brought about by the type of pollination (by wind) present in this family.

In this work we only make reference to *Q. rotundifolia* Lam. In Extremadura, seven more species in the genus *Quercus* are also found. These are *Q. pyrenaica* Willd. in Cáceres and some parts of Badajoz; *Q. faginea* Lam. in almost all the province; *Q. canariensis* Willd. in some mountainous parts of Badajoz and

Cáceres with higher rainfall (>800 mm/year); *Q. coccifera* L. in the warmer parts of Extremadura; *Q. suber* L. in some areas with acid substrates and an annual precipitation over 600-650 mm; and *Q. robur* L. and *Q. lusitanica* Lam. in the south of Badajoz and north of Cáceres in closed valleys of mountainous areas with higher annual rainfall (>900 mm/year).

Wind pollination between the different species gives a series of hybrids that need taxonomic study in order to differentiate them from the stable taxa, and to determine their origin. We have been able to detect in the areas of mixing between encinares (*Q. rotundifolia*) and alcornoques (*Q. suber*), individuals with a leaf color similar to that of the alcornoque, but with bark and floral characters very similar to those of the encina. There were also examples of cupule and acorn specimens very similar to those of the alcornoque, even though their taste is sweet, and with bark and leaf color very similar to the encina. Because of this, we believe it was not appropriate to study these individuals because we consider them *Q. suber* L. x *Q. rotundifolia* Lam., (*Q. x morisii* Borzi), commonly called "mestos".

We also found some trees of *Q. rotundifolia* that had aborted (sterile) female flowers and male flowers in large numbers, corresponding to *Q. ballota* f. *mascula* Colmeiro & E. Boutelou. We have not treated these as independent taxon because they have no progeny

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Quercus rotundifolia . . .

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and so do not have continuity. However, these individuals could pollinate other trees, which would then be able to produce viable acorns, which in turn could produce trees with the same characteristics. This would be the only way these characters could be preserved, and without it, the oaks with aborted female flowers would not be able to reproduce.

All of this demonstrates that there are enormous opportunities for research in the Extremadura Region, with considerable economic implications. We consider it fundamental to maintain the present research line and to also develop other parallel areas of study on other varieties, forms and existing hybrids.

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