

REDISCOVERY OF *OPHRYS OMEGAIFERA* SUBSP. *HAYEKII* (H. FLEISCHM. & SOÓ) AND *DACTYLORHIZA MARKUSII* (TINEO) H. BAUMANN & KÜNKELE KREUTZ IN THE REGION OF TIZI OUZOU (GREAT KABYLIA, ALGERIA)

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Abstract: Botanical surveys were carried out in spring 2022 in the wilaya of Tizi Ouzou, allowing the rediscovery of *Ophrys omegaifera* subsp. *hayekii* and *Dacylorhiza markusii*. Ecological ratings are also provided. This rediscovery will enrich the Algerian orchid flora in general and that of the Tizi Ouzou region in particular.

Keywords: Orchidaceae, *Ophrys omegaifera* subsp. *hayekii*, *Dacylorhiza markusii*, Conservation, Great Kabylia, Algeria

1. Introduction

The *Ophrys omegaifera* subsp. *hayekii* or otherwise named: The admirable ophrys of Mr. Von Hayek, described for the first time by Geniez and Melki (1991) [1] in Sicily (Mediterranean island of Italy), a species sometimes attached to the much talked about taxon of Tunisia *Ophrys hayekii* H. Fleischm. & Soó, can be considered as Siculo-Tunisian probably extinct from its only habitat in Tunisia more than 100 years ago, or else strictly endemic to Sicily [2].

In Algeria, this *Ophrys* was discovered for the first time in small Kabylia (Chemini, Bejaia) by Rebbas & Vela (2008) [2], then other research was carried out for the discovery and rediscovery of other new stations in Algeria during recent years (Rebbas & vela 2013; Kreutz *et al.* 2013-2014; Boukehili *et al.* 2018; Babali *et al.*, 2018; Hamel *et al.*, 2017-2018; Rebbas & Bounar, 2014; Madoui *et al.*, 2017; Martin *et al.*, 2020; Rebbas *et al.*, 2021; Haddad *et al.*, 2021) [3,4,5,6,7,8,9,10,11,12,13,14].

In Tunisia, this beautiful ophrys in its home station is Jebel Bou Kornine [15], It has often been compared to *Ophrys atlantica* Munby, and even admitted as a subspecies: *O. atlantica* subsp. *hayekii* (H. Fleischm. & Soó) Soó. This taxon was discovered in 2008 south of Nefza (north-west Tunisia) [16,17]; thus two other

stations discovered by the second author of this article (KR) in 2018 in the Msila region [13].

It appears that this species until now had not been reported in the wilaya of Tizi Ouzou due to the lack of exploration and botanical inventory for this region, with the exception of the publication by Kreutz *et al.* (2013) [4], indicating the presence of this orchid in the Bouira region (at the southern limit of Djurdjura).

Dacylorhiza markusii is rare in Algeria which has a disjunct distribution area across the western Mediterranean: North Africa (Algeria), and southern Italy (Sicily). It is an orchid of open mountain forests, scrub and mountain pastures [18, 19].

According to Vela & Benhouhou (2007) [20], Djurdjuren Kabylia takes on the status of a biodiversity hotspot, in relation to its belonging to the Mediterranean basin considered as one of the richest and most complex regions both in terms of geological and biological as well as cultural [21,22,23]. These so-called hotspots are characterized by their specific richness and their rate of endemism, in which a large number of plants find their refuges, including the Orchids [24, 25, 26].

An orchidological inventory of Great Kabylia is necessary, so in this article we mark a point on the rediscovery of *Ophrys omegaifera* subsp. *hayekii* and *Dacylorhiza markusii* in the wilaya of Tizi Ouzou.

2. Description of the study site

Tizi Ouzou nicknamed "the capital of Djurdjura_" and "Col des Genêts" In the North, the limit of the sea, with three hundred kilometers of coast, In the East, the Soummam valley marks the delimitation of the "Great Kabylia" with the "Little Kabylia", In the South, the Djurdjura draws the border nature of Great Kabylia. Its average altitude is one thousand five hundred meters with peaks like Lalla Khadija (2308 m.) and the Hand of the Jew. To the west, the limit can be determined by the course of the Isser wadi and its tributary, the Djemaa wadi.

The relief of Great Kabylia is made up of three parts, maritime Kabylia to the north, Djurdjura to the south and, between the two, the Agawa massif [27].

In the national park of Djurdjura, Tikjda is classified as perhumid with a rainfall quotient

value ($Q_2=166$) and that of Tala Guilef ($Q_2=141$) is classified as humid. The stations located on the southern side of Djurdjura, from sea level to 1100 m altitude, with 600-900 mm per year of rain, are classified as a subhumid bioclimate. The records of xericity are recorded by the stations of the valley of the Sahel wadi ($Q_2 < 50$) which are classified in semi-arid and arid bioclimate [28].

The region of Tabouda located in the plains (commune of Illoula oumalou), which is located at a maximum altitude of 601 meters above the Mediterranean Sea, southeast of the wilaya of Tizi Ouzou where the station of *Ophrys omegaifera* subsp. *hayekii* is located.

The first station of *Dacylorhiza markusii* is located at the Col de Chellata, at the eastern limit of the Djurdjura National Park, the second station was observed at the Col de Tirourda and the last station is located south of the Akouker (Fig. 1).



Fig. 1. Geographical location of the observation area of *Ophrys omegaifera* subsp. *hayekii* and *Dacylorhiza markusii* in the wilaya of Tizi Ouzou (Wikimedia, 2022 modified)

3. Methodology

During our botanical outings in the field within the framework of the realization of a doctoral thesis which relates to the inventory of the orchids of the wilaya of Tizi ousou, cartography and means of conservation; the field was approached in a random way by the authors of the article, thus the identification of the orchids was carried out from the classic morphological botanical characters [18, 19], then checked and updated based on the work of: De Belair *et al.* (2005); Rebbas & Vela (2008 - 2013); Dobignard & Chatelain (2010); El Mokni *et al.* (2012); Kreutz *et al.* (2013-2014); Martin *et al.* (2015); Hamel *et al.* (2017); Boukehili *et al.* (2018); Rebbas & Vela (2018); Martin *et al.* (2020); Rebas *et al.* (2021) [29,2,3,30,31,4,5,17,8,6,32,12,13].

The lack of information on the areas of distribution of orchids in the wilaya of Tizi Ouzou let us opt for a random sampling method that directly targets the places of development of Orchids, as had already been done by De Bélair *et al.* (2005) [29] for the whole of Numidia and Rebbas *et al.* (2021) [13] for the wilaya of Béjaia. To this end, land surveys were carried out throughout the year 2021/2022.

At the level of the prospected station, ecological parameters were studied, namely the abundance of the admirable ophrys (number of individuals listed), the altitude (alt), the exposure (ex). A GPS location of the station was made in order to produce a map.

4. Results and discussion

Ophrys omegaifera subsp. *hayekii* (H. Fleischm. & Soó) Kreutz

Perennial herb (Geophyte with tuber) green and glabrous, morphologically close to *Ophrys dyris* or *algarvensis* but is distinguished by a labellum much less convex (almost flat) and narrower [2], plant 15-30 cm, with flowers in a loose spike of 1- 4 flowers rarely 5, Lateral lobes of the labellum longer and narrower, oblong,

rounded at the apex, entire, directed forwards and separated from the median lobe by a deep sinus; median lobe narrowed at base, broadly obcordate, margin not crenate. Lip bearing a prominent fold on the median line 15 to 19 mm long, bordered by a narrow yellowish glabrous margin, has a very discreet groove at the base [18].

The petals are relatively long, reaching 3/4 of the sepals, and wavy. The underside of the labellum is nuanced with reddish-brown and dark green becoming lighter towards the base [2].

Ophrys omegaifera subsp. *hayekii* was observed by one of us (Z. BSS) during a botanical survey of the Tabouda region (Iloula Oumalou commune, Tizi Ouzou) on 04.19.2022. The orchid is characterized by broadly oval lanceolate lateral sepals; large petals; hairless, subspatulate; the center of the petals is yellowish green, a little darker than the sepals, with wavy olive-coloured edges, for the labellum it is horizontal; quite convex, slightly swollen in the basal part of the labellum [33].

The flowers at the bottom of the open flower bud only and other individuals observed in buds (Fig. 2, 3) was the famous and rare Sicilian orchid “ *Ophrys mirabilis* ” at the start of its flowering!

A second outing was carried out by one of us (Z.BSS) for the station on 22.04.2022 to collect a specimen of *Ophrys omegaifera* subsp. *hayekii* and put it in herbarium.

The last outing (confirmation outing) with the second author (KR), on 07.04.2022 was maintained, allowed us to observe the individuals in full bloom, as well as to inventory other beautiful orchids from the same station and to other station nearby, to take beautiful photographic captures for the rediscovery station.

The population of *Ophrys omegaifera* subsp. *hayekii* is considered globally stable, although abundance and rarity differ from country to country. It is considered abundant in Italy [34] and very rare and localized in Tunisia [17], where only a few individuals are known in the only recorded site. In Algeria, it is estimated that 10 to 20 individuals occur per station [2, 35].



Fig. 2. Top left: *Ophrys omegaifera* subsp. *hayekii* photographed at the start of flowering on 04/19/2022. Top right: measurement of the labellum of *Ophrys* (Photos Z. Ben si said). Bottom left: individual of *Ophrys omegaifera* subsp. *hayekii* photographed on 07.05.2022, bottom right: general view of the rediscovery station (Photos K. Rebbas)



Fig. 3. A specimen of *O. Omegaifera* subsp. *hayekii* for the herbarium, Tabouda (Illoula Oumalou), 22.04.2022, photo Z. Ben Si Said

***Dactylorhiza markusii* (Tineo) H.Baumann & Künkele**

This orchid is quite rare in Kabylia, in the pastures, scrub and mountain forests. Recently the two authors (KR and ZBSS) rediscovered a station of this orchid at the Chellata pass, upstream of the road leading to Illilten on 05/11/2022 (Fig. 4).

On 05/18/2022, more than 100 individuals were observed after the source of the Djurdjura hotel towards Assouel (Kef Edib) (36°28'09.01"N, 4°10'27.02"E, 1868 m).

On 25/05/2022, 10 individuals were rediscovered in front of a cedar forest at the Col de Tirourda, commune of Iferhounene (36°28'25"N, 4°20'45"E, 1734 m). *Dactylorhiza markusii* was first described in Sicily in 1846 and named in

honor of Doctor Markus. It is a rare orchid that has a disjunct distribution area across the western Mediterranean: North Africa (Algeria), and southern Italy (Sicily). It grows on neutral to acid substrates in full sun or partial shade and shows a preference for open mountain forest.

Dactylorhiza romana sl (incl. *Dactylorhiza markusii*) was recently assessed for the IUCN Red List of Threatened Species. *Dactylorhiza romana* is categorized as Least Concern [36].

All orchids are included in Appendix B of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

It is therefore important to propose to classify *Dactylorhiza markusii* in the list of non-cultivated and protected plants appearing in the Algerian executive decree [37].



Fig. 4. *Dactylorhiza markusii* and the habitat of the species, southern Akouker - Kef Edib, 18.05.2022, photos K. Rebbas

Conclusions

This inventory made it possible to rediscover Orchid stations which have not been previously reported in the Tizi Ouzou region.

This region is very original in terms of biodiversity. Several stations in the wilaya have not been prospected, hence the need to travel through these areas, explore the different ecosystems that characterize the region of Great

Kabylia (Forests, high altitude lawns, Maquis, edges of springs, fields of olive grove).

The following actions are recommended to protect these two orchids: habitat protection from agricultural use and land improvement; fence vulnerable sites to protect habitat from trampling; control and management of orchid production from tubers; raise awareness ; protection of living individuals by legislation prohibiting picking or digging up the species; ex situ conservation: artificial propagation, reintroduction, seed collections; monitoring and surveillance of existing populations and sites; estimate the size of the population and study its dynamics [36].

Also the continuation of this work will aim at the botanical exploration of other regions bordering on the wilaya of Tizi Ouzou, thus a generalization of this type of work on the orchids of the other sectors of Algeria will be necessary for the taxonomic clarification and nomenclature of this family and to establish geographical distribution maps of these orchids in Algeria.

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