

Several hybrids from Papuk – rare or new taxa in the national flora

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Abstract

Four hybrid taxa, previously rarely, or now for the first time recorded in Croatia, observed during the spring of 2020 and 2022 on Mt. Papuk, are presented. A hybrid of *Primula vulgaris* Huds. and *P. veris* L. called *P. × polyantha* Mill. is known as an ornamental plant, which comes in a whole palette of colors, but the occurrence of spontaneous hybrids that occur in nature in Croatia has been discussed in print only once, by Degen in 1937. *Ophrys × hybrida* Pokorny ex Rchb. f. is a cross between *O. sphegodes* Mill. and *O. insectifera* L., and it has never previously been recorded in Croatia. *Orchis × beyrichii* (Rchb. f.) A. Kern. and *O. × angusticuris* Franch are rarely recorded hybrids in which *O. simia* Lam. participates, the first by crossing with the species *O. militaris* L., and the second with *O. purpurea* Huds.

Keywords: flora, hybrids, Orchidaceae, *Primula*, Primulaceae, *Ophrys*, *Orchis*

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Sažetak

Predstavljani su nalazi četiri hibridne svojte koje su ranije rijetko, ili sada po prvi puta bilježene u Hrvatskoj, a opažene su tijekom proljeća 2020. i 2021. na Papuku. Križanac vrsta *Primula vulgaris* Huds. i *P. veris* L. naziva *P. × polyantha* Mill. poznat je kao uresnica koja dolazi u cijeloj paleti boja no spontane hibride koji nastaju u prirodi, u Hrvatskoj je objavio samo Degen 1937. godine. *Ophrys × hybrida* Pokorny ex Rchb. f. križanac je između vrsta *O. sphegodes* Mill. i *O. insectifera* L. te do sada nije bilježen u Hrvatskoj. *Orchis × beyrichii* (Rchb. f.) A. Kern i *O. × angusticuris* Franch rijetko su bilježeni hibridi u kojima sudjeluje *O. simia* Lam., prvi križanjem s vrstom *O. militaris* L., a drugi s *O. purpurea* Huds.

Ključne riječi: flora, hibridi, Orchidaceae, *Primula*, Primulaceae, *Ophrys*, *Orchis*

Introduction

Mt. Papuk is one of a few mountains in the predominantly flat, Pannonian part of Croatia. Most of it is protected as nature park, Natura2000 site and UNESCO Geopark with a rich flora that is relatively well researched and comprises more than 1200 plant species (Samardžić 2005, Pandža 2010, Tomašević 2016). Although it has been explored for a couple of centuries, new taxa are discovered constantly. The genus *Primula* is represented in the Croatian flora by 12 taxa, while only two can be found on Mt. Papuk. The family Orchidaceae has 173 recorded taxa in Croatia, of which 22 are infrageneric and two intergeneric hybrids (Nikolić 2005-onwards), while on Papuk 50 taxa have been recorded (Doboš & Jušić 2022). The genus *Orchis* in Croatia comprises 31 taxa, including seven named hybrids, while 63 taxa of the genus *Ophrys*, including nine named hybrids, have been recorded (Nikolić 2005-onwards). On Papuk, four species of the genus *Ophrys* and one hybrid are recorded,

and from the genus *Orchis*, 13 taxa that include two hybrids are known (Doboš & Jušić 2022).

Four hybrid taxa that are rare or completely new for Croatian flora recorded on Mt. Papuk during 2020 and 2022 are described here. In all of the described taxa, both parent species were present on the same site and had flowering periods that overlapped, even if only slightly.

Materials and Methods

The described plants were spotted and recorded during trips to Mt. Papuk in 2019, 2020 and 2022. They were photographically documented, geo-referenced and uploaded to a public database, iNaturalist (www.inaturalist.org), several users confirming the identification. The first assumption that they are hybrids is based on the morphological characteristics as well as the presence of both parents.

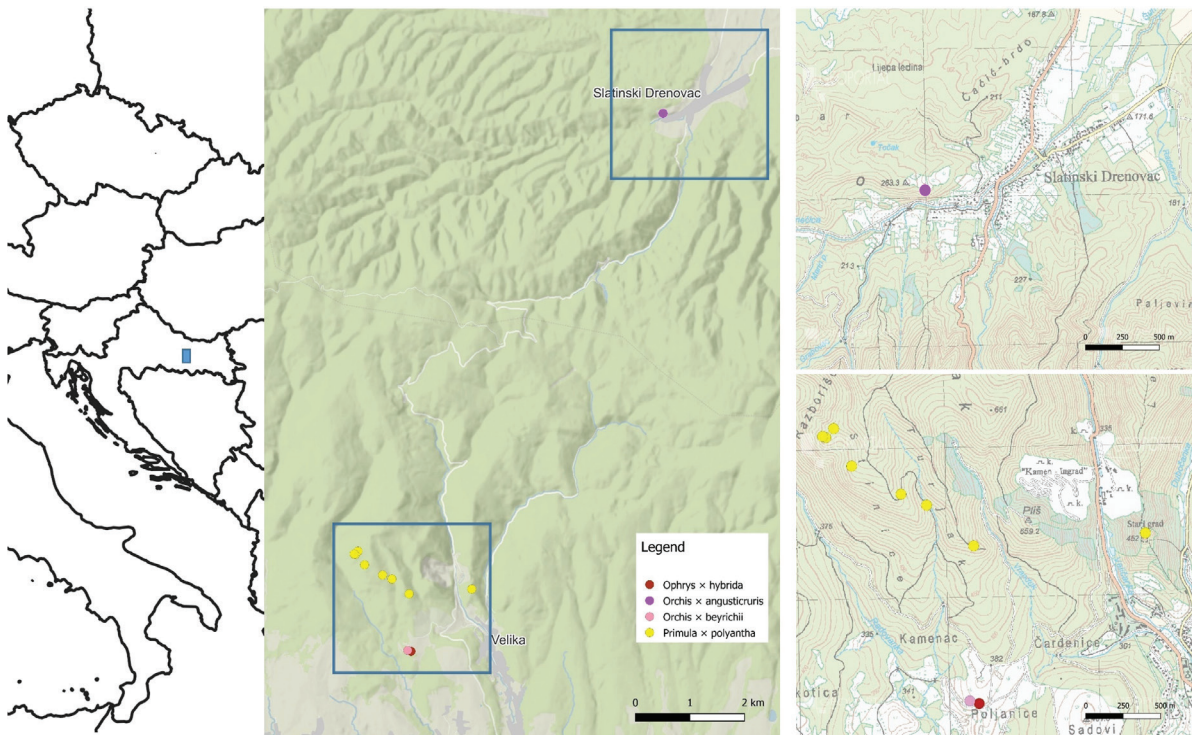


Figure 1. Localities of the newly found *Primula* × *polyantha*, *Ophrys* × *hybrida*, *Orchis* × *beyrichii* and *Orchis* × *angusticuris* described in this article.

Most orchid floras do not give information about hybrids (e.g. Williams et al. 1978, Baumann & Kunkele 1988, Kranjčev 2005, Baumann et al. 2006, Delforge 2006, Djordjević 2021, Griebel 2021) so identification is made with the help of other experts, iNaturalist database users and of popular articles found on the internet (Jacquemyn et al. 2009, Hardy Orchid Society 2023, O'Reilly & Parker 2023) or other articles such as Zadavec et al. (2015).

Habitat types are identified and listed according to the Handbook for the determination of terrestrial habitats in Croatia according to the Habitats Directive of the EU (Topić & Vukelić 2009).

Results and discussion

The localities of the four described crosses are on the southern and northern slopes of Mt. Papuk and are given in Fig. 1 and Appendix 1.

Primula × polyantha Mill.

Parental species: *Primula veris* L. and *Primula vulgaris* Huds.

The English botanist Philip Miller gave the first description of this taxon in 1768 in his *Gardeners' Dictionary*, Edition 8 (Miller 1768). This hybrid is considered an ancestor of many cultivated forms of primrose that we find in horticulture. Through artificial selection over several centuries, variants with diverse characteristics were created, Miller referring to the improvement of its characteristics in the 50 years before the publication of his work in 1768. This is also the reason why it is not possible to find an exact map of distribution of natural hybrids and in different databases such as GBIF (GBIF 2023) or iNaturalist (iNaturalist 2023) both cultivated and naturalized plants are included. However, natural hybrids probably occur wherever both parental species are present.

In a lot of national floras hybrid taxa are rarely recorded, and according to several other sources this taxon is distributed in Austria, Belgium, Denmark, France, Germany, Great Britain, Ireland,

Italy, Sweden, Switzerland, 'Yugoslavia' and is introduced in Bolivia (POWO 2022). From the former Yugoslavia it is known from Bosnia (Šarić 2018) and Slovenia (Trnkoczy 2014). In the Croatian flora it was first mentioned from Mt. Velebit by Degen (1937). It was also mentioned by Nikolić in *Flora Croatica* Vol. 3 determination key (Nikolić 2020, p. 420) as a side note.

Morphologically, *Primula × polyantha* is the exact intermediate between the parent species if we look at the leaf, inflorescence, flower and pubescence (Jacquemyn et al. 2009). A single stem (peduncle) bears a cluster of blooms (umbel on a scape), as in *P. veris*, but in *P. × polyantha* it is shorter than in *P. veris*. In contrast, the pedicels of hybrid plants are longer than those in *P. veris*. Petal size, shape and coloration of *P. × polyantha* is somewhere between the smaller *P. veris* and the larger *P. vulgaris*, light yellow on the outside and brighter yellow with pronounced darker lines on the inside (Fig. 2).

The hybrid is described as partially fertile, since backcrossing and introgression are rare (Jacquemyn et al. 2009).

On Mt. Papuk, there were eight total observations in the period between April 2020 and April 2022. All the records are from the nearby area, several neighboring ridges, Stinice, Turjak and Lapjak (Fig. 1). Distribution of this taxon in the area is limited by the distribution of the parent species *P. veris*, which is much rarer in the Slavonia region than the widely distributed *P. vulgaris* (Tomašević 2016, Nikolić 2005-onwards). As for limiting *P. veris*, *Primula × polyantha* was found on thermophilic southern exposed slopes on dolomites in the Pannonian woods with *Quercus pubescens* (91H0) mixed with semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (6210).

Earlier this year, at the time this article was under review, on March 22nd 2023 this taxon was also observed on Mt. Učka near Mala Učka village, but this record is not described in any precise detail in this text. Some details of this observation were added in Appendix 1.



Figure 2. *Primula vulgaris* (A), *Primula* × *polyantha* (B), *Primula veris* (C).

Ophrys × *hybrida* Pokorny ex Rchb. f.

Parental species: *Ophrys sphegodes* Mill. and *O. insectifera* L.

This hybrid is known from Spain, France, Germany, Austria, Italy, 'Yugoslavia' (GBIF 2023, iNaturalist 2023, POWO 2023), Serbia (Djordjević 2021), Hungary (Molnár & Csábi 2021), United Kingdom (Hardy Orchid Society 2023), but it is probably much more widespread.

Hybrids within the genus *Ophrys* are common, and in fact all the species can be artificially crossed (Delforge 2006). The Croatian flora has 63 taxa of the genus, including nine hybrids, but *O.* × *hybrida* is not recorded in any reference (Nikolić 2020, Nikolić 2005-onwards) so this would be the first record for our national flora.

A single hybrid specimen was recorded on May 21st 2020, NW of Velika, on semi-natural dry grasslands on calcareous substrates (*Festuco-Brometalia*) (6210) in succession to scrubland, in the area known as Poljanice (TK25) just below the ridges where the previously described *Primula* × *polyantha* was found.

Ophrys × *hybrida* in flower shows similarities with both parental species (Fig. 3). Size of flower and inflorescence height are closer to *O. sphegodes*. Shape of the median lobe of the lip has intermediate form, and the lateral lobes are much more pronounced and bigger than in *O. sphegodes*, but thicker and more hirsute than *O. insectifera*. Petals are thinner and dark colored, like *O. insectifera*, but much longer and bigger in general.

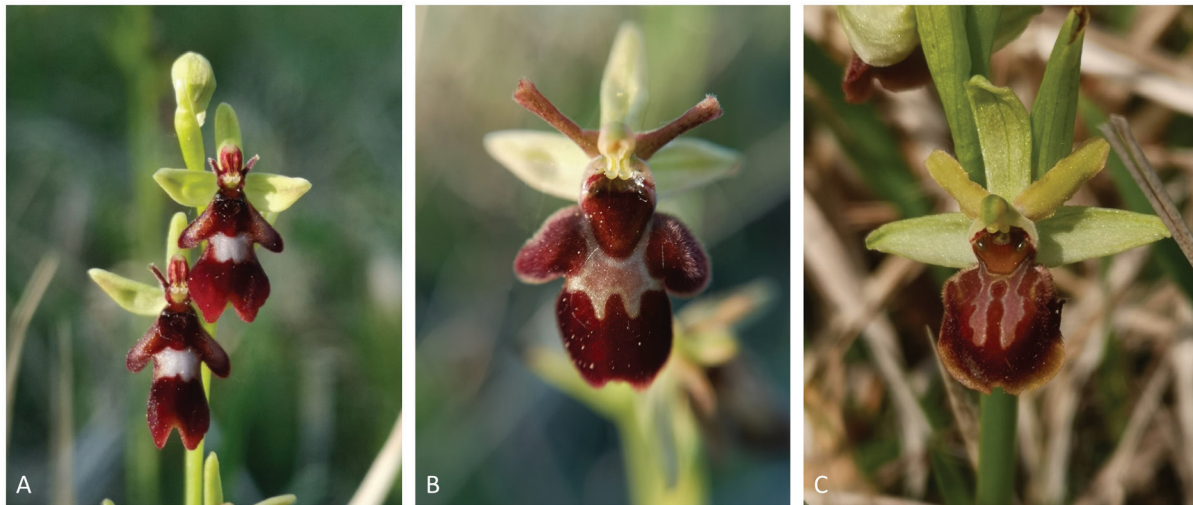


Figure 3. *Ophrys insectifera* (A), *Ophrys* × *hybrida* (B), *Ophrys sphegodes* (C).

Orchis × *beyrichii* (Rchb. f.) A. Kern.

Parental species: *Orchis militaris* L. and *O. simia* Lam.

This taxon is known from Spain, France, Germany, Netherlands, Austria, Italy, Switzerland, Hungary, ‘Yugoslavia’, Turkey, Ukraine (Krym), North Caucasus, Iran, and it is considered extinct in Great Britain (POWO 2023, iNaturalist 2023).

In Croatia, it was first recorded in Istria, NE of Pazin in 1989 by Michael Perko (Griebel 2009), then in 2015 on a single site called Krč on SE Mt. Medvednica, (Zadravec et al. 2015), and later in 2016 and 2019 at the same locality (Zadravec & Zadravec 2023). A specimen that would fit this taxon was photographed and published by Kranjčev in his monograph (2005) but without mention of the hybrid’s name. It is also included in Flora Croatica 3 (Nikolić 2020, p. 223) as a side note, without the determination key, which can be found in a short communication by Zadravec et al. (2015). Although *O.* × *beyrichii* is described as hardly distinguishable

from *O. simia* (Zadravec et al. 2015), the plants recorded on Poljanice looked like intermediates of both parents, and one of the most distinguishable characters being the presence of lip lobes (‘arms’ and ‘legs’) a bit wider than *O. simia* (Fig. 4.)

On Mt. Papuk it was first observed on May 12th 2022 on Poljanice, the same site where *Ophrys* × *hybrida* described above was found two years earlier (Fig. 1). Only two specimens were observed at the time as *Orchis* × *beyrichii*, but as both parent species are abundant in the area, hybrid individuals are probably present in larger quantities as described by Zadravec et al. (2015) where 2/3 of the population at Krč is assumed to be of hybrid origin. Although this taxon is sometimes hard to distinguish from the parental species due to their polymorphism, the question of the back crossing and ‘purity’ of both parental species populations arises, but Cozzolino et al. (2006) proved that in the genus *Orchis* backcrossing is quite rare and most hybrids belong to the first generation.



Figure 4. *Orchis simia* (A), *Orchys × beyrichii* (B), *Orchys militaris* (C).

Orchis × angusticuris Franch.

Parental species: *Orchis simia* Lam. and *O. purpurea* Huds

Another hybrid taxon, known from Algeria, Spain, France, Great Britain, Germany, Switzerland, Italy, Bulgaria, Romania, Greece, Ukraine (Krym), Russia (European part), North Caucasus, Transcaucasus, Turkey (GBIF 2023, iNaturalist 2023, POWO 2023, Anonymous 2023), Hungary (Anonymous 2014), Slovenia (Anonymous 2023b), Serbia (Radak 2016), called *Orchis × angusticuris* is found.

Kranjčev (2005) presented a photo of a hybrid between *O. purpurea* and *O. simia*, without mentioning the taxon's name. The present report can be considered first and only report of *Orchis × angusticuris* for the country. There have been no other known records in Croatia but its presence is mentioned as possible in Zadravec et al. (2015).

The hybrid individual shows morphological characters of both parents at the same time (Fig. 5). At first glance it seems closer to *O. simia*, but it is quite distinct in having shorter, flatter and a bit wider lip lobes. Purple maculation with tufts of hair on the lip is located similar to *O. simia*, but the tufts are bigger, more like those in *O. purpurea*. Dorsal sepal coloration is also intermediate between the parent species.

A single specimen of *Orchis × angusticuris* was found just above the village Slatinski Drenovac, on the slopes of Šumeće brdo. On the locality there is a forest with a mixture of species (*Fagus sylvatica* L., *Tillia* sp., etc.) and the presence of sporadic *Juniperus communis* L. indicates, and Google Earth historical images (Google Earth 2023) confirms, that the habitat was more open in the past. Process of succession started intensively after the war in the 1990s.



Figure 5. *Orchis simia* (A), *Orchis* × *angusticuris* (B), *Orchys purpurea* (C).

Conclusion

Individuals of *Primula* × *polyantha* do not seem rare and they are probably present where parental species coexist. Three of the presented orchid taxa of hybrid origin were found as one or only two individuals, but they were all accidental records so if targeted and additional research is taken, it is possible that more orchid hybrids could be found, not just the ones described in this article.

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Appendix 1. Details on location for each observation for four taxa described above. Coordinates are given in WGS84 coordinate system.

Taxon	Locality	Date	iNaturalist code	x	y
<i>Primula</i> × <i>polyantha</i>	Above Velika, Lapjak, Stari grad	11.04.2022.	111245490	45.471558	17.653686
	Above Velika, Turjak	05.04.2022.	110517629	45.470926	17.638996
	Above Velika, between Stinice and Turjak	06.04.2022.	110604087	45.473406	17.635027
	Above Velika, Stinice	06.04.2022.	110636458	45.474087	17.632854
	Above Velika, Stinice	11.04.2020.	41937765	45.475815	17.628670
	Above Velika, Stinice, Razborišće	20.04.2022.	112297738	45.478080	17.627174
	Above Velika, Stinice, Razborišće	11.04.2020.	41937896	45.477551	17.626493
	Above Velika, Stinice, Razborišće	06.04.2022.	110645548	45.477623	17.626234
<i>Ophrys</i> × <i>hybrida</i>	*Mt. Učka, near Mala Učka village	22.4.2023.	167764295	45.258914	14.192412
	Above Velika, Poljanice	21.05.2020.	46764152	45.461457	17.639285
<i>Orchis</i> × <i>angusticuris</i>	Near Slatinski Drenovac, Šumeće brdo	02.05.2020.	44611310	45.549457	17.700187
<i>Orchis</i> × <i>beyrichii</i>	Above Velika, Poljanice	12.05.2022.	117090414	45.461626	17.638495

* The record from Mt. Učka is not described in this article in more detail