Note

Chorological data regarding the presence of *Corylus colurna* species in Romania

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Abstract

The Turkish hazel or Turkish filbert (*Corylus colurna*) is a less widespread tree species in Romania. Data on the presence of *C. colurna* species in the Romanian flora are quite rare. The article’s aim is to analyse the scientific information and those of the main herbariums regarding the presence of *C. colurna* species on the Romanian territory. The presence of the species on the Romanian territory was signalled about 122 years ago in the paper “Conspectus of Romanian Flora”. Subsequent scientific information identifies the species in different locations, especially in the southwest of Romania, in dendrological and natural parks. Scientific importance of the species lies in its rarity, the species has an area limit on Romanian territory and in the value, it gives to natural ecosystems in which it grows. The practical value is given by its edible fruits, valuable from a food or medicinal point of view and by its agronomic characteristics. As a result, the biodiversity conservation strategy should include forest protected areas as important objectives.

Keywords: chorological data; *Corylus colurna*; distribution; plants; Romania

Introduction

*Corylus* genus belongs to Corylaceae family (Dihoru, 1975; Beldie, 1977; Ciocârlan, 2000, 2009) or Betulaceae family (Prodan, 1939; Georgescu, 1952; Prodan and Buia, 1966; Resmeriță, 1970). *Corylus* genus represents a diverse group of useful woody plants, ranging from small, multi-stemmed shrubs to tall, stately trees, all of which produce edible nuts (Molnar, 2011). *Corylus* genus is widely distributed across temperate regions of the Northern Hemisphere, with species found in Japan, Korea, and China, through Tibet, India, Northern Iran, Turkey, the Caucuses, Europe, and North America (Molnar, 2011). *Corylus colurna* L. (Turkish hazel or Turkish filbert) and *C. avellana* L. (Common hazel) are the most common hazel species in Europe (Riechmueller et al., 2014). *C. avellana* L., which has a wide distribution, while, *C. colurna* L., restricted to the Balkans, Romania, and Northern Turkey (Thompson et al., 1996). In spontaneous flora of Romania, *Corylus* genus is represented by 2 species: *C. avellana* L. and *C. colurna* L. In southern regions of Romania there is also *C. maxima* Mill. cultivated as well, a taxon synonymous with *C. avellana*, the difference between them being at the level of involucre (Mehlenbacher, 1991; Thompson et al., 1996; Erdogan and Mehlenbacher, 2000a, b). The spreading of *C. colurna* in Romania is quite small, only in Banat and Oltenia and Vâlcan Mountains is its northern limit of the area (Boruz et al., 2013). *Corylus avellana* is commonly found in both national and European levels. *C. avellana* is widely distributed in Europe, in natural stands ranging from...
Scandinavia to the south of the continent (Palmé and Vendramin, 2002). In the north it can be found in Norway up to 67°N, although its northern limit decreases further to the east (Deacon, 1974). It is the first species to colonize the European continent since the last ice age, as evidenced by studies on pollen and chloroplast (Palmé and Vendramin, 2002; Boccacci and Botta, 2009). *C. colurna* is a calcicolous species that has its origin in the Balkans (Boruz *et al.*, 2013) and is a member of the Europe-Siberia flora region (Molnár, 2011). *C. avellana* is the only cultivated species and contains a great amount of genetic diversity (Rovira, 1997). *C. colurna* is one of the common species in Turkey (Aydinoglu, 2010). Beside scientific information, also valuable information on the presence of certain species in certain ecological areas is obtained from herbarium collections. Herbal collections have a scientific, didactic, educational, and also informative value. The collection of plants began in the 16th century. Later, J.P. Tourefort (ca 1700, France) used the term “herbarium” for plants (Bridson and Forman, 1999). One of the oldest herbariums in South-Eastern Europe, a pre-Linnaean herbarium dating from 1734, is in the botanical collection of the Natural History Museum within Brukenthal Museum (Sibiu, Romania). Their purpose is important because they provide information about plants and their area of spread during long periods that help to carry out studies in taxonomy, biodiversity, ecology, anatomy, morphology etc. (Vechiu and Dinca, 2019). Evidence of the hazelnut species spread is the information presented in various herbariums. The aim of this article is to analyse the scientific information and the main herbariums regarding the presence of *C. colurna* species on the Romanian territory.

**Materials and Methods**

The material used to carry out this paper consisted in specialized sections that contained the species *Corylus colurna* in the floristic list or in the composition of some phytocenoses, according to the herbarium data from the main herbariums in the country (Bucharest, Cluj-Napoca, Iași and Craiova). The material is based also on the analysis of the data obtained following the trips made in different resorts where they are vegetating. The acronyms used for the herbariums consulted are: BUCA (Herbarium of Biology Institute of the Romanian Academy), CL (Herbarium of “Babeș-Bolyai” University Cluj-Napoca), I (Herbarium of “Al. I. Cuza” University Iași) and CRA (Herbarium of Craiova University). A data base for *C. colurna* was realized, focusing on the following data: plate number; Herbarium/Botanic Collection/Institution; Species name; Harvesting date; Harvesting place; the person who has collected the plant; conservation grade, coded with numbers from 1 to 4 (1 = well preserved plant, 2 = plant with parts detached from the plate, but still present, 3 = plant detached from the plate, with missing parts and 4 = plant detached and fragmented, with over 50% of its parts missing) (Vechiu and Dinca, 2019). For localities mapping was used the UTM Code, according to Lehrer and Lehrer (1990). The distribution maps of the species were obtained using Corolog 2010 Program, realized in Biology Institute of Bucharest. The program uses a data base access, with information from literature, herbarium and field and two types of maps, the maps of annual average temperature and precipitation in Romania. The Stereo 70 coordinates corresponding to the points where plant material was collected were inserted in the table.

**Results and Discussion**

*C. colurna* (Turkish hazel) is a less widespread tree species in Romania. Data on the species *C. colurna* in the Romanian flora are sporadic until the publication of the paper “Conспектul Florei României” (Grecescu, 1898) which speaks of *C. colurna* as a fairly common species in the Balkan Peninsula, which is found only in Mehedinti to Verciorova and Banat. Prodan (1939) in the paper “Flora for determining and describing the plants growing in Romania” states that there are 3 species of Corylus in the Romanian flora (*C. avellana*, *C. colurna* and *C. maxima*) and in *C. maxima* he gives *C. tubulosa* Willd. as synonymous. In Flora Românci
(volume I, 1952, pp. 197-202), Georgescu (1952) mentions the same 3 species: *C. avellana*, *C. colurna* and *C. maxima*. In 2 of them he presents intraspecific variability. In *C. colurna* the variety glandulifera (C. Koch) A. DC is mentioned, and in *C. avellana*, the typica form C. K. Schn. Laubholzk. with the subforms: *brachychlamys* Spach and *schizochlamys* Spach. About *C. maxima* it is only stated that it is cultivated, but rarely. Prodan and Buia (1966) in “The small illustrated flora of Romania” in Corylus genus they mention 3 species. In each species the main morphological characters, the flowering and fruiting period and the ecology are presented, and in *C. avellana* the cenotic affiliation is also given. Beldie (1977) also quotes 2 species (*C. avellana* and *C. colurna*) in the paper “Flora of Romania - illustrated determinator of vascular plants” (pp. 79-80). Each key taxon has the main differentiating characters, lifespan, biological form, height, flowering period, spread over areas and floors of vegetation, resorts where they can be found, soil type, trophicity and geo-element. In “The illustrated flora of Romania Pteridophyta & Spermatophyta” shows the presence of 3 species, 2 spontaneous (*C. avellana* and *C. colurna*) and one cultivated (*C. maxima*). Among the analysed plants by the authors new data on the chorology of their *Corylus* species were also found in various synthesis papers that had as object of study the flora and vegetation of a certain territory. Information on the spread of *C. avellana*: Pop (1968) in the Crisurilor Plain is frequently presented; Resmeriță (1970) in the Vlădeasa Massif; in the Eastern Carpathians (Oprea and Sirbu, 2009); Rodna Mountains by Coldea (1990) etc. *C. avellana* species has a good representation in the literature. It was mentioned by Cârțu (1969) from in Amaradia river basin, by Cârțu (1972) in the area between Jiu-Desnău-Criovoa and the Danube, by Năstase (1982) in Bucoș forest, by Karácsonyi (1995) in Satu-Mare county, by Oroian (1998) in Mureș Gorge, between Toplița and Deda, by Negrean et al. (2017) in Salaj county. These last authors also identified the *C. colurna* species in several points: Șimleul Silvaniei N, Măgura Șimleului, Bâile Iz. Data on the presence of *C. colurna* in Romania are rare. Near Oravița (Romania) exists a big stand (80 ha) of *C. colurna*, the maximum data of age was 329 years (Richter, 2016). *C. colurna* was identified in the Iron Gates Park (Mehedinți) and Cheile Nerei-Beușnița National Park (Carag-Scărișor) by Borlea et al. (2006) in the forest of Domogled (Bâile Herculane, Romania) by Manoiu et al. (2015) and Ștefan et al. (2013). *C. colurna* was also identified in arranged dendrological parks, parks that include a several plants, very rare, in Bistrița (Rusu and Gavriiloaie, 2011), in “Bazoș Arboretum” protected area (Cadar et al., 2014), in Cheile Nerei-Beușnița Site (Biri et al., 2016). Turkish hazel is a tolerant semi-shade tree species that can create mixed stands with other species and has a low level of invasion potential (Șeho et al., 2019).

**Table 1.** Table 1 *Corylus colurna* inventory in Romania

| Plate no | Herbarium/ Botanic collection/ Institution | Harvesting date | Harvesting place | Collected/ Determinated by: | Conservation Degree | COD_UTM | Stereo70 |
|----------|------------------------------------------|-----------------|------------------|-----------------------------|---------------------|---------|---------|
| 1        | I20946                                    | August 23, 1965 | Dolj County, Craiova town, Parcul Poporului - public park | Leg. et det. Nicolaeascu. Revised Topa | 1 | GQ21 | 404569.4953 311780.9795 |
| 1        | I33672/ Flora Romaniae Exsiccata nr. 392  | May 27, 1923    | Carag-Severn County, Domogled Mountain, forest | Leg. et det. Borza & Nyarady | 1 | FQ28 | 297836.6474 377959.5701 |
| 1        | I38321                                    | July 23, 1972   | Carag-Severn County, Bâile Herculane town, Domogled Mountain, forested limestone cliffs | Leg. et det. Sârbu | 1 | FQ18 | 296893.0355 378533.3915 |
| 1        | I44603 / Flora Exsiccată Forestieră a R.P.R. nr. 55 | October 12, 1959 | Carag-Severn County, Berzasca village, on Sirina river valley | Leg. Grapini, det. Beldic. | 1 | EQ74 | 258778.9364 355521.1017 |
|   | Code / Flora Romaniae Exsiccata nr. | Date 1, 2 | Location 1, 2 | Collector(s) 1, 2 | Herbarium 1, 2 | Latitude 1, 2  | Longitude 1, 2  |
|---|------------------------------------|----------|--------------|-----------------|--------------|-------------|--------------|
| 1 | I44604 / Flora Romaniae Exsiccata nr. 392. | October 6, 1922 - May 27, 1923 | Caraș-Severin County, Silvam formans in Domogled Mountain, alt cca 700-900 m | Leg. Borza, Borza & Nyarady | 1 | FQ18 | 296893.0355 378553.3915 |
| 2 | I44605, I46606, I72701 / Flora Romaniae Exsiccata nr. 392b | March 31, 1945 | Timiș County, Culta in horto Muhle oppidi Timisooara. Arbor 12 m alt. | Leg. Bujorean. Revised Borza | 1 | ER16 | 206586.4622 478873.4057 |
| 3 | Herbarul Grădinii Botanice Iași / Flora Romaniae Exsiccata nr. 392b | March 31, 1945 | Timiș County, Culta in horto Muhle oppidi Timisooara. Arbor 12 m alt. | Leg. Bujorean. Revised Borza | 3 | ER16 | 206586.4622 478873.4057 |
| 1 | Herbarul Grădinii Botanice Iași | June 21, 1973 | Caraș-Severin County, Bâile Herculane town, in Crucea Alba forest | Leg. et det. Goia | 1 | FQ17 | 297012.6274 379327.0347 |
| 2 | Herbarul Grădinii Botanice Iași | May 27, 1951 | Cluj County, Borșa | Leg. et det. Topa | 1 | G809 | 397770.7925 606459.5031 |
| 1 | Herbarul Grădinii Botanice Iași | June 18, 1951 | Caraș-Severin County, Bâile Herculane town, in Crucea Alba forest | Leg. et det. Celan | 1 | | |
| 1 | BUCA150593 | July 03, 1931 | Caraș-Severin County, Domogled Mountain | Leg. et det. Grintescu | 1 | FQ28 | 297836.6474 377959.5701 |
| 1 | BUCA131847 | March 2, 1966 | Oltenia Region, Tr. Severin district, SE of Ilovița forest, N Vârciorova | Leg. et det. Dihoru | 1 | FQ16 | |
| 1 | BUCA131628 | June 26, 1964 | Oltenia Region, Tr. Severin district, SE of Ilovița forest, N Vârciorova | Leg. et det. Roman | 1 | FQ15 | 300683.1994 363968.9998 |
| 3 | BUCA044836 / Flora Romaniae Exsiccata nr. 392b | March 31, 1945 | Timiș County, Culta in horto Muhle oppidi Timisooara. Arbor 12 m alt. | Leg. Bujorean. Revised Borza | 3 | ER16 | 206586.4622 478873.4057 |
| 1 | BUCA / Flora Romaniae Exsiccata nr. 392 | May 27, 1923 | Caraș-Severin County, Domogled Mountain, forest | Leg. et det. Borza & Nyarady | 1 | FQ28 | 297836.6474 377959.5701 |
| 1 | BUCA | March 26, 1948 | Mehedinți District, in a forest on Marcopriciu, towards Vârciorova | Leg. Ularu | 1 | FQ15 | 312713.0338 391274.319 |
| 1 | BUCA / Flora Exsiccata Forestiera a R.P.R. nr. 55 | October 12, 1959 | Caraș-Severin County, Berzasca, on Sirina river valley | Leg. Grapini, det. Beldie. | 1 | EQ74 | 258778.9364 355521.1017 |
| 1 | BUCA011749 | September 09, 1949 | Hunedoara Region, Simeria Dendrological Park | Leg. et det. Negrean | 1 | FR57 | 346196.3421 486659.6678 |
| 2 | CL661848 | July 28, 2003 | Romania, Banat region, Mehedinți | Leg. et det. Negrean | 1 | FQ04 | 282570.2909 348429.2714 |
|   | Collection Date | Location | Specimen Details | Collector | Catalog Numbers | Latitude | Longitude |
|---|-----------------|----------|------------------|-----------|----------------|----------|-----------|
| 1 | May 25, 1988    | Banat Reion, Caras-Severin district, Domogled Mts., in the forest above Bâile Herculane town | Leg. et det. Groza | 1 | FQ17 | 296345.3594 | 380056.3988 |
| 2 | August 29, 1948 | Oltenia region, Gorj district, Chestnut forest in Tismana village | Leg. Borza | 1 | FQ59 | 337669.2452 | 400170.29 |
| 3 | May 20, 1939    | Banat region, Caras-Severin county, Berzasca, on Sirina river valley | Leg. Pop, det. Schneider | 1 | FQ04 | 284783.8028 | 352200.8366 |
| 4 | October 12, 1959 | Caras-Severin County, Berzasca, on Sirina river valley | Leg. Grapini, det. Beldie | 1 | EQ74 | 258778.9364 | 355521.1017 |
| 5 | August 28, 1983 | Domogled Mountain, above Bâile Herculane town | Leg. Bociai | 1 | FQ17 | 296345.3594 | 380056.3988 |
| 6 | May 19, 1939    | Above Bâile Herculane town | Leg. Pop, det. Schneider | 1 | FQ17 | 296345.3594 | 380056.3988 |
| 7 | May 20, 1920    | Caras-Severin County, Bâile Herculane town, limestone cliffs on Suscului Peak | Leg. Borza | 1 | FQ17 | 296345.3528 | 380056.3952 |
| 8 | June 29, 1948   | Banat region, Caras district, on Beul sec river valley | Leg. Borza et Buia | 1 | FQ06 | 246161.9903 | 385618.3098 |
| 9 | March 31, 1945  | Timis County, Culta in horto Mulie oppidi Timisoara. Arbor 12 m alr. | Leg. Bujorean, Revised Borza | 2 | ER16 | 206586.4622 | 478873.4057 |
| 10| August 23, 1942 | Banat region, Caras district, on Beul sec river valley | Leg. Borza et Ogrutan | 1 | FQ06 | 246161.9903 | 385618.3098 |
| 11| September 09, 1949 | Hunedoara region, Simeria Dendrological Park | 1 | FR57 | 346196.3421 | 486659.6678 |
| 12| May 19, 1939    | Banat region, Severin district, above Bâile Herculane town | Leg. Borza et Todor | 1 | FQ17 | 296345.3594 | 380056.3988 |
| 13| May 27, 1923    | Caras-Severin County, Domogled Mountain, forest | Leg. et det. Borza & Nyarady | 1 | FQ28 | 297836.6474 | 377959.5701 |
| 14| May 20, 1920    | Cerna river Valley | Leg. Pavai | 1 | FQ39 | 302949.8893 | 391210.8189 |
Herbarium data with this taxon are also scarce (Table 1). Herbarium material from Iași (I), Cluj (CL), Bucharest (BUCA) and Craiova (CRA) shows that the oldest plant, belonging to *C. colurna* species, was collected in 1920 from Caraș-Severin County, Băile Herculane (calcareous rocks on Suscului peak) by Al. Borza (Figure 1). Also, during period 1920-1930, information appears regarding the identification of some *C. colurna* specimens on the territory of Caraș-Severin county, evidence introduced in the herbariums in Iași and Bucharest. Most plants were harvested during 1940-1949 and are preserved in the herbariums of Bucharest, Cluj and Iași. The last plant preserved in Craiova herbarium was harvested in 2004, from Mehedinți area, Dealul Comăneștilor, by Iulian Costache. The place of sampling is located in Romania (Figures 1 and 2). The plants were collected mainly from the southwestern part of Romania. The county from which most specimens were collected is Caraș-Severin, especially in the areas of Mount Domogled, above Băile Herculane; Mehedinți - Cazanele Mari, Ciucarul Mare peak, Comăneștilor Hill, in the forest on Marcopriciu, towards Vârcioro; Hunedoara - Smeria Dendrological Park, Gorj - Tismana, Dolj - Craiova. The analysis of the data shows that the distribution of *C. colurna* in Romania is quite small, only in Banat and Oltenia (ie southern Banat, Mehedinți Mountains, Mehedinți Plateau and Motru Hills) (Boruz *et al.*, 2013) and is found in different parks,
in areas favourable for the cultivation of this species. The presence of *C. colurna* species is also indicated by Bușe Dragomir and Nicolae (2014) in the Iron Gates park, Mehedinți. Turkish hazel has been found sporadically in forest habitats in Central, Eastern and Western Serbia (Mitrovic *et al*., 2001). Therefore, the remaining Turkish hazel populations in different locations are of critical importance, and the genetic conservation of this species plays a key role in the sustainable development of forests. *Corylus* species have scientific and practical importance. *C. colurna* has no relevant economic importance, but agronomic characteristics are very important, it does not produce basal shoots, an important aspect for hazelnut cultivation (Avanzato, 2008). Biodiversity conservation strategy should include forest protected areas as important objectives (Borlea *et al*., 2006). The people who collected and identified the plants are Romanian specialists, famous botanists: A. Borza, E.J. Nyárády, A. Nicolaescu, E. Topa, I. Sârbu, V. Grapini, A. Beldie, G. Bujorean, I. Goga, E. Țopa, M. Celan, G. Grintescu, G. Dihoru, N. Roman, G. Bujorean, I. Ularu, G. Negrean, Gh. Groza, E. Pop, E. Schneider, Monica Boșcai, E. Pop, Al. Buia, G. Bujorean, P. Ogruțan, I. Todor, Hb. Pavai, I. Costache.

![Figure 2. Distribution of species *C. colurna* correlated with annual average precipitation](image)

**Figure 2.** Distribution of species *C. colurna* correlated with annual average precipitation

### Conclusions

In conclusion, the presence of *C. colurna* species on the Romanian territory is signalled about 122 years ago in the paper "Conspectus of Romanian Flora". Subsequent scientific information identifies the species in different locations, especially in the South-Western Romania, in dendrological and natural parks. Scientific importance of *C. colurna* species lies in its rarity, the species has an area limit on the territory of Romania and in the value, it gives to the natural ecosystems in which it grows. The practical value is given by the edible fruits,
valuable from a food or medicinal point of view and by its agronomic characteristics (it does not produce basal shoots).

**Authors' Contributions**

Conceptualization of research (SC, DR); Design of the experiments (SC); Contribution of experimental materials (DR); Analysis of data and interpretation (SC, DR); Preparation of the manuscript (SC, DR). Both authors read and approved the final manuscript.

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**Conflict of Interests**

The authors declare that there are no conflicts of interest related to this article.

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