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Research Article

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Fruiting bodies of Termitomyces intermedius collected in Iriomote – Ishigaki National Park, Ishigaki Island, Okinawa, Japan as sources of minerals

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ABSTRACT

Samples of fruiting bodies of T. intermedius which were collected in Iriomote National Park, Ishigaki Island, Okinawa, Japan from June to July 2016 were air dried prior to elemental analysis. To determine the distribution of elements within the fruiting body, the stipe was partitioned into 3 parts namely bottom, middle, and upper. The pileus was also analyzed. Elemental analysis of the dried fruiting bodies was done using Thermo EDX System (Noran System 6, Ultra Dry, 10mm2 SDD crystal, 129eV resolution, NORVAR window, LN2-Free Type Detector) installed in Hitachi SU1510 scanning electron microscope.

Nine elements namely N, O, Mg, Si, P, S, K, Fe and Ca were detected in the different parts of its fruiting bodies. The most abundant are O>Si>Fe>K>P>Ca>Mg>S>N in decreasing order of abundance. Most of the elements are concentrated in the stipe. All the elements except calcium are distributed within the fruiting body where most of the elements are concentrated at the bottom part of the stipe. Among the elements, calcium was only detected in the stipe and not in the pileus.

Key words: *mineral composition, termite – associated mushrooms, Termitomyces*

INTRODUCTION

Iriomote-Ishigaki National Park which consists of the major parts of Iriomote and Ishigaki in the Yaeyamashoto Islands is located in the southern part of the main island of Okinawa. The park which has a total size of 205.69 km² also includes the islands of Taketomi, Kuroshima, Kohama and some of the other small islands in the group of islands in Yaeyama. The marine water surrounding the islands and the coral lagoon between Ishigaki and Iriomote Islands has been designated part of the National Park. Its mountainous area which is located at the center of the island has an elevation of 400-500 meters above sea level. It is covered with thick evergreen broad-leaved forests. The prevailing climatic condition in the area is tropical. Its tropical climatic condition coupled with rich vegetation favor the proliferation of rich floral species including mushrooms. One of the groups of mushrooms is the termite – associated species of *Termitomyces*. *Termitomyces* which belongs to The genus *Termitomyces* R. Heim belongs to the Super kingdom Eukaryota, Kingdom Fungi, Division Basidiomycota, Class Basidiomycetes, Subclass Agaricomycetidae, Order: Agaricales, Family Lyophyllaceae is a genus of edible macrofungus that is associated with termite mound [1]. It is usually ubiquitous in the different regions of the world [2] [3] [4] [5]. One of its species, *T. intermedius* is associated with the caste of subterranean termites. Fruiting bodies of T*ermitomyces* are usually collected from the wild as sources of culinary ingredients due to their strong aroma and taste [6] [7].

To date, there is no report yet on the mineral compositional profiling of mushrooms particularly the *Termitomyces* in Iriomote – Ishigaki National Park. Our research team initiated the efforts of providing baseline scientific data about the mineral composition of mushrooms found in the park in our desire to harness their ecological and economic importance for the development of mushroom-based nutraceutical and cosmeceutical products. In this paper, the first mineral compositional profiling of *Termitomyces intermedius* is being presented.

MATERIALS AND METHODS

Collection and processing of samples

Fruiting bodies of *T. intermedius* were collected from June to July 2016 in Iriomote-Ishigaki National Park (Fig. 1). Purposive sampling was done in the collection site. Samples were cleaned using brush to remove the soil debris and air dried prior to elemental analysis. To determine the elemental composition, the fruiting bodies were partitioned as follows: A- bottom part of the stipe, B– middle part of the stipe, C- upper part of the stipe and D- pileus (Fig. 2).

Analysis of mineral composition

Mineral composition of the dried samples of fruiting bodies of *T. intermedius* were analyzed using Thermo EDX System (Noran System 6, Ultra Dry, 10mm2 SDD crystal, 129eV resolution, NORVAR window, LN2-Free Type Detector) installed in Hitachi SU1510 Scanning Electron Microscope.

RESULTS AND DISCUSSION

Mushrooms in general are good sources of minerals [8] [9] [10] [11] in addition to their antihypertensive, antidiabetic and anticancer properties [12] [13] [14] [15]. Recently, we have investigated the antioxidant activities of mushrooms [16]. For the first time, the elemental composition within the fruiting body of *Termitomyces intermedius* was elucidated in this study. Based on our investigation, we found out that nitrogen (N), oxygen (O), magnesium (Mg), silicon (S), phosphorus (P), sulphur (S), potassium (K), iron (Fe) and calcium (Ca) are distributed in the different parts of its fruiting body. The

Figure 1. Flowchart in the collection and processing of *T. intermedius* samples for elemental analysis

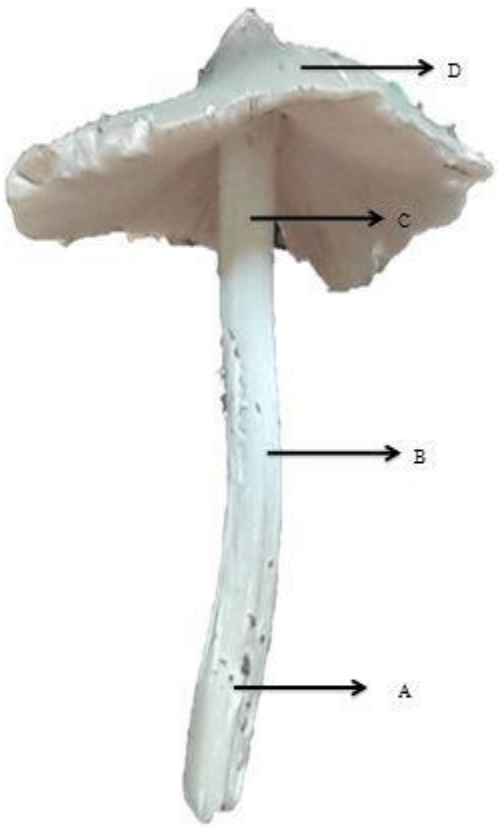

Figure 2. Parts of the fruiting body of *T. intermedius* subjected to elemental analysis
Note: A- bottom part of the stipe, B– middle part of the stipe, C- upper part of the stipe and D - pileus

most abundant are oxygen, followed by silicon, iron, potassium, phosphorus, calcium, magnesium, sulphur and nitrogen in decreasing order of abundance. In contrast, potassium was the most abundant on wild grown edible mushrooms compared to phosphorus, iron, calcium and magnesium as reported by previous researchers [9] [11]. The stipe of *T. intermedius* contains more elements compared to its pileus (Fig 3). Most of the elements except calcium are concentrated at the bottom part of the stipe. The distribution of elements within the fruiting body of mushroom is dynamic. This observation conforms with previous observation on the distribution of minerals within the fruiting body of *Volvariella volvacea* [17]. In this study, calcium was only detected in the stipe and not in the pileus. The distribution and concentration of most elements on the stipe of *T. intermedius* contradicts with previous report on *Pleurotus sajor caju*, *Agaricus bisporus* and *Lentinula edodes* [8].

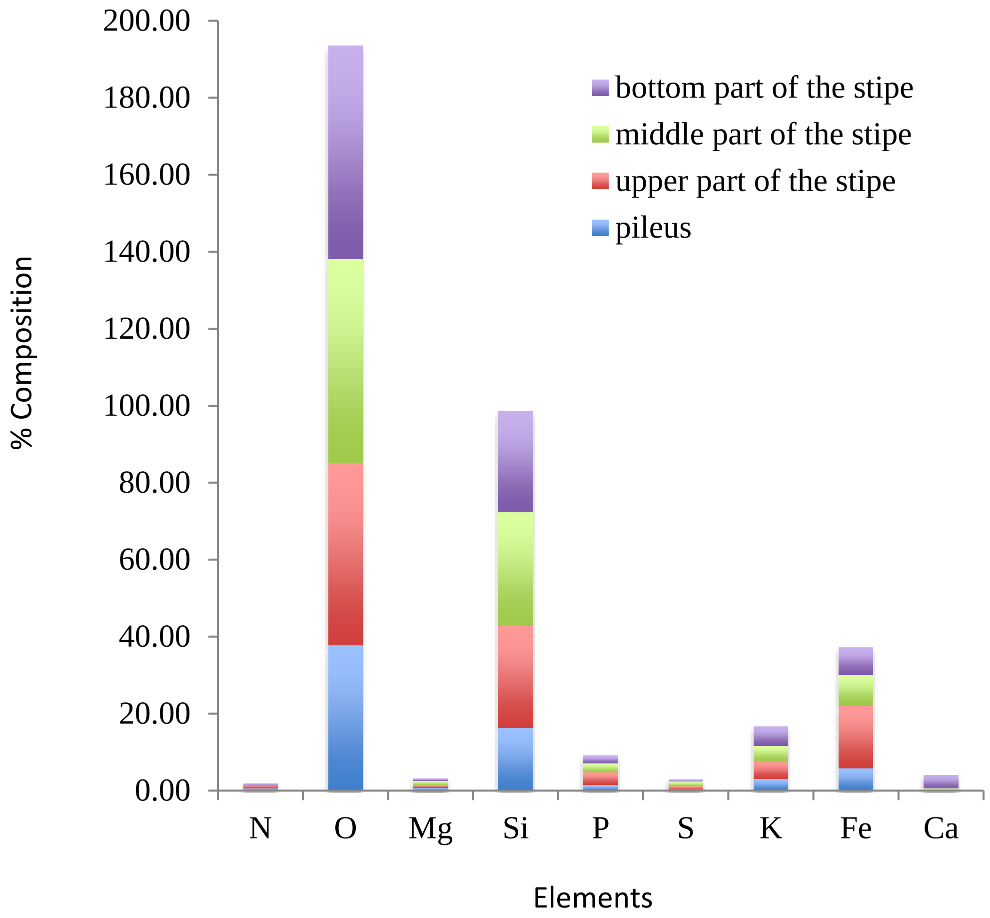

Figure 3. Elemental composition in the different parts of the fruiting body of *T. intermedius*

CONCLUSION

T. intermedius from Okinawa, Japan contains elements which may serve as important sources of minerals. There is a need to harness the economic importance of this wild mushroom for the nutraceutical and cosmeceutical industries.

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