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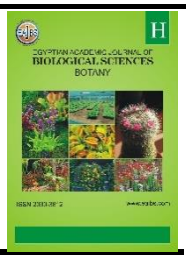

Bryum radiculosum Brid. New to Arabian Peninsula with New Bryaceae Additions to South Hejaz Region in Saudi Arabia

Mai Ahmed Taha* and Usama Yehia Abou-Salama
Department of Botany, Faculty of Science, Ain Shams University, Egypt
*****E-Mail : maitaha33@yahoo.com

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ABSTRACT

South Hejaz (SH) is the richest region in Saudi Arabia (SA) with Bryaceae, where 8 out of a total of 13 species have been recorded. In the present work, four Bryaceae species have been recorded for the first time from SH and one of them (*Bryum radiculosum* Brid.) is a new record to SA and to Arabian Peninsula (AP). This brings the total number of fully identified mosses known from SH to 79 and from SA to 123. In addition, the number of Bryaceae species known from AP increased to 22 species.

An identification key for the recorded Bryaceae from SH and all data about the studied specimens (e.g. Localities of collection, habitats, latitudes, longitudes, and altitudes.…etc.) are provided. The current study presented a distribution of Bryaceae recorded from SH region in different phytogeographical regions in SA and AP countries, with spotlights on their floristic elements. The new record (*Bryum radiculosum* Brid.) is described, illustrated and some of its floristic aspects are discussed.

INTRODUCTION

Bryaceae is a large cosmopolitan moss family, includes about 500 species worldwide (Spence, 2014). In the Arabian Peninsula (AP) Bryaceae is represented by 21 taxa (Kürschner and Frey, 2011; Kürschner and Ochyra, 2014); thirteen of them (in 6 genera) exist in Saudi Arabia (SA).

In SA Bryaceae is the second largest family after Pottiaceae (59 taxa) (Taha, 2019a; Taha *et al.*, 2020). *Bryum argenteum* and *B. dichotomum* are the most common species of Bryaceae in Saudi Arabia (recorded in 4 out of 8 regions) followed by *Brachymenium exile* and *Bryum turbinatum* (recorded in 3 regions); the other species are restricted in distribution to one or two regions (Taha, 2019a).

Seventy-five mosses were recorded from South Hejaz (Taha, 2019a, b; Taha *et al.*, 2020), arranged in descending order i.e. Pottiaceae (29 taxa), Bryaceae (8 taxa), Fissidentaceae (5 taxa), Brachytheciaceae, and Grimmiaceae (4 taxa each), Fabroniaceae, Funariaceae and Leskeaceae (3 taxa each), Bartramiaceae, Encalyptaceae, Hypnaceae and Orthotrichaceae (2 taxa each), Amblystegiaceae, Fontinalaceae, Hedwigiaceae, Leptodontaceae, Leucobryaceae, Leucodontaceae, Neckeraceae and Racopilaceae (one taxon each).

South Hejaz (SH) is the richest region in SA with Bryaceae (Taha, 2019a), where 8 Bryaceae species (viz. *Anomobryum julaceum* (Schrad. ex P.Gaertn.*et al.*) Schimp., *Brachymenium exile* (Dozy & Molk.) Bosch. & Sande Lac., *Bryum argenteum* Hedw., *B. dichotomum* Hedw., *B. turbinatum* (Hedw.) Turner, *Imbribryum alpinum* (Huds.ex With.) N.Pedersen, *Ptychostomum moravicum* (Podp.) Ros & Mazimpaka, *P. pseudotriquetrum* (Hedw.) J.R. Spence & H.P. Ramsay) have been recorded out of the 13 Bryaceae recorded from SA. Among those eight, four species are restricted in distribution to SH region.

There are Bryaceae specimens collected by Abou-Salama (the second author) from SH region and preserved in CAIA without full identification (only to family level). The current work aimed to identify some of these Bryaceae specimens and therefore increase our knowledge about the moss flora of SA. Moreover, the present paper provides distribution and floristic aspects of all Bryaceae known from SH region. This study is considered the third on the moss flora of this region; it is concerned with Bryaceae while the two previous studies (Abou-Salama *et al.*, 2005 and Taha, 2019b), were concerned with Funariaceae and Grimmiaceae respectively.

MATERIALS AND STUDY AREA

Among mosses collected from the South Hejaz region (SH) by the second author throughout August 1999, spring 2002 (April and March), and January 2003; only 18 Bryaceae specimens have been studied in the current work.

The eighteen studied specimens were collected from two areas (**A.** Al-Shafa, **B.** Al-Hada) and six main localities of SH (see Fig. 1): **I.** Wadi El-Deik, **II.** Wadi Zee Ghazal, **III.** Besides of Al-Shafa road, **IV.** Wadi Al-Shafa and **V.** Wadi Al-Malek, from Al-Shafa area and **VI.** Side road from Al-Hada pelt way from Al-Hada area. Nearly all the studied specimens were collected from Al-Shafa area (17 out 18 specimens) in 8 sites (belong to 5 main localities), except one specimen has been collected from Al-Hada area in one site. The collected materials were mainly found growing in shaded wet habitats on or between rocks, on substratum below the water reservoir.

Both of Al-Shafa and Al-Hada areas belong to Taif Province in Makkah at SH region (Fig. 1). Al-Shafa area lies at 21°04′ N 40°18′ E, ca. 30 km southwest of Taif city, 1500-2500 m a.s.l.; while Al-Hada area lies at 21°22′ N 40°17′ E, up to ca. 2000 m a.s.l., ca. 20 km northwest of Taif city (Abou-Salama *et al.*, 2005). The average annual rainfall in the study area is up to 200 mm. The relative humidity in summer is 25-27% and in winter is 56-61%. The average temperature degrees in summer are 26-28°C and in winter are 14-16°C (Abou-Salama *et al.*, 2005; Taha, 2019b). It is worth mentioning that, more relevant information about the study areas (Al-Shafa, Al-Hada) was referred to by Abou-Salama *et al.* (2005) and Taha (2019b). All data about habitats and sites of collections are included in Table 1.

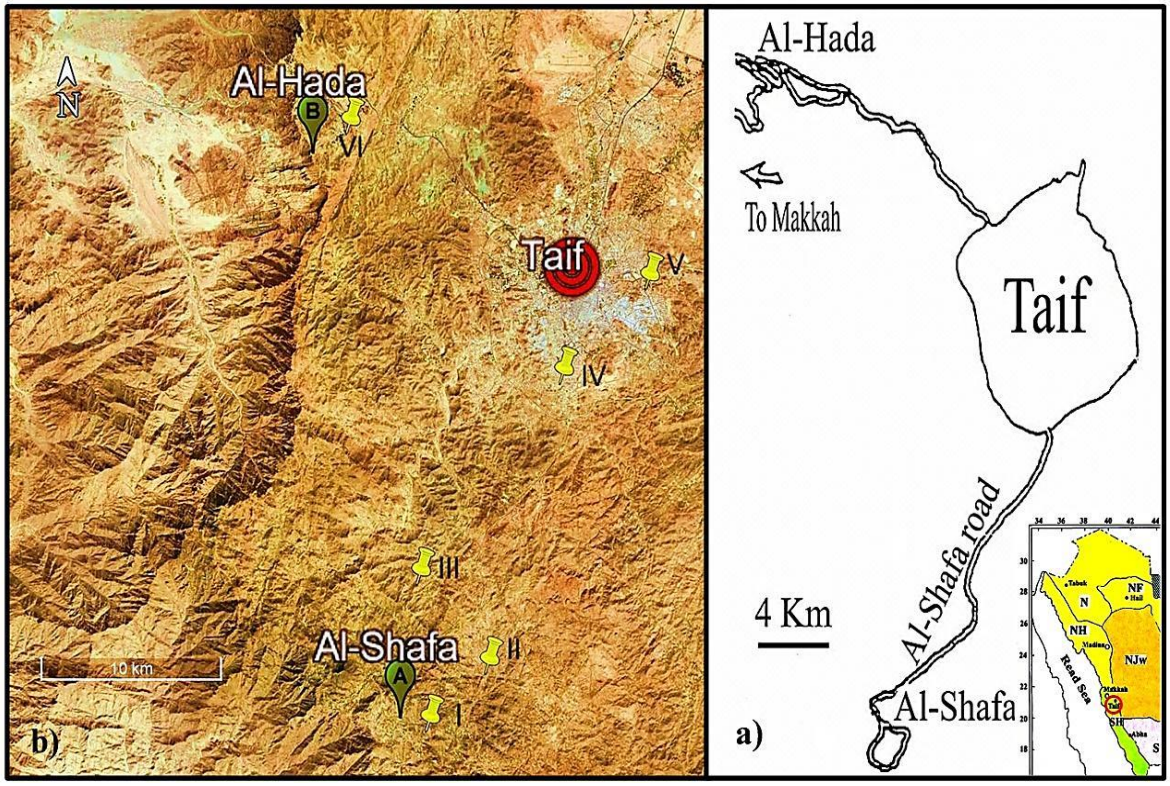

Fig. 1: a) Map showing location of Taif province (red circle) in South Hejaz (SH) region (green area); with the two main study areas Al-Shafa and Al-Hada (after Abou-Salama *et al.*, 2005) and other regions abbreviations: NH= North Hejaz, N= Northern region, NF= Nefud, Njw= west Najd, S= Southern region. **b)** Google earth satellite image showing six localities of collections in **A.** Al-Shafa area: **I.** Wadi El-Deik, **II.** Wadi Zee Ghazal, **III.** Beside of Al-Shafa road, **IV.** Wadi Al-Shafa, **V.** Wadi Al-Malek and in **B.** Al-Hada area: **VI.** Side road from Al-Hada pelt way (https://earth.google.com, 2020).

RESULTS

The study of the 18 Bryaceae specimens showed that they belong to six species in two genera. One of them; *Bryum radiculosm* is a new record to Saudi Arabia and the Arabian Peninsula, while three (*Bryum arachnoideum*, *Ptychostomum capillare* and *P. imbricatulum*) are new records to South Hejaz region, and the rest two (*Bryum argenteum* and *B. dichotomum*) were recorded previously from the study area. Thus, this study raised the total number of fully identified mosses known from SH from 75 to 79 (12 of them belong to Bryaceae) and from SA from 122 to 123 (14 of them belong to Bryaceae). In addition, the number of Bryaceae species known from AP increased to 22 species.

The current results include **I.** A key for the Bryaceae species which were recorded from the South Hejaz region; **II.** All data about the 18 studied specimens: species names, their herbarium numbers, localities of the collection (as shown in Fig.1) including sites numbers, latitudes, longitudes and altitudes, habitats, dates of the collection (Table 1); **III.** The distribution of Bryaceae recorded from SH region in different phytogeographical regions in SA and in AP countries (Table 2) based on Kürschner (2000), Kürschner and Frey (2011), Taha (2019a) and their floral elements (see, Table 2) based on Kürschner (2000, 2003 and 2008), Kürschner *et al.* (2001). **IV.** Description and illustration of *Bryum radiculosm* (the new record to the AP) in SA.

I. Key of Bryaceae Species Recorded from South Hejaz Region:

0. Plants julaceous; leaves strongly concave; laminal cells narrowly linear to vermicular, more than 4 x as long as wide……..….***Anomobryum julaceum***
0. Above combination absent……...……..……**1**
1. Basal laminal cells at margins are quadrangular; capsules if present are erect……...……..…***Brachymenium exile***
1. Basal laminal cells at margins not quadrangular; capsules if present are inclined to pendulous……...…….……**2**
2. Plants whitish pale green; leaf apex hyaline…… ……..…...……**3**
2. Plants green, or yellowish, brownish, reddish-green, not whitish; leaf apex not hyaline…….…...……**4**
3. Leaves orbicular to broad ovate; costa long excurrent as leaf lamina long or longer……...……..…..***Bryum arachnoideum***
3. Leaves ovate; costa ending below apex or short excurrent.....***B. argenteum***
4. Axillary propagules present…….……..…….....**5**
4. Axillary propagules absent…….……..…….....**6**
5. Axillary gemmae filamentous.…….***Ptychostomum moravicum***
5. Axillary bulbils ovoid to subcylindrical…….……..…***B. dichotomum***
6. Leaves widest above middle, spathulate to obovate, strongly twisted around the stem when dry……...……..……***Ptychostomum capillare***
6. Leaves widest at or below middle, ovate to oblong-lanceolate, not twisted when dry…..**7**
7. Leaves un-bordered, or inconspicuously bordered (seldom unistratose)…….……..…**8**
7. Leaves conspicuously bordered by 2-5 rows of narrow elongated cells…….……....**10**
8. Costa ending in or below apex; apex obtuse or bluntly acute….....***Imbribryum alpinum***
8. Costa short to long excurrent; apex acute to acuminate…….....**9**
9. Plants usually grow in dense tufts; leaves spreading on the stem; costa short excurrent in smooth arista; leaf margins ± recurved; rhizoidal gemmae abundant…….....***B. radiculosm***
9. Plants don't grow in dense tufts; upper leaves forming distinct comal tufts (crowded and larger than basal ones); costa long excurrent in slightly denticulate arista; leaf margins strong recurved; rhizoidal gemmae few or absent.....***P. imbricatulum***
10. Plants glossy; leaves bordered by 3-5 rows of narrow elongated cells with long decurrent base; leaf margins slightly recurved……....***P. pseudotriquetrum***
10. Plants not glossy; leaves bordered by 2-3 rows of narrow elongated cells without or with slightly decurrent base; leaf margins plane…….……...***P. turbinatum***

II. Data About The Studied Specimens:

As shown in Table 1 below; *Ptychostomum imbricatulum* was the most common species being represented by 6 specimens (out of 18) followed by *Bryum dichotomum* by 4 specimens, while the rest species were represented by 1-3 specimens.

Table 1: Data of the 18 studied specimens: species name, herbarium numbers, localities of collection (as given in Fig.1) including sites numbers, habitats, date of collection, latitude, longitude and altitude.

Species Name	Herbarium no.	Locality of collection	Date and Habitat of collection	Latitude, Longitude and Altitude (above sea level)
Bryum arachnoideum	1423b 1427	**I.** Wadi El-Deik, site 3	20/8/1999; below water reservoir, on vertical wet substrate	21º06´N, 40º19´E; ca. 1860 m
B. argenteum	1411c	**I.** Wadi El-Deik, site 2	20/8/1999; on vertical and inclined faces of rocks	21º04´N, 40º20´E; ca. 2160 m
	1470	**V.** Wadi El-Malek, site 8	23/8/1999; between rocks of a vertical wall, with hepatics and ferns	21°13` N, 40°25` E; ca.1600 m
B. dichotomum	2160a	**III.** on side of Al-Shafa road, site 5	14/3/2002; oblique land	21º08´N, 40º19´E; ca. 880 m
	2368b 2369	**II.** Wadi Zee Ghazal (at its contact with wadi Harjal), site 4	2/1/2003; below rocks	21° 05'N, 40° 22'E; ca. 840 m
	2469a	**VI.** Al-Hada side road from Al-Hada pelt way, site 9	24/1/2003; horizontal shaded land, moss mat about 2.5x 1m	21°20` N, 40°17` E; ca. 1950 m
B. radiculosm	1411d	**I.** Wadi El-Deik, site 2	20/8/1999; on vertical and inclined faces of rocks	21º04´N, 40º20´E; ca. 2160 m
Ptychostomum capillare	1411e 1415d	**I.** Wadi El-Deik, site 2	20/8/1999; on vertical and inclined faces of rocks	21º04´N, 40º20´E; ca. 2160 m
	1421b	Wadi El-Deik, site 3	20/8/1999; below water reservoir, on vertical wet substrate	21º06´N, 40º19´E; ca. 1860 m
P. imbricatulum	1407	**I.** Wadi El-Deik, site 1	20/8/1999; on vertical and inclined faces of rocks	21º03´N, 40º21´E; ca. 1950 m
	1416e	**I.** Wadi El-Deik, site 2	20/8/1999; on vertical shaded substrate	21º04´N, 40º20´E; ca. 2160 m
	1425b 1426b	**I.** Wadi El-Deik, site 3	20/8/1999; below water reservoir, on vertical wet substrate	21º06´N, 40º19´E; ca. 1860 m
	1451a	**V.** Wadi El-Malek, site 7	23/8/1999; between rocks of a vertical wall	21°16` N, 40°27` E; ca.1400 m
	2255a	**IV.** Wadi Al-Shafa, site 6	11/4/2002; on land between rocks	21°13` N, 40°24` E; ca. 1050 m

III. Distribution and the Floral Elements of the Recorded Bryaceae Family in SH Region:

As given in Table 2 below: *Bryum argenteum* and *B. dichotomum* were the most common species been found in four out of 8 regions of SA; on the other side five species namely: *Anomobryum julaceum, B. radiculosm, Imbribryum alpinum, Ptychostomum moravicum* and *P. pseudotriquetrum* were restricted to SH region.

B. dichotomum is the most common species in AP countries being found in 5 countries followed by *P. imbricatulum* recorded in 4; whereas *Imbribryum alpinum, P. moravicum, B. radiculosm* were recorded in SA and not found in any Arabian Peninsula countries else. It is worthy to mention that *B. radiculosm* is a new record to the Arabian Peninsula through the current study.

Table 2 shows that the 12 Bryaceae species recorded in SH region are represented by four floristic elements; 6 species are (Sub) Cosmopolitan, 2 species are Northern, Tropical (Pantropical and Palaeotropical) and Circum-Tethyan elements for each.

Table 2: The 12 Bryaceae species recorded in South Hejaz (SH) region and their distribution in different phytogeographical regions in Saudi Arabia (SA), Arabian Peninsula (AP) countries and their floristic elements. Abbreviations and symbols meaning: **E=** Eastern region, **NH=** North Hejaz, **NF=** Nefud, **Nje=** east Najd, **S=** Southern region; **KU=** Kuwait, **UAE**= United Arab Emirate, **Ye-Soc=** Socotra, **Ye=** Yemen; ***=** New record to SH region, ****=** New record to SA.

Species	Distributions in SA	Distributions in AP	Floristic elements
1. *Anomobryum julaceum*	SH	SA, Ye-Soc	Northern
2. *Brachymenium exile*	S, SH, Nje	SA, Ye	Tropical (Pantopical)
3.* *Bryum arachnoideum*	S, SH	SA, Ye-Soc	Tropical (Strictly Palaeotropical)
4. *B. argenteum*	E, S, SH, Nje	SA, Ye	(Sub) Cosmopolitan
5. *B. dichotomum*	NF, S, SH, Nje	SA, Ye, Ye-Soc, UAE, Ku	(Sub) Cosmopolitan
6.** *B. radiculosm*	SH	SA	Circum- Tethyan
7. *B. turbinatum*	NH, S, SH,	SA, UAE	Circum- Tethyan
8. *Imbribryum alpinum*	SH	SA	(Sub) Cosmopolitan
9.* *Ptychostomum capillare*	S, SH	SA, Ye, Ye-Soc	(Sub) Cosmopolitan
10.* *P. imbricatulum*	NF, SH	SA, Ye, Ye-Soc, UAE	(Sub) Cosmopolitan
11. *P. moravicum*	SH	SA	Northern
12. *P. pseudotriquetrum*	SH	SA, UAE, Ye	(Sub) Cosmopolitan

IV. Description and Illustration:

Bryum radiculosum Brid. (Plate I; Figs. 1-14):

Plants often grow in dense tufts, up to 8 mm high; stem branched or un-branched; leaves imbricate when dry, erect to erect-patent, ± concave when moist; leaf shape ovate, elongated triangular, oblong to ovate-lanceolate, 0.7-1.4 mm long, 0.25-0.4 mm wide; costa strong, short excurrent in smooth arista; margins ± recurved above, ± denticulate at the apex, smooth below; upper lamina cells smooth, incrassate, 10-15 µm wide, (30-) 40-50 (-55) µm long; rhizoids yellowish brown, with densely coarse papillae; rhizoidal gemmae abundant, reddish to yellowish-brown color, ± spherical, outlines smooth (not protuberant), 110-170 µm in diameter.

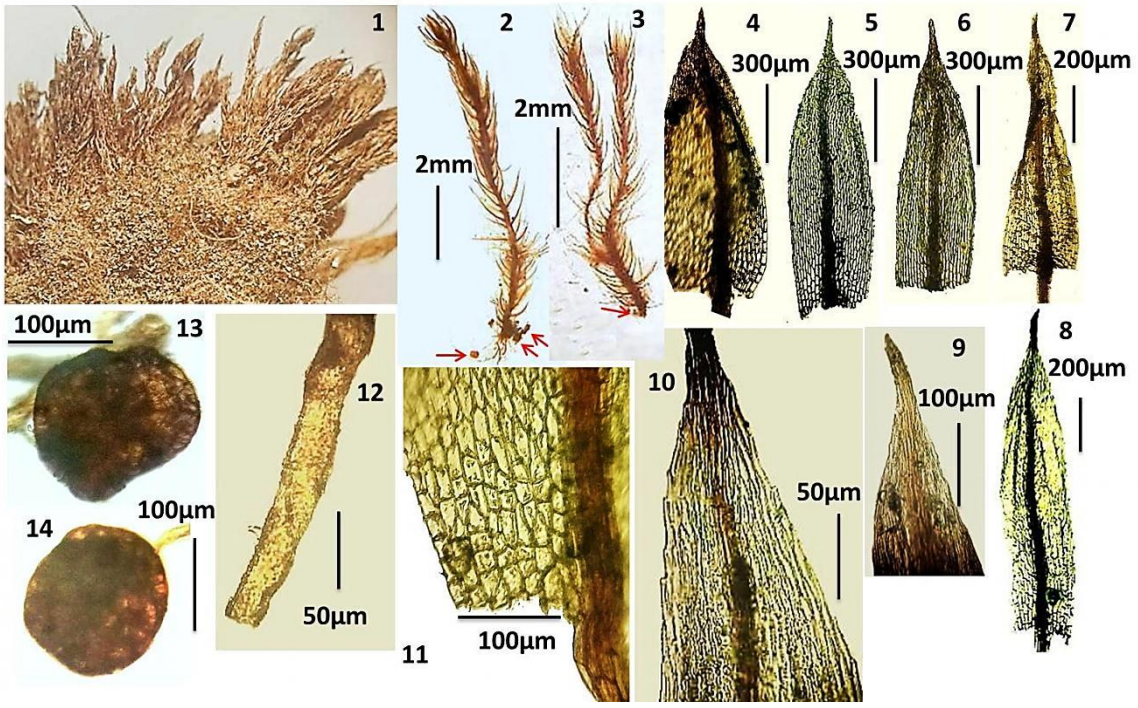

Plate I; Figs. 1-14: ***Bryum radiculosum*** **Brid.; Fig.1** Dry plants; **Figs.2, 3** Wet plants (simple and branched stems respectively); **Figs.4-8** Stem leaves of slightly varying shapes; **Fig.9** Upper part of leaf; **Fig.10** Magnifided upper cells of leaf; **Fig.11** Basal part of leaf; **Fig.12** Rhizoid showing densely coarse papillae; **Figs.13, 14** Rhizoidal gemmae.

DISCUSSION

Bryaceae is a large moss family with confusing relationships like several other families (e.g. Leptostomaceae, Mielichhoferiaeae, Mniaceae, Roellobryaceae, ….etc.) included in order Bryales. Bryaceae is, therefore, treated as one of the heterogeneous families with a reputation of taxonomic difficulty (Holyoak and Pedersen, 2007; Spence, 2014a, b).

Bryaceae leaves have many morphological variations, so their identifications in most bryofloras (e.g. Flowers, 1973; Nyholm, 1975; Crum and Eckel, 1994; Heyn and Herrnstadt, 2004; Smith, 2004; Casas *et al.* 2006; Lüth and Ahrens, 2007) are mainly based on sporophytic and other vegetative characters (i.e. rhizoids, gemmae, bulbils), sometimes they were referred to a kind of their growing habitats as a key character (e.g. in Smith, 2004: *Ptychostomum bornholmense* is referred to as calcifuge and not recorded in arable fields; *P. rubens* do not grow on rocks and many other examples).

The identification of *Bryum radiculosum* was mainly based on color and features of rhizoids and the rhizoidal gemmae. Whereas it was similar to three species (i.e. *Bryum subapiculatum* Hampe, *B. ruderale* Crundw. & Nyholm and *Ptychostomum rubens* (Mitt.) Holyoak & N. Pedersen) included in *B. erythrocarpum* complex by Smith (2004), in some leaf characters and sometimes in habitats.

B. radiculosum is characterized by yellowish-brown with dense coarsely papillose rhizoids and their gemmae are reddish to yellowish-brown, not protuberant, 110-170 µm in diameter. While rhizoids in *B. subapiculatum* are finely papillose and their gemmae are scarlet red or brick red and larger in diameter; but rhizoids in *B. ruderale* are purple or bright to deep violate and their gemmae are bright or purplish-red to orang; and gemmae in

Ptychostomum rubens are red or dark red in color and have strongly protuberant cells (Kürschner and Frey, 2011).

Sometimes, *B. radiculosum* may be mistaken for *B. dichotomum* but the former can be easily distinguished by lack of axillary bulbils, comal leaves are appressed imbricate when dry and the rhizoids are coarse (Magill, 1981; Heyn and Herrnstadt, 2004).

South Hejaz is the richest region of moss diversity in Saudi Arabia (Taha, 2019a). Also; it is the richest one with Bryaceae, especially after this study, where 12 Bryaceae species out of 14 (ca. 86% of Bryaceae in SA) have been recorded and moreover five Bryaceae species (i.e. *Anomobryum julaceum*, *B. radiculosm*, *Imbribryum alpinum P. moravicum P. pseudotriquetrum*) are restricted to this region. All these results are correlated well with the highest average of annual rainfall (from 200 to more than 500 mm) and also the highest elevation (1000 to more than 2000 m a.s.l.) which reflect the high fertility of the SH region (Kürschner, 2000; Taha, 2019a).

In spite of the wide distribution of *I. alpinum*, *P. moravicum*, and *B. radiculosm* in nearly all continents (Magill, 1981; Crum and Eckel, 1994; Heyn and Herrnstadt, 2004; O'Shea, 2006; Kürschner and Frey 2011; Ros *et al.*, 2013; www.tropicos.org, 2020), yet in the AP they are known from only Saudi Arabia which may be emphasized by the same previous explanation of high fertility, rainfall, and elevation for this region compared to other AP countries (see climate and topography of AP in Kürschner, 2000).

As a result of several geological processes at the beginning of the Jurassic era (ca. 180 million years ago) to the Tertiary (the era from 66 million to 2.6 million years ago) which has been developed the hypothetical floristic elements (Kürschner, 2000). Saudi Arabian moss flora comprises six bryofloral elements: (Sub) Cosmopolitan, Northern, Xerotherm-Pangean, Circum-Tethyan, Tropical, and Endemics derived from different ancestral floral origins (Frey and Kürschner, 1988; Kürschner, 2000 and 2008).

Despite the relatively small number of Bryaceae species in SH compared to number of mosses in SA (i.e. 12 out of 123 mosses), but these species are represented by four floral elements: (Sub) Cosmopolitan, Northern, Circum-Tethyan and Tropical.

Six species of Bryaceae in SH are (Sub) Cosmopolitan which is attributed to human activities (Kürschner, 2000 and 2008) including the more intensive studies of the bryoflora around the world (this correlates with numerous moss additions around different regions all over the world).

The Northern element is represented by both *Anomobryum julaceum* and *P. moravicum* in SH, where this element during the Pleistocene has a laurasian distribution pattern that was distributed in north temperate, cold zones, sub-Mediterranean and sub-Atlantic. Although, today the two former species became nearly Sub-Cosmopolitan in the distribution pattern yet the northern origin of both is explained by Kürschner (2000) who mentioned that the Arabian species belonged to the Northern element represented in micro-niches of the escarpments with the highest amount of rainfall.

Circum-Tethyan comprises taxa distributed along the northern and southern coasts of the Tethys Sea (Kürschner, 2000 and 2008) represented by both *B. radiculosm* and *B. turbinatum* in SH. The presence of this element may be attributed to migration from Saharo-Sindian or Irano-Turanian regions (Kürschner, 2000) or maybe due to the effects of coastal climate; especially the record of *B. radiculosm* which is a typical taxon of dry and coastal environments (Schintu *et al.*, 2005). Also, it is worth mentioning that both of the two Circum-Tethyan species today became nearly Sub-Cosmopolitan in distribution.

Tropical element is represented in SH by *Bryum arachnoideum* as Palaeotropical and *Brachymenium exile* as Pantropical which originate in Cretaceous (era from 145 to 66 million years ago) and Tertiary times, by the migration of a great number of taxa of Gondwanan origin northwards into the Circum-Tethyan and Laurasian regions (Kürschner,

2008). According to Kürschner (2008) Pantropical comprises taxa in South Arabia as a bridge between Africa and Asia (as *B. exile*) while Palaeotropical comprises taxa with an African-South-West, Asian-South-East Asian distribution pattern which is well correlated with the distribution of *B. arachnoideum* which was widespread in middle and South Africa (i.e. Angola, Benin, Burkina Faso, Burundi, Cameroon, Ivory Coast, Kenya, Lesotho, Madagascar, Malawi, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Zambia, Zimbabwe) and has little records in Asia (i.e. Socotra and Saudi Arabia), also in South America (i.e. Brazil); (O'Shea, 2006; Forzza, 2010; Kürschner and Frey, 2011).

In the conclusion the current paper is considered the first work about Bryaceae family in South Hejaz region in Saudi Arabia; where it provided an identified key, the distribution of the current family in different phytogeographical regions in SA and AP countries, and also their florisitic elements.

This study has provided the description and illustration of the new record *Bryum radiculosum* Brid. to AP in SA and increased the number of Bryaceae known from AP to 22 and from SA to 14. Also, added four new distribution data to SH region (*Bryum arachnoideum*, *B. radiculosm*, *Ptychostomum capillare,* and *P. imbricatulum*) which raised the Bryaceae number to 12 species and the total mosses known from this region to 79 taxa.

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ARABIC SUMMARY

تسجيل جديد لشبه الجزيره العربيه مع اضافات برايسي جديده لمنطقة جنوب الحجاز بالمملكة العربيه السعودية *Bryum radiculosum* Brid.

مي أحمد طه وأسامه يحي أبوسلامه

قسم النبات- كلية العلوم- جامعة عين شمس- جمهورية مصر العربيه

جنوب الحجاز هي أغنى منطقة في المملكة العربية السعودية بالبرايسي حيث سجل بها 8 أنواع من أصل 13 نوعا. في العمل الحالي، تم تسجيل أربعة أنواع من البرايسي لأول مرة من منطقة جنوب الحجاز؛ واحد منها (*Bryum radiculosum* Brid) يعد تسجيلا" جديدا" للمملكة العربية السعودية ولشبة الجزيره العربية. وبذلك يرتفع إجمالي عدد الحزازيات المعروفه من منطقة جنوب الحجاز من 75 إلى 79 ومن المملكة العربية السعوديه من 122 إلى 123. بالإضافة إلى ذلك، زاد عدد أنواع البرايسي المعروفة من شبة الجزيره العربية إلى 22 نوعًا.

تم عمل مفتاح تعريفي للبرايسي المسجّله من منطقة جنوب الحجاز، كما قدم العمل الحالي جميع البيانات الخاصه بالعينات المدروسة، مثل مواقع التجميع والموائل وخطوط العرض والطول والارتفاعات ... إلخ. وتناولت الدراسة توزيع البرايسي المسجّله من منطقة جنوب الحجاز في المملكة العربية السعودية وشبه الجزيرة العربية، وأيضا تم تسليط الضوء على العناصر الفلوريه الخاصه بها. وقدم العمل الحالي وصفا" وتصويرا" لـنوع الـ *Bryum radiculosum* Brid الجديد مع الأشاره لبعض الجوانب الفلوريه.