

Ethnobotany and Distribution of *Dioscoreahispida* Dennst. (Dioscoreaceae) in Besut, Marang and Setiu Districts of Terengganu, Peninsular Malaysia

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Abstract—*Dioscorea* species or commonly named as yam is reported to be one of the major food sources worldwide. This ethnobotanical study was conducted to document local knowledge and potentials of *Dioscoreahispida* Dennst. and to investigate and record its distribution in three districts of Terengganu. Information was gathered from 23 villagers from three districts of Besut, Marang and Setiu by using semi-structured questionnaire. The villagers were randomly selected and no appointment was made prior to the visits. For distribution, the location of *Dioscoreahispida* was recorded by using the Global Positioning System (GPS). The villagers identified *Dioscoreahispida* or locally named *ubigadong* by looking at the physical characteristics that include its leaf shape, stem and the color of the tuber's flesh. The villagers used *Dioscoreahispida* in many ways in their life such as for food, medicinal purposes and fish poison.

Keywords—*Dioscoreahispida*, ethnobotany, intoxicating yam, *ubigadong*, Terengganu.

I. INTRODUCTION

THE term ethnobotany was devised in 1895 by a North American botanist, John Harshberger to describe studies of plants used by primitive and aboriginal people [1]. Ethnobotany is a multidisciplinary science which can be defined as the interaction between plants and people. This is where the relationship between plants and human cultures is not limited to the use of plants for food, clothing and shelter but also includes their usage for religious ceremonies, ornamentation and health care [2].

Species of *Dioscorea* belong to the family Dioscoreaceae, or commonly called yam, are food plants of tropics and subtropics [3]. *Dioscoreahispida*, also known as intoxicating yam, grows wild in South East Asia, Indonesia and extends to Papua New Guinea, the Philippines and India [4]. It has a toxic principle that has been reported as dioscorine, a toxic chemical [5]. Reference [4] has also reviewed this species which was not cultivated to any great extent although some cultivation is practiced in Java Island, Indonesia.

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Previous studies elsewhere have shown that *Dioscoreahispida* has many uses in life, for example this yam can be used as medicine, as food source, to prepare poison and many more. From medicinal aspects, [6] have reported that the corm infuse from *Dioscoreahispida* can decrease the blood glucose. Reference [7] found that the Temuan tribe uses the pounded leaves from intoxicating yam for treating sores of yaw. Other than that, people in Machang, Terengganu use the decoction of *Dioscoreahispida* leaf and apply it frequently to treat foot cracks [8]. From [9], the people there eat intoxicating yam after processing it by slicing, soaking in running water and then cooking.

According to the International Institute of Tropical Agriculture (IITA), yam has attracted many research attentions in recent decades. Reference [10] has reported that yam contributes as major economic and cultural importance in sub-Saharan Africa which accounts for about 95% of the world population. From the study by [11], they found that 23 indigenous yam types belonging to at least four *Dioscorea* species in Southeast Ethiopia, where this shows that yam is widely distributed in Ethiopia. Although yam contributed a lot in economy and culture in some parts of the world, its distribution especially in Peninsular Malaysia has not been studied in detail. Very little study has been carried out on the distribution of *Dioscoreahispida* in Malaysia.

This study was aimed at documenting ethnobotanical knowledge and potentials of *Dioscoreahispida* or also commonly known as intoxicating yam (*ubigadong*), and to investigate and record the distribution throughout Terengganu.

II. MATERIALS AND METHODS

A. Study Area

The study was carried out in the state of Terengganu which is situated in the north-east of Peninsular Malaysia, with an area of 13,035 km². Terengganu is divided into seven districts: Besut, Dungun, Hulu Terengganu, Kemaman, Kuala Terengganu, Marang and Setiu. The temperature ranges from an average of 23 °C to 32 °C from February to October and 19 °C to 22 °C from November to January. The samplings were done in three districts that face the South China Sea i.e. Marang, Besut and Setiu. In every district, three villages in

which *Dioscoreahispida* has been reported and sighted were randomly selected.



Fig. 1 Map of Terengganu state, Peninsular Malaysia, Malaysia (Downloaded from [12])

B. Data Collection

The ethnobotanical surveys were carried out from January to February 2011 by using semi-structured questionnaire. Up to 23 villagers were randomly selected from villages, whereby 13 respondents were male and 10 respondents were female. The respondents were men and women at various ages. No appointment was made prior to the visits. For distribution, the locations of *Dioscoreahispida* were recorded by using the Global Positioning System (GPS) (Table I).

TABLE I
SAMPLING SITE AND LOCATION OF *DIOSCOREA HISPIDA*

Accession No.	Sampling Sites	District	Location
DH 0003	Kg Denger	Besut	N 05° 46.030' E 102° 29.337'
DH 0004	Kg Denger	Besut	N 05° 46.030' E 102° 29.337'
DH 0005	Kg Denger	Besut	N 05° 46.030' E 102° 29.337'
DH 0006	Kg PasirAkar	Besut	N 05° 39.299' E 102° 29.933'
DH 0007	Kg PasirAkar	Besut	N 05° 39.299' E 102° 29.933'
DH 0008	Kg PasirAkar	Besut	N 05° 39.299' E 102° 29.933'
DH 0009	Kg PasirAkar	Besut	N 05° 39.299' E 102° 29.933'
DH 0010	Kg Denger	Besut	N 05° 46.030' E 102° 29.337'
DH 0011	Kg PasirAkar	Besut	N 05° 39.299' E 102° 29.933'
DH 0012	Kg SeberangBatu 13	Besut	N 05° 34.017' E

DH 0013	Kg SeberangBatu 13	Besut	102° 29.907' N 05° 34.017' E
DH 0014	Kg SeberangBatu 13	Besut	102° 29.907' N 05° 34.017' E
DH 0015	Kg SeberangBatu 13	Besut	102° 29.907' N 05° 34.017' E
DH 0016	Kg Keruak	Besut	102° 29.907' N 05° 28.552' E
DH 0017	Kg Keruak	Besut	102° 29.422' N 05° 28.552' E
DH 0018	Kg Keruak	Besut	102° 29.422' N 05° 28.552' E
DH 0019	Kg Keruak	Besut	102° 29.422' N 05° 28.552' E
DH 0020	Kg Keruak	Besut	102° 29.422' N 05° 28.552' E
DH 0021	Kg Keruak	Besut	102° 29.422' N 05° 28.552' E
DH 0022	Kg La	Besut	102° 29.789' N 05° 31.660' E
DH 0023	Kg La	Besut	102° 29.789' N 05° 31.660' E
DH 0024	Kg La	Besut	102° 29.789' N 05° 31.660' E
DH 0025	Kg Keruak	Besut	102° 29.422' N 05° 28.552' E
DH 0026	Kg Keruak	Besut	102° 29.422' N 05° 28.552' E
DH 0107	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.211' E 103° 07.624'
DH 0108	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.211' E 103° 07.624'
DH 0109	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.211' E 103° 07.624'
DH 0110	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.211' E 103° 07.624'
DH 0111	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.203' E 103° 07.618'
DH 0112	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.203' E 103° 07.618'
DH 0113	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.203' E 103° 07.618'
DH 0114	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.203' E 103° 07.618'
DH 0115	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.203' E 103° 07.618'
DH 0116	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.207' E 103° 07.620'
DH 0117	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.207' E 103° 07.620'
DH 0118	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.207' E 103° 07.620'
DH 0119	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.207' E 103° 07.620'
DH 0120	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.207' E 103° 07.620'
DH 0121	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.214' E 103° 07.616'
DH 0122	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.214' E 103° 07.616'
DH 0123	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.214' E 103° 07.616'
DH 0124	Bukit Belacan, Kg Sungai Serai	Marang	N 05° 10.214' E 103° 07.616'
DH 0125	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.402' E 103° 07.348'
DH 0126	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.402' E 103° 07.348'
DH 0127	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.402' E 103° 07.348'
DH 0128	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.402' E 103° 07.348'
DH 0129	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.400' E 103° 07.317'

DH 0130	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.400' E 103° 07.317'
DH 0131	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.400' E 103° 07.317'
DH 0132	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.400' E 103° 07.317'
DH 0133	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.388' E 103° 07.320'
DH 0134	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.388' E 103° 07.320'
DH 0135	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.388' E 103° 07.320'
DH 0136	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.388' E 103° 07.320'
DH 0137	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.390' E 103° 07.295'
DH 0138	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.390' E 103° 07.295'
DH 0139	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.390' E 103° 07.295'
DH 0140	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.390' E 103° 07.295'
DH 0141	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.376' E 103° 07.311'
DH 0142	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.376' E 103° 07.311'
DH 0143	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.376' E 103° 07.311'
DH 0144	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.385' E 103° 07.300'
DH 0145	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.385' E 103° 07.300'
DH 0146	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.385' E 103° 07.300'
DH 0147	Bukit Toktong, Kg Sungai Serai	Marang	N 05° 10.385' E 103° 07.300'
DH 0148	SekolahItifakiah, PasirAkar	Besut	N 05° 35.946' E 102° 30.772'
DH 0149	Sungai Kemia	Besut	N 05° 28.493' E 102° 29.740'
DH 0150	PasirAkar	Besut	N 05° 35.551' E 102° 30.775'
DH 0151	Kg Pecah Rotan	Setiu	N 05° 26.745' E 102° 59.805'
DH 0152	Kg Pecah Rotan	Setiu	N 05° 26.745' E 102° 59.805'
DH 0153	Kg Air Terjun	Besut	N 05° 45.679' E 102° 27.647'
DH 0154	Kg GuntungDalam	Besut	N 05° 30.384' E 102° 43.601'
DH 0155	Kg LapanKejur	Besut	N 05° 40.485' E 102° 29.930'
DH 0156	Kg Subhanallah	Besut	N 05° 39.299' E 102° 30.778'
DH 0157	PasirAkar	Besut	N 05° 37.834' E 102° 29.408'
DH 0158	PasirAkar	Besut	N 05° 38.342' E 102° 29.523'
DH 0159	PasirAkar	Besut	N 05° 38.549' E 102° 29.523'

Note: Kg refers to Kampung or Village.

III. RESULTS AND DISCUSSIONS

From Table II, all the respondents answered that they have heard of *ubigadong* or *Dioscoreahispida* from their ancestors and they didn't know the other common names for *ubigadong*. A total of 100% of the respondents answered that they tried eating *ubigadong*. Only 4% of respondents didn't know that *ubigadong* contains toxin or is poisonous, while the rest of respondents knew that *ubigadong* contains toxin and can fatally affects them. Up to 57% of respondents told that they

have seen people selling *ubigadong* in wet market or shops, while 43% of them told that they haven't seen people selling *ubigadong*. Only 22% of respondents answered that they had tried or see people cultivating *ubigadong*, while 78% answered no. A total of 86% of respondents answered that they knew the detailed information regarding *ubigadong* whilst only 14% answered that they didn't know. Up to 87% of respondents answered that they rarely use *ubigadong* in their daily life while only 13% answered that they often use *ubigadong* in their daily life.

TABLE II
LIST OF QUESTIONS AND THE ANSWER'S PERCENTAGE

Questions	Percentage	
	Yes	No
Have you ever heard of <i>Ubigadong</i> ?	100 %	0 %
Do you know other common names for <i>Ubigadong</i> ?	0 %	100 %
Have you ever tried eating <i>Ubigadong</i> ?	100 %	0 %
Do you know that <i>Ubigadong</i> contains toxin?	96 %	4 %
Have you ever seen people selling <i>Ubigadong</i> ?	57 %	43 %
Did you ever try or see people commonly cultivate <i>Ubigadong</i> ?	22 %	78 %
Do you know more details about <i>Ubigadong</i> ?	86 %	14 %
Do you use <i>Ubigadong</i> in your daily life?	13 %	87 %

All the respondents, which are the traditional villagers, had identified *Dioscoreahispida* by looking at the morphological characteristics. They identified this plant by looking at the intoxicating yam's leaf that looks like a betel leaf but hairy. The tendril is hairy as well and the stem is thorny. *Dioscoreahispida* is a creeping plant. The tuber's flesh is of yellowish white in color and a bit sticky.

Villagers in Besut, Marang and Setiu districts of Terengganu use this intoxicating yam in many ways in their daily life (TableII). Usage of *Dioscoreahispida* as food, traditional medicine and poison were also answered by the respondents.

Dioscoreahispida was used as their food source, for example in making popular traditional local food called *kuihputrimandi*, *kuihonde-onde* and also as *pengat*. Besides that, many of the villagers ate intoxicating yam with glutinous rice and grated coconut especially during breakfast or rainy season. There were few processes to remove the toxin from the intoxicating yam tubers before the cooking process, so that the yam can be safely eaten. Based from the answers in the questionnaire, the villagers in Terengganu have identified several de-toxification techniques of *ubigadong* tubers. The first step was by slicing the tubers thinly as though making chips. Then, the sliced yam was soaked for three days in water that is already mixed with salt. After that, the respondents put the yam in a sac and then soaked it again in a river or flowing water for the extra three days. The yam was tested after de-toxification by looking whether the fish is feeding on them. In other places in the world, the de-toxification is tested by feeding dogs or other domestic animals [4]. According to [9], this process has also been practiced by people in Papua New Guinea where they sliced and boiled the *Dioscoreahispida* tubers for two days to remove its toxin before cooking the yam. Sakai people in Thailand also removed the toxin by prolonged boiling with wood ashes before eating the yam [13].

Some of the villagers used de-toxicated intoxicating yam by sun-drying followed by pounding for making flour.

Dioscoreahispida was also used by the villagers as traditional medicine. Part of the intoxicating yam that was used the most is its leaves, especially to cure illness. Some of the respondents used the intoxicating yam as de-worming medicine. The leaves were pounded and then applied on stomach. Besides that, they also used the pounded leaves to cure stomach bloating. Some of the villagers claimed that intoxicating yam leaves was also used in curing hernia and asthma as well.

Dioscoreahispida was also used as bait in catching prawns. Some villagers used intoxicating yam as fish poison so that it will be easier for them to catch the fish. According to [4], some parts in Asia used intoxicating yam to prepare poison, and it has been suggested that the residue that is left over after starch extraction could be used as insecticides.

The villagers were asked for their opinion on commercialization of *Dioscoreahispida* and some of them had agreed that intoxicating yam can be commercialized because it is easy to grow even without commercial cultivation. Besides, the tubers were harvested in abundance from each matured trees as compared to other *Dioscorea* species. But some of the villagers disagreed because *Dioscoreahispida* has toxin and the de-toxification process is difficult, thus indirectly suggesting that a new effective technique need to be developed for commercialization.

IV. CONCLUSION

From this study, the villager's knew how *Dioscoreahispida* can be used in many ways. They knew that this yam contains toxin and the de-toxification technique they used was rather similar to other techniques used by other people in some parts of the world. The villagers also used *Dioscoreahispida* as food sources especially during rainy or monsoon seasons, and they used the yam as medicine as well. *Dioscoreahispida* has potential in medicinal aspects and biopesticides, therefore further study should be done since less study has been done in these aspects.

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REFERENCES

- [1] M. Balick, and P. Cox, *Plants, People and Culture*. The Science of Ethnobotany, USA: Scientific American Library, 1996, pp. 228.
- [2] R. E. Schultes, "Ethnobotany and technology in the Northwest Amazon: A partnership," in *Sustainable Harvest and Marketing of Rain Forest Products*, Plotkin and Famolare Ed. CA: Island Press, 1992, pp. 45-76.
- [3] L. N. Sharma, and R. Bastakoti, "Ethnobotany of *Dioscorea* L. with emphasis on food value in Chepang communities in Dhading districts, central Nepal," *Journal of Plant Science*, vol. 6, pp. 12-17, 2009.
- [4] Natural Resources Institute, *Root Crop Second Edition*. Tropical Development and Research Institute, USA: University of Waikato, 1987, pp. 308.
- [5] J. Webster, W. Beck, and B. Ternai, 1984, "Toxicity and bitterness in Australian *Dioscorea bulbifera* L. and *Dioscoreahispida* Dennst. from Thailand. *Journal Agriculture Food Chemical*, vol. 32, pp. 1087-1090, 1984.
- [6] E. S. Sunarsih, Djatmika, and R. S. Utomo, 2007, "Influence of administration of gadung corm (*Dioscoreahispida* Dennst.) infusion to decrease of blood glucose level at aloksan induced male diabetic rats," *Majalah Farmasi Indonesia*, vol. 18, no. 1, pp. 29-33, 2007.
- [7] F. Hanum, and N. Hamzah, "The use of medicinal plant species by the Temuan Tribe of Ayer Hitam Forest, Selangor, Peninsular Malaysia," *Pertanika Journal Tropical Agriculture Science*, vol. 22, no. 2, pp. 85-9, 1999.
- [8] H. C. Ong, and M. Nordiana, "Malay ethno-medico botany in Machang, Kelantan, Malaysia," *Fitoterapia*, vol. 70, pp. 502-513, 1999.
- [9] B. R. French, *Food Plants of Papua New Guinea*. 2006, pp. 31.
- [10] Food and Agriculture Organization of the United Nations (FAO), Statistical database, <http://faostat.fao.org/faostat/collections?subset=agriculture>, 2004. Last accessed on 29 March 2011.
- [11] E. Hildebrand, S. Demissew, and P. Wilkin, "Local and regional appearance in species of *Dioscorea* L. (Yams) in Southwest Ethiopia," In *Ethnobiology and Biocultural Diversity*. J. R. Stepp, F. S. Wyndham and R. R. Zarger (eds). *Proc. of the 7th International Congress of Ethnobiology*, University of Georgia Press, USA, 2002, pp. 678-695.
- [12] Anon, <http://www.dromoz.com/directory/place/?id=33&p=terengganu>, 2011. Last accessed on 29 March 2011.
- [13] K. Maneenoon, P. Sirirugsa, and K. Sridith, "Ethnobotany of *Dioscorea* L. (Dioscoreaceae), a major food plant of the Sakai Tribe at Banthad Range, Peninsular Thailand," *Journal of Plant, People and Applied Research*, vol. 6, pp. 385-394, 2008.