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In Situ Conservation of Some Rare and Endemic Species of Iridaceae Family in National Botanical Garden of Georgia

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Abstract. The article covers some information on anthropogenic influence upon natural ecosystems that is considered to be one of the strongest factors for reducing biodiversity of Georgian flora.

With this purpose, some species of fam. ***Iridaceae*** that need to be protected under ***in situ*** conditions are being studied.

The paper focuses on the fam. **Iridaceae**. This family is particularly interesting as it unites a considerable number of valuable, beautifully flowering plants with ornamental leaves, representing different biomorphs. Particularly rare and endangered species are: ***Iris iberica***, *I.* ***Grossheimii***, ***I. Lycotis***, ***I. Camillae***, ***I. Elegantissima***, etc.

We have carried out complex studies of bio-ecological peculiarities of bulbous geophytes and ephemeroids of genus ***Iridodictyum winogradowii***, ***Ir. Reticulatum***, ***Siphonastilis lasica*** and ***Iuno caucasica***. There has been studied rhythm of growth and development of vital cycle of monocarpic shootings and ways of their propagation in the sub arid zone of East Georgia. There should be mentioned that they have perfectly adapted to the conditions.

Such rare species of rootstock plants like ***Iris iberica***, *I.* ***Carthalinical***. ***Aphylla***, *I.* ***graminea***, *I.* ***imbricata***, *I.* **timofejewii**, *I.* ***prilipkoana***, *I.* ***musulmanica***, ***Siphonastilis lazica*** and others even give abundant self-seedlings that undoubtedly makes it possible to protect them from being finally extinct.

All the investigated plants can be recommended for using in landscape architecture under the conditions of East Georgia that will contribute to conservation of the valuable genofond of relict and endemic plants of Georgian flora.

The work deals with the results of in situ conservation of some of rare and endemic species of fam. Iridaceae from Iridaceae Juss family.

According to IUCN categories, the studied taxaare discussed as the endangered species in nature.

Keywords: endemic; plants; endangered; species; relict; *ex situ; in situ* conservation.

Introduction

The problem of protecting vegetable cover as well as the whole environment has never had such a great importance as today. Because of human impact the natural landscape is being sharply altered, biogeocenose is violated and is followed by ecological changes and decrease of flora species.

Protection of biodiversity of Caucasus, particularly of Georgia, and methods of purposeful utilization are not properly defined and studied. Therefore, protection and preservation of, rare, endemic and relict species through the ex-situ conservation are considered very serious and important matter.

Botanical gardens play special role in vegetation preserving, their activities are based on existing of plant collections and scientific-research works carried out on them. From this viewpoint it's quite interesting to study some of the iris species form the fam. **Iridacecae** in the conditions of ***ex situ*** conservation in semiarid zone of Tbilisi.

Fam. Iridaceous is cosmopolitan, it combines 82 names and about 17000 species, that is characteristic for South Africa, east Mediterranean, central and North America. Fam. Iridaceous is represented by 210 species, spread in Eurasia, North Africa and North America. Thirty species grow in Caucasus and 11 species – in Georgia [1].

They belong to ecologically open space plants; grow in swampy places as well as in different types of meadows, from the lowlands to the highlands.

According to lots of years of observation, it must be mentioned, that in recent period the total number of nearly all species of fam. Iridaceae is significantly reduced. Some of their populations are destroyed due to the violation of where bouts conditions; the majority of them are found sporadically in the form of individuals or small groups. They are differentiated morphologically, bio-ecologically and are distinguished by the diversity. Most of them adapt well to the climate conditions of Tbilisi that allows their introduction in culture.

Materials and Methods

Over the years, bio-ecological observations are carried out on Iris species introduced in National Botanical Garden of Georgia in conditions of their ex-situ conservation.

Genera *Iuno*Tratt; -I*uno caucasica* (Hoffm.) Klatt; *Iridodictyum – Iridodictyum winogradowii* (Fomin) Rodionenko*; Iridodictyum reticulatum* (Bieb.) Rodionenko*; Siphinostylis* W. Schulze.-*Siphinostyli slazica* (Albov) W.Schulze have been studied [6].

From genus Iris the following species have been studied: *Iris aphylla* L., *I. camillae* Grossh.,*I.carthaliniae* Fomin, I.graminea L., *I. elegantissima* Sosn., *I. grossheimii* Woronow ex Grossh., *I. hungarica*. Waldst.,*I. iberica* Hoffm., *I. imbricate* Lindl., *I. lycotis* Woronow., *I. musulmanica* Fomin, *I. prilipkoana* Kem.-Nath, *I. pseudacorus* L., *I. timofejewii* Woronow [6].

We have studied: bio-ecological peculiarities of each species, rhythm of development of underground and over ground organs of investigated plants, identifying potential abilities of adaptation, changeability of development rhythm, renewal bud formation in bulb, root formation, determination of bud type location, and time of formation and development of monocarpstem, vegetative and generative reproduction.

The species have been divided into phenological groups: evergreen, summer green and autumn-wintergreen.

Braun-Blanqet's method (Braun-Blanqet, 1951) was used for measuring viability and productivity of target species. Phenological observations were carried out on each parameter of a plant. We used the Methodology of Phenological observations in Botanical gardens (Methodology of Phonological Observations in Botanical Gardens, 1975) [4]. Vital form of plant was studied by Raunkier's (Raunkier 1934) method [3]. Criteria of qualification of critically endangered species were determined according to IUCN categories. Nomenclature of the species was approved according to S. Czerepanov (1995) and R.Gagnidze (2005) [5, 6].

Results and Discussion

Thus, fam. Iridaceae plants are differentiated according to the different heights from the sea level. Therefore, they have different requirements in culture towards the moisture; e.g.: *Iris pseudacorus, I.sibirica, Siphonostylis lazica, Iris carthalinica, Iuno caucasica* develope well in wetlands and loose soils, and *Iris prilipkoana, I.camillae, I.graminea, I.hungarica, I.elegantissima, I.imbricata, I.iberica, I.lycotis, I.aphylla* adapt well to sunny, dry and stony places in Tbilisi and are characterized with satisfying growth and development.

Based on eco-morphological peculiarities, *Iris musulmanica, I. graminea, I. sibirica, I. pumila, Siphonostylis lazica* reveal tropic and sub tropic features during the whole vegetative period and remain evergreen species, meanwhile other representatives of fam. Iridaceae, like *Iridodictyum winogradowii, I.reticulata, Iuno caucasica* move to the biological rest period like ephemeroid plants.

*Iridodictyum winogradowi*is characterized be the interesting bio-ecology. That is noteworthy for being included in the Red Book of Georgia as a rare, endemic plant of local distribution. Although it is an Apinebelt plant (its classical spreading place is Mountain Lomis 2157 m. high from the sea level) it was adapted to the sub arid zone of Tbilisi. In culture it begins vegetation in the second decade of March, delivers small leafless flower before the stem development, and after the finishing of blossoming delivers 2 short four facet leaves. Blossoming lasts for 8-10 days. After the seed maturing, the root depletes completely and bulbs begin existing independently.

Compared with it, *Iridodictyum reticulata* and *Iuno caucasica* adjust better to the rocky soil of National Botanical Garden, as these plants grow in shrubs and steppes in the lower, middle, and upper belts of mountain. They start flowering in February and March. Over ground organs get dry in May. Their vegetation (over ground) lasts 4-5 weeks, and during the rest period, generative and vegetative organ formation takes place in underground organ (bulb).

Iridodictyum winogradowii, I.reticulatum and *Iuno caucasica* are the ephemeroids of special group, bulb plants, that have developed special growth rhythm during their evolutionary development, which enables them to finish vegetation and pass into the biological rest period before the unfavorable conditions (summer, drought, lack of sediments, etc.). Depending on the climate conditions of the current year, the plants begin flowering from February-March. Rapid flowering begins along with the rise of temperature. This period lasts 8-10 days. After the bud formation, they develop long quadrangular stems, which dry in May-June, right after the seed maturing. During the rest period 1 or 2 bulbs develop on the maternal bulbs and continue their development with them in the soil. There the bulbs continue slow growth and still develop new buds, flower stalk and leaves.

According to their biological and ecological peculiarities, we have divided the mentioned plants into the following groups:

1. Hydrophytes: *Iris pseudacorus, I.musulmanica, I.sibirica.*
2. Mezofites*: Iris carthaliniae, I.prilipkoana, I.imbricata, Siphonosty lislazica.*
3. Xero-mezofites: *Iris imbricata, I.pumila, I.graminea, I.timofejewii, I.aphylla*
4. Mezo-xerofites: *Iris iberica, I.lycotis, I.elegantissima, I.camillae, I.paradoxa, I.grossheimii.*
5. Krio-mezofites: *Iridodictyum reticulatum, I. winogradowii, Iuno caucasica.*

Representatives of *Iris iberica, I. elegantissima, I.camillae, I.paradoxa, I.lycotis*and *I.grossheimi* are characterized by almost the same bio-ecological peculiarities. After the finishing of floweringin June – July of the same year, the plants lose their over ground parts and develop the parts underground for the next year. Here conception and development of monocarp stem buds take place, which, as we have observed, lasts for more than two years. In the first year root-close leaves and flower stems are formed, in the next year the stem passes into the generative phase of development: the plant blossoms and then dies. They stay over ground just for 3-4 months, and vegetate underground for 7-8 months.

As for Georgian *Iris iberica,* this eastern Caucasus endemic specie is included in the Red List of Georgia. In culture, it starts vegetation in autumn, from September, after the summer rest period; Active vegetation begins in spring, from March and lasts 120-145 days; Blossoms in April

and ripens in June. 56- to 60 wrinkled seeds are per box. The whole development cycle finishes with losing over ground parts after the vegetation. In summer and winter period, the vital processes are decelerated.

Important morphological changes take place on every stage of development of experimental plants, from blossoming to seed ripening. Development of morphogenesis differs according to species in culture. Therefore, we found it necessary to study bio-ecological peculiarities of each species that allowed us their protection in culture.

The studies of morphogenesis have assured us that development terms of generative stem are changeable according to the species due to their seasonal development.

The flower bud development and flowering period depend on their geographical and ecological conditions; e.g. generative stems of *Iris carthaliniae, I.imbricata, I.prilipkoana, Siphonostylis lazica* form in earlier terms than those of *Iridodictyum winogradowii, Iris timofejewii* and others. These plants belong to Alpine meadow plants, and therefore flower stem forms later than in lower belt plants; e.g., *Iris prilipkoana, I.musulmanica* are characterized by the high amplitude of adaptation in culture. Here they advance in flower bud conception in the top and lateral buds.

Morphogenesis studies of Iris (fam. *Iridaceae)* in Tbilisi conditions revealed that two rest periods in winter and summer are very insignificant. In winter, with the fall of temperature, minor break for organ formation can be noticed on the central and lateral stems of plants. The flowers form and develop almost simultaneously, but very slowly. In the hot and dry, vegetative period of a year (June, July, August) monocarp stem development is in progress, that is advanced by the conception and differentiation of new update buds. In the first year, after the bud opening, the plant develops assimilating leaves, and in the next year – generative stem, which dies after the finishing of blossoming and fruit bearing. Update buds are formed on them every year during spring and summer, and leaves are formed in autumn-winter period. In the time of seasonal development, the period of flower bud development depends on their geographic and ecological peculiarities. If the plant develops healthy, able to arise seeds in culture, it means that it is possible to protect and save this specie. Observations were carried out on the flower fertilization processes in order to prove this.

It has been revealed that Iris flower fertilization is performed through the cross-pollinating by insects, mainly by the sucking ones. Cross-pollination is also promoted by the biological phenomena – protandry, which proves that in the flower the stamen matures before the pistil. There also occur self-pollination cases, but in these cases, the fruits and the seeds are less developed.

The time and ability of seed arising differ according to the species, as both fertile and sterile kind of seeds can be found in the box. Rapid reproduction and survival of different kind of species depend on the seed quality; e.g., *Iris carthaliniae I. prilipkoana, I.iberica* and *I.aphylla* and other species produce about 30 fertile seeds per box. It must be mentioned that the seeds do not sprout simultaneously. Shoots appear gradually each year, the percentage of which is approximately 10-30 %.

The first blossoming varies from three to twelve years according to the species during the propagation with seed. Reproduction of *Iris prilipkoana, I.carthaliniae* can be performed faster by the root division.

Studies of bio-ecological peculiarities of the experimental plants have revealed that in order of reproduction it is possible to divide them by the location and amount of renewal buds existing on the roots. Dividing the plants in autumn has a good result. The roots must be divided in the way that each divided one contained several buds. These kind of plants blossom much earlier (than those bred from the seeds). The first flowering begins in 2-3 years after the dividing, which is more profitable for ***ex situ*** and ***in situ*** conservation.

Almost all of the studied plants are rare, local, relict, and endemic species, included in the Red Book. At present, these species are reduced in number. These species passed through the long way of evolution to reach the present state and nowadays they are under the danger of extinction, as unfortunately, there are no appropriate steps taken to preserve and protect them. Thus, collection of fam. *Iridaceae* family species in Georgian National Botanical Garden is very important for *in situ* conservation, as it will contribute to the restoration of plant consistence and amount in their natural distribution area. It will also contribute to survival of endemic and relict

species of Georgian flora under the conditions of ***ex situ*** conservation. It will allow us to maintain this valuable gene pool for the next generations.

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