Ornamental Use of Wild Species of Genus *Gladiolus*

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Abstract

Two Mediterranean species of genus *Gladiolus* were studied in order to diversify the range of ornamental plants on offer: *G. illyricus* for use as a rockery plant and *G. italicum* preferably for use as a cut flower, although it could be used in gardening.

Both species can be sexually or asexually propagated, although seed production is higher than cormels production in both species. The growth and development characteristics of both species were tested both in their natural habitats and in an unheated greenhouse. Plants cultivated in the greenhouse grew faster and were larger. The length of the floral spike was also greater. The time elapsing to the onset of flowering was almost four months in *G. italicus* plants grown in the greenhouse and three months in *G. illyricus*. We suggest that more studies are necessary in order to understand the behaviour of these *Gladiolus* species whether grown in the open air or in the greenhouse.

INTRODUCTION

There is growing interest in the use of native Mediterranean species for ornamental purposes, both for their capacity to adapt to a variety of environmental conditions and because of the potential for saving water. The ornamental plant sector is changing as consumers look for new and original material, as is reflected by the incorporation of autochthonous plants on the market. Furthermore, in most European countries the demand for traditional ornamental products (except roses) is falling and new species and cultivars are constantly being sought. The fashion is for cut flowers which look like wild flowers (Chimonidou-Pavlidou, 2000).

The genus *Gladiolus* is widely distributed throughout the world (Lewis et al., 1972). Both *Gladiolus italicus* Ker-Gawler (syn. *G. segetum*) (Goldblatt, 1994), that is distributed throughout southern Europe, North Africa, SW Asia and Macaronesia, and *G. illyricus* Koch., that is distributed throughout S and W Europe, North Africa and Western Asia, are widely present in SE Spain. The first is found more inland, while the second is abundant in all areas. The climate where they are found is dry, with mild winters, in which conditions *G. italicus* grows to between 40 and 110 cm in height with a spicate inflorescence consisting of 5-10 flowers with pink tepals; *G. illyricus* shows a certain botanical similarity but is shorter and with fewer number of leaves (Sánchez et al., 1994). Their growth cycle in their natural habitat begins in the autumn when shoots appear and finishes in early summer with fruiting. Once domesticated, *G. italicus* is suitable for use as a cut flower (although also in garden displays) while *G. illyricus* is more suitable as a rockery plant.

The object of the study we describe was to compare the behaviour of both species in their natural habitat and in their cultivated form to determine their possible use as ornamental plants.

MATERIAL AND METHODS

Gladiolus illyricus and *G. italicus* were used in this experiment. The corms used for planting in the greenhouse, came from Murcia (SE of Spain) and Ibiza (Balearic Islands) and were harvested the year prior to the experiment. Plants of the same species

were observed in their natural habitat – *G. illyricus* in the Campo de Cartagena (Mediterranean coast of SE Spain) and *G. italicus* in the upper Guadalentín Valley (in the interior of the province of Murcia). The corms used were 6/7 and 8/9 calibre in the case of *G. italicus* and 4/6 for *G. illyricus*.

Corms were planted in an unheated greenhouse on 25 October 2000 and were grown on benches using perlite as substrate. The planting density for both species was 100 corms per square meter. The field trial was conducted using cultural practices common to Gladiolus production in this area (González et al., 1998). The basis plots measured 0.8 m^2.

Twenty-five plants per species of a normal size growing in the wild were observed periodically. After flowering, the plants were pulled up to be measured. Climatological data during the experimental period were recorded at a nearby site.

The sexual and asexual reproduction potential of the species was evaluated, by counting the number of corms produced, their calibre and weight in the first case (Korkut et al., 1998), while the potential for sexual reproduction was evaluated by counting the number of seeds produced per fruit.

The following parameters were measured in the plant: (i) vegetative features, such as the length of leaves; (ii) flowering stem quality, represented by the flowering stem and spike length and number of buds per flowering stem and (iii) the yield and earliness of the crops, measured as the number of flower stems per corm and the number of days from planting to the onset of flowering.

RESULTS AND DISCUSSION

The climatological data recorded during the experiment were normal for the area concerned (Fig. 1). In the case of *G. illyricus*, the mean temperature between October 2000 and May 2001, when the experiment took place, was 14.9ºC, while the accumulated rainfall was 238 mm with a maximum of 122 in October. The average temperature of the habitat where *G. italicus* grew was 11.7ºC while the accumulated rainfall was 285 mm, with an October maximum of 152 mm. In the case of the cultivated plants the mean greenhouse temperature during growth was 15.9ºC.

The number of seeds produced per fruit was quite irregular and independent of the original corm size (Table 1). *G. italicus* plants growing in the wild produced more seeds than their greenhouse-grown counterparts (maximum and minimum numbers of 19.5 and 2.6 in the wild and 14.2 and 4 in the greenhouse). In both the wild and cultivated plants grown there was a direct correlation between the number of fruits produced and the calibre of the corm used. The fruits nearest the apex contained the highest number of seeds. On the other hand, the number of seeds produced by *G. illyricus* was greater in cultivated plants (34-20 seeds maximum and minimum compared with less than half that number in wild plants). Similarly, the wild plants produced substantially fewer fruits than their cultivated counterparts (two compared with the five fruits of cultivated plants)

As regards the vegetative reproduction of the corms, the number of principal and secondary corms obtained at the end of flowering was counted, recording only the subterranean corms produced near the mother corm, although axillary subterranean corms produced above the mother cormels where the leaves began were also evident (usually a small corm of 1/2 calibre although occasionally a bunch of the same). In general the number of cormels produced was substantially less than the number of seeds (Table 1 and 2). Of note is the fact that in *G. italicus* the number of cormels produced was greater and their size larger when large corms were used to produce plants (Table 2). Regardless of the size of corm used, cormels production by wild plants was greater than in the cultivated plants, although the existence of cormels produced previously may have been responsible for this greater number. Whatever the case, it would be worth studying the root system of growing plants in greater depth, particularly gladiolus contractile roots, since these contribute 22.4 % to the enlargement of the corms (Kawa and De Hertogh, 1992; Iziro and Hori, 1983)

Normally, the length of the leaves was greater in each successive leaf, except the

last leaf, which tended to be smaller than the previous one (Table 3). Generally speaking, for the same calibre of corm used, the greenhouse-cultivated plants were bigger for both species. Furthermore, in *G. italicus* the number of leaves formed was greater in plants grown from large corms, confirming the findings of previous studies (González et al., 2001).

Greenhouse-grown plants also grew higher and produced a larger floral spike than the wild plants (Table 4), perhaps because of the higher temperatures (Fig. 1), as has been described previously by Boulard and Baille (1984). Larger corms produced better quality and a greater number of flowers per spike in both cultivation conditions. *G. italicus* plants grown from the same size corm produced a similar number of flower in the wild as in the greenhouse. However, in the case of *G. illyricus*, greenhouse-grown plants produced more flowers than wild plants. Regardless of the production method, the number of flower stems produced per corm was greater in large corms, two stems being common in most plants grown from 8/9 *G. italicus* corms (Table 5). Lastly, the time elapsing from planting to flower initiation was almost four months in greenhouse-grown *G. italicus* plants, while *G. illyricus* flowered in slightly more than three months. This longer growth cycle of *G. italicus* might be reduced by exposing corms to low temperatures, as has been observed in other species of gladiolus (González et al., 1988)

The results of these experiments conducted in the wild and greenhouse conditions were interesting but point to the need for more studies to fully understand the behaviour of these species of Gladiolus in the said conditions.

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Tables

Table 1. Characteristics of sexual production of the two *Gladiolus* species cultivated in the greenhouse and in the wild.

Species	Plant origin	Corm size	No. of fruits	No. of seeds per fruit				
				1st fruit	2nd fruit	3rd fruit	4th fruit	5th fruit
G. italicus	Cultivated	8/9	4.2±1.0	12.8±2.9	14.2±2.6	10.8±5.1	6.6±0.5	7.4±1.7
		6/7	2.5±1.1	8.8±2.9	11.5±3.0	9.3±3.8	-	-
	Wild	8/9	5.5±1.3	19.5±4.5	18.3±2.9	10.8±2.5	10.0±2.7	14.3±5.7
		6/7	3.4±0.8	9.0±4.3	7.0±2.6	5.3±4.6	2.6±3.1	
G. illyricus	Cultivated	4/5	5.2±1.1	34.0±3.6	26.4±2.8	26.2±2.6	20.6±1.7	23.0±2.3
	Wild	4/5	2.3±0.7	16.4±1.4	11.0±1.0	5.0±0.9	-	-

Table 2. Vegetative reproduction potential of the two *Gladiolus* species cultivated in the greenhouse and in the wild.

Species	Plant origin	Corm size	Corms produced					
			Principal			Secondary		
			Number	Average size	Weight (g)	Number	Average size	Weight (g)
G. italicus	Cultivated	8/9	2.2±0.2	9/10	5.6±1.9	2.6±0.2	2/4	2.6±1.2
		6/7	1.4±0.1	6/+	2.4±0.4	2.2±0.2	2/3	1.7±0.2
	Wild	6/7	1.2±0.3	6/+	2.0±0.3	2.5±0.4	2/3	1.6±0.1
G. illyricus	Cultivated	4/5	1.2±0.2	5/6	2.1±0.5	3.7±0.3	2	0.6±0.3
	Wild	4/5	1.1±0.2	4/+	1.8±0.2	4.6±1.1	<2	0.2±0.1

Table 3. Vegetative parameters of the two *Gladiolus* species cultivated in the greenhouse and in the wild.

Species	Plant origin	Corm size	No. of leaves	Length of leaves (cm)				
				1st	2nd	3rd	4th	5th
G. italicus	Cultivated	8/9	5.2±0.5	27.2±3.2	53.4±5.2	81.1±5.8	87.0±6.7	80.3±5.5
		6/7	4.1±0.3	31.1±2.9	61.0±9.1	77.4±8.5	77.9±6.3	75.8±6.8
	Wild	8/9	4.2±0.4	33.9±0.2	50.5±2.7	48.8±1.9	45.1±0.3	-
		6/7	3.2±0.4	27.9±1.6	38.3±3.2	37.2±3.3	-	-
G. illyricus	Cultivated	4/5	4.3±0.2	26.4±5.3	26.2±5.7	29.5±3.8	31.5±2.9	-
	Wild	4/5	4.1±0.3	24.7±6.6	24.9±6.2	24.3±7.9	26.5±6.8	-

Table 4. Quality parameters of the two *Gladiolus* species cultivated in the greenhouse and in the wild.

Species	Plant origin	Corm size	Length of flower stem (cm)	Length of spike (cm)	No. of flower buds
G. italicus	Cultivated	8/9	98.5±18.5	30.2±5.4	11.8±1.5
		6/7	80.8±9.3	20.1±3.6	7.1±1.7
	Wild	8/9	66.9±7.4	26.5±2.2	11.6±1.6
		6/7	47.8±6.8	18.4±2.0	8.6±0.9
G. illyricus	Cultivated	4/5	52.6±5.2	22.4±3.7	11.6±1.0
	Wild	4/5	34.8±4.3	11.9±1.8	7.9±0.7

Table 5. Number of days to the onset of flowering and yield of the two *Gladiolus* species cultivated in the greenhouse and in the wild.

Species	Plant origin	Corm size	No. of flower stems/corm	No. of days to the onset of flowering
G. italicus	Cultivated	8/9	1.7±0.3	115±2
		6/7	1.1±0.1	121±4
	Wild	8/9	1.7±0.2	-
		6/7	1.0±0	-
G. illyricus	Cultivated	4/5	1.3±0.2	95±4
	Wild	4/5	1.0±0	-

Figures

Fig. 1. Greenhouse air temperature and air temperature and rainfall in the natural habitat for both species of *Gladiolus* studied.