



Zingiberaceae in Mt. Bagalbal, Kalatungan Range, Lourdes, Valencia City, Bukidnon, Philippines

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Received: February 12, 2020, Accepted: April 14, 2020, Published: April 14, 2020.

ABSTRACT

It is quite that Mindanao, the second largest island in Philippines is poorly known and understudied. The study aimed to identify and described morphologically family Zingiberaceae; determine the distribution of family Zingiberaceae and compare the affinity of the species through cluster analysis. Findings of the study revealed a total of 14 species belonging to two subfamily, two tribe and seven genus. Morphological characters of species are far more superior proven by the species to fall to their particular genera of which they are associated and it implies that the morphological descriptions agree with the numeric analysis. Furthermore, Zingiberaceae species distribution is generally scattered and dwells on the elevation of 900-1600 meters asl. Thus, monitoring of Zingiberaceae as indicator species should be conducted to assess the environmental conditions and conservation status of the forests in Mindanao.

Keyword: *Zingiberaceae, distribution, cluster analysis*

INTRODUCTION

Zingiberaceae are scattered all over tropical regions like Philippines which is relatively unexplored. The distribution of species into different zones in the tropics is distinguished by their various characters, which most likely are the result of evolutionary changes and their adaptation to several climatic, geographic and topographic conditions. There are number of other high mountains in Mindanao which warrant exploration, because the possibility of finding species new to science is relatively high, the distribution knowledge of species will become better known (Naïve, 2017).

One part of Kalatungan Range of Baranagy Lourdes known as Mt. Bagalbal, 22 km away from national high way and has a coordinate of 7o56'01.8'' N 124o56'07.6'' and has an elevation of 1500 meters asl. Mt. Bagalbal provides diverse flora and fauna amongst its vegetation and helps provide habitats for wild life.

The ginger family, Zingiberaceae, is a monocot family and is the largest of 8 families in order Zingiberales. According to Lamb et al. (2013), the family consists of more than 1500 species in 53 genera, which can be mostly found in tropical forest. Furthermore, Philippine Zingiberaceae are one of the least known group in our rapidly expanding recent knowledge of the family (Funakoshi and Fujiyama, 2004) should be crypto magically explored.

MATERIALS AND METHODS

A. Entry Protocol and Research Design

Prior to conduct the study, a formal letter was given to the school head, Barangay Captain, Forest Ranger official and the

tribal mandatory of Lourdes, Valencia City, Bukidnon, Philippines of asking permission to have a research to be conducted in Mt. Bagalbal, Kalatungan Range, Lourdes, Valencia City, Bukidnon, Philippines.

B. Collections of Samples

The study was conducted at Mt. Bagalbal, Kalatungan Range, Lourdes, Valencia City, Bukidnon, Philippines. Transect walk method was employed. The collected plants was pressed for herbarium specimens and parts of the flowers and fruits were also being preserved in 70% ethanol for spirit collection. A taxonomic characters of gingers was also observed for scientific study.

C. Numeric Analysis of Characters

The Bray-Curtis Cluster Analysis was utilized for this purpose using Biodiversity Professional v.2.0 software. Cluster analysis was done by giving weights on the plant characteristics. Data were encoded for computer processing as such it sorts out characters, over all similarly producing phenogram that is dendrogram of phonetic relations of the species collected.

D. Ex situ Conservation

One live representative specimen of each species were collected during sampling. Collected samples were collected and transferred to Lourdes Integrated School Garden. All for propagation and conservation purposes. Prior to collection, a section rhizome approximately 15-20 cm long, with at least one developed leafy shoots and presence of several growth buds was cut away from plant then placed in a pot and then planted and monitored.

RESULTS AND DISCUSSION

There was a total of 14 species belonging to Family Zingiberaceae recorded from Mt. Bagalbal Kalatungan Range, Bukidnon, Philippines namely: *Alpinia haenkei* C.Presl, *Curcuma longa* Linnaeus, *Curcuma Zedoaria* Roscoe, *Etilingera cf. alba* (Blume) A. D. Poulsen, *Etilingera elatior* (Jack) R. M. Sm, *Etilingera philippinensis* (Ridl.) R.M.Sm, *Etilingera pubimarginata*, *Etilingera sp.*, *Hedychium philippinense* K.Schum, *Hornstedtia lophophore* Plagiostachys sp., *Zingiber Spectabile* Griff, *Zingiber Officinale* Roscoe, and *Zingiber sp.* are only separated into two (2) subfamilies namely; Zingiberoideae and Alpinioideae. There are also two (2) tribes that separate the collected samples named Zingibereae and Alpinieae. The collected sample has only seven (7) Genus called *Alpinia*, *Curcuma*, *Etilingera*, *Hedychium*, *Hornstedtia*, *Plagiostachys*, and *Zingiber*. Brief descriptions or short notes, where appropriate, are provided below.

Table 1. List of ginger species found in Mt. Bagalbal, Kalatungan Range, Bukidnon, Philippines.

No.	Tribe	Genus	Species
1	Alpinieae	Alpinia	1
2		Hedychium	1
3		Hornstedtia	1
4		Plagiostachys	1
5		Etilingera	4
6	Zingibereae	Curcuma	2
7		Zingiber	4
TOTAL	2	7	14

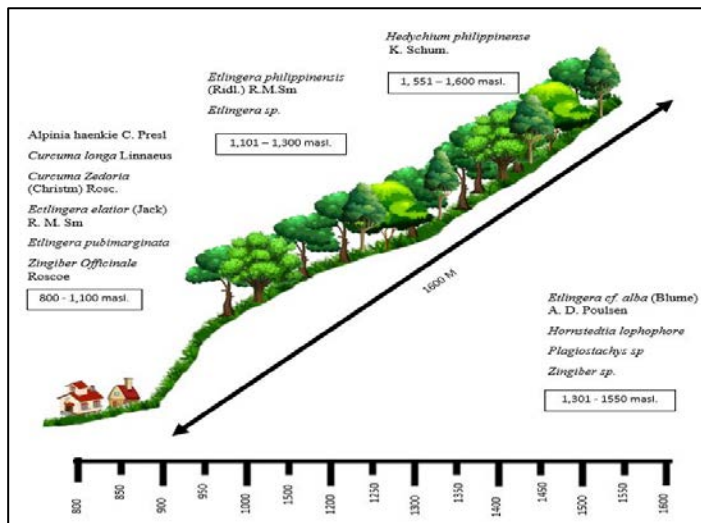
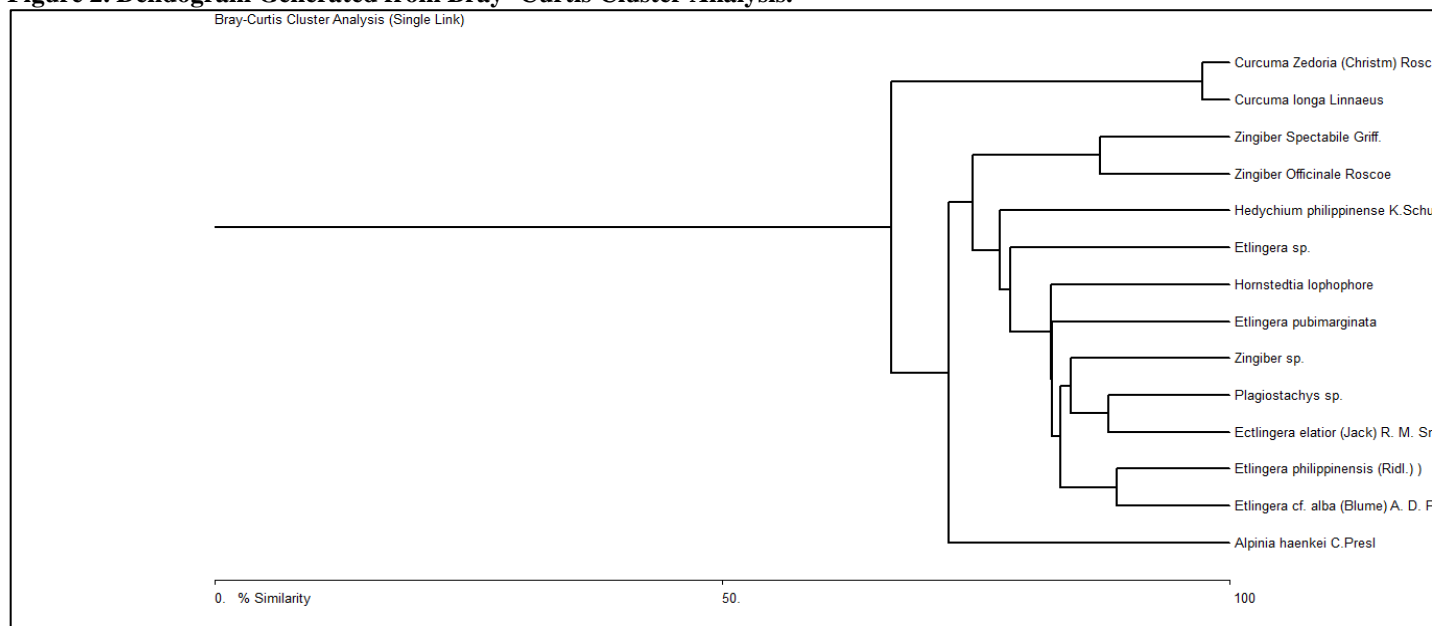


Figure 1. Transect Map of gingers found Mt. Bagalbal, Kalatungan Range, Bukidnon, Philippines.

Transect Map showing the Distribution of Zingiberaceae species across elevation in Mt. Bagalbal, Lourdes, Valencia City, Bukidnon. The species are observed in different elevations. Species *Alpinia haenkei* C.Presl (1057 masl.), *Curcuma longa* Linnaeus (975 masl.), *Curcuma Zedoaria* (Christm) Rosc (954 masl.), *Etilingera elatior* (Jack) R. M. Sm (959 masl.), *Etilingera pubimarginata* (975 masl.), *Zingiber Officinale* Roscoe (907 masl.), *Zingiber Spectabile* Griff (961 masl.), *Etilingera philippinensis* (Ridl.) R.M.Sm (1203 masl.), *Zingiber Sp.*(1447), *Etilingera cf. alba* (Blume) A. D. Poulsen (1499 masl.), *Hornstedtia lophophore* (1453 masl.), *Plagiostachys sp.* (1415 masl.), *Zingiber Sp* (1447 masl.), *Hedychium philippinense* K.Schum (1453 masl.).

Figure 2. Dendrogram Generated from Bray- Curtis Cluster Analysis.



The Cluster analysis of fourteen (14) Zingiberaceae species using the Bray- Curtis Cluster analysis revealed seven (7) Clusters namely; *Curcuma longa* Linnaeus, *Curcuma Zedoaria* (Christm)

Rosc (Cluster I); *Zingiber Officinale* Roscoe, *Zingiber Spectabile* Griff (Cluster II); *Hedychium philippinense* K.Schum (Cluster III); *Etilingera sp.*, *Hornstedtia lophophore*, *Etilingera*

pubimarginata (Cluster IV); *Zingiber Sp.*, *Etilingera elatior* (Jack) R. M. Sm (Cluster V); *Etilingera cf. alba* (Blume) A. D. Poulsen, *Etilingera philippinensis* (Ridl.) R.M.Sm (Cluster VI); *Alpinia haenkei* C.Presl (Cluster VII).

First Cluster has two species namely: *Curcuma longa* Linnaeus and *Curcuma Zedoria* (Christm) Rosc since it features are similar such as cuneate leaf base with raised veins purple band color along midrib. The second Cluster dominated by the *Zingiber Officinale* Roscoe and *Zingiber Spectabile* Griff since these two species shared most of the morphological features such as phyllotaxy, leaf shape, margin, base, apex and texture. The species *Hedychium philippinense* K.Schum, the only species belonging to third Cluster since its morphological features are unique from the others such as infructescence having fleshy spines. The species *Etilingera sp.*, *Hornstedtia lophophore* and *Etilingera pubimarginata* that belongs to fourth cluster. These species belong with similar morphological characteristics such as inflorescence like emergence and shape, colors of bracts, bracteoles, calyx, corolla and labellum. The fifth Cluster has only its two (2) sole species *Zingiber Sp. and Etilingera elatior* (Jack) R. M. Sm which possess same characteristics with respects of emergence, shape, color of bracts, bracteoles, calyx, corolla and labellum. The sixth cluster dominated by both by *Etilingera cf. alba* (Blume) A. D. Poulsen, *Etilingera philippinensis* (Ridl.) R.M.Sm, since this species are similar in having distichous phyllotaxy, lanceolate, leaf shape, ciliated margin, Truncated base and acuminate leaf apex. For the seventh cluster that has only *Alpinia haenkei* C.Presl which possess a unique shape of inflorescence having abaxially villous morphological characteristic. Though they belong to the same cluster, their branching indicates that they have unique characteristics from one another.

CONCLUSION

The inventory of family Zingiberaceae in Mt. Bagalbal, Kalatungan Range, Valencia City, Bukidnon, Philippines revealed a total of fourteen species, two subfamily, two tribe and seven genus. The distribution of Zingiberaceae species revealed that it is generally scattered and dwells on the elevations of 900-1600 meters asl. Ecological status assessment implies that *Etilingera elatior* (Jack) R.M. Sm. is the most abundant species recorded in the area followed by *Zingiber officinale* Roscoe and are one of remaining least recorded in the area. Weights of the similar morphological character traits of the species are far more superior proven by the species to fall to their particular genera of which they are associated. Further, it implies that the morphological descriptions agree with numeric analysis. Furthermore, monitoring of Zingiberaceae as indicator species should be conducted to assess the environmental conditions and conservation status of the forest in Mindanao.

ACKNOWLEDGEMENT

On behalf of the team, we wish to thank Barangay officials headed by Hon. Eva E. Tinamban of barangay Lourdes for the support given during the entire study. Lourdes Integrated School for the approval of the research and community who are always along our side during field sampling.

REFERENCES

1. Afzal, M., Al-Hadidi, D., Menon, M., Pesek, J., Dhimi, M.S., 2001. Ginger: an ethno medical, chemical and pharmacological review. *Drug Metab. Drug Interact.* 18, 159–190
2. Awang, D.V.C., 1992. Ginger. *Can. Pharm. J.* 125, 309–311.

3. Baker JG (1892) Scitamineae. In: Hooker F, Flora of British India (Vol VI), L. Reeve and Co., London, pp 198-264
4. Carreon, Jenny, David A., Dy K., Nasol, Ma., V., Tan, A, Zeta, M. 2003. A Comparative Study of Lichens and density found in the University of the Philippines, Diliman and the University of Santo Tomas.
5. Chaiyakunapruk, N., Kitikannakorn, N., Nathisuwan, S., Leeprakobboon, K., Leelasattagool, C., 2006. The efficacy of ginger for the prevention of postoperative nausea and vomiting: a meta-analysis. *Am. J. Obstet. Gynecol.* 194, 95–99.
6. Chen ZY (1989) Evolutionary patterns in cytology and pollen structure of Asian Zingiberaceae. In: Holm-Nielsen LB, Nielsen IC, Balslev H (Eds) *Tropical Forests: Botanical Dynamics, Speciation and Diversity*, Academic Press, Harcourt Brace Javanovich, Publishers, Tokyo, pp 185-191
7. Chrubasik, S., Pittler, M.H., Roufogalis, B.D., 2005. Zingiberis rhizoma: a comprehensive review on the ginger effect and efficacy profiles. *Phytomedicine* 12, 684–701.
8. Coquilla, K.L. (2012) Taxonomic Study of Zingiberaceae in Mt. Apo Davao City, Philippines. Unpublished Undergraduate Thesis. Central Mindanao University Musuan, Maramag, Bukidnon. Pp 13-18.
9. COX, P. A. and Balick M.J. 1997. *Plants people and culture: The science of Ethnobotany*. Scientific American Library, New York, N.Y.
10. Funakoshi, H. and S. Fujiyama. 2004. Four endemic genera of Zingiberaceae in the Philippines and their phylogenetic placement in gingers. <http://agris.fao.org/agris-search/search.do?recordID=PH20 05000273>.
11. Gao J, Zhang L, Deng X, Ren P, Kong J, Li Q (2004) The floral biology of *Curcumorpha longiflora* (Zingiberaceae): a ginger with two-day flowers. *American Journal of Botany* 91, 289-293
12. Grzanna, R., Lindmark, L., Frondoza, C.G., 2005. Ginger – an herbal medicinal product with broad anti-inflammatory actions. *J. Med. Food* 8, 125–132
13. Keogh, J.B., Clifton, P.M., Williams, P.G., Fazio, V.A., Inge, K.E., 2006. Health benefits of herbs and spices: the past, the present, the future. *Med. J. Aust.* 185 (Suppl. 4), S4–S24
14. Kress WJ, Prince LM, Williams KJ (2002) The phylogeny and a new classification of the gingers (Zingiberaceae): evidence from molecular data. *American Journal of Botany* 89, 1682-1696
15. Larsen, K., Ibrahim H., Khaw, S.H. & Saw, I.G. (K.W. Wong-Ed). (1999). *Gingers of Peninsular, Malaysia and Singapore*. National History Publications (Borneo) Ketakinabalu, Malaysia. 137.
16. Leong-Škorničková, J. and M.F. Newman. 2015. *Gingers of Cambodia, Laos and Vietnam*. Singapore: Singapore Botanic Gardens, National Parks Board, in association with Royal Botanic Garden Edinburgh and Pha Tad Ke Botanical Garden. 1-226.
17. Maagurran, Anne E., 2004. *Measuring Biological Diversity*. Blackwell science Ltd. Blackwell Publishing Company.
18. Merrill, E. 1924. An enumeration of Philippines flowering plants. Bureau of Printing, Manila. 4: 228-247.
19. Naive, M.A.K. 2017. Zingiberaceae of Kalatungan Mountain Range, Bukidnon, Philippines. *Bioscience Discovery* 8: 311–319.
20. Pelsner, P.B., J.F. Barcelona and D.L. Nickrent (eds.). 2011 onwards. *Co's Digital Flora of the Philippines*. <http://www.philippineplants.org> (Accessed 24 October 2015).

21. Ravinderan PN, Nirmal BK, Shiva KN (2005) Botany and crop improvement of ginger. In: Ravinderan PN, Nirmal BK (Eds) *Ginger: The Genus Zingiber*, CRC Press, New York, pp 15-85
22. Shukla, Y., Singh, M., 2007. Cancer preventive properties of ginger: a brief review. *Food Chem. Toxicol.* 45, 683–690.

Citation: Cababan, Mc Arthur L *et al.* (2020). Zingiberaceae in Mt. Bagalbal, Kalatungan Range, Lourdes, Valencia City, Bukidnon, Philippines. *J. of Advanced Botany and Zoology*, V7I3.02. DOI: 10.5281/zenodo.3751300.

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