

## THE LIVERWORT GENUS *MARCHANTIA* (MARCHANTIACEAE) OF MOUNT SIBAYAK NORTH SUMATRA, INDONESIA

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### ABSTRACT

Knowledge on the liverworts (Marchantiophyta) flora of Sumatra is very scanty including that of genus *Marchantia* (Marchantiaceae). This study was conducted to explore the diversity of *Marchantia* in Mount Sibayak North Sumatra, Indonesia. Altogether, seven species of *Marchantia* are found in Mount Sibayak North Sumatra, of which five are previously known (*Marchantia acaulis*, *M. emarginata*, *M. geminata*, *M. paleacea*, and *M. treubii*), while one is as new species record (*M. polymorpha*) for Sumatra, and one species has not been identified (*Marchantia* sp.). An identification key to the species of *Marchantia* from Sumatra is provided.

**Key words:** Liverwort, *Marchantia*, Marchantiaceae, Mount Sibayak, North Sumatra

### INTRODUCTION

*Marchantia* L. is one of the largest genera in the liverworts order Marchantiales. This genus is represented by 36 species found in the world (Bischler-Causse 1998). In Indonesia especially Sumatra, the floristic work on *Marchantia* is still very scarce. Herzog (1943) in his study of liverworts from Sumatra, recorded three species of *Marchantia*, namely *M. emarginata*, *M. mucilaginoso* and *M. nitida*. A monograph of *Marchantia* from Asiatic and Oceanic regions was by Bischler-Causse (1989), who listed six species from Sumatra, namely *M. acaulis*, *M. emarginata*, *M. geminata*, *M. miqueliana*, *M. paleacea*, and *M. treubii* (*M. mucilaginoso* is a synonym of *M. acaulis* and *M. nitida* is a synonym of *M. paleacea*).

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It is well known that the species of liverworts from Sumatra, especially North Sumatra is very much undercollected. So it is assumed that this study will improve the knowledge on *Marchantia* in Sumatra especially North Sumatra. This study is conducted to explore and improve our understanding of the diversity of *Marchantia* in Mount Sibayak, North Sumatra, Indonesia.

## MATERIALS AND METHOD

The study area is located in Mount Sibayak, North Sumatra Indonesia, approximately 60 km from Medan city. The locality has an altitude of about 700 - 2050 m asl, annual rainfall of 2400 - 2800 mm/year, and relative humidity of at least 80 - 90 %. Exploration was carried out along the tracks of Mount Sibayak from lowland to the peak. Eighty newly collected material specimens of *Marchantia* from Mount Sibayak and three dried specimens deposited in BO (collected from North Sumatra) were used for the study. The specimens collected were classified and identified based on morphological characters, using Bischler-Causse (1989) and Gradstein (2011) in concept and species delimitation. All newly acquired specimens are deposited in BO herbarium. An identification key to the species of *Marchantia* known from Sumatra is provided.

## RESULTS AND DISCUSSION

There are seven species of *Marchantia* found in Mount Sibayak, North Sumatra, *M. acaulis*, *M. emarginata*, *M. geminata*, *M. paleacea*, *M. polymorpha*, *M. treubii* and *Marchantia* sp. *Marchantia polymorpha* is reported as a new species record from Sumatra.

*Marchantia emarginata*, *M. geminata* and *M. treubii* are the most common species in Mount Sibayak, found from lowland to high level altitude. *Marchantia geminata* was found from lowland to near the peak and numerous around the Dwi Warna waterfall. *Marchantia acaulis* is common species in lowland altitude (less than 1000 m altitude). Rare species of *Marchantia* was found in Mount Sibayak: *M. polymorpha* (only at high level altitude  $\pm$  1500 m) and *Marchantia* sp. (only around the Dwi Warna waterfall). The populations of these two species were limited. *Marchantia paleacea* was found in certain places from 1150-1250 m altitude, but densely populated.

In this study, we did not find the species of *M. miqueliana* that has been reported by Bischler-Causse (1989) from Sumatra. *Marchantia grisea* var. *sumatrana* was reported by Burgeff (1943) from Brastagi, North Sumatra. However, this species was not confirmed by Bischler-Causse (1989) since the specimen type was unknown. It might belong to *M. acaulis* or to *M. wallisii* (Bischler-Causse 1989).

**Key to species of *Marchantia* in Mount Sibayak, North Sumatra and the species of *Marchantia* recorded from Sumatra (modified from Bischler-Causse 1989):**

1. Thallus margin crenulate; scales over almost entire ventral surface of thallus, reaching the thallus margin, sometimes visible at the margin in dorsal view; lobes of female receptacle terete.....5. *M. polymorpha*
1. Thallus margin entire; scales only along thallus midline of ventral surface, invisible in dorsal view; lobes of female receptacle flat apically.....2
2. Cupules with ciliate lobes and densely papillose on outer surface.....4. *M. paleacea*
2. Cupules ciliate, no or few papillae on outer surface.....3
3. Thallus more than 5 mm wide. Involucre ciliate .....*M. miqueliana*\*
3. Thallus as wide as or less than 5 mm wide. Involucre entire or crenulate.....4
4. Compact ventral tissue of thallus with numerous mucilage cavities per section. Involucres are almost as long as or longer than lobes.....5
4. Compact ventral tissue of thallus without or with 1-3 mucilage cavities per section. Involucre shorter than lobes .....6
5. Appendage of median scales of length : ratio width = 1.1-1.5 : 1; margins sharply toothed. Male receptacles sessile or nearly so.....1. *M. acaulis*
5. Appendage of median scales of length : ratio width = 1.5-2.4 : 1; margins nearly entire to bluntly toothed. Male receptacle distinctly stalked.....*M. wallisii*\*
6. Appendages of median scales acute or acuminate with row of 2-3 cells apically.....7
6. Appendages of median scales rounded or obtuse with single cell apically .....7. *Marchantia* sp.
7. Appendage of median scales toothed, the teeth mostly consisting of 2-3 cells and often recurved towards base of appendage. Lobe of female receptacle emarginate or truncate apically .....2. *M. emarginata*
7. Appendage of median scales entire or toothed, the teeth mostly unicellular and oriented obliquely towards apex of appendages. Lobes of female receptacle split apically.....8
8. Appendage of median scales yellow with orange or purplish borders, ovate. Number of female lobes usually 4.....3. *M. geminata*
8. Appendage of median scales purple, narrowly triangular. Number of female lobes variable 3-6.....6. *M. treubii*

1. *Marchantia acaulis* Steph. (Fig.1 A-B).

Thallus always with dark median band on dorsal surface, however Bischler-Causse-Causse (1989) found sometimes specimens without median band on dorsal surface. Antheridium and archegonium sometimes are found on the same thallus (monoecious) but male rays are never found on the female receptacles as the description by Bischler-Causse (1989). Lobes of female receptacle sometimes curved up when mature.

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\* The species was reported from Sumatra, but it was not found and described in this study

**Note:** *Marchantia acaulis* is similar to *M. geminata* but the latter species has a distinctly stalked male receptacles, thallus without large cavities, and longer appendage of median scales. *Marchantia acaulis* is easily recognized by the male receptacle without stalk, the large and numerous mucilage cavities in compact ventral tissue in the thallus and the yellowish appendage of median scales.

**Habitat:** found abundant on soil or rocks in open place or semi shaded place from 870 to 900 m altitude.

**Distribution:** Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Borneo (Sabah, Sarawak), Malaysia, Singapore, Philippines, Sri Lanka (Burgeff 1943; Bischler-Causse-Causse 1989; Piippo *et al.* 2002; Chuah-Petiot 2011).

**Specimens examined:** Mt. Sibayak, Etti Siregar 02, 03, 33, 102, 587, 589, 592, 594, 914, 1426, 1428; Etti Siregar & Nunik S Ariyanti 1517, 1519, 1526, 1753.

2. *Marchantia emarginata* Reinw., Blume et Nees. (Fig.1C-D).

**Note:** this species shows wide variations in thallus and female receptacles. Thallus can be without or with median band on dorsal side, small to medium size, with margins purplish, reddish, sometimes hyaline. Female receptacles are often curved toward stalk, sometimes straight; lobes varies from (5-13); dorsal surface flat or with indistinct to distinct rounded median projection, slightly asymmetric to symmetric. Apex of receptacle lobes varies from emarginate, truncate or sometimes rounded. In Bischler-Causse (1989), all of *M. emarginata* have a rounded median projection on dorsal side of female receptacles, but we found some specimens with indistinct to distinct median pojection on dorsal surface of female receptacles.

**Habitat :** soil, rocks (moist, damp or wet, shaded, semi-exposed places, riversides, creeks) from 870 to 1450 m altitude.

**Distribution:** Japan, Korea, China, India, Sri Lanka, Andaman and Nicobar Island, Thailand, Malaysia, Indonesia (Sumatra, Java, Lesser Sunda Island, Bali, Moluccas, Irian jaya), Borneo (Sabah, Sarawak), Philippines, Marianas, Guam, New Guinea, New Britain, Solomon Island (Bischler-Causse 1989; Bischler-Causse & Piippo 1991; Song 2006; Lai *et al.* 2008; Chuah-Petiot 2011; Singh & Singh 2012).

**Specimens examined:** Mt. Sibayak, Etti Siregar 31, 47, 70, 112, 134, 219, 367, 374, 375, 380, 460, 462, 463, 465, 467, 468, 473, 475, 476, 593, 599, 608, 757, 760, 863, 868, 1427; Etti Siregar & Nunik S Ariyanti 1445, 1447, 1520, 1524, 1794, 1826. Sibolangit-North Sumatra, Lorzing 12707 (BO).

3. *Marchantia geminata* Reinw., Blume et Nees (Fig.1E).

**Note:** This species is easily recognized by the appendages of median scales yellow with orange-red borders; ovate and acuminate apically.

**Habitat:** soil, rocks (shady or open places) from 870-1975 m altitude.

**Distribution:** India, Andaman Island, Indonesia (Sumatra, Java, Kalimantan), Malaysia, Philippines (Tan & Engel 1986; Bischler-Causse 1989; Chuah-Petiot 2011; Singh & Singh 2012).

**Specimen examined:** Mt. Sibayak, Etti Siregar 426, 427, 517, 745, 762, 821, 912, 915; Etti Siregar & Nunik S Ariyanti 1522, 1603, 1607, 1610. Brastagi-North Sumatra, Meijer 15609 (BO).





Figure 1. A-B. *Marchantia acaulis* with female and male plants, B. shows monoicous plant; C-D. *M. emarginata* with female and male plants; E. *M. geminata* with female plants; F. *M. paleacea* (gc: gemmae cup); G. *M. polymorpha* with female plants; H. *M. treubii* with female and male plants. (Photographed by: Etti S Siregar).

4. *Marchantia paleacea* Bertol. (Fig. 1F).

**Note:** *M. paleacea* is easily recognized vegetatively by the large thallus without median band on dorsal surface and cupules with ciliate lobes.

**Habitat:** soil (wet place, waterfall); rocks of creek wall in semi shaded place, from 1150 to 1250 m altitude.

**Distribution:** Turkey, Lebanon, Iran, Yemen, Russia, USSR, Afghanistan, Pakistan, India, Bhutan, China, Taiwan, Korea, Japan, Thailand, Vietnam, Indonesia (Sumatra, Java, Irian Jaya), Borneo, Philippines, New Guinea (Lai *et al.* 2008), (Bischler-Causse-Causse 1989; Piippo 1990; Bischler-Causse & Piippo 1991; Konstantinova *et al.* 2009; Daniels 2010; Dandotiya *et al.* 2011; Wang *et al.* 2011; Singh & Singh 2012).

**Specimens examined:** Mt. Sibayak, Etti Siregar 185, 763; Etti Siregar & Nunik S Ariyanti 1611.

5. *Marchantia polymorpha* L. (Fig. 1G).

**Note:** *Marchantia polymorpha* is easily recognized by its large thallus with scales extending over the entire ventral surface, reaching the thallus margin and  $\pm$  visible at the margin in dorsal view. Its female receptacles are also distinctive with terete rays.

**Habitat:** rocks of creek wall in exposed places, 1500 m altitude.

**Distribution:** Turkey, Syria, Lebanon, Israel, Iraq, Iran, Russia, USSR, Uzbekistan, Tadzhikistan, Afghanistan, Pakistan, India, Sri Lanka, Nepal, Bhutan, China, Taiwan, Korea, Japan, Thailand, Vietnam, Malaysia, Indonesia (Java, Sumatra - new record based on present study, Irian Jaya), Philippines, New Guinea, New Zealand, Tasmania (Bischler-Causse 1989; Söderström *et al.* 2010; Singh & Singh 2012).

**Specimens examined:** Mt. Sibayak, Etti Siregar 373, 377, 378, 466, 470, 759; Etti Siregar & Nunik S Ariyanti 1808.

6. *Marchantia treubii* Schiffn. (Fig. 1H).

**Note:** *Marchantia treubii* is similar to *M. geminata*, but the latter species has a longer apical split in the lobes of female receptacle, receptacle usually constantly 4-lobed (in *M. treubii* receptacles vary from 3-5 lobed), appendage of median scales are ovate and acuminate apically, epidermis of thallus are without papilla.

**Habitat:** soil or rock in open place and semi shaded place, altitude from 870-1610 m.

**Distribution:** Indonesia (Sumatra, Java, Lesser Sunda Island), Borneo, Malaysia (Bischler-Causse 1989; Chuah-Petiot 2011).

**Specimens examined:** Mt. Sibayak, Etti Siregar 28, 588, 743, 746, 608, 744. Brastagi-North Sumatra, Breedveld GJF 5 (BO).

7. *Marchantia* sp. (Fig. 2).

Thallus with dark median band on dorsal surface. Epidermal pores 50-112  $\mu$ m in diameter. Appendages orange or purplish with dark colour in borders or apically (rarely entire orange or purplish); apex vary from rounded, obtuse to acuminate (Figure 2. C-E). Cupules with cilia 1-9 cells long and 2-4 cells basally, arranged in uniseriate, biseriate or sometimes triseriate cell. Female receptacle always dissected into 5 shallowly lobes; lobes apex emarginate; involucre purplish, margin entire.

**Note:** This species is closely related to *M. rubribarba*. However, in *M. rubribarba*, thallus without median band on dorsal surface, the cilia of cupules are shorter (3-4 cells long) and the basal cell of cupules are smaller (1-2 cells); apex of appendage of median scale

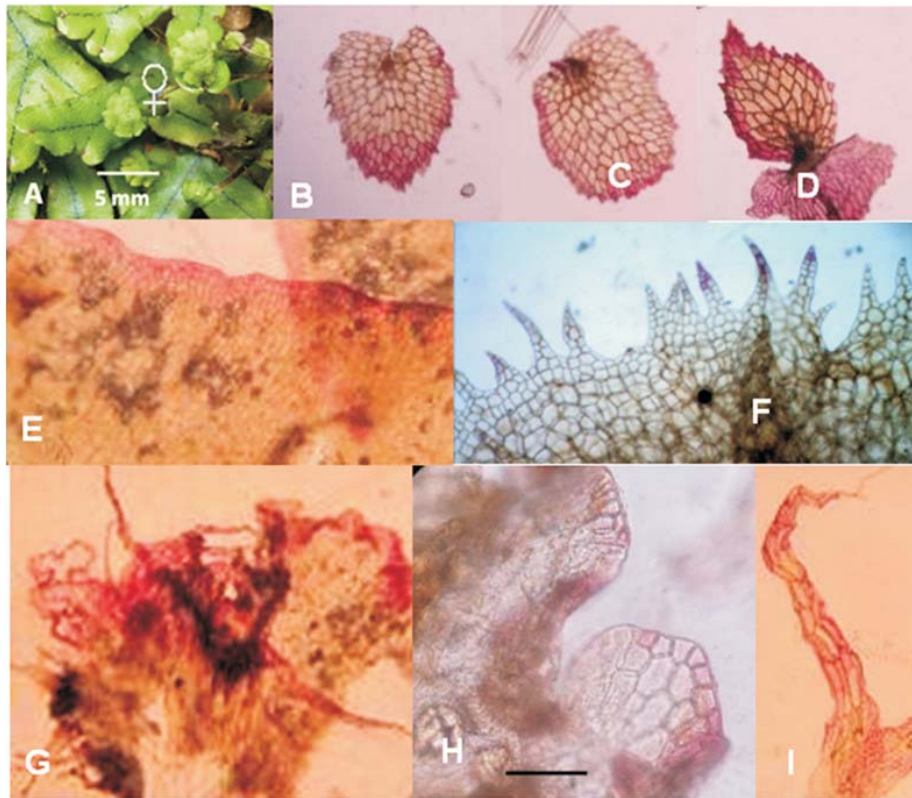


Figure 2. *Marchantia* sp. : A. female plants; BD. appendage of median scales; E. margin of thallus; F. cupule; GH. involucre; I. scale of female receptacle; all from Etti Siregar 1972 (BO). Scale bar = 200  $\mu\text{m}$ . (Photographed by: Etti S Siregar).

obtuses, rounded or bluntly acute. The female receptacle dissected into 5-9 lobed; involucre hyaline. We have not seen any specimen of *M. rubribarba*. So we could not decide whether it belongs to *M. rubribarba* only from description and drawings. More data are needed to decide whether it belongs to *M. rubribarba* or as a new species.

*Marchantia* sp. is also different from *M. miqueliana*, the species of *Marchantia* from Sumatra has been reported by Bischler-Causse (1989). The latter species has larger thallus with no distinct median band on dorsal surface; the cilia of cupules are shorter and arranged in uniseriate cell; appendage of median scales acute or apiculate apically with row of 13 cells (in *Marchantia* sp. with single apical cell); lobes of female receptacle truncate or rounded apically; involucre ciliate with row of 3-9 cells long (Bischler-Causse 1989).

**Habitat:** found on soil in wet place, only around the Dwi Warna waterfall at 1100 m altitude.

**Specimen examined:** Mt. Sibayak, Etti Siregar 1972; Etti Siregar & Nunik S. Ariyanti 1612, 1613, 1616.



## CONCLUSIONS

There are seven species of *Marchantia* found in Mount Sibayak, North Sumatra, *Marchantia acaulis*, *M. emarginata*, *M. geminata*, *M. paleacea*, *M. polymorpha*, *M. treubii* and *Marchantia* sp. *Marchantia polymorpha* is reported as a new species record from Sumatra.

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