

Short Communication: Diversity, distribution and potential uses of *Ficus* spp. in Sumatra, Indonesia

SILVIA INDRA DEWI¹, SYAMSUARDI^{1,✉}, NURAINAS²

¹Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Andalas. Limau Manis, Padang 25167, West Sumatra, Indonesia.

Tel./fax.: +62-751-71181, ✉email: syamsuardi@sci.unand.ac.id

²Herbarium ANDA, Universitas Andalas. Limau Manis, Padang 25167, West Sumatra, Indonesia

Manuscript received: 1 May 2023. Revision accepted: 23 June 2023.

Abstract. Dewi SI, Syamsuardi, Nurainas. 2023. Short Communication: Diversity, distribution and potential uses of *Ficus* spp. in Sumatra, Indonesia. *Biodiversitas* 24: 3431-3437. The Andalas Herbarium is the largest herbarium in Sumatra, with specimens totaling 34,850 sheets and 2011 species of vascular plants from 126 families and 491 genera. It serves as a valuable resource for the study of biodiversity, particularly on the island of Sumatra. The purpose of this study was to examine the diversity, distribution, and potential uses of *Ficus* spp. in Sumatra based on Andalas Herbarium (ANDA) specimens. A total of 2300 herbarium sheets were examined, resulted in 53 species of *Ficus* spp. collected at Andalas Herbarium. The *Ficus* at Andalas Herbarium consists of six subgenera, namely *Ficus*, *Pharmacosycea*, *Sycidium*, *Sycomorus*, *Synoechia*, and *Urostigma*. The subgenus with the highest number of species is *Urostigma* while the lowest is *Pharmacosycea*. Our examination found the new occurrence of *F. rubroscapitata* in West Sumatra. The herbarium specimens were mostly collected from Padang city and least collected from Kampar District. In general, all species of *Ficus* were found in lowlands and some species were found in highlands. Among the *Ficus* species recorded at Andalas Herbarium, 63% have the potential uses as medicine, ornamental plants, or consumed as young shoots and fruit.

Keywords: Ara, biodiversity, fig, herbarium, specimen

INTRODUCTION

Herbarium is a plant specimen collection stored with certain standards to keep the plant specimens preserved to remain durable. The basic things considered as standards in herbarium management include temperature, humidity, ventilation, and pests and how to eradicate them. Herbarium as a collection center of plant specimens can reflect the diversity of flora in a particular region. The herbarium can be divided into general (international) herbarium, local and special herbarium. Among many herbariums in Indonesia, there is Andalas Herbarium (ANDA) which is located in West Sumatra Province and under the auspice of Andalas University. This herbarium was established in 1983 and has been indexed by Index Herbariorum since October 2010.

ANDA can be classified as special herbarium group because of its function as an educational and research herbarium. The specimen collection was obtained from field activities carried out by students and researchers who conducted their research in ANDA Herbarium (Andalas University Herbarium Team 2008). Since 2018, ANDA has partnered with the Global Biodiversity Information Facility (GBIF) to catalog and digitize the herbarium collection. To date, the cataloged specimens have reached 34,850 sheets, consisting 2011 species of 126 families and 491 genera of vascular plants. Such collection has been reported in several datasets (GBIF 2023). With the availability of digital access, Andalas Herbarium specimen data can be accessed and used worldwide for biodiversity studies.

Ficus spp., commonly known as figs or banyan, is a genus from the Moraceae family. This genus has a distinct character of the shape and structure of the fruit called as fig or synconium. Fig or synconium is a compound pseudo-flower or fruit composed of a receptaculum or a fleshy and juicy flower base. However, the real flowers and fruits are found on the inner wall of the receptaculum (Hooker 1982). *Ficus* is widespread both in tropical and subtropical regions (Brown 2016). Reportedly, the number of *Ficus* species worldwide reached 883 (POWO 2023), of which 120 species were found in America, 150 in Africa, and 367 in the Asia-Australia. One area in Asia-Australia where *Ficus* can be found is the Malesia region. In Malesia, the distribution center of *Ficus* species covers Papua New Guinea, the Philippines, Malaysia, Brunei Darussalam, Singapore, and Indonesia (Berg and Corner 2005).

Indonesia has a higher diversity of *Ficus* species than the other Malesian regions (Berg and Corner 2005). Berg and Corner (2005) reported that there are 75 *Ficus* species in Java and 97 species in Sumatra. Other studies by Ismanidar 1998 (unpublished data), Nur'aini (2013), and Prabowo (2019) reported a total of 74 species of *Ficus* in Sumatra. Such studies gathered data through limited number of direct field observations. Therefore, there is a need of study by using alternative approach other than field studies. Here, we utilized the potential benefits of herbarium for biogeographical study by focusing on particular group of plants. Based on rapid observations conducted in Andalas Herbarium (ANDA), there have been

more than 2000 sheets of *Ficus* specimens collected from various regions in Sumatra, especially West Sumatra. The specimens reflect the wealth of *Ficus* species present in the region. Such herbarium specimens can serve as a basis data to do research in more detail to add the existing knowledge on *Ficus* diversity in Sumatra. Therefore, this study aimed to examine the specimens in Andalas Herbarium (ANDA) to obtain the diversity, distribution, and potential uses of *Ficus* in Sumatra. In this study, the *Ficus* specimens in Andalas Herbarium (ANDA) were also re-identified and rearranged in order to correspond with the most update plant names.

MATERIALS AND METHODS

Study period and geographical scope

The study was conducted from April to August 2021 at Andalas Herbarium (ANDA), Andalas University, Padang, West Sumatra, Indonesia. The geographical scope of this study is *Ficus* specimens collected from Sumatra, yet the majority of the specimens were from West Sumatra.

Research procedure

This study was conducted using the Herbarium method referring to de Vogel (1987) and observations of *Ficus* specimens stored in the Andalas Herbarium (ANDA). Specimens' sortation and identification used a determination key and compared the descriptions, specimens and photographs, asked experts, and used various authentic references and literature such as Flora Malesiana series 1, Spermatophyta, Moraceae: Ficeae (Berg and Corner 2005) and Tree Flora of Malaya Volume Three (Kochummen 1978). Revalidation of the accepted name was done by referring to the *Ficus* database on the Plants of the World Online (POWO) and The Global Biodiversity Information Facility (GBIF). The potential uses of *Ficus* spp. were determined by reviewing related literature (Vanegas 2021) such as Plants of Southeast Asia (2022), PlantUse English (2016), PROSEA (Miller 2000). A list of species was made in the form of tabulations.

RESULTS AND DISCUSSION

Diversity of *Ficus* in Sumatra based on ANDA Herbarium collection

Based on examination of the specimens at the Andalas Herbarium (ANDA), there are 2300 specimens under *Ficus* genus consisting of 53 species as presented in Table 1. We grouped the taxonomical order following Berg and Corner (2005) and Pederneiras et al. (2015). There are six subgenera of *Ficus* in this study, namely *Ficus*, *Pharmacosycea*, *Sycidium*, *Sycomorus*, *Synoechia* and *Urostigma*. The largest subgenus is *Urostigma* with 14 species out of 33 species found by Berg and Corner (2005) in Sumatra. The subgenus *Pharmacosycea* is the least common with two species among the five discovered by Berg and Corner (2005) in Sumatra. The discovery of all subgenera of *Ficus* in Sumatra demonstrates the island's high diversity.

Six species have not been reported in previous research conducted by Ismanidar 1998 (unpublished data), Nur'aini (2013) and Prabowo (2019) were added in this study. The species are *Ficus oleifolia*, *Ficus tricolor*, *Ficus rubroscupidata*, *Ficus schwarzii*, *Ficus villosa* and *Ficus pallescens*. The number of *Ficus* species found in Sumatra is higher than in Gianyar, Bali, Indonesia with 23 species (Wijaya and Defiani 2021), 14 species found in Kuantan, Malaysia (Moulana et al. 2020), and 33 species found in Kerala, India (Nair et al. 2021).

Of the 53 species found, there is one species of *Ficus* that has one variation: *Ficus ribes* var. *ribes*, which is a variation of the species *Ficus ribes* Reinw. ex Blume. The specimen of *Ficus ribes* var. *ribes* in the Andalas Herbarium (ANDA) was previously identified as *Ficus scortechinii*. However, after revalidation referring to POWO (2023), *Ficus scortechinii* was revised to *Ficus ribes* var. *ribes*. Based on this, since this study only covers species diversity, *Ficus ribes* var. *ribes* is not considered a distinct species from *Ficus ribes* Reinw. ex Blume.

Distribution of *Ficus* spp. in Sumatra

The result of this research showed that *Ficus* spp. were found in 16 cities and regencies in Sumatra. Information related to the existence of *Ficus* spp. can be determined by the locality section listed on the specimen label in Andalas Herbarium (ANDA). The specimens housed in ANDA were collected from field coursework and research fieldworks conducted in Sumatra and Western Sumatra area in particular. The complete locality wise distribution of *Ficus* spp. at the ANDA Herbarium is presented in Figure 2.

According to Figure 2, Padang City becomes the location where *Ficus* spp. are found the most while the least are in Kampar District, followed by Sungai Penuh city, Bungo Tebo District and Indragiri Hulu District. *Ficus grossularioides*, *F. hispida*, *F. lepicarpa*, *F. obscura*, *F. punctata*, *F. sinuata*, and *F. subulata* are the most common species found in Sumatra. While *F. elastica*, *F. geocarpa*, *F. magnoliifolia*, *F. pallescens*, *F. schwarzii*, and *F. vasculosa* are the least common and can only be found in one district in Sumatra. Despite is patchy distribution, Sumatra consists 53 different species of *Ficus*, or equivalent to 21% of all *Ficus* in Indonesia and 14% of all the species found in Malesia. Species richness and population size are related to environmental variables, such water availability, but some species survive even in highly degraded landscapes (Coelho et al. 2014).

In term of altitude, the result of this study shows that *Ficus* spp. can be found at varying altitudes ranging from lowland to highland. This result is in line with Hendrayana et. al (2019) that stated *Ficus* can be found in altitude 600-1000 m asl and Yusuf (2011) added that some species might be found in mountainous areas with an altitude of 1500-2500 m above sea level. *Ficus deltoidea* and *F. oleifolia* can be found at altitudes greater than 2500 m asl. Berg and Corner (2005) mentioned that the two species have adapted to a nutrient-poor environment and can also become holo-epiphytic plants for their survival. According to Sukmawati (2019) the higher the altitude of an area, the fewer species of *Ficus* that can be found.

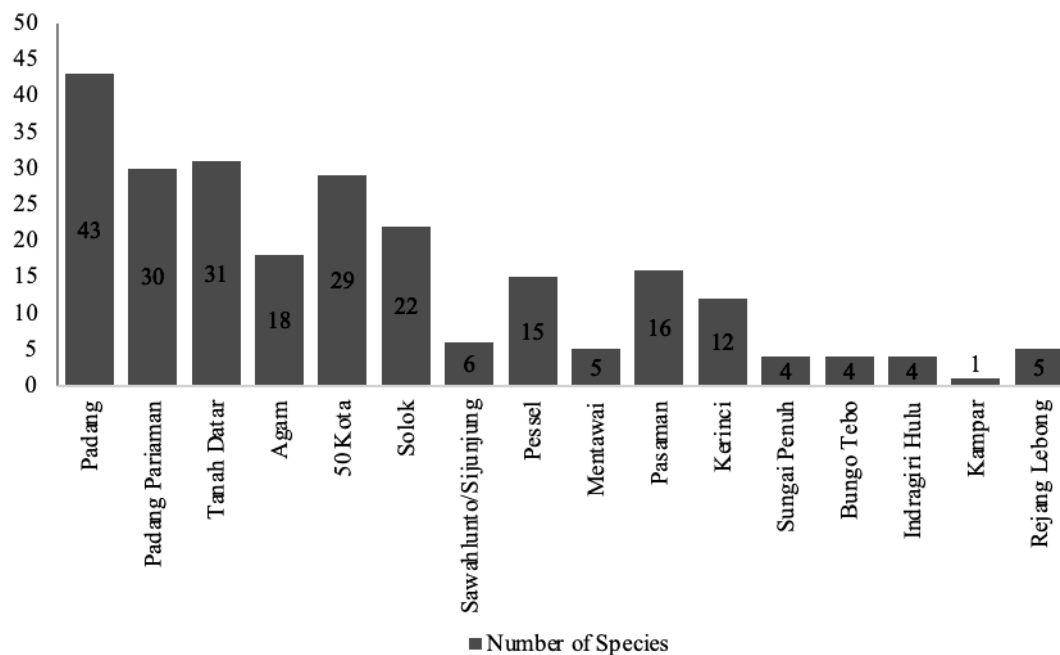


Figure 2. Distribution of *Ficus* species in Sumatra at a district/city scale based on specimens stored in ANDA herbarium



Figure 3. Specimen of *Ficus rubroscuspida* Corner of the collection of ANDA Herbarium

Ficus rubroscuspida is identified as new record in this research. This species had never been documented to exist in West Sumatra area, making this finding as important and noteworthy aspect of this research. According POWO (2023) and GBIF (2023), *F. rubroscuspida* is only found in Kalimantan and has only one occurrence in Sumatra, namely Riau. This information is based on the observation in the past. In our study, *F. rubroscuspida* is recorded in the Solok region, more specifically on Pantai Cermin and Mount Talang. By examining Andalas Herbarium (ANDA) specimens no. 49118, no. 49119, no. 49120, and no. 49121 and then comparing them with protologue of *F. rubroscuspida* found by Corner (1960), we conclude that those specimens have the same morphology despite the

limited characters examined. The morphological characters examined were frutescens or shrubs often epiphytic, twigs slender, lamina elliptic-obovate or lanceolate-elliptical, tip caudate-acuminate, paired axillary receptacles, fig yellow-red when mature, figs 4-5 mm wide that indicate the fig is so tiny, pedicel 0-1.5 mm long that indicate pedicel is very short.

Potential uses of *Ficus* species

Based on the literature review, *Ficus* spp. in general is widely known and used by the community and it can be seen in Table 1.

Table 1. Diversity of *Ficus* spp. in Sumatra based on ANDA Herbarium collection

Subgenus	Section	Species	Altitude (m)	Potential uses	Literature source	IUCN status
<i>Ficus</i>	<i>Ficus</i>	<i>Ficus deltoidea</i> Jack	0-2565	Potion to relieve headache, fever, and toothache	Adam et al. 2012	LC
<i>Ficus</i>	<i>Ficus</i>	<i>Ficus excavata</i> King	-	-	-	NE
<i>Ficus</i>	<i>Ficus</i>	<i>Ficus oleifolia</i> King	500-2520	-	-	LC
<i>Ficus</i>	<i>Eriosycea</i>	<i>Ficus aurata</i> (Miq.) Miq.	200-1100	Potential to be used as a cytotoxic compound	Nurhamidah et al. 2018	NE
<i>Ficus</i>	<i>Eriosycea</i>	<i>Ficus fulva</i> Reinw. Ex Blume	0-700	The bark is used for string, latex contains wax	Berg and Corner 2005	LC
<i>Ficus</i>	<i>Eriosycea</i>	<i>Ficus glandulifera</i> (Wall. ex Miq.) King	600-1500	Ornamental tree. The moderate hardwood is used as charcoal. The fibrous bark is used for making ropes and as a mouthwash for ulcers. It was also previously used for making clothes	Flora Fauna Web 2022	NE
<i>Ficus</i>	<i>Eriosycea</i>	<i>Ficus grossularioides</i> Burm.f.	0-1250	Young shoots are eaten raw, and decoctions of leaves are used to treat kidney problems	Plants of Southeast Asia 2022	LC
<i>Ficus</i>	<i>Eriosycea</i>	<i>Ficus padana</i> Burm.f.	200-700	Potion to cure stomachache, dysentery, hemorrhoid, and gonorrhea	Irsyam et al. 2021	LC
<i>Ficus</i>	<i>Eriosycea</i>	<i>Ficus schefferiana</i> King	2200-2750	-	-	LC
<i>Ficus</i>	<i>Eriosycea</i>	<i>Ficus tricolor</i> Miq.	60-1550	-	-	NE
<i>Pharmacosycea</i>	<i>Oreosycea</i>	<i>Ficus magnoliifolia</i> Blume	200-500	Food seasoning, fabric fibers, firewood, and religious tools	Siappa et al. 2016	NE
<i>Pharmacosycea</i>	<i>Oreosycea</i>	<i>Ficus vasculosa</i> Wall. ex Miq.	200-1000	Cultural or religious value as heritage tree	Flora Fauna Web 2022	LC
<i>Sycidium</i>	<i>Sycidium</i>	<i>Ficus ampelos</i> Burm.f.	40-1400	The latex is taken internally to treat diarrhea. In Indonesia, it is used as a diuretic. The leaves are used for sandpapering	PlantUse English 2022	LC
<i>Sycidium</i>	<i>Sycidium</i>	<i>Ficus montana</i> Burm.f.	80-1800	Leaves are used to cure headaches, syphilis	Mustaqim 2021	NE
<i>Sycidium</i>	<i>Paleomorphe</i>	<i>Ficus heteropleura</i> Blume	300-1700	-	-	NE
<i>Sycidium</i>	<i>Paleomorphe</i>	<i>Ficus lasiocarpa</i> Miq.	550-1500	-	-	NE
<i>Sycidium</i>	<i>Paleomorphe</i>	<i>Ficus obscura</i> Blume	20-1400	Potential for antioxidant and antibacterial	Zarta et al. 2020	LC
<i>Sycidium</i>	<i>Paleomorphe</i>	<i>Ficus parietalis</i> Blume	490-1300	A decoction of the roots is used to treat stomachache	Plants of Southeast Asia 2022	LC
<i>Sycidium</i>	<i>Paleomorphe</i>	<i>Ficus rubroscapitata</i> Corner*	1300-2200	-	-	NE
<i>Sycidium</i>	<i>Paleomorphe</i>	<i>Ficus sinuata</i> Thunb.	200-1700	The small fruits are considered very tasty	PlantUse English 2016	NE
<i>Sycidium</i>	<i>Paleomorphe</i>	<i>Ficus stipata</i> King	60-400	-	-	NE
<i>Sycidium</i>	<i>Paleomorphe</i>	<i>Ficus subulata</i> Blume	200-1200	It is used for making bonsai, as ornamental plants, and as fodder	Lepcha 2021	LC
<i>Sycidium</i>	<i>Paleomorphe</i>	<i>Ficus uniglandulosa</i> Wall.	200-1700	-	-	LC
<i>Sycomorus</i>	<i>Sycomorus</i>	<i>Ficus racemosa</i> L.	90-900	Bark contains anti-inflammatory	Dharmadeva et al. 2019	LC
<i>Sycomorus</i>	<i>Sycomorus</i>	<i>Ficus variegata</i> Blume	20-500	The wood is used for knife sheaths. Latex is used as a food additive in palm starch. Fruits are edible	Plants of Southeast Asia 2022	LC
<i>Sycomorus</i>	<i>Sycocarpus</i>	<i>Ficus fistulosa</i> Reinw. ex Blume	300-1400	It is used to remedy diarrhea, diabetics, malaria	Raka et al. 2019	LC
<i>Sycomorus</i>	<i>Sycocarpus</i>	<i>Ficus geocarpa</i> Teijsm. ex Miq.	550-600	-	-	NE
<i>Sycomorus</i>	<i>Sycocarpus</i>	<i>Ficus hispida</i> L.f.	50-1100	It is used widely in traditional medicines and has multiple pharmacological effects	Cheng et al. 2019	LC
<i>Sycomorus</i>	<i>Sycocarpus</i>	<i>Ficus lepica</i> Blume	20-1000	The fruits are edible. Young shoots are eaten raw as a vegetable	Plants of Southeast Asia 2022	LC
<i>Sycomorus</i>	<i>Sycocarpus</i>	<i>Ficus ribes</i> Reinw. ex Blume	0-1500	Bark and leaves used to be chewed with areca nuts as a substitute for gambier. An extract from the bark, locally called gambir utan, used to be applied against malaria, but proved to be ineffective	PlantUse English 2016	NE

<i>Sycomorus</i>	<i>Sycocarpus</i>	<i>Ficus ribes</i> var. <i>ribes</i>	60-850	-	-	NE
<i>Sycomorus</i>	<i>Sycocarpus</i>	<i>Ficus schwarzii</i> Koord	0-750	The latex is used against ringworm. Fruits are edible	Plants of Southeast Asia 2022	LC
<i>Sycomorus</i>	<i>Sycocarpus</i>	<i>Ficus uncinata</i> (King) Becc.	400-650	The fruits are edible	Plants of Southeast Asia 2022	NE
<i>Synoecia</i>	<i>Kissosycea</i>	<i>Ficus punctata</i> Thunb.	150-1300	-	-	LC
<i>Synoecia</i>	<i>Kissosycea</i>	<i>Ficus ruginervia</i> Corner	500-950	-	-	NE
<i>Synoecia</i>	<i>Rhizocladus</i>	<i>Ficus pendens</i> Corner	200-1300	-	-	NE
<i>Synoecia</i>	<i>Rhizocladus</i>	<i>Ficus pumila</i> L.	0-900	The extracts of leaves are useful for hypertension and dyslipidemia	Suzuki et al. 2020	NE
<i>Synoecia</i>	<i>Rhizocladus</i>	<i>Ficus recurva</i> Blume	100-1200	A decoction of the roots can be used to treat back pains and stomachache. The roots can be used as a betel nut (<i>Areca catechu</i>) substitute when finely chopped	Flora Fauna Web 2022	NE
<i>Synoecia</i>	<i>Rhizocladus</i>	<i>Ficus sagittata</i> Vahl	500-900	Cultivated for its ornamental value. The leaves are said to have narcotic properties	PlantUse English 2016; Miller 2000	LC
<i>Synoecia</i>	<i>Rhizocladus</i>	<i>Ficus villosa</i> Blume	200-1250	Ornamental plant	Flora Fauna Web 2022	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus annulata</i> Blume	150-1100	It can be used as medicinal plants, animal and livestock feed, micro-climate providers, and ornamental plants.	Rofifah et al. 2021	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus benjamina</i> L.	50-1200	Latex and fruit extracts are used to treat skin problems, inflammation, piles, vomiting, leprosy, malaria, nose diseases, and cancer besides their use as a general tonic	Imran et al. 2014	LC
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus consociata</i> Blume	150-1100	The latex was used as rubber although it is less elastic. The bark is very rich in tannin and can be used for binding books	PlantUse English 2016	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus crassiramea</i> (Miq.) Miq.	300-1200	The roots, bark, and leaves are pounded into a paste and used against snake bites	Plants of Southeast Asia 2022	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus crassiramea</i> subsp. <i>stupenda</i> (Miq.) C.C.Berg	-	-	-	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus curtipes</i> Corner	250-1550	The latex is said to be of fairly good quality for rubber production but in Malaysia, the tree is too rare to be of any economic importance	PlantUse English 2016	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus elastica</i> Roxb. ex Hornem.	0-10	Ornamental plant. The milky white latex was used to make rubber in the 1900s	Flora Fauna Web 2022	LC
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus pallescens</i> (Weiblen) C.C.Berg	400-700	-	-	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus pellucidopunctata</i> Griff.	200-500	-	-	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus retusa</i> L.	35-500	Latex has been used to produce rubber, although three-quarters of the latex is resin. The powdered adventitious roots are used in Peninsular Malaysia to treat toothache. In India roots and leaves are applied to treat wounds and bruises, bark and leaves for headaches, juice from the leaves externally for colic, and juice from the bark internally for liver disease	PlantUse English 2016	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus rumphii</i> Blume	800-1000	Bark is used to treat haematuria and phenolic compound can eradicate cancer cells	Parveen et al. 2014	NE
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus sumatrana</i> Miq.	60-800	-	-	LC
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus sundaica</i> Blume	-	-	-	LC
<i>Urostigma</i>	<i>Urostigma</i>	<i>Ficus xylophylla</i> (Miq.) Wall. ex Miq.	175-950	The brightly colored figs and the leaves are attractive enough to introduce this plant in landscaping	Plants of Southeast Asia 2022	NE

Note: (-): No data, *: New occurrence to Sumatra, LC: Least Concern, NE: Not Evaluated

The main potential uses of *Ficus* spp. are as medicinal and ornamental plants, in which some species are utilized as bonsai, a type of ornamental plant with high economic value. In addition, the fruit of some *Ficus* species are edible. Many species of *Ficus* not only serve as keystone species in the context of ecology but are also important in supporting human life. According to Wilson and Wilson (2013), regardless of the extent of the spread of *Ficus* spp., undoubtedly the importance of figs also provides a vital spiritual, health, and functional role for humans throughout its distribution.

Discussion

In many taxonomical studies, direct observations in the field are required to investigate plant diversity. Nonetheless, such method takes a significant amount of time, energy, and expense to complete the work. Furthermore, disasters such as the COVID-19 pandemic have an impact on the mobility of researchers, constraining them to carry out research in a given region. Other circumstances make it difficult to do because there is only a small number of herbarium, making the data sources that can be used extremely restricted. An evaluation study of a plant taxon based on specimens stored in the herbarium is very relevant for solving such problems. Additionally, the data obtained from this method is considered credible and can be justified scientifically in some way. Also, the specimens data of the herbarium can be validated with the data on the GBIF website (GBIF 2023). Because the data entered into the website has been validated by the respective plant experts, the information in the GBIF is considered to be reliable.

Research using herbarium specimens is very important for the conservation of threatened plant species (Rocchetti et al. 2021). This study found no *Ficus* species in Sumatra is listed as threatened according to the IUCN Red List (IUCN 2023). Nonetheless, it is important to note that all *Ficus* species in Sumatra are conserved in ex-situ conservation areas, such as botanic gardens and arboretums. Many *Ficus* plants are found in areas near river streams, and the richness and abundance of *Ficus* increase with distance from the river. Conserving *Ficus* plants in the riparian zone can also mitigate the risk of floods and landslides which are caused by unpredictable weather due to global warming.

Ficus is known to be one of the keystone species because of its importance in terms of ecology, vegetation community, and food sources for frugivorous animals in the forest. According to Corner (1967), almost all species of *Ficus* spp. are pioneer plants and have an important role in the succession process in tropical forests. Thornton et al. (1996) and Yurkewycz et al. (2014) found 24 species of *Ficus* on the island of Krakatoa which four of them were pioneer plants, namely *F. fulva*, *F. septica*, *F. hispida* and *F. fistulosa*, that helped animals in the colonization process during the last century after the Krakatoa eruption in 1883.

While Kuaraksa et al. (2012) stated that *F. hispida* and *F. semicordata* are the most excellent species for forest restoration. In line with this, Soejono et al. (2013) stated that some *Ficus* species showed advantageous characteristics for restoration and maintaining water resources (e.g.,

springs) due to the deep and broad rooting system, dense branching in low position and broad canopy which reduce the speed of rainfall drops and reduce erosion or landslides. For frugivores, synconia have high nutrient value although some debates remained about its quality, yet the ability of *Ficus* to produce large amounts of fruits in all year-round is important to support them especially when the feed sources are scarce (Lok et al. 2013). Many *Ficus* plants are also utilized for bonsai, including *F. benjamina* and *F. microcarpa* which are the most common species suitable for bonsai. It is likely that there are other *Ficus* species that can be utilized for bonsai as the genus is highly diverse.

Andalas Herbarium (ANDA) contains 296 sheets of *F. grossularioides*, which is the species with the highest number of specimens. This species occurs at an elevation ranging from 0 to 1250 m asl. This demonstrates that *F. grossularioides* has a widespread distribution and suitable habitat requirements, particularly in West Sumatra. Thus, it is understandable that this species is listed as Least Concern (LC) on IUCN Red List which is likely due to its stable population. In addition, the widespread distribution of *F. grossularioides* in the wild is likely attributable to its shrubby habitus, making it relatively easy to regenerate.

By examining 2300 specimens of *Ficus* stored in Andalas Herbarium (ANDA), this study revealed 53 *Ficus* species with geographical distribution in Sumatra. Such specimens were collected from 16 cities and regencies in Sumatra, with Padang city having the most collected specimens and Kampar district having the least. *Ficus* spp. can be found at altitudes ranging from lowland to highland. From this study, we found a new record of *Ficus rubrocaespitata* Corner in West Sumatra. Of the 53 species *Ficus* recorded, 63% might be used as food, ornamental plants or for medicinal purposes.

ACKNOWLEDGEMENTS

The authors thank the curator of the ANDA Herbarium at Andalas University for making it possible to use specimens from the herbarium as research materials and the herbarium technicians who have helped in data collection. Also, we thank Prof. Dr. Chairul, Dr. Tesri Maideliza, and Dr. Solfiyeni for their input to improve this article. We acknowledge the Institute of Research and Community Service (LPPM), Andalas University, West Sumatra, Indonesia for the research grant in the *Skim Riset Publikasi Terindeks* (RPT) with the contract no. 4/UN/MWA/PTN-BH/2021.

REFERENCES

- Andalas University Herbarium Team. 2008. Rusjdi Tamin: Kurator Herbarium Universitas Andalas. Herbarium Universitas Andalas, Padang.
- Berg CC, Corner E.J.H. 2005. Moraceae (*Ficus*) in Flora Malesiana Series I-seed plants. University Leiden Branch. National Herbarium Netherlands.
- Brown SH. 2016. *Ficus: Trees and Vine of Florida*. University of Florida/IFAS-Ex, Lee County Southwest Florida, Florida.

- Cheng JX, Zhang BD, Zhu WF, Zhang CF, Qin YM, Abe M, Akihisa T, Liu WY, Feng F, Zhang J. 2019. Traditional uses, phytochemistry, and pharmacology of *Ficus hispida* L.f.: A review. *J Ethnopharmacol* 248: 112204. DOI: 10.1016/j.jep.2019.112204.
- Coelho LFM, Ribeiro MC, Pereira RAS. 2014. Water availability determines the richness and density of fig trees within Brazilian semideciduous forest landscapes. *Acta Oecologica* 57: 109-116. DOI: 10.1016/j.actao.2013.02.002.
- Corner EJJ. 1960. Taxonomic Notes on *Ficus* Linn., Asia and Australasia. Sections 1-4. The Gardens' Bulletin Singapore 4 (17): 368-485.
- Corner EJJ. 1967. *Ficus* in the Solomon Islands and its bearing on the post-Jurassic History of Melanesia. *Philos Trans R Soc Lond B Biol Sci* 253 (783): 23-159. DOI: 10.1098/rstb.1967.0033.
- Dharmadeva S, Galgamuwa LS, Prasadinie C, Kumarasinghe. 2019. In vitro anti-inflammatory activity of *Ficus racemosa* L. bark using albumin denaturation method. *Intl Quarterly J Res Ayurveda* 39 (4): 239-242. DOI: 10.4103/ayu.AYU_27_18.
- Hendrayana Y, Widodo P, Kusmana C, Widhiono I. 2019. Diversity and distribution of figs (*Ficus* spp.) across altitudes in Gunung Tilu, Kuningan, West Java, Indonesia. *Biodiversitas* 20 (6): 1568-1574. DOI: 10.13057/biodiv/d200612.
- Hooker JD. 1982. *Flora of British India* Vol. V. Binshen Singh Mahendra Pal Singh. India.
- GBIF. 2023. GBIF Backbone Taxonomy. www.gbif.org
- Imran M, Rasool N, Rizwan K, Zubair M, Riaz M, Zia-Ul-Haq M, Rana UA, Nafady A, Jaafar HZ. 2014. Chemical composition and Biological studies of *Ficus benjamina*. *Chem Cent J* 8 (1): 12. DOI: 10.1186/1752-153X-8-12.
- Irsyam ASD, Mustaqim WA, Irwanto RR. 2020. *Ficus padana* Burm.f. Moraceae. In: Franco F. (eds). *Ethnobotany of the Mountain Regions of Southeast Asia*. Ethnobotany of Mountain Regions. Springer, Cham. DOI: 10.1007/978-3-030-14116-5_212-1.
- IUCN [International Union for Conservation of Nature]. 2023. The IUCN Red List of Threatened Species.
- Kuaraksa C, Elliott S, Hossaert-McKey M. 2012. The phenology of dioecious *Ficus* spp. tree species and its importance for forest restoration project. *For Ecol Manag* 265: 82-93. DOI: 10.1016/j.foreco.2011.10.022.
- Kochummen KM. 1978. Moraceae in the Tree Flora of Malaya Volume Three. Longman Group Limited, London.
- Lepcha C, Sharma B. 2021. Diversity of *Ficus* L. (Moraceae) and its uses in Sikkim Himalayas (India). *Intl J Bot Res* 11 (2): 39-56.
- Lok AF, Ang WF, Ng BYQ, Leong TM, Yeo CK, Tan HTW. 2013. Native fig species as a keystone resource for the Singapore urban environment. *Raffles Museum of Biodiversity Research National University of Singapore, Singapore*.
- Miller JS. 2000. *Plant Resources of South-East Asia* No. 12: Medicinal and Poisonous Plants 1. Backhuys Publishers, Leiden, The Netherlands.
- Moulana BA, Shahari R, Amri CNAC, Shamsuddin MS, Rusmadi NNNN. 2020. A preliminary checklist of *Ficus* L. species in Kuantan, Pahang. *Sci Herit J* 4 (2): 56-58. DOI: 10.26480/gws.02.2020.56.58.
- Mustaqim WA. 2021. *Ficus montana* Burm.f. Moraceae. In: Franco F. (eds). *Ethnobotany of the Mountain Regions of Southeast Asia*. Ethnobotany of Mountain Regions. Springer, Cham. DOI: 10.1007/978-3-030-38389-3_204.
- Nair SS, Bachan KHA, Ebin PJ. 2021. Diversity and phenetic study on syconium of *Ficus* L. (Moraceae) from Kerala, India revealing natural classification along with an identification key. *Reinwardtia* 20 (1): 27-36. DOI: 10.14203/reinwardtia.v20i1.4031.
- Nur'aini, Syamsuardi, Arbain A. 2013. Jenis-jenis tumbuhan *Ficus* L. (Moraceae) di hutan konservasi Prof. Soemitro Djojohadikusumo PT. Tidar Kerinci Agung (TKA) Sumatera Barat. *Jurnal Biologi Universitas Andalas* 2 (4): 235-241. [Indonesian]
- Nurhamidah, Nurdin H, Manjang Y, Dharma A, Suryati. 2018. Cytotoxic activity assay from leaves and fruit extracts of *Ficus aurata* (Miq.) using brine shrimp lethality test method. *IOP Conf Series J Physics Conf Series* 1116: 042028. DOI: 10.1088/1742-6596/1116/4/042028.
- Parveen M, Malla AM, Alam M, Ahmad F, Silva PS, Silva MR. 2014. Two new phenolic compounds from *Ficus rumphii* and their antiproliferative activity. *Nat Prod Res* 28 (9): 646-652. DOI: 10.1080/14786419.2014.891201.
- Pederneiras LC, Carauta JPP, Romaniuc NS, Mansano VF. 2015. An overview of the infrageneric nomenclature of *Ficus*. *Taxon* 64: 589-594. DOI: 10.12705/643.12.
- Plants of Southeast Asia. 2022. www.asianplant.net
- PlantUse English. 2016. uses.plantnet-project.org
- POWO [Plant of the World Online]. 2023. www.powo.science.kew.org
- Prabowo DA, Mirmanto, Manurung BS. 2019. Distribusi *Ficus* di Way Cangkung, Taman Nasional Bukit Barisan Selatan, Lampung. *Pros Sem Nas Masy Biodiv Indon* 5: 155-164. DOI: 10.13057/psnmbi/m050203. [Indonesian]
- Raka SC, Rahman A, Kaium MKH. 2019. Evaluation of antioxidant and antimicrobial activity of methanolic extract of *Ficus fistulosa* leaves: An unexplored phytomedicine. *Pharmacology* 1 (1): 354-360.
- Rocchetti, GA, Armstrong, CG, Abeli T, Orsenigo S, Jasper C, Joly S, Bruneau A, Zytaruk M, Vamasi JC. 2021. Reversing extinction trends: New uses of (old) herbarium specimens to accelerate conservation action on threatened species. *New Phytologist* 230: 433-450. DOI: 10.1111/nph.17133.
- Rofifah I, Indriyanto, Asmarahman C. 2021. Species and benefits of *Ficus* spp. in the collection block of Tahura War Lampung Province. *Jurnal Rimba Lestari* 1 (2): 88-98. DOI: 10.29303/rimbalestari.v1i2.17
- Siappa H, Hikmat A, Kartono AP. 2016. Komposisi, pola sebaran dan faktor habitat nunu pisang (*Ficus magnoliifolia*) di Hutan Pangale Desa Toro Sulawesi Tengah. *Botanic Gardens Bulletin* 19 (1): 33-46. [Indonesian]
- Soejono, Budiharta S, Arisoelaningsih E. 2013. Proposing local trees diversity for rehabilitation of degraded lowland areas surrounding water spring. *Biodiversitas* 14: 37-42. DOI: 10.13057/biodiv/d140106.
- Sukmawati JG. 2019. Keanekaragaman dan distribusi ekologis *Ficus* spp. di Kalimantan. *Buletin Kebun Raya* 22 (2): 85-94. [Indonesian]
- Suzuki K, Gonda K, Kishimoto Y, Katsumoto Y, Takenoshita S. 2020. Potential curing and beneficial effects of Ooitabi (*Ficus pumila* L.) on hypertension and dyslipidaemia in Okinawa. *J Hum Nutr Diet* 34 (2): 395-401. DOI: 10.1111/jhn.12806.
- Thornton IWB, Compton SG, Wilson CN. 1996 The role of animals in colonization of the Krakatau Islands by fig trees (*Ficus* species). *J Biogeogr* 23: 577-592. DOI: 10.1111/j.1365-2699.1996.tb00019.x.
- Vanegas RM, Rodriguez MA, Santayana MP, Mabberley DJ. 2021. A global database of plant services for humankind. *PLoS ONE* 16 (6): e0253069. DOI: 10.1371/journal.pone.0253069.
- Vogel EF. 1987. *Manual of Herbarium Taxonomy Theory and Practice*. UNESCO, Jakarta.
- Wijaya IMS, Defiani MR. 2021. Diversity and distribution of figs (*Ficus*: Moraceae) in Gianyar District, Bali, Indonesia. *Biodiversitas* 22 (1): 233-246. DOI: 10.13057/biodiv/d220129.
- Wilson D, Wilson A. 2013. Figs as a global spiritual and material resource for humans. *Hum Ecol* 41: 459-464. DOI: 10.1007/s10745-013-9582-z.
- Yusuf R. 2011. Sebaran Ekologi dan Keanekaragaman *Ficus* spp. di Indonesia. *Berk. Penel. Hayati Edisi Khusus: 5A* (83-91). Puslitbang Biologi LIPI. [Indonesian]
- Yurkewycz, RP, Bishop JG, Crisafulli CM, Harrison JA, Gill RA. 2014. Gopher mounds decrease nutrient cycling rates and increase adjacent vegetation in volcanic primary succession. *Oecologia* 176: 1135-1150. DOI: 10.1007/s00442-014-3075-7.
- Zarta AR, Aryani F, Hernandi F, Wartomo, Sofi FM, Andika. 2020. Bioaktivitas antioksidan dan antibakteri dari ekstrak etanol kulit kayu nangka (*Ficus obscura* Blume). *Prosiding Seminar Nasional Terapan Riset Inovatif (SENTRINOV)*. Politeknik Banyuwangi, Banyuwangi, 26 September 2020. [Indonesian]