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Keywords

Biscutella glacialis (BOISS. et REUTER) JORDAN, Taxonomy, Morphology, Distribution, Spain

Abstract

OLOWOKUDEJO J. D. (1986): The morphological variation and geographical distribution of *Biscutella glacialis* (BOISS. et REUTER) JORDAN in Spain. — Folia Geobot. Phytotax., Praha, 21: 397—403. — A study was made of the morphological variation in seven population samples of *B. glacialis*. Data on quantitative and qualitative characters reveal that one of the populations differs considerably from the rest. Observations on geographical distribution show that this species is not endemic to the peaks of Sierra Nevada but far more widely distributed than previously realized. Two varieties of *B. glacialis*, one of which is new, are described.

INTRODUCTION

B. glacialis (BOISS. et REUTER) JORDAN is an endemic Spanish species commonly associated with the Mulhacén and Veleta peaks of Sierra Nevada. It was first described as a variant of *B. laxa* (now a synonym of *B. sempervirens* L.) and its habitat given as "in summis montis Sa Nevada" (BOISSIER 1853). JORDAN (1864) recognised the distinct nature of this taxon and described it as a new species in his diagnoses. WILLKOMM (1880), adopting the earlier approach of BOISSIER et REUTER (l.c.), classified it as a variety of *B. laxa* while ROUY et FOUCAUD (1895) described it as a subspecies of *B. laevigata* L. This treatment was adopted by MALINOWSKI (1910) when he later monographed the genus. MACHATSCHKI-LAURICH (1926) lumped *B. glacialis* with *B. sempervirens* because she thought that both share the same geographical distribution and villous indumentum.

However in subsequent and more recent treatments of the genus, the specific status of *B. glacialis* was restored (GUINEA 1963, GUINEA et HEYWOOD 1964) and it was regarded as endemic to Sierra Nevada, La Sagra and Sierra Tejeda. In a revised opinion, GUINEA (1968) stated that *B. glacialis* is endemic to the Mulhacén and Veleta

peaks of the Sierra Nevada, he regarded the plants collected in La Sagra, Sierra Tejeda and Serranía de Ronda as belonging to *B. sempervirens* L. In a nomenclatural revision, MALAGARRIGA (1973) reduced *B. glacialis* to a subspecies of *B. intermedia* GOUAN. This brief historical sketch has been given to high-light the nature of taxonomic problems existing within this taxon.

In the course of my revisionary studies on the genus I examined all the available specimens of *B. glacialis* in eleven herbaria and made personal field observations on the plants in Spain where I sampled five populations and obtained three others from the Department of Botany, University of Granada. Specimens of *B. glacialis* have never been collected from four of these localities before. The field studies have provided relevant data regarding the intra- and inter-populational variation patterns and the actual geographical distribution of *B. glacialis*.

MATERIAL AND METHODS

Specimens of *B. glacialis* in the following herbaria were examined: BC, BCF, BM, GJO, HBG, K, MA, MAF, RNG, SEV, W. Seven population samples consiting of four of the samples collected by the author using mass collection technique (ANDERSON 1941, 1943) and three others collected by two staff members of the Department of Botany, University of Granada, using a similar technique, were studied. These population samples are listed below with the collector's numbers which could be found on all voucher specimens. The numbers are used in this paper for ease of reference:

Locality and altitude	Collector & number
(i) Granada: Sierra Nevada, near the Veleta, 3200 m.	OLOWOKUDEJO, 67
(ii) Granada: Sierra Nevada, near the road to the univesity Alpine Garden, 2800 m.	OLOWOKUDEJO, 68
(iii) Granada: La Sagra: Barranco rio Lanjaron, 2200 m.	OLOWOKUDEJO, 60
(iv) Granada: Sierra Nevada, near Mulhacen peak, 3400 m.	OLOWOKUDEJO, 200
(v) Granada: Sierra Harana, proximidales a la Atalaya, 2000 m.	SOCORRO, 205
(vi) Granada: Sierra Harana, Gueva del Agua, 2000 m.	SOCORRO, 208
(vii) Granada: Sierra Harana, Cortijo del Sotillo, 2000 m.	SOCORRO, 209

All morphological measurements were based on parts at similar developmental stages and in comparable positions on different plants of the populations. Assessments of rosette leaves were based on mature leaves in the middle of each rosette while mature and fully formed flowers and fruits were chosen for measurement. Voucher specimens of all the population samples are deposited in the following herbaria: BM, M, RNG, WU, BUH, ATH.

RESULTS

Figure 1 shows the general distribution patterns of *B. glacialis* including the seven population samples and their representative leaves. Table 1 summarises six morphological characters of the seven populations while Fig. 2 comprises a pictorialized scatter diagram portraying the morphological variations in the seven populations.

Morphological characters

Plant height: There is considerable variation in this character both within and between the seven populations. The population from the Veleta (no. 67) has the lowest mean value of 8.1 cm while plants from Cortijo del Sotillo (no. 209) have a mean value of 24.86 cm — the highest figure for all the seven samples. The popula-

tion from Gueva del Agua (no. 208) is the nearest to the former population with a mean value of 20.93 cm. The remaining populations have mean values which are below 15 cm (Table 1).

Table 1. Six quantitative characters of *B. glacialis* populations (mean ± standard error; range in parenthesis). The populations are arranged in geographical sequence from north to south using the collectors' numbers.

Population	Plant height (cm)	Petiole length (cm)	Basal leaf length (cm)	Basal leaf width (cm)	Fruit length (mm)	Fruit width (mm)
69	9.77 ± 1.03 (8.0–15.2)	1.23 ± 0.29 (0.2–2.0)	2.86 ± 0.43 (1.2–3.9)	0.26 ± 0.03 (0.2–0.4)	–	
208	20.93 ± 0.48 (18.4–22.6)	0.91 ± 0.1 (0.6–1.4)	2.64 ± 0.13 (2.1–3.1)	0.32 ± 0.02 (0.22–0.4)	3.54 ± 0.11 (3.2–4.0)	6.46 ± 0.16 (6.0–7.2)
205	14.56 ± 0.55 (11.7–18.5)	1.13 ± 0.16 (0.8–2.8)	2.82 ± 0.3 (2.1–6.0)	0.17 ± 0.02 (0.1–0.3)	2.58 ± 0.13 (2.4–3.0)	4.88 ± 0.11 (4.5–5.0)
209	24.86 ± 1.79 (21.5–30.4)	2.18 ± 0.33 (1.4–3.4)	5.38 ± 0.43 (4.6–6.9)	0.39 ± 0.04 (0.26–0.5)	4.3 ± 0.2 (4.0–5.0)	6.96 ± 0.24 (6.5–7.8)
67	8.1 ± 0.36 (6.4–9.3)	0.88 ± 0.14 (0.3–1.9)	1.88 ± 0.17 (1.1–2.7)	0.23 ± 0.02 (0.15–0.35)	–	–
68	9.71 ± 0.89 (5.7–14.7)	1.07 ± 0.14 (0.4–1.8)	2.65 ± 0.24 (1.6–4.3)	0.36 ± 0.03 (0.2–0.55)	–	–
200	14.09 ± 0.56 (9.9–17.5)	1.28 ± 0.12 (0.7–1.8)	2.89 ± 0.21 (1.9–4.0)	0.24 ± 0.01 (0.2–0.35)	2.53 ± 0.07 (2.0–3.0)	5.2 ± 0.1 (4.5–5.6)

Leaf characters: The leaf size varies slightly both within and between six of the populations. The plants from Cortijo del Sotillo (no. 209) differ considerably from the rest by its longer and wider leaves. The length of its leaves doubles those of other populations. The smallest leaves are found in the plants from the Veleta (no. 67). Population no. 209 also has the longest petioles with a mean value of 2.18 cm while in the remaining six populations the petiole length varies from 0.88 cm in no. 67 to 1.28 cm in no. 200. Cauline leaves occur in all the samples but they are most developed, both in size and number, in populations 208 and 209. The basal leaves may be linear, oblanceolate or spathulate and these different shapes may be found in a single rosette. The leaves may be entire, dentate or sinuate-dentate with 1–3(–4) small teeth spread evenly along each margin. The indumentum is densely villous except in population 209 from Cortijo del Sotillo where the hairs are very sparse. Figure 1 shows the intra- and interpopulational variation in leaf characters in the seven populations.

Floral and fruiting features: The sepals and petals are generally small and relatively uniform in all the samples examined. The sepals are about 2×1 mm while the petals measure 3.5–4×1.5–2 mm. The fruit length varies from 2.53 mm in population no. 200 to 4.3 mm in population no. 209, while the width ranges between 4.88 mm in population no. 205 and 6.96 mm in population no. 209. This shows that population 209 has the biggest fruits.

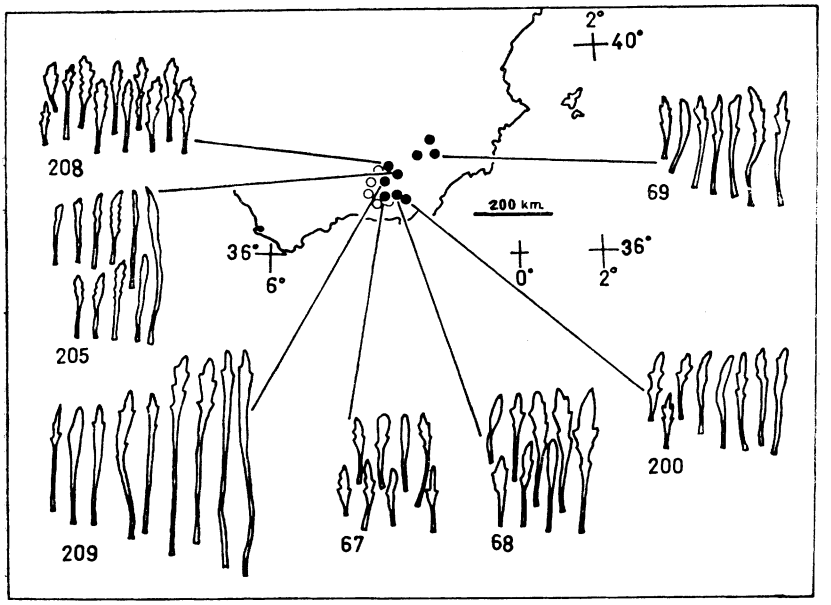

Fig. 1. Geographic distribution of *B. glacialis*. Representative leaves of the seven populations analysis are shown. The basal leaves were traced from comparable positions, each one from a different plant of the population. The populations sampled by the author are shown in black dots while the localities of herbarium specimens are in white circles.

Geographical distribution and ecology

Herbarium sources revealed that about 94 % of the available specimens of *B. glacialis* were collected from the Sierra Nevada. However, in the course of this study four new localities have been discovered and these include: Jaen: Sierra del Pozo, East of Cazorla, Olowokudejo 177 (RNG); Jaen: Sierra de Segura, Segura de la Caldera, Mesa 300 (RNG); Granada: La Sagra, Barranco rio Lanjaron, Olowokudejo 69 (BM, M, WU); Granada: Sierra Harana, Gueva del Agua, Socorro 208 (RNG); Granada: Sierra Harana, Cortijo del Sotillo, Socorro 209 (RNG, ATH). Herbarium specimens collected from other localities apart from the Sierra Nevada also include the following: Granada: Sagra Sierra, Willkomm s. n. (BM); Granada: Macizo de la Sagra, Ellaliano 963 (SEV); Sierra de Baza, Cerro de Santa Barbara, Cannon et al 776 (RNG); Cerro La Sagra, Cannon et al 865 (RNG); Sierra Cazorla, East of Ubeda, Fraser—Jenkins 125 (RNG).

The distribution pattern shows a conspicuous tendency towards the mountain peaks of South West Spain where the populations occur at altitudes usually above 2000 metres. Personal observations also revealed that the populations are small in size and consist of solitary scattered individuals which grow on exposed slopes and summit of limestone rocks and screes.

DISCUSSION

The results show that *B. glacialis* is not endemic to the Mulhacén and Veleta peaks of Sierra Nevada as GUINEA (1968) stated but more widespread in the high mountain ranges of South West Spain. The availability of large herbarium specimens from the Sierra Nevada can be attributed to the fact that this region is frequently visited by naturalists and general collectors because of its reputation for housing many endemic species. Specimens are therefore collected regularly from this region while the other unknown regions are often neglected and unexplored.

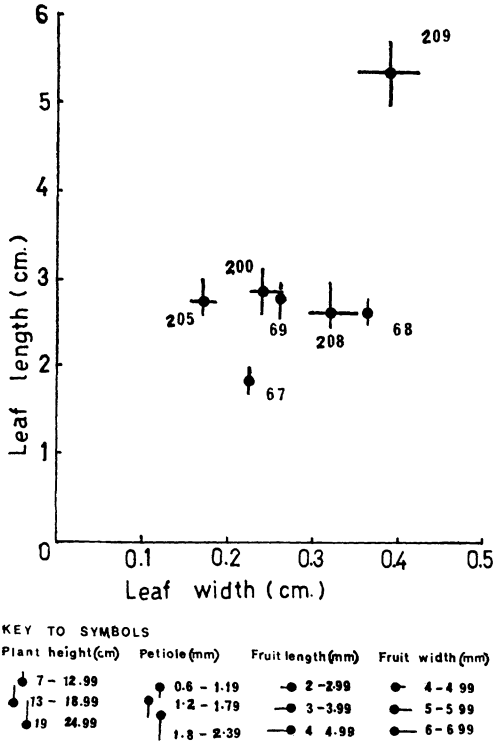

Fig. 2. Pictorialized scatter diagram portraying variation in six morphological characters in the seven populations.

The morphological analyses have revealed the patterns of variation within the species. Figure 2 shows that the length and width of the basal leaves are not correlated in any form and the morphological characters also show no correlation with the geographical locations. However the relative uniformity of six of the populations in a number of characters is revealed while the distinct nature of population no 209 is clearly shown. The study shows that *B. glacialis* consists of two entities which are recognised at the varietal level. The plants collected from Sierra Harana, Cortijo del Sotillo (no. 209) differ from the other populations and herbarium specimens studied in a number of morphological characters. Cytological studies have shown that this

population has the same chromosome number of 2n = 18 with the other plants of *B. glacialis* (Olowokudejo et Heywood 1984). The two varieties are described and a key is produced for recognising them.

Key to the varieties

1 Stems 5—22 cm; basal leaves 1—5×0.1—0.5 cm, densely villous; silicula 2—4×4—7 mm... (a) var. *glacialis*
1 Stems 20—32 cm, basal leaves 4—7×0.2—0.5 cm, sparsely villous, silicula 4—5×6.5—8 mm... (b) var. ***harana***

B. glacialis (Boiss. et Reuter) Jordan, Diagn. 1: 310, 1864.

(a) *B. glacialis* (Boiss. et Reuter) Jordan var. *glacialis*

Synonyms: *B. laxa* var. *glacialis* Boiss et Reuter, Diagn. Pl. Orient. 3: 43 (1853); Willk. et Lange, Prodr. Fl. Hisp. 3: 763, 1880.
B. laevigata L. subsp. *glacialis* (Boiss. et Reuter) Rouy et Fouc. Fl. Fr. 2: 108, 1895.
B. sempervirens Mach.-Laur (non L.) Bot. Arch. 13: 37, 1926.
B. intermedia subsp. *glacialis* (Boiss. et Reuter) Malag. Las subesp. y Variac. Geogr. 7, 1973.

Perennial herb. Rhizome long, thick and woody. Stem 5—22 cm simple or branched, slender. Basal leaves densely rosulate, 1—5×0.1—0.5 cm, usually narrowly linear or oblanceolate; densely villous, apex obtuse. Petiole 0.3—3 cm. Cauline leaves 1—3 minute, linear. Silicula 2—4×4—7 mm.

Distribution: Sierra Nevada, Sierre Tejeda, Sierra Harana, Sierra de Segura, La Sagra, Sierra del Pozo, Sierra Cazorla, Sierra de Baza. Chromosome number: 2n = 18 (Manton 1932; Olowokudejo et Heywood 1984).

(b) *B. glacialis* (Boiss. et Reuter) Jordan var. *harana* Olowo. var. nov.

Perennial herb. Rhizome long, thick and woody. Stem 20—32 cm, simple or branched, slender. Basal leaves densely rosulate, 4—7×0.2—0.5 cm, usually narrowly linear or oblanceolate, sparsely villous, apex obtuse, petiole 1.2—3.5 cm. Cauline leaves 1—4 minute, linear. Silicula 4—5×6—8 mm.

Distribution: Granada: Sierra Harana, Cortijo del Sotillo.
Chromosome number: 2n = 18 (Olowokudejo et Heywood 1984).

Herba perennis. Rhizoma longum, crassum, lignosum. Caulis 20—32 cm, simplex vel ramosus, gracilis. Folia basilaria in rosulam densam congesta, 4—7×0.2—0.5 cm, saepissime angustiora linearia vel oblanceolata, sparsim villosa, apice obtusa, petiolus 1.2—3.5 cm. Folia caulina 1—4 minima, linearia. Silicula 4—5×6—8 mm.
Holotypus: Spain, Granada: Sierra Harana, Cortijo del Sotillo, alt. 2000 m, June 1976, Socorro 209, RNG.

SUMMARY

The morphology and geographical distribution of *B. glacialis* (BOISS. et REUTER) JORDAN have been studied in detail. Literary and herbarium records suggest that this species is endemic to the Sierra Nevada region in Spain. However, personal observations have revealed that the species is more widespread and can be found in Sierra del Pozo, Sierra de Segura, La Segra and Sierra Harana among others. The results of morphological analyses lead to the description of two varieties one of which is new. A detailed list of other localities outside the Sierra Nevada is given.

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