

On the distribution, abundance and habitat of lichen communities around two species of *Rhizocarpon* in Razavi Khorasan Province, Iran

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Abstract. The present paper is a part of a more extensive investigation of *Rhizocarpon* Ramond ex DC. based on collections made since 2007 in Razavi Khorasan province in north-eastern Iran. In this study, a total of 358 thalli belonging to *R. viridiatrum* and *R. macrosporum* have been investigated in terms of ecology. Abundances of 17 lichen species adjacent to the species were determined. Identification of the materials was done by using morphology, anatomy and lichen substances.

Keywords: Lichen, *Rhizocarpon*, Iran, Razavi Khorasan

1. Introduction

Razavi Khorasan province, with an area of c. 127,432 sq.km, is located in the northeast of Iran at the border with Turkmenistan and Afghanistan. Biogeographically it belongs to the Holartic Kingdom, Irano-touranian region and Armenian-Iranian province (Thakhtajan, 1986). Floristically heterogenous communities, distributed in low situated, open valleys with man-influenced vegetation cover. Although the quantity of rainfall shows a large difference from north to south of the province, the annual average precipitation is about 150 mm. The oldest bedrock in the province dates from the Jurassic period (Aghanabati, 2004).

In the last year's special attention has been paid to Iran's lichen flora (Seaward *et al.* 2004, 2008). *Rhizocarpon* is a large lichen genus containing approximately 200 species worldwide (Feuerer, 1978). The most well-known representative of this genus is perhaps *R. geographicum* (L.) DC. (map lichen), which is widely used for dating rock surfaces. The species of *Rhizocarpon* grow predominantly on siliceous rocks, whereas some grow on basic rocks and a few are parasites on other lichens (Purvis *et al.*, 1992). *Rhizocarpon* was first recorded from Iran by Müller (1892). Only a few papers are devoted to biodiversity and taxonomy of the genus *Rhizocarpon* Lam. ex DC. in the country (Moniri *et al.* 2009; Haji Moniri *et al.* 2010; Haji Moniri & Kamyabi, 2010). In this paper that is a preliminary step in the ecological investigation of two species of *Rhizocarpon* abundance, distribution and habitat of their tangent lichens were described.

2. Material and methods

Field investigations were carried out during 2007. The majority of the study area that is covered by permanent grasslands and permanent pastures in irregular arranges, is situated in cold climatic area. Thirty mountainous localities in the province were investigated (Fig. 1); these ranges from ca. 900 to more than 2300 m. The samples of *Rhizocarpon* and the other lichen species tangent to the genus were examined with light microscopy, standard chemical spot-test reagents and TLC (Orange *et al.* 2001). Approximately 17 lichen species with different frequencies were found adjacent to the thalli of two species *viridiatrum* and

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macrosporum of *Rhizocarpon*. Identifications were made using Runemark (1956) and Purvis *et al.* (1992). The results of biodiversity have been presented by Moniri *et al.* (2009).

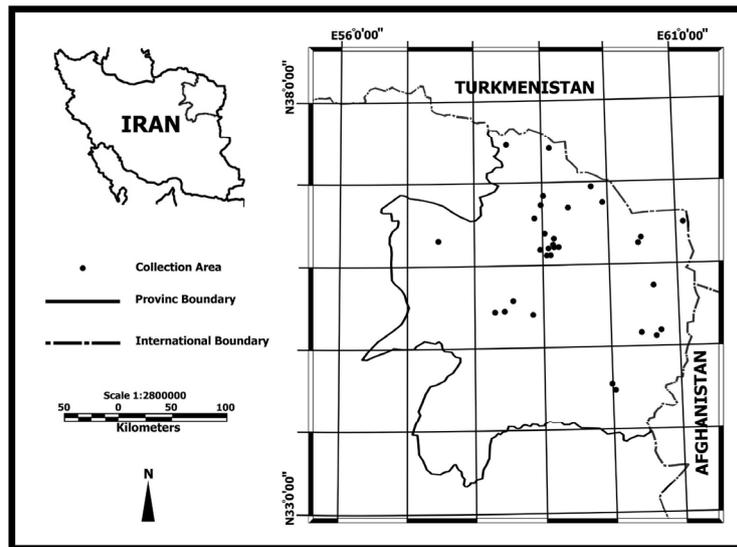


Fig 1. Map of the sampling sites in Razavi Khorasan province, NE Iran (Kamyabi, 2009).

3. Results and Discussion

Rhizocarpon macrosporum and *R. viridiatrum* are parts of the “*Geographicum* group” and “*Viridiatrum* group” of species, respectively. The both groups have multiseptate ascospores (Runemark, 1956a). 358 thalli of *R. viridiatrum* were found on siliceous and calcareous-siliceous rocks from 26 sampling sites, ranging from 960 to 2306 m. For more information about the sampling sites see Haji moniri *et al.* (2009). 459 lichen materials including 17 species adjacent to the thalli of *R. viridiatrum* collected from 18 localities with calcareous-siliceous habitat were identified, so far (Table 1) (Kamyabi, 2009). *R. viridiatrum* with the widest distribution among the other species of the genus in the province is the only species of *Rhizocarpon* group that was found in the altitude less than 1000 m. The most observed samples of the species were occupied the concave surfaces of the substrates. *Aspicilia calcarea* (L.) Korb. with 208 thalli and frequency of 58.26 % is the commonest species close to *R. viridiatrum*. The lowest frequencies (28%) belong to *Lecanora crenulata* Hook. and *Dimelaena oreina* (Ach.) Norman, with only a thallus (Fig. 2).

Table 1. The Abundance of the adjacent species to *Rhizocarpon viridiatrum* (Kamyabi, 2009).

| Adjacent species | Number of thallus | Frequency (%) |
|--------------------------------|-------------------|---------------|
| <i>Acarospora bullata</i> | 45 | 12.6 |
| <i>Acarospora anatolica</i> | 1 | 0.28 |
| <i>Aspicilia calcarea</i> | 208 | 58.26 |
| <i>Aspicilia desertorum</i> | 50 | 14 |
| <i>Aspicilia candida</i> | 1 | 0.28 |
| <i>Caloplaca variabilis</i> | 28 | 7.84 |
| <i>Candelariella aurella</i> | 4 | 1.12 |
| <i>Candelariella vitellina</i> | 30 | 8.40 |
| <i>Endocarpon pusillum</i> | 24 | 6.72 |
| <i>Fulgensia subbracteata</i> | 3 | 0.84 |
| <i>Dimelaena oreina</i> | 1 | 0.28 |
| <i>Lecanora dispersa</i> | 3 | 0.84 |
| <i>Lecanora crenulata</i> | 1 | 0.28 |
| <i>Lecanora muralis</i> | 6 | 1.68 |
| <i>Lecanora garovaglii</i> | 14 | 3.92 |

| | | |
|--------------------------|----|------|
| <i>Toninia diffracta</i> | 28 | 7.84 |
| <i>Xanthoria elegans</i> | 12 | 3.36 |

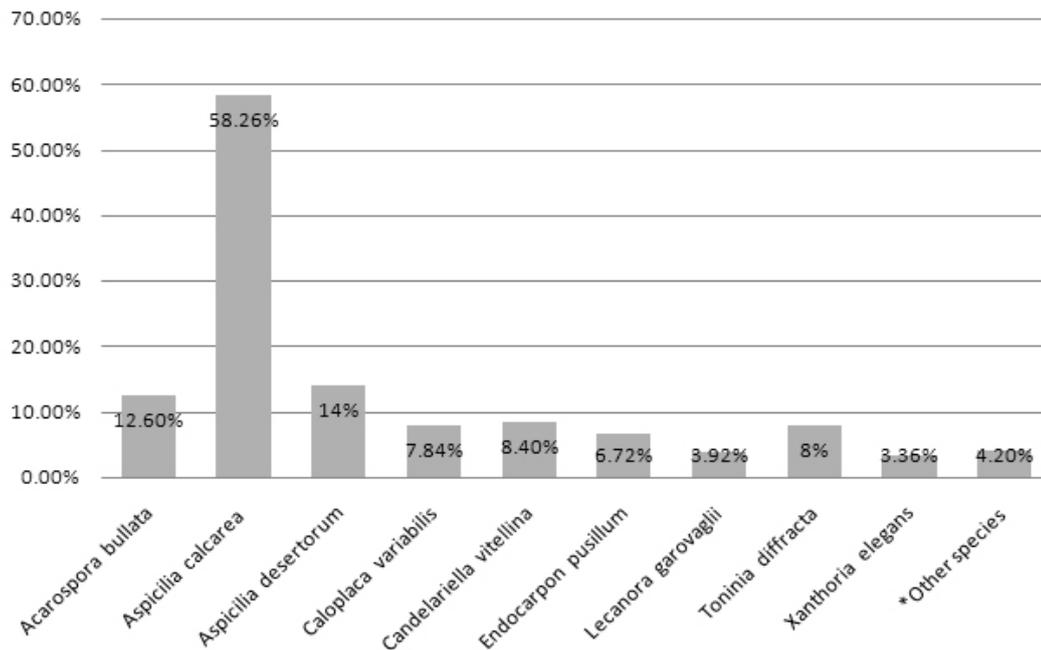


Fig. 2. The graph of abundance (%) of the adjacent species to *Rhizocarpon viridiatrum*; (*: Frequency less than 10%) (Kamyabi, 2009).

R. macrosporoum was rarely accessible so that only one thallus of the species was found on siliceous-calcareous rock from the highland with approximately 1650 m. The species, however, could be much more abundant in the area than has been assumed. The identified species near the thallus of *R. macrosporoum* was *Lecanora garovaglii* (Körb.) Zahlbr. (Kamyabi, 2009).

Studies of lichen diversity require more knowledge and time. Yet, even with these components, the picture remains incomplete if the goal is to determine neighboring to *R. viridiatrum* and *R. macrosporoum* in Razavi Khorasan province.

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