

THE CORNELIAN CHERRY (*Cornus mas* L.):
COLLECTION, PRESERVATION, AND UTILIZATION
OF GENETIC RESOURCES

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A B S T R A C T

The Cornelian cherry has only recently captured the attention of fruit breeders. Systematic collection, selection and breeding programs have recently been established in the Ukraine, Bulgaria, Slovakia, Austria, Yugoslavia, France, Germany, Poland and Turkey.

In Ukraine, the main collection of Cornelian cherry genotypes is located at the Hryshko National Botanical Gardens in Kiev, operated by the Ukrainian National Academy of Sciences. The collection contains fourteen officially registered cultivars as well as numerous hybrids developed during the course of the breeding and selection program. The genetic pool consists of over a hundred wild and cultivated genotypes from Ukraine, Bulgaria, Slovakia, the United Kingdom, Austria and Georgia.

The best varieties in the collection are 'Evgenia', 'Semen', 'Koralovy Marka', 'Svetlyachok', 'Elena', 'Vydubetsky', 'Elegantny', 'Luk'anovsky', 'Exotichesky', 'Radost', 'Nikolka', 'Vavilovets', 'Vladimirsky' and 'Grenader'.

The collection of Cornelian cherry genotypes at the Hryshko National Botanical Gardens in Kiev represents a wealth of biological and economic potential, as well as a rich source of material for further breeding and selection.

Key words: Cornelian cherry, genetic collection, selection, varieties; National Botanical Gardens in Kiev

INTRODUCTION

Until recently, Cornelian cherries were mostly gathered from bushes growing in the wild. Habitat erosion has meant that it has become harder and

harder to meet the demand for the fruit. Furthermore, wild bushes bear irregular yields of small, dry fruits, especially in dry years.

The Cornelian cherry has only recently captured the attention of fruit breeders. Systematic collection, selection and breeding programs have recently been established in the Ukraine, Bulgaria, Slovakia, Austria, Yugoslavia, France, Germany, Poland and Turkey.

The Cornelian cherry is a valuable food, medicinal and ornamental plant (Foster, 1955). It is rarely attacked by pests and diseases, and can be grown with minimal use of chemicals (Klimenko, 1990). It is also winter-hardy and drought resistant, and does not require much care. The cornelian cherry is therefore a very profitable crop.

The fruits of the Cornelian cherry can be dark red, cherry red, pink or yellow. They can be oval, pear-shaped or bottle-shaped. Average fruit weight ranges from 5.0 to 8.0 grams. The stone makes up 7.5 to 11.0% of the total fruit weight.

In the wild, yield ranges from 2.8 to 4.8 kg per bush. With ideal amounts of sunshine and rain, yields can reach 10 kg per bush (Kosykh, 1967; Leontiak, 1976). Under cultivation, the Cornelian cherry regularly bears abundant yields of large, juicy fruits; yield per plant ranges from 30 to 80 kg (Klastersky, 1960; Lancaster, 1990; Pirc, 1994; Klimenko, 2000).

The aim of this study was to collect specimens of the Cornelian cherry from all over the Ukraine at the Hryshko National Botanical Gardens in Kiev, evaluate the acquisitions in the collection in terms of productivity, fruit quality and winter hardiness, and to select those varieties best suited to the needs of commercial growers and amateur gardeners.

MATERIAL AND METHODS

Specimens of the Cornelian cherry were collected from practically every region of the Ukraine and added to the collection at the Hryshko National Botanical Gardens in Kiev. Specimens were collected from a variety of sources, including experimental orchards, research institutions, arboretums, commercial farms, private gardens, the grounds of abandoned mansions, as well as from the wild. Over 350 different varieties were encountered, of which over 100 were selected for the collection and propagated for further study and breeding.

The collection of Cornelian cherry genotypes at the Hryshko National Botanical Gardens in Kiev represents a wealth of biological and economic potential, as well as a rich source of material for further breeding and selection. The first step of our breeding program was to identify the most promising candidates for breeding. The second step was to develop hybrids with specific properties and features. Two of the cultivars, 'Svetlyachok' and 'Exotichesky', were developed as the result of somatic mutations.

RESULTS

The greatest variety among the Cornelian cherry varieties encountered was in the Crimea (Kosykh, 1967).

The Cornelian cherry is considered to grow mostly in warmer, southern climates. Some researchers think that the primeval forests in which the Cornelian cherry naturally occurs are remnants of late Pliocene forests (Kleopov, 1990; Udra, 1984; Sheliag-Sosonko, 1974). The Cornelian cherry, like other components of the forest community, survived the cold quaternary period *in situ*.

Regular selection of the Cornelian cherry has not been carried out long. There is little information on its cultivation outside the Ukraine (Browich, 1986; Hofman, 1954; Simmons, 1972; Tyskiewich, 1977). Recently, there has been a lot of work in Europe and America on Cornelian cherry cultivation and on developing new varieties (Dudukal and Rudenko, 1984; Pirc, 1990; Reich, 1996).

In 1985, two interesting cultivars were registered in Bulgaria by Tsolo Nagov of the Bulgarian research and production company "Sortovi Semena i Posadchen Material". 'Kazanlytsky' has pear-shaped fruits, and 'Pancharevsky' has cylindrical fruits.

In 1989, two cultivars, 'Dvin' and 'Titus', were registered by the Slovakian Institute of Horticulture.

In 1991, 'Joliko', which had been developed by Dr. Helmut Pirc from Austria, was registered by the Arnold Arboretum in the United States. 'Joliko' has large fruits with an average weight of 5.6 g. The stone makes up 10% of the total fruit weight (Pirc, 1994). 'Joliko' is being widely evaluated and propagated by fruit-growers in Austria, Germany and Switzerland.

In 1992, another cultivar was registered in France.

The Azerbaijan Institute of Genetics and Selection has developed the cultivars 'Armudi-Zogal' and 'Ak-Zogal'.

Extensive investigations of the natural gene pool as well as breeding of new cultivars are underway at the Central Institute of Horticulture in Yalovaya, Turkey, and at the Department of Horticulture of the Tbilisi Institute of Agriculture in Georgia. G. Leontyak in Moldavia is investigating natural populations of the Cornelian cherry. G. Dudukal and I. Rudenko of the Moldavian Institute of Botany have studied reproduction and genetic diversity.

The Cornelian cherry did not appear on the Ukrainian State Register until 1990. The main collection of Cornelian cherry genotypes is located at the Hryshko National Botanical Gardens in Kiev, operated by the Ukrainian National Academy of Sciences. Recent work at the Hryshko National Botanical Gardens has brought the state of knowledge on the Cornelian cherry in the Ukraine up to date.

In Ukraine, the main characteristics selected during the breeding process were reliable bearing, high productivity and frost resistance in the local forest-steppe climate zone.

‘Elegantny’ is a dwarf bush from 1.5 to 1.8 m high, with a compact crown. ‘Koralovy Marka’ has big pink fruits. ‘Semen’ is one of the most valuable cultivars in the collection and has pear-shaped fruits which ripen late in the season.

‘Nezhny’ and ‘Yantarny’ have yellow fruits and are particularly interesting. One of them has been submitted to the state cultivar-testing program.

Yellow Cornelian cherry fruits have the same shape and size as red fruits. The differences are, of course, the color, which is an attractive amber-yellow, and the exquisite taste. Varieties with yellow fruits probably no longer occur in the wild. Even as far back as 1838, Steven reported that varieties with yellow fruits were very rare. At the beginning of the twentieth century, Lev Simirenko reported that bush which gave rise to present varieties with yellow fruits was discovered in the Crimean forest by the horticulturalist Kefeli who introduced it into culture (Simirenko, 1973).

‘Svetlyachok’ and ‘Exotichesky’ were developed as the result of somatic mutations. The Cornelian cherry, like other fruit trees, has a high degree of somatic variability, which can provide new material for breeding and selection. Somatic variability and its potential role in breeding new clones of fruit species is a rapidly developing branch of genetics. Breeding based on somatic variability promises to be no less important than traditional breeding techniques.

DISCUSSION

The main collection of Cornelian cherry genotypes is located at the Hryshko National Botanical Gardens in Kiev, operated by the Ukrainian National Academy of Sciences. The collection contains fourteen officially registered cultivars as well as numerous hybrids developed during the course of the breeding and selection program (Reyestr, 2001). The genetic pool consists of over a hundred wild and cultivated genotypes from Ukraine, Bulgaria, Slovakia, the United Kingdom, Austria and Georgia. The collection represents a wealth of biological and economic potential.

The fruits of the Cornelian cherry can be dark red, cherry red, pink or yellow. Form-wise, they can be oval, pear-shaped or bottle-shaped. An average fruit weight ranges from 5.0 to 8.0 grams. The stone makes up 7.5 to 11.0% of the total fruit weight. Total sugar content ranges from 8.0 to 11.0%. Organic acids content ranges from 1.3 to 1.9%. Vitamin C content ranges from 101 to 193 mg%. Anthocyanin content ranges from 670 to 850 mg% in the skin, and from 36 to 121 mg% in the pulp.

The best varieties in the collection are ‘Evgenia’, ‘Semen’, ‘Koralovy Marka’, ‘Svetlyachok’, ‘Elena’, ‘Vydubetsky’, ‘Elegantny’, ‘Luk’anovskyy’, ‘Exotichesky’, ‘Radost’, ‘Nikolka’, ‘Vavilovets’, ‘Vladimirskyy’ and ‘Grenader’.

Commercial Cornelian cherry orchards can produce for decades. It is recommended to plant 400 to 625 bushes per hectare. Yield per plant in culture ranges from 30 to 80 kg. Average fruit weight ranges from 5.0 to 8.0 grams. The stone makes up 7.5 to 11.0% of the total fruit weight. The average number of stones per tree ranges from 7,500 to 24,000. Yield per hectare ranges from 20 to 25 tones.

Investigating the natural gene pool and breeding new cultivars of the Cornelian cherry depend on efficient propagation. Techniques for the vegetative propagation of the Cornelian cherry have been devised. The main technique used is budding, which has a 90 to 98% success rate. Propagation by offsets has a success rate of 85 to 90%. Propagation by green grafts has a success rate of 75 to 78%. Seedlings serve as stock for inoculation.

Further breeding of the Cornelian cherry requires the preservation of its gene pool, which will always be essential for developing reliably productive varieties suited to the needs of commercial growers and amateur gardeners.

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KOLEKCJA DERENIA WŁAŚCIWEGO (*Cornus mas* L.): GROMADZENIE, ZACHOWANIE, WYKORZYSTANIE

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S T R E S Z C Z E N I E

W ostatnich latach zainteresowanie dereniem właściwym w świecie wzrosło. Systematyczne prace nad tworzeniem kolekcji, odbudową zasobów genowych i selekcją są prowadzone na Ukrainie, Bułgarii, Słowacji, Austrii, Jugosławii, Francji, Niemczech, Polsce i Turcji.

Dereń właściwy jest gatunkiem, którego owoce odznaczają się wysokimi właściwościami leczniczymi i dietetycznymi. Jest dobrze przystosowany do niekorzystnych warunków środowiska, i jednocześnie mało podatny na choroby i szkodniki. Dereń jest rośliną stosunkowo młodą we współczesnym ogrodnictwie.

Zasoby genowe derenia właściwego na Ukrainie są tworzone głównie z typów selekcyonowanych w Państwowym Ogrodzie Botanicznym w Hryshko (NBG) należącym do Ukraińskiej Akademii Nauk.

Oficjalnie jest zarejestrowanych 14 odmian derenia (1987, 1999, 2001), ale jest także już wyselekcjonowanych wiele mieszańców. Nasze zasoby genowe zawierają ponad 100 okazów kolekcyjnych pochodzących od roślin dzikich oraz uprawianych na Ukrainie, a także wyselekcjonowanych w Bułgarii, Słowacji, Anglii, Austrii i Gruzji. Zasoby genowe derenia zgromadzone w NBG odznaczają się dużą różnorodnością biologiczną i produkcyjną.

Średnia masa owocu wynosi 5,0-8,0 g, masa pestki stanowi 7,5-11,0% masy owoców. Owoce są owalne, kształtu butelkowatego lub gruszkowatego, ciemnoczerwone, wiśniowe, różowe i żółte.

W naszych warunkach do najlepszych i najbardziej produktywnych odmian należą: 'Vydubetsky', 'Luk'anovsky', 'Koralovy Marka', 'Svetlyachok', 'Elegantny', 'Nezhny' i 'Yantarny'.

Kolekcja zasobów genowych, odmian, typów i form derenia właściwego stanowi wartościowy i bogaty rezerwuwar genetyczny do prowadzenia dalszych prac selekcyjnych.

Słowa kluczowe: dereń właściwy, zasoby genowe, selekcja, odmiany; Państwowy Ogród Botaniczny w Kijowie