A NUMERICAL TAXONOMY OF *Sida* spp. (MALVACEAE) IN JAVA AND BALI ISLAND, INDONESIA

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ABSTRACT

Sida* is a pantropical weed that can be annual or perennial. Several species have been identified in Indonesia. *Sida cordifolia, S. rhombifolia, S. alnifolia, S. rhomboidea, S. acuta, S. glutinosa,* and *S. mysorensis* were chosen for this study because they are representative of the species that are extensively spread in Indonesia. This study aims to update taxonomic information on the *Sida* genus in Indonesia. A phenogram was created using the data that was derived from the scoring of 70 morphological features. At PAST, the phenogram was created using cluster analysis, and Principal Cluster Analysis was used to determine the reason for clustering. The first cluster shows the separation of *Sida acuta* from all OTUs at a distance of 0.30. The second cluster shows the separation of OTU *Sida cordifolia* from OTU *Sida glutinosa* and OTU *Sida mysorensis* cluster at a distance between 0.20 until 0.25. The third cluster shows the separation of OTU *Sida rhomboidea* from OTU *Sida rhombifolia* and OTU *Sida alnifolia* cluster at a distance that was close to 0.20. The biggest value of PCA results is -0.45 and belongs to awn tip which is a character of mericarps. It demonstrates how crucial the mericarp trait is to identifying and appreciating the diversity of the genus *Sida.

Keywords: biodiversity, biosystematic, malvaceae, taxonomical data.
running title: A numerical taxonomy of *sida* in Indonesia

التصنيف الرقمي لـ Sida Species في جزيرة جافا وبالي ، إندونيسيا

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المستخلص

سيدا نبات عشبي استوائي يمكن أن يكون سنويًا أو معمرًا. تم تحديد العديد من الأنواع في إندونيسيا. تم اختيار Sida cordifolia و S. rhombifolia و S. alnifolia و S. rhomboidea و S. acuta و S. glutinosa و S. mysorensis لهذه الدراسة لأنها تمثل الأنواع المنتشرة على نطاق واسع في إندونيسيا. تهدف هذه الدراسة إلى تحديث المعلومات التصنيفية عن جنس سيدا في إندونيسيا. تم إنشاء فينوجرام باستخدام البيانات المستمدة من تسجيل 70 سمة مورفولوجية. في PAST ، تم إنشاء الفينوجرام باستخدام تحليل الكتلة ، وتم استخدام تحليل الكتلة الرئيسية لتحديد سبب التجميع. تُظهر المجموعة الأولى فصل Sida acuta عن جميع OTUs على مسافة 0.30. تُظهر المجموعة الثانية فصل OTU Sida cordifolia عن مجموعة OTU Sida glutinosa و OTU Sida mysorensis على مسافة تتراوح بين 0.20 حتى 0.25. تُظهر المجموعة الثالثة فصل OTU Sida rhomboidea عن مجموعة OTU Sida rhombifolia و OTU Sida alnifolia على مسافة قريبة من 0.20. أكبر قيمة لنتائج PCA هي −0.45 وتنتمي إلى طرف awn وهو أحد سمات mericarps. يوضح مدى أهمية سمة المريكارب في تحديد وتقدير تنوع جنس سيدا.

الكلمات المفتاحية: التنوع البيولوجي ، النظام الحيوي ، Malvaceae ، البيانات التصنيفية

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INTRODUCTION

Sida is one of heterogeneous genera with highest number of species in Malveae (8, 14; 27). *Sida* refers to a genus in family Malvaceae, subfamily Malvoideae, tribe Malveae and subtribe Abutilinae. This genus consists of several sections, including *Cordifoliae, Distichifoliae, Ellipticifoliae, Hookerianae, Malacroideae, Muticae, Nelavagae, Oligandrae, Sidae, Spinosae* and *Stenindae* (1, 29). Almost all *Sida* species knew as annual or perennial common weeds in highland and lowland areas. Mabberley (18) recorded 250 species of *Sida* spread across the tropics and subtropics. In Indonesia, *Sida* occurs in waste places, teak forests, coconut plantations, along roadsides, and near the coast. Taxonomical research of *Sida* in Indonesia has recorded the presence of several species. Baker & Bakhuizen (5) and in Flora of Java and Malesian Malvaceae Revised noted that there are twelve species in Java, which include *S. acuta*, *S. balica*, *S. cordifolia*, *S. elongata*, *S. glutinosa*, *S. javensis*, *S. mysorensis*, *S. retusa*, *S. rhombifolia*, *S. spinosa*, *S. subcordata*, and *S. veronicaefolia*. While Steenis (25) only recorded *S. rhombifolia* and *S. acuta* on the island of Java. Generally, *Sida* is recognized as a wild shrub with serrated leaf margin, yellow flowers, and brownish schizocarpic fruit. However, *Sida* has distinctive features from related genera in tribe Malveae. According to Brandao et al. (8) and Aguilar et al. (1), the calyx of *Sida* is 10-ribbed and the schizocarpic fruit is polycoccus type, uniseminate and consist 5-14 mericarps which is trigonous shaped and muticous to prominently aristate. Commonly used as ethnomedical medicine in several countries such as Brazil, Colombia, Nigeria, Philippines, Central America, and India. *Sida* has benefits to treat rheumatism, asthma, facial paralysis, gonorrhea, diarrhea, snake bites, and fever. This plant is also used for the treatment of wounds, anti-inflammatory, and skin diseases (22). According to Bai et al. (5), *Sida* are used in various Ayurvedic and ethnic medicines. Phytochemical studies aimed by Aminah et al. (2) revealed *Sida* has several secondary metabolisms such as alkaloid, flavonoid, coumarins, ecdysteroids, triterpenes, and tocopherols. In Indonesia, *S. rhombifolia* itself is the one of Indonesian herbal medicine list from the Indonesian Ministry of Health scientific program (17). According to Choudhuri (10), numerical taxonomy refers to phenetic that attempts to group species into higher taxa based on overall similarity, usually in morphology. Phenetic is also one of major approach to biological classification beside phyletic and cladistic (26). Because morphology-based grouping is always obvious and understandable, numerical taxonomy can serve as a basic classification. It can be seen which characters are different between taxon (OTU) and also know the characters that affect taxon grouping. This study is usually carried out on non-cultivated and cultivated plants. For cultivated plants such as *Begonia* L. (24), it can be a reference for hybridization to obtain new hybrids. For non-cultivated plants such as wild *Datura* L. (9) and *Abutilon* author? (2), it provides data on the distribution of the taxon and data on taxon grouping which can be different or the same as taxon's original classification. The goal of this study was to identify relationships based on morphological characteristics. Ancient classification systems, naming, identification, and descriptions of plants were all based on morphological characteristics. Almost all taxonomic issues are still resolved using morphological features, which may be applied at all taxonomic levels, from the variety to the division (26). The capacity to observe plant diversity more easily is another advantage morphological characteristics have over other traits (21). The resulting grouping shows the most frequent morphological similarities across taxa, which may different if researched using other bases. The study was carried out in an effort to advance knowledge of Indonesian biodiversity, particularly in genus *Sida* (Malvaceae). Circumscription of Malvaceae has changed as the result of recent scientific advancements, making it crucial to understand the variety of morphological characteristics among its members. The gathered information will reveal what morphological traits exist in *Sida* and how they influence the relationships between *Sida* species.

MATERIALS AND METHODS

The research was conducted at the Biosystematics Laboratory, Department of

Biology, Faculty of Science and Technology, Airlangga University, East Java, Indonesia. This research was conducted from January to June 2020. Plant materials were collected from living specimen ad literature of plant description (Table 1). *S. cordifolia* and *S. acuta* were found in the West Bali National Park. Specimens of *S. rhombifolia*, *S. alnifolia* and *S. rhomboidea* were found in Kediri (East Java). Two specimens namely *S. glutinosa* and *S. mysorensis* were obtained from papers or scientific publications entitled Malesian Malvaceae Revised. Malesian Malvaceae Revised, a scientific journal, provided the species description, and morphological characteristics were derived by observing the sample. The morphological characters used in this study were 70 characters which included 20 leaf characters, 17 flower characters, 10 fruit characters, 10 mericarp characters, 6 seeds characters and 7 stem characters which 24 quantitative characters and 46 qualitative characters (Table 2). The numbered morphological data (Table 3) exacted to cluster analysis and principal component analysis were performed by PAST 4.3. According to Permata & Susandarini (2022), cluster analysis using the UPGMA clustering method and Gower coefficient of similarity produces a phenogram that shows the relationship between species. Meanwhile, principal componen analysis shows the large character effect on grouping.

Table 1. Material samples of *Sida* spp

Sample code	Scientific name	Method of collection	Specimen source	Distribution
RHF	***Sida rhombifolia***	**Observation from living specimen**	**Kediri, East Java**	**Common throughout in Indonesia (include Java and Bali Island)**
RHD	***Sida rhomboidea***	**Observation from living specimen**	**Kediri, East Java**	**Common throughout in Indonesia (include Java and Bali Island)**
ALN	***Sida alnifolia***	**Observation from living specimen**	**Kediri, East Java**	**Common throughout in Indonesia(include Java and Bali Island)**
COR	***Sida cordifolia***	**Observation from living specimen**	**West Bali National Park**	**Common throughout in Indonesia but Borneo**
ACT	***Sida acuta***	**Observation from living specimen**	**West Bali National Park**	**Common throughout in Indonesia (include Java and Bali Island)**
GLT	***Sida glutinosa***	**Observation based on literature (specimen description)**	**Malesian Malvaceae Revised (1966) and Leaf Anatomical Study of Three Members of Malvaceae Family in Jatiluhur Resevoir Area (2016)**	**Mostly in West Java, but also occured in Central Java.**
MYS	***Sida mysorensis***	**Observation based on literature (specimen description)**	**Malesian Malvaceae Revised (1966) nd Flora of Java (1963)**	**Mostly in Central and East Java, but also occured in Sumatra, West Java and Lesser Sunda Islands**

Table 2. Morphogical character of *Sida* spp. and the codes

Morphologial characters
Leaf
LA: Leaf apex (1. acuminate, 2. acute, 3. almost obtuse until acute, 4. obtuse)
LB: Leaf base (1. rotundate, 2. emaginate, 3. truncate until rotundate)
ADS: Adaxial surface (1. glabrous, 2. pubescent)
ABS: Abaxial surface (1. glabrous, 2. pubescent)
LV: Leaf venation (1. penninervis, 2. palminervis)
LC: Leaf circumscription (1. ovate or ovate until lanceolate, 2. cordate, 3. obovate or obovate until rhomboide, obcordate, 4. oblong)
LM: Leaf margin (1. integer, 2. serrate)
LLNA: Leaf length near apex (1. 0 - 2,5 cm, 2. x > 2,5 cm)
LLNB: Leaf length near base (1. 0 - 5 cm, 2. x > 5 cm)
LWNA: Leaf width near apex (1. 0 - 1,2 cm, 2. x > 1,2 cm)
LWNB: Leaf width near base (1. 0 – 2,4 cm, 2. x > 2,4 cm)
NL: Number of leaves (1. not folium simplex, 2. folium simplex)
PS: Petiole surface (1. glabrous, 2. pubescent)
PL: Petiole length (1. x > 1 cm, 2. x > 1 cm)
PC: Petiole colour (1. maroon, 2. lawn green, 3. green yellow)
PLS: Presence of lateral stipule (1. absent, 2. present)
NLS: Number of lateral stipule (1. not pair, 2. pair)
LSC: Lateral stipule circumscription (1. filiform, 2. linear)
LSL: Lateral stipule length (1. 0 – 0,6 cm, 2. 0,61 – 1 cm)
LSCR: Lateral stipule colour (1. maroon, 2. lawn green, 3. green)
Flower
CS: Calyx surface (1. glabrous, 2. pubescent)
CL: Calyx length (1. 0 – 0,6 cm, 2. 0,61 – 1 cm)
CA: Calyx apex (1. not acute, 2. acute)
CC: Calyx colour (1. not lawn green coloured, 2. lawn green coloured)
NCX: Number of calyx (1. not five numbered, 2. five numbered)
PEC: Presence of epicalyx (1. absent, 2. present)
PDC: Pedicel colour (1. maroon, 2. lawn green, 3. green)
PDS: Pedicel surface (1. glabrous, 2. pubescent)
PDL: Pedicel length (1. 0 - 1 cm, 2. x > 1 cm)
PHLY: Phyllotaxis (1. not axillar, 2. axillar)
ANC: Anther colour (1. not yellow coloured, 2. yellow coloured)
NCR: Number of corolla (1. not five numbered, 2. five numbered)
CRA: Corolla aestivation (1. valvata, 2. aperta)
CRL: Corolla length (1. 0 - 1 cm, 2. x > 1 cm)
CRW: Corolla width (1. 0 – 0,5 cm, 2. x > 0,5 cm)
CRC: Corolla colour (1. yellow orange, 2. yellow)
STP: Stamen type (1. not monoadelph, 2. monoadelph)
Fruit
FTT: Fruit type (1. not polycoccus, 2. polycoccus)
CCF: Colour of the calyx that covers the fruit (1. saddle brown, 2. burly wood, 3. sienna)
NCF: Number of the calyx that covers the fruit 1. not five numbered, 2. five numbered)
SCF: Surface of the calyx that covers the fruit (1. glabrous, 2. pubescent)
LFP: Length of fruit pedicel (1. 0 – 1,3 cm, 2. x > 1,3 cm)
CFP: Colour of fruit pedicel (1. saddle brown, 2. burly wood, 3. sienna)
SCP: Surface of fruit pedicel (1. glabrous, 2. pubescent)
JFP: Presence of joint in fruit pedicel (1. not jointed, 2. jointed)
SFP: Spot of fruit pedicel (1. not axillar, 2. axillar)
NFP: Number of mericarp in fruit (1. one until nine numbered, 2. more than nine numbered)

Mericarp

SMC: Mericarp surface (1. glabrous, 2. pubescent or pubescent in tangential side)
HMC: Mericarp height (1. 0 – 2 cm, 2. x > 2 cm)
SPMC: Mericarp shape (1. trigonous with convex tangential sides, 2. C letter)
PVCM: Presence of veins or condition on tangential mericarp (1. absent, 2. present and obvious)
PVRM: Presence of veins on the right and left radial mericarp (1. absent, 2. present and obvious, 3. present and uncertain)
PAW: Presence of awn (1. absent, 2. present as protruding awn, 3. present as elongated awn)
LAW: Awn length (1. absent, 2. 0 – 1 cm, 3. x > 1 cm)
TAW: Awn tip (1.acute like spines or bird beak, 2. obtuse, 3. retuse, 4. curved inwards)
SAW: Awn surface (1. glabrous, 2. pubescent)
NAW: Number of awn (1. double, 2. single)

Seed

SSD: Seed shape (1. cordate, 2. ovate, 3. reniform)
HSD: Seed height (1. 2 mm, 2. x < 2 mm, 3. x > 2 mm)
NSD: Number of seed in mericarp (1. not single, 2. single)
CSD: Seed colour (1. black saddle brown, 2. dim grey, 3. grey saddle brown)
SFSD: Seed surface (1. glabrous, 2. pubescent)
HSP: Hilus spot (1. apex, 2. radial)

Stem

PHB: Plant habits (1. not shrubs, 2. shrubs)
SGD: Stem growing direction (1. erect, 2. ascendens)
SSH: Stem shape (1. not teres, 2. teres)
SHG: Stem height (1. x < 100 cm, 2. 100 cm, 3. x > 100 cm)
SSF: Stem surface (1. glabrous, 2. pubescent, 3. full of lenticels)
SCR: Stem colour (1. maroon, 2. lawn green, 3. green almost tan)
PCM: Presence of cambium (1. absent, 2. present)

Table 3. The numbered morphological characters of *Sida* spp

	ACT	RHF	ALN	COR	RHD	MYS	GLT
LA	2	1	1	4	3	1	1
LB	2	1	1	2	3	2	2
ADS	1	1	1	1	1	1	1
ABS	1	1	1	1	1	1	1
LV	1	1	1	1	1	2	1
LC	4	2	2	3	2	1	1
LM	1	1	1	1	1	1	1
LLNA	2	1	1	1	2	1	1
LLNB	1	2	1	1	2	2	2
LWNA	2	1	2	1	2	1	1
LWNB	1	1	2	1	2	2	2
NL	1	1	1	1	1	1	1
PS	1	1	1	1	1	1	1
PL	1	1	1	2	2	2	2
PC	3	1	1	2	1	2	2
PLS	1	1	1	1	1	1	1
NLS	1	1	1	1	1	1	1
LSC	2	1	1	1	2	1	2
LSL	2	1	1	1	2	2	2
LSCR	3	1	1	2	1	2	2
CS	1	1	1	1	1	1	1
CL	2	1	1	1	1	2	1
CA	1	1	1	1	1	1	1
CC	1	1	1	1	1	1	1
NCX	1	1	1	1	1	1	1
PEC	0	0	0	0	0	0	0
PDC	2	1	1	2	1	2	2
PDS	1	1	1	1	0	1	1
PDL	1	1	1	2	1	2	2
PHLY	1	1	1	1	1	1	1
ANC	1	1	1	1	1	1	1

NCR	**1**	**1**	**1**	**1**	**1**	**1**	**1**
CRA	**1**	**1**	**1**	**1**	**1**	**1**	**1**
CRL	**1**	**1**	**1**	**2**	**1**	**1**	**1**
CRW	**1**	**1**	**2**	**2**	**2**	**1**	**1**
CRC	**1**	**1**	**1**	**2**	**1**	**1**	**1**
STP	**1**	**1**	**1**	**1**	**1**	**1**	**1**
FTT	**1**	**1**	**1**	**1**	**1**	**1**	**1**
CCF	**3**	**1**	**1**	**2**	**1**	**2**	**2**
NCF	**1**	**1**	**1**	**1**	**1**	**1**	**1**
SCF	**1**	**1**	**1**	**1**	**1**	**1**	**1**
LFP	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CFP	**3**	**1**	**1**	**2**	**1**	**2**	**2**
SCP	**1**	**1**	**1**	**1**	**0**	**1**	**1**
JFP	**0**	**1**	**1**	**0**	**1**	**1**	**1**
SFP	**1**	**1**	**1**	**1**	**1**	**1**	**1**
NFP	**1**	**1**	**1**	**2**	**2**	**1**	**1**
SMC	**1**	**1**	**1**	**1**	**1**	**1**	**1**
HMC	**1**	**1**	**1**	**2**	**2**	**2**	**2**
SPMC	**1**	**1**	**1**	**1**	**1**	**1**	**1**
PVCM	**1**	**1**	**1**	**1**	**1**	**0**	**1**
PVRM	**1**	**1**	**2**	**1**	**2**	**0**	**0**
PAW	**1**	**2**	**2**	**1**	**2**	**2**	**1**
LAW	**1**	**1**	**1**	**2**	**0**	**0**	**2**
TAW	**1**	**3**	**4**	**1**	**2**	**1**	**1**
SAW	**1**	**1**	**1**	**1**	**1**	**1**	**1**
NAW	**1**	**1**	**1**	**1**	**1**	**1**	**1**
SSD	**1**	**1**	**1**	**1**	**1**	**2**	**1**
HSD	**2**	**1**	**1**	**1**	**1**	**1**	**2**
NSD	**1**	**1**	**1**	**1**	**1**	**1**	**1**
CSD	**1**	**1**	**1**	**1**	**1**	**1**	**1**
SFSD	**0**	**0**	**0**	**0**	**0**	**0**	**0**
HSP	**1**	**1**	**1**	**1**	**1**	**1**	**1**
PHB	**1**	**1**	**1**	**1**	**1**	**1**	**1**
SGD	**2**	**1**	**2**	**1**	**1**	**1**	**1**
SSH	**1**	**1**	**1**	**1**	**1**	**1**	**1**
SHG	**2**	**2**	**1**	**1**	**3**	**3**	**3**
SSF	**2**	**1**	**1**	**1**	**1**	**1**	**1**
SCR	**3**	**1**	**1**	**2**	**1**	**2**	**2**
PCM	**1**	**1**	**1**	**1**	**1**	**1**	**1**

RESULTS AND DISCUSSION

Numerical taxonomy studies among OTUs (seven species of *Sida*) presented in the phenogram (Figure 1). There are three main clusters that appear on the phenogram. The first cluster shows the separation of OTU *S. acuta* from all OTUs at a distance of 0.30. The second cluster shows the separation of OTU *S. cordifolia* from OTU *S. glutinosa* and OTU *S. mysorensis* cluster at a distance between 0.20 until 0.25. The third cluster shows the separation of OTU *S. rhomboidea* from OTU *S. rhombifolia* and OTU *S. alnifolia* cluster at a distance that was close to 0.20. The first cluster shows that OTU *S. acuta* is separated from remaining species at a distance of 0.30 (Figure 1). This is because it has a distinctive morphological character. This plant has an acute leaf apex, oblong leaf circumscription, lawn green color in the petiole and the lateral stipule, burlywood color in the pedicel, and the calyx that covers the fruit and green almost tan color in stem. The separation between the second (sect. *Cordifoliae* and *Nelavaga*) and third (sect. *Sida*) clusters is at a distance that is close to 0.25. This separation is caused by twelve morphological characters including leaf base, leaf circumscription, leaf width near apex, petiole length, petiole color, lateral stipule color, pedicel color, pedicel length, color of calyx that covers the fruit, fruit pedicel color, awn tip , and stem color. The second cluster consists of OTU *S. glutinosa* and OTU *S. mysorensis* which are members of

the section *Nelavaga* and OTU *S. cordifolia* which are members of the section *Cordifoliae*. OTU *S. cordifolia* is separated from the members of the section *Nelavaga* at a distance between 0.20 and 0.25 due to several morphological characters, such as leaf apex, leaf circumscription, leaf length near the base, leaf width near the base, lateral stipule length, corolla length, corolla width, color of corolla, fruit pedicel length, presence of jointed in fruit pedicel, number of mericarp on fruit, and the presence of veins on the right and left radial mericarp. Meanwhile, all members of the third cluster consist of members of the section *Sida*, including OTU *S. rhombifolia*, OTU *S. alnifolia,* and OTU *S. rhomboidea*. In this observation, seven *Sida* species have several same morphological characters such as; the abaxial and adaxial leaf surface is pubescent, serrate leaf margin, folium simplex leaf, pubescent petiole surface, pair lateral stipules, the calyx is five numbered, pubescent calyx surface, calyx apex is acute, the calyx is lawn-green coloured, epicalyx is absent, axillar phyllotaxis, anther is yellow coloured, the corolla is five numbered and valvate aestivation, monoadelph stamen, polycoccus fruit, the calyx is five numbered and pubescent, an axillary spot of fruit pedicel, mericarp is a trigonous shape, pair awn, pubescent awn surface, single seed, glabrous seed surface, seed colour is black saddle brown, hilus spot in apex, shrubs, teres stem, and cambium is present. Among 70 morphological characters, there are 6 morphological characters that greatly affect the clustering of OTUs (the seven species of *Sida*). There are values greater than 0.20 or less than -0.20. The six morphological characters such as petiole color (PC 0.30), lateral stipule color (LSCR 0.30), color of the calyx that covers the fruit (CCF 0.30), color of fruit pedicel (CFP 0.30), stem color (SCR 0.30) and awn tip (TAW -0.45). Then, leaf circumscription (LC) and presence of epicalyx (PEC) which has an exact value of 0.20 indicates that both morphological characters are quite influential on the clustering of OTUs. The morphological character approach, which considers the characteristics of leaves, flowers, fruits, mericarps, seeds, and stems, was used to conduct the numerical taxonomy analysis of the seven *Sida* species. All of plant organs have an important role to distinguish between species but to determine *Sida* from remaining members of the Malvaceae, floral and seed features are the principal morphological traits. According , all of *Sida* species in the Malesia region have a yellow corolla. The problem is they appear to be very similar to one another at first glance. Therefore, to differentiate between species, the majority of taxonomists rely on the traits of the leaves and mericarp. Foliar researches such as Saibaba & Rao (22), Aworinde et al. (4), and also Khunnur & Kotresha (15) studied leaf venation and various leaf circumscription of several *Sida* species. The researches show the differences in leaf venation and circumscription between species and can be used as an identification reference. Mericarp or mericarpium is often used by taxonomists of the genus *Sida* in identifying a species, delimiting related taxa such as sections and species, or discovering to a new species or variety. Several studies such as; Yoshikawa et al. (29) released the species *Sida uniaristata* sp. nov. using the singular mericarpium awn character, Verdcourt (28) published the reviews the mericarpium of each varieties of *Sida rhombifolia* in East Africa, and Bharati (6) was published the reviews characteristics of various *Sida* species that are identified by mericarpium. Other traits also are seen in the color of the lateral stipule, petiole, and stem. All section *Sida* members (S. rhombifolia, S. rhomboidea, S. alnifolia) have a maroon or reddish color on lateral stipule, petiole, and stem. Petiole anatomy research of *Sida* by Olatunji and Bakare (8) shows that tanniniferous substances are responsible for red coloration. Regularly, color characteristics are important to be used in the identification of all plant species. Genus *Sida* has several sections including *Sida*, *Nelavaga*, *Cordifoliae* and *Distichifolia*. In 1966, *S. acuta*, *S. cordifolia*, *S. glutinosa* and *S. rhombifolia* were in section *Sida*. This has been published in Malesian Malvaceae Revised which was written by Borssum Waalkes. This shows that almost all species were formerly members of the section *Sida* before switching sections. *S. acuta* has been a member of the section *Distichifolia* since 2003 (Krapovickas, 2003).

Meanwhile, according to Fryxell (12). *S. cordifolia* is in the section Cordifoliae, and *S. glutinosa* is a synonym of *S. glabra* which this species belongs to the section *Nelavagae*. Section *Sida* contains three species of which two of them are considered by many taxonomists to be synonyms of *S. rhombifolia* itself. Sivarajan & Pradeep (23) in their publication described *S. alnifolia* and *S. rhomboidea*. The two species are not a synonym but closely related to *S. rhombifolia*. In this study, all three show differences in the own tip. *S. rhombifolia* has a retuse awn tip, *S. alnifolia* has a curved awn tip and *S. rhomboidea* has an obtuse awn tip. his own tip character is a differentiator that has a high value in principal component analysis. The different morphological characters were analyzed using PCA to find out the contribution value in the grouping of seven *Sida* species. The morphological character with the largest contribution or the most important role has a value greater than 0.20 or less than -0.20. The result shows in Figure 2. The greater value belongs to the awn tip that has -0,45. It shows that the character of mericarp is an important character to identify and see the diversity of the genus *Sida*. This is proven by two studies such as the identification of *Sida* species based on the mericarp such as Identification of Indian *Sida* through mericarp written by Bharati in 2015 and the discovery of *S. uniaristata* in 2019 by Yoshikawa et al. which is based on the one awn of a mericarp. As a heterogeneous and polyphyletic genus, *Sida* has undergone several reductions and resulted in 10 separate genera (1; 13; 8). Furthermore, there has been an infrageneric classification change in *Sida* species recently. Nomenclaturally, many species in this genus have synonyms and it cause confusion about the number of accepted species. Seeing this, taxonomic studies on the genus *Sida* continue to be carried out both phylogenetic and phenetic. This morphological data collection is expected to allow genus *Sida* to achieve the monophyletic status. In conclusion, *Sida* is a heterogeneous genus in the Malvaceae family of which there are seven species in Indonesia. *S. acuta*, *S. rhombifolia*, *S. alnifolia*, *S. rhomboidea*, *S. cordifolia*, *S. glutinosa* and *S. mysorensis* have many similarities and differences in morphological characteristics. These seven species are the member of section *Sida*, *Distichifolia*, *Cordifoliae*, and *Nelavaga* are divided into 3 groups, with mericarp as the main distinguishing tools which also often function as identification tools in this plant. Finally, this research is an attempt to provide numerical taxonomy data related to *Sida* spp. based on morphological characters which are expected to be useful for biosystematics and taxonomy in Indonesia.

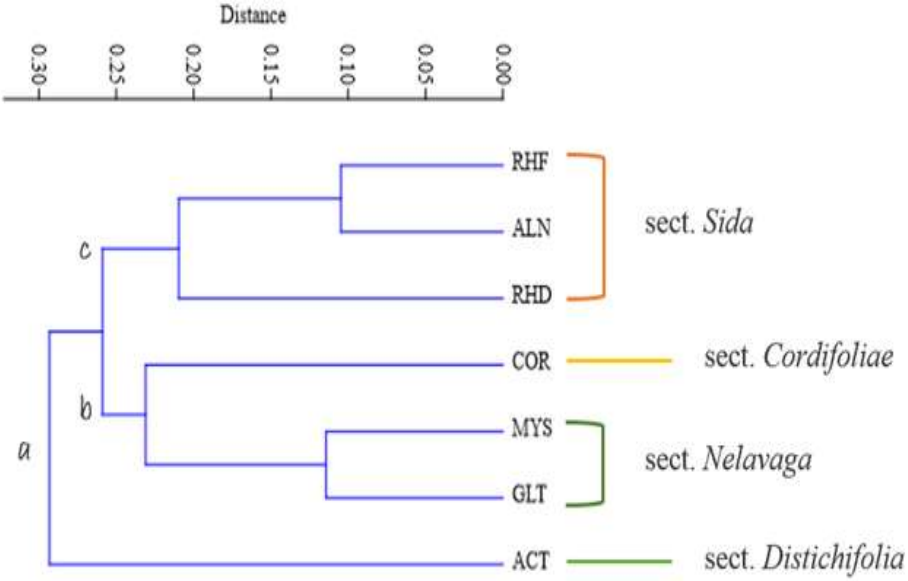

Figure 1. Phenogram of seven species of *Sida*.
(a. First cluster; b. Second cluster; c. Third cluster)

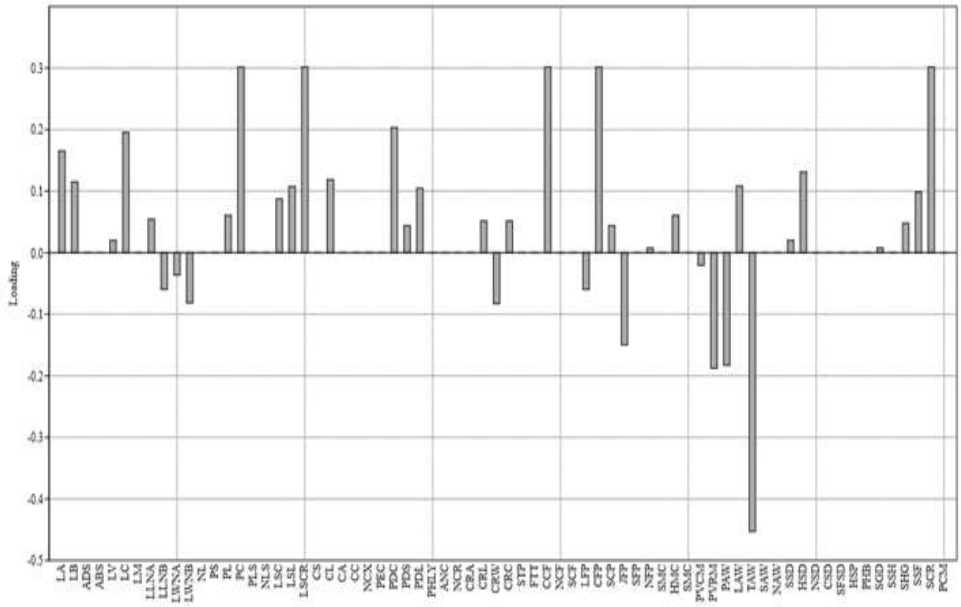

Figure 2. Loading plot of principal component for seven species of *Sida*

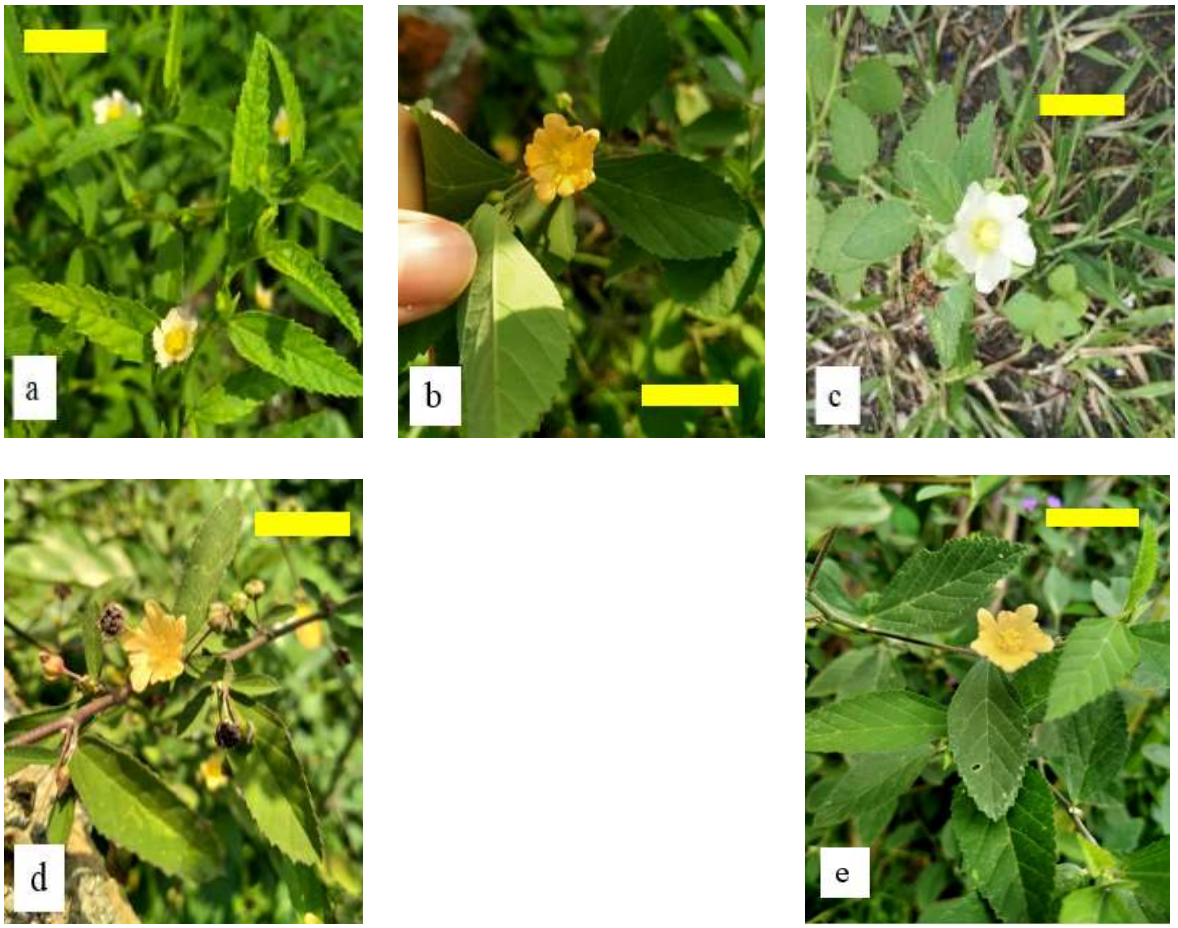

Figure 3. Morphology of *Sida* spp. a. *Sida acuta*, b. *Sida alnifolia*, c. *Sida cordifolia*, d. *Sida rhombifolia*, e. *Sida rhomboidea*. (Scale line: 3 cm)

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