



FIVE ESTABLISHED ORCHIDS *OPHRYS APIFERA* VAR. *CHLORANTHA*, *AURITA*, *PURPUREA*, *PURPUREA. F. ALBA*. AND *FLAVESCENS* (ORCHIDACEAE) IN LEBANON AS PART OF THE NATIVE FLORA.

ADDAM K.*¹, TAKKOUSH J.¹, BOU-HAMDAN M.² AND ITANI J.³

¹Faculty of Business Administration, Research department, Arts, Sciences and Technology University in Lebanon, AUL

²Clinker Production Unit at Ciment De Sibline (LCF: Lebanese Cement Factory).

³Faculty of Sciences and Fine Arts, Arts, Sciences and Technology University in Lebanon, AUL

*Corresponding Author: Email- draddam@hotmail.com

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Abstract- Addam K. & Bou-Hamdan M. 2015: Four new varieties of *Ophrys apifera* Huds. (Orchidaceae) and one Form were established in Lebanon (near the east of the Mediterranean Sea) but have not been described as part of the native flora before. The authors note the recent discovery of:

Ophrys apifera var. *aurita* (Moggr.) Greml. *Ophrys apifera* Huds. var. *chlorantha* (Hegetschw.) Nyman, *Ophrys apifera* var. *purpurea* (Tausch) Nyman. Synonym= *Ophrys apifera* Huds. var. *tilaventina* Nonis & Liverani, *Ophrys apifera* var. *purpurea* (Tausch) Nyman. f. *alba*. K. Addam & M. Bou-Hamdan and *Ophrys apifera* Huds. And *Ophrys apifera* var. *flavescens* Rosbach

Discovered varieties were under probation and observation for 7 years. They were diagnosed, described and put under strict observation to be saved or transmitted if they become in danger. These new varieties resemble the *Ophrys apifera* Huds. In morphology. In the World Checklist of Selected Plant Families: Kew Royal Botanic Gardens (till 2012) they consider all of them as synonyms to *Ophrys apifera* Huds, but indeed in most cases they differ a lot from it. All these differences are explained in details and with illustrations.

Keywords- Orchidaceae, *Ophrys apifera* var. *aurita* (Moggr.) Greml. *Ophrys apifera* var. *chlorantha* (Hegetschw.) Nyman. *Ophrys apifera* var. *purpurea* (Tausch) Nyman. Synonym = *Ophrys apifera* Huds. var. *tilaventina* Nonis & Liverani and *Ophrys apifera* var. *purpurea* (Tausch) Nyman. f. *alba*. K. Addam & M. Bou-Hamdan., *Ophrys apifera* var. *flavescens* Rosbach, Biodiversity, flora, Lebanon, Mediterranean

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Introduction

Among all the angiosperm plants, the family of the Orchidaceae is considered to be the largest. It includes more than 22,000 accepted species in 880 genera.

Two principal large groups divide the Orchids:

1. Epiphytic and epilithic orchids that can attach their aerial roots to stones and trees.
2. Terrestrial orchids (second big group of orchids) have underground roots or rhizomes that supply the plant with water and nutrients. Many species form root (tubers); their shape is where the families' name is derived from (gr. ορχις = testicle).

Most Mediterranean and European distributed orchids are terrestrial. They come from the subfamilies *Epidendroideae* (e.g. *Epipactis*, *Listera*, *Neottia*) and *Orchidoideae* (e.g. *Orchis* l., *Dactylorhiza*, *Platanthera*, *Ophrys*.) [1].

The number of orchid species in Europe varies and have a big contrast between authorities and scholars, for example, Flora Europaea (1980) and Pedersen & Faurholdt (2007) listed about 20 species in Europe as a whole [2,3].

In 1986, 63 (including 30 sub-species) were recognized by Baumann & Künkele [4].

In 1991, Edwin John Butler raised the number of species in Europe to 53 for a slightly larger geographical area [5]. In 1994, the number was growing more and more till it reached 150 [4].

Pierre Delforge, in 1995, set his own classification of orchids in Europe and the

species became a total of 130. [6] Six years later (2001), he raised the number to 215 species. This was the last classification set and accepted by him [4].

The great conflict and main problem of Orchids classification is still a worldwide debate among the scientists and botanists who have dissimilar points of view in this field and without finding a solution for it till now [7].

The genus *Ophrys* was first described by Hudson from England (1762) [8]. Bauhin gave the name 'Ophrys' to this genus and was modified after translation to 'Ophrys'. *Ophrys* means in the ancient Greek language eyebrow. The classification of the genus *ophrys* in the classical botany is as follow: Family *Orchidaceae*+ Subfamily *Orchidoideae*+ Group-tribe *Orchidoideae*+ Subgroup-Subtribe *Orchidinae*+ Genus *Ophrys* various species [9].

Ophrys is a pervasive orchid with a distribution from central to south Europe, North Africa, Asia Minor, up to the Caucasus Mountains, from the Canary Islands to the Caspian Sea, and from southern Scandinavia to the northern Maghreb but predominately in the Mediterranean region. It is considered as the most important and richest genus among the species of European and Mediterranean terrestrial orchids (ground orchids). This is so regarding its introgression, hybridization, high genetic compatibility and selection by pollinating insects [4,8,10,11].

Within the genus *Ophrys*, about 2000 names were proposed for species, subspecies and "nothospecies" (i.e. species of hybrid origin) [12].

Other authors have specified that it is young and still changing; as a consequence, its species are not completely fixed [4].

By disparity, in 2008, around 10 distinguishable groups were suggested by a molecular phylogenetic study [13].

The taxonomic correlations in this genus are still not completely clear, although many studies have been done in the domain of its morphology [14].

The interesting singularity in its morphology and noticeable pseudo-copulatory reproductive strategy makes this genus (*Ophrys*) famous among all other orchids. It is considered as notorious due to its controversial taxonomy and problematic species delimitation [15].

The genus *Ophrys* contains about 150 taxa extensively spread in the Euro-Mediterranean area and the flower resembles a fat bumble-bee [14,16].

The species *apifera* is only one in the rich genus *Ophrys*. [17] Its name means the orchid whose flower bears: (*api*) = bee, (*fera*) = bears [9].

Ophrys apifera is an interesting species due to its normal form, which is quite typical and very constant. It has many varieties and might have the highest extensive distribution compared to any other *Ophrys* species. But many amazing forms are found, varying greatly from the typical *O. apifera* having only one thing in common; the autogamous process [18].

Some scholars pretend that the extreme changes in the lip morphology of *Ophrys apifera*'s varieties are related to a single genetic mutation. The subsequent persistence of such variants might be related to the affection of these species to self-pollination, a phenomenon that might subscribe to the generally consistent morphology found in the genus [17].

For these reasons there are many difficulties especially in the area of classification and specifically for those who work in this field. Moreover, there is no internationally or widely-accepted system for classification and nomenclature of species for this genus. This problem is not only in this genus but also found in other genera of orchid species [9].

Which classification we are going to use? This was a very difficult decision. Finally, and after a lot of readings and comparisons among the classifications of these varieties, we (Addam K. & Bou-Hamdan M.) made our decision to follow the classification approach of P. Delforge, which in many cases has been modified with the goal of practical simplification and identification of species that produce hardly tangible differences.

These plants are gorgeous in that they successfully reproduce via pseudo-copulation, that is, their flowers resemble female insects to such a degree that amorous males insects are fooled into mating with the flowers, thereby pollinating them [6,9].

Biology and Deviating Forms

The bee orchid is almost, if not completely, an autogam [19-20] (NB: Odd hybrids with other *Ophrys* species appear due to insect visitors removing excess pollen from already-fertilized flowers) [21-22]. Many forms and varieties can be found that do not resemble at all the typical *O. apifera* Huds and continue to bear on since there is no means apart from genetic drift by which mutated genes can be eliminated [28]. The prolonged repetition of self-pollination is the major cause of these deviating forms at different taxonomic levels as they usually reveal patrimonial features like sepal-like petals which increase the description of *O. apifera* Huds [8].

Taxonomic Rank for the Deviating Forms

"In more recent times, there were continuous discussions if these taxa should be considered to be forms, varieties, subspecies or even species. The International Plant Names Index (IPNI) updated in 2012) gives the rank subspecies only for the epithet *trollii* (*Ophrys apifera* Huds. subsp. *Trollii* (Hegetschw) O. Bolös), whereas all other known variants are attributed to the ranks of forma (*f.*) (*Ophrys apifera* Huds. *f. bicolor* (O.Nägeli) P.D.Sell) or variety (*var.*) (*Ophrys apifera* Huds. *var. saraepontana* (Ruppert) H. Baumgartnerbis & Kreutz). Hassler & Rheinheimer [30], in their updated online data-base, (Illustrated World Compendium of Orchids - List of Taxa) treat all variants and forms as varieties (*var.*)" [8].

Lebanon (to the east of Mediterranean Sea) hosts more than 3150 species of plants documented by various botanists. The native flora of Lebanon contains 90 species and subspecies of *Orchidaceae* in Lebanon. Thirty four of them were identified to belong to *Ophrysgenus*. However, new species, subspecies and forms of *Orchidaceae* family are continually being discovered of which five are described here. These new specimens have been recognized, studied and

documented by the authors for the first time in Lebanon [23-30].

The wild orchids constitute a significant part of the botanic wealth of Lebanese flora.

Even though Lebanon have a small area (10,452 km²) compared to other big countries in the Mediterranean (France, Italy, Greece, Palestine, Syria, Turkey and others...) it is still like a very important reserve for many native, endemic and very rare species of orchids. This is due to its geological up-bringing, affirmative climate, and topographical diversity that bestow greatly the richness of species. Lebanon contains around the third of the 250 European species which are very close to the number of orchids that grow in Greece [9, 29, 23-26].

Some botanists who worked on the Lebanese flor found only the *Ophrys apifera* in their field work and didn't report any varieties or forms of this species in their books and publications [23-30].

In the year 2015, Dr. Khodr Addam & Mounir Bou-Hamdan published a new world record of this species; *Ophrys apifera* var. *Libanotica*, K. Addam & M. Bou-Hamdan [28]. This event was staggering because many obstacles stand against the efforts of scientists and researchers working in the field of flora in Lebanon.

The major problem is the presence of these species in places that cannot be accessed easily & safely due to political & armed disputes in these regions [25]. Moreover, the urbanization, missed role of the government in protecting these endemic species, and the land mines that are left without any serious solutions, makes the search & follow-up sometimes out of question. All these factors have a direct influence on the number of species discovered by us [9, 28], for example, when we published our first world record in October 01, 2013 *Ophrys gharifensis*, the number of flowers discovered was 61 found in five places in Lebanon. After two years, the number has increased to more than 200 flowers in more than 10 places in Lebanon [25]. The number of flowers of our second world record *Neotinea tridentate* var. *libanotica* K. Addam & M. Bou-Hamdan, published in May 01, 2014, was 10 in 3 different places. Five more flowers were found in a fourth place and the total number became 15 [26]. The third world record *Ophrys apifera* var. *libanotica*. K. Addam & M. Bou-Hamdan was published in March 09, 2015 and the total number of flowers found in 3 years rose to 29. After one month from this publication, 10 new flowers were found raising the final number to 39. We think that the number of all these orchids found can be doubled after two or three years if the before-mentioned obstacles are solved [28].

Morphologic description of *Ophrys apifera* Huds.

The plant is 10-50 cm long. It has a pale green stem with two scale leaves at the base while the basal leaves are up to six, veined, keeled, strap-shaped but become narrower, and are colored pale green with two bract-like non-sheathing leaves towards the flower spike. This spike is loose, with two to twelve flowers. A pale green lanceolate bract is pointed at the tip and is longer than the ovary which is green and slightly curved. The sepals of the flower are oval, concaved and often hooded with a pale rose to a deep pink with green veins. Rarely, the sepals are white. The lateral sepals are horizontal and swept backwards; the upper sepal is held upright but very frequently bends backwards. Petals are short and strap-shaped with rolled back margins which make them appear narrow; their color varies between greenish, pink to pinkish-brown with fine white hairs. The lip is tongue-shaped strongly molded downwards (from the sides and front) and two small conical side lobes at the base that are hairy on the outer side. The tip of the lip has two lobes with a pointed nib in the shallow notch between them; appendage is large long lanceolate or trapiziform and pointed forwards. At the base of the lip, there is an elongated, semi-circular, hairless, dull orange area that is bordered by narrow maroon-brown and pale [Fig-1] [28].

New established varieties

Ophrys apifera var. *aurita* (Moggridge) Gremli.

History

This variety was discovered by John Traherne Moggridge, a British botanist, entomologist, and arachnologist in 1887 [31].

Morphologic description

It resembles the regular flower but have long and narrow revolute petals,

reaching almost half the length of the sepals [Fig-2] [9].



Fig-1 *Ophrys apifera* Huds. (Photo by: Addam K.)



Fig-2 *Ophrys apifera* Huds. var. *aurita* (Moggridge) Gremli. Flower viewed from different sides (Photos by: Addam K.)

Distribution

South of Lebanon, KfarJarra (N 33 32' 402" EO 35 25' 347"), alt 305.97 m, located in the Kaza of Jezzine, it is one of the eight mohafazats (governorates) of Lebanon, 50 km away from Beirut, the capital of Lebanon, 7.7 km from Saida and 22 km from Jezzine [Map-1] [28].

Habitat characteristics

Dry or well drained calcareous basic-rich soil, limestone areas, poor meadows, open rocky places and open woodlands. It can easily adapt to new habitat such as the new road sides, motorways, industrial waste ground and garbage places (found there) where weathering has led to a basic substrate [28].

Phenology: From March to May.

Holotype

The samples were dried; a voucher specimen of the holotype (1004GU) was deposited in Herbarium of Global University - Beirut. Collected by Dr. Khodr Addam on 7-4-2012, collection number (GU 1004).

Specimens examined, Notes and Discussion

Four flowers of *Ophrys apifera* Huds. var. *aurita* (Moggridge) Gremli. were found By Dr. Khodr Addam for the first time in Lebanon-Gharifeh on 7-4-2012. In the same region after one year on 31-3-2013, another five flowers were found, so we decided to pay more attention in our field search for this variety. It was very difficult because this variety looks the same as *Ophrys apifera* with its petals longer only. Finally, on 12-4-2014 and May 2015 many specimens of this variety were found because we tested the petals of every *Ophrys apifera* we found (a very exhausting work).

***Ophrys apifera* Huds. var. *chlorantha* (Hegetschw.) Nyman.**

History

This variety was discovered for the first time by Johannes Jacob Hegetschweiler, a Swiss physician and botanist in 1882 [32].

Morphologic description

Ophrys apifera var. *chlorantha* is an interesting common variant of *Ophrys apifera* and is considered by some authors throughout the range of the type species. Its appearance is particular. Although general shape and configuration is normal, its coloration is very different. The flowers lack the red-brown pigments. This is due to the hypochromatic condition that minifies pigmentation. The level of pigment reduction determines the appearance of the plant and it can vary from a partial loss of color (semi hypochromatic) to a complete color loss that renders the specimen simply yellow and white. In general, the flower has usually typical white sepals and a greenish-yellow lip marked with white. Unsurprisingly, this variation is commonly called the White Bee Orchid [Fig-3] [33].



Fig-3 *Ophrys apifera* Huds var. *chlorantha* (Hegetschw.) Nyman Flower viewed from different sides (Photos by: Addam K. & Bou-Hamdan M.)

Holotype

After the samples were dried; a voucher specimen of the holotype (Addam 4) was deposited in the Post Herbarium at AUB (American University of Beirut) Collected by Dr. Khodr Addam at 14/IV/2015 collection number (Addam 4)

Distribution

Mount Lebanon, Gharifeh (Kaza of Chouf) (N 33 38'493" EO 35 31'584") alt 713 m (N 33 38' 49" - EO 35 30' 95") alt 680 m (N 33 37' 40" EO 35 31' 00") alt 675.5 m (N 33 38' 50" EO 35 31' 59") alt 683.6 m, 56 km away from the capital of Lebanon, Beirut. The village of Gharifeh is located in the kaza of Chouf one of the 6 kazas of the mohafazah of Mount-Lebanon [Map-1] [25].

Habitat

Fresh dry calcareous basic-rich soils, poor meadows, open rocky place and woodlands, under pine trees and direct sunlight [28].

Phenology

From April to May.

Specimens examined, Notes and Discussion

Eight flowers of *Ophrys apifera* Huds. var. *chlorantha* (Hegetschw.) Nyman. were discovered for the first time by Mounir Bou-Hamdanat on 24-4-2009 in Gharife. It was a surprise for us to find a yellow *apifera* in Lebanon so we decided to focus seriously on it. One year later (2010), we couldn't find it and so on was the case for five years (up to 2014). The flowers were under continuous search during these years but were not found & they disappeared completely (sometimes we found leaves of orchids in the place they were found in for the first time but we were not sure that they were *O. apifera* var. *chlorantha*). On the sixth year (2015) & after a very heavy rain and snow in autumn and winter, another six flowers appeared on 14-4-2015. It was a big surprise for us. We were also happier to find more of them in a nearby place. We think it is very important to study the causes of this shocking re-appearance of this *Ophrys* by botanists and scientists.

***Ophrys apifera* var. *purpurea* (Tausch) Nyman. Synonym = *Ophrys apifera* Hudson var. *tilaventina* U. Nonis & P. Liverani and *Ophrys apifera* var. *purpurea* (Tausch) Nyman. f. *alba*. K. Addam & M. Bou-Hamdan.**

History

Ophrys apifera var. *purpurea* (Tausch) Nyman was first discovered by Ignaz Friedrich Tausch (Bohemian botanist) in 1882 [34].

In April 1997, Paolo Liverani and Umberto Nonis reported the presence of a strange new specimens of *Ophrysapifera* found at southern foothills of the Alps in Italy, where it is mainly at home in the valleys of Tagliamento and Piave rivers, in the eastern province of Udine lake near river Tagliamento. It was called *Tilaventina* derived from the Latin name of the river, (the name '*Tilaventina*' is an old Roman name *Tilaventum* of the river Tagliamento). But this variety of *Ophrys apifera* (*Ophrysapifera* var. *tilaventina*) should be called by the old name '*purpurea*' (*Ophrys apifera* var. *purpurea* (Tausch) Nyman. because it was already known in the 18th century by Ignaz Friedrich Tausch (1793-1848) and had been described by him in 1831 as *Ophrys purpurea* [34-36].

Morphologic description

The plant is slim, slender, 15-45 cm high, basal leaves are oblanceolate while the upper ones are lanceolate, spike is loose, 4-6 flowers, sepals are elongated cyclamen to dark pink, tinged with poor hairy pink petals, lip is yellow-pink, elongated oval free drawing, colored to the sepals, with two yellowish specks in place of the lobes, bracts are linear and lanceolate [Fig-4] [37-39].

Distribution

Mount-Lebanon. Three flowering plants were found in Gharifeh (Kaza of Chouf in mohafaza of Mount-Lebanon). Gharifeh (Kaza of Chouf) (N 33 37'347" EO 35 33' 162"), 761 m alt, 56 km away from Beirut [Map-1] [25].

Habitat

Fresh dry to wet calcareous basic-rich soils, acidic or limestone soils, poor meadows, open rocky place, open woodlands and under olive trees [28,40].



Fig-4 *Ophrys apifera* var. *purpurea* (Tausch) Nyman. Flower viewed from different sides (Photos by: Addam K.)

Phenology

From April to May.

Holotype

After the samples were dried; a voucher specimen of the holotype (Addam 3) was deposited in the Post Herbarium at AUB (American University of Beirut) Collected by Dr. Khodr Addam on 28-4-2013, collection number (Addam 3).

Specimens examined, Notes and Discussion

Twelve flowers were found by chance for the first time by Khodr Addam on 28-4-2013 in an olive tree garden in Gharifeh. First we thought that it was an anomaly but the big number of flowers found made us exclude the possibility of anomaly. It was very difficult for us to find information about this variety, indeed even the information found was scarce and most of it was in Italian language. The second year on 19-4-2014, 8 flowers were found in the same place, but this year (2015) none was found.

Although the soil where it was found was very dry, the lip of the flower was very big compared to the lip described of this variety in Europe.

***Ophrys apifera* var. *purpurea* (Tausch) Nyman. f. *alba*. K. Addam & M. Bou-Hamdan (2012)**

History

This form was found and observed by Mounir Bou-Hamdan and Dr. Khodr Addam.

Morphologic description

This variety resembles *Ophrys apifera* var. *purpurea* (Tausch) Nyman, with the exception of the sepals always white, and the lip yellow with greenish yellow,

white hues, and total absence of design [Fig-5].

Distribution

Mount-Lebanon. Three flowering plants were found in Gharifeh (Kaza of Chouf in mohafaza of Mount-Lebanon). Gharifeh (Kaza of Chouf) (N 33 37' 208" EO 35 33'31"), alt 820 m, 56 km away from Beirut [Map-1] [25].

Habitat

Fresh dry to wet calcareous basic-rich soils or limestone places, poor meadows, open rocky place, open woodlands and under pine trees [28].



Fig-5 *Ophrys apifera* var. *purpurea* (Tausch) Nyman f. *alba*. K. Addam & M. Bou-Hamdan.

Flower viewed from different sides (Photos by: Bou-Hamdan M.)

Phenology

From April to May.

Holotype

The samples were dried; a voucher specimen of the holotype (1003 GU) was deposited in Herbarium of Global University - Beirut. Collected by Dr. Khodr Addam on 5-4-2012, collection number (GU 1003).

Specimens examined, Notes and Discussion

Three flowers were found for the first time by Mouir Bou-Hamdan on 5-4-2012 at a roadside inside a pine forest in Gharifeh. Since that time; they have never been seen again despite our continuous field observation. It was said to be endemic to Europe (Italy and Switzerland) but exceptionally then we found it in Lebanon.

***Ophrys apifera* var. *flavescens*. Rosbach**

History

O. apifera v *flavescens* was first found and described by Rosbachin 1880. This variety was described in 1996 as *Ophrys apifera* f. *flavescens* (Rosbach) P.D.Sell (synonym) by P.D.Sell, G.Murrell [41,42].

Morphologic Description

This variety resembles the regular flower *Ophrys apifera* Huds. Its appearance is very distinctive but the general shape and configuration is normal, the main difference is in the lip's colour. The pigmentation is reduced as a clear result of the hypochromatic condition affecting the markings' color of the lip. These

markings might vary from a little fade of the markings' color to an indistinct yellowish brown colouration. This is different from the strong marked bleaching effect which is clear in *O. apifera* v *chlorantha*. The flowers are large; stem might carry up to six flowers sometimes. The color of the sepals varies from white with green lines and hues to very light rose with green lines. Petals are small with yellow green to orange yellow color [43-49] [Fig-6].



Fig-6 *Ophrys apifera* var. *flavescens*. Rosbach.

Flower viewed from different sides (Photos by: Addam K.)

Distribution

South of Lebanon, Kfar Jarra (N 33 32' 402" EO 35 25' 347"), alt 305.97 m, and (N 33 32' 419" EO 35 25' 364"), alt 310 m, located in the Kaza of Jezzine. Jezzine is one of the eight Mohafazats (governorates) of Lebanon, 50 km away from Beirut, the capital of Lebanon, 7.7 km of Saida (south) and 22 km from Jezzine (south) [Map-1] [28].

Habitat

Dry or well-drained calcareous basic-rich soil, limestone areas, poor meadows, open rocky places and open woodlands. It can easily adapt to new habitat such as the new roadsides, motorways, industrial waste ground and garbage places (found there) where weathering has led to a basic substrate [28,51].

Phenology

End of March to May.

Holotype

After the samples were dried; a voucher specimen of the holotype (1005 GU) was deposited in Herbarium of Global University - Beirut. Collected by Dr. Khodr Addam at 31-3-2013, collection number (GU 1005).

Specimens examined, Notes and Discussion

Three flowers of *Ophrys apifera* Huds. var. *aurita* (Moggridge) Gremlil were found by Dr. Khodr Addam for the first time in Lebanon-Gharifeh on 31-3-2013. We did not recognize it as a variety first and we thought it was an original *Ophrys apifera* Huds with pale light rose sepals. The feature we missed then was the light color of the lip. The year after on 30-3-2014, two new varieties were found in the same place but again we thought they were hypochromic. In April 2015, more flowers from the same variety were found and this time they had a very clear light color of the lip.

Conservation Status and Threat

Ophrys apifera Huds was found in many places from the North to the South of Lebanon. We observed it for almost 13 years. Due to the low number of flowers found (about 200 including the varieties); they need to be protected.

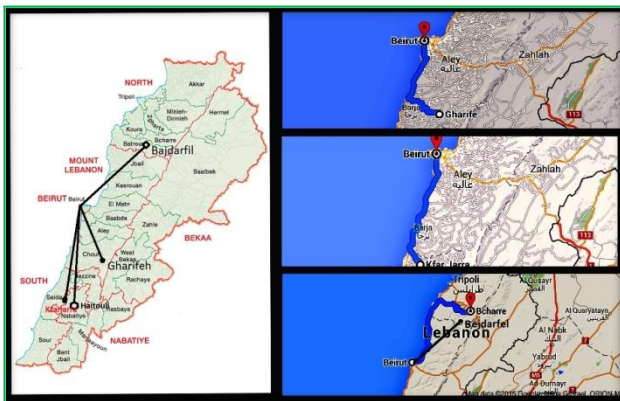
The Lebanese orchids face a serious threat. Although they have a wide distribution and great adaptability, they are experiencing number reduction and sometimes-total fading of their habitats. The population, urbanization, industrialization, communications development, and ecotourism activities have rapidly increased the negative impact on the landscape and its long-term destruction. Another fact is the use of massive amounts of fertilizers in the agricultural mechanization to increase productivity, which have reduced diversity and the number of orchids. One of the most dangerous causes that could lead to the extinction Lebanese or even the Mediterranean orchids is the culinary use of the orchid's tubers (Salep).

In Lebanon, there is insufficient protection of our orchids and especially the endemic and rare one. Moreover there is no Red List yet of all the flowers that need to be protected. All the varieties mentioned in this article are very rare and protected orchids all over the world; so they need to be urgently protected also in Lebanon [28].

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Conflicts of Interest: None declared.



Map 1- Distribution of all *Ophrys apifera*'s varieties in Lebanon

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