Journal of Applied and Natural Science 5 (1): 148-152 (2013)

JANS

A study on *Tornabea scutellifera* (Lichenized Ascomycete, Lecanorales) in northeastern Iran

Sara Ghanbari Parsa[1], Mahroo Haji Moniri[1*] and Ahmad Asoodeh[2]

[1]Department of Biology, Faculty of Sciences, Mashhad Branch, Islamic Azad University, Mashhad, IRAN
[2]Department of Chemistry, Faculty of Sciences, Ferdowsi University of Mashhad, Mashhad, IRAN
[*]Corresponding author. E-mail: m.h.moniri@mshdiau.ac.ir

Received:February 7, 2013; Revised received: March 26, 2013; Accepted: April 15, 2013

Abstract: The present study shows the morphology, anatomy and chemistry of *Tornabea scutellifera* occurring in north eastern Iran . Most thalli are corticolouse, even though its thalus also shows some degree of vegetation on rocky substrates.

Keywords: Lichen, *Tornabea scutelifera*, Northern Khorasan, Iran

INTRODUCTION

Tornabea is a monotypic genus characterized by corticated lobes with thick walled longitudinal hyphae, septate brown ascopspores, lecanorine apothecia with thin thalline exciple, bitunicate asci with an amyloid tholus, and three strong disjunctions in the pattern of distribution (*Purvis et al., 1992;* Nimis and Tretiach, 1997). *Tornabea scutellifera* (With.) J. R. Laundon a member of Physciaceae, is a highly polymorphic fruticose, mostly epiphytic species without lichen substances. It is widely distributed in the old and new world with three varietal ranks including *cylindrica*, *intricata*, and *spinifera* (Tavares, 1957; Kurokowa, 1962; Nimis and Tretiach, 1997). Based on former records of its distribution in the Irano-touranian region, it was restricted to coastal and mountainous habitats (Nimis and Tretiach, 1997) ,but during the last decade it has also been found in coastal habitats of the Khazar Sea and in Golestan Natural Park in the Siberian (Seaward *et al*., 2008), Zanjan province (Sohrabi *et al*., 2010), and Darkesh reserved region (Northern Khorasan province) in mountainous semi-arid regions (Haji Moniri and Sipman, 2011).

Appearently, *T. scutellifera* and some species of *Seirophora* are naturally good neighbors independent of the substrate, as exemplified by Nimis and Tretiach (1997) who found it together with *Seirophora villosus* (Ach.) Norman and *S. californicus* Sipman. It has also been recorded with *S. contortuplicata* (Ach.) Frödén on calcareous rock (Sohrabi *et al*., 2010), and with S. *austroarabica* (Sipman) Frödén on *Quercus castaneifolia* (Haji Moniri and Sipman, 2011).

In October of 2004 and March of 2005, the second author undertook lichenological survey of the Darkesh reserved region (37°24'-37°27'N, 56°4'-56°49'E) in Northern Khorasan province. This c. 4000 hectare survey site is located at altitudes ranging 1100 to 2450 m in the Ala Dagh, about 75 km west of the town of Bojnurd (Fig. 1), where annual precipitation is c. 500 mm, the average temperature is 15°C, and a mainly western wind has an average speed of 8.7 ms^{-1} (Anonymous, 1994). The complex topography and habitat heterogeneity, in addition to the influence of the Caspian, Siberian and Mediterranean climate, have resulted in the formation of diverse vegetation. It is home to at least 506 vascular species (Aidani 2004), of which, such as *Acer monspessulanum* subsp. *turcomanicum* (Pojark.) Rech. f., *Salix aegyptiaca* L., *Juniperus sabina* L., *Pyrus boissieriana* Boiss. & Buhse, *Quercus castaneifolia* C. A. Mey. subsp. *Castaneifolia* and *Crataegus pentagyna* Waldst. & Kit., have a very important role as lichen substrates. Lichens identified from the site comprise 51 species from 32 genera (Seaward *et al*., 2008; Haji Moniri and Kukwa, 2009; and Haji Moniri and Sipman, 2009 , 2011). The present study has been made on morphology, anatomy and chemistry of *Tornabea scutellifera* occurring on bark and twigs of *Quercus castaneifolia and Crataegus pentagynna*.

MATERIALS AND METHODS

Significant quantities of the samples (herb. nos of 1989-1998, 2002 and 2004) previously identified as *T. scutellifera*, collected from the bark and twigs of living *Q. castaneifolia* and *C. pentagyna*, were studied morphologically and anatomically and subjected to chemical analysis. Vouchers are deposited in the private

ISSN : 0974-9411 (Print), 2231-5209 (Online)

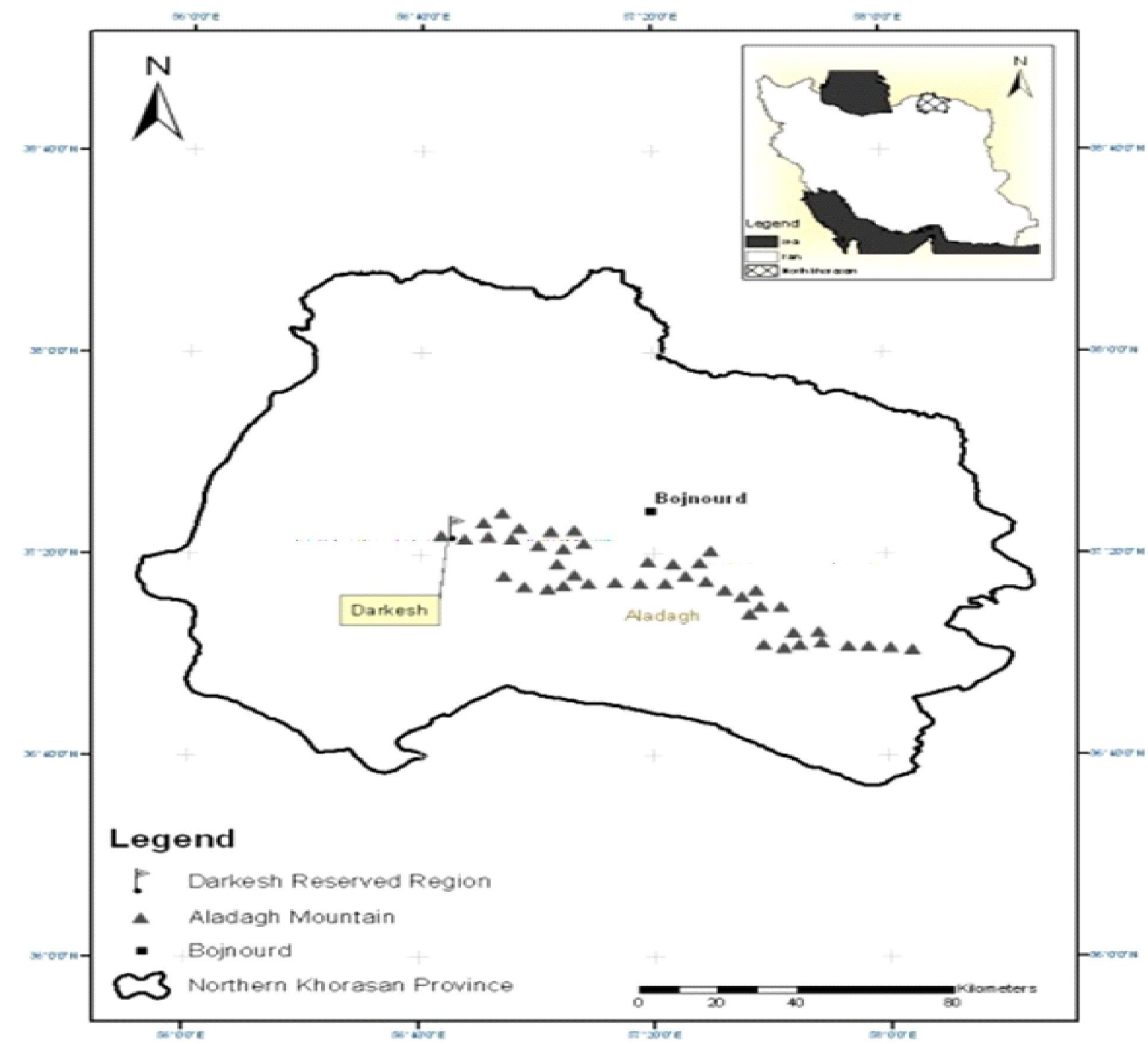

Fig. 1. *Location of Darkesh in Northern Khorasan province (URL:http://mpo-kh.ir).*

lichen collection of the second author with duplicates in herb. Seaward (Nos. 1989, 1990 and 1993) and in the Botanical Garden and Museum, Berlin (No. 2002). All specimens were studied with a Nikon Ys2-T light microscope using hand-sections in distilled water. Light microscopy measurements were done by means of Dino Capture 2.0. Specimens were spot tested with routine reagents and examined with standardized biochemical methods for finding probable none identifies substances by TLC (Purvis et al., 1992). Three gram of thalli together with reagents such as Guaiacol and 4-aminoantypyrine respectively was taken for assay The methods such as ion exchange chromatography and zymography were used for peroxidase assay (Mc-Adam *et al.*, 1992; Schagger 2006).

RESULTS AND DISCUSSION

Thallus (Figs. 2-4) fruticose with thickening of 15-70 ìm, secondary branches dichotomous, c. 30-55 ¼m thick at the base, with tufted and irregular branches, c. 35-50 ¼m thick, gradually narrowing to 4-20 ¼m at the apex, covered with hairs, 1-3 × 4-5 ¼m; surface matt, usually grayish green, light grey to brown, rarely reddish brown. Cortex thin, 2-3 ¼m thick, consisting of distinct thick walled hyphae; algal layer *Trebouxia*-type, more or less immersed in cortex, clustered, with 12-18 algal cells per one mm^2 (Fig. 5); medulla lax, colourless, made of crossed hyphae, broadening towards the apex (Fig. 6).

Apothecia sessile, lecanorine, 3-8 mm in diam.; thalline margin conspicuously thickened, c. 1 mm thick, persistent; disk deep grey to black-brown, more or less pruinose, convex (Fig. 7). Hypothecium usually 5-10 ¼m, brown. Hymenium 55-60 ¼m tall, colourless. Epithecium 14-20 ¼m thick, beige to light brown. Paraphyses simple to moderately branched, apically swollen, with brown pigment apices (Fig. 8).

Asci 8-spored, clavate, 40-58 × 15-18 ¼m, *lecanora*-type,

Fig. 2. *Habitat photograph of Tornabea scutellifera*

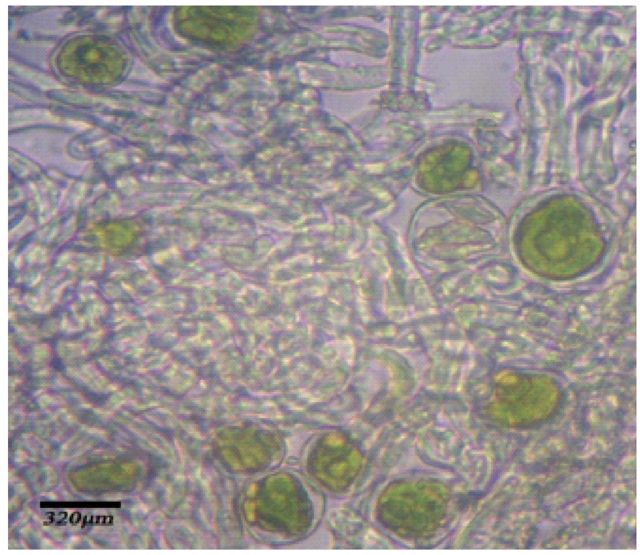

Fig. 5. *Trebouxia-type algae in among fungal hyphae.*

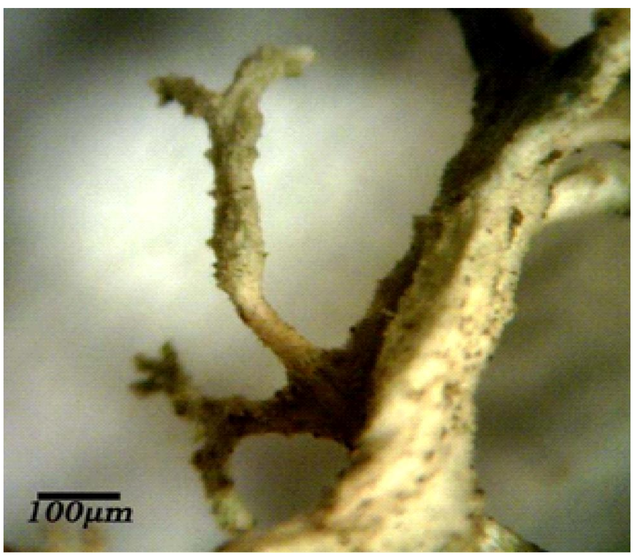

Fig. 3. *Overview of the fruticose channeled thallus.*

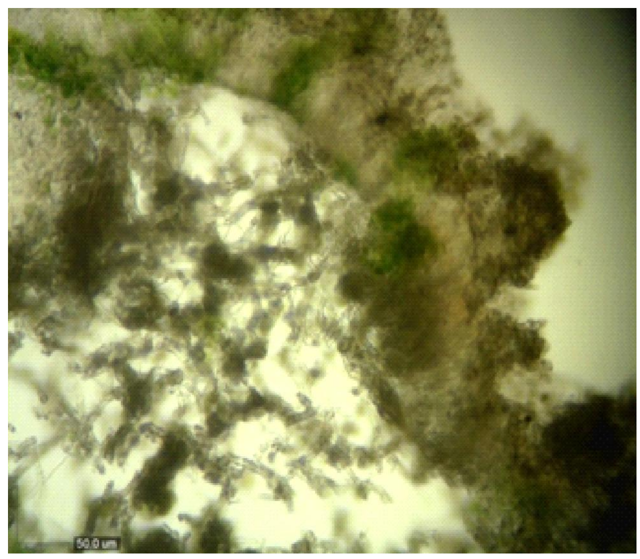

Fig. 6. *Light micrograph of a thallus cross section.*

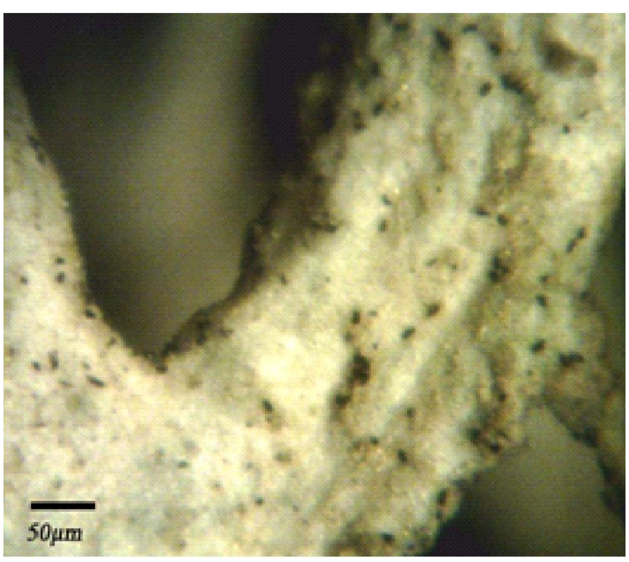

Fig. 4. *Close-up of Fig. 3.*

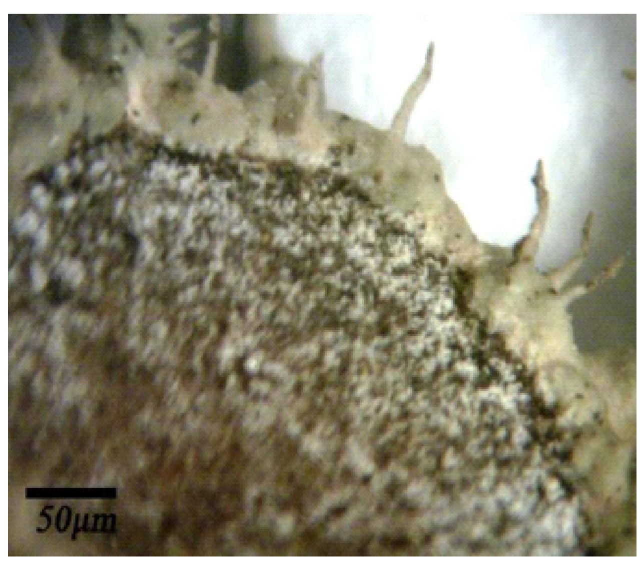

Fig. 7. *Lecanorine apothecium of Tornabea scutellifera.*

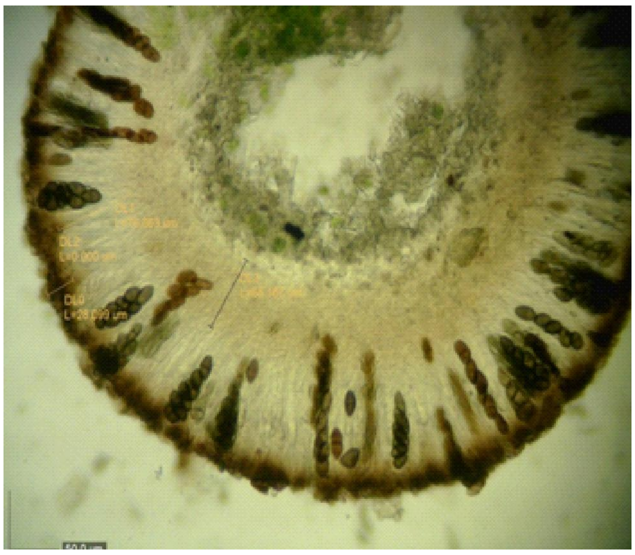

Fig. 8. *Light micrograph of the apothecium (cross section in water).*

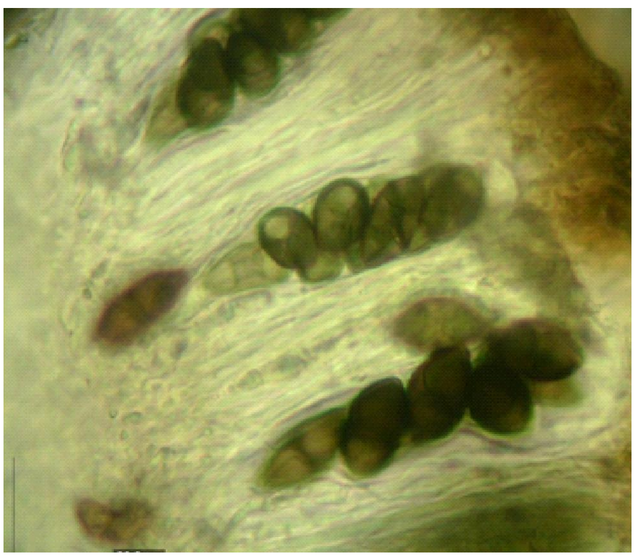

Fig. 9. *Light micrograph of mature ascospores.*

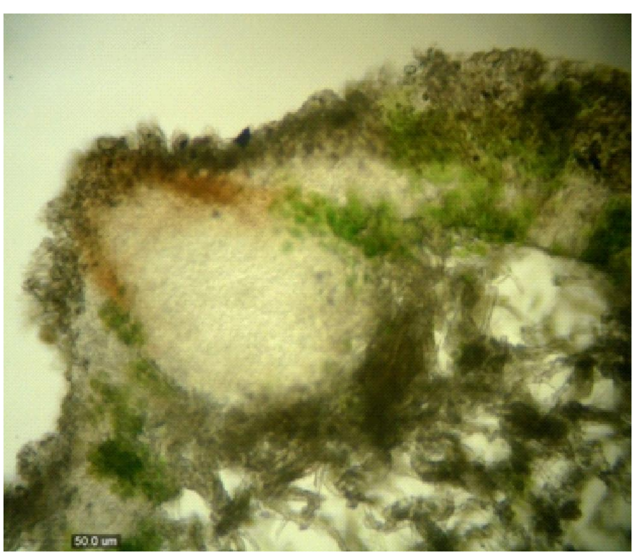

Fig. 10. *Light micrograph of a pycnidium.*

amyloid in Lugol's. Ascospore ellipsoid, ***brown, septate with no apical thickening***, 22-43 × 10.5-20 ¼m [n= 30], no ornamentation visible by light microscopy (Fig. 9).

Pycnidia (Fig. 10) common, immersed, with a brown ostiolum, pear-shaped, 312 × 169 ¼m, unilocular densely covered by several hyphal layers; conidia simple, broadly bacilliform, 3.5-4.5 × 1 ¼m [n= 50].

Chemistry: All spot tests negative, UV-.With difficulty, Guaiacol peroxidase enzyme assay was undertaken with Guaiacol led to a maximum absorbance of 0.1 at 436 nm and the protein quantification with Bradford Microassay Method proved to be 0.245 mg/ml, and specific activity of crude extract of the enzyme was 0.29 U/ml.

The significance of these observations for detecting the related variety are discussed. The morphological data correlate rather with results of the study by Tavares (1957); the evaluation of possible characters including abundant apothecia, intricate hairy branches are compared with var. *intricata*. We were not able to find the tendency of the formation of vegetative propagules in the studied material although Tavares (1957) had emphasized on. It seems that high frequency of ascocarps offset this feature. Thin cortex, cluster algal cells penetrate in the cortex, and lax medulla (Fig. 6) correspond to *scutellifera*-type anatomy collected from Persia (Kurokowa, 1962).

Tornabea scutellifera has a wide range of substrate such as soil, lignin, coastal bushes, siliceous rock, cement walls, Cactaceae and even it is vagrant (Nimis and Tretiach, 1997). As all our floristic knowledge is incomplete, Iranian samples have been recorded from three substrates including siliceous rock, *Quercus* and *Crtaegus pentagyna* (Seawrd *et al*., 2008). According to the first author's observations in the field, *Tornabea scutellifera* is widely distributed on *Quercus castaneifolia* and *Crataegus pentagyna*, with large biomass at the lower of fog-belt.

REFERENCES

Aidani, M. (2004). Floristic studies of the Darkesh reserved region in the NW of Khorasan Province. M.Sc. Thesis, Islamic Azad University, Tehran.

Anonymous, (1994). Forest reserves management studies of Darkesh-Bojnurd County (Phase II). Natural resources organization of Khorasan- URL: http://www.nr-khr.ir.

Haji Moniri, M. and Kukwa, M. (2009). Additions to the Lichen Biota of Iran. *Mycotaxon* 110: 155- 161.

Haji Moniri, M. and Sipman, H. J. M. (2009). Lichens from two nature reserves in NE Iran. *Willdenowia* 39: 199-202.

Haji Moniri, M. and Sipman, H. J. M. (2011). Lichens from three mountain sites in Khorasan provinces, Iran, including four species new to Iran. Cryptogamie, *Mycologie* 32 (2): 145-150.

Kurokowa, S. (1962). A note on the lichen genus Tor-nabenia Trev. *Journal of Japanese Botany* 37: 289- 294.

Mac-Adam, J. W. and Nelson Sharp, C. J. (1992). Peroxidase activity in the leaf colongation zone of tall Fescue. *J. Plant Physiology*, 99: 872-878.

Nimis, P. L. and Tretiach, M. (1997). A revision of Tornabea, a genus of fruticose lichens new to North America. *The Bryologist* 100 (2): 217-225.

Purvis, W. O., Coppins, B. J., Hawksworth, D. L., James, P. W. and Moore, D. M. (1992). The Lichen Flora of Great Britain and Ireland. The British Lichen Society, pp. 710.

Schagger, H. (2006). Tricine-SDS-PAGE. Nat. Protocols 1: 16-22.

Seaward, M. R. D., Sipman, H. J. M. and Sohrabi, M. (2008). A revised checklist of lichenized, lichenicolous and allied fungi for Iran. *Sauteria* 15: 459-520.

Sohrabi, M., Sipman, H. J. M., Toghranegar, Z. and Nejadsattari, T. (2010). A contribution to the lichenized mycota of Zanjan province, Iran. *Iran. Journ.* 16 (1): 125-129.

Tavares, C. (1957). Teloschistes bioreti des Abb. and the variation in Anaptychia intricata (Desf.) Mass. *Por-tugaliae Acta Biologica ser. B.* 6: 44-52.