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NEW DATA ABOUT POPULATION OF A RARE PROTECTED CULTIVAR
CRATAEGUS TOURNEFORTII GRISEB. GROWING IN SOUTH-EAST CRIMEA

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Introduction

Crataegus tournefortii Griseb. (= *C. schraderiana* Ledeb.) is an east-mediterranean cultivar, being entered into the “Red Data Book of Ukraine” (category “vulnerable”) [11]. It is a hybrid origin cultivar, bred of *Crataegus* of two different sections: *C. orientalis* Pall. ex Bieb. (section *Azaroli* Loud.) and *C. pentagyna* Waldst. et Kit. (section *Pentagynae* C.K. Schneid.). Recently most authors have considered this cultivar as subspecies of *C. Orientalis* [3, 15]. Other authors in opposite believe it is a separate species [9, 12, 16]. We hold the second opinion. According to K.M. Zavadsky [4], subspecies spatially exclude each other, that is an area occupied by one definite taxon cannot be inhabited by another, they just mix on the narrow border lines. In all study populations *C. Tournefortii* grows in combination with *C. Orientalis*. Besides in nature being in generative condition they have visual distinctions (table 1).

Fig. Habit view and fruits of *Crataegus orientalis* (on the left) and *Crataegus tournefortii* (on the right)

Table 1

Morphological characteristics of *Crataegus orientalis* and *Crataegus tournefortii* [2, 6]

Characteristics	<i>Crataegus orientalis</i>	<i>Crataegus tournefortii</i>
Annual shoots	Dark-brown, downy-felted	Cherry, densely piliferous-downy
Barbs	5–10 sm long	4–5 sm long

leaves	Light-green, mild downiness	Dark-green, appressed bristly downiness
Inflorescences	compact, 5–8-flowers	Loose, 6–18-flowers
Flowers	Till 20 mm across diameter	Till 15 mm across diameter
fruits	Color ranges from orange-yellow to orange-red	Dark cherry colored

Data about general distribution of *C. tournefortii* are rather conflicting. V.M. Kosyh notes that its areal is limited by the Crimea and South Transcaucasia [6]. “The Red Data Book of USSR” includes Greece as well, besides the Crimea and South Transcaucasia (Zangezur, Gorissky district, outskirts of Goris mountain) [7]. In “Flora of Eastern Europe” areal of this cultivar is presented within the Crimea, the Caucasus (Transcaucasia) and Minor Asia [12].

In the Crimea its population is registered within: Monastyrskaya mountain (close to village Rodniki, Belogorsky district), Agarmysh range (close to Stary Krym city), in hole Karagach (outskirts of Sudak). Single specimens of this cultivar are presented there, few places with small groups of plants [11]. There is information *C. Tournefortii* also grows within Karadag, Echkidag and on Tepe-Oba range [5, 13, 14].

Therefore research objective is to determine its population, geographical and coenotic belongings and reveal biological characteristics of this cultivar.

Objects and methods of the research

Study object became plants of *C. tournefortii*. Well-known populations of this cultivar were investigated and area of South East Crimea with similar phytocenoses were studied as well to find out new populations: Karadag, Echki-Dag, partly Armatlukskaya valley (nearby mountain Belaya and Tatar-Khaburga), Tepe-Oba range, outskirts of Stary Krym city and village Rodniki, hawthorn growth along highways Stary Krym-Russkoye and Sudak-Grushevka.

Quantitative composition of population was defined due to calculation of reproductive trees. The following parameters of each plant were measured: height, crown diameter, a number of stems, diameter of the largest stem.

Seed propagation of *C. Tournefortii* was researched due to methodic of I.V. Vainagy [1]. Particularly he suggested to split “seed productivity” into two notions: 1) potential seed productivity (PSP), that is a number of seedbuds per a specimen or a reproductive shoot; 2) actual seed productivity (ASP), that is a number of seeds. In this way productivity coefficient

(PC) is calculated by formula: $PC = \frac{ASP}{PSP} * 100$.

As a number of seedbuds in gynoecium and a number of seeds in a fruit for *C. tournefortii* are determined statistically and range from 3 to 5, seed productivity (potential and actual) was measured by elementary units, that is a flower and a fruit.

Results and discussion

As a result of our field researches occurrence of populations in outskirts of Rodniki village and on Agarmysh range was proved, at the same time a new population was found out close to spring of St. Panteleimon in the valley of Churuk Su valley to south from Stary Krym city (fig.1). Population size approximately made: on agarmysh range (population 1) – 6 ha; close to spring of St. Panteleimon (population 2) – 60 ha; in outskirts of Rodniki village (population 3) – 25 ha. In spite of the largest area belongs to population 2 (its length made about 2 km, width 300 m), the biggest size of *C. tournefortii* was registered in population 3 – 38 plants (table 2). Investigations within other study areas weren't successful.

In all three populations the cultivar is a part of shrub cenoses, located on the slope of range (population 1), along the forest edge (populations 2, 3), on clearing in the wood

(population 3). Only once *C. tournefortii* was found out in the forest. The subtend shrubs and arboreal cultivars: in population 1 – *Acer campestre* L., *Crataegus orientalis* Pall. ex Bieb., *Fraxinus excelsior* L., *Ligustrum vulgare* L., *Padellus mahaleb* (L.) Vass., *Prunus divaricata* Ledeb., *P. spinosa* L., *Rhamnus cathartica* L., *Rosa corymbifera* Borkh., *R. turcica* Rouy, *Ulmus carpinifolia* Rupp. ex Suckow; in population 2 – *Carpinus orientalis* Mill., *Cornus mas* L., *Crataegus atrofusca* Stev. ex Fisch. et Mey., *C. curvisepala* Lindm., *C. orientalis* Pall. ex Bieb., *Ligustrum vulgare* L., *Malus sylvestris* Mill., *Pyrus communis* L., *P. elaeagnifolia* Pall., *Rosa corymbifera* Borkh., *Swida australis* (C.A. Mey.) Pojark ex Grossh., *Quercus pubescens* Willd.; in population 3 – *Crataegus dipyrena* Pojark., *C. orientalis* Pall. ex Bieb., *Ligustrum vulgare* L., *Malus sylvestris* Mill., *Pyrus elaeagnifolia* Pall., *Rosa corymbifera* Borkh. Crown density of a shrub layer is rather high in all three cases – 0,5-0,6. Though, if in two cases shrubs are distributed evenly across the whole locality, in population 1 *C. tournefortii* is a part of dense growth, available in clusters on open dry slopes.



Fig.1 Locality of *C. Tournefortii* populations in South-East Crimea; 1 –population on Agarmysh range; 2 – population close to spring of St Panteleimon; 3 – population in outskirts of Rodniki village

Morphologic peculiarities of *C. tournefortii* are described by many authors [6, 12, 15]. In study populations we marked out two types of plant crown: loose and dense globular. On more moistened areas nearby gullies and dells plants reach 4-5 m high and possess loose crown; on dry stony-rubble highlands plants are no more than 1,5 m and have close location of skeletal axes and branches, shoot tops create more or less even surface, as a result crown is globular. The largest number of plants with globular crown was registered in population 1 - 5 (26,3%) of 19 specimens. Population 2 included 4 (11,8%) of 34 plants, population 3 – 2 (5,3%) of 38 plants. Besides population 3 consisted of plants with larger diameter of a stem (12,1 sm) and a height (3,3 m) than in rest both populations. As an opposite, population 1 was characterized by the smallest average stem diameter (9,9 sm) and the lowest average plant height (2,3 m) (table 2).

Table 2

Characteristic of *C. Tournefortii* population in South-East Crimea

Population	Locality	A number of plants	Morphological characteristics of plants			
			Height, m	Crown diameter	A number of stems	Stem diameter, sm

			aver.	max/ min	aver.	max/ min	aver.	max/ min	aver.	max / min
Population 1	Agarmysh range	19	2,3	5/1,5	3,4	5/2	7	14/2	9,9	15/5
Population 2	Nearby spring of St Panteleimon	34	2,7	5/1,2	3,3	6/1,5	4	20/1	11,5	24/3
Population 3	Outskirts of rodniki vilage	38	3,3	5/2	–	–	5	15/1	12,1	20/8

Therefore allowing for this fact it can be suggested that population 3 (outskirts of Rodniki village is the oldest one), the youngest – population 1 (Agarmysh range).

If population on Agarmysh range includes only deliquescent plants (from 2 to 14 stems), it means the rest two populations have monocormic trees as well. The largest number of such trees was registered in population 2 – 8 (23,5%) of 34 plants (within Rodniki village there are only 3 such specimens). We consider grazing sheep and goats impacts on formation of the monocormic trees; this factor became determining in population 2, but it wasn't fixed in others. Goats and sheep, browsing shrubs, destroy brushwood of hawthorn, sometimes it causes changes of habitus of the whole plant (crown becomes umbrallate-shaped). Though grazing isn't the only factor, that influences on crown formation. *C. Tournefortii* growing in outskirts of Stary Krym city on the border line with its natural areal in the Crimea, adapts to growth under extreme natural conditions (arid climate, big range of temperature variations in summer and winter periods)

In populations of *C. tournefortii* we marked out plants with small fruits. In comparison with standard fruit average size – 13,5 – 17,1 mm with flattened-globular shape of dark-cherry color, they were 10,1-10,2 mm on average with almost regular globular shape, brick-red-colored (table 3). As a rule small fruits are typical for plants with dense globular-shaped crown, but they were fixed on plants with loose crown as well. In this way almost all population 1 consists of small-fruited trees, in population 2 they seldom occur, population 3 doesn't include such plants at all.

Therefore, populations of *C. tournefortii* included plants with different shapes of crown and fruits. Further investigations will reveal if these morphological distinctions are intraspecific diversity of ecological forms. Though on this stage it's obviously they occur on the borderline of hawthorn natural areal only. Allowing for these factors it can be concluded that growing within Piedmont Crimea in the belt of piedmont forest-steppe, *C. Tournefortii* doesn't spread to east from Stary Krym city and other populations could be found to west from here, that is Belogorsky and Simferopolsky districts. Besides data about *C. Tournefortii* occurrence in outskirts of Sudak, on Echki-Dag, Karadag and Tepe-Oba range seems mistaken.

Table 3

Characteristics of different fruit forms of *Crataegus tournefortii* (dated by 2012)

Form	Fruit size						Weight of 100 fruits, g
	Length			Diameter			
	M+m, mm	max/min, mm	Cv, %	M+m, mm	max/min, mm	Cv, %	
Tree with standard fruits	13,5±0,3	14,8/12,3	4,9	17,1±0,3	18,7/14,9	5,2	202,4

Tree with small fruits	10,1±0,2	10,8/9,0	4,6	10,2±0,2	11,4/8,6	5,8	59,0
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Study of *C. Tournefortii* seed productivity revealed it is heterogeneous: together with high efficient trees there are trees with low productivity as well (table 4). In general, seed productivity of *C. Tournefortii* on territory of South-East Crimea is rather low: only in single cases coefficient of productivity exceeded 10% (tree № 1 on Agarmysh range – 17,95% and tree № 21 in outskirts of Rodniki village – 12,36%). Coefficient of productivity of *C. tournefortii* plants mainly made 1%. The lowest productivity level was registered in population № 2. As such a poor fruitification happens not the first year running [8], we suppose it is connected with hybrid origin of a cultivar what causes its low population in the Crimea.

Table 4

**Seed productivity of *Crataegus tournefortii*
of pattern trees, expressed by accounting units (dated by 2013)**

Tree №	Age condition	Locality	A number of inflorescences on a branch	A number of flowers on a branch (PSP)	A number of ripen fruits on a branch (ASP)	Productivity coefficient (PC)
№1	G ₃	Agarmysh	16	156	28	17,95
№ 6	G ₃	Agarmysh	15	201	6	2,98
№11	G ₂	Agarmysh	39	250	2	0,80
№22	G ₃	Spring of St Panteleimon	165	1392	4	0,29
№29	G ₃	Spring of St Panteleimon	25	234	1	0,43
№28	G ₂	Spring of St Panteleimon	54	333	3	0,90
№25	G ₂	Spring of St Panteleimon	49	233	0	0
№1	G ₃	Rodniki village	50	203	1	0,49
№21	G ₃	Rodniki village	89	809	100	12,36
№25	G ₃	Rodniki village	177	1129	95	8,42

Conclusions

1. *Crataegus tournefortii* grows in three population within South-East Crimea: in outskirts of Rodniki village (38 plants) and Sary Krym city; on Agarmysh range there are 19 plants and nearby spring of St Panteleimon – 34 plants. Population nearby spring of St. Panteleimon was found out for the first time.

2. *C. Tournefortii* plants on study areas within: shrub cenoses (population 1), on the forest edge (population 2, 3) and rare occurrence was fixed on clearings of wood (population 3).

3. Populations have got two crown forms (loose and dense globular), and fruit forms as well (large dark-red and small brick-red colored). All study plants present low seed productivity.

4. This cultivar needs extra protection, that's why it would be a reasonable step to include it into Red Data books of the Crimea and RF.

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Population of a rare protected cultivar *Crataegus tournefortii* growing in south-east Crimea was investigated in terms of this research. Its size, geographical distribution, coenotic belonging and some biological characteristics were determined as well.

Key words: *Crataegus tournefortii*; south-east Crimea; population.