

Diversity of Asteraceae Tribe on the Edge of Ranu Gumbolo Tulungagung Tourist Area

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Abstract

Background: Asteraceae grows a lot in the tourist area of Lake Ranu Gumbolo Tulungagung and is not given much attention because it is only considered a wild plant. Hence, the utilization and management of these plants could be more optimal. This research aimed to identify the species diversity of the Asteraceae tribe on the shores of Lake Ranu Gumbolo, Tulungagung. **Methods:** The method used was to explore every corner of the observation location and calculate its diversity index. **Results:** A total of 8 species of the Asteraceae tribe have been identified on Lake Ranu Gumbolo, including *Blumea balsamifera*, *Sphagneticola trilobata*, *Grangea maderaspatana*, *Ageratina Riparia*, *Ageratum conyzoides*, *Emilia sonchifolia*, *Tridax procumbens*, and *Eupatorium odoratum*. The calculation of the diversity index showed that the species of the Asteraceae tribe at the observation site had a high diversity of 1.9. **Conclusions:** The results of this study can provide new knowledge about the plant diversity of the Asteraceae tribe, which readers or researchers can use as a source or reference. The results of this observation can be a different added value for Lake Ranu Gumbolo Tulungagung tourism and become an attraction for tourists.

Keywords: Asteraceae; Diversity; Environmental Factors



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Introduction

The tribe Asteraceae ranks second with the most significant number of members after the Orchidaceae tribe (Lawrence, 1965). This plant has high diversity, with more than 25,000 species and 1,700 genera growing worldwide except in Antarctica (Sell & Murrel, 2006). Based on their diversity, the tribe Asteraceae is classified into 13 sub-tribes with more than 43 numbers of plants in them. The sub-Classification of Asteraceae sub-tribes includes Asteroideae, Corymbioideae, Cichorioideae, Gymnarrhenodiae, Pertyoideae, Carduoideae, Hecastocleidoideae, Gochnatiodeae, Wunderlichioideae, Stifftiodeae, Mutisioideae, Famatinanthoideae, and Barnadesidae (Bisht & Purohit, 2010). Asteraceae is also an easy-to-maintain and cosmopolitan plant spread across areas ranging from rice fields and plantations to roadsides (Tjirosoepomo, 1996; Burke et al., 2002).

Asteraceae in Indonesian is known as kenikir-kenikiran. Included in this Tariff are sunflower, edelweiss, and lettuce. Asteraceae plants live in the form of herbaceous plants or shrubs, and almost none of them are trees. The stems grow upright, stolons (geragih), and there are also rhizomes (rhizoma). Asteraceae generally grows upright, but some of its members grow to creep like *Mikania micrantha* (Farishi, 2019).

Asteraceae plants have scattered or opposite leaves, and some are single-leaved and have compound flowers densely shaped like discs. Flowers in Asteraceae plants often have aesthetic visuals and attract the eye because of their diverse colors and shapes.

Asteraceae can be both bisexual and unisexual. This flower is arranged in clusters (forest) and attached to a hump (capitula) covered by a dressing leaf (bractea involucrium) (Baloogy, 2001; Katinas, L. et al., 2016). The flower crown has loose leaves, whereas the crown tube has stamens. The fruit of this plant sinks with a seed and has one pistil stalk (Tjitrosoepomo. G., 2010).

In addition to having beautiful flowers and being used as an ornamental plant, Asteraceae also has benefits as an herbal plant. For example, *Helianthus* sp., whose stems help treat itching of the skin, *Gynura procumbens* leaves act as a cure for injuries and diabetes, and *Ageratum conyzoides* leaves which help stop bleeding in wounds (Lingkubi et al., 2015). Some species can also be used as food, such as *Lactuca sativa* (lettuce), *Cynara cardunculus* (sunflower), and *Cynara cardunculus* (globe artichoke) (Heyne, 1987). Besides being directly edible, Asteraceae can also be used as a flavoring ingredient in dishes, such as *Blumea chinensis* (spears) and *Adenostemma lavenia* (shoots of pig grass) (Heyne, 1987).

Research on the diversity of the Asteraceae tribe has previously been carried out, one of which is in the Kalimpa'a tourist area of the Lore Lindu National Park Area. The research was motivated by a lack of information about the Asteraceae tribe, causing less optimal utilization of plants belonging to the tribe (Megawati et al., 2017). Another study was conducted by Utami et al. (2014), in the Plawangan area of Mount Merapi National Park. The study aimed to determine the types of plants classified as the Asteraceae tribe at the research site as a source of information and an alternative source of learning biology in the academic unit. Based on previous studies that have been described, it can be concluded that information about the diversity of the Asteraceae tribe in an area is essential to know. Another benefit of the research results on the Asteraceae tribe is that it can provide new knowledge about the diversity of plants of the Asteraceae tribe that readers or subsequent researchers can use as a source or reference.

Looking at the capacity and benefits of the Asteraceae plant, researchers are interested in studying this plant. Asteraceae grows a lot in the tourist area of Ranu Gumbolo Tulungagung, and its existence is not considered because it is only considered a wild plant. Hence, the utilization and management of the plant could be more optimal. This observation aims to determine the diversity of members of the Asteraceae Tribe who grew up in the Ranu Gumbolo Tulungagung tourist area. From the observations, it is hoped that it can provide information about the diversity of Asteraceae members in the region so that its utilization and management can be optimal.

Method

Ranu Gumbolo is a tourist attraction located in Mulyosari Village, Pagerwojo District, Tulungagung Regency, precisely on the edge of the Wonorejo Reservoir. This tourist spot consists of reservoirs and pine forests neatly arranged around the tourist area. The topographical conditions are undulating and are in the lowlands with an altitude of about 182 meters above sea level. The study area is focused on the edge of the Ranu Gumbolo tourist area, which is a 200-meter-long pine forest area.

The observation was held on Saturday, November 6, 2021, from 09.00-13.00 WIB. The observation begins with determining the specific location to be observed, limiting the observation location, and then making observations by identifying plants from the Asteraceae tribe at the site. The observation location is determined and limited because the overall Ranu Gumbolo tourist spot is wide.

Observations of environmental conditions on the day are also carried out to obtain data on the height of the place, humidity, temperature, and lighting. The altitude data of the place is obtained from the search results on the internet. While humidity and temperature data are searched using the help of smartphones, lighting data is obtained from direct observations. Environmental condition data is needed to determine whether the environmental conditions in Ranu Gumbolo are suitable as a habitat for plants of the

Asteraceae tribe.

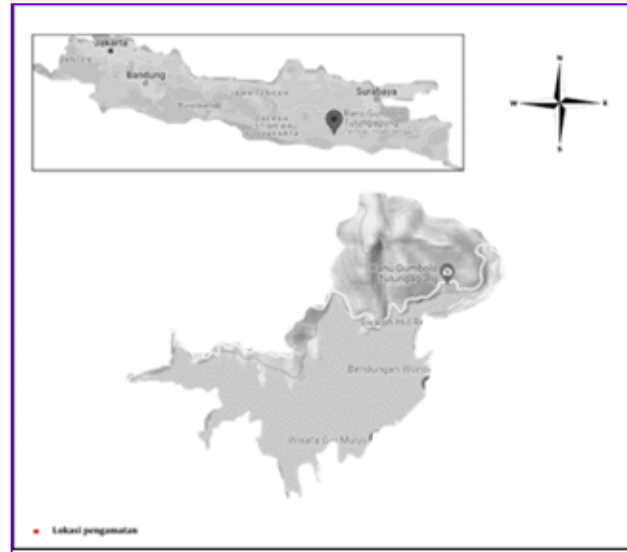


Figure 1. Research Location: Ranu Gumbolo Tourist Area, Tulungagung, East Java

Sampling was carried out by the method of exploration [Rugaya & Praptiwi \(2004\)](#), which explores every angle of the observation location. Sampling was carried out at predetermined locations, namely the pine forest area and the edge of the tourist area where there are plants of the Asteraceae Tribe.

The calculation of the diversity of the Asteraceae Tribe uses the Shannon-Wiener Diversity Index formula, namely:

$$H' = - \sum_{i=1}^s \left(\frac{n_i}{N} \right) \ln \left(\frac{n_i}{N} \right)$$

Information:

H' : Shannon diversity index

s : number of species

I : species order

ni : number of individuals of the i-th species

N : the sum of all individuals of all species.

The magnitude of the \hat{H} value indicates a plant community's high and low diversity in the ecosystem ([Odum, 1996](#)). Shannon species diversity indicators are as follows:

1. $H' < 1$ indicates that species diversity in a particular area is low.
2. $1 \leq H' \leq 3$ indicates moderate species diversity in a particular area.
3. $H' > 3$ indicates that species diversity in a particular area is high.

Result

Species Diversity

Through observations on the edge of the *Ranu Gumbolo* tourist area, nine species of Asteraceae were found. The most commonly encountered species is *Grangea maderaspatana*, and the least is *Ageratina Riparia*. The species of Asteraceae found are further numbered and presented in [Table 1](#).

Table 1. Asteraceae Tribal Diversity Index on the edge of the Ranu Gumbolo Tulungagung tourist area

Species	Sum	H'
<i>Blumea balsamifera</i>	78	0,23
<i>Sphagneticola trilobata</i>	147	0,31
<i>Grangea maderaspatana</i>	171	0,33
<i>Ageratina Riparia</i>	35	0,14
<i>Ageratum conyzoides</i>	66	0,21
<i>Emilia sonchifolia</i>	57	0,19
<i>Tridax procumbens</i>	60	0,20
<i>Eupatorium odoratum</i>	164	0,32
H'	778	1,9

Based on calculations using the Shannon Index, a Diversity Index value of 1.9 was obtained, which showed moderate species diversity because it has an H' value between 1-3.

Environmental Conditions

Several factors, such as the height of the place, air humidity, temperature, and lighting, influence an environment's conditions. We obtained data on environmental conditions at the observation site presented in Table 2.

Table 2. Environmental Factors at the Observation Site

Factor	Value
Altitude	182 mdpl
Humidity	82 %
Temperature	25° C
Lighting	Sufficient

Based on the data we obtained, the Ranu Gumbolo tourist area is 182 meters above sea level, so it is a lowland. This area's air humidity level is relatively high, with a temperature of 25 °C and sufficient lighting.

Discussion

Based on the data we got, it shows that the edge area of the tourist area Ranu Gumbolo is overgrown with many species of Asteraceae. The plants we found had a high level of diversity, as evidenced by a diversity index that showed a calculation result of 1.9. The high diversity of Asteraceae in the edge of the Ranu Gumbolo tourist area is influenced by the environmental conditions around the tourist area that support the growth of this species. Ranu Gumbolo Tourism is at an altitude of 182 mdpl. Lawrence (1965) explained that plants belonging to the Asteraceae tribe could be found at an altitude of 0-1200 mdpl.

According to Cox et al. (2016), Asteraceae can grow in abundant quantities and are highly diverse in tropical, subtropical, Mediterranean, and semi-arid climates. This causes the Asteraceae tribe to grow in large numbers with high diversity on the edge of the Ranu Gumbolo tourist area. The Asteraceae we found on the edge of the Ranu Gumbolo tourist area grow wild with free development. As many as eight species from the Asteraceae tribe that we found on the edge of the Ranu Gumbolo tourist area can decrease or

increase depending on human activities around the area. If there is an environmental cleanup activity, then there is a possibility that species from the Asteraceae tribe will be reduced because they are considered weeds that have no benefit.

Most Asteraceae species found at the observation site are *Grangea maderaspatana* and *Eupatorium odoratum*. *Grangea maderaspatana* can grow well in wet places such as riverbanks (Bandeira et al., 2007). Only a few individuals differ from *Grangea maderaspatana*, namely *Eupatorium odoratum*. The species *Eupatorium odoratum* has a relatively high degree of competition and adaptability. In addition, this species does not require high living conditions and can reproduce quickly (Heyne, 1987). According to Odum (1993), the *Eupatorium* header is more comprehensive than other types to receive good sunlight. Sunlight itself plays an essential role in the photosynthesis process and significantly affects the growth of a type of plant.

Ageratina riparia is the least common species of Asteraceae found at the observation site, with 35 species. *Ageratina reparia* usually grows in humid rainforest areas, highlands, and mountains (Setyawati et al., 2015). The edge of the Ranu Gumbolo tourist area is less humid when compared to the highlands and mountains, which usually have reasonably high air humidity.

Classification and Description of Types of Asteraceae Found on the Edge of the Ranu Gumbolo tourist area



Figure 1. Asteraceae species, a. *Blumea balsamifera*; b. *Sphagneticola trilobata*; c. *Grangea maderaspatana*; d. *Ageratina riparia*; e. *Ageratum conyzoides*; f. *Emilia sonchifolia*; g. *Tridax procumbens*; h. *Eupatorium odoratum*.

***Blumea balsamifera* (Sembung Plant)**

Blumea balsamifera (Figure 1.a) (local name: spongy plant) is a plant of the Asteraceae Tribe found on the lower edge of the Ranu Gumbolo tourist area. This plant is a type of shrub with a characteristic upright stem with a height of up to 4 m, has flowers that are clustered at the ends of the branches and are yellow, the fruits of this plant are slightly curved and have a length of about 1 mm (Herbie, 2015). *Blumea balsamifera* has single green leaves 10 - 30 cm long, 2.5 - 12 cm wide, and a petiole length of 1 - 2 cm. The shape of the leaves is oval and pointed at the ends, the edges of the leaves have sharp serrations, and there are hairs on the surface of the leaves (Herbie, 2015).

Convex plants usually grow in tropical climates, often found on the banks of rivers, farms, yards, and on moderately wet soils at altitudes up to 2,200 meters above sea level (Herbie, 2015).

Sembung leaves can facilitate blood circulation, are anti-inflammatory, kill the growth of pathogenic bacteria, cure various diseases such as bloating, influenza, rheumatism, fever, diabetes, and asthma, and relieve menstrual pain (Haryanti, 2009).

Classification of *Blumea balsamifera*

Kingdom	: Plantae
Subkingdom	: Embryophyta
Division	: Spermatophyta
Subdivision	: Angiosperms
Class	: Dicotyledonae
Order	: Asterales
Tribe	: Asteraceae
Genus	: Blumea
Species	: <i>Blumea balsamifera</i> (Pang et al., 2014)

***Bellis perennis* (Daisy Flower)**

Bellis perennis (local name: Daisy Flower) is a plant of the Asteraceae Tribe found on the upper edge of the Ranu Gumbolo tourist area. This plant is a herbaceous plant that has short roots, upright stems, and winged leaves. The size of the leaves is about 6 - 40 x 4 x 20 mm with a thin base, and the ends of the leaves are rounded. The height of the stems of this plant is about 15 - 20 cm.

This plant blooms in spring - summer and can be found in moist grasses. The young flowers and leaves of *Bellis perennis* have a slightly bitter taste that is usually consumed as a vegetable and is used traditionally as a treatment for the common cold, stomach pain, eye diseases, eczema, skin ulcers, gastritis, enteritis, diarrhea, bleeding, rheumatism, inflammation, and upper respiratory tract infections (Al-Snafi, 2015).

Classification of *Bellis perennis*

Kingdom	: Plantae
Subkingdom	: Tracheobionta
Super Division	: Spermatophyta
Division	: Magnoliophyta
Class	: Magnoliopsida
Subclass	: Asteridae
Order	: Asterales
Tribe	: Asteraceae
Genus	: Bellis
Species	: <i>Bellis perennis</i> (Hassler, 2022)

***Sphagneticola trilobata* (Seruni Jalar)**

Sphagneticola trilobata (Figure 1.b) (local name: Seruni jalar) is a plant from the Asteraceae tribe found on the upper edge of the Ranu Gumbolo tourist area. This plant is a perennially growing plant with a height of 45 - 60 cm, has a green stem, is spherical, has a length of 10 - 30 cm, and branches on the axial part.

This jarred seruni has green leaves, textured leaf flesh, and leaves 2- 5 cm wide and 4 - 5 cm long; the arrangement is crossed oppositely and jagged (Sandoval & Rojas, 2013).

Classification of *Sphagneticola trilobata*

Kingdom	: Plantae
Division	: Spermatophyta
Subdivision	: Angiosperms
Class	: Dicotyledonae
Tribe	: Asteraceae
Genus	: Sphagneticola
Species	: <i>Sphagneticola trilobata</i> (Sandoval & Rojas, 2013).

***Grangea maderaspatana* (Forest Forest)**

Grangea maderaspatana (Figure 1.c) (local name: Serawan Hutan) is a plant from the Asteraceae tribe found on the upper edge of the Ranu Gumbolo tourist area. The plant has a taproot, is yellowish-white and hairy, and can grow up to 70 cm in height. Forest

serawan has buds that are white and fluffy. The leaves are crisscrossed, have no branches, are pinnate in shape, and are green. The flowers are small, and many have a yellow or greenish-yellow color; there are hairs and glands on the outside. The fruit is top-shaped and romping and has fluffy plumage and glands.

This plant is commonly used as an abdominal medicine because it has obstruent and antispasmodic properties that are used to treat menstrual disorders.

Classification of *Grangea maderaspatana*

Kingdom : Plantae
Division : Tracheophyta
Class : Magnoliopsida
Order : Asterales
Tribe : Asteraceae
Genus : *Grangea*
Species : *Grangea maderaspatana* (TIM KKN-KP Biologi UNM 2015, 2019)

***Ageratina riparia* (Regel)**

Ageratina riparia (Figure 1.d) (local name: Regel) a plant from the tribe Asteraceae found on the lower edge of the Ranu Gumbolo tourist area. The height of this plant ranges only from 40 cm - 60 cm. It is a perennial herbaceous plant whose life cycle is chronic. This regel has elongated-shaped leaves; the bones of the leaves are pinnate, the edges of the leaves are jagged, and the tips of the leaves are pointed. The length of the leaves is about 3 - 6 cm, and the width is 0.4 - 1.3 cm. The location of the leaves is opposite to the shape of a single leaf.

This plant has white flowers that grow at the end of the stem. The fruits are blackish-brown and small in size. Regel is usually found in places close to water or wet areas. This plant serves to absorb pollutants and can be used for urine decay.

Classification of *Ageratina riparia*

Kingdom : Plantae
Division : Tracheophyta
Subdivision : Spermatophytina
Class : Magnoliopsida
Order : Asterales
Tribe : Asteraceae
Genus : *Ageratina*
Species : *Ageratina riparia*

***Ageratum conyzoides* (Bandotan)**

Ageratum conyzoides (Figure 1.e) (local name: Bandotan) is a plant from the Asteraceae tribe found on the lower edge of the Ranu Gumbolo tourist area. Bandotan has single-stemmed leaves, and their position facing each other at the base of the leaves looks like an ovoid and at the ends forms a pointed tip; the edges of the bandotan leaves are jagged and measure 1 - 10 cm long and 0.5 - 6 cm wide, on the top and bottom of the leaves have long hairs in which there are glands on the lower surface of the leaves (Syamsuhidayat & Hutapea, 1991).

This bandot plant is usually found in tropical and subtropical regions such as Indonesia (Syamsuhidayat & Hutapea, 1991). *Ageratum conyzoides* is usually used as a remedy for wounds, boils, and eczema and can be an infectious disease from bacteria, body fresheners, and hair care (Syamsuhidayat & Hutapea, 1991).

Classification of *Ageratum conyzoides*

Kingdom : Plantae
Division : Magnoliophyta
Class : Magnoliopsida
Sub Class : Asteridae

Order : Asterales
Tribe : Asteraceae
Genus : *Ageratum*
Species : *Ageratum onyzoides*

***Emilia sonchifolia* (Temu Wiyang)**

Emilia sonchifolia (Figure 1.f) (local name: Temu Wiyang) is a plant from the tribe Asteraceae found on the lower edge of the Ranu Gumbolo tourist area. Temu wiyang has a yellowish-white taproot with a length of 20 cm. In addition, the roots do not have internodes and calyptra. The stem is purplish, has a length of 10 - 40 cm, and has a dense round shape of green color with an inter-book length of 2 - 6 cm.

The plant has leaves of green color at its top and the bottom purplish in color. The edges of the leaves are serrated.

Classification of *Emilia sonchifolia*

Kingdom : Plantae
Super Division : Spermatophyta
Division : Magnoliophyta
Class : Magnoliopsida
Sub Class : Asteridae
Order : Asterales
Tribe : Asteraceae
Genus : *Emilia*
Species : *Emilia sonchifolia* (Pramana, 2013)

***Tridax procumbens* (Gletang)**

Tridax procumbens (Figure 1.g) (local name: Gletang) is a plant from the Asteraceae tribe found on the upper edge of the Ranu Gumbolo tourist area. This plant belongs to perennial herbaceous plants with a spear root that spreads at the base. The stem is erect with a length of 0.2 - 0.8 m, branched, spherical in shape, purplish-colored, and has long root hairs.

Classification of *Tridax procumbens*

Kingdom : Plantae
Division : Spermatophyta
Class : Dicotyledoneae
Order : Asterales
Tribe : Asteraceae
Genus : *Tridax*
Species : *Tridax procumbens*

***Eupatorium odoratum* (Kirinyuh)**

Eupatorium odoratum (Figure 1.h) (local name: Kirinyuh) is a plant derived from the Asteraceae tribe found on the upper edge of the Ranu Gumbolo tourist area. This plant is a shrub with a characteristic erect trunk and numerous branches. The plant has a height of about 2 - 6 m, a stem has a diameter of about 2 cm, has single leaves with a facing position, ovoid in shape, the edges are serrated, the leaves are pointed at the tip and base, the leaf bones are pinnate and downy, green in color, the length of the leaves is 4 - 5 cm, and the width is 1 - 1.5 cm (Heyne, 1987).

The kirinyuh plant is commonly used to heal wounds, malaria, headaches, antimicrobials, antispasmodics, antihypertensives, anti-inflammatory, astringent, and diuretics. In addition, it is also helpful as a mouthwash to treat sore throat and cough (Vital & Rivera, 2011).

Classification of *Eupatorium odoratum*

Kingdom	: Plantae
Divisio	: Spermatophyta
Sub Division	: Angiosperms
Class	: Dicotyledoneae
Order	: Asterales/ Synandreae
Tribe	: Compositae/ Asteraceae
Species	: <i>Eupatorium odoratum</i> (Heyne, 1987)

Conclusions

Based on the results of observations on the edge of the Ranu Gumbolo Tulungagung tourist area, the diversity of the Asteraceae tribe is relatively high, with a diversity index reaching 1.9. The number of individuals found out of a total of 8 species is 778 individuals. This shows that the Ranu Gumbolo Tulungagung tourist area is a suitable habitat for the Asteraceae Tribe's place of life. This diversity can be an added value for tourism in the Ranu Gumbolo Tulungagung tourist area and become an attraction for tourists. The diversity of the Asteraceae Tribe in the tourist area of Ranu Gumbolo Tulungagung needs to be preserved. One of the efforts that can be made is to ensure that environmental conditions are maintained.

Declaration statement

The authors reported no potential conflict of interest.

References

- Al-Snafi, A. (2015). The Pharmacological importance of *Bellis perennis* - A review. *International Journal of Phytotherapy*, 5, 63–69.
- Baloogy, V. (2001). *Malesian Seed Plants Volume 3. National Herbarium*. Universiteit Leiden Branch.
- Bandeira, S. O., Bolnick, D., & Barbosa, F. M. A. (2007). *Flores Nativas do Sul de Moçambique/Wild Flowers of Southern Mozambique*. Universidade Eduardo Mondlane, Maputo, Mozambique. Universidade Eduardo Mondlane.
- Bisht, V. ., & Purohit, V. (2010). Medicine and aromatic plants diversity of Asteraceae in Uttarakhand. *Nature and Science*, 8(3), 121–128.
- Burke, J. M., Gardner, K. ., & L.H., R. (2002). The Potential for Gene Flow Between Cultivated and Wild Sunflower. *American Journal of Botany*, 89(9), 1550–1552.
- Cox, C. B., Moore, P. D., & Ladle, R. (2016). *Biogeography: An Ecological and Evolutionary Approach, Ninth Edition*. John Wiley & Sons, Inc.
- Farishi, D. D. A. (2019). *Asteraceae Universitas Indonesia*. UI Publishing.
- Haryanti, N. W. (2009). *Ilmu Nutrisi dan Makanan Ternak Ruminansia*. Universitas Indonesia Press.
- Hassler, M. (2022). Synonymic Checklists of the Vascular Plants of the World. In O. Bánki, Y. Roskov, M. Döring, G. Ower, L. Vandepitte, D. Hobern, D. Remsen, P. Schalk, R. E. DeWalt, M. Keping, J. Miller, T. Orrell, R. Aalbu, R. Adlard, E. M. Adriaenssens, C. Aedo, E. Aesch. *Catalogue of Life Checklist*, 14(3). <https://doi.org/10.48580/dfqt-3dd>
- Herbie, T. (2015). *Kitab Tanaman Berkhasiat Obat-226 Tumbuhan Obat untuk Penyembuhan Penyakit dan Kebugaran Tubuh*. Octopus Publishing House.
- Heyne, K. (1987). *Tumbuhan berguna Indonesia, Jilid III*. Yayasan Sarana Wana Jaya.
- Katinas, L., M. P., Hernandez, A. M., Arambarri, & Funkk, V. A. (2016). The Origin of the bifurcating style in Asteraceae (Compositae). *Annals of Botany*, 117, 1009–1021. <https://doi.org/10.1093%2Faob%2Fmcw033>
- Lawrence, G. H. M. (1965). *Taxonomy of Vascular Plants, Third Edition*. The Macmillan Company.
- Lingkubi, J. R., Sumakud, M. Y., Nurmawan, W., & Pangemanan, E. F. (2015). Pemanfaatan Tumbuhan Obat di Kecamatan Bunaken, Kota Manado, Provinsi Sulawesi Utara. *In Cocos*, 6(5), 3–9.
- Megawati, Samsurizal, M., Sulaeman, & Pitopang, R. (2017). Diversity of Asteraceae Family at Kalimpa'a Lake in Lore Lindu National Park. *Natural Science: Journal of Science and Technology*, 6(3), 239 – 253.
- Odum, E. P. (1993). *Fundamental of Ecology*. WB Saunders Coy.
- Odum, E. P. (1996). *Dasar – Dasar Ekologi (edisi ketiga)*. Gajah Mada University Press.
- Pang, Y., Wang, D., Fan, Z., Chen, X., Yu, F., Hu, X., Wang, K., & L., Y. (2014). *Blumea balsamifera*. A *Phytochemical and Pharmacological Review*. *Molecules*, 19(7), 9453–9477. <https://doi.org/10.3390/molecules19079453>
- Pramana, F. (2013). *Gulma Kebun, Plantamor*. Accessed: <http://www.plantamor.com/index.php?plant=525>

- Rugaya, W. E. A., & Praptiwi. (2004). *Pengumpulan Data Taksonomi: Pedoman Pengumpulan Data Keanekaragaman Flora*. Puslit LIPI.
- Sandoval, & Rojas, J. (2013). *Sphagneticola trilobata*. Accessed: <https://www.cabi.org/isc/datasheet/56714>
- Sell, P., & Murrel, G. (2006). *Flora of Great Britain and Ireland: volume 4, Campanulaceae-Asteraceae*. Cambridge University Press.
- Setyawati, T., Sari, N., Bahri, I. P., & Raharjo, G. T. (2015). *A Guide Book to Invasive Alien Plant Species in Indonesia*. Research, Development and Innovation Agency, Ministry of Environment and Forestry.
- Syamsuhidayat, & Hutapea, J. R. (1991). *Inventaris Tanaman Obat Indonesia*. Departemen Kesehatan Republik Indonesia, Badan Penelitian dan Pengembangan Kesehatan.
- TIM KKN-KP Biologi UNM 2015. (2019). *Atlas Tumbuhan Sulawesi Selatan*. Jurusan Biologi FMIPA UM.
- Tjirosoepomo, G. (1996). *Taksonomi tumbuhan (spermatophyta)*. Gadjah Mada University Press.
- Tjirosoepomo, G. (2010). *Taksonomi Tumbuhan Obat-obatan*. Gadjah Mada University Press.
- Utami, P. R., Sasongko, H., Iii, K., & Soepomo, J. P. (2014). Keanekaragaman Jenis Suku Asteraceae di Kawasan Plawangan Taman Nasional Gunung Merapi Sebagai Sumber Belajar Biologi Kelas X untuk Memenuhi Kompetensi Dasar 3.7 Kurikulum 2013. *JUPEMASI-PBIO*, 1(1), 121-124.
- Vital, P., & Rivera, W. (2011). Antimycobacterial activity and cytotoxicity of *Chromolaena odorata* L.f., King and Robinson and *Uncaria perrottetii* (A. rich) Merr. Extracts. *Journal of Medicinal Plants*, 3(7), 511-518.