

THE TAXONOMIC STATUS OF AVENA MAGNA - REAPPRAISAL

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Resumen. El descubrimiento de *Avena magna*, una avena silvestre tetraploide ($2n=28$), ha sido un hito en el entendimiento de la evolución de la poliploidía en las avenas. Baum, en su monografía del género *Avena*, consideró a este taxón sinónimo de *A. maroccana*, basándose en un viejo ejemplar de herbario de origen dudoso y cuyo paradero actual se desconoce. Hay tres pruebas que sugieren que *A. magna* y *A. maroccana* no deberían considerarse como sinónimos, y que son de hecho especies diferentes con entidades biológicas independientes: 1, la morfología de *A. maroccana* tal como puede deducirse de la fotografía del tipo, es más próxima a *A. sterilis* que a *A. magna*; 2, la ecología y tipo de suelo de la localidad típica de *A. maroccana* son completamente diferentes de los que se presentan en las localidades conocidas de *A. magna*; 3, el número cromosómico tetraploide que es un caracter importante de *A. magna*, no se puede conocer en el ejemplar tipo de *A. maroccana*. En vista de estos hechos, *A. magna* continua siendo el nombre válido de esta importante avena tetraploide.

Summary. The discovery of the wild tetraploid ($2n=28$) oat, *Avena magna*, has been a land mark in understanding polyploid evolution in oats. Baum, in his monograph of the genus *Avena* treated this taxon as a synonym of *A. maroccana*, based on an old herbarium specimen of doubtful origin which at the moment can no longer be traced. Three lines of evidence suggest that *A. magna* and *A. maroccana* should not be regarded as synonymous, and are in fact different species and independent biological entities: 1. The morphology of *A. maroccana*, as can be inferred from the photograph of the type specimen, is closer to *A. sterilis* than to *A. magna*; 2. The ecology and soil type in the *A. maroccana* type locality are completely different from those occurring in the known localities of *A. magna*; 3. Tetraploid chromosome number which is an important characteristic of *A. magna*, could not be recorded in the *A. maroccana* type specimen. In this view, *Avena magna* remains the valid name of this important tetraploid oat.

Avena magna Murphy et Terrell is a tetraploid ($2n=28$) wild oat species. It was discovered among *A. sterilis* material collected in Morocco (MURPHY & al., 1968) following hybridization experiments with the cultivated hexaploid ($2n=42$) *A. sativa*. All the hybrids were sterile and cytological examination revealed them to be pentaploids ($2n=35$) and the wild parent to contain 28

chromosomes. Further cytological studies (MURPHY & al., 1968; LADIZINSKY, 1969), indicated that *A. magna* is the closest tetraploid relative of the hexaploid oats, wild and cultivated.

In his monograph of the genus *Avena*, BAUM (1977) treated *A. magna* as a heterotypic synonym of *A. maroccana* Gdgr. (GANDOGGER, 1908), on the grounds that the holotype of the latter contains the morphological features of *A. magna*. By doing so, Baum believed to bring to an end the controversy (see *Science* 163: 594-595, 1969, and RAJHATHY, 1969) about the correct name of the tetraploid oat described by MURPHY & al., 1968).

Various lines of evidence accumulated in the last few years and other considerations, which are discussed below, cast serious doubts about the identity between the biological form *A. magna* and the holotype of *A. maroccana*.

Avena maroccana was described by GANDOGGER in 1908. This French botanist apparently visited the littoral Morocco twice. In 1903 he visited Ceuta. At that time, as he noted (GANDOGGER, 1907), it was a period of unrest in the region and strangers were not allowed to go outside the town. Nevertheless, being escorted by Spanish soldiers, he managed to collect some plants in the vicinity of Ceuta. Among the collected plants, he listed three *Avena* species: *A. fatua*, *A. sterilis* and *A. longiglumis*. The latter occurs along the coasts of the Mediterranean, but exclusively on sandy and sandy loam soils. In 1908, he made another trip; this time he visited the Chafarinas Islands near Melilla from where he mentioned *A. maroccana* and provided a description of this new taxon. However, strangely enough, he referred to Ceuta as the type locality, with description «sterilibus herbosis maritimis circa Ceuta» (GANDOGGER, 1908).

A recent ecogeographic survey of *A. magna* in Morocco indicated that this taxon grows SE of Casablanca, SE of Rabat and N of Meknes, and exclusively on crumbling heavy black-brown soil (LEGGETT & al., 1992). In the Ceuta area only sandy loam soils were encountered, and despite an extensive search no *A. magna*-like tetraploid plants were found. The sandy loam soils observed in the Ceuta area are in accordance with the edaphic requirements of the *A. longiglumis* collected there by Gandoger, suggesting that other oat species collected by him also grew on sandy soils. Accordingly, one may assume that *A. maroccana* is in fact the *A. sterilis* collected by Gandoger during his 1903 visit to Ceuta, as also indicated by the date, 25 April 1903, on the type specimen. In spring 1993 I reexamined the ecology of the hills around Ceuta. They are made of metamorphic rocks with shallow soil coverage and the only *Avena* species which occasionally grow there is *A. barbata*. In deeper soil pockets and in cultivated plots the soil is light brown, extremely compact with hard surface, where only a few *A. sterilis* plants may be found.

BAUM (1977) mentioned that the holotype of *A. maroccana* is deposited in the herbarium of Lyon. I was told by the keeper of the herbarium that this type

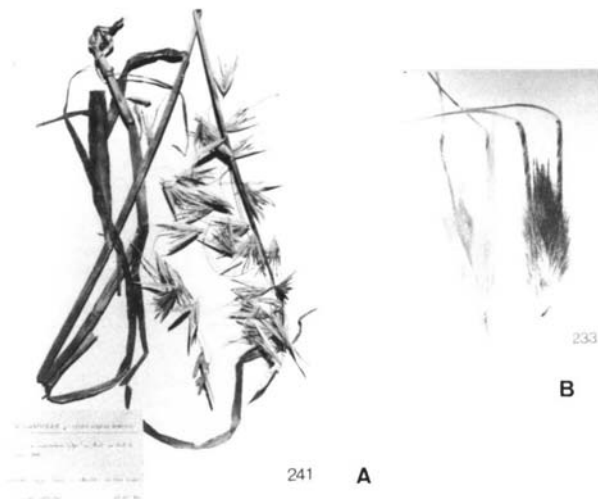


Fig. 1. A, the holotype of *A. maroccana*, note the open V shaped spikelets. B, typical spikelet of *A. magna* (Reproduced from Baum, 1977).

has disappeared since it was inspected by Baum, but on the other side, Baum (pers. commun.) has not taken it on loan. So, unfortunately, all my attempts to examine it have been unfruitful. However, a photograph of the holotype shown in Baum's monograph (p. 270) provides some hints about the morphology of that taxon (Fig. 1, A). Obviously, the spikelets in that photograph are typically V shaped with the lemma tips of the two lower foresets being widely apart from one another, as in *A. sterilis*, while in typical *A. magna* these lemma tips are close to each other (Fig. 1, B).

The tetraploid chromosome number ($2n=28$) is one of the most important characteristics differentiating *A. magna* from the *A. sterilis* taxon of the hexaploid oats. This attribute made the discovery of *A. magna* so exciting and sheds a new light on the evolution of the hexaploid oats. The chromosome number of *A. maroccana* was not mentioned by Gandoger and Baum could not examine it because the seeds, even if the holotype contained some, were too old to germinate and for chromosome counts. Thus, the lack of a chromosome

number, together with the habitat in which *A. maroccana* was collected, and its morphological features make the holotype of this taxon quite remote from typical *A. magna*. It is apparently an *A. sterilis* specimen as Gandoger had mentioned in his 1907's paper, and it is perhaps another example of Gandoger as «one of the greatest splitters» (STAFLEU & COVAN, 1976). All this indicates that *A. magna* Murphy et Terrell remains the valid name of this important tetraploid oat.

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