KnE Social Sciences

UICRIC 2018
UNNES International Conference on
Research Innovation and Commercialization 2018
Volume 2019

Knowledge E
enriching | engaging | empowering

Conference Paper

Species Richness of Pteridophyta in Mount Ungaran

Margareta Rahayuningsih, Mualimaturrochmah, and Amin Retnoningsih

Abstract

Mount Ungaran is one area that has the natural forest and has a diverse of biodiversity flora and fauna in Central Java. One of flora such as Pteridophyta can be found in Mount Ungaran. Pteridophyta has many beneficial to human, but knowledge of the local community is still low associated with it. The objective of the researched was know the species richness of Pteridophyta in Mount Ungaran. This research was conducted on March – July 2018. Location of this research in Bukit Gentong, Mount Ungaran. The research used exploration method, and identification of Petridophyta using a guidebook such as Plant Systematics, Flora for Schools in Indonesia, Encyclopedia of Garden Ferns, and Pteridophyta. The data analysis using descriptive qualitative. The results showed a total of 21 species of Pteridophyta was found belonging to five classes, six order and 11 families. The highest of species richness were Pteridaceae (six species), Polypodiaceae (five species) and the lowest species richness of Pteridophyta are Davalliaceae (two species) and also in eight other families (one species).

Keywords: Mount Ungaran, Pteridophyta, species richness

Corresponding Author:
Mualimaturrochmah
mualimaturrochmah10@gmail.com

Received: 21 May 2019
Accepted: 26 June 2019
Published: 7 July 2019

Publishing services provided by Knowledge E

Selection and Peer-review under the responsibility of the UICRIC Conference Committee.

1. Introduction

Mount Ungaran is one area that has remaining natural forest in Central Java. Located between Kendal and Ungaran. Mount Ungaran has a diverse of biodiversity flora, fauna, and microorganisms, particulalry of it is protected by government law and IUCN red list data (Rahayuningsih *et al*., 2017) [1]. One of flora such as Pteridophyta can be found in Mount Ungaran.

Pteridophyta is the division from plants which is commonly knowns as ferns. Pteridophyta is a vascular plant (plant with xylem and phloem), but that do not produce flowers and seeds. Ferns are the most diverse group of a vascular plant after seed plant. More than 10.000 species of fern distributed in worldwide. In Indonesia, ferns are estimated around 1.300 species or 13 percent ferns species in the world.

The main characteristic of fern is has crozier and produced spores. Located spores on the abaxial surface of the leaf. Fern distribution are large, from low to high regions. Pteridophyta habitats in terrestrial and are also present in some aquatic or epiphytes in other plants. They are commonly can grow in areas with moisture and shady.

Pteridophyta is an important part of the ground vegetation in forest communities and they are also can help prevent soil erosion. Some Pteridophyta is used for food, as a biological fertilizer, as a phytoremediation to absorb metal such as arsenic from the soil (Agrawal *et al*., 2017) [2]. Some few species of Pteridophyta are economically important, such as use is horticultural, as garden plants, and used handicrafts (Yatskievych *et al*., 2014) [3].

Some species of Pteridophyta are beneficial to humanity, but several groups of species include weeds. Knowledge of the local community is still low associated with it. Therefor Pteridophyta has not been utilized and are more considered as weeds. In mount Ungaran there are many Pteridophyta found, but publication and documentation are still lacking. Therefore, the objective of the research was to know species richness of the Pteridophyta in Mount Ungaran.

2. Method

The research location was located in Bukit Gentong, Mount Ungaran, Central Java. The early research was conducted on March – July 2018. The study used the exploration method, which the observation carrried out along left – right side of tea plantation's and Bukit Gentong path. The data analysis uses descriptive qualitative, and identification of Pteridophyta using a guidebook such as Plant Systematics, Flora for Schools in Indonesia, Encyclopedia of Garden Ferns, and Pteridophyta.

3. Result and Discussion

The result of the research showed total 21 species of Pteridophyta were found belonging to five classes, six order, and 11 families. This result was showed in table 1.

Data shows that there are more Pteridophyta species in Bukit Gentong than tea plantation. This is because, Bukit Gentong has high humidity and low light intensity. Therefore, Pteridophyta species can grow optimally on the Bukit Gentong. According to Hamel *et al*. (2017) [4], moist soil have more Pteridophyta species

The highest species composition of Pteridophyta are Petridaceae family (28 percent) and Polypodiaceae (24 percent), while the lowest family is Davalliaceae (nine percent) and eight other species. The family Pteridaceae and Polypodiaceae have a large number of species because both family have a big tolerance to the environment. It can be seen from several abiotic factors that influence the Pteridophyta growth. According to Watkins

Table 1: The data species of Pteridophyta found in Mount Ungaran.

Order	Family	No. Species	Species	Tea	Bukit Gentong
Lycopodiales	Lycopodiaceae	1	*Lycopodium cernuum*		√
Selaginellales	Selaginellaceae	2	*Selaginella intermedia*		√
Equisetales	Equisetaceae	3	*Equisetum sp*		√
Marattiales	Marattiaceae	4	*Angiopteris evecta*	√	√
Gleicheniales	Gleicheniaceae	5	*Gleichenia linearis*	√	√
Polypodilaes	Athryaceae	6	*Diplazium proliferum*	√	√
	Blechnaceae	7	*Blechnum orientale*	√	
	Dryopteridaceae	8	*Arachniodes aristata*	√	√
	Davalliaceae	9	*Davallia denticulata*		√
		10	*Davallia repens*		√
	Polypodiaceae	11	*Belvisia spicata*		√
		12	*Drynaria rigidula*	√	√
		13	*Goniophlebium subauriculatum*		√
		14	*Loxogramme involuta*		√
		15	*Microsorum sp*		√
	Pteridaceae	16	*Adiantum hispidulum*	√	√
		17	*Pityrogramma calomelanos*	√	
		18	*Pityrogramma chrysophylla*	√	√
		19	*Pteris biaurita*	√	√
		20	*Pteris ensiformis*	√	
		21	*Vittaria elongata*		√

Source: Author's own work

Table 2: Environment factor in Mount Ungaran.

No.	Environment Factor	Tea Plantation	Bukit Gentong
1	Elevation	1060 - 1100 masl	1040 - 1160 masl
2	Humidity	55 % - 65%	57% - 60%
3	Light intensity	160 – 240 lux	210 – 230 lux
4	Temperature	29^{O} – 31°C	28° – 30°C

Source: Author's own work

et al. (2006) [5] many environmental factors affect the ferns richness such as elevation, temperature and humidity.

The Pteridaceae and Polypodiaceae family can grow at altitudes 1040 - 1160 masl in a slightly dry to wet soil. High elevation of 1000 masl, increasing altitude, the air humidity will increase and the temperature will decrease (Patil *et al*. 2016) [6]. Most of Pteridaceae

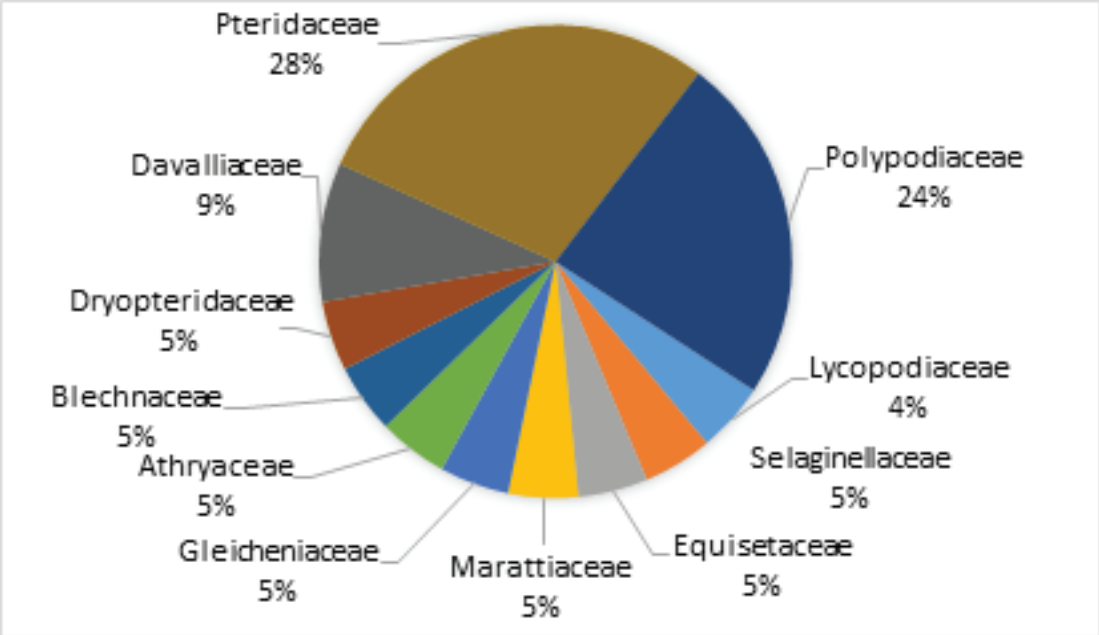

Figure 1: Species composition of Pteridophyta per family in Mount Ungaran.

and Polypodiaceae family are found in sheltered areas. The presence of large trees on the Bukit Gentong causes low light intensity and high air humidity. The light intensity effect to air humidity, the lower light intensity, the higher air humidity. High air humidity causes some ferns grow optimally. This is in accordance with the study results by Imaniar *et al*. (2017) [7] and Dudani *et al*. (2014) [8] that ferns from Polypodiopsida class can grow and develop well under shade with a high humidity.

Based on the measurement results of abiotic factors, the average humidity in the sheltered area ranges from 57% -60%, include to quite high humidy, so the number of ferns are quite a lot. Besides the humidity factor, the ferns type is also influenced by light intensity. Data showed that the light intensity in sheltered areas ranged from 210 to 230 lux (table 2). The low light intensity is caused by the large trees presence on the Bukit Gentong. Light intensity affects plant growth because plants need to do photosynthesis to get food. The temperature on Getong hill is 28˚-30˚C.

The lowest species richness is from the Family Davalliaceae (two species) and eight other species with each family consist of one species. This might be due to the plant's low adaptability to environmental conditions. The number of Pteridophyta species that are not evenly associated with adaptation patterns of each species (Imaniar *et al*., 2017). The lowest ferns group is mostly ferns which live in open areas. Open areas that are not protected by shade have more light intensity. A lot of light intensity will make air humidity to be low. This is not in accordance with fern habitat. Therefore, ferns from the Davalliaceae family and other families tend to be lower.

Some families have specific habitats, such as dry or wet areas. Blechnaceae and Gleicheniaceae family has dry habitat. Equisetaceae, Lycopodiaceae, Selaginellaceae, Marattiaceae, Athryaceae, and Dryopteridaceae family have habitats in wet and open areas, most of them are found on the river banks. Therefore, the number of those species tends to be less because of this limited habitat. No species will be found in arid regions (Castan & Vetaas, 2005) [9].

4. Conclusion

Mount Ungaran is a habitat that support for the growth of the Pteridophyta species. The results showed a total 21 species of Pteridophyta, belonging to five classes, six order and 11 families. The highest of species richness were Pteridaceae and Polypodiaceae, while the lowest special richness of Pteridophyta are Davalliaceae and eight other family.

Acknowledgements

The author would like to thank the Ministry of Research, Technology and Higher Education of the Republic of Indonesia for grant-based competence financing. The author also thanked to all the people who have helped this research.

References

[1] Rahayuningsih, M., Utami, N. R. and Abdullah, M. 2017. Developing Local Wisdom to Integrate Ethnobiology and Biodiversity Conservation in Mount Ungaran, Central Java Indonesia. *International Journal of Environmental and Ecological Engineering*, vol. 4, no. 9.

[2] Agrawal, T., Danai, P. and Yadav, M. 2017. General Aspects of Pteridophyta. *International Journal of Current Research and Academic Review*, vol. 5, no. 3, pp. 80-85.

[3] Yatskievych, G., Garden, M. B., and Louis, S. 2014. *Pteridophytes (Fern)*, (March). https://doi.org/10.1038/npg.els.0003679

[4] Hamel, T., Boulemtafes, A., Slimani, A., Madoui, B. E. M. and Drid, M. D.. 2017. Diversity and Ecology of Pteridophyta in the Skikda Region (North East Algeria). *International Research Journal Of Biological Science*, vol. 6, no. 3, pp. 42-47.

[5] Watkins, J. E., Cardelus, C, Colwell, R. K. and Moran, R. C. 2006. Species Richness and Distribution of Ferns Along An Elevation Gradient in Costa Rica. *American*

Journal of Botany, vol. 93, no. 1, pp. 73-83.

[6] Patil, S., R. Lavate., V. Rawat. and M. Dongare. 2016. Diversity and Distribution of Pteridophytes from Satara District, Maharashtra (India). *Plant Science Today*, vol. 3, no. 2, pp. 149-156.

[7] Imaniar, R. and Murdiyah, S. 2017. Identifikasi Keanekaragaman Tumbuhan Paku di Kawasan Air Terjun Kapas Biru Kecamatan Pronojiwo Kabupaten Lumajang Serta Pemanfaatannya Sebagai Booklet. *Jurnal Pendidikan Biologi*, vol. 6, no. 3, pp. 337-345.

[8] Dudani, S. N., Mahesh, M. K., Subash, C. M. D. and Ramachandra, T. V. 2014. Pteridophyte Diversity in Wet Evergreen Forests of Sakleshpur in Central Western Ghat. *Ind J PltSci*, Vol. 3, no. 1, pp. 28-29.

[9] Ferrer-Castan, D. and Vetaas, O. R. 2005. Pteridophyte Richness, Climate, and Topography in the Iberian Peninsula: Comparing Spatial and Nonspatial Model of Richness Patterns. *Global Ecology and Biogeography*, vol. 14, pp. 115-165.