



Documentation of inherited knowledge on wild edible fungi from Malaysia

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Key words

Malaysia
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Abstract The gradual loss in traditional knowledge on wild edible fungi is a common phenomenon the world over, including Malaysia. A documentation of known edible fungi in Malaysia was executed, with the objective of salvaging traditional knowledge on the identification and edibility of these mushrooms, particularly from her village communities. Among those that have been successfully documented in this study were *Cookeina* and *Galiella* of the class *Ascomycetes* and *Termitomyces*, *Schizophyllum*, *Hygrocybe*, *Lentinus*, *Calvatia*, *Calostoma* and *Auricularia*, from the *Basidiomycetes* which make up a total of 13 or 14 species belonging to 9 genera. It is hoped that this documentation will contribute towards an updated scientific identification, including their genetic sequences in the near future.

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INTRODUCTION

Fungi have been known to be consumed since the time of the pharaohs of Egypt over 4 000 years ago. In modern times, mushrooms form a prized component in the diet of some communities in Europe. In the Southeast Asian region, Thailand has been documented to have fairly voluminous sales of a wide variety of wild mushrooms in the market places (Jones et al. 1994). Such a sight is completely absent in Malaysia. Part of the reason could be the very small numbers of edible fungi available for picking per collection site per trip, so that in excess of domestic requirement few can be sold. A very heavy rainfall which typifies the equatorial belt may actually discourage the fungi to appear; and so too may the frequent hot, humid non-rainy days. Weather factors aside, the lack of knowledge in the correct identification of the wild edible fungi is an underlying factor which has resulted in collections to be made by a very limited and select number of people. This too is a chance occasion, as mushroom gatherers as a profession is non-existent in Malaysia. In addition, edible fungi are viewed only as the vegetable component of one's diet, which can be interchanged by a variety of other very easily available vegetables sold in the market or better still, available as home-grown. Mass media reports of deaths or poisonings caused by wild fungi are another good reason why wild mushrooms are avoided and only the safe, commercial varieties sold in the supermarkets are consumed, if at all. Inadvertently, this also contributes to the gradual loss of ethnic knowledge on the correct identification of wild edible fungi.

In view of the above, this study was carried out to document the wild edible fungi as known to the Malay population; including several autochthonous populations in East Malaysia. The vernacular names were documented and species identifications made, to the best possible means, based on traditional morphological characteristics. It is hoped that this is a first step towards future studies in the use of other techniques as well,

such as gene sequencing of the species, to strengthen their identifications.

A mushroom is usually perceived as a complete entity, but in fact, it is only the spore-carrying component of the entire fungus. Technically, this component is referred to as the basidioma or more commonly, the 'fruiting body' which is typically produced above ground or on its food source ('substrate'). Although the fruiting bodies may be picked, the thallus remains in the soil or within the substrate ready for the production of the next batch of fruiting bodies when the conditions are right.

The fruiting body can take a wide variety of forms, depending on the species. However, the layman's perception of a mushroom is often limited to those that have a cap-shaped structure with gills on the underside and with or without a stem ('stipe'). Since a mushroom can be as different in shape as a rounded puffball, here, we will use the term 'fungi' instead of 'mushroom'. A diverse variety of edible fungi are currently available in Malaysian supermarkets; some are imported wild fungi, others are commercially cultivated. This study is limited to fungi found in the wild in Malaysia and which have not been commercially exploited.

MATERIALS AND METHODS

Collections were made by the author, either alone or with students or individuals of the local community when in East Malaysia, some of whom are listed in the acknowledgements. The most intensely collected sites were located on the Universiti Putra Malaysia campus. The collected fresh samples were shown to several ethnic Malay individuals who appeared to have some basic knowledge on the edibility status and vernacular names of fungi. Collections were also made in forests, oil palm plantations and makeshift market stalls in various parts of the country, including Sabah and Sarawak. The vernacular names of those found on sale in the markets were easily recorded, but sometimes the same fungus in the same market is marketed under different names, due to different ethnic identities of the sellers. In cases where they were collected wild from the forests, the specimens were shown to village elders or members of the community known to have some knowledge on the edible fungi from whom the vernacular names were recorded. Apart from

¹ Faridah Binti Abdullah, the main author of this paper died on 9 June 2009. Her sudden death shocked many and she will definitely be missed by her many friends, colleagues and co-workers local and abroad. She will be remembered for all her accomplishments in mycology and the *Trichoderma* based biofertilizer she discovered.

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photography and botanical sketches of the samples, spores were collected and mycelial cultures made whenever possible, for purposes of more intensive future taxonomic studies. These cultures are kept in the Mycology Laboratory, Faculty of Science, UPM.

RESULTS

The wild edible fungi consumed by the indigenous populations of Malaysia belong to both major classes of Fungi, *Ascomycetes* and *Basidiomycetes*. A total of 9 genera and 13 species were identified. Two genera with one species each were *Ascomycetes*, namely *Cookeina sulcipes* and *Galiella rufa*, the remaining were *Basidiomycetes*, to which most mushrooms belong. These were the gilled fungi *Termitomyces* (4 species), *Schizophyllum commune* (1) and *Hygrocybe* (1); the polyporous *Lentinus* (2); the ear fungi *Auricularia* (2 or 3) and the puffballs *Calostoma* (1) and *Calvatia* (1).

Details about each of the species are given below:

Cookeina sulcipes (Berk.) Kuntze

Called 'kulat mangkuk' or 'bowl fungus' in Malay, this wild fungus is known to be edible by some, but not all Malays. It is called by the same name by village communities in Sarawak and Sabah. This fungus can be found in several colours, ranging from cream to scarlet red; however, the most commonly found are pale shades of pink and peach. They are usually found along riverbank environments and grow on twigs. *Cookeina sulcipes* differs from another species, often found growing next to each other, which is *C. tricholoma*. The latter has characteristic trichomes on the outer surface and is deemed inedible, although no knowledge on whether this inedibility was due to the 'hair-like' structures or because they were poisonous could be found.

Galiella rufa (Schwein.) Nannf. & Korf

This dark brown rubbery cup fungus with a firmer semi-solid, depressed centre which ranged in colour from mustard yellow to light tan is known as 'mata rusa' (deer eyes) in Sabah. It is quite rarely found but known to the Dusuns (and perhaps neighbouring communities as well) who prized it for its edibility. The same species is eaten in Sarawak where it is known as 'mata kerbau' (buffalo eyes). The fungus is usually found attached to branches and twigs with the spore-bearing depressed centre facing upwards.

Termitomyces heimii Natarajan

Species of the termite-fungus (genus *Termitomyces*) are a local delicacy (Faridah et al. 2002) and a favourite among all of the indigenous populations in Peninsular as well as East Malaysia. Jones et al. (1994) also mentioned the termite fungus ('Hed Khone') as a much prized delicacy in Thailand. The most commonly found in Peninsular Malaysia when in season is *T. heimii*, most commonly called 'cendawan busut', translated to mean mound fungus (Fig. 1d). The fruiting body is white, large (5–10 cm diam) and smooth often with light scales and has a hardened greyish tissue at the centre of the pileus, or the umbo. The stipe which is also white, solid and has an annulus continues below the ground as a long, smooth, tough and hollow pseudorhiza, which is attached to a termite mound (Bels & Pataragetvit 1982). As most termite mounds in Malaysia are subterranean and also since it is not easy to pull the mushroom while keeping the pseudorhiza intact, many mushroom pickers are not aware of the relationship of this fungus to termite nests.

Termitomyces heimii is usually found in clumps that can reach up to 300 fruiting bodies per day and over 3 days from one particular site, in the experience of the author. Identifications of species of *Termitomyces* were referred to Pegler & Vanhaecke (1994).

Termitomyces clypeatus R.Heim

More highly prized than *T. heimii* is *T. clypeatus*. It is known as 'cendawan kaki pelanduk', translated as mousedeer leg fungus in Malay. The fruiting body is greyish brown becoming paler towards the margin with a darker grey-black colour at the central, sharply raised (or 'spiniform') perforatorium. The stipe is usually long and cylindrical and solid, more slender than *T. heimii* and has a whitish to pale brown colour. Unlike *T. heimii* they are usually found in smaller clumps and therefore considered very rare.

Termitomyces aurantiacus (R.Heim) R.Heim

This large, golden termite fungus is quite commonly found in Peninsular Malaysia but in small quantities at any one time. People who collect this mushroom from UPM campus sites do not know its proper name apart from 'a type of cendawan busut' but they know it is edible because of the presence of the pseudorhiza when the fungus is pulled. Its salient features include the large, ochraceous orange, easily splitting fruiting body. Surprisingly, this fungus is known to the Iban community in the interiors of Sarawak as 'kulat tahun' (annual fungus) which appears to be a Malay name in origin. Interestingly, some Malays in Peninsular Malaysia refer to *T. heimii* as 'kulat tahun' which seems to indicate identification of members of the genus *Termitomyces*, rather than the species names.

Termitomyces microcarpus (Berk. & Broome) R.Heim

Unlike others in the genus, this species has notably small fruiting bodies, at an average of 3–6 cm diam. The pileus is pale cream to pale grey in colour with a silky and smooth texture and, like *T. clypeatus*, has a pronounced perforatorium. They can be found in smaller groups of 20–30 per site, in the author's experience. The Malays in Peninsular Malaysia call it 'kulat tali' or rope fungus.

Schizophyllum commune Fr.

This species is known as the world's most widely distributed fungus. The Malays call it 'cendawan kukur' or 'cendawan sisir'; in Sarawak it is known as 'kulat kerang' and in Sabah as 'kodop'. Tuno (2001) reported it as one of the wild fungi consumed by the Majangir, an Ethiopian tribe. According to Lee et al. (2006) the species was known to and consumed by 5 aborigine subtribes of Peninsular Malaysia. Although it is widely distributed, this author found that the fungus is not necessarily available all the year round. The fungus has a characteristic 'split gill' appearance on the undersurface. They can be found in oil palm and rubber estates, in residential compounds and even on wood-based items such as a broom handle, wooden stool and fence; however, the sizes are too small to make it worth collecting. They are sold in some night markets when in season. The night market at Serdang, Selangor was found to obtain its supplies from the forests of the neighbour state of Pahang, where they are larger and deemed more fit for consumption.

Hygrocybe cf. *similis* (Petch) Pegler

This attractive, small, reddish orange to yellow fungus is a favourite among several indigenous populations in Malaysia.



Fig. 1 a. *Hygrocybe* cf. *simile*, known locally as 'kulat buah'; b. *Lentinus sajor caju* with its prominent annulus ring on the short stipe; c. *Auricularia polytricha* on a dead tree trunk. The whitish part is the spore-bearing side; d. *Termitomyces heimii* on sale by a roadside in Kuala Selangor. Note the long pseudorrhizas continuous with the stipe; e. very young *Calvatia cyathiformis* puffballs showing very firm flesh when cut.

It is known among the highland Kelabits of Bario, Sarawak as 'yellow fungus' when translated from their language and as 'kulat buah' or fruit fungus among the non-highland communities in Sarawak because of the spectacular mix of yellow, orange and red colours of its pileus, resembling a ripening fruit (Fig. 1a). It is not known to the Malays in Peninsular Malaysia to the best of the author's knowledge but an almost similar look-alike was recorded by Lee et al. (2006) as eaten by 3 aboriginal subtribes in Peninsular Malaysia which the authors identified as *Hygrocybe conica* (Scop.) P.Kumm.

***Lentinus squarrosulus* Mont.**

Known as 'kulat burak' to most ethnic communities in Sarawak, this fungus is found quite commonly on old stumps and buried roots but is apparently not recognized as edible nor poisonous to the Malays of Peninsular Malaysia. The fungus is white with pale scales on the pileus which showed peeling in older specimens; the underpart has crowded gills with a slight tinge of yellow. The spore print of this fungus has a creamy-yellow colour. They are eaten when young as the fungus becomes tough and leathery when old.

***Lentinus sajor-caju* (Fr.) Fr.**

This mushroom is known to most indigenous populations in Malaysia. Called 'kulat gelang kaki' (ankle bracelet fungus) by the Melanaus or simply 'kulat gelang' to some of the Malays in Peninsular as well as to some communities in Sarawak, it is obvious that the name is owed to the prominent annulus ring at the base of the short stipe (Fig. 1b). It is eaten young as the mushroom toughens with age. The fungus is often found on dead branches but if they appear to sprout from the soil, it must have come from buried roots.

***Calvatia cyathiformis* (Bosc) Morgan**

A very common puffball in Malaysia is *Calvatia cyathiformis* (Fig. 1e). Referred to as 'cendawan kumbul', the edibility of this fungus is well known to the Malays living in the northern regions. In the central-southern region of Peninsular Malaysia this fungus is apparently not known to be edible. The almost spherical puffball, resembling the embryo of a mature coconut ('kumbul') within a coconut shell, is eaten very young when the flesh is still very firm. It is deemed inedible when the puffball 'gives' when pressed, or worse, when dark coloured spores can already be detected within the fruiting body. *Calvatia cyathiformis* is somewhat hemispherical and has a sterile, stout, rudimentary or sometimes more prominent stipe. The ball-like fruiting body is usually white, but occasionally they can be of a pale lilac-brown colour. The spores are brown when freshly dispersed but after the fruiting-body remnants are dried, purple spores can be observed. Its common English name is the purple-spored puffball and its distribution is widely recorded in most parts of the world. Pegler & Spooner (1999) recorded *C. cyathiformis* as an edible species.

***Calostoma* cf. *fuscum* (Berk.) Massee**

In Sarawak, this puffball-ally is known as 'kulat mata babi', translated as pigs' eye fungus. A very big *Calostoma* can be around 6 cm diam but 3–4 cm is the more commonly found size. The fungus is round and covered by a firm yet gelatinous capsule that looks like the flesh of a lychee fruit. The actual fruiting-body is white, round, firm and has a white flesh when cut. Both the 'ball' and the surrounding capsule is eaten young, before spores are formed, just as in *Calvatia*. When boiled, the gelatinous matrix remained intact but becomes mushy if the fungus is a bit 'old'. *Calostoma* is also reported as edible

in Thailand and the species was reported as *C. junghuhnii* (Bandoni et al. 1998).

Auricularia spp.

There are several species of this 'ear-fungus' which grows wildly on logs and tree trunks. The Malays call them 'telinga kera' (monkeys' ears) for the firmer type, often a darker brown in colour, which is believed to be *A. auricula-judae* (Bull.) Quél. Sometimes the same name is also given to a larger and tougher variety, *A. polytricha* (Mont.) Sacc. (Fig. 1c). The thinner, more gelatinous ear-fungus is known as 'kulat gelememeh' in Malay, or mushy mushroom. If the latter is a reddish purple colour when young, it is probably *A. fuscossuccinea* (Mont.) Henn., an ear fungus which does not dry well. The ethnic communities in Sarawak also gave different names to the firm and soft types; the firmer variety is called 'kulat Pek' (pronounced as 'perk' in Melanau) and 'kulat tepik' in Iban. A thinner, softer variety is called 'kulat bibir' or 'sebibir' (lip fungus in Sarawak Malay) or 'Nyamir' (Melanau).

DISCUSSION

There is still no tried and tested method of identifying poisonous fungi from the edible ones, and this holds true worldwide. Very often too, what is deemed as inedible by one community is considered edible by another. The only option left is to know and identify the fungus correctly. In Malaysia, knowledge of wild edible fungi is perceived by the general public to lie in the hands of the autochthonous population, who are more familiar with the forests. While this is true to a large extent, a case of mushroom poisoning among an aboriginal family in Temerloh, Pahang in 2005 was related to this author by a Chemistry Department personnel, Ministry of Science, Technology and Innovations Malaysia (pers. comm.), who had brought the said mushroom for the author to identify. The poisonous mushroom was identified as *Chlorophyllum molybdites* (G. Mey.) Massee, and not *Termitomyces*. Such mistakes further strengthens the worry that even the autochthonous population is also slowly losing their forest knowledge. Eating wild fungi is an inherited

culture, passed on from one generation to another. In the quest for material development today, concomitant with the shrinking forest size followed by the lack of interest in the younger generation, this inherited knowledge is slowly disappearing among Malaysia's indigenous population.

This study has listed 13 species of the most common wild edible fungi eaten mainly by the Malays and the village communities of Sabah and Sarawak. With this as a starting point, it is hoped that more studies will be done on their taxonomic status so that more of the known edible fungi can be correctly identified. Some may perhaps be cultivated on a commercial basis.

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