

## THREE NEW RECORDS OF EPIPHYTIC LICHEN SPECIES FROM IRAN

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The lichen species *Bilimbia sabuletorum* (Schreb.) Arnold, *Canoparmelia crozalsiana* (B. de Lesd. ex Harm.) Elix & Hale and *Candelaria pacifica* M. Westb. & Arup are reported for the first time from Iran; Involved are new reports of two genera for Iran, *Bilimbia* and *Canoparmelia*. The species grow as epiphyte in broad-leaved forests in Golestan Province. Characteristics of morphology, habitat and geographic distribution of these species are discussed.

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**Key words:** Iran; Golestan; new record; epiphyte; lichen

گزارش سه گونه جدید از گلسنگ‌های اپیفیت برای ایران

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گونه‌های گلسنگ *Canoparmelia crozalsiana* (B. de Lesd. ex Harm.) Elix & Hale، *Bilimbia sabuletorum* (Schreb.) Arnold و *Candelaria pacifica* M. Westb. & Arup برای اولین بار از ایران گزارش می‌شوند، که از میان آنها جنس‌های *Bilimbia* و *Canoparmelia* برای ایران جدید هستند. این گونه‌ها به فرم اپیفیت در جنگل‌های پهن برگ استان گلستان رویش دارند. ویژگی‌های ریخت‌شناسی، رویشگاه و پراکنش جغرافیایی گیاهی این گونه‌ها مورد بحث قرار گرفته است.

### INTRODUCTION

The Hyrcanian Forests are a green belt of predominantly temperate deciduous forests stretching over the northern slopes of the Alborz Mountain range, along the southern borders of the Caspian Sea. The forests rise from sea level up to an altitude of 2800 m and encompass a variety of different forest types (Tohidifar & al., 2016). The extent of Hyrcanian forests is approximately 800 km long and 110 km wide, with a total area of 1.85 million ha. The area experiences a subtropical climate with mild winters and hosts a vast

biodiversity, including many broadleaved tree species that had been constituents of temperate forests during the Tertiary period but that became extinct in Central Europe during the Pleistocene cold climate phases (Sagheb-Talebi & al. 2004). Some of the main bioclimatic particularities of this area are: high amount of annual precipitation decreasing from west to east ranging from ca. 2045 mm/yr (in Pilambra) to ca. 213 mm/yr (in Agh Togheh), relatively even distribution of annual precipitation with maximum rainfall occurring during the early autumn, very short duration or absence

of a dry season especially in the western Hyrcanian province, high percentages of mean annual relative air humidity exceeding 80% in some stations creating almost permanent fogs in higher altitudes and average of minimum of temperatures of the coldest month higher than the freezing point (Akhani & al., 2010).

The Hyrcanian forests provide diverse habitats for a large number of mesophytic groups such as bryophytes, lichens and fungi. Some of the lichenological studies in the area are: Riahi & Valadbeigi, 2004, 2005; Seaward & al., 2004; Sohrabi & Orange, 2006; Sohrabi & Sipman, 2007; Seaward & al., 2008; Sohrabi & Ramezani, 2010; Sohrabi & al., 2010; Valadbeigi & Sipman, 2010; Aptroot & al., 2012; Westberg & al., 2012; Ismailov & al., 2017.

For an assessment of the lichen mycota in the forests of Golestan province, lichens were collected from Naharkhoran forest in 2017 and 2018. Some of the more interesting discoveries are presented here providing short characteristics, collected localities, habitat and geographic distribution.

## MATERIALS AND METHODS

The examined specimens of lichens were collected from Naharkhoran forest, situated between 54.464937° to 54.429075° longitude and 36.793011° to 36.671064° latitude, at altitude range of 300-2200 meters above sea level and comprising about 300 km<sup>2</sup>. Morphologic features of the lichens were observed with a Luxeo 4D stereomicroscope and an Olympus microscope. Analytical keys used for determination of the specimens include Nash & al. (2002), Smith & al. (2009) and Westberg & al. (2011). For the chemical test reagents used see Orange & al. (2010). Images have been captured with the stereomicroscope equipped with a Luxeo 4D camera with Pixelpro software. The identifications were approved by Dr. Harrie J.M. Sipman in 2018. The specimens are deposited in TARI and compared with herbarium samples in B (Berlin, Germany).

## RESULTS

Two genera and one species of epiphytic lichens not reported before from Iran were identified from Naharkhoran forest.

*Bilimbia sabuletorum* (Schreb.) Arnold (figs. 1 A & B).

*Examined specimen:* Golestan: Gorgan, around Ziarat village, Sardansar hillside, 36.678814°N, 54.440665°E, 1441 m, 18. 11. 2017, Kazemi 9133 (TARI).

Thallus crustose, grayish-green, granular with dominant warts, granules 0.05-0.1 mm broad; cortex 15-33 µm thick; medulla absent. Apothecia dark brown

to black, when young pale pink or pale brown, rounded, sessile, convex, sometimes flat, 0.4-0.9 mm diam., without pruina; margin hardly visible, black; in section true exciple pale brown to pale yellow, sometimes colourless, dark brown in upper parts; hymenium colorless to slightly brown, K-, N+ purple; hypothecium red-brown to orange-brown, K+ purple; asci clavate, 8-spored; ascospores colorless, 14-42 × 4-9 µm, 3-5 septate (fig. 1B), fusiform, with warted epispore.

The genus *Bilimbia* has been considered as similar to *Bacidia*, with transversely septate, hyaline spores but with biatorine, not black, excipulum. Currently (Hafellner & Türk, 2001, sub *Myxobilimbia*) it is considered in a much more restricted sense, differing by the presence of a tubular structure in the ascus apex and a rugulose epispore around the ascospores. *Bilimbia sabuletorum* is the commonest species, with unusually large, fusiform ascospores (Printzen & al. 2009).

*Chemistry:* Thallus C-, K-, KC-, Pd-.

*Habitat:* Growing on bryophytes on dusty trunk of *Prunus divaricata* shrubs in open forest around Ziarat village.

*Geographical distribution:* Asia (Turkey, Armenia, Caucasus, India, China), Europe (Russia, France, Belgium, Luxembourg), Africa, North and South America, Australia, Antarctica (Arcadia, 2018).

*Canoparmelia crozalsiana* (B. de Lesd. ex Harm.) Elix & Hale (fig. 2)

*Examined specimen:* Golestan: Gorgan, Naharkhoran forest toward environmental station, 36.786754°N, 54.478224°E, 573 m, 19.11.2017, Kazemi 9119 (TARI).

Thallus foliose, 3-8 cm wide, adnate; lobes 4-10 mm broad, irregular to subirregular, elongate, without cilia; upper surface greenish gray, with low, reticulate ridges, cracked, white-pruinose and maculate; soredia present along margin, isidia absent; medulla white; lower surface black in center, toward lobe margins brown; rhizines black, simple, scattered, sometimes pale at tip, to 1 mm long. Apothecia not seen. Pycnidia present, immersed.

Among Iranian Parmeliaceae this species resembles most closely *Flavoparmelia caperata* (L.) Hale, which has a greenish yellowish color and contains usnic acid in the cortex, while *Canoparmelia crozalsiana* has a whitish grayish thallus with atranorin in the cortex. This can be recognized by the KOH- reaction: the cortex is K+ yellow in *C. crozalsiana* and K- in *F. caperata*. In *F. caperata* the soralia develop on wrinkles on the surface, while in *C. crozalsiana* they develop along the margins, later spreading over the adjacent surface.

**Chemistry:** Upper cortex K+ yellow, C-, KC-, P+ yellow; medulla K + orange, C-, KC-, P+ orange-red.

**Habitat:** On *Quercus castaneifolia* bark on fallen branches of *Q. castaneifolia* tree in mixed forest in south of Gorgan.

**Geographical distribution:** Asia (India, South Korea) (Udeni & al., 2012), SW Europe, southern U.S.A., Mexico, South America, Africa, Australia (Nash & Elix., 2002).

***Candelaria pacifica*** M. Westb. & Arup (figs. 3 A & B)

**Examined specimen:** Golestan: Gorgan, Ghale Hasan village heights, 36.809576° N, 54.478692° E, 342 m, 9.6.2018, Kazemi 9093, 8848, 8898 (TARI).

Thallus foliose, small, greenish yellow to bright yellow; lobes 0.1 to 0.5 mm wide, and lobe tips slightly convex; soredia present along the margins and on the lower side; upper cortex thick; medulla white; lower cortex absent, lower surface arachnoid, greenish white, with white short rhizines. Apothecia not seen.

*Candelaria pacifica* is very similar to *C. concolor* (Dicks.) Arnold and differs from it mainly by the

absence of a lower cortex. Moreover *C. pacifica* has coarse soredia ("blastidia") on the lower side, it has small, erect lobes, and the soredia are very abundant and dominating the thallus, while in *C. concolor* the lower side is completely corticate, the thallus lobes are larger and prostrate and are more visible than the soredia (Neuwirth, 2014).

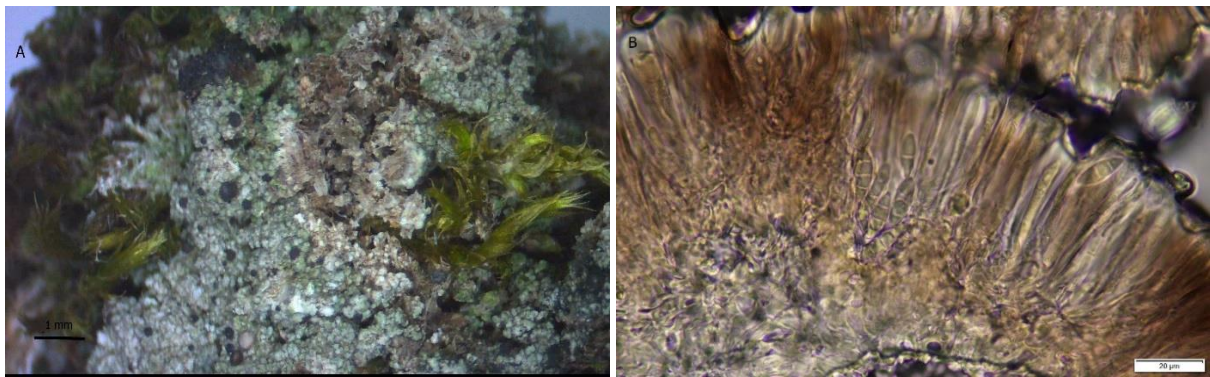
**Chemistry:** Thallus K-, C-, KC-, P-.

**Habitat:** On *Mespilus germanica* and *Crataegus melanocarpa* branches in abandoned gardens at forest margin in south of Gorgan.

**Geographical distribution:** Asia (Turkey), Europe, North America (Westberg & al., 2007, 2012, Neuwirth, 2014).

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Figs. 1. A & B, *Bilimbia sabuletorum* (Schreb.) Arnold: A, habit (scale bar=1mm); B, Asci with Ascospore (scale bar=20 µm).

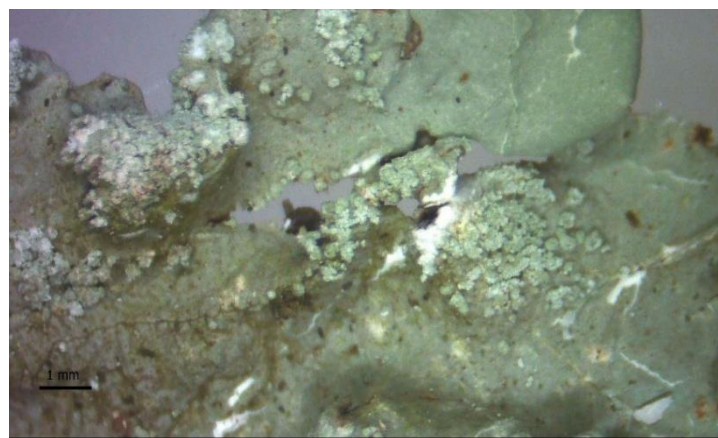
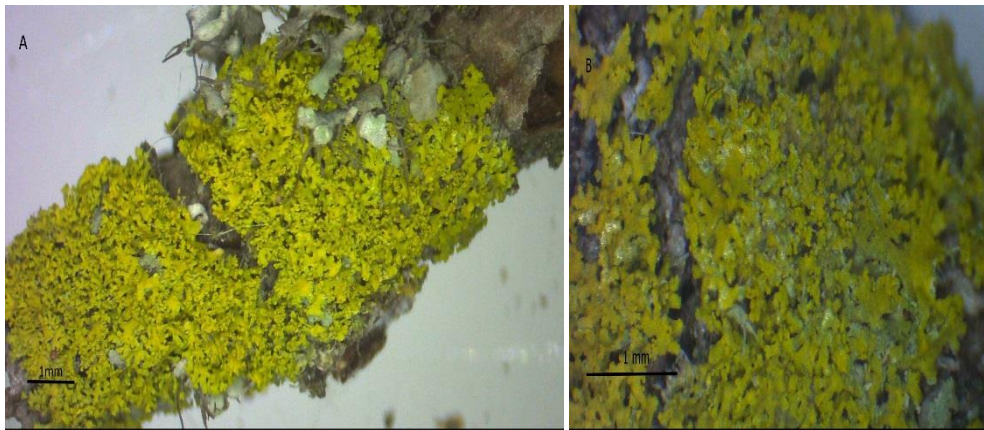


Fig. 2. *Canoparmelia crozalsiana* (B. de Lesd. ex Harm.) Elix & Hale (scale bar=1mm).



Figs. 3. A & B *Candelaria pacifica* M. Westb. & Arup (scale bars=1mm).

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