Scientific Papers. Series B, Horticulture. Vol. LXVI, No. 1, 2022
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

PRELIMINARY SURVEY FOR MAPPING THE DISTRIBUTION OF SPONTANEOUS GOJI BERRY SHRUBS IN ROMANIA

Mala-Maria STAVRESCU-BEDIVAN[1], Cristina Florentina PELCARU[2, 3], Cătălin Mihai CROITORU[2], Clara Daniela MIHAI[4], Roxana CICEOI[5]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Agriculture, 59 Marasti Blvd, District 1, Bucharest, 011464, Romania
[2]Comana Natural Park Administration, 608 Gellu Naum Str., Comana, Giurgiu County, 087055, Romania
[3]University of Bucharest, Faculty of Biology, 91-95 Splaiul Independenței, 050095, Bucharest, Romania
[4]University of Bucharest, Faculty of Biology, 1-3 Intrarea Portocalelor, RO-060101, Bucharest, Romania
[5]Research Center for Studies of Food Quality and Agricultural Products, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59, Mărăști Blvd, Bucharest, 011464, Romania

Corresponding author email: cristina.pelcaru@drd.unibuc.ro

Abstract

So far in Romania, based on literature, online resources, and personal reports, the solanaceous shrubs of Lycium barbarum L. (syn. L. halimifolium Mill.) were recorded in Bucharest and 37 counties, from a total of 41. During the field trips between July 2021 and February 2022, made by the authors and researchers in the frame of the ProtectGoji citizen science-based project, new data about the locations where the wild goji berry bushes are encountered were gathered and some of these records have already been introduced and validated in the iNaturalist database.
The present study records of spontaneous goji berry plants included Bucharest and 18 counties, as follows: Arad, Brăila, Brașov, Buzău, Caraș-Severin, Călărași, Cluj, Constanța, Galați, Giurgiu, Ialomița, Iași, Ilfov, Prahova, Olt, Teleorman, Tulcea and Vrancea. Of these, Bucharest and 14 counties (Arad, Brașov, Buzău, Caraș-Severin, Călărași, Cluj, Constanța, Galați, Giurgiu, Iași, Ilfov, Olt, Tulcea and Vrancea) were previously mentioned in the dedicated literature or online databases, whilst Ialomița, Brăila, Prahova and Teleorman represent new occurrences for wild goji distribution. To the best of author's knowledge, there are still no records or published data concerning distribution of wild Lycium shrubs in Covasna, Dâmbovița, Hunedoara and Sălaj, although some goji plantations have been reported in some of these counties.
The aim of this survey was to design a preliminary map of distribution for wild Lycium spp. in Romania, considering the increasing importance in terms of ornamental, nutritional and therapeutic value, but also for plant protection reasons, to prevent the spread of new alien species in the commercial fields via the reservoirs of wild goji berry plants.

Key words*: Lycium sp., citizen science, distribution map, spontaneous, Romania.*

INTRODUCTION

Lycium barbarum L., syn. *L. halimifolium* Miller and *L. vulgare* Dunal, is a solanaceous plant of Asian origin, mainly China, cultivated as an ornamental and medicinal plant, that was introduced in most of the Euromediterranean area, Central and Western Asia, throughout Canada and USA, and some parts of South America and Australia (EPPO, 2022). It was deliberately introduced in Romania, where is characterized as an invasive, locally abundant (Anastasiu & Negrean, 2009) and distributed in all nine historic regions of the country: Maramureș, Transilvania, Crișana, Banat, Oltenia, Muntenia, Moldova, Bucovina, and Dobrogea (Oprea, 2005).
According to Sîrbu & Oprea (2011), the fences sea buckthorn ("cătina de garduri" in Romanian) is known in Romania since the 19th century, when it was mentioned in Moldova (cultivated next to fences and subspontaneous), Banat (hedges) and Transylvania.
Spontaneous goji berry has received different Romanian common names, depending on the geographical region, e.g. in Transylvania it was

called “licină” or “liţian”, in Bucovina “rachipară”, “răchișoară” or “zăhăricǎ”, being described as a thorny shrub, poisonous, with long, thin and flexible branches, with purple flowers and elongated red berries and fruits (Coteanu et al., 2010).

The tradition of using goji berry for nutritional purposes and as medicine is due to the fruit’s nutraceutical qualities, that were well documented in the past (Asănică et al., 2016; Clapa et al., 2021). The increasing demand for goji berry has become undeniable, as evidenced by numerous *Lycium* plantations in Europe, including in Romania (Mencinicopschi et al., 2012; Ciceoi et al., 2021). Some papers recently reported data about new varieties and locations with cultivated *Lycium* plants, however little is known about wild goji berry distribution in Romania.

Today, goji berry is the name used mainly to the fruits of two goji species, *Lycium barbarum* and *L. chinense*, grown in central and western China and Tibet. The wild goji grows also in different parts of Europe and Western Asia, including Romania. The retailers may distribute both products under the generic name of "goji", either involuntarily or out of a desire to mislead consumers and the lack of knowledge in differentiate the fruit origin might have a direct impact on consumers. The safety of *Lycium* fruits was considered uncertain after the detection of three tropane alkaloids, such as atropine and hyoscyamine in fruits of *L. barbarum* (India) and scopolamine in *L. halimifolium* at concentrations higher than the toxic dose (Barceloux, 2008; Qian et al., 2017). According to Befu (2015), the Romanian wild goji berry has smaller fruits and become bitter, which is not the case for the cultivated varieties. As goji is increasingly successful on the Romanian market, the differences between the cultivated goji and the wild goji must be clearly defined and made available for the consumers.

Recently, wild goji berry drew attention to the plant protectionists, since these shrubs are hosting an invasive alien mite, *Aceria kuko* that might affect also other economic solanaceous species, as the sweet pepper (Agrointel, 2017; Ciceoi et al., 2021).

Although not exhaustive, the aim of this work was to investigate the distribution of wild goji berry bushes in Romania, which could be of great interest for conservation biologists and potentially interested people in consuming fruits for health benefits.

MATERIALS AND METHODS

To build up the distribution map of spontaneous goji plants in Romania, online databases, as iNaturalist (inaturalist.org), Global Biodiversity Information Facility (gbif.org), Plants Database (garden.org), etc., citations databases and offline resources as Oprea (2005), Anastasiu & Negrean (2009), Sîrbu & Oprea (2011) were consulted. In addition, in the frame of ProtectGoji citizen science-based project (Ciceoi et al., 2021), some locations with wild *Lycium* bushes were collected from field trips during July 2021 to February 2022 period, while other observations and photos were provided by iNaturalist database and Facebook groups, such as “Plants from Romania” (*Plante din Romania*). Where possible, GPS coordinates (DMS) for each location were given.

Overlapping the literature review with personal study records, a map was compiled.

RESULTS AND DISCUSSIONS

Out of a total of 41 counties of Romania, the presence of *Lycium* sp. has been mentioned so far in 37 counties and in Bucharest (Figure 1). The new data allowed to note that wild goji shrubs have not been recorded in Covasna, Dâmbovița, Hunedoara and Sălaj counties. However, there are documented several *Lycium* plantations in Dâmbovița, Hunedoara (Ciceoi et al., 2021) and Sălaj (Agerpres, 2014) counties.

The citizen scientist’s records of wild goji berry shrubs during the study period included Bucharest and 18 counties (Arad, Brăila, Brașov, Buzău, Caraș-Severin, Călărași, Cluj, Constanța, Galați, Giurgiu, Ialomița, Iași, Ilfov, Olt, Prahova, Teleorman, Tulcea and Vrancea) (Table 1) (Figures 2-4).

On the one hand, Bucharest and 14 counties (Arad, Brașov, Buzău, Caraș-Severin, Călărași, Cluj, Constanța, Galați, Giurgiu, Iași, Ilfov, Olt, and Tulcea and Vrancea) were previously documented in the above-mentioned resources as locations for wild *Lycium* sp. shrubs.

According to iNaturalist database, *Lycium barbarum* was introduced in Brașov and Cluj counties via anthropogenic means.
On the other hand, Ialomița, Brăila, Prahova and Teleorman counties represent new distribution records for the growth of spontaneous *Lycium* genus in Romania, compared to already published data.
More research is needed in order to obtain a detailed map of the wild goji berry distribution on the Romanian territory.

Figure 1. Wild goji berry distribution in Romania: literature review ◆ and present study records ▲


Figure 2. *Lycium* sp. from Eforie Sud, Constanța county, August 2021 (photo by Mala Stavrescu-Bedivan)

Table 1. Citizen scientist's occurrence of wild *Lycium* sp. in Romania

County	Location and/or GPS coordinates
Arad	Near the railway embankment, 46°10'46.4"N 21°20'26.5"E
Brăila	Baldovinești; Bărăganu; Cazasu; Câineni-Băi; Constantinești; Corbeni; Grădiștea; Lacu Sărat; Mărul Roșu-Lacu Rezii; Muchea; Oprișenești; Plășoiu; Plopu; Racovița; Spiru Haret; Surdila Găiseanca; Șuțești; Tudor Vladimirescu; Tufești; Ulmu (cemetery); Vișani; Viziru; Vultureni; at the exit of Însurăței towards Slobozia (44°54'19.8"N 27°35' 22.3"E); Brăila city (Catholic Cemetery, Sf. Maria Cemetery, Sf. Constantin Cemetery, Sf. Mina Cemetery, Danube cliff, Great Garden Park)
Brașov	Turcheș, Săcele (iNaturalist)
Buzău	Râmnicu-Sărat (45°24'29.2"N 27°02'56.8"E)
Caraș-Severin	Măcești; Șușca (44°46'59.0" N 21°32' 32.1"E)
Cluj	Gruia; Turda (iNaturalist)
Constanța	Eforie Sud, viran area (44°02'02.9"N 28°39'08.3"E) (iNaturalist)
Galați	Between villages Vasile Alecsandri and Braniștea
Giurgiu	Comana Natural Park: – Crânguri (44°12'24.4"N 25°58'46.8"E, 44°12'30.5"N 25°58'48.5"E), – Singureni (44°13'19.9"N 25°57'30.1"E), – Călugăreni (44°11'09.5"N 26°00'28.8"E), – Vlad Țepeș (44°07'46.0"N 26°08'12.0"E; 44°07'40.0"N 26°08'16.0"E), – Pietrele (44°03'38.0"N 26°06'55.0"E); Iepurești (44°15'55.2348"N 25°51'59.2776"E); Goleasca (44°21'24.8"N 25°35'39.1"E); Mihăileşti (44°19'36.1"N 25°54'16.4"E); Greaca (44°06'38.0"N 26°19'27.0"E, 44°06'22.0"N 26°18'39.0"E, 44°06'36.0"N 26°18'59.0"E, 44°06'35.0"N 26°19'14.0"E)
Călărași	Călărași (Facebook)
Ialomița	At the exit of Slobozia towards Drajna Nouă, 44°32'55.2"N 27°23'11.5"E
Iași	Oprișeni (47°07'51.3"N 27°49'04.8"E) (iNaturalist); near Ion Corvin commune (44°05'01.4"N 27°48'02.2"E)
Ilfov	Near Dinamic Parc, Lacul Morii Str.
Olt	Ibănești; Lunca; 44°38'06.7"N 24°22'36.4"E
Prahova	At the entrance of Blejoi commune, 44°59'15.0"N 26°00'53.3"E; Fântânele (45°00'35.1"N 26°22'30.8"E)
Teleorman	Turnu Măgurele (43°45'37.3"N 24°51'46.0"E; 43°45'35.7"N 24°51'47.4"E; 43°45'52.9"N 24°52'42.4"E; 43°45'58.7"N 24°52'44.0"E).
Tulcea	At the exit of Cataloi, towards Brăila (45°07'51.3"N 28°45'21.9"E); near the railway, between Cataloi and Tulcea (45°07'50.7"N 28°45'21.6"E); irrigation canal, before entering Tulcea city (45°07'51.3"N 28°45'21.9"E); Babadag Str. (45°09'41.5"N 28°47' 13.0"E); Intrarea Marmurei Str. (iNaturalist); Slava Rusa (Facebook)
Vrancea	Dumbrăveni (45°32'17.2"N 27°06'23.1"E); Obrejița (45°30'18.5"N 27°04'41.1"E)
București	On the fences of a childcare nursery, Militari district, sector 6 (44°26' 20.148"N 26°1'14.0916"E); Tineretului Park, sector 4 (44°24'18.7"N 26°06'31.6"E); Văcărești Natural Park (44°24'11.5194"N 26°8'2.8896"E)

Figure 3. *Lycium* sp. from Singureni, Giurgiu county, September 2021 (photo by Cristina Pelcaru)

Figure 4. Wild *Lycium* sp. bushes (arrows) in Teleorman county, February 2022 (photo by Marian Lincă)

CONCLUSIONS

The present work draws attention to the importance of mapping the distribution of spontaneous goji plants in Romania, a country where there has been a growing interest for setting up new *Lycium* plantations. This study revealed that spontaneous goji berry shrubs have been reported so far in several online and offline resources, but the available data are still scarce. The number of reports for Romania is increasing on open access platforms, as iNaturalist, following the activity inside the ProtectGoji citizen science-based project.

Currently, several online platforms make available for conservation biologists information regarding the geographical distribution of *Lycium* plants. This may contribute to a better understanding of the potential for future use of goji plants but also to the need for protection against anthropogenic impact.

The Distribution Map of *Aceria kuko* in Romania, an open sources map for accurate data on the national distribution of goji berry gall mite, will include the dataset on spontaneous goji berry shrubs in Romania.

ACKNOWLEDGEMENTS

The research work was carried out with the support of a grant of UASVM of Bucharest No. 1268/30.07.2021, acronym ProtectGoji, within IPC 2021.

The authors would also like to thank Dr. Petronela Camen-Comănescu ("Dimitrie Brândză" Botanical Garden Bucharest), forestry engineer Marian Lincă (Turnu-Măgurele), Nicolae Reinholz (Arad), biologist Amalia-Raluca Dumbravă (The Iron Gates Natural Park), biologist Vlad Cioflec (Văcărești Natural Park), biologist Alexandru Alistar and Dr. Cosmin-Ovidiu Manci for providing help in gathering field data.

REFERENCES

Anastasiu, P. & Negrean, G. (2009). *Neophytes in Romania*, pp: 66-97. In: Rakosy, L., Momeu, L. (eds.), Neobiota din Romania. Presa Universitară Clujană.

Asănică, A., Manole, C., Tudor, V., Dobre, A. & Teodorescu, R. I., (2016). *Lycium barbarum* L. juice - natural source of biologically active compounds. *AgroLife Scientific Journal 5*(1), 15–20.

Barceloux D.G. (2008). *Medical Toxicology of Natural Substances. Foods, Fungi, Medicinal Herbs, Plants, and Venomous Animals*, John Wiley & Sons, Inc., Publication, p.127.

Befu, D. (2015). Goji plantations in Romania. Myth or a culture with real productive potential? (Plantațiile de Goji în România. Mit sau o cultură cu real potențial productiv? (In Romanian) [Internet]. 29 iunie 2015 [Cited 01 March 2021], https://agrointel.ro/35670/plantatiile-de-goji-in-romania-mit-sau-o-cultura-cu-real-potential-productiv/.

Ciceoi, R., Tabacu, A., Palanciuc, V., Gutue, M. & Stavrescu-Bedivan, M. (2021). Goji berry gall mite expansion in Europe, with emphasis on southeastern part of Romania. *Bulletin of University of*

Agricultural Sciences and Veterinary Medicine. Food Science and Technology 78(2), 93-99.

Clapa, D., Fira, A., Borsai, O., Hârța, M., Sisea, C. R., Dumitraș, A. F. & Pamfil, D. (2021). *Lycium barbarum* L. - a new cultivated species in Romania. *Acta Horticulturea.* 1308, 205-212.

Coteanu, I., Sala, M. & Dănăilă, I. (2010). The little academic dictionary (Micul dicționar academic, ediția a II-a), (In Romanian) [Internet], Academia Română, Institutul de Lingvistică, Editura Univers Enciclopedic, https://dexonline.ro/intrare/Lycium/81051.

Mencinicopschi, I. C., Bălan, V. & Manole, C. G. (2012). *Lycium barbarum* L. – a new species with adaptability potential in Bucharest's area. *Sci Pap Ser A Agron LV*, 361–364.

Oprea, A. (2005). Critical list of vascular plants of Romania *Lista critică a plantelor vasculare*. Ed. Universitatii „Al. I. Cuza" Iași.

Qian, D., Zhao, Y., Yang, G. & Huang, L. (2017). Systematic Review of Chemical Constituents in the Genus *Lycium* (Solanaceae). *Molecules*, 22:911. doi:10.3390/molecules22060911

Sîrbu, C. (coord.) & Oprea, A. (2011). *Adventitious plants in the Romanian flora* (*Plante adventive în flora României*). Edit. "Ion Ionescu de la Brad" Iaşi, 733 pp., ISBN 978-973-147-096-2.

*Agerpres (2014). Sălaj report: A priest brings a village back to life through a different kind of agriculture (Reportaj Sălaj: Un preot readuce la viață un sat printr-o altfel de agricultură), (In Romanian) [Internet], https://www.agerpres.ro/social/2014/09/22/reportaj-salaj-un-preot-readuce-la-viata-un-sat-printr-o-altfel-de-agricultura-14-45-06?fb_comment_id=1314715961975882_1376584795788998.

*Agrointel (2017). How do you tell the difference between true goji and sea buckthorn with toxic fruits! (Cum faci diferența dintre goji adevărat și cătina de gard cu fructe toxice!). (In Romanian) [Internet], https://agrointel.ro/79208/cum-faci-diferenta-dintre-goji-adevarat-si-catina-de-gard-cu-fructe-toxice/.

*EPPO Global Database, *Lycium barbarum* (LYUHA). Internet]. [Cited 09 March 2021], https://gd.eppo.int/taxon/LYUHA.

*https://www.inaturalist.org/

*https://www.gbif.org/species/

*https://garden.org/plants/

*https://www.facebook.com/groups/plantedinromania