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Nothoscordum Kunth (Amaryllidaceae, formerly Liliaceae or Alliaceae) in the NE Iberian Peninsula: a confusing denizen of parks and gardens

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ABSTRACT: Two morphologically distinct plants of the genus *Nothoscordum* are examined, following long-term observation of populations in Catalonia and neighbouring Spanish territories. Morphological characters are contrasted, and the relevant literature consulted. The author's conclusions support the recognition of two distinct species, postulated as *N.* × *borbonicum* and *N. nudicaule*.

Key words: alien, Catalonia, false garlic, hybrid, Iberian Peninsula, invasive, *Nothoscordum* gr. *gracile*, *nudicaule*, × *borbonicum*, weed.

RESUMEN: Se estudian dos plantas morfológicamente distintas del género *Nothoscordum*, siguiendo observaciones hechas durante dos décadas en Cataluña y tierras vecinas, España. Se contrastan los caracteres morfológicos consultando la literatura relevante. Las conclusiones del autor apoyan el reconocimiento de dos distintas especies, a saber, *N.* × *borbonicum* y *N. nudicaule*.

Palabras claves: ajo fragante, alóctona, Cataluña, híbrido, invasora, mala hierba, *Nothoscordum* gr. *gracile*, *nudicaule*, × *borbonicum*, Península ibérica.

INTRODUCTION

Nothoscordum differs from *Allium* principally in its basally united tepals and lack of obvious garlic smell in all its parts. It is a taxonomically complicated genus, both within the limits of the genus and beyond its generic limits when discussing close genera such as *Ipheion*, *Tristagma* and *Allium*, see Guaglianone (1972). It also contains species with mechanisms of asexual reproduction (in this case, bulbils) considered to be amongst the world's significantly invasive plants. Seen from a different viewpoint, these plants are very successful pioneer species, with a tremendous capacity to defend themselves against all odds and establish themselves, principally, in new man-altered environments.

Since 2001, the year of my taking up work in Barcelona, two distinct entities belonging to the genus *Nothoscordum* have come to my attention. Both have been collected on several occasions, and have been signalled as belonging to the section *Inodorum* Guaglianone (Guaglianone, 1972), or subgenus *Euryscordum* (Ravenna 1991), having been considered in a broad sense as belonging to *N. gracile* (Dryand. ex Aiton) Stearn [*N. fragrans* (Vent.) Kunth; *N. inodorum* auct. non (Sol. ex Ait.) G. Nicholson] as, for example, in *Flora iberica* (Aedo, 2013). But lumping both plants within this taxon in this age of refined European botany is not entirely satisfactory, when native European species of higher plants have, in most cases, been treated with more discernment. My conclusion is that these two morphologically distinct alien garlic plants need to be looked at in more detail, the aim of this article being to communicate the main morphological differences, and thus to apply an adequate scientific name to both of them. Field observations are mainly from within Catalonia.

ARGUMENT

Nothoscordum is a critical genus. Morphological characters, including those of the flower structure, are rather variable, and the seed testa appears to have little diagnostic relevance. On studying the pertinent literature, I have come to the conclusion that one of these false garlics, a plant very frequent in planted areas and on road verges and waste ground, corresponds to the troublesome weed *N.* × *borbonicum* Kunth, and that this identity should be accepted as convenient for purposes of recognition in the horticultural trade worldwide, expelling doubts that only further serve to cloud the issue. This plant is clearly a hybrid, and considered to be the putative hybrid *N. gracile* × *N. entrerianum* Ravenna, according to Ravenna (1991) himself. Its

remarkable ability to disperse itself both by seed and via bulbils has earned it a bad reputation with gardeners. It very effectively colonizes man-altered habitats, and is extremely difficult to irradicate. The following comments apply to this plant, and a fuller description can be found in Ravenna (op. cit.) and in Guaglianone (op. cit.) ut *N. inodorum.*

- Bulbils produced profusely (average 65 per bulb, counted on 10 individuals).
- Leaves broad, to 10 (15) mm wide, flat or faintly keeled. Ligules absent.
- Spathes (bracts) generally >10 mm long; broad, acute but not strongly acuminate.
- Umbels composed of unequal pedicels, even at fruiting stage.
- Tepals 10-12 mm, entirely white or with a green, brown, or brownish-lilac median stripe.
- Flowers ± weakly scented; open during the day and remaining open into the night.
- Filaments erect, ± linear and parallel, but abruptly contracted towards their apex, forming a cylindrical column around the gynoecium.
- Mature seed testa slightly rugose to almost smooth, but somewhat variable.

Supporting the claim that this is a hybrid plant is its strong growth and aggressive, pioneering behaviour. On one plant examined, the mother bulb had produced over 170 bulbils. The individuals are strong-growing, with tall scapes and long, wide leaves (on some plants, 60 cm long).

As for distinguishing the hybrid from one of its putative parents, *N. gracile* (here including *N. macrostemon* Kunth), the diurnal opening of the flowers contrasts with Guaglianone's comment regarding *N. gracile* (ut *N. inodorum* var. *inodorum*): "*Las flores se abren al caer el sol, cerrándose hacia la noche*", and with Ravenna's remark: "*Flowers opening in the evening, well expanded at night and lasting until next morning*". The hybrid opens its flowers during the morning, and on sunny days they are wide open before midday. They remain open till late evening, closing at night. Our most-prolific weed clearly belongs not to the pure *N. gracile*, but rather, to *N.* × *borbonicum*.

The other plant is similar, but differs in the following mostly morphological characters:

- Bulbils present but of modest production (average 9 per bulb, counted on 10 individuals).
- Leaves narrower, from 1,5-6 (9) mm wide, and more obviously keeled. Ligules absent.
- Spathes generally ≤ 10 mm long; narrower, often more acuminate than in the hybrid.
- Umbels with unequal pedicels before anthesis, but these almost equal at fruiting stage
- Tepals shorter (±9 mm) with a dark pink to purple median stripe.
- Flowers strongly scented; open from midday to early evening.
- Filaments ± erect but narrowly triangular (as opposed to ± linear) and gradually tapering towards their apex, forming a reduced cylinder only in the lower half or third.
- Mature seed testa variable, in some cases quite strongly rugose

This second plant may have also been classified within *N. gracile* (or its synonyms) by collectors and revisors in our national herbariums. Its true identity is not a simple matter. Our European botanists, if indeed they have encountered it, have preferred to include it within the one widely recognised species naturalized in Europe, variously known as *N. fragrans*, *N. gracile* or *N. inodorum* (this last name to be rejected, as it turns out to be referable to *Allium neapolitanum* Cir., see Stearn 1986). The presumption here is that revisors have seen material of this particular plant. This solution is not unreasonable but, when faced with the presence of two plants that remain obviously distinct despite varying habitat factors, and maintain this distinction under cultivation, it becomes necessary to learn more about them, and see if they have at some stage been resolved taxonomically.

Not wishing to re-examine the genus exhaustively (this task should be carried out by New World botanists) I do, however, consider it my duty to communicate these observations and suggest a possible identity for this plant. It seems to be fairly frequent in Catalonia, though less common than the other plant, and since it also produces bulbils, can be weedy, but to a much lesser degree than *N.* × *borbonicum*. These bulbils facilitate the dispersion of *Nothoscordum*, especially by mechanical means (the moving of soil and plants from one location to another), of which man is clearly the principal vector. Guaglianone, when publishing her synopsis on the species of *Ipheion* and *Nothoscordum* present in Argentina's Entre Ríos province and the surrounding regions, emphasised the weedy nature of both *N. gracile* (ut *N. inodorum*) and *N. nudicaule* (Lehm.) Guagl. in her introduction to the genus. Her description of *N. nudicaule* lacks details regarding leaf size and structure, but in other ways matches our (second) plant closely. The description in Cabrera (1968) ut *N. euosmum* (Link & Otto) Kunth (now considered synonymous with *N. nudicaule*) gives leaves of some 300 mm length and 2 – 6 mm width, this

corresponding to the measurements taken of the plant in question, though the leaves can be considerably shorter. The flowers are open during daylight hours, according to Guaglianone; this is also the case with our plant.

Having ruled out species belonging to Guaglianone's Sect. *Nothoscordum* (or Subgen. *Nothoscordum* Ravenna), in particular, *N. bivalve* (L.) Britton -a species also potentially problematic in gardens and nurseries- I consider that our plant best adjusts to *N. nudicaule*, although possible hybridization might still need to be examined.

While on the subject of Sect. *Nothoscordum*, it is worth mentioning that *N. bivalve*, along with other allied species in its section, possesses a ligule at the base of the leaf lamina. This is a useful detail when checking collected plants, since the stated species is known as an alien in Japan, and could make its appearance here in the forseeable future. The spreading stamens of the plants in this section (those of Sect. *Inodorum*, or *Euryscordum*, being more upright and close to each other) are also an important distinguishing feature, especially on freshly-gathered material.

The distribution of the plant I interpret as *N. nudicaule* in the Iberian Peninsula and Baleares is not yet clear. Aedo (loc. cit.) considers *N. gracile* (in its wide sense adopted in *Fl. iberica*) to be present throughout the Peninsula and on the Balearic islands of Mallorca and Menorca. I have observed *N* × *borbonicum* widely in Aragón, Catalonia and Valencia, but the plant I interpret as *N. nudicaule*, distinct at a glance for the discerning field observer, I have seen so far only in Catalonia, within the province of Barcelona and mainly near the coast. Herbarium material, all records seen by the author as being post-1981 (see Appendix), also confirms its presence in Hostalric, Girona, and it is more than likely to occur further down the coast towards Valencia. It appears, therefore, that this plant has been introduced fairly recently, whereas *N.* × *borbonicum*, according to O. Bolòs & Vigo (2001), has been present in the 'Països Catalans' much longer, having first been observed (in the city of Barcelona) in 1908, as can be seen in the Appendix.

DISCUSSION AND CONCLUSIONS

The identity of the first false garlic, with an extremely proliferous vegetative propagation, seems clear. The epithet *N.* × *borbonicum* should be applied to this plant, which is clearly a hybrid (Souza & *al*., 2012). Since it produces seed and multiplies itself successfully by this means too, it becomes a very successful colonizer, and a very difficult weed to erradicate from cultivated land.

The second one multiplies both vegetatively and sexually, but to a considerably lesser extend than the former. It corresponds, or lies close, to *N. nudicaule* (Lehm.) Guagl. Whether our plant is identical to *N. nudicaule*, or an established hybrid involving this species, is not yet clear.

Cabrera & Zardini (1978) include these species in a couplet within their key (the former ut *N. inodorum*) and distinguish them on the basis of the filaments. These do indeed seem to constitute the most reliable distinguishing feature, but are more easily discerned when the plant is in a fresh state, as seen in Fig. 1. The shrivelled filaments on herbarium material are more difficult to judge (best seen after reconstituting them in water). Other characters observed which serve to separate the two plants are the contrasting number of bulbils, leaf width and length, and the more equal pedicels of the second plant. Ovary shape and anther length, these rather variable according to Guaglianone, are not so useful in distinguishing between these two species. As already stated, the seeds are similar in both cases, those of the hybrid plant generally displaying a slightly smoother testa than those of the other plant. The pollen, despite the occurrence of hybrids, is normal and viable (oblong and perfectly formed), a detail supported both by Souza and his team and my own observations. To sum up, the filament shape, tepal size and colour, as well as the number of bulbils, are the most differential characters when considering the elaboration of a key for the two species.

Guaglianone indicated an identical chromosome number for both *N. nudicaule* and her *N. inodorum* (*N. gracile*), this being tetraploid: 2n=19, reported by Núñez & *al*. (1972) but see Souza (op. cit.) for a discussion on this matter. The hybrid plant is clearly a tetraploid, but diploids have been found to occur in *N. nudicaule* (and also in the night-flowering *N. macrostemon*) and such plants are morphologically well-defined, evidently constituting a good species. Our plants are probably tetraploid, which is consistent with their adaptability to new environments.

N. nudicaule was published originally as *Allium nudicaule*, by Christian Lehmann in *Semina in Horto Botanico Hamburgensi* (*Sem. Hort. Bot. Hamburg.*) 3: 17, in the year 1826. It occurs naturally in Southern Brazil, Uruguay, Northern Argentina and Bolivia, and probably also in Paraguay, and has probably travelled from this area via plant production in nurseries, and established itself in other regions. Its habitat as a native plant is stated (in Souza & *al.*) to be riverbanks (diploid races), and humid soils in man-altered environments (es-

pecially tetraploid races).

My proposal, therefore, is to recognise two entities in the NE Iberian Peninsula: *N.* × *borbonicum* Kunth (Fig. 3) and *N. nudicaule* (Lehm.) Guagl. (Fig. 2; Fig. 4), the former having been indicated sensu lato in Aedo's (2013) treatment of the genus, while the latter can be considered as included but not distinguished from *N. gracile*.

The hybrid symbol (×) I understand to be optional here according to H.3.3 note 1 in the appendix of the ICBN (Melbourne) code, 2012. I include it in conformity with my conviction that the plant in question is a tetraploid hybrid, distinct from native populations of *N. gracile*. While it is evident that more study would be welcome here, this contribution aims at fomenting debate, and drawing awareness to the presence of two entities, probably constituting two good species, which this author considers sufficiently distinct to formally recognize. Hopefully these notes will help bring to light more records both in the Iberian Peninsula and in other parts of Europe and the Mediterranean Region.

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Appendix

Material studied (selected sheets; most observation done in the field with fresh material).

Nothoscordum × *borbonicum* Kunth: BARCELONA: 31T DF28, Barcelona, Bonanova, ex herbari J. Darder. 26-IV-1934 (BCN73428); 31T DG60, Caldes d'Estrac ('Caldetes') , ex herbari J. Darder. 3-VI-1934 (BCN73433); 31T DG60, Sant Pol de Mar, vora l'estació. T. Casasayas. 3-V-1983 (BCN46047); 31T DG70, Calella, vora el passeig del mar. T. Casasayas. 19-V-1981 (BCN46048); 31T DF2979, Barcelona: Montjuïc, Jardí Botànic de Barcelona, 120 m. S. Pyke. 23-V-2016 (BC958310); 31T DF3282, Barcelona: en el parque parterres del Monumento a Prim (Ciutadela) naturalizada en los jardines. P. Font i Quer. 1-X-1915 (BC62523); idem. M. Llenas. VIII-1908 (BC62272); 31T DG41, Sant Pere de Vilamajor (Montseny), Garriga de Gallardo. sin fecha (BC125411); 31T DG0037, Monistrol de Montserrat, carr. a Montserrat, 175 m, J. Nuet Badia 26-VI-1984 (BC658231); CASTELLÓ: 31T BE88, Vinaròs. F. Royo. 1-XI-1999 (BCN 27057); GIRONA: 31T DG64, La Cellera de Ter, carrer d'Amargura. sin recolector. 26-V-1920 (BC62365); 31T [EG02], Sant Feliu de Guixols (aprop de), torrent. P. Font i Quer. 18-IV-1945 (BC949489); TARRAGONA: 31T CF76, Comarruga. T. Casasayas. 28-V-1981 (BCN46046); ZARAGOZA: 30T XM8016, Zaragoza: Santa Isabel, 200 m, S. Pyke. 10-V-1995 (JACA669795).

Nothoscordum nudicaule (Lehm.) Guagl.: BARCELONA: 31T CF96, Vilanova i la Geltrú, a la platja força abundant i localitzat. T. Casasayas. 5-V-1981 (BCN46049); Barcelona, Desert de Sarrià. T. Casasayas. 8-X-1981 (BCN46045); 31T CF9965, Sitges: nucli urbà, escorcells, 15-20 m. S. Pyke. 16-V-2004 (BC866863); 31T DF2879, Barcelona: Montjuïc, Anella Olímpica, entre roques, 50 m. S. Pyke. 23-V-2016 (BC958311); idem., al costat d'aigua exudant, S. Pyke. 26-V-2017 (BC990560); GIRONA: 31T DG62, Hostalric, vora de carretera. T. Casasayas. 10-V-1983 (BCN46044).

Fig. 1. Tepals and stamens. Left: *N.* × *borbonicum*; Right: *N. nudicaule* (the flowers have been cut and displayed without the gynoecium).

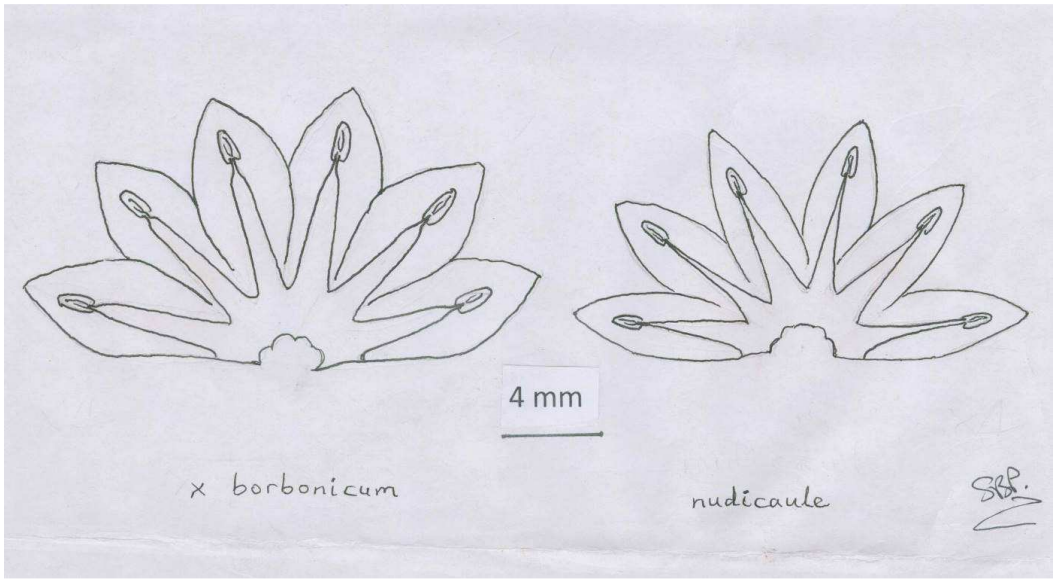

Fig. 2. *Nothoscordum nudicaule*. Umbels in flower (and post-anthesis) in Jardí Botànic de Barcelona, early June 2017.

Fig. 3. *Nothoscordum* × *borbonicum*. Sant Feliu de Guíxols (Girona).

Fig. 4. *Nothoscordum nudicaule*. Montjuïc, Barcelona (Barcelona).