

**AUTENTIKASI *Zingiber album* Nurainas TUMBUHAN ENDEMIK
SUMATERA MENGGUNAKAN PENANDA MOLEKULER *Internal
Transcribed Spacer (ITS)***

SKRIPSI SARJANA BIOLOGI

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**JURUSAN BIOLOGI
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS ANDALAS
PADANG, 2021**

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**Skripsi ini diajukan sebagai salah satu syarat
Untuk memperoleh gelar Sarjana Sains Bidang Studi Biologi**

OLEH:

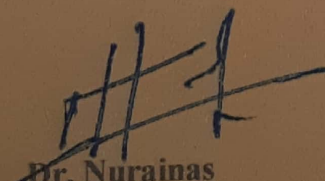
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ABSTRAK

Penelitian tentang Autentikasi *Zingiber album* menggunakan Penanda Molekuler *Internal Transcribed Spacer* telah dilakukan dari bulan Januari hingga Mei 2021 di Herbarium ANDA dan Laboratorium Genetika dan Biomolekuler Jurusan Biologi Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Andalas, Padang. Penelitian ini bertujuan untuk mengetahui karakter molekuler *Zingiber album* dan hubungan kekerabatan *Zingiber album* dengan kerabat dekatnya menggunakan penanda molekuler *Internal Transcribed Spacer* (ITS). Penelitian ini menggunakan metode survei dan eksperimen. Berdasarkan hasil penelitian didapatkan panjang sekuen *Zingiber album* 695 bp dan ditemukan 8 karakter basa yang berbeda dari kerabat dekatnya pada posisi 182, 229, 321, 449, 512, 535, 544, 594 dan hubungan kekerabatan *Zingiber album* dengan kerabat dekatnya membentuk 2 kluster dan *Zingiber album* berada pada kluster 1 bersama dengan *Zingiber officinale* dan 27 *Zingiber* lainnya serta memiliki *sister taxa* dengan *Zingiber sulphureum* dan *Zingiber acuminatum*.

Kata kunci: Autentikasi, ITS, Molekuler, *Zingiber album*



ABSTRACT

Research on *Zingiber album* Authentication using Molecular Markers Internal Transcribed Spacer was conducted from January to May 2021 at the ANDA Herbarium and the Genetics and Biomolecular Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, Andalas University, Padang. This study aims to determine the molecular character of *Zingiber album* and filogenetik *Zingiber album* and close relatives using Internal Transcribed Spacer (ITS) molecular markers. This study used survey and experimental methods. Based on the results of the study, the sequence length of *Zingiber album* was 695 bp and found 8 different base characters from close relatives at positions 182, 229, 321, 449, 512, 535, 544, 594 and filogenetik *Zingiber album* with close relatives formed 2 clusters and *Zingiber album* was at cluster 1 together with *Zingiber officinale* and 27 other *Zingiber* and has *sister taxa* with *Zingiber sulphureum* and *Zingiber acuminatum*



- Frederick, M.A., Brent, R., Kingston, R.E., Moore, D.D., Seidman, J.G., Smith, J.A. & Struhl, K. (2003) *Current Protocols in Molecular Biology*. Massachusetts, John Wiley & Sons, Inc.
- Hajibabaei M *et al.* 2006. A minimalist barcode can identify a specimen whose DNA is degraded. *J Compilation Blackwell Publishing*. 6: 959-964.
- Hall, T. A. 1999. BioEdit: A User-Friendly Biological Sequence Alignment Aditor and Analysis Program for Windows 95/98/NT. *Nucleic Acid Symposium Series*. 41: 95-98
- Hebert, Paul D. N. And Gregory, T. Ryan. 2005. The Promise of DNA Barcoding for Taxonomy. *Systematic Biology*. 54(5):852–859.
- Hershkovitz MA, Leipe DD. 1998. *Phylogenetic Analysis*. New York: John
- Hidayat T, Yukawa T, Ito M. 2005. Molecular phylogenetics of subtribe *Aeridinae* (*Orchidaceae*): Insights from plastid *matK* and nuclear ribosomal ITS sequences. *J Plant Res*. 18:271-284.
- Irmawati. 2003. Perubahan Keragaman Genetik Ikan Kerapu Tikus Generasi Pertama Pada Stok Hatchery. *Thesis tidak diterbitkan*. Bogor: Institut Pertanian Bogor.
- IPNI. 2021. The International Plant Name Index. <https://www.ipni.org/n/798355-1> Diakses pada 29 Mei 2021.
- KBBI. 2021. Kamus Besar Indonesia. Offline. Diakses 17 Juni 2021.
- Jamil, N., M. Rizman-Idid and H. Ibrahim. 2014. Molecular Phylogenetics of *Alpinia* in Peninsular Malaysia. Master Thesis, University of Malaysia. <http://studentsrepo.um.edu.my/4935/>. Diakses 18 Juni 2021
- Jorgensen RA, Cueller RE, Thomson WF, Kavanagh TA. 1987. Structure and variation in ribosomal RNA gene of *Pea*. *Plant Mol. Biol*. 8:3-12.
- Kress WJ, Liu AZ, Newman M, Li QJ. 2005. The Molecular Phylogeny of *Alpinia* (*Zingiberaceae*): A complex and polyphyletic genus of gingers. *American Journal of Botany* 92: 167-178.
- Kress WJ, Prince LM, Williams KJ. 2002. The phylogeny and a new classification of ginger (*Zingiberaceae*): Evidence from molecular data. *American Journal of Botany* 89: 1682-1696.
- Kress, WJ. 2017. Plant DNA barcodes: Applications today and in the future. *Journal of Systematics and Evolution*. 55: 291–307.
- Larsen K, Ibrahim H, Khaw SH, Saw LG. 1999. Ginger of Peninsular, Malaysia, and Singapore. *Natural History Publication (Borneo)*, Kota Kinabalu, Malaysia.

- Lestari, Cinthya. 2012. Analisis Biomolekuler Gen *Internal Transcribed Spacer* (ITS) dalam Studi Filogenetik *Zingiber Loerzingii* Valetton (Zingiberaceae). Skripsi. Sarjana Biokimia. Fakultas Matematika dan Ilmu Pengetahuan Alam Institut Pertanian Bogor. Bogor.
- Li, W., dan Graur, D. (1991): *Fundamental of Molecular Evolution*. Sinauer Associates.Inc.
- Li, M., H. Cao, P.P.H But, P.C. Shaw. 2011. Identification of Herbal Medicinal Material Using DNA Barcodes. *J Syst Evol* 49(3): 271-283.
- Moller M. Cronk Q.C.B. 1997. Origin and Relationships of Saintpaulia (*Gesneriaceae*) Based on Ribosomal DNA Internal Transcribed Spacer (ITS) Sequence. *AM J Bot.* 84: 956-965
- Mondini L, Noorani A, Pagnotta MA. 2009. Review: Assessing Plant Genetic Diversity by Molecular Tools. *Diversity* 1:19-35.
- Muladno. 2002. *Teknologi Rekayasa Genetika*. Bogor: Pustaka Wirausaha Muda.
- NCBI. 2017. National Center for Biological Information. <http://www.ncbi.nlm.nih.gov/>. Terakhir diakses pada 25 Mei 2021
- Nurainas, N. Arbain, D. 2017. A New Species And Record Of Zingiberaceae From Sumatera Indonesia. *Taiwania* 62(3): 294-298.
- Nurainas. 2007. *Keanekaragaman Jenis Jahe-Jahean (Zingiberaceae) Liar Pada Kawasan Cagar Alam Rimbo Panti Pasaman Sumatera Barat*. Laporan Penelitian Dosen Muda. Direktorat Jenderal Pendidikan Tinggi (Tidak Dipublikasi)
- Pradipta, Y. 2012. Studi Molekuler untuk Menentukan Kekerabatan Genus *Zingiber* Varietas *Zerumbet* Skripsi. Sarjana Biokimia. Fakultas Matematika dan Ilmu Pengetahuan Alam Institut Pertanian Bogor. Bogor.
- Qin, Y., Meihui, L., Young, C., Ya, G. and Wei, Z. 2017. Molecular Thresholds of ITS2 and Their Implication for Molecular Evolution and Species Identification in Seed Plants. *Springer-Nature* 7:1-7.
- Rahayu, D A., & Nugroho E D. 2005. *Biologo Molekuler dalam presepektif konservasi*. Yogyakarta. Indonesia: Plantaxia
- Saitou, N dan M Nei 1987. The neighbor-joining method: a new method for reconstructing phylogenetic trees. *Mol. Biol. Evol.* 4 (4): 406-425
- Saitou, N and Imanishi. 1989. Relative Efficiency of the Fitch-Margolish, Maximum-Parsimony, Maximum-likelihood, Minimum Evolution and Neighbour-Joining

Methods of Phylogenetic Tree Construction in Obtaining the Correct Tree. *Mol. Biol. Evol.* 6 (5): 514-525

Soltis DE, Soltis PS. 1998. Choosing an Approach and an Appropriate Gene for Phylogenetic Analysis. Di dalam: Soltis DE, Soltis Ps, Doyle JJ, editor. *Molecular Systematics of Plants II: DNA Sequencing*. Massachusetts: Kluwer Academic Publishers

Syafaruddin dan Trijoko Santoso. 2011. Optimasi Teknik Isolasi dan Purifikasi DNA yang Efisien dan Efektif pada Kemiri Sunan (*Reutalis trisperma* (Blanco)) Airy Shaw. *Jurnal Littri*. Vol. 17(1), Maret 2011

Thompson JD, Gibson TJ, Plewniak F, Jeanmougin F, Higgins DG (1997). The Clustal-X windows interface: flexible strategies for multiple sequence alignment aided by quality analysis tools. *Nucleic Acids Res.* 25: 4876- 4882.

Tudge C. 2000. *The Variety Of Life*. New York: Oxford University Press.

Ubaidillah R, Sutrisno H. 2009. *Pengantar Biosistemik: Teori dan Praktik*. Jakarta: LIPI Press.

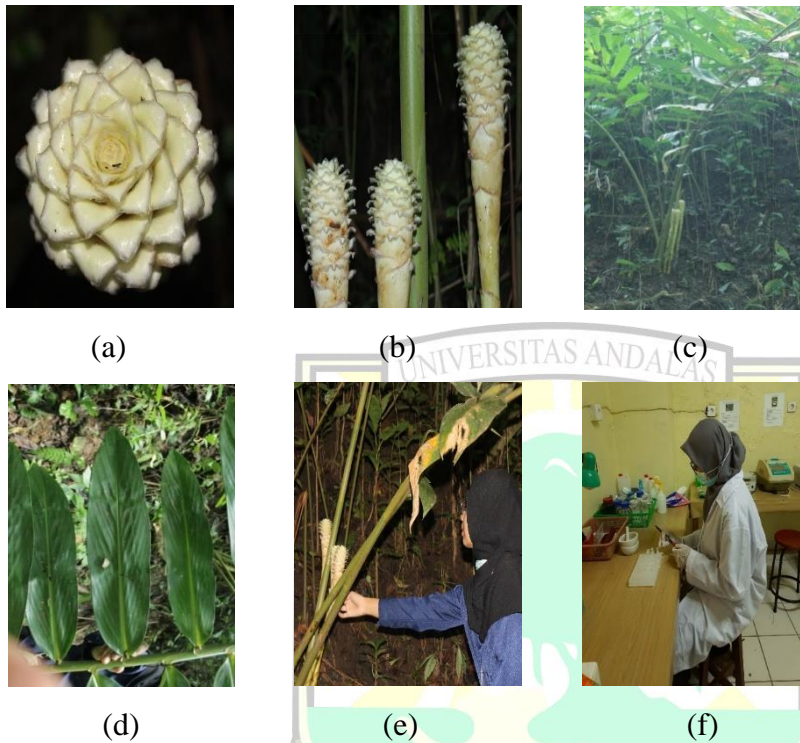
Valentini A, Pompanon F, Taberlet P. 2009. DNA Barcoding for Ecologists. *Trends in Ecology and Evolution* (24)2:110-117.

White TJ, Bruns T, Lee S, Taylor J.1990. Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenies. Di dalam: MA Innis, DH Gelfand, JJ Sninsky, TJ White, editor. *PCR protocols: A Guide to Methods and Applications*. San Diego: Academic Press.

Woodland, W. D.1999. *Contemporary Plant Systematics Second Edition*. Andrews Universit Press. Berrien Springs. Michigan. United States Of America.

LAMPIRAN

Lampiran 1. Foto pengoleksian *Zingiber album* di lapangan



Keterangan

- (a). Susunan braktea dilihat dari atas (d). Bentuk daun *zingiber album*
(b). Susunan braktea dari samping (e). Pengoleksian sampel di lapangan
(c). Habitat ditemukan *zingiber album* (f). Pengolahan sampel di laboratorium

Lampiran 2. Hasil Contiq Sekuen Forward dan Sekuen Reverse

