

## INTRODUCING IN THE ARCHITECTURAL LANDSCAPE OF SOME GENTIANA SPONTANEOUS SPECIES WITH ORNAMENTAL

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### Abstract

The purpose of the present paper is to lay out the landscape by introducing in its architecture some *Gentiana* species from the spontaneous flora of the country. There were studied species like: *Gentiana acaulis* L.; *Gentiana verna* L (ssp. *Balkanica*); *Gentiana asclepiadeia*, 'Knightshayes' var.; *Gentiana lutea* L.; *Gentiana sino-ornata*, 'Angel's Wings' var. and 'Alba' var. There were followed their germination, the germination time, the germination percentage and the percentage of acclimatization. The experiment took place in conditions of laboratory, the seeds were germinated in petri pots, on a bed of filter paper which was moisten with:  $V_o$  = moisten with tap water and  $V_1$  = moisten with 100ppm AIB solution. After 20 – 30 days, there were followed, at regular intervals, the germination capacity and energy of the seeds of the five *Gentiana* species. The germination time depends on the specie or on the variety of *Gentiana*, but also on the auxin treatment for stimulating germination: at  $V_o$ , the time is between 37 – 60 days, the lowest germination time is registered by *G. acaulis* – 37 days, and the greatest by *Gentiana sino – ornata* variety – about 55-58 days and over 60 days by *Gentian asclepiadeia* var. „Knightshayes”; on  $V_1$  the shortest germination time is registered at *Gentian verna*, 25 days and at *Gentian lutea* – 30 days, to the other species, the germination time is between 40 – 50 days. The germination and acclimatization percentage of the plantlets reaches different values based on the specie or on the treatment: the highest percentage of germinated seeds is registered at *Gentiana acaulis* 82% (about 80% of the plants have a perfect acclimatization) and *Gentiana lutea* about 78% (only 50% acclimatized); at the untreated seeds the lowest germination percentage is registered at *Gentiana sino-ornata*, about 20% and at *Gentiana asclepiadeia* var. „Knightshayes”, about 23%; at  $V_1$  (variant treated with auxin) the same species and varieties double the germination and acclimatization percentage. We conclude that the species worth being introduced in the architectural landscape due to their value of floristry (color, size, arrangement of flowers) and to the port of the plants, and also for their conservation, being vulnerable elements (protection from extinction). And for increasing the percentage of germinated seeds we recommend stimulating germination by treatment with auxin solution, in concentration of 100ppm (in this experiment indolil beta butyric acid).

**Key words:** rare species, *Gentian L.* genre, species: *acaulis*, *verna*, *asclepiadea*, *lutea*. germination time, acclimatization percentage.

### INTRODUCTION

The purpose of the study is the knowledge of the ornamental value, behavioral aspects, origin, the culture technique, etc., of some species and varieties of the *Gentiana* genre, for their introduction in the architectural landscape in order to compile some ornamental spaces or gardens with an aspect similar to the ones from the countries with tradition in the landscape architecture (Warton, 1995), countries which exploit, from an ornamental point of view, the rustic species from their spontaneous flora (Bajard,

Bencini, 1996; Bonnechere, De Bruyn, 1998). Our research over time is focused on the preservation of some species from the spontaneous flora of the country, species with ornamental value (Vlad, Coman, 2010; Vlad, 2011). It is also known the interest for the application of the synthetic phitohormones in the stimulation of some physiological processes at some species of plants (Milică, 1983; Neamțu, Irimie, 1991). For us, rushing the flowering process, the rooting of the cuttings or the germination of the seeds presented interest over time (Vlad, 2009). In our country, the species of the spontaneous flora are studied as components of the vegetal carpet (Borza, Boșcaiu 1965), alongside the research undertaken in the Retezat National Park (RPNR), where Gentianas are protected in the so-called 'Gentiana Shelter' with a number of species and varieties of scientific and flora interest (Täuber, 1985). They are being framed as rare species in the group of vulnerable plants (VU) according to the red list of the vascular plants (Dihor, Negreanu, 2009).

*Origin and culture.* *Gentianas* (*Gentianaceae* fam.) encompass about 400 perdurable flowers (Noordhuis, 1995). They live in temperate, alpine regions, in North America or Japan (Encyclopédie universelle des 15.000 de plantes, 1999). They flower between May – October (depending on the chronology of the specie), and have flowers similar to a trumpet or bell flower, from deep blue to light blue, yellow or white (le Calendrie du Jardinage, 2002). They flower in spring, some even in autumn, with a flower rosette which persists in winter, being considered semi perdurable (Preda, 1989). They have a very good annual, rustic, biannual or perennial species, with falling, semi perdurable or rusticity, and can bear temperatures up to -15<sup>0</sup>C or even lower (Phillips, Rix, 1992, Vol. I and II). In Bucegi Mountains live over 15 species (Pârvu, 2004), true ornaments of the Mountain, some endemic as *Gentiana punctate* (a variety of the *Gentianeii lutea* specie) with yellow flowers (Opriș, 1990). It prefers the light soil with sufficient moisture but well drained, the ones which flower in autumn prefer a slightly acid soil. Many of them multiply by seeds, seedling being made in early spring, and when they get to the second pear of leaves they reply (Brunie et al., 1999). They also multiply by breakup from the bush, in early spring before the start in vegetation (Șelaru, 2007), a method which is often used at many flower species, because it does not connect all the seeds or because not all the seeds germinate (Vlad I., 2010). We present the studied *Gentiana* species: *G. acaulis* L; *G. verna* L (ssp. *Balcanica*); *G. ascelpiadea*, 'Knightshayes' var.; *G. lutea* L; *G. sino-ornata*, 'Angel's Wings' var. and 'Alba' var.

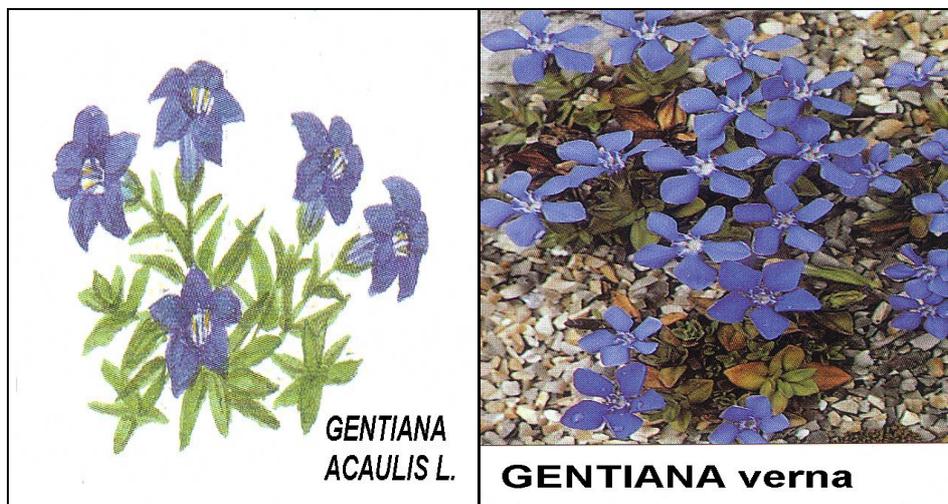


Fig. 1. *Gentiana acaulis* L.

Fig. 2. *Gentiana verna* L. ssp. Balcanica

*Gentiana acaulis* L. perennial, perdurable rosette – shaped leaves (of 1-4 cm), elliptic or lance width leaves, it flowers in May – June, solitary flowers in the form of a trumpet (of 2-5 cm) with deep blue color (Fig. 1), common in the Carpathians, in the North – East of Spain, in the Italian Alps, in the former Yugoslavia (Flora RSR, 1966). *Gentiana verna* L. or spring *Gentiana* (Fig. 2), perennial, with ephemeral flowers and elliptic leaves. It flowers in March – May, with solitary deep blue flowers (3-4 cmØ). It is prevalent in the mountains of Europe, Ireland and Russia. It has many varieties, among which the most common is ssp. Balcanica (pontica) with deep blue flowers.

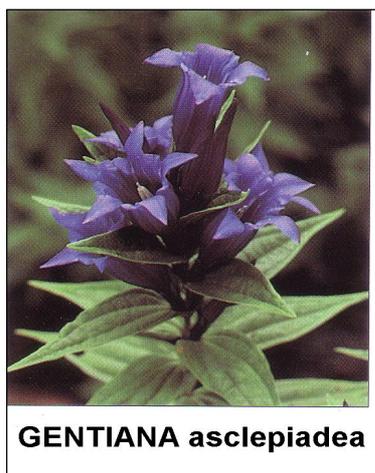


Fig. 3. 'Knights Hayes' Var.



Fig. 4. *Gentiana lutea* L.

*Gentiana asclepiadea* L. - a perennial specie, with flowers arranged on a right rod, inserted in a handful of three, with lance width leaves of 5-8 cm length. It flowers in June until November, and the flowers are arranged in inflorescences of dark blue color (of 2-3 flowers of 4-5 cm). `Knightshayers` var. is common in mountainous areas in Southern and Central Europe and in Turkey (Flora RSR), deep blue color (Fig. 3). *Gentiana lutea* L. or yellow or great gentian, name which comes from the port and color (about 30 cm). Lance width leaves arranged in a wisp at the basis of the yellow colored flowers, and the flowers arranged around the stem, in a number of three to ten, flower in July. It is common in the Pyrenees, Carpathians, Alps and Apennine Mountains (Fig. 4). *Gentiana sino-ornata* Balf. is perennial, very ornamental, with semi perdurable rosette, with basal arranged leaves of 3-4 cm length, lance width. It flowers in autumn from September until November, having solitary flowers in the form of a trumpet, from deep blue (Fig. 5), to varieties with white flowers (Fig. 6), widespread in Eastern China and in Tibet, but perfectly acclimatized on our continent.



**GENTIANA sino - ornata**



**GENTIANA sino-ornata"Alba"**

Fig. 5. `Angel's Wings` var.

Fig. 6. `Alba` var.

#### MATERIAL AND METHOD

The seeds harvested from the recalled *Gentiana* species and varieties (of six years), from the Retezat National Park (RPNR) and from the Cluj-Napoca and Iasi Botanical Gardens were put to germinate in laboratory conditions (or in cold greenhouses). The initiation of the experiment took place in March and there were conceived two variants:  $V_0$  = untreated seeds, which have been moisten at need with tap water and  $V_1$  = seeds treated with

100ppm AIB (indolil beta acetic acid), the auxin solution applied twice every two days (by moistening the filter paper on which the seeds are placed), then watered with tap water depending on the status of the filter paper, up to the moment of establishing the germination percentage. When the plantlets have formed 2-4 real leaves they were placed in boxes with peat or in pots with 5-10cmØ, they were kept in cold greenhouses or seedbeds, and when the plantlet formed the bush it was planted in the experimental field following the acclimatization capacity and percentage of the plantlets at large. The acclimatization capacity is essential for planting the *Gentiana* mature plants at the definitive place (flower-beds, rocks, pergolas, groups of plants different as port and color) and also for establishing the germination value (energy and germination capacity) of the seeds, depending on their age, on the followed specie or variety.

## RESULTS AND DISCUSSION

The observations related to the state of the seeds were done regularly establishing the *germination time* of the *Gentiana* species and varieties, the *germination and acclimatization percentage*, and their appreciation by evaluation, the results being presented in Table 1.

Table 1

Germination capacity and energy of the *Gentiana* experimented species and varieties  
(FB = very good; B = good; S = weak; SF = satisfactory)

Specie/ variety	Variant	Germination time (days)	Germination %	Acclimatization %	Evaluation
<i>Gentiana acaulis</i> L	V <sub>0</sub>	37	70	75	xxxxxx (FB)
	V <sub>1</sub>	25	82	80	xxxxxxx (FB)
<i>Gentiana verna</i> L ssp. Balcanica	V <sub>0</sub>	52	68	40	xxxx (B)
	V <sub>1</sub>	40	70	45	xxxxx (B)
<i>Gentiana asclepiadeia</i> L 'Knights Hayes' var.	V <sub>0</sub>	60	23	40	xx (S)
	V <sub>1</sub>	45	42	50	xxx (SF)
<i>Gentiana lutea</i> L	V <sub>0</sub>	40	67	48	xxxxxx (FB)
	V <sub>1</sub>	30	78	50	xxxxxxx (FB)
<i>Gentiana sino-ornata</i> Balf 'Angel's Wings' var.	V <sub>0</sub>	58	20	22	xx (S)
	V <sub>1</sub>	48	38	25	xxx (SF)
<i>Gentiana sino-ornata</i> Balf 'Alba' var.	V <sub>0</sub>	55	20	35	xx (S)
	V <sub>1</sub>	50	45	35	xxx (SF)

*Germination time* is presented in Table 1, depending on the experimented specie and variant, from which we can see that at the variants treated with auxin (100ppm AIB) the germination time was shorter with about two weeks, so the effect of stimulation and rushing of the seeds germination took place. The species which germinated in the shortest time

are *Gentiana acaulis* (between 25-37 days) and *lutea* (between 30-40 days); the other species and varieties had a longer germination time, depending on their nature and variant of treatment, between 45-55 days (see Table 1). Figure 7 presents the germination time of the *Gentiana* species and varieties from which there can clearly be emerged the effect of reduction of the germination time at the treatment with auxin (see variants V<sub>1</sub> from Fig. 7), and also the differences related to the followed species and varieties.

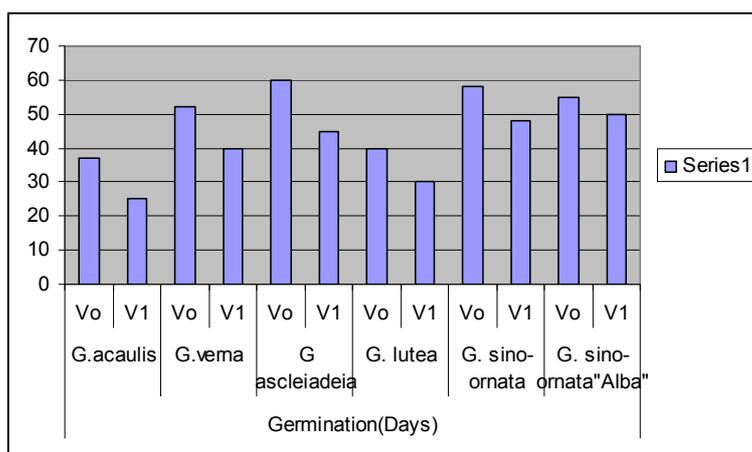


Fig. 7. Germination time of the *Gentiana* species (expressed in days)

*Germination and acclimatization percentage* of the *Gentiana* species according to the time mentioned in the table points out the fact that the largest percentage of germinated seeds is also registered on the variants treated with auxin (V<sub>1</sub>) and approximately at the same species: *Gentiana acaulis* 82% and about 80% acclimatization percentage, followed by *lutea* with 78%, and 50% acclimatization percentage; then by *Gentiana verna* with 70% germination percentage and 45% acclimatization. The other species and varieties reach on V<sub>0</sub> a germination percentage of only 20-23% and acclimatization of 38-40% (only about half of the germinated seeds): on V<sub>1</sub> germinate about 38-45%, with an acclimatization percentage of 25-35%. Our statement is also proved by the data from Figure 8 from which we deduce the positive role of the treatment of the seeds with auxin and the role of the specie with a maximum reaction.

We can state that there is a correlation between the germination – acclimatization percentage and the positive or negative reaction of the species. The *evaluation* of the *Gentiana* variants and species depending on the followed parameters is presented in Table 1, from which we can see that, the greatest grades (7 and 6) were received by the variants on which the germination of the seeds was stimulated with auxin solution (V<sub>1</sub>-100ppm AIB).

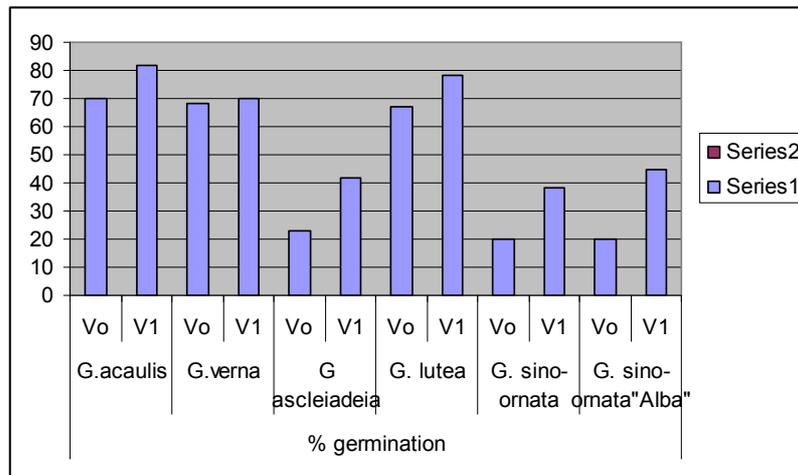


Fig. 8. Germination percentage of the *Gentiana* seeds

## CONCLUSIONS

1. The application of the treatment for stimulating the germination of the seeds of some species from the spontaneous flora older than five years has proved beneficial for the seeds of the *Gentiana* species and varieties studied by us.
2. The concentration of 100ppm auxin (in our case AIB) doubles the percentage of germinated seeds at some *Gentiana* species, having effect even at some species known as having a poor germination: *G. asclepiadeia* L. 'Knightshayes' var. and *G. sino-ornata* Balf. 'Angel's Wings' var. and 'Alba' var. (see Encyclopédie universelle des 15.000 de plantes, 1999).
3. The germination time depends on the treatment with auxin, on the *Gentiana* specie or variety:
  - a. Untreated seeds of *Gentiana acaulis* and *lutea* germinate in the shortest time of 37 – 40 days; at the other varieties the germination time is between 52-60 days (depending on the specie);
  - b. At the ones treated with auxin the number is smaller: at *Gentiana acaulis*, *lutea* and *verna* is of 25, 30 and 40 days; at *Gentiana asclepiadeia* 'Knightshayes' var. of 40 days, at the *sino-ornata* Balf. specie, 'Angel's Wings' var. and 'Alba' var. of 48 - 50 days.
4. The germination percentage of the seeds and the acclimatization percentage of the plantlets reaches positive values also on the variants with auxin and at the same species, hence:
  - a. at the untreated seeds the germination percentage is of: 78% at *Gentiana lutea* and of 70% at *verna* and *acaulis*; the other species have a germination percentage of 23-20%;

- b. *at the seeds treated with auxin* the percentage is of: 82% at *Gentiana acaulis*, of 78% at *lutea* and of 70% at *verna*; at the other varieties the percentage after the treatment with auxin has doubled in regard to the untreated ones (of 38, 42 and 45%).
5. *Evaluation: Gentiana acaulis* and *lutea* have received the greatest grade, 7 on the variants treated with auxin, and 6 on the untreated ones; the other ones were appreciated with grades between 2 and 5, depending on the specie and variety (see Table 1).

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