Two UK *Gladiolus*

ANTHONY HAMILTON discusses the status of naturalized 'Byzantine' gladiolus, also common in gardens, and a 'native species' found in the New Forest

Andrew Lawson

THERE ARE TWO taxa of *Gladiolus* that can be found in the 'wild' in the UK. *Gladiolus communis* subsp. *byzantinus* is an introduction from Mediterranean countries that is widely grown in gardens and naturalized on rough ground, particularly in the southwest. *Gladiolus illyricus* is reputedly native and found only in the New Forest in south Hampshire (it also occurs in Europe).

This article is based on ideas I originally disseminated at a one-day conference on the New Forest *Gladiolus* co-organized by the Botanical Society of the British Isles in March 2010. The ideas were further amplified at a symposium in South Africa organized by the Indigenous Bulb Association of South Africa in August 2011. In this article I shall examine the status of these two taxa and demonstrate that both are clones, and that *G. illyricus* is also naturalized and not native.

Background

Gladiolus is a large genus of around 270 species of African origin. Its centre of diversity is at the Cape where it has its lowest chromosome numbers. The diploid number there is 2n=30 (the basic number being x=15 for the genus). The chromosome number of the different species increases to

Common in gardens in southern England, *Gladiolus communis* subsp. *byzantinus* has also escaped on to waste ground and roadsides

Alan Hobbs

Restricted to the New Forest in the UK, *Gladiolus illyricus* is often hidden under bracken and difficult to find

Alan Hobbs

The flowers of *Gladiolus illyricus*

tetraploid 2n=60 as you progress north up the continent.

Beyond mainland Africa, *Gladiolus* are found in Madagascar, the Arabian Peninsula, the Middle East and around the Black and Caspian Seas. They are also found around the Mediterranean, including North Africa, where the genus has evolved a new centre of diversity, very much based on an increase in chromosome number, doubling to octoploid 2n=120, but not exclusively.

However, perhaps not surprisingly for such a large genus covering such an enormous geographical area, it has evolved frost resistance as the species enter Europe. The most northerly populations of the genus are found in the Baltic, principally around the Gulf of Finland from Helsinki to the Saint Petersburg area.

The two commonest species, *G. communis* (excluding subsp. *byzantinus*) and *G. italicus*, both have 2n=120. In the case of *G. italicus* several new features have evolved, but in the context of this investigation it is the unwinged seeds which are notable. This character is not exclusive to *G. italicus* and a handful of related species found in the same geographical area, the so-called Fertile Crescent, share the condition. This is the area where humans first selected important grain crops, such as wheat, from wild grasses. As grain crops were progressively improved, especially in size, over the millennia, the seeds of weedy *Gladiolus* species evolved to match their size so they would be harvested and sown with the grain crop. In addition to human-aided dispersal, unwinged *Gladiolus* seeds are transported and effectively 'sown' by ants, which are attracted to the elaiosome (oily food body on the surface of the seed). *Gladiolus communis* has often been confused with *G. italicus*. However, *G. italicus* has narrow, oblong, side tepals and distinctive, unwinged, pellet-like seeds. Flower colour in most European *Gladiolus* is so similar, usually variations of magenta, so other floral characters must be used for identification.

A different group of Eurasian tetraploid species has winged seeds – this is the usual method of dispersal throughout the genus. Of these species, *G. illyricus* is one of the most common in Western Europe and is found through Portugal and Spain to France, and debatably to England. *Gladiolus communis* also belongs to this group.

Gladiolus communis subsp. *byzantinus*

This is the plant that used to be known as Miller's *Gladiolus byzantinus* (he coined the name at species level in 1768). It is common in gardens in southern England where it spreads readily and often escapes. If any plant can be called

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Gladiolus communis on Malta (left), and, on the same island, a specimen of *G. communis* (right) resembling its likely progenitor, *G. illyricus*

the 'British gladiolus', it is this. It does not appear to suffer from any diseases, unlike every other gladiolus, and appears immune to viruses.

It has acquired its own mythology – namely that is is a wild taxon, it spreads by seed, and it comes from Byzantium (an area centred on the ancient city of this name in north-east Greece). These beliefs have arisen from careless and casual observation without any checking.

The first thing to notice is that the flowers exhibit no significant variation – they are essentially the same on every plant.

Secondly, those who are untidy gardeners, like me, will know that left to its own devices and not cleared away it will seemingly form a few seed capsules in most years. However, if these are allowed to progress to maturity a different story emerges. You will find a lot of chaff and a small number of seeds, but these do not have a healthy, plump interior between the wings. These seeds appear to be viable but the germination rate is extremely poor and most seedlings die within a few weeks. Those few that do survive grow weakly and can linger on for years, gradually deteriorating and never flowering. This is because of their chromosome number – *G. communis* subsp. *byzantinus* is hexaploid, 2n=90. This means that it will form gametes (pollen and ovules) which have a range of different chromosome numbers (aneuploid). Because these are unable to form balanced pairs of chromosomes in their subsequent seed, when self-pollinated, most will abort. This usually happens before the fertilized ovules even get to the seed stage. In functional terms it behaves like a triploid – the chromosomes cannot pair up, resulting in sterility. Hence the poor seed-set.

I initially pulled these observations together in the early 1960s when I was a postgraduate student. I was confused and did not know how to handle it taxonomically. I therefore treated it as *G. communis* subsp. *byzantinus* in *Flora Europaea* (Hamilton 1968). That position is, I think, incorrect and should be re-examined.

I have managed to get a seedling from self-pollinated seed to flower. It looked very much like *G. illyricus*, which is what I would expect because I have always regarded that species to be the tetraploid progenitor of the octoploid *G. communis*. The photograph (above right) illustrates this point.

It may seem strange, after what I have just written, but *G. communis* subsp. *byzantinus* has been used experimentally in crosses with other garden *Gladiolus*. The pollen and ovules of *G. communis* subsp. *byzantinus* are aneuploid, but one of these gametes may have a full compliment of the essential genes (even if it also has some extra ones,

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White *Gladiolus communis* has garden potential

which will be superfluous). If that gamete meets a balanced gamete in a successful pollination from another taxon, it will produce a cytologically balanced seed.

I have crossed *G. communis* subsp. *byzantinus* (the garden clone), as the female parent, with *G. communis* which I collected from Gibraltar. This produced a good collection of normal seed, even though the cross was 2n=90 x 2n=120.

This leads to the question, if *G. communis* subsp. *byzantinus* does not spread by seed which, even if fertile, the young plants will be killed by frost, how does it spread? The answer is by large cormlets produced on deeply entrenched stolons. These are then further distributed by human activity.

With regard to frost hardiness, I tested *Gladiolus* corms to destruction when I was a postgraduate student at Durham University. I compared corms of *G. communis* subsp. *byzantinus* from UK gardens with corms of *G. imbricatus* from Saint Petersburg in Russia. I placed unprotected corms on a bench in an unheated greenhouse for several weeks in mid winter during which freezing temperatures frequently prevailed. The corms of *G. communis* subsp. *byzantinus* rapidly succumbed to frost and the corms were reduced to pulp. In contrast, the corms of *G. imbricatus* were unaffected.

However, in the south of England, plants that are growing in the ground are relatively frost resistant. The resting corms gain a degree of protection from being buried relatively deep. Also, the foliage is frost-resistant and can be frosted and snowed on with complete impunity. This may account for references in garden literature suggesting *G. communis* subsp. *byzantinus* is hardier than it is.

The final question to answer is the geographic origin of *G. communis* subsp. *byzantinus*. Despite Philip Miller's belief that it came from an area that includes west Turkey, Bulgaria, Greece, Albania and the former Yugoslavia, it has never been found wild in those countries. Its closest wild relatives can be found in north-west Africa, principally Morocco. There, richly coloured forms, principally dark red, of *G. communis* can be found, unlike the paler coloured forms common in most of the Mediterranean. These are natural populations that spread by seed. In my recent studies of this species in the Maltese islands I have found similarly coloured forms, including white ones (Mifsud & Hamilton, in press).

Gladiolus illyricus

We are fairly short of detailed knowledge of this species, especially its representatives in the UK. However, following a conference in 2010 the situation has improved. In the UK it is assumed to be native but is currently restricted to the New Forest, although formerly occuring on the Isle of Wight (Stace 2010). It was also thought to spread by seed, just like the Continental forms, and to be hardy in southern England.

Finding *G. illyricus* in the New Forest is very difficult because it normally flowers under bracken (*Pteridium aquilinum*) which both shelters it, hides it, and protects it from grazing. This is almost certainly why it was not until Victorian times that it was first discovered in the UK, on the Isle of Wight.

Indeed, the best way to monitor a non-flowering plant is to visit early in the year to spot the young leaves. Then insert bamboo canes beside the emerging foliage, using short ones so as not to draw attention to the plants, and return on a regular basis to watch progress. You also need a detailed map or a GPS device, as it is easy to get lost in the New Forest. Plants of flowering size will bloom from the end of June to mid July, depending on the season. Any work that might disturb these protected plants needs to be licenced by Natural England. Fortunately, the Forestry Commission is now clearing scrub around *Gladiolus* sites so it does not develop into forest, shade out the plants, and lead to extinction.

Typical *G. illyricus* in continental Europe has a range of flower shapes and colour distribution in its tepals (see p54). This is exactly what one would expect from populations reproducing from seed. It is when these Continental flowers are compared to English *G. illyricus* that one striking fact emerges. There is no natural variation; all the flowers of English *G. illyricus* are the same. They share this same lack of variation with *G. communis* subsp. *byzantinus* and is a vital clue as to ➤

what sort of plants they might be.

The next thing to consider is chromosome number. Continental *G. illyricus* is tetraploid (2n=60) but English *G. illyricus* is hexaploid (2n=90) (Darlington & La Cour 1960). I took my counts from plants collected at Wilverley Walk in the New Forest, which yielded 2n=90. I suspect the same figure would be found in other New Forest colonies, but it would be prudent to examine others.

However, from what I have found so far, it would appear that *G. communis* subsp. *byzantinus* and *G. illyricus* are both semi-sterile hexaploids.

Seed capsules on *G. illyricus* have usually formed by September. They are usually somewhat sparse on the spike, often only two or three, which might be assumed to be the result of poor pollination conditions when the flowers were out in June and July. However, when the ripe capsule is opened one finds very few viable seeds and they are only partly winged. I have tried germinating them after exposure to cool conditions, as a sort of mild vernalization, but have not exposed them to frost. I have not been able to raise seedlings, and I am not aware of any other claims to have successfully done so.

What appears to be happening with both *G. illyricus* and *G. communis* subsp. *byzantinus* is that at pollination time, the pollen tube extends down the style. This is enought to stimulate, probably hormonally, later pod formation.However, when the pollen tube reaches the ovules, the mis-match of chromosome numbers results in seeds not forming or being virtually sterile.

Gladiolus illyricus spreads through the New Forest very slowly. The photograph (p55) shows a mature plant and the site of a now dead mature corm which has been taken over by its own cormlets. By repetition of this process a colony will gradually spread outwards. There are now disjunct colonies around the New Forest. I speculate that this distribution is the result of old agricultural practices which would have involved harvesting and transport of the associate plant, bracken, which was mainly used for animal bedding. Corms and cormlets would have been pulled up during the harvesting and spread around.

The avoidance of cold and continued survival of *G. illyricus* in the New Forest plant can be accounted for by the corms and cormlets being found fairly deep (7–8cm) in the soil and the insulating layer of bracken debris.

There has been much speculation on the origin of these English *G. illyricus*. Herbarium records of British-type *G. illyricus* on the Continent are few. Some have been collected from Saumur and Fontainebleau in France but no recent living specimens have been found there. Indeed, they would naturally die out once forest climax conditions became dominant. A more recent record has been made from Belle Île off the north-west coast of France, where the habitat is similar to the New Forest, but I have not been able to visit the population.

It is not known how it reached England. I like to think that the Romans brought it from the Continent, although there is no evidence for this. Perhaps a Roman gardener found it in France, admired its beauty, and transferred it to a settlement in southern England. The Romans were also present on Belle Île!

Alex Lockton

Alex Lockton

Spanish *Gladiolus illyricus* in the wild, where the flowers are variable in form and colour. One of the most noticeable differences is in tepal width, being either narrow (left) or wide (right).

Jonathan Stokes

Gladiolus illyricus in the New Forest reproduces by dispersal of corms. The plant on the right has reached maturity and will flower. The smaller leaves on the left are growing from immature corms arising from the site of a mature corm that has flowered and died.

Conclusion

These two taxa have previously been considered to be normal, wild representatives of the same group of Eurasian *Gladiolus* species. However, after careful examination they have been found to be clones that spread vegetatively and locally by cormlets. There is no evidence of any seed spread and their climatically mild and protected habitats ensure that these plants survive from year to year.

Purely as a working position, I have coined the unpublished name *G. illyricus* "subsp. *anglicus*" for the English gladiolus while I have been studying it. This matches the existing subspecific treatment of *G. communis* subsp. *byzantinus*. However, their clonal status, that has now been clearly demonstrated in this work, mitigates against treating them as natural taxa which the designation of subspecies would imply. The correct treatment that should be given to them is cultivar status and this will be done, after consultation, over the next few years.

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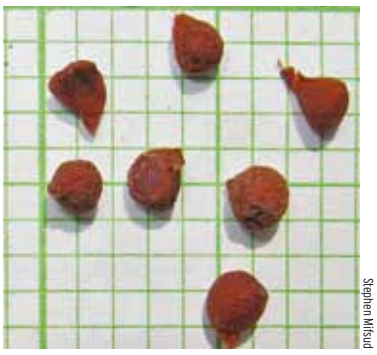

Stephen Mifsud

The two *Gladiolus* discussed in this article (*G. communis* and *G. illyricus*) have winged seeds, such as those of *G. communis* (left). Other species, such as *G. italicus* (centre), have evolved unwinged seeds (right) to aid dispersal with grain crops.