

Botany

The Results of Introduction of Some Red List Georgian Species in the National Botanical Garden of Georgia (Tbilisi)

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ABSTRACT. The paper discusses the results of introduction of some Georgian Red List species in the National Botanical Garden of Georgia (NBGG) viz.: *Pterocarya pterocarpa* (Michx) Kunth ex I. Iljinsk, *Acer ibericum* Bieb., *Juniperus foetidissima* Willd., *Berberis iberica* Stev. & Fisch. ex DC., *Salvia garedji* Troitzk., *Pistacia mutica* Fisch. & C. A. Mey. and *Pyrus sachokiana* Kuthateladze. The paper covers information on the principal phenological phases for each species, their natural distribution ranges and habitats. All considered species are distinguished by high adaptive capability. The principal phenological indices observed in nature and the National Botanical Garden of Georgia are almost identical. This is mostly due to more or less similar physico-geographical conditions of their natural ranges and the NBGG. At the same time, the studied plants were provided with niches which are similar to their natural habitats in the NBGG. © 2011 Bull. Georg. Natl. Acad. Sci.

Key words: vegetation, flowering, fructification, adaptation.

Normal growth and development of a plant is reflected in its seasonal life cycle. Under the conditions of introduction normal development process of seasonal rhythm is one of the main indicators of a plant's adaptive capability.

We have studied the phenology of some Georgian Red List species [2] introduced to the National Botanical Garden of Georgia (former Tbilisi National Botanical Garden), viz.: *Pterocarya pterocarpa* (Michx)Kunth ex I. Iljinsk, *Acer ibericum* Bieb., *Juniperus foetidissima* Willd., *Berberis iberica* Stev. & Fisch. ex DC., *Salvia garedji* Troitzk., *Pistacia mutica* Fisch. & C. A. Mey. and *Pyrus sachokiana* Kuthateladze. The results of the research are given below. Taxon Latin names are given according to R. Gagnidze [1].

1. *Pterocarya pterocarpa* (Michx) Kunth ex I. Iljinsk (Fam. Juglandaceae) (Fig. 1)

Distribution:

General distribution: Southwest Asia, South Caucasus;

Georgia: Abkhazia, Samegrelo, Imereti, Guria, Adjara, Kakheti, Kiziki;

Geographical range type: Caucasian-Southwest Asian (South Caucasian-Southwest Asian);

Habitat: lowland and lower mountain belt; humid lowland and riverine terraces, alluvial and silt soils, shingles; riparian forest.

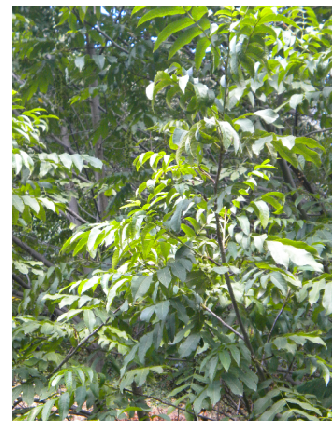
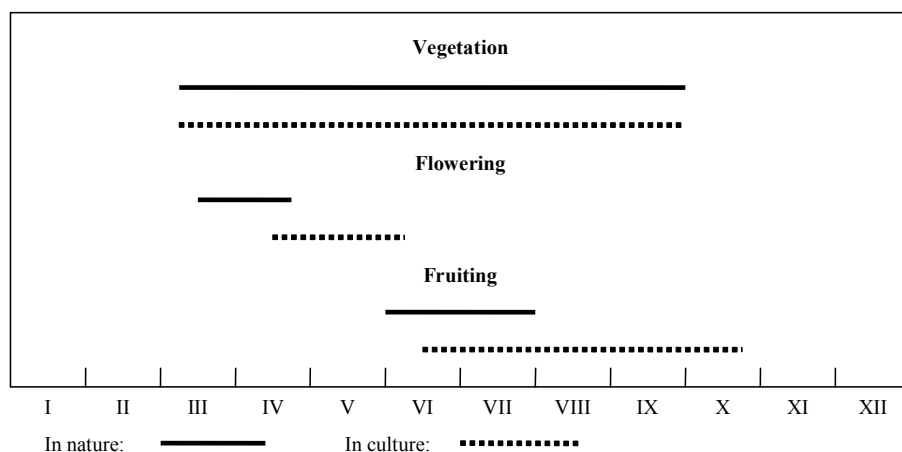


Fig.1. Phenology of *Pterocarya pterocarpa* in nature and culture (the NBGG)

It is a Tertiary relict.

In the National Botanical Garden of Georgia (NBGG) vegetation is observed to begin in early March (Fig. 1). The overwintered bud, developed in September of the previous year, begins active growth and development in spring (March-April) and opens with 6-12 pair leaves. In this phase unisexual whitish- greenish flowers are seen in the ament inflorescence. It flowers from April till the end of June. Fructification begins in June. In September and October ripe fruit is dark brown that remains on branches after leaf fall even in December-January. Annual growth of a sprout differs by years. It is generally about 65-85 cm. It yields 17-20 years after it was planted. Vegetative period in nature and the NBGG coincides, though flowering and fructification phases occurs later and lasts longer in comparison with natural conditions.

2. *Acer ibericum* Bieb. (Fam.: Aceraceae) (Fig. 2).

Distribution:

General distribution: Southwest Asia (Northeast Turkey, North and Northwest Iran), Caucasus (South Caucasus);

Georgia: Kartli (Tbilisi environs), Kiziki, Trialeti (Tetri Tskaro, Orbeti rock, the river Aslanka gorge, the river Khrami gorge), Kvemo Kartli;

Geographical range type: Caucasian-Southwest Asian (South Caucasian-Southwest Asian);

Habitat: lower and middle mountain belt; slopes, ravine-gullies; arid forest cinnamonic, humus-carbonate and forest cinnamonic soils; arid forest and foothill deciduous forests (dry oak and ash tree forests); rarely forms small stands of arid forest.

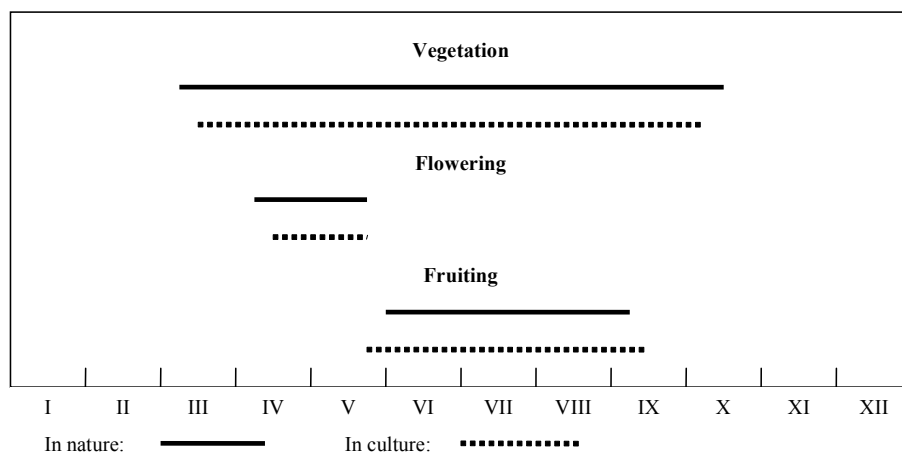


Fig. 2. Phenology of *Acer ibericum* in nature and culture (the NBGG)

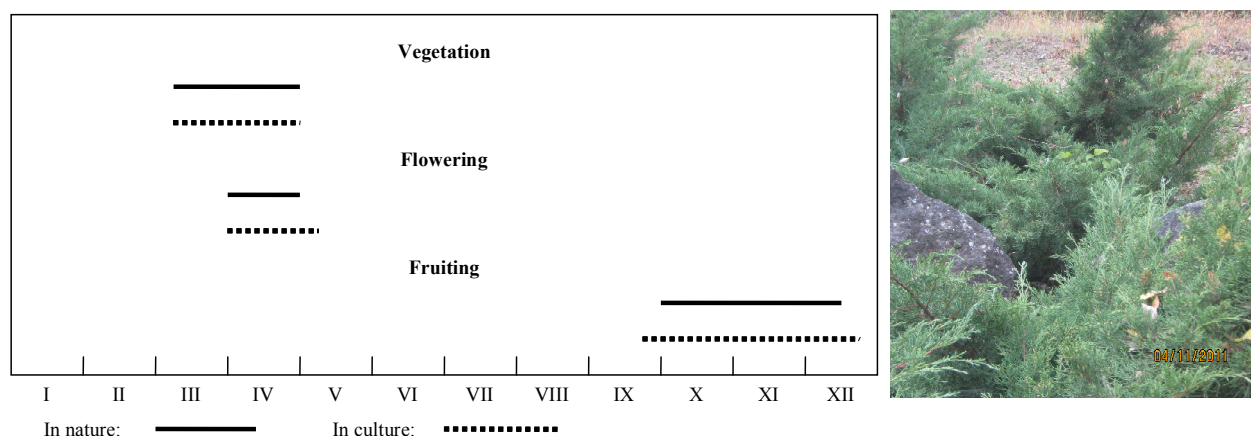


Fig. 3. Phenology of *Juniperus foetidissima* in nature and culture (the NBGG)

In the NBGG it begins vegetation in March. Flowers in April-May. In comparison with the natural conditions these phases are observed to occur 7-10 days earlier. Fructification lasts from July to September. In comparison with the previous phases fructification begins 7-8 days earlier in nature. Seeds are characterized by good germination ability. If seeds are planted in autumn they produce numerous (90-95%) shoots.

3. *Juniperus foetidissima* Willd. (Fam.: Cupressaceae) (Fig. 3)

Distribution:

General distribution: East Mediterranean (Balkan, Cyprus), Crimea, Southwest Asia (Anatolia), Caucasus;

Georgia: Kartli, Kiziki, Gare Kakheta, Trialeti (Manglisi);

Geographical range type: Mediterranean (East Mediterranean);

Habitat: Lower and middle mountain belt; dry slopes and flattened areas, ravine-gullies; arid forest cinnamonic, grey cinnamonic, clayey and loamy soils, claysandy, sandstones and rocky substrate, rarely clayey and loamy badlands; arid forests (edificator-dominants), secondary shrubbery of shibliak type and rarely, phryganoid vegetation.

It is a Tertiary relict.

It is distinguished by slow growth in nature as well as in the NBGG. Annual amount of growth is 8-12 cm. Vegetation period and duration in nature and culture are the same (Fig. 3). Flowers in April-May. Fruit ripens the year after it begins flowering. Flowering and fructification duration is slightly longer (7-10 days) in comparison with that in nature. It does not develop any seedlings or

offshoots. We succeeded in propagating the plant by vegetative means (cuttings and layering) under ex situ conservation conditions. As a result, 16 specimens have been propagated. At present, their height is approximately 90-120 cm.

4. *Berberis iberica* Stev. & Fisch. ex DC. (Fam.: Berberidaceae) (Fig. 4)

Distribution:

General distribution: Caucasus;

Georgia: Kartli, Gare Kakheta, Kiziki;

Geographical range type: Caucasian (endemic of East Caucasus);

Habitat: Lower and middle mountain belt; dry slopes and flattened areas, ravines and their debris cones; stony and skeletal arid forest cinnamonic soils, shingles; arid forests and hemixerophilous shrubberies.

Vegetation in Georgian Botanical Garden begins late in March (or from April). Sprouts are formed from the buds located along the stalk as well as at the neck of roots. Sprout growth is about 45-50 cm, which lignifies and turns brown the same year. The sprouts grown out from the buds that were germinated in the root neck the previous year develop gradually.

Flowering begins from May and lasts 36-48 days. Fruit begins ripening from September. It develops seeds of high germination (90-97%) ability. First flowering is observed 12-13 years after the germination. Phenological phases coincide in nature and in culture.

The best propagation method in culture is vegetative division and layering. This propagation method ensures availability of more planting material in the shortest time.

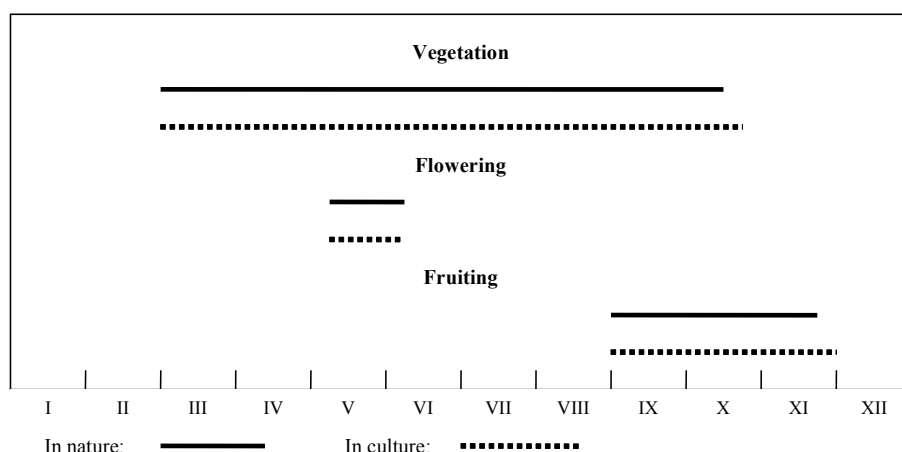


Fig. 4. Phenology of *Berberis iberica* in nature and culture (the NBGG)

5. *Salvia garedji* Troitzk. (Fam.: Labiatae) (Fig. 5)

Distribution:

General distribution: Caucasus (South Caucasus);

Georgia: Gare Kakheti (Garedji valley);

Geographical range type: Caucasian (South Caucasian); South Caucasian endemic;

Habitat: Dry slopes and ravines; loamy soils; phryganoid vegetation.

It is distinguished by slow growth in nature as well as in Georgian National Botanical Garden. It begins vegetation in March like in Nature. Flowering begins from April and its duration lasts longer in comparison with that in nature lasts longer (until the end of June, sometimes till the mid of July).

Fructification (July-August) almost coincides. It is propagated by seeds and vegetative means (rootlets). It germinates 3 months after the sowing. Seeds are characterized by poor germination ability. (12-14 %).

The experiments show that the best way of propagation in culture is division of rootlets. In case this propagation method is used the plant begins fructification in 2-3 years. If the plant is propagated by seeds flowering and consequently fructification begins much later, in 5-6 years.

6. *Pistacia mutica* Fisch. & C.A. Mey (Fam.: Anacardiaceae) (Fig. 6)

Distribution:

General distribution: Mediterranean, Southwest Asia, Crimea, Caucasus

Georgia: Kartli, Gare Kakhet, Kiziki, Trialeti (villages: Samshvilde, Tetri Tskaro, the river Khrami gorge), Kvemo Kartli;

Geographical range type: Mediterranean, Southwest Asian;

Habitat: Lower and middle mountain belt; slopes, plains, hills and debris cones, river and ravine terrace,

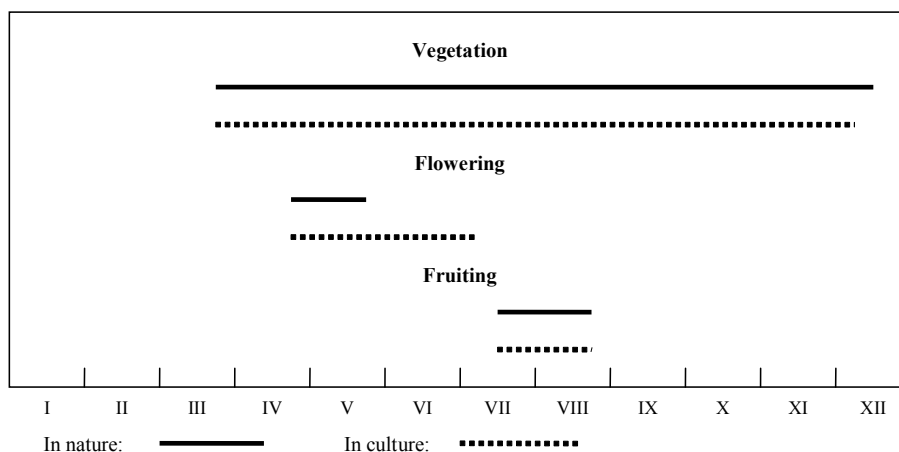
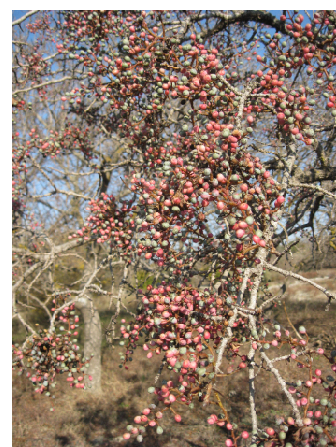
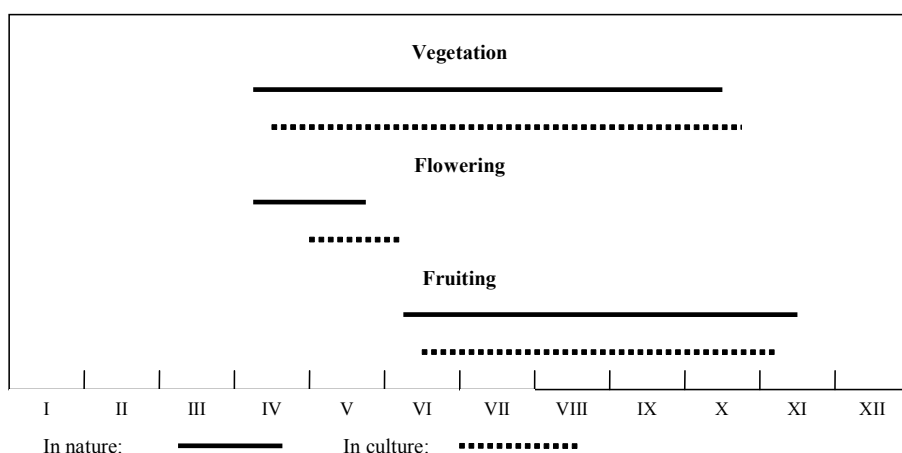
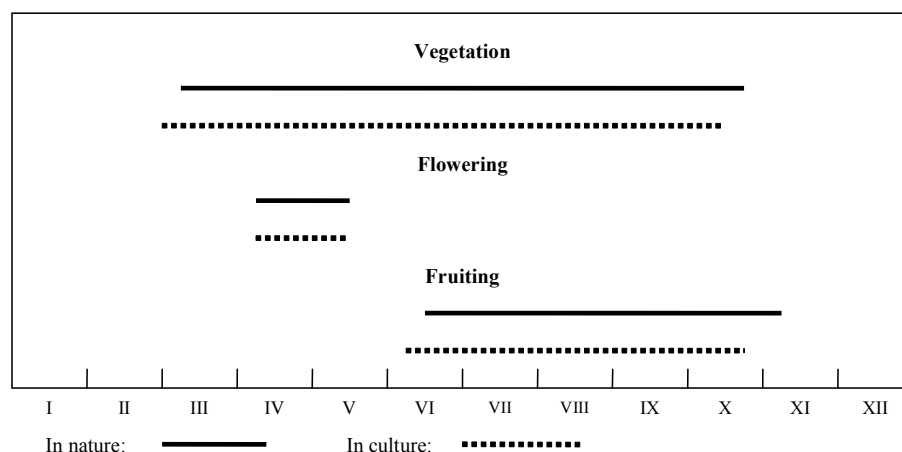


Fig. 5. Phenology of *Salvia garedji* in nature and culture (the NBGG)

Fig. 6. Phenology of *Pistacia mutica* in nature and culture (the NBGG)Fig. 7. Phenology of *Pyrus sachokiana* in nature and culture (the NBGG)

ravine-gullies, rarely clayey and claysandy badlands, arid forest cinnamonic soils, slightly and moderately saline grey soils and also sandstones; arid forests (one of edificator-dominants), hemixerophilous shrubberies, rarely phryganoid vegetations.

It is a Tertiary relict.

In comparison with the nature vegetation and particularly flowering period is delayed. In the NBGG it flowers from May till the first decade of June. In the NBGG young specimens give their first flowers at the age of 12-14 years. Fructification continues from June to September. Its duration, is slightly shorter (by 10-15 days) in comparison with nature. It should be mentioned that fruit does not develop properly - they become black and fall down. Consequently, propagation by seeds is impossible.

7. *Pyrus sachokiana* Kutatheladze (Fam.: Rosaceae) (Fig. 7)

Distribution:

Georgia: Kiziki (Mt. Shavimta), Meskhети;

Geographical range type: Caucasian (South Caucasian), Georgian endemic.

Habitat: Lower mountain belt; dry slopes; humus-carbonate soils; forms arid forest-like small stands; also occur in shrubberies.

In the NBGG vegetation is observed to commence from the end of February. The well developed buds on the branches begin active growth and development in March. From each bud about 6-12 assimilating leaves develop. In June sprouts lignify. Annual sprout growth is 23-30 cm. Flowers from April. Late in August the fruit diameter is 3.8 cm, width – 6 cm, petiole -3.6 cm. By this time fruit is still green. The sprout with fruit ends in a thorn. The plant does not have this morphological sign under natural conditions. This plant is observed to have vegetation and fructification phases 7-10 days earlier. Fairly visible (3-3.5) buds of the following year are formed on the sprouts in September and October in comparison with natural conditions. They begin active vegetation process in the following spring.

Plant leaves become yellow from October when defoliation begins and the plant falls into the phase of winter dormancy.

Under cultural conditions we succeeded in propagation of 28 specimens by vegetative means. At present their height is about 200-250 cm.

The data represented in this paper show that all studied species are distinguished by high adaptive quality in the NBGG. The principal phenological indi-

ces both in nature and Georgian National Botanical Garden are almost identical. (see minor differences in Fig. 1-7). This is due to more or less similar physico-geographical conditions of their natural distribution ranges and the NBGG [3]. At the same time, the investigated plants were provided with niches similar to their natural habitat in the NBGG.

ბოტანიკა

“საქართველოს წითელი ნუსხის” ზოგიერთი სახეობის ინტროდუქციის შედეგი საქართველოს ეროვნულ ბოტანიკურ ბაღში (თბილისი)

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(წარმოდგენილია აკადემიის წევრის გ. ნახუცრიშვილის მიერ)

განხილულია “საქართველოს წითელი ნუსხის” ზოგიერთი სახეობის ინტროდუქციის შედეგი საქართველოს ეროვნულ ბოტანიკურ ბაღში (თბილისი). ეს სახეობებია: *Pterocarya pterocarpa* (Michx.) Kunth ex I. Iljinsk., *Acer ibericum* Bieb., *Juniperus foetidissima* Willd., *Berberis ibérica* Stev. & Fisch. ex DC., *Salvia garedjii* Troitzk., *Pistacia mutica* Fisch. & C. A. Mey. და *Pyrus sachokiana* Kuthatheladze. თითოეული სახეობისათვის მოცემულია ძირითადი ფენოლოგიური მაჩვენებლები, ასევე მათი ბუნებრივი არეალები და ჰაბიტატები. ყველა განხილული სახეობა ადაპტაციის მაღალი ხარისხით გამოირჩევა. ამაზე მიუთითებს მათი ძირითადი ფენოლოგიური მაჩვენებლებიც ბუნებასა და საქართველოს ეროვნულ ბოტანიკურ ბაღში, რომლებიც თითქმის იდენტურია. ჩვენი აზრით, განპირობებულია მათი ბუნებრივი ჰაბიტატების ფიზიკურ-გეოგრაფიული პირობებისა და საქართველოს ეროვნული ბოტანიკური ბაღის შესაბამისი მონაცემების მსგავსებით. ამასთანავე, შესწავლილ მცენარეებს საქართველოს ეროვნულ ბოტანიკურ ბაღში შექმნილი აქვთ ბუნებრივი ჰაბიტატების მსგავსი საარსებო ნიშები.

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