

Cultivation of Wild Species from *Goniolimon* genera: a Case Study

KANINSKI A.¹⁾, S. BISTRICHANOV, Ivanka IVANOVA

¹⁾ Regional Centre for Research and Extension service of Floriculture and Agriculture,
Sofia, 1222 Negovan, Bulgaria, e-mail: bistrichanov@abv.bg

Abstract

During the period 1996-2001 three wild perennial Bulgarian plants belong to *Plumbaginaceae* family (*Goniolimon tataricum* Boiss., *Goniolimon besserianum* (Shut ex Reichenb.) and *Goniolimon collinum* (Griseb.)) were studied at the Floriculture Institute – Negovan (now RCNPO-Sofia). The *Goniolimon tataricum* Boiss. and *Goniolimon besserianum* species are spread along the North and South Black Sea coast. *Goniolimon collinum* (Griseb.) Boiss is spread in the Sofia region and South Black Sea (Kiten village). The flowers were cultivated under optimal agricultural conditions. Three parameters were studied: leaf rosette diameter, height, and number of flower stems per plant. Coefficients of variance under cultivation conditions compared with the natural habitats conditions showed approximately 2-2.5 times higher values. Variation values of the parameters at the *Goniolimon* species, showed its natural specificity even during species cultivation.

Keywords: *Goniolimon* species, cultivation, specificity

Introduction

Wild perennial plants from *Goniolimon* genera and *Limonium* genera are widely used as ornamental plants (Alarcon et al. 1999; Rizzotto, 1999). Some of them are introduced in breeding programs (Palacios and Gonzales, 1999), or recommended for direct cultivation (Yanev, 1959).

All presented in Bulgarian flora species from *Goniolimon* genera (*Plumbaginaceae* family) are listed in Bulgarian Red Book of Plants (Kojucharov, 1992). Because of the unfavourable anthropogenic influence many of these species are threatened to extinct and listed in Biodiversity Protection Act of Bulgarian Parliament (2002).

Some scientists reported that these species have good ornamental qualities (Veltchev, 1984; Anchev, 1982). Salmon (1971) stated that it is possible to cultivate *Goniolimon* species in greenhouses at low temperature level allowing prolonged harvest period. Very scarce information concerning cultivation of species from *Goniolimon* genera are available in specialty literature.

The aim of the present research was to investigate the possibilities of cultivation species from *Goniolimon* in Bulgaria.

Materials and methods

The study concerning *Goniolimon* species began many years ago, but the attempts for their cultivation in Bulgaria started in 1996 at the Institute of Floriculture, Negovan. The experiments were carried out during the period 1996-

2001 with three species: *G. tataricum* Boiss., *G. collinum* (Griseb.) Boiss and *G. besserianum* (Shut ex Reichenb.). First two species are rare and protected, while third one is just protected.

G. tataricum and *G. besserianum* are widespread in rare populations in Haskovo region and along Black Sea Coast. *G. collinum* occurred in Sofia and Kardjali district and also along the Black Sea Coast (near to villages Rusalka, Balchishka Tuzla, Sozopol, and Kiten).

According to our purposes we collected seeds for the investigated species from the native habitats: from Kiten (*G. tataricum*, and *G. collinum*), and from Bodrovo and Haskovo region (*G. besserianum*). After drying and cleaning, seeds were sowed in March. The seedlings were replacing in the beginning of September.

All three species were planted on double high beds (70:40 cm). The following agricultural techniques were applied:

Fertilization: N -100 kg/ha, P – 250 kg/ha, K - 200 kg/ha

Deep ploughing: 30 – 32 cm

Two cultivations

Bed formation.

Because these plants are distinguished with high resistance to drought were irrigated only when it was necessary.

The following morphological parameters were measured: diameter of leaf rosette, plant height, and number of flower stem per plant.

Table 1 Phenological observations during the development of *Goniolimon tataricum*, *Goniolimon besserianum* and *Goniolimon collinum*

Species	Cultivation conditions			Natural conditions		
	Initial flowering	Full flowerage stage	Seed maturity	Initial flowering	Full flowerage stage	Seed maturity
<i>G. tataricum</i>	01.07	12.07	13.08	22.06	02.07	03.08
<i>G. besserianum</i>	30.06	12.07	15.08	20.06	02.07	01.08
<i>G. collinum</i>	02.07	20.07	21.08	23.06	10.07	08.08

All phenological (according to Beideman, 1974) and biometrical (according to Lidanski (1998)) measurements were carried out at both places (native habitats and in the area of cultivation). Average data from 5 years period were subjected to statistical analysis.

Results and discussion

G. tataricum and *G. besserianum* are characterized with mosaic structure of the populations. They have spread along Black Sea Coast in small groups from 5 - 15 plants or even individual plants. *G. collinum* have also occurred at Black Sea Coast and formed bigger groups consisted of 30 - 150 plants.

In the nature blossom in the all three species started at 20-23 June, full flowerage for *G. tataricum* and *G. besserianum* was observed on 2 July, while for *G. collinum* it was observed nearly a week later (Table 1).

During the species cultivation the flowering stages started approximately 10 days later. We suppose that this delay can be explained by the higher altitude of the cultivation areas, or by the different agricultural techniques applied. It was established that mass blossom started a week earlier in *G. tataricum* and *G. besserianum*, compared with *G. collinum*. Whole flowering period takes 20 days irrespective of the conditions.

Seed maturity in the nature for all three species was observed at the begin of August (01 - 08). Cultivated plants reached seed maturity 10-15 days later.

The data regarding plant height, leaf rosette diameter and number of flower stems strongly varied amongst the species are presented in Table 2.

The higher values of these coefficients of variance were measured in *G. tataricum* and minimal values were observed in *G. collinum*. For example *G. tataricum* formed 20-25 flower stem per plant. *G. tataricum*, *G. besserianum* and *G. collinum* under conditions of cultivation (Table 2) have the following characteristics: very large leaf rosette, plants are high, formed more flower stems than the species in the nature.

Morphological parameters such as plant height, leaf rosette diameter and number of flower stems for the native populations (Table 2) were lower compared with the same specie in cultivated conditions.

The levels of parameters changed to a lower extent, a lower variation was observed in case of cultivation. We suppose that the lower variation could be a result of more optimal growing conditions (Vitanova and Kaninski, 2001; Protich, 1987; Alexiev, 1994).

Most differences were observed regarding plant height for *G. tataricum* (CV = 13.03%) and *G. collinum* (CV = 7.48%), with a difference of 5.6%. A difference of 2 - 3% was observed for the other two investigated parameters (leaf rosette diameter and number of flower stems) on the

Table 2 Effect of vegetation area conditions on leaf rosette diameter, plant height and number of flowering stems of *Goniolimon tataricum*, *Goniolimon besserianum* and *Goniolimon collinum* under conditions of cultivation and in nature

Species	Leaf rosette diameter (cm)		Plant height (cm)		Number of flowering stems per plant	
	MV±SE	CV%	MV±SE	CV%	MV±SE	CV%
Cultivation conditions						
<i>G. tataricum</i>	56.10± 4.78	8.52	41.53± 5.41	13.03	25.72± 2.31	11.15
<i>G. besserianum</i>	31.57± 3.30	10.45	29.00± 2.49	8.59	17.97± 2.10	11.69
<i>G. collinum</i>	27.95± 2.10	7.51	20.05± 1.50	7.48	10.05± 1.50	14.93
Natural conditions						
<i>G. tataricum</i>	13.00± 2.81	21.62	32.08± 6.23	19.42	8.65± 2.57	29.71
<i>G. besserianum</i>	11.97± 2.22	18.55	17.12± 3.24	18.93	5.80± 1.65	28.45
<i>G. collinum</i>	8.00± 1.51	18.87	9.85± 1.83	18.58	4.43± 1.26	28.44

Mean values (MV)± standard error (SE); CV % - Coefficient of variation

studied species (Table 2). The variation of the coefficients on the studied parameters in the native species populations were of 2 - 2.5 times higher than those under conditions of cultivation.

Conclusions

Diameter of leaf rosette, plant height and number of flower stems per plant are strongly influenced by the way of cultivation and by the specific characteristics of the species.

Cultivated species showed higher values of the studied morphological parameters than the species from the native habitats. Maximal values of leaf rosette diameter, plant height and number of flower stems per plant were observed in *G. tataricum* irrespectively of the conditions.

Coefficients of variance of all studied characteristics in natural species populations were 2 - 2.5 times higher than those obtained in cultivated species.

References

- Alarcon, J. J., A. Morales, A. Torrecillas, M. Y. Sanchez-Blanco, 1999, Growth, water relations and accumulation of organic solutes in the halophyte *Limonium latifolium* cv. Avignon and its interspecific hybrid *L. caspia* x *L. latifolium* cv. Beltaard during salt stress. *Journal of Plant Physiology* 5-6, 795-801.
- Alexiev, Al., 1994, The cultivation or rare decorative plants. IPPS in Bulgaria, Scientific conference (30. 10 – 01. 11. 1994) 23 – 25.
- Anchev, M., 1982, Bulgarian Flora, V. Fam. *Plumbaginaceae*, 342-364.
- Beideman, I. N., 1974, Method fenologicheskikh nabljudenii pri geobotanicheskikh izsledovanija M., 113.
- Biodiversity Protection Act of Bulgarian Parliament, 2002, Bulgarian Official Gazette, №77.
- Kojucharov, S., 1992, Opredelitel na vishite rastenija v Bulgaria, 562-564.
- Lidanski, T., 1998, Statisticheski metodi v biologijata i selskoto stopanstvo.
- Palacios, C., F. Gonzales, 1999, AFLP analysis of the critically endangered *Limonium cavanillesii* (*Plumbaginaceae*). *Journal of Heredity* 4, 485-489.
- Protich, Nicolina, 1987, Studies on six bulb plant species on the Bulgarian flora promising for flower production. *Plant Science* XXIV (6), 59 – 63.
- Rizzotto, M., 1999, Research on the genus *Limonium* (*Plumbaginaceae*) in the Tuscan archipelago (Italy). *Webbia*, 2, 241-282.
- Salmon, C. E., 1971, *Journal of Botany* 53, 33-34.
- Velchev, V., 1984, Bulgarian Red Book 1, 287-288.
- Vitanova, Gely, A. Kaninski, 2001, Some biological specifics at cultivation of species belong to g. *Goniolimon*. Jubilee scientific session "80 years Agricultural Education in Bulgaria" - Plovdiv

XLVI (4), 167 – 172.

Yanev, A., 1959, Decorativni rastenija vav florata na Bulgaria, 377-379.