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## AN INVENTORY OF *Fissidens* spp. (Fissidentaceae, Bryophyta) IN CIBODAS BOTANIC GARDEN

### Inventarisasi *Fissidens* spp. (Fissidentaceae, Bryophyta) di Kebun Raya Cibodas

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#### Abstract

Inventarisasi *Fissidens* spp. (Fissidentaceae, Bryophyta) di Kebun Raya Cibodas telah dilakukan. Pengoleksian dilakukan pada blok-blok yang ada di Kebun Raya Cibodas dan karakteristik dari setiap lokasi pengoleksian dicatat. Sebanyak enam puluh tujuh koleksi berhasil dikumpulkan dan diidentifikasi, yang mencakup 40% dari jenis-jenis yang disebutkan oleh Fleischer (1900-1902). Kunci determinasi menuju jenis-jenis *Fissidens* disajikan pula. Tiga jenis catatan baru dari Cibodas dilaporkan pada makalah ini, yaitu *F. perpusillus*, *F. bryoides* subsp. *schmidii* dan *F. obscurirete*.

**Keywords:** *Fissidens*, Bryophyta, Kebun Raya Cibodas.

#### INTRODUCTION

The genus *Fissidens* is one of most diversified genera of mosses, and about 900 species have been described from all over the world (Iwatsuki and Suzuki, 1982). Eddy (1988) explained that there are 44 species of *Fissidens* in Malesia. Twenty-four species of *Fissidens* are recorded from Peninsular Malaysia and Singapore (Iwatsuki and Mohamed, 1987). No comprehensive research in Indonesia has been made on the genus, except for some regional inventories such as 33 species in Bogor and affinities, which 22 species out of the list were collected from the mountainous areas of Mount Gede-Pangrango and Mount Salak (Fleischer, 1900-1902), eight species in Sulawesi (Gradstein *et al.*, 2005)

and 23 species from Seram Island (Iwatsuki and Suzuki, 1988). Akiyama (1993) found a new species of *Fissidens* from West Kalimantan.

Lower montane forests at 1.000-2.000 m above sea level (asl) usually have a much more luxuriant bryophyte vegetation than submontane and lowland forests. Open montane areas interspersed with secondary forests are exceptionally rich in mosses (Gradstein, 2005). Cibodas Botanic Garden, which situated at 1250-1450 m asl is a very good habitat for bryophytes, including *Fissidens*. No inventory has been made for this genus in Cibodas Botanic Garden before. The discovery of new species of *Fissidens* from Cibodas (Bruggeman-Nanenga, 1994) also added the need for a complete inventory. The aim of this study is to acquire

information on species diversity of *Fissidens* in the garden.

## METHODS

The inventory and collections were conducted in an explorative way in the blocks of Cibodas Botanic Garden. Each block was explored and information on each site such as habitat, relative humidity and light exposure was recorded. Identification of the collections was done by using determination keys (Eddy, 1988; Li, 1985).

## RESULTS

Sixty seven collections were made during the inventory, and 12 species of *Fissidens* were identified. Determination key to the 12 species is given below. Table 1 shows the list of species and their habitat in Cibodas Botanic Garden.

### Key to species of *Fissidens* of Cibodas Botanic Garden

1. a. Leaves at least partly bordered by elongate cells (limbidia) ..... 2
  - b. Leaves not bordered by elongate cells ..... 7
2. a. Limbidia present on apical, dorsal and vaginant lamina ..... 3
  - b. Limbidia confined to the vaginant lamina (often only on perichaetial leaves) ... 4
3. a. Cells at base of vaginant lamina much larger than those of apical lamina; axillary hyaline nodules distinct ..... *F. zollingeri*
  - b. Cells at base of vaginant lamina only slightly larger than those of apical lamina; axillary hyaline nodules not differentiated ..... *F. bryoides* subsp. *Schmidii*
4. a. Leaves very narrow, linear-lanceolate ..... *F. obscurirete*
  - b. Leaves oblong lanceolate to broadly lanceolate ..... 5
5. a. Vaginant lamina 2/3 or more of the leaf length ..... *F. cf. ceylonensis*
  - b. Vaginant lamina about 1/2 of the leaf length ..... 6
6. a. Seta scabrous ..... *F. hollianus*
  - b. Seta smooth ..... *F. perpusillus*
7. a. Marginal cells markedly different color from inner cells, either darker or lighter ..... 8
  - b. Marginal cells not markedly different color from inner cells ..... 9
8. a. Marginal cells lighter in color ..... *F. cristatus*
  - b. Marginal cells darker in color ..... *F. nobilis*
9. a. Plants very short, with up to 5 leaf pairs; lamina cells thin walled ..... *F. serratus*
  - b. Plants with at least 6 leaf pairs ..... 10
10. a. Base of dorsal lamina tapering narrowly towards base of costa; costa reddish-brown ..... *F. crassinervis* var. *crassinervis*
  - b. Base of dorsal lamina ending abruptly or broadly rounded ..... 11
11. a. Epiphytic plants, less than 7 mm tall ..... *F. braunii*
  - b. Terrestrial plants, often more than 10 mm tall ..... *F. gedehensis*

**Table 1.** List of species and their habitat in Cibodas Botanic Garden

No.	Species	Habitat
1	<i>Fissidens zollingeri</i> Mont.	On soil and wet rocks, shaded. Relative humidity ranges from 86.0-89.5%.
2	<i>Fissidens bryoides</i> Hedw. subsp. <i>schmidii</i> (C.Mull.) Norkett	On wet rocks, sometimes washed by running water, shaded, only very rarely slightly exposed to the sun. Relative humidity ranges from (66-) 73-92(-100)%.
3	<i>Fissidens obscurirete</i> Broth. & Par. In Broth.	On soil, rarely on rocks, rather shaded. Relative humidity ranges from 78-88%.
4	<i>Fissidens</i> cf. <i>ceylonensis</i> Dozy & Molk.	On wet rocks, rather shaded. Relative humidity ranges from 82-83%.
5	<i>Fissidens hollianus</i> Dozy & Molk.	On soil, shaded. Relative humidity 81%.
6	<i>Fissidens perpusillus</i> Wils. ex Mitt.	On rocks, rather exposed to the sun. Relative humidity 85%.
7	<i>Fissidens cristatus</i> Wils. ex Mitt.	On rocks, soil, on roots and lower part of tree trunks, shaded. Relative humidity ranges from 80-92%.
8	<i>Fissidens nobilis</i> Griff.	On soil and rocks, rather shaded. Relative humidity ranges from 78-92%.
9	<i>Fissidens serratus</i> C. Müll.	On soil and rocks, rather shaded. Relative humidity 86%.
10	<i>Fissidens crassinervis</i> Lac. var. <i>crassinervis</i>	On soil and rocks, rather exposed. Relative humidity ranges from 76-85%.
11	<i>Fissidens braunii</i> (C. Mull.) Dozy & Molk.	Epiphytic on tree trunk, shaded. Relative humidity 87%.
12	<i>Fissidens gedehensis</i> Fleisch.	On wet rocks and soil, rather shaded. Relative humidity ranges from 77-85%.

## DISCUSSION

Nine species out of 12 identified covers 40% of Fleischer's list (1900-1902) of *Fissidens* in the mountainous areas of Mount Gede-Pangrango and Mount Salak. Based on his account, three species of *Fissidens* were added as new records from Cibodas region, namely *F. perpusillus*, *F. bryoides* subsp. *schmidii* and *F. obscurirete*. Only one collection was found under the name of *F. perpusillus*. Apparently this is an uncommon species, found on rocks, rather exposed to the sunlight. *F. obscurirete* can be found growing on shaded soil, while *F. bryoides* subsp. *schmidii*, being the commonest species collected during the inventory, grows mainly on shaded wet-rocks, sometimes washed by running water.

Among species of *Fissidens* found in the garden, *F. nobilis* and *F. cristatus* were the easiest taxa to be recognised. *F. nobilis* is identifiable at sight by its

large, dark-green fronds and long, dark bordered leaves. *F. cristatus* has large fronds, but the plant color is yellowish-green and the leaves were bordered by paler cells.

Two smaller species, *F. gedehensis* and *F. bryoides* subsp. *schmidii* are similar in size, but they can easily be distinguished by the present of limbidia on the latter. *F. braunii* always epiphytic, readily separated from the rest species of *Fissidens*. *F. serratus* is the smallest of all while *F. crassinervis* var. *crassinervis* has the reddish-brown color.

## CONCLUSION

Twelve species of *Fissidens* spp. were identified from Cibodas Botanic Garden. Based on Fleischer's account, three species of *Fissidens* were added as new records from Cibodas region, namely *F. bryoides*

subsp. *schmidii*, *F. obscurete*, and *F. perpusillus*. Other species found in Cibodas Botanic Garden are *F. braunii*, *F. cf. ceylonensis*, *F. crassinervis* var. *crassinervis*, *F. cristatus*, *F. gedehensis*, *F. hollianus*, *F. nobilis*, *F. serratus*, and *F. zollingeri*.

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