

ROSEHIP (*ROSA CANINA*) AND HAWTHORN (*CRATAEGUS MONOGYNA*) – RICH HORTICULTURAL SOURCES OF BIOACTIVE COMPOUNDS FROM ROMANIA'S WILD FLORA. A REVIEW.

MĂCEȘUL (*ROSA CANINA*) ȘI PĂDUCELUL (*CRATAEGUS MONOGYNA*) - SURSE HORTICOLE BOGATE ÎN COMPUȘI BIOACTIVI DIN FLORA SPONTANĂ A ROMÂNIEI. RECENZIE.

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Abstract. *Rosehips (*Rosa canina*) and hawthorn (*Crataegus monogyna*) are considered important forest fruits from Romania's wild flora by Rosaceae family. According to research conducted on this topic, the horticultural sources above-mentioned are associated with many benefits for human health due to their richness in natural bioactive compounds. Increasing attention has been recently paid to the bioactive nutrients from rosehips and hawthorn. *Rosa canina* considered pseudo-fruit has been known to be an important medicinal plant since 2,000 years ago and includes several subspecies. Compounds of interest for human health included: flavonoids, carotenoids, fatty acids, high vitamin content (especially vitamin C), antioxidants and anti-inflammatory agents. As for their specific composition, it can be influenced by various climatic or technologic factors like all other plant products. It has been shown that several components of the rosehip can be used in medicine, especially due to its anti-inflammatory effect. Moreover, the consumption of this fruits may reduce symptoms associated with arthritic conditions) and also can be correlated with beneficial effects in the treatment of numerous diseases, such as: HIV infection, eye disorders (myopia, astigmatism), cardiovascular diseases (angina pectoris, arrhythmia, hypertension, myocardial injuries, etc). Furthermore, the plant of *Crataegus monogyna* has various interesting physiological and pharmacological activities due to the presence of different bioactive natural compounds. The most representative of phytochemicals from whole plant of *Crataegus monogyna* are represented by: flavan-3-ols (catechin, epicatechin), procyanidins (procyanidin B2, procyanidin B4, procyanidin B5), flavones and flavonols (hyperoside, vitexin, methoxykaempferol), anthocyanins and anthocyanidins (cyanidin-3-galactoside), chloreogenic acids, triterpenes (oleanolic acid, ursolic acid, betulinic acid, butyrospermol, cycloartenol). The aim of this study was to make an inventory of the species, subspecies and varieties of hawthorn and rosehip, the health benefits provided by the use of these species and the ecological conditions that influence their growth and development*

Keywords: horticultural sources, rosehips, hawthorn, bioactive compounds, health benefits.

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Rezumat. Măceșele (*Rosa canina*) și păducelul (*Crataegus monogyna*) sunt considerate importante surse horticole din flora spontană a României, din familia Rosaceae. Conform cercetărilor efectuate pe această temă, sursele horticole menționate sunt asociate cu numeroase beneficii pentru sănătatea umană datorită bogăției lor în compuși bioactivi naturali. Recent, o atenție sporită a fost acordată nutrienților bioactivi din fructele de măceșe și păducel. *Rosa canina* considerată pseudofruct este cunoscută ca fiind o plantă medicinală importantă încă de acum 2000 de ani ce include mai multe subspecii. Printre compuşii de interes pentru sănătatea umană se evidențiază: flavonoidele, carotenoidele, acizii grași, conținutul ridicat de vitamine (în special vitamina C), antioxidanții și agenții antiinflamatori. În ceea ce privește compoziția lor specifică, aceasta poate fi influențată de diverși factori climatici sau tehnologici, ca toate celelalte produse vegetale. Mai mult, consumul acestor fructe poate reduce simptomele asociate cu afecțiunile articulare) și, de asemenea, poate fi corelat cu efecte benefice în tratamentul a numeroase boli, cum ar fi: infecția HIV, afecțiuni oculare (miopie, astigmatism), boli cardiovasculare (angină pectorală, aritmie, hipertensiune arterială, leziuni miocardice etc). În schimb, păducelul (*Crataegus monogyna*) include diverse particularități fiziologice și farmacologice importante datorită prezenței diferiților compuși naturali bioactivi. Cele mai importante substanțe fitochimice din planta de *Crataegus monogyna* sunt reprezentate de: flavan-3-oli (catehină, epicatechină), procianidine (procianidină B2, procianidină B4, procianidină B5), flavone și flavonoli (hiperosid, vitexină, metoxicaemferol), antociani și antocianidine (cianidin-3-galactosid), acizi clorogenici, triterpene (acid oleanolic, acid ursolic, acid betulinic, butirospemol, cicloartenol). Scopul acestui studiu a fost inventarierea speciilor, subspeciilor și varietăților de măceșe și păducel, a beneficiilor pentru sănătate pe care le asigură utilizarea acestor specii și a condițiilor ecologice care influențează creșterea și dezvoltarea în arealele lor de răspândire.

Cuvinte cheie: surse horticole, măceșe, păducel, compuși bioactivi, beneficii pentru sănătate

INTRODUCTION

In the last years, due to the increased interest in herbal therapies, a lot of research has focused on a large number of plants known and used in traditional medicine (Ninomiya *et al.*, 2007, Nagatomo *et al.*, 2015 and Winther *et al.*, 2016). In this regard, this article aims to highlight the known bioactive constituents of plants such as the rosehip (*Rosa canina* L.) and the hawthorn (*Crataegus monogyna*). In this context, the chemical properties of plants, their medicinal and pharmaceutical uses and, last but not least, their uses in the food industry will be highlighted. The requirement and usefulness of writing this summary study derives precisely from the suitability of the rose hip and hawthorn for use in various fields of global interest (food, health, pharmacy), but also from the multitude of horticultural forms and varieties of these fruits. Studied species are spread in temperate climate zone of the globe (fig. 1).

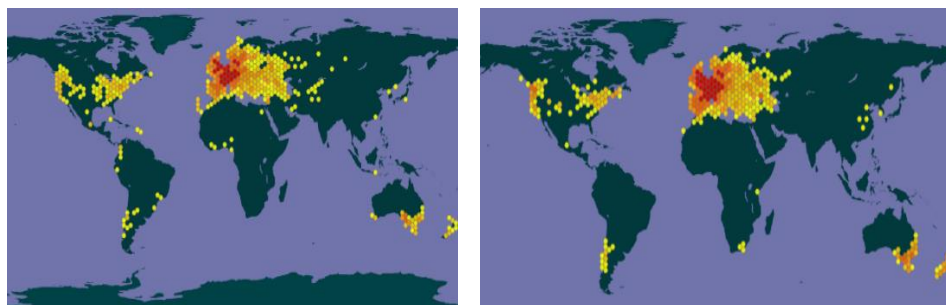


Fig. 1. Global distribution of (a.) rose hip and (b.) hawthorns (according to <https://www.gbif.org/species/3002461>)

RESULTS

1. Taxonomic classification of the studied species (tab. 1). For *Rosa canina* a total of 249 species, 4 subspecies, 33 horticultural varieties were identified, while for *Crataegus monogyna* we found the same number of species (249) but fewer horticultural varieties.

Table 1

Taxonomic classification of rose hips and hawthorns
(according to (<https://www.gbif.org/species/3002461>))

Taxonomic level	Rose hips	Hawthorns
Kingdom	<i>Plantae</i>	<i>Plantae</i>
Phylum	<i>Tracheophyta</i>	<i>Tracheophyta</i>
Class	<i>Magnoliopsida</i>	<i>Magnoliopsida</i>
Order	<i>Rosales</i>	<i>Rosales</i>
Family	<i>Rosaceae</i>	<i>Rosaceae</i>
Genus	<i>Rosa</i> L.	<i>Crataegus</i> L.
Species	<i>Rosa canina</i> L.	<i>Crataegus monogyna</i> Jacq.
Subspecies	1. <i>Rosa blondeauana</i> Ripart ex Déségl. 2. <i>Rosa surculosa</i> J.Woods 3. <i>Chavinia belgradensis</i> (Pančić) Gand. 4. <i>Crepinia aciphylla</i> (A.Rau) Gand. 5. <i>Crepinia canina</i> (L.) Gand. 6. <i>Crepinia psilophylla</i> (A.Rau) Gand. 7. <i>Rosa achburensis</i> Chrshan. 8. <i>Rosa aciphylla</i> A.Rau	1. <i>Crataegus aegeica</i> Pojark. 2. <i>Crataegus aguilaris</i> Sennen 3. <i>Crataegus alemanniensis</i> Cinovskis 4. <i>Crataegus alemanniensis</i> f. <i>microalemanniensis</i> Cinovskis 5. <i>Crataegus alemanniensis</i> var. <i>heterodonta</i> (Pojark.) Cinovskis

9. <i>Rosa aciphylloides</i> Crép. ex Cottet & Castella	6. <i>Crataegus alemanniensis</i> var. <i>orientobaltica</i> (Cinovskis) Cinovskis
10. <i>Rosa actinodroma</i> Gand.	7. <i>Crataegus alemanniensis</i> var. <i>subborealis</i> (Cinovskis) Cinovskis
11. <i>Rosa adenocalyx</i> Gren.	8. <i>Crataegus apiifolia</i> Medik.
12. <i>Rosa adscita</i> Déségl.	9. <i>Crataegus azarella</i> Griseb.
13. <i>Rosa afzeliana</i> Fr.	10. <i>Crataegus azarolus</i> var. <i>heterophylla</i> (Flüggé) Regel
14. <i>Rosa agraria</i> Ripart	11. <i>Crataegus bracteolaris</i> Gand.
15. <i>Rosa agraria</i> Ripart ex Déségl.	12. <i>Crataegus brevispina</i> Kunze
16. <i>Rosa albolutescens</i> Ripart ex Déségl.	13. <i>Crataegus brevispina</i> var. <i>javorkae</i> (Pénzes) Ker.-Nagy
17. <i>Rosa albolutescens</i> Ripart ex Heinr.Braun, 1882	14. <i>Crataegus brevispina</i> var. <i>microphylla</i> (Csató) Ker.-Nagy
18. <i>Rosa albolutescens</i> Ripart, 1876	15. <i>Crataegus bruantii</i> Carrière
19. <i>Rosa amansii</i> Déségl. & Ripart ex Déségl.	16. <i>Crataegus calycina</i> var. <i>cuneata</i> Diap.
20. <i>Rosa ambigua</i> Lej.	17. <i>Crataegus chlorocarpa</i> Gand.
21. <i>Rosa analoga</i> Déségl.	18. <i>Crataegus cuneata</i> Halácsy
22. <i>Rosa arguta</i> Steven	19. <i>Crataegus debeauxii</i> Cand.
23. <i>Rosa arguta</i> Steven ex M.Bieb.	20. <i>Crataegus debeauxii</i> Gand. & Debeaux
24. <i>Rosa armata</i> Steven	21. <i>Crataegus dissecta</i> Borkh.
25. <i>Rosa armata</i> Steven ex Besser	22. <i>Crataegus diversifolia</i> (Pers.) M.Roem.
26. <i>Rosa armoricana</i> Boullu	23. <i>Crataegus diversifolia</i> (Pers.) Steud.
27. <i>Rosa arnoldii</i> Sumnev.	24. <i>Crataegus elegans</i> (Poir.) Mutel
28. <i>Rosa arnoldii</i> Sumnev. ex Tkatsch.	25. <i>Crataegus fissa</i> (Poir.) Bosc
29. <i>Rosa arvensis</i> var. <i>biserrata</i> (Mér.) Crép.	26. <i>Crataegus fissa</i> (Poir.) Bosc ex DC.
30. <i>Rosa aspermata</i> Déségl.	27. <i>Crataegus floribunda</i> Gand.
31. <i>Rosa aspratilis</i> Crép. ex Déségl.	28. <i>Crataegus heterophylla</i> C.A.Mey.
32. <i>Rosa belgradensis</i> Pancic	29. <i>Crataegus heterophylla</i> C.A.Mey. ex Hohen.
33. <i>Rosa belgradensis</i> Pani, 1865	30. <i>Crataegus heterophylla</i> Lindl.
34. <i>Rosa biebersteiniana</i> Tratt.	31. <i>Crataegus hirsuta</i> Schur
35. <i>Rosa bourgeonensis</i> Ozanon	32. <i>Crataegus inermis</i> Sennen
36. <i>Rosa bujedana</i> Sennen & Elías	33. <i>Crataegus inegnae</i> (Guss.) Bertol.
37. <i>Rosa calvatostyla</i> Gren.	
38. <i>Rosa calycina</i> M.Bieb.	
39. <i>Rosa canina</i> f. <i>arnbergensis</i> (Heinr.Braun) Ker.-Nagy	
40. <i>Rosa canina</i> f. <i>brachypetala</i> (J.B.Keller) Ker.-Nagy	
41. <i>Rosa canina</i> f. <i>discolor</i> R.Keller	

42. <i>Rosa canina</i> f. <i>glaucoides</i> R.Keller	34. <i>Crataegus intermedia</i> Fuss
43. <i>Rosa canina</i> f. <i>glaucophylla</i> R.Keller	35. <i>Crataegus intermedia</i> Schur
44. <i>Rosa canina</i> f. <i>karlovicensis</i> (Kupcsok) Ker.-Nagy	36. <i>Crataegus jacquinii</i> (A.Kern.) Dalla Torre & Sarnth.
45. <i>Rosa canina</i> f. <i>krameri</i> (Heinr.Braun) Ker.-Nagy	37. <i>Crataegus krumbholzii</i> R.Doll
46. <i>Rosa canina</i> f. <i>laxifolia</i> Borbás	38. <i>Crataegus kyrtostyla</i> Fingerh. ex Schltld.
47. <i>Rosa canina</i> f. <i>laxiphylla</i> Borbás	39. <i>Crataegus laciniata</i> Kar. & Kir.
48. <i>Rosa canina</i> f. <i>lucorum</i> (R.Br.) Vukic.	40. <i>Crataegus laciniata</i> var. <i>decussata</i> (Wallr.) Diap.
49. <i>Rosa canina</i> f. <i>mucronulata</i> (Déségl.) Murr	41. <i>Crataegus laciniata</i> var. <i>lasiocarpa</i> (Lange) Lange
50. <i>Rosa canina</i> f. <i>pedunculipilosa</i> Popek	42. <i>Crataegus lamprophylla</i> Gand.
51. <i>Rosa canina</i> f. <i>pseudodiscolor</i> R.Keller	43. <i>Crataegus leiomonogyna</i> Klokov
52. <i>Rosa canina</i> f. <i>racemosula</i> Heinr.Braun	44. <i>Crataegus lipskyi</i> Klokov
53. <i>Rosa canina</i> f. <i>sanctamathiae</i> R.Keller	45. <i>Crataegus maroccana</i> Pers.
54. <i>Rosa canina</i> f. <i>semibiserrata</i> Borbás	46. <i>Crataegus maura</i> L.fil.
55. <i>Rosa canina</i> f. <i>sempervirens</i> Wigand	47. <i>Crataegus maura</i> var. <i>diversifolia</i> Pers.
56. <i>Rosa canina</i> f. <i>stmathiae</i> R.Keller	48. <i>Crataegus monogyna</i> Hayek
57. <i>Rosa canina</i> f. <i>subglauca</i> (Heinr.Braun) Ker.-Nagy	49. <i>Crataegus monogyna</i> Ledeb.
58. <i>Rosa canina</i> f. <i>vinealis</i> (Ripart) C.W.Christ.	50. <i>Crataegus monogyna</i> f. <i>alboplana</i> (Rehder) C.K.Schneid.
59. <i>Rosa canina</i> f. <i>vinealis</i> (Ripart) C.W.Christ. ex J.A.Christ. et al.	51. <i>Crataegus monogyna</i> f. <i>azarella</i> (Griseb.) Buia
60. <i>Rosa canina</i> subsp. <i>cariotii</i> (Chabert) Hayek	52. <i>Crataegus monogyna</i> f. <i>biflora</i> (Weston) Rehder
61. <i>Rosa canina</i> subsp. <i>catalaunica</i> (Costa) Malag.	53. <i>Crataegus monogyna</i> f. <i>decussata</i> (Wallr.) Hegi
	54. <i>Crataegus monogyna</i> f. <i>denudata</i> (Schumach.) Beck
	55. <i>Crataegus monogyna</i> f. <i>dissecta</i> (Borkh.) Buia
	56. <i>Crataegus monogyna</i> f. <i>filicifolia</i> Koehne
	56. <i>Crataegus monogyna</i> f. <i>fissa</i> (Poir.) Hegi
	57. <i>Crataegus monogyna</i> f. <i>genuina</i> Posp.
	58. <i>Crataegus monogyna</i> f. <i>hirsuta</i> (Schur) Buia

62. <i>Rosa canina</i> subsp. <i>dumalis</i> Holmboe, 1914	59. <i>Crataegus monogyna</i> f. <i>hirsuta</i> (Schur) Hegi
63. <i>Rosa canina</i> subsp. <i>flexibilis</i> (Déségl.) Keller	60. <i>Crataegus monogyna</i> f. <i>insegrae</i> (Tineo ex Guss.) Hayek
64. <i>Rosa canina</i> subsp. <i>glabra</i> Celak.	61. <i>Crataegus monogyna</i> f. <i>inzengae</i> Hayek
65. <i>Rosa canina</i> subsp. <i>glabra</i> Desv.	62. <i>Crataegus monogyna</i> f. <i>karpatii</i> Péntzes
66. <i>Rosa canina</i> subsp. <i>glabrescens</i> (Neilr.) Celak.	63. <i>Crataegus monogyna</i> f. <i>macrocarpa</i> Szafer
67. <i>Rosa canina</i> subsp. <i>globularis</i> (Boreau) Hayek	64. <i>Crataegus monogyna</i> f. <i>microcarpa</i> Kobendza
68. <i>Rosa canina</i> subsp. <i>keissleriana</i> (Sennen) Sennen	65. <i>Crataegus monogyna</i> f. <i>microphylla</i> Chenevard
69. <i>Rosa canina</i> subsp. <i>lutetiana</i> (Léman) Arcang., 1882	66. <i>Crataegus monogyna</i> f. <i>microphylla</i> Chenevard ex Gams
70. <i>Rosa canina</i> subsp. <i>lutetiana</i> (Léman) Hayek	67. <i>Crataegus monogyna</i> f. <i>nordica</i> (Franco) P.D.Sell
71. <i>Rosa canina</i> subsp. <i>lutetiana</i> Batt., 1889	68. <i>Crataegus monogyna</i> f. <i>pendula</i> (Lodd. ex Loudon) Dippel
72. <i>Rosa canina</i> subsp. <i>nitens</i> (Desv.) Debeaux	69. <i>Crataegus monogyna</i> f. <i>pendula</i> (Lodd. ex Loudon) Rehder
73. <i>Rosa canina</i> subsp. <i>sarmentacea</i> (J.Woods) Macreight	70. <i>Crataegus monogyna</i> f. <i>polyacantha</i> (Jan ex Guss.) Buia
74. <i>Rosa canina</i> subsp. <i>senticosa</i> (Ach.) Nyman	71. <i>Crataegus monogyna</i> f. <i>polyacantha</i> (Jan ex Guss.) Gand.
75. <i>Rosa canina</i> subsp. <i>sepium</i> Döll	72. <i>Crataegus monogyna</i> f. <i>praecox</i> (Loudon) Hegi
76. <i>Rosa canina</i> subsp. <i>spuria</i> (Puget ex Déségl.) Heinr.Braun	73. <i>Crataegus monogyna</i> f. <i>pteridifolia</i> (Lodd. ex Loudon) Rehder
77. <i>Rosa canina</i> subsp. <i>squarrosa</i> (A.Rau) Hayek	74. <i>Crataegus monogyna</i> f. <i>roseiflora</i> V.Rastetter, 1966
	75. <i>Crataegus monogyna</i> f. <i>rubroplena</i> Rehder

78. <i>Rosa canina</i> subsp. <i>subdumetorum</i> (E.S chenk) Lemke	76. <i>Crataegus monogyna</i> f. <i>rubroplena</i> Rehder ex C.K.Schneid.
79. <i>Rosa canina</i> subsp. <i>subdumetorum</i> (E.S chenk) Lemke ex Rothm.	77. <i>Crataegus monogyna</i> f. <i>schizophylla</i> Beck
80. <i>Rosa canina</i> subsp. <i>surculosa</i> (J.Woods) Macreight	78. <i>Crataegus monogyna</i> f. <i>semperflorens</i> (André) C.K.Schneid.
81. <i>Rosa canina</i> subsp. <i>virens</i> Wahlenb.	79. <i>Crataegus monogyna</i> f. <i>stricta</i> (Loudon) Zabel
82. <i>Rosa canina</i> subsp. <i>vulgaris</i> (W.D.J.Koch) Gams	80. <i>Crataegus monogyna</i> f. <i>szaferi</i> Gost.-Jak.
83. <i>Rosa canina</i> var. <i>afzeliana</i> Nyman, 1889	81. <i>Crataegus monogyna</i> f. <i>trifida</i> (Wallr.) Beck
84. <i>Rosa canina</i> var. <i>angustifolia</i> Dierb.	82. <i>Crataegus monogyna</i> f. <i>trifida</i> (Wallr.) Hegi
85. <i>Rosa canina</i> var. <i>armidae</i> Webb & Berthel.	83. <i>Crataegus monogyna</i> f. <i>trilobata</i> Ny
86. <i>Rosa canina</i> var. <i>armidii</i> Webb & Berthel.	84. <i>Crataegus monogyna</i> f. <i>trilobata</i> Nyár. ex Buia
87. <i>Rosa canina</i> var. <i>arnbergensis</i> Heinr.Braun	85. <i>Crataegus monogyna</i> f. <i>villosa</i> (Peterm.) Beck
88. <i>Rosa canina</i> var. <i>belgradensis</i> (Pancic) Brumme & Gladis	86. <i>Crataegus monogyna</i> subsp. <i>acutiloba</i> (J.Kern.) Baranec
88. <i>Rosa canina</i> var. <i>blondeauana</i> (Ripart ex Déségl.) Crép.	87. <i>Crataegus monogyna</i> subsp. <i>aegeica</i> (Pojark.) Franco
89. <i>Rosa canina</i> var. <i>brachypetala</i> J.B.Keller	88. <i>Crataegus monogyna</i> subsp. <i>aguilaris</i> (Sennen) Sennen
90. <i>Rosa canina</i> var. <i>caesia</i> J.J.Schmitz & Regel	89. <i>Crataegus monogyna</i> subsp. <i>azarella</i> (Griseb.) Franco
91. <i>Rosa canina</i> var. <i>decipiens</i> L.A.W.Hasse	90. <i>Crataegus monogyna</i> subsp. <i>brevispina</i> (Kunze) Franco
92. <i>Rosa canina</i> var. <i>desmata</i> L.A.W.Hasse	91. <i>Crataegus monogyna</i> subsp. <i>inermis</i> Sennen
93. <i>Rosa canina</i> var. <i>dilucida</i> (Déségl. & Ozan.) Heinr.Braun	92. <i>Crataegus monogyna</i> subsp. <i>insegnae</i> (Guss.) Lange
	93. <i>Crataegus monogyna</i> subsp. <i>intermedia</i> (Schur) J

94. <i>Rosa canina</i> var. <i>dumetorum</i> Gren. ex Gren. & Godr.	94. <i>Crataegus monogyna</i> subsp. <i>intermedia</i> (Schur) Jáv.
95. <i>Rosa canina</i> var. <i>edita</i> (Déségl.) Rouy	95. <i>Crataegus monogyna</i> subsp. <i>intermedia</i> (Schur) Péntzes
96. <i>Rosa canina</i> var. <i>exilis</i> (Crép.) R.Keller	96. <i>Crataegus monogyna</i> subsp. <i>jacquini</i> Péntzes
97. <i>Rosa canina</i> var. <i>fallens</i> (Déségl.) Brumme & Gladis	97. <i>Crataegus monogyna</i> subsp. <i>latiloba</i> Hrabetová
98. <i>Rosa canina</i> var. <i>flavidifolia</i> (Vuk.) Brumme & Gladis	98. <i>Crataegus monogyna</i> subsp. <i>leiomonogyna</i> (Klokov) Franco
99. <i>Rosa canina</i> var. <i>flexibilis</i> (Déségl.) Brumme & Gladis	99. <i>Crataegus monogyna</i> subsp. <i>maritima</i> Corill.
100. <i>Rosa canina</i> var. <i>flexibilis</i> (Déségl.) Keller	100. <i>Crataegus monogyna</i> subsp. <i>maura</i> (L.fil.) Maire
101. <i>Rosa canina</i> var. <i>frondosa</i> (Stev. ex Spreng.) Brumme & Gladis	101. <i>Crataegus monogyna</i> subsp. <i>mongyna</i> Jacq.
102. <i>Rosa canina</i> var. <i>frutetorum</i> (Besser) P.V.Heath	102. <i>Crataegus monogyna</i> subsp. <i>monogyna</i>
103. <i>Rosa canina</i> var. <i>glaberrima</i> (Dumort.) Christ	103. <i>Crataegus monogyna</i> subsp. <i>nordica</i> Franco
104. <i>Rosa canina</i> var. <i>glabra</i> Desv.	104. <i>Crataegus monogyna</i> subsp. <i>pinnatifida</i> Hartm.
105. <i>Rosa canina</i> var. <i>glauca</i> Wender.	105. <i>Crataegus monogyna</i> subsp. <i>plesivecensis</i> Hrabetová
106. <i>Rosa canina</i> var. <i>glaucescens</i> (Desv. ex Mérat) Steud.	106. <i>Crataegus monogyna</i> subsp. <i>polyacantha</i> (Guss.) Nyman
107. <i>Rosa canina</i> var. <i>globosa</i> Desv., 1813	107. <i>Crataegus monogyna</i> subsp. <i>tauscheri</i> Péntzes
108. <i>Rosa canina</i> var. <i>hirtella</i> Christ	108. <i>Crataegus monogyna</i> var. <i>acutiloba</i> J.Kern.
109. <i>Rosa canina</i> var. <i>inermis</i> (Wirtg.) Wirtg.	109. <i>Crataegus monogyna</i> var. <i>albablena</i> Rehder
110. <i>Rosa canina</i> var. <i>intercedens</i> (Heinr.Braun) Heinr.Braun	110. <i>Crataegus monogyna</i> var. <i>alboplana</i> Rehder
111. <i>Rosa canina</i> var. <i>krameri</i> Heinr.Braun	111. <i>Crataegus monogyna</i> var. <i>arborescens</i> Kuntze
	112. <i>Crataegus monogyna</i> var. <i>arborescens</i> Kuntze ex Péntzes

112. <i>Rosa canina</i> var. <i>leucantha</i> Wender.	113. <i>Crataegus monogyna</i> var. <i>azarella</i> (Griseb.) Koehne
113. <i>Rosa canina</i> var. <i>libertiae</i> (Dumort.) P.V.Heath	114. <i>Crataegus monogyna</i> var. <i>brevispina</i> (Kunze) Dippel
114. <i>Rosa canina</i> var. <i>libertii</i> (Dumortier) P.V.Heath	115. <i>Crataegus monogyna</i> var. <i>brevispina</i> (Kunze) P.D.Sell
115. <i>Rosa canina</i> var. <i>lutetiana</i> (Léman) Baker	116. <i>Crataegus monogyna</i> var. <i>coccinea</i> Rehder
116. <i>Rosa canina</i> var. <i>lutetiana</i> (Léman) N.H.F.Desp.	117. <i>Crataegus monogyna</i> var. <i>contracta</i> Hrabetová
117. <i>Rosa canina</i> var. <i>mairei</i> Keller	118. <i>Crataegus monogyna</i> var. <i>coriacea</i> Podp.
118. <i>Rosa canina</i> var. <i>mandonii</i> (Déségl.) Menezes	119. <i>Crataegus monogyna</i> var. <i>csatoi</i> Péntzes
119. <i>Rosa canina</i> var. <i>mucronulata</i> (Déségl.) Brumme & Gladis	120. <i>Crataegus monogyna</i> var. <i>decussata</i> (Wallr.) Murr
120. <i>Rosa canina</i> var. <i>myrtilloides</i> Tratt.	121. <i>Crataegus monogyna</i> var. <i>decussata</i> (Wallr.) Péntzes
121. <i>Rosa canina</i> var. <i>nemophila</i> (Déségl. & Ozan.) Brumme & Gladis	122. <i>Crataegus monogyna</i> var. <i>denudata</i> Schumach.
122. <i>Rosa canina</i> var. <i>nervulosa</i> (Debeaux) J.B.Keller	123. <i>Crataegus monogyna</i> var. <i>dissecta</i> (Borkh.) Gost.-Jak.
123. <i>Rosa canina</i> var. <i>nitens</i> (Desv.) Debeaux	124. <i>Crataegus monogyna</i> var. <i>fastigiata</i> Lauche
124. <i>Rosa canina</i> var. <i>nitens</i> (Desv.) Heinr.Braun	125. <i>Crataegus monogyna</i> var. <i>fissa</i> (Poir.) Lauche
125. <i>Rosa canina</i> var. <i>nitida</i> (Sw.) Fr.	126. <i>Crataegus monogyna</i> var. <i>flabellata</i> Lange
126. <i>Rosa canina</i> var. <i>opaca</i> Fr.	127. <i>Crataegus monogyna</i> var. <i>flexuosa</i> Lauche
127. <i>Rosa canina</i> var. <i>opaca</i> Hartm., 1820	128. <i>Crataegus monogyna</i> var. <i>granatensis</i> (Boiss.) Dippel
128. <i>Rosa canina</i> var. <i>pseudoblondiana</i> A.Félix	129. <i>Crataegus monogyna</i> var. <i>granatensis</i> (Boiss.) P.D.Sell
129. <i>Rosa canina</i> var. <i>pubescens</i> Schltld.	130. <i>Crataegus monogyna</i> var. <i>gumperi</i> Lauche

130. <i>Rosa canina</i> var. <i>racemulosa</i> Heinr.Braun	131. <i>Crataegus monogyna</i> var. <i>halacsyi</i> Hayek
131. <i>Rosa canina</i> var. <i>ramosissima</i> A.Rau	132. <i>Crataegus monogyna</i> var. <i>heterodonta</i> (Pojark.) Gost.-Jak.
132. <i>Rosa canina</i> var. <i>schottiana</i> Ser. ex DC.	133. <i>Crataegus monogyna</i> var. <i>horrida</i> (K.Koch) Dippel
133. <i>Rosa canina</i> var. <i>splendens</i> J.Becker	134. <i>Crataegus monogyna</i> var. <i>insegnae</i> (Tineo ex Guss.) Beck
134. <i>Rosa canina</i> var. <i>spuria</i> (Déségl.) Crép.	135. <i>Crataegus monogyna</i> var. <i>intermedia</i> (Fuss) Gams
135. <i>Rosa canina</i> var. <i>squarrosa</i> A.Rau	136. <i>Crataegus monogyna</i> var. <i>intermedia</i> (Fuss) Vollm.
136. <i>Rosa canina</i> var. <i>subcylindrica</i> J.Becker	137. <i>Crataegus monogyna</i> var. <i>intermedia</i> (Schur) Buia
137. <i>Rosa canina</i> var. <i>subglauca</i> Heinr.Braun	138. <i>Crataegus monogyna</i> var. <i>intermedia</i> (Schur) Hegi
138. <i>Rosa canina</i> var. <i>subinermis</i> Ball	139. <i>Crataegus monogyna</i> var. <i>inzengae</i> Briq.
139. <i>Rosa canina</i> var. <i>substylosa</i> Keller	140. <i>Crataegus monogyna</i> var. <i>javorkae</i> Pénzes
140. <i>Rosa canina</i> var. <i>superba</i> (Chast.) Heinr.Braun	141. <i>Crataegus monogyna</i> var. <i>kyrtostyla</i> (Fingerh.) Beck
141. <i>Rosa canina</i> var. <i>surculosa</i> (J.Woods) Bab.	142. <i>Crataegus monogyna</i> var. <i>kyrtostyla</i> (Fingerh.) Simonk.
142. <i>Rosa canina</i> var. <i>sylvestris</i> Roth	143. <i>Crataegus monogyna</i> var. <i>laciniata</i> (Ucria) Kerguélen
143. <i>Rosa canina</i> var. <i>syntrichostyla</i> (Ripart) Brumme & Gladis	144. <i>Crataegus monogyna</i> var. <i>laciniata</i> K.Koch
144. <i>Rosa canina</i> var. <i>szliacsensis</i> (J.B.Keller) Ker.-Nagy	145. <i>Crataegus monogyna</i> var. <i>laciniata</i> Lauche
145. <i>Rosa canina</i> var. <i>transitoria</i> Keller	146. <i>Crataegus monogyna</i> var. <i>lanigera</i> Beck
146. <i>Rosa canina</i> var. <i>umbellata</i> (Lib.) Wirtg.	147. <i>Crataegus monogyna</i> var. <i>lasiocarpa</i> (Lange) K.I.Chr.
147. <i>Rosa canina</i> var. <i>umbellata</i> Dierb.	
148. <i>Rosa canina</i> var. <i>vinealis</i> (Déségl.) Keller	

149. <i>Rosa canina</i> var. <i>virens</i> Wahlenb.	148. <i>Crataegus monogyna</i> var. <i>latimonogyna</i> P
150. <i>Rosa canina</i> var. <i>vulgaris</i> A.Rau	149. <i>Crataegus monogyna</i> var. <i>mandyi</i> Péntzes
151. <i>Rosa caninella</i> Bommel	150. <i>Crataegus monogyna</i> var. <i>maritima</i> Corill., 1977
152. <i>Rosa caucasea</i> Lindl.	151. <i>Crataegus monogyna</i> var. <i>microphylla</i> (Chenevard ex Gams) Diap.
153. <i>Rosa caucasea</i> Pall.	152. <i>Crataegus monogyna</i> var. <i>microphylla</i> Csató
154. <i>Rosa caucasica</i> Lindl.	153. <i>Crataegus monogyna</i> var. <i>monogyna</i> Jacq.
155. <i>Rosa caucasica</i> Pall.	154. <i>Crataegus monogyna</i> var. <i>nordica</i> (Franco) P.D.Sell
156. <i>Rosa caucasica</i> var. <i>lindleyana</i> Ser.	155. <i>Crataegus monogyna</i> var. <i>oliveriana</i> (Poir.) K.Koch
157. <i>Rosa chaboissaei</i> Gren.	156. <i>Crataegus monogyna</i> var. <i>paulii</i> Rehder
158. <i>Rosa ciliato-sepala</i> Blocki	157. <i>Crataegus monogyna</i> var. <i>pendula</i> Lauche
159. <i>Rosa ciliopetala</i> Besser	158. <i>Crataegus monogyna</i> var. <i>plesivecensis</i> (Hrabetová) Baranec
160. <i>Rosa cladoleia</i> Ripart ex Crép.	159. <i>Crataegus monogyna</i> var. <i>poloniensis</i> (Cinovskis) Cinovskis
161. <i>Rosa cladoleia</i> Ripart, 1869	160. <i>Crataegus monogyna</i> var. <i>pteridifolia</i> (Lodd. ex Loudon) Rehder
162. <i>Rosa communis</i> Rouy & E.G.Camus	161. <i>Crataegus monogyna</i> var. <i>punicea</i> Bogenh.
163. <i>Rosa communis</i> subsp. <i>canina</i> (L.) Rouy	162. <i>Crataegus monogyna</i> var. <i>pyramidalis</i> Rehder
164. <i>Rosa communis</i> var. <i>analoga</i> (Déségl.) Rouy & E.G.Camus, 1900	163. <i>Crataegus monogyna</i> var. <i>reginae</i> Lauche
165. <i>Rosa communis</i> var. <i>augustinensis</i> Rouy & E.G.Camus, 1900	164. <i>Crataegus monogyna</i> var. <i>ronnigerii</i> K.Malý
166. <i>Rosa communis</i> var. <i>caerulescens</i> Ravaud	165. <i>Crataegus monogyna</i> var. <i>rubraplena</i> Rehder
167. <i>Rosa communis</i> var. <i>caerulescens</i> Ravaud ex Rouy	166. <i>Crataegus monogyna</i> var. <i>segobricensis</i> Pau
168. <i>Rosa communis</i> var. <i>coerulescens</i> Ravaud	
169. <i>Rosa communis</i> var. <i>coerulescens</i> Ravaud ex Rouy	
170. <i>Rosa communis</i> var. <i>ellipsoides</i> (Godet) Rouy & E.G.Camus, 1900	
171. <i>Rosa communis</i> var. <i>glabrata</i> (Déségl.) Rouy	

172. <i>Rosa communis</i> var. <i>globosa</i> (Desv.) Rouy & E.G.Camus, 1900	167. <i>Crataegus monogyna</i> var. <i>semperflorens</i> Dippel
173. <i>Rosa communis</i> var. <i>globularis</i> (Franch. ex Boreau) Rouy & E.G.Camus, 1900	168. <i>Crataegus monogyna</i> var. <i>sericea</i> Dzekov
174. <i>Rosa communis</i> var. <i>mollardiana</i> (Moutin) Rouy & E.G.Camus, 1900	169. <i>Crataegus monogyna</i> var. <i>splendens</i> (K.Koch) Dippel
175. <i>Rosa communis</i> var. <i>oxyphylla</i> Rouy & E.G.Camus, 1900	170. <i>Crataegus monogyna</i> var. <i>stricta</i> (Loudon) Rehder
176. <i>Rosa communis</i> var. <i>pseudoravaudii</i> Rouy & E.G.Camus, 1900	171. <i>Crataegus monogyna</i> var. <i>stricta</i> Lauche
177. <i>Rosa communis</i> var. <i>sublaxa</i> Rouy & E.G.Camus, 1900	172. <i>Crataegus monogyna</i> var. <i>szepesfalvyi</i> Pénzes
178. <i>Rosa condensata</i> Puget	173. <i>Crataegus monogyna</i> var. <i>tauscheri</i> (Gand.) Soó
179. <i>Rosa condensata</i> Puget ex Déségl.	174. <i>Crataegus monogyna</i> var. <i>trifida</i> (Wallr.) Murr
180. <i>Rosa controversa</i> Ripart	175. <i>Crataegus monogyna</i> var. <i>trilobata</i> (Nyár. ex Buia) Gost.-Jak.
181. <i>Rosa controversa</i> Ripart ex Déségl.	176. <i>Crataegus monogyna</i> var. <i>typica</i> Beck
182. <i>Rosa cuneata</i> Chast.	177. <i>Crataegus monogyna</i> × <i>rhpidophylla</i>
183. <i>Rosa curticola</i> Puget	178. <i>Crataegus oligacantha</i> Gand.
184. <i>Rosa curticola</i> Puget ex Déségl.	179. <i>Crataegus orientobaltica</i> Cinovskis
185. <i>Rosa desvauxii</i> N.H.F.Desp.	180. <i>Crataegus orientobaltica</i> f. <i>glabra</i> Cinovskis
186. <i>Rosa didoensis</i> Boiss.	181. <i>Crataegus orientobaltica</i> f. <i>laciniata</i> Cinovskis
187. <i>Rosa dilucida</i> Déségl. & Ozanon	182. <i>Crataegus oxyacantha</i> L.
188. <i>Rosa disparilis</i> Lucand & Ozanon	183. <i>Crataegus oxyacantha</i> Pennant
189. <i>Rosa dollineriana</i> J.B.Keller	184. <i>Crataegus oxyacantha</i> f. <i>splendens</i> C.K.Schneid.
190. <i>Rosa dolosa</i> Godet	185. <i>Crataegus oxyacantha</i> subsp. <i>coriacea</i> Maire
191. <i>Rosa dumalis</i> subsp. <i>afzeliana</i> P.Fourn.	186. <i>Crataegus oxyacantha</i> subsp. <i>inzengae</i> (Tineo ex Guss.) Fiori
192. <i>Rosa dumosa</i> Salisb.	187. <i>Crataegus oxyacantha</i> subsp. <i>maura</i> (L.fil.) Maire
193. <i>Rosa edita</i> Déségl.	
194. <i>Rosa eriostyla</i> Ripart & Déségl.	
195. <i>Rosa exilis</i> Crép.	
196. <i>Rosa fallax</i> Puget	

197. <i>Rosa fallax</i> Puget ex Baker	188. <i>Crataegus oxyacantha</i> subsp. <i>monogyna</i> (Jacq.) Rouy & E.G.Camus
198. <i>Rosa fallens</i> Déségl.	189. <i>Crataegus oxyacantha</i> subsp. <i>monogyna</i> (Jacq.) Syme
199. <i>Rosa firma</i> Puget	190. <i>Crataegus oxyacantha</i> subsp. <i>monogyna</i> Arcang., 1882
200. <i>Rosa firma</i> Puget ex Déségl.	191. <i>Crataegus oxyacantha</i> subsp. <i>monogyna</i> Bonnier & Layens, 1894
201. <i>Rosa firmula</i> Godet	192. <i>Crataegus oxyacantha</i> subsp. <i>oxyacantha</i>
202. <i>Rosa fissispina</i> Wierzb.	193. <i>Crataegus oxyacantha</i> subsp. <i>saccardiana</i> Maire
203. <i>Rosa fissispina</i> Wierzb. ex Heuff.	194. <i>Crataegus oxyacantha</i> var. <i>acutiloba</i> H.Lév.
204. <i>Rosa flavidifolia</i> Vuk.	195. <i>Crataegus oxyacantha</i> var. <i>albaplana</i> Bean
205. <i>Rosa flexibilis</i> Déségl.	196. <i>Crataegus oxyacantha</i> var. <i>alboplana</i> Bean
206. <i>Rosa flexuosa</i> Raf.	197. <i>Crataegus oxyacantha</i> var. <i>azarella</i> (Griseb.) Sanio
207. <i>Rosa fraxinoides</i> (Heinr.Braun) Heinr.Braun	198. <i>Crataegus oxyacantha</i> var. <i>biflora</i> Weston
208. <i>Rosa frivaldskyi</i> Braun	199. <i>Crataegus oxyacantha</i> var. <i>brevispina</i> (Kunze) Maire
209. <i>Rosa frivaldszkyi</i> Heinr.Braun, 1888	200. <i>Crataegus oxyacantha</i> var. <i>ciliata</i> Maire
210. <i>Rosa frondosa</i> Steven	201. <i>Crataegus oxyacantha</i> var. <i>coccineaplana</i> Bean
211. <i>Rosa frondosa</i> Steven ex Spreng.	202. <i>Crataegus oxyacantha</i> var. <i>coriacea</i> Maire
212. <i>Rosa gabrielis</i> F.Gérard ex Magn.	203. <i>Crataegus oxyacantha</i> var. <i>discolor</i> H.Lév.
213. <i>Rosa generalis</i> Chast.	204. <i>Crataegus oxyacantha</i> var. <i>elegans</i> (Poir.) Noulet, 1837
214. <i>Rosa glaberrima</i> Dum.Cours.	205. <i>Crataegus oxyacantha</i> var. <i>eriodclada</i> H.Lév.
215. <i>Rosa glaberrima</i> Dumort.	
216. <i>Rosa glauca</i> Schott	
217. <i>Rosa glauca</i> Schott ex Besser	
218. <i>Rosa glaucescens</i> Desv. ex Mérat	
219. <i>Rosa glaucina</i> Ripart	
220. <i>Rosa glaucina</i> Ripart ex Ozanon	
221. <i>Rosa glaucina</i> Ripart ex T.Durand	
222. <i>Rosa globularis</i> Franch.	
223. <i>Rosa globularis</i> Franch. ex Boreau	
224. <i>Rosa heterostyla</i> Chrshan.	
225. <i>Rosa hirsuta</i> Déségl. & Ozanon	
226. <i>Rosa hirtella</i> Ripart	
227. <i>Rosa hirtella</i> Ripart ex Crép.	
228. <i>Rosa horridula</i> Déségl.	
229. <i>Rosa inconspicua</i> Déségl.	
230. <i>Rosa intercedens</i> Braun	

231. <i>Rosa istriaca</i> Degen	206. <i>Crataegus oxyacantha</i> var. <i>fallax</i> Maire
232. <i>Rosa istricea</i> Degen	207. <i>Crataegus oxyacantha</i> var. <i>florealbaplena</i> Rodigas
233. <i>Rosa keissleriana</i> Sennen	208. <i>Crataegus oxyacantha</i> var. <i>horrida</i> (K.Koch) Regel
234. <i>Rosa laxifolia</i> Borbás	209. <i>Crataegus oxyacantha</i> var. <i>incisa</i> (Mérat) H.Lév.
235. <i>Rosa laxiphylla</i> (Borbás) B.D.Jacks.	210. <i>Crataegus oxyacantha</i> var. <i>incisa</i> Mérat, 1812
236. <i>Rosa lemaitrei</i> Ripart	211. <i>Crataegus oxyacantha</i> var. <i>insegnae</i> (Tineo ex Guss.) Fiori
237. <i>Rosa lemaitrei</i> Ripart ex Verl.	212. <i>Crataegus oxyacantha</i> var. <i>intermedia</i> (Fuss) Sanio
238. <i>Rosa lioclada</i> Boullu	213. <i>Crataegus oxyacantha</i> var. <i>kyrtostyla</i> (Fingerh.) Regel
239. <i>Rosa litigiosa</i> Crép.	214. <i>Crataegus oxyacantha</i> var. <i>kyrtostyla</i> (Fingerh.) Rouy & E.G.Camus
240. <i>Rosa litvinovii</i> var. <i>slobodjanii</i> Chrshan.	215. <i>Crataegus oxyacantha</i> var. <i>laciniata</i> (K.Koch) Regel
241. <i>Rosa lonaczewskii</i> Dubovik	216. <i>Crataegus oxyacantha</i> var. <i>laciniata</i> (Ucria) Fiori
242. <i>Rosa longituba</i> Debeaux	217. <i>Crataegus oxyacantha</i> var. <i>maura</i> (L.fil.) Batt.
243. <i>Rosa ludibunda</i> Gren. & Paill.	218. <i>Crataegus oxyacantha</i> var. <i>miniata</i> Maire
244. <i>Rosa lutetiana</i> L	219. <i>Crataegus oxyacantha</i> var. <i>monogyna</i> (Jacq.) Batt.
245. <i>Rosa lutetiana</i> Léman	220. <i>Crataegus oxyacantha</i> var. <i>monogyna</i> (Jacq.) Loudon
246. <i>Rosa lutetiana</i> var. <i>glaucescens</i> (Desv. ex Mérat) Boullu	221. <i>Crataegus oxyacantha</i> var. <i>monogyna</i> (Jacq.) Moritzi
247. <i>Rosa lutetiana</i> var. <i>globularis</i> (Franch. ex Boreau) Wolley-Dod, 1920	222. <i>Crataegus oxyacantha</i> var. <i>monogyna</i> (Jacq.) Regel
248. <i>Rosa lutetiana</i> var. <i>nitens</i> (Desv. ex Mérat) Boullu	
249. <i>Rosa lutetiana</i> var. <i>senticosa</i> (Ach.) Boullu	
IMMEDIATE CHILDREN: SUBSPECIES, VARIETY	
A. SUBSPECIES	
1. Subspecies <i>Rosa afzeliana</i> subsp. <i>afzeliana</i>	
2. Subspecies <i>Rosa afzeliana</i> subsp. <i>subcanina</i> Hayek, 1931	
3. Subspecies <i>Rosa afzeliana</i> subsp. <i>subcollina</i> Hayek, 1931	
4. Subspecies <i>Rosa canina</i> subsp. <i>unranked</i> Thory, 1824	

	<p>B. VARIETY</p> <p>1. Variety <i>Rosa canina</i> var. <i>andegavensis</i> (Bastard) N.H.F.Desp.</p> <p>2. Variety <i>Rosa canina</i> var. <i>andegavensis</i> Arechav. , 1901</p> <p>3. Variety <i>Rosa canina</i> var. <i>apiculata</i> Heinr.Braun</p> <p>4. Variety <i>Rosa canina</i> var. <i>biserrata</i> (Mérat) Chevall.</p> <p>5. Variety <i>Rosa canina</i> var. <i>blondaeana</i> (Déségl.) Crép.</p> <p>6. Variety <i>Rosa canina</i> var. <i>blondeana</i> (Ripart ex Déségl.) Crép.</p> <p>7. Variety <i>Rosa canina</i> var. <i>brevipes</i> Borbás</p> <p>8. Variety <i>Rosa canina</i> var. <i>calophylla</i> (Christ) Brumme & Gladis</p> <p>9. Variety <i>Rosa canina</i> var. <i>canina</i></p> <p>10. Variety <i>Rosa canina</i> var. <i>erdneri</i> Schwertschl.</p> <p>11. Variety <i>Rosa canina</i> var. <i>euoxyphylla</i> (Borbás) Brumme & Gladis</p> <p>12. Variety <i>Rosa canina</i> var. <i>fallax</i> (Puget) Brumme & Gladis</p> <p>13. Variety <i>Rosa canina</i> var. <i>finitima</i> Heinr.Braun</p> <p>14. Variety <i>Rosa canina</i> var. <i>fissidens</i> Borbás</p> <p>15. Variety <i>Rosa canina</i> var. <i>oblonga</i> Heinr.Braun</p> <p>16. Variety <i>Rosa canina</i> var. <i>ololeia</i> (Ripart) Borbás</p>	<p>223. <i>Crataegus oxyacantha</i> var. <i>monogyna</i> (Jacq.) Wahlenb.</p> <p>224. <i>Crataegus oxyacantha</i> var. <i>monostyla</i> DC.</p> <p>225. <i>Crataegus oxyacantha</i> var. <i>obovato-cuneatis</i> Ball</p> <p>226. <i>Crataegus oxyacantha</i> var. <i>pendula</i> Lodd.</p> <p>227. <i>Crataegus oxyacantha</i> var. <i>pendula</i> Lodd. ex Loudon</p> <p>228. <i>Crataegus oxyacantha</i> var. <i>plena</i> Weston</p> <p>229. <i>Crataegus oxyacantha</i> var. <i>praecox</i> Loudon</p> <p>230. <i>Crataegus oxyacantha</i> var. <i>punicea</i> Lodd.</p> <p>231. <i>Crataegus oxyacantha</i> var. <i>punicea</i> Lodd. ex Loudon</p> <p>232. <i>Crataegus oxyacantha</i> var. <i>reginae</i> Loudon</p> <p>233. <i>Crataegus oxyacantha</i> var. <i>saccardyana</i> Maire</p> <p>234. <i>Crataegus oxyacantha</i> var. <i>stenoloba</i> Maire</p> <p>235. <i>Crataegus oxyacantha</i> var. <i>stricta</i> Loudon</p> <p>236. <i>Crataegus oxyacantha</i> var. <i>villosa</i> H.Lév.</p> <p>237. <i>Crataegus parvifolia</i> Lojac.</p> <p>238. <i>Crataegus paucifoliata</i> Pau</p> <p>239. <i>Crataegus pectinata</i> (Dum.Cours.) Bosc</p> <p>240. <i>Crataegus petiolulata</i> Gand.</p> <p>241. <i>Crataegus pinnatifida</i> var. <i>gharanica</i> Paulsen</p> <p>242. <i>Crataegus pinnatifida</i> var. <i>ghoranica</i> Paulsen</p> <p>243. <i>Crataegus poloniensis</i> Cinovskis</p> <p>244. <i>Crataegus polyacantha</i> (Jan ex Guss.) Nyman</p> <p>245. <i>Crataegus polyacantha</i> Jan ex Guss.</p>
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	<p>17. Variety <i>Rosa canina</i> var. <i>opaca</i> (Fr.) Brumme & Gladis</p> <p>18. Variety <i>Rosa canina</i> var. <i>oxyphylla</i> Ripart ex Heinr.Braun</p> <p>19. Variety <i>Rosa canina</i> var. <i>pervulgata</i> (Schwertsch l.) Brumme & Gladis</p> <p>20. Variety <i>Rosa canina</i> var. <i>ragusina</i> J.B.Keller</p> <p>21. Variety <i>Rosa canina</i> var. <i>scabrata</i> Crép.</p> <p>22. Variety <i>Rosa canina</i> var. <i>separabilis</i> Déségl.</p> <p>23. Variety <i>Rosa canina</i> var. <i>sepium</i> Arechav., 1901</p> <p>24. Variety <i>Rosa canina</i> var. <i>squarrosa</i> (Rau) Brumme & Gladis</p> <p>25. Variety <i>Rosa canina</i> var. <i>squarrosidens</i> Borbás</p> <p>26. Variety <i>Rosa canina</i> var. <i>subertii</i> (Ripart) Brumme & Gladis</p> <p>27. Variety <i>Rosa canina</i> var. <i>subhercynica</i> Heinr.Braun</p> <p>28. Variety <i>Rosa canina</i> var. <i>subvirens</i> (Wierzb.) Hayek</p> <p>29. Variety <i>Rosa canina</i> var. <i>swartzii</i> (Fr.) Heinr.Braun</p> <p>30. Variety <i>Rosa canina</i> var. <i>tortuosa</i> (Wierzb.) Borbás</p> <p>31. Variety <i>Rosa canina</i> var. <i>transotoria</i> R.Keller</p> <p>32. Variety <i>Rosa communis</i> var. <i>communis</i></p> <p>33. Variety <i>Rosa communis</i> var. <i>globata</i> (Déségl.) Rouy</p>	<p>246. <i>Crataegus praearmata</i> Klokov</p> <p>247. <i>Crataegus pterifolia</i> Lodd.</p> <p>248. <i>Crataegus pulchella</i> Gand.</p> <p>249. <i>Crataegus raadvadensis</i> Raunk.</p> <p>IMMEDIATE CHILDREN:</p> <p>A. VARIETY</p> <p>1. Variety <i>Crataegus monogyna</i> var. <i>foucaudii</i> Briq.</p> <p>2. Variety <i>Crataegus monogyna</i> var. <i>insularis</i> Briq. & Prodr.Fl.</p> <p>3. Variety <i>Crataegus monogyna</i> var. <i>lasiocarpa</i> (Lange) K.I.Chr.</p> <p>4. Variety <i>Crataegus monogyna</i> var. <i>odemisii</i> Dönmez & Özderin</p> <p>5. Variety <i>Crataegus monogyna</i> var. <i>pteridifolia</i> (Lodd. ex Loudon) K.Koch</p> <p>6. Variety <i>Crataegus monogyna</i> var. <i>sericea</i> Dzetov, 1974</p> <p>7. Variety <i>Crataegus xsubsphaerica</i> var. <i>subsphaerica</i></p>
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2. Chemical composition and health benefits of rose hip and hawthorn.

Chemical composition of rose hip. Rose hips are important horticulture sources of vitamins, carotenoids, flavonoids (Uttara *et al.*, 2009, Diniz *et al.*, 2015, Homayoun *et al.*, 2015) triterpenoic acids, galactolipids and dietary fibres especially pectines found in seeds (Winther *et al.*, 2016), polysaccharides (Lee *et al.* 2014, Guo *et al.*, 2015), quercetin (Fuji *et al.*, 2011), minerals (Erci şli, 2007, Sanderson and Fillmore, 2014). However, the composition of bioactive compounds is also affected by the ripening stage of the rosehips at harvest (Guimaraes *et al.* 2010).

Vitamins comprise a group of very different compounds with very different chemical properties. B, D, E, K represent the main vitamins in rose hips composition, but especially fruits its recognised for high quantities of vitamin C. *Rosa canina* does not contain vitamin A, but carotenoids from fruits are vitamin A precursors, that improve eyesight, growth and reproduction, B-coenzymes, C-antioxidant (Phetcharat *et al.*, 2015), D- regulation of calcium and phosphate metabolism, E-coagulant, E-antioxidant and K helps the blood coagulation (Winther *et al.*, 2016).

Medicinal use of rose hip. People are now more worried than ever about their diets and general health. Fruit and berries are treasured for their frequently high amount of chemicals that are beneficial to health. Since the Middle Ages, rose hips fruits have been revered as valuable therapeutic plants in this context. Fruits of rose hips, with petals, leaves, and seeds, have been used to make a variety of tonics and remedies to treat a variety of diseases. As a result, therapeutic activity against the common cold, gastrointestinal issues, gastric ulcers, as well as different types of inflammatory illnesses, like arthritis, have been described.

Additionally, laxative and diuretic uses have been documented (Nybom and Werlemark). Also, rosehip extracts have been linked to a variety of therapeutic benefits (Erci şli and Gülerüz, 2005), including the prevention of the growth of some cancer cells (Olsson *et al.* 2004), a reduction in the activity of reactive oxygen species (ROS) in rat colons (Håkansson *et al.* 2006), and an anti-inflammatory response in osteoarthritis patients (Winther *et al.* 2005).

Also, therapeutic activity against the common cold, gastrointestinal issues, gastric ulcers, as well as different types of inflammatory illnesses, like arthritis uses have been described.

Chemical composition of hawthorn. Flavonoids (rutin, hyperosidae, vitexin) are the main components (Barnes *et al.*, 2007). Pentacyclic triterpene derivatives (oleanolic, ursolic, and crategolic acids), essential oil (0.1–2%) catechin, epi-catechins, and simple phenolic acids (chlorogenic acid 0.01%, caffeic acids) are all found in hawthorn flowers and leaves.

Its fruits are high in antocians, leucoantocians, catehine, flavonols, beta-carotens, ascorbic acid, cumarines, pectins, sorbitines, saponines, vitamin B, carbohydrates, and a fat oil (Beldeanu, 2004; Goji and Dinulica, 2011). Hawthorn fruits also contain minerals such as: Ca, P, K, Mg, Na, Al, Cr, Fe, Li, Ni, Pb, Se, V (Musa *et al.*, 2005).

Medicinal uses of hawthorn. Additionally, they have diuretic, anti-inflammatory, anti-hypertensive, and sedative properties. Hawthorn has been linked to cardiovascular activity, which the flavonoid components are responsible.

Hawthorn-based treatments have hypotensive properties because they increase irrigation and the delivery of oxygen to the heart and brain while reducing myocardial excitability and boosting its activity. Also, bromine and lithium are two minerals from hawthorn chemical complex that support biological functions but have not yet been proven to be essential (Macrae, Robinson and Sadler, 1993a, Musa *et al.*, 2005).

All of the active components present in the hawthorn-based formulations provide the pharmacodynamic and therapeutic effect. These organs are dried and used as tea in conventional medicine (Beldeanu, 2004, Goji and Dinulica, 2011).

Another material with advantageous pharmacological traits is lithium, which has been successfully utilized to treat manic depressive illnesses (Macrae, Robinson, & Sadler, 1993b, Musa *et al.*, 2005).

As regards the *pharmaceutical sector* the fruits of rose hips and hawthorns are used to prepare tinctures, capsules, teas/infusions, oils, and cosmetics (Karahana, 2005).

Rose hip and hawthorn are used in *food industry* to obtain juices, jellies, marmalades, jams, powders, wine, cider, liqueurs, and other products. Also, are occasionally grown as ornaments, particularly in public spaces where people value their toughness and rustic appearance.

3. Environmental requirements of rose hip and hawthorn. *Rosa canina* fruits (fig. 1), often known as rose hip, wild rose, or dwarf rose, have been used in herbal remedies since ancient times (Marstrand and Campbell-Tofte, 2016). In temperate locations, species of the rose hip grow wild along roadsides and in disturbed places and some countries have also practiced limited rose hip cultivation.

However, the growing desire in food items with health-improving ingredients may result in new plantations (Nybom and Werlemark, 2017). The flowers are usually pale pink color, but there are also plants with white or dark pink flowers. The fruit is elongated, deep red in color, ripening in September, but manifest sensitivity to drought and frost.



Fig. 1. Fruits of *Rosa canina*-rose hip (original photo)

Small trees and shrubs comprise the *Rosaceae* family member known as hawthorn (*Crataegus spp.*). Hawthorns (fig. 2) are known by a variety of common names, including mayblossom, fast thorn, whitethorn, haw hazels, gazels, half, bread and cheese tree (Ozcan *et al.*, 2005). It has white, fragrant flowers and small red fruit with a large seed and yellow flesh. It has a wide range and is a warmth plant. It is nicknamed the *heart plant* or *Fruit of God* and is one of the most widely used plants in medicine.



Fig. 2. Fruits of *Crataegus monogyna*-hawthorn (original photo)

CONCLUSIONS

Various researches have been carried out to investigate the properties of *Rosa canina* and *Crataegus monogyna*. This review addresses only a small part of these researches, especially those aimed at understanding the positive effects of rosehip and hawthorn from chemical, medical, pharmaceutical, food, cosmetic, ornamental points of view. Studies on the different bioactive properties of compounds from the horticultural sources presented are also ongoing worldwide.

Fresh or processed fruits of this sources, can be used for a variety of purposes. They are mostly used to obtain juices, jams, and syrups in the food industry, as well as cosmetic emulsions, oils, creams, and food supplements in the cosmetic and pharmaceutical sectors.

In medicine, research has shown that various chemical compounds of the rose hip and hawthorn can be used in particular because of their anti-inflammatory, antioxidant and cardiovascular protective effect on the human body.

In this review, *Rosa canina* and *Crataegus monogyna* have been presented as natural sources of antioxidants with an important potential for use in the prevention and treatment of some dysfunctions of the body due to their high content in polyphenols and vitamins, having a synergistic antioxidant effect.

The development of rose hips and hawthorns exhibits considerable promise as a substitute agricultural crop.

Acknowledgments: *The authors are grateful for the technical support provided by the Horticultural Research Centre of the Faculty of Horticulture of the University for Life Sciences "Ion Ionescu de la Brad" Iasi (http://www.uaiasi.ro/horticultura/centru_cercet.php).*

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