


Research Article

 OPEN ACCESS

# Exploration and Identification Morphological Character of Torch Ginger in Solok District West Sumatera Province

Rachmad Hersi Martinsyah, Irfan Suliansyah, and Nugraha Ramadhan

*Department of Agrotechnology, Faculty of Agriculture, Andalas University, Padang, West Sumatera, 25163, Indonesia*

## Article Info

**Received:**  
26 February 2021

**Accepted:**  
28 February 2021

**Published:**  
10 March 2020

**Competing Interest:**  
The authors have declared that no competing interest exists.

**Corresponding Author:**  
Rachmad Hersi Martinsyah,  
Department of Agrotechnology,  
Faculty of Agriculture, Andalas  
University, Padang, West Sumatera, ,  
25163, Indonesia  
*Email: Rachmad\_hm@agr.unand.ac.id*

© 2021 The Authors. This is an open access article under the CC BY license.

## Abstract

Torch ginger is one of the spices used as food and traditional medicine which is rich in antioxidants. However, the existence of this plant is decreasing every year, especially in Solok district, West Sumatera province. So it is necessary to explore and identify the morphology of torch ginger in Solok district, West Sumatera province. The research was conducted by exploring and analyzing the similarity clusters with the Minitab 16 application. The purpose of this study was to collect germplasm and study the morphological characters and similarities of torch ginger plants in Solok district, West Sumatera province. The exploration results obtained 20 torch ginger accessions from 8 locations in the Solok district. Kinship or similarity level obtained 2 clusters. The differences between the two plant clusters were indicated by the similarities and differences in morphological characters in the stem color, leaf edge color, and flower stem color. The similarity value obtained is 0.22-1.00, which means the highest similarity is 100% and the lowest is 22%.

**Keywords:** character morphological, germplasm, exploration, torch ginger, similarity



## 1. Introduction

Indonesians have a lot of natural wealth that is high enough to be developed as a source of food and natural herbal medicine. During the Covid-19 pandemic, natural remedies were needed to maintain and increase immunity, such as spices. Torch ginger (*honje*) is a forest plant that has the potential as a spice. Judging from the chemical content of the torch ginger, it has the potential to maintain body immunity because there are active ingredients, namely flavonoids, polyphenols, saponins, alkaloids, steroids, and essential oils as antioxidants (Hudaya, 2010). According to Wahyuni et al. (2017) stated that the content of flavonoid compounds in the ethanol extract of torch ginger flower is thought to have the ability to increase the immunomodulatory system. Immunomodulators are substances or drugs that can modulate the function and activity of the immune system.

With a rich content of active ingredients as antioxidants, torch ginger is often used as vegetables, fresh vegetables, and even as a spice mixture in cooking. According to Sukandar et al. (2011) stated that torch ginger flowers have been used in the culinary world since time immemorial. Apart from being food, torch ginger is often used by the Baduy tribe as a substitute for soap in keeping their bodies clean because using industrial products is a prohibition. The results of the research by Virgianti and Shofi. (2015) that a solution of torch ginger extract or more than 15% is very effective as an antioviposition of the *Aedes aegypti* mosquito. Besides torch ginger flower extract can also repel and kill mosquitoes in a short time, especially killing *Culex* and *Aedes aegypti* mosquitoes (Astuti, 2011; Gurning et al. 2015). So that the torch ginger flower extract has the potential to be used as an anti-mosquito lotion ingredient. Besides, torch ginger flower extract can be used as a dye in lipstick preparations and meets the quality requirements (Adliani et al. 2012). However, the utilization of torch ginger has not been maximized, especially in the Solok district of West Sumatra.

Torch ginger can grow well in the lowlands to the highlands in Indonesia however, the existence and availability of that plants are decreasing every year, especially in the Solok Regency area of West Sumatra. The reduced existence and availability of torch ginger is because the community knows the torch ginger is a forest plant and is less useful so it is often considered a weed. Besides that, the conversion of land into roads and settlements can lead to reduced availability of

torch ginger. The initial step for the preservation and development of natural food plants and herbal medicines is the exploration of germplasm to protect and inventory.

## 2. Materials and Methods

### A. Time and place of research

The research was conducted in Solok district, West Sumatra province. The research was conducted from August to November 2020.

### B. Research implementation

This research was carried out by the exploration method of torch ginger in the Solok Regency area with three stages, namely the initial survey, location determination and survey, observation of morphological characters. This research was carried out by the exploration method of torch ginger in the Solok Regency area with three stages, namely the initial survey, location determination and survey, observation of morphological characters. Character observation parameters refer to the guidelines for the conduct of test for distinctness, uniformity, and stability of ginger (*Zingiber officinale* Rosc.)(UPOV. 1996) and plant taxonomy (Schizophyta, Thallophyta, Bryophyta, Pteridophyta) (Gembong. 2011). The characters observed were 14 namely plant height, stem diameters, number of stems, stem color, leaf length, leaf width, number of leaves, leaf tip shape, leaf base shape, leaf edge shape, leaf edge color, leaf color, flower stem color, flower color. Diversity analysis is carried out based on morphological characters that are qualitative and quantitative, then the data is converted into binary data with data scoring based on predetermined criteria. Furthermore, binary data in cluster analysis is used to analyze the similarity based on the above morphological properties. Cluster analysis is one of the multivariate (stratified) statistical techniques to identify a group of objects that have similarities with certain properties that can be separated from other object groups. The similarity is expressed as a percentage, 100% which means the same or perfect while 0% means completely different. Similarity matrix is made dendrogram using the Minintab 16 application.

## 3. Results and Discussion

### A. Exploration of Torch Ginger

The results of the exploration were found 20 accessions of torch ginger from 8 locations in Solok district, West Sumatra province. The accessions and locations found are in table 1.

**Table 1.** Accessions and locations of torch ginger found in the survey results

No	Location	Accessions	Altitude
1	Batang Burus	BB1	997 m dpl
		BB2	997 m dpl
		BB3	944 m dpl
		BB4	1200 m dpl
		BB5	1209 m dpl
2	Koto Gadang Guguk	KGG1	838 m dpl
3	Cupak	C1	569 m dpl
4	Kubung	K1	454 m dpl
5	Aripan	A1	632 m dpl
		A2	646 m dpl
6	Singkarak	S1	618 m dpl
		S2	431 m dpl
7	Danau Kembar	DK1	1595 m dpl
		DK2	1497 m dpl
		DK3	1553 m dpl
		DK4	1575 m dpl
8	Alahan Panjang	AP1	1566 m dpl
		AP2	1543 m dpl
		AP3	1573 m dpl
		AP4	1554 m dpl

### B. Characters quantitative

The identified plant heights were found to be two groups of plant height, namely 4 m <.....<5 m and 5 m <.....<6 m. The criteria for plant height 4 m <.....<5 m were found in accessions DK1, BB2, K1, DK4, AP2 while 5 m <.....<6 m criteria were found in accessions BB1, BB3, BB4, BB5, KGG1, C1, A1, A2, S1, S2, DK2, DK3, AP1, AP3, AP4 (Table 1). The number of leaves was identified and obtained 2 criteria, namely the number of leaves 10<...<15 and 15<...<20. The criteria for the number of leaves 10<...<15 were

obtained in accessions DK1, BB2, K1, DK4, AP2 while criteria for the number of leaves 15<...<20 were obtained for accessions BB1, BB3, BB4, BB5, KGG1, C1, A1, A2, S1, S2, DK2, DK3, AP1, AP3, AP4 (Table 1). Plant height and number of leaves have the same accession group, which means that plant height has a positive correlation. The number of leaves is related to plant height, because the higher the plant, the more leaves are formed (Haryadi et al. 2015).

**Table 2.** characters quantitative

Accessions	Variable			
	Plant Heights (m)	Number of Leaves	Leaf Length (cm)	Leaf Width (cm)
BB1	5.3	15	56.5	17.7
BB2	4.6	13	52.6	15.5
BB3	5.6	17	57.6	18.6
BB4	5.0	15	55.0	16.4
BB5	5.1	15	55.2	16.5
KGG1	5.0	15	54.4	16.3
C1	5.4	16	57.3	18.0
K1	4.8	13	53.2	15.7
A1	5.5	17	57.5	18.2
A2	5.2	15	56.2	17.0
S1	5.2	15	56.2	17.4
S2	5.3	16	56.2	17.6
DK1	4.3	12	52.4	15.3
DK2	5.6	17	57.5	18.4
DK3	5.1	15	55.2	16.7
DK4	4.2	12	50.5	15.3
AP1	5.0	15	54.4	16.1
AP2	4.0	10	50.3	15.2
AP3	5.0	15	54.7	16.3
AP4	5.2	15	55.5	17.3

In the identified leaf length, one criteria were found for leaf length and leaf width, namely 50 cm <... <60 cm and 15 cm <... <20 cm (Table 1). Leaf length and leaf width are very influential in determining leaf area. According to Febjislamy et al. (2017) stated that the longer and wider the leaves, the wider the leaves will be, this is one of the factors determining the quantity of cat's whiskers plant production if it is also supported by the number of leaves. The diversity in the appearance of the identified quantitative characters is

### C. Character qualitative

The color of the stem that has been identified as two stem colors, namely green and reddish-green.

thought to be due to the influence of environmental factors such as humidity, light intensity, and soil fertility. Based on the research results of Setiawan. (2019) stated that honje plants at 65% shade produced the highest plants, the highest number of leaves, and chlorophyll content compared to 75% and 0% shade. This is also supported by Fahrudin's statement. (2009) stated that the N, P, and K nutrients in the soil can affect the number of plant leaves.

The accessions that showed reddish green stem color were BB1, BB3, and KGG, while accessions that

showed the overall green stem color were BB2, BB4, BB5, C1, K1, A1, A2, S1, S2, DK1, DK2, DK3, DK4, AP1, AP2, AP3 and AP4 (Table 2). In the parameter of leaf tip and leaf base, all accessions showed the same shape, namely the pointed leaf tip and the blunt base of the leaf. Leaf color and leaf color were observed were young but perfectly open leaves. In the leaf color, there are 2 criteria, namely the whole green leaf and green above and red below. Accessions that show the overall green leaf color are

BB2, BB4, BB5, C1, K1, A1, A2, S1, S2, DK1, DK2, DK3, DK4, AP1, AP2, AP3, and AP4 (Table 2). Meanwhile, the green leaves above and below the red are the accessions of BB1, BB3, and KGG. In the leaf edge color, there are 2 criteria, namely green and red, for accessions that show red leaf edge, namely BB1, BB3, and KGG, while for green leaf edge color are accessions BB2, BB4, BB5, C1, K1, A1, A2, S1, S2, DK1, DK2, DK3, DK4, AP1, AP2, AP3, and AP4 (Table 2).

**Table 2.** Character qualitative

Accessions	Variable						
	Stem Color	Leaf Tips	Leaf Base	Leaf Color	Leaf edge Color	The Color of The Flower Stalk	Flower Color
BB1	Reddish Green	Pointed	Blunt	Green above red below	Red	Red	Pink
BB2	Green	Pointed	Blunt	Overall green	Green	Green	Whitish pink
BB3	Reddish Green	Pointed	Blunt	Green above red below	Red	Red	Pink
BB4	Green	Pointed	Blunt	Overall green	Green	Green	Whitish pink
BB5	Green	Pointed	Blunt	Overall green	Green	Green	Whitish pink
KGG	Reddish Green	Pointed	Blunt	Green above red below	Red	Red	Red
C1	Green	Pointed	Blunt	Overall green	Green	Green	Pink
K1	Green	Pointed	Blunt	Overall green	Green	Green	Pink
A1	Green	Pointed	Blunt	Overall green	Green	Green	Pink
A2	Green	Pointed	Blunt	Overall green	Green	Green	Pink
S1	Green	Pointed	Blunt	Overall green	Green	Green	Pink
S2	Green	Pointed	Blunt	Overall green	Green	Green	Pink
DK1	Green	Pointed	Blunt	Overall green	Green	Green	Red
DK2	Green	Pointed	Blunt	Overall green	Green	Green	Pink
DK3	Green	Pointed	Blunt	Overall green	Green	Green	Pink
DK4	Green	Pointed	Blunt	Overall green	Green	Green	Pink
AP1	Green	Pointed	Blunt	Overall green	Green	Green	Pink
AP2	Green	Pointed	Blunt	Overall green	Green	Green	Pink
AP3	Green	Pointed	Blunt	Overall green	Green	Green	Pink
AP4	Green	Pointed	Blunt	Overall green	Green	Green	Pink

The color of the flower stalk shows 2 criteria, namely green flower stalks and reddish-green / red color of flower stalks. Green flower stalks are indicated by accessions BB2, BB4, BB5, C1, K1, A1, S1, S2, DK1, DK2, DK3, DK4, AP1, AP2, and AP4. Meanwhile, the accessions BB1, BB3, and KGG showed reddish-green / red flower stalks. In the identified flower color characters, there are 3 criteria, namely red, pink, and whitish-pink flowers. Red flowers are indicated by accessions KGG and DK1, for

pink flowers are indicated by accessions BB1, BB3, C1, K1, A1, A2, S1, S2, DK2, DK3, DK4, AP1, AP2, AP3, and AP4. In BB4, BB5, and BB2 accessions, the flowers show whitish pink color.

The qualitative character of torch ginger shows diversity, this is thought to be influenced by genetic factors. Genetics is a factor that has been passed down by the parents. According to Syukur et al. (2012) stated that qualitative characters are generally influenced by genetics, namely simple and few genes.

#### D. Cluster analysis

From the results of cluster analysis, it was found that the similarity value of accessions obtained by torch ginger plants was quite high. The highest similarity matrix values were found in accessions BB1 and BB3, BB4 and BB5, C1 and A1, A2, S1, S2, DK2, DK3,

AP1, AP3, AP4 and K1 and DK4, AP2. The similarity value shown is 100, which means that the similarity is 100% the same. While the lowest matrix values are BB2 and K1. The similarity value shown is 22.54, which means that 22.54% are the same.

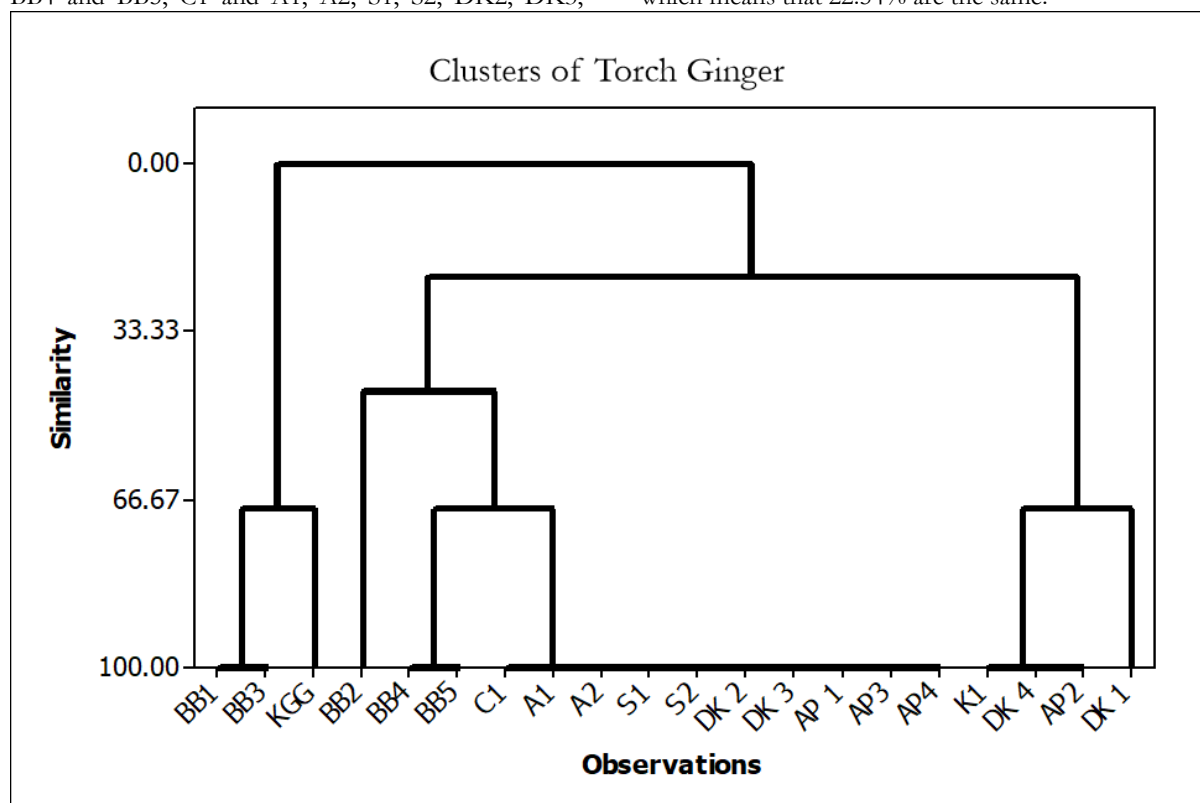


Figure 1. Cluster dendrogram of Torch Ginger

The farther the kinship relationship, the smaller the success of the crossing, but the possibility of obtaining superior genotypes is greater if the crosses are successfully obtained (Julisaniah *et al.* 2008). Based on the dendrogram in Figure 1, accession plants are divided into 2 groups (clusters). The first group consisted of BB1, BB3, and KGG. Whereas group 2

consisted of BB2, BB4, BB5, C1, A1, A2, S1, S2, DK2, DK3, AP1, AP3, AP4, K1, DK4, AP2, DK1 accessions. The first cluster has the same diversity, namely in the character of the stem color, leaf edge color, and flower stem color as well as what differentiates it from the second cluster.

#### 4. Conclusions

Torch ginger from the exploration obtained 20 plant accessions in 8 locations. The kinship relationship of torch ginger accessions shows that there are accessions that have close and distant relationships. Based on the

coefficient matrix value obtained is in the value of 0.22 - 1.00, the genetic diversity of torch ginger in the Solok district has high diversity because the coefficient matrix distance is very large.

## Acknowledgments

The author thanks the Institute for Community Service Research (LPPM), Andalas University for financing this research. DIPA UNAND funding sources in 2020 with research contract no: T / 23 / UN.16.17 / PT.01.03 / IS-RDP / 2020.

## References

- [1] Adliani, N., Nazliniwaty, D., Purba. 2012. Formulasi Lipstik Menggunakan Zat Warna Dari Ekstrak Bunga Kecombrang (*Etingera elatior* (Jack) R.M.Sm). *Journal of Pharmaceutics and Pharmacology*. Vol 1(2):87-94.
- [2] Astuti, M.A.W.2011. Uji bunuh ekstrak bunga kecombrang (*Nicolaia speciose* (Blume) Horan.) terhadap larva nyamuk *Culex quinquefasciatus* Say. Skripsi. Universitas Atma Jaya Yogyakarta.
- [3] Fahrudin, F. 2009. Budidaya caisim (*Brassica juncea* L.) menggunakan ekstrak the dan pupuk kascing. Skripsi. Universitas Sebelas Maret. Surakarta.
- [4] Febjislamy, S., Maya, M., Ani, K., Yudiwanti, W. 2017. Karakter agronomi dan kadar sinenetin beberapa aksesi tanaman kumis kucing (*Orthosiphon stamineus*). *J. Hort. Indonesia*, Vol 9 (3):206-215.
- [5] Guming, D. M., Marsaulina, I., Wirsal, H. 2015. Efektivitas Ekstrak Bunga Kecombrang (*Etingera elatior*) Sebagai Repellent Nyamuk *Aedes aegypti*. *Jurnal Lingkungan dan Kesehatan Kerja*. Vol 4 No.1 Hal :1-11.
- [6] Haryadi, D., Husna, Y., Sri, Y. 2015. Pengaruh pemberian beberapa jenis pupuk terhadap pertumbuhan dan produksi tanaman kaliaan (*Brassica alboglabra* L.). *Jom Faperta*, Vol 2(2).
- [7] Hudaya, A. 2010. Uji Antioksidan dan antibakteri ekstrak air bunga kecombrang (*Etingera elatior*) sebagai pangan fungsional terhadap *Staphylococcus Aureus* dan *Escherichia Coli*. Skripsi. Universitas Islam Negeri Syarif Hidayatullah. Jakarta. 83 hal.
- [8] Julisaniyah, N.I., Liliek, S., Arifin, N.S. 2008. Analisis kekerabatan mentimun (*Curcumis sativus* L.) menggunakan metode RAPD-PCR dan isozim. *Biodiversitas* 9 (2): 99-102.
- [9] Setiawan, E. 2019. Keragaan pertumbuhan tanaman honje (*Etingera elatior*) pada beberapa level kerapatan naungan. *Jurnal Agro* vol 6(1):24-34.
- [10] Sukandar, D., Nani, R., Ira, J., Anna, M., Adeng, H. 2011. Uji Aktivitas antioksidan ekstrak kasar air bunga kecombrang (*Etingera elatior*) sebagai bahan pangan fungsional. *Jurnal Kimia Terapan Indonesia* vol 13(1).
- [11] Syukur, M., S. Sujiprihati, R. Yunianti. 2012. Teknik Pemuliaan Tanaman. Jakarta (ID): Penebar Swadaya.
- [12] [UPOV] Geneva. 1996. Guidelines For The Conduct of Tests For Distinctness, Uniformity and Stability Of Ginger (*Zingiber officinale rosc.*). International Union For The Protection Of New Varieties Of Plants.
- [13] Virgianti, D. P., Shofi, M. 2015. Efektifitas ekstrak daun kecombrang (*Etingera elatior*) sebagai antiovipisisi nyamuk *aedes aegypti*. *Jurnal Kesehatan Tunas Husada*. Vol 14(1):108-112.
- [14] Wahyuni, Muh.Hajrul, M., Adryan, F., Muhammad, I.Y., Sahidin. 2017. Potensi Imunomodulator ekstrak etanol buah kecombrang (*Etingera elatior* (Jack) R.M. Smith) Terhadap Fagosit Makrofag Mencit Jantan Galur BALB/C. *Jurnal Farmasi UNSRAT*, Vol 6 (3): 350-355. Anggraini, Fita, Agus Suryanto, dan Nurul Aini. 2013. Sistem Tanam dan Umur Bibit Pada Tanaman Padi Sawah (*Oryza sativa* L.) Varietas Inpari 13. *Jurnal Produksi Tanaman* Vol.1 No.2. Universitas Brawijaya.