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Mushrooms, Space and Ecological Knowledge: The Geography of Ancient Natural Science in Dioscorides's *De Materia Medica*

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Abstract: This study examines Dioscorides's knowledge of mushrooms from a cultural geography perspective, filling a gap in the literature on the landscape of ancient mushroom knowledge and offering an original reading. The aim of the study is to reveal the spatial and ecological dimensions of Dioscorides's knowledge of mushrooms and to understand the geography in which this knowledge was formed. In this context, the study is structured around the questions of which environmental indicators and spatial characteristics were the basis of knowledge about mushrooms in antiquity, and how it was produced spatially. The research employs qualitative content analysis, and the data obtained are analyzed holistically from a cultural geography perspective, focusing on how the ancient geographical landscape can be read. The study considers the version of Dioscorides's work, *De Materia Medica*, prepared by Osbaldeston and Wood. The results of the research show that Dioscorides's knowledge of mushrooms is not merely a biological dataset, but that mushrooms are associated with specific geographical regions and form a risk landscape. It is observed that Dioscorides's knowledge of mushrooms constitutes an ecological knowledge network that extends throughout the work. A holistic examination of the spatial distribution of mushrooms, their physical effects, environmental characteristics, hazards, and intervention measures against mushroom poisoning reveals how ancient mushroom knowledge was constructed in the geography of antiquity. The research also offers an interdisciplinary field of study by demonstrating the place and use of ancient mushroom knowledge in daily life practices.

Keywords: Mushroom, Dioscorides, De Materia Medica, Cultural Geography, Ecological Knowledge

Mantar, Mekân ve Ekolojik Bilgi: Dioscorides'in *De Materia Medica*'sında Antik Doğa Bilgisinin Coğrafyası

Öz: Bu çalışma Dioscorides'in mantar bilgisini kültürel coğrafya perspektifiyle incelemekte, antik mantar bilgisinin peyzajı konusunda literatürdeki boşluğu doldurarak özgün bir okuma sunmaktadır. Çalışmanın amacı Dioscorides'in mantar bilgisinin mekânsal ve ekolojik boyutlarını ortaya koymak ve bu bilginin oluştuğu coğrafyayı anlamaktır. Bu bağlamda çalışma antik çağda mantarlarla ilgili bilgilerin hangi çevresel göstergelere ve mekânsal özelliklere dayandırıldığı ile mekânsal anlamda nasıl üretildiği soruları üzerine kurgulanmıştır. Araştırmada nitel içerik analizi yöntemi kullanılmış, elde edilen veriler kültürel coğrafya perspektifiyle bütüncül olarak çözümlenmiş ve antik coğrafi peyzajın nasıl okunabileceği üzerinde durulmuştur. Çalışmada Dioscorides'in *De Materia Medica* adlı eserinin Osbaldeston ve Wood tarafından hazırlanan



versiyonu dikkate alınmıştır. Araştırmanın sonuçları Dioscorides'in mantar bilgisinin sadece biyolojik bir veri seti olmadığını, mantarların belirli coğrafi bölgelerle eşleştirildiğini ve bir risk peyzajı oluşturduklarını göstermektedir. Dioscorides'in mantar bilgisinin eserin geneline yayılmış olan ekolojik bir bilgi ağını oluşturduğu görülmektedir. Mantarların mekânsal dağılımı, bedensel etkileri, çevresel özellikleri, tehlikeli yönleri ve mantar zehirlenmelerine karşı müdahale önlemleri holistik açıdan incelendiğinde antik mantar bilgisinin antik çağ coğrafyasında nasıl inşa edildiği anlaşılmaktadır. Araştırma, antik mantar bilgisinin günlük hayat pratiklerindeki yerini ve nasıl kullanıldığını göstermesi bakımından da disiplinlerarası bir çalışma alanı sunmaktadır.

Anahtar kelimeler: Mantar, Dioscorides, De Materia Medica, Kültürel Coğrafya, Ekolojik Bilgi

Introduction

Dioscorides's "De Materia Medica" is one of the most important works of medicine and pharmacology in antiquity. Research has shown that the work influenced not only Roman civilization but also Europe and the Mediterranean world in subsequent centuries. For a very long time, the book served as a primary reference and treatment guide in these regions (Eadie, 2004; Scarborough, 2018). Dioscorides's work is not merely a medical compilation; it is a comprehensive geographical resource that presents the types of products from antiquity, how and where they were collected, and how they were used in daily life, thus generating and disseminating spatial information from that era. From this perspective, the information on mushrooms in the work goes beyond a simple plant list; it culturally reconstructs a geographical space by indicating the environment in which mushrooms grow, their morphological characteristics, and their practical uses.

The concepts of cultural geography and traditional ecological knowledge provide an important framework in the literature. Geographical space is undoubtedly of indispensable importance as it forms the basis for areas where various elements, which are sources of traditional ecological knowledge in nature, exist, and where ecological knowledge is produced and disseminated based on these elements (Livingstone, 2003; Secord, 2004). Therefore, it is not possible to consider ecological knowledge independently of space. In this sense, the concept of traditional ecological knowledge should not be seen merely as an abstract set of knowledge. Traditional ecological knowledge should be viewed as a whole, passed down through generations, formed through diverse experiences, tested for accuracy or validity through various practices, and accompanied by diverse beliefs (Berkes, 2018).

Dioscorides's work should not be considered solely as a good source of traditional ecological knowledge. It stands out particularly for providing an important analytical framework concerning the distribution areas, uses, identification methods, and management of harmful situations arising from the collection of many products

from nature. This aspect of the work, which produces knowledge about nature, is further enhanced by the "space-observation-use" relationship that emerges when combined with a geographical perspective. Mushrooms are among the most striking examples of this "space-observation-use" relationship. The work contains remarkable information about mushrooms in various sections. Therefore, this work is noteworthy in terms of the "relationship between mushrooms and space."

Dioscorides's "De Materia Medica" exists in various versions across different languages. The version under study is the English edition prepared and indexed by Osbaldeston and Wood (Osbaldeston & Wood, 2000). Therefore, the editors state that this version does not exactly resemble the original Greek version, and that some plant species are described not as they actually are, but with their most likely equivalents (Osbaldeston & Wood, 2000).

Material and Method

The primary material for this study is Dioscorides's "De Materia Medica," a work that exists in numerous versions across various languages. However, this study focuses on the indexed English version prepared by Osbaldeston and Wood (Osbaldeston & Wood, 2000). The secondary material consists of a textual dataset comprised of cultural geography and traditional ecological knowledge literature.

The aim of this study is to examine the knowledge of mushrooms in Dioscorides's "De Materia Medica" from a geographical perspective, within the context of ancient, space-oriented natural knowledge. Rather than focusing on a biological classification of mushrooms, the study emphasizes how the "space-observation-use" relationship related to mushrooms in the work relates to the traditional ecological knowledge framework. The study is structured around two research questions. The first concerns the environmental indicators and spatial characteristics upon which the information about mushrooms in the work is based. The second research question examines how ancient natural knowledge about mushrooms was produced and classified spatially, and

how this can be interpreted from a cultural-geographical perspective.

This research employs qualitative content analysis. This method is known to be frequently used in studies examining historical texts, particularly in social science research, and is considered quite suitable for this purpose in the literature (Mayring, 2000; Hsieh et al., 2005). This version of the text, used in the analysis phase, facilitated the systematic separation and examination of the sections related to mushrooms. This version allows for the systematic identification and examination of relevant sections in the text concerning mushrooms. The analysis of the sections related to mushrooms was carried out in four stages: Data selection, coding of the selected data, thematic analysis of the coded data, and interpretation of the analyzed data from a geographical perspective.

In the data selection phase of the research, sections that best represented ancient ecological knowledge and its spatial character were identified without disrupting the thematic integrity of the work. In identifying these sections, the direct and indirect information given in the work regarding mushrooms was systematically evaluated. These sections consist of *Meli* (2-101), *Agaricon* (3-1), *Apsinthion* (3-26), *Muketes* (4-83), substances suggested in the text regarding mushroom poisoning, and other information about mushrooms found in fragments within the text. In creating the coding categories, both fundamental concepts in cultural geography were considered, and the original data included in the work were evaluated using an inductive approach. To ensure the validity of the categories, thematic consistency checks were performed on the dataset under study. This coded content was then analyzed within the themes of "spatial context-use and effects-risk prevention". The data obtained were interpreted in relation to the research questions of the study. In this way, a methodological relationship was established between coding and cultural geography analysis, and this relationship was concretized to ensure the transparency and reproducibility of the study.

Results

a) Knowledge of Fungi in "De Materia Medica"

The information about mushrooms in Dioscorides's work is not limited to a single section. The section on "Muketes" (4-83) is the main focus in terms of mushrooms, and other parts providing information about mushrooms are distributed throughout the text around this main focus. This resulting structure allows for a gradual distinction between descriptive findings obtained directly from the ancient text and interpretive approaches used in cultural geography. The section "Agaricon" (3-1) focuses on mushroom-like (fungus-like) natural elements

and provides information about their growing environments. The sections "Apsinthion" (2-26), "Meli" (2-101), and "Salt" in the fifth chapter contain information about eating mushrooms, the effects of consuming them, and the precautions to be taken to prevent them. This shows that the work does not simply offer a "gather and eat" approach to mushrooms, but rather addresses the subject of mushrooms holistically, covering all aspects. Furthermore, the mention of the relational characteristics of mushrooms and other natural elements in different parts of the text demonstrates the multi-dimensional approach to mushrooms in this ancient work.

b) Fungi, Natural Sciences and Spatial Characteristics

In the work "De Materia Medica," knowledge of mushrooms is intertwined with knowledge of nature and spatial characteristics. To fully understand the content related to mushrooms, the sections on mushrooms must be read and evaluated alongside the rest of the text. Dioscorides offers original explanations about mushrooms in his work. He describes his personal experiences with mushrooms, the methods to identify them, the times when mushrooms are collected, and the places where they are identified, collected, and grow. For example, he states that it is more suitable to collect plants on sunny days, and that the areas where mushrooms and plants grow determine the various characteristics of the mushrooms found there. He expresses in the work that whether a place is mountainous, windy, sunny, has temperature values, is arid or rainy, is swampy, and is dark and airless are determining and differentiating characteristics for plant and mushroom species.

Dioscorides provides detailed information about plants and their growth stages due to their close relationship with fungi. He states that plants should be monitored from their initial growth stages, from when they emerge from the soil or sprout, through the changes during the maturation phase, and finally until the plant dies at the end of its vegetation period. He even gives an example. According to Dioscorides, those who closely follow all vegetative stages of different plants growing in different regions, as described, will be the most knowledgeable about plants. And, according to him, these people will learn a great deal about both plants and fungi. Here, Dioscorides's close association of plants and fungi is evident. The work clearly shows us the "place-plant-fungus" relationship. Undoubtedly, the existence of this relationship is an undeniable fact even today. In this ancient work, fungi are evaluated through the elements of nature, season, and observation. Furthermore, the concept of "uniqueness (oneness) of places," a fundamental characteristic of the discipline of geography, is highlighted here. Dioscorides's observations on plants

and fungi include information that species vary according to location. This is important because it shows that spatial differentiation regarding species was known and used as a fundamental data point in his work. In this context, it will also be proven that Dioscorides acted with the reflex of a geographer in his own time.

c) Agaricon: The Geography of a Mushroom

Agaricon (3-1) constitutes one of the most remarkable sections in the work concerning mushrooms. It provides information about the structure, growing locations, and various characteristics of the mushroom called *Agaricon* (*Agaricon* also known as Eburiko or Quinine's mushroom). In this section, it is stated that *Agaricon* grows in the region called *Agaria* (although its exact location is unknown, it is estimated to be the land of the "Agari" people, who settled on the northern shores of the present-day Sea of Azov), within the borders of the country of *Sarmatia* (the name of the region inhabited by the Sarmatian people in ancient times. It was an area corresponding to present-day Central Ukraine, Southeastern Ukraine, Southern Russia, the Volga, the Southern Urals, Moldova, and the Balkans. It is also mentioned that *Agaricon* grows in *Asia* (the term "Asia" in the text is probably used to refer to the Roman Empire's province of Asia. This region corresponds to present-day Western Anatolia-Türkiye), *Cilicia* (this expression in the

text corresponds to the southern Mediterranean region of present-day Türkiye), and *Galatia* (It is a name given to Central Anatolia in ancient times. In Türkiye, it can be roughly described as the area around present-day Ankara and Eskişehir). (Figure 1). While describing *Agaricon*, some characteristics of this mushroom are also mentioned; in some places it is described as a substance resembling a tree root, in others it is found between tree roots and trees, and in others it is described as a type of mushroom that grows on the trunks of decaying trees. The text also includes explanations about which plants *Agaricon* grows in association with. For example, it is stated that *Agaricon* grows on the cedar trees in *Cilicia*, but that these *Agaricon* species are thinner and more fragile than others. It is known that the region called *Cilicia* here is a region in present-day Türkiye that includes the *Taurus Mountains*. And it turns out that the cedar trees mentioned here correspond to the present-day Taurus cedar (*Cedrus libani*) in the region. These explanations show that Dioscorides established a systematic relationship between "location and influence" factors in relation to fungi. By relating the geographical distribution and growing conditions of the *Agaricon* mushroom during the period in which it lived, Dioscorides essentially placed ancient knowledge of fungi within an analytical geographical framework.

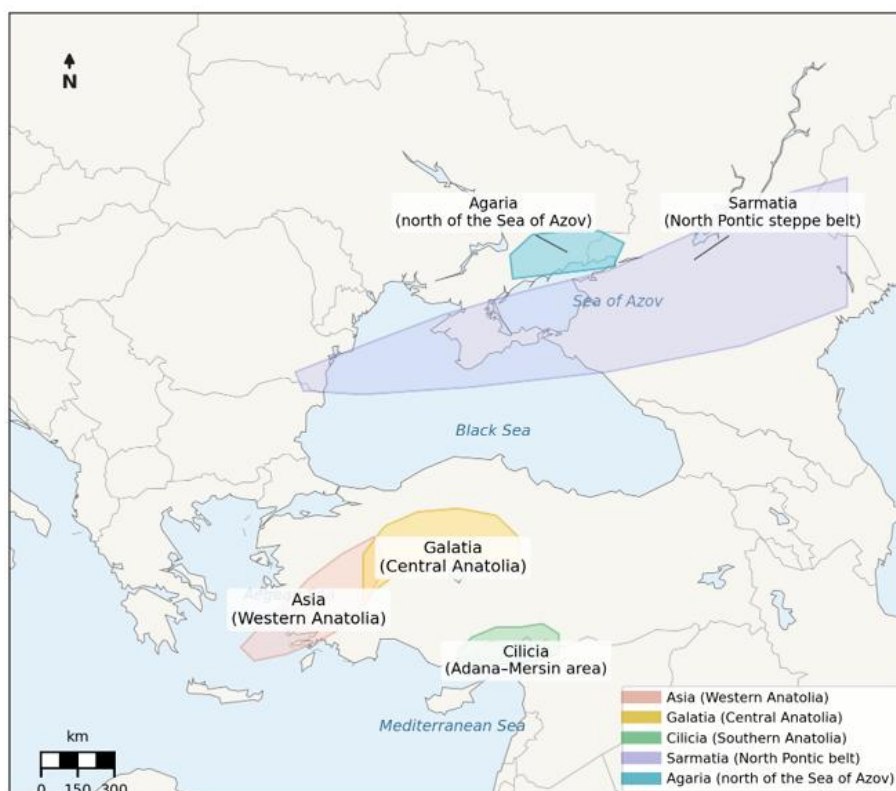


Figure 1. Approximate spatial equivalents of place names mentioned in Dioscorides's *De Materia Medica* regarding mushrooms.

On the other hand, it is understood that the mushroom species referred to as *Agaricon* in the work is a type of fungus that grows on the trunks of trees today and causes the tree to rot. This mushroom species turns out to be *Laricifomes officinalis*, known by various names such as Quinine's Mushroom, Nail Mushroom, Tinder Mushroom, or Wood Mushroom (Figure 2). This

mushroom species is known to have been used in medicine and belief systems from ancient times to the present day. It is recorded in the literature that this mushroom species, called "the bread of ghosts" in local languages, is frequently used especially in Shamanism (Blanchette et al., 1992).



Figure 2. Four different views of *Laricifomes officinalis*. Lateral view of the stem (a), texture view (b), multiple basidiocarps on the same substrate (c), pore layer view (d), (Sesli et al., 2020; URL-1)

d) Muketes: Functional and Risk-Oriented Fungal Classification

The section titled *Muketes* (4-83) in "De Materia Medica" is the part where mushrooms are dealt with most directly and clearly. In this section, mushrooms are grouped as edible and poisonous (inedible). The text does not make a specific classification of mushrooms in this sense. The work generally divides them into "beneficial" and "harmful" mushrooms. A detailed explanation is given regarding harmful mushrooms in this section. Regarding poisonous mushrooms, it is stated that these mushrooms grow around snake holes, among

rusty nails, in rotten glands, and near trees with harmful fruits. It is also mentioned that these poisonous mushrooms contain a dark liquid that appears quite sticky and clotted. Furthermore, it is stated that these poisonous mushrooms spoil quickly after being collected and rot for a short time. In contrast, it is stated that non-toxic, i.e., edible mushrooms, have a sweet taste when boiled in broth, but even these non-poisonous mushrooms can be dangerous if consumed in large quantities.

One important reason why this section of the text, *Muketes*, yields interesting findings regarding mushrooms is that it describes not only the mushrooms

themselves but also their environment (the spatial characteristics in which they grow). The environmental conditions described here—snake holes, areas with rusty nails, decaying glands, or near trees with harmful fruits—do not provide valid and decisive scientific evidence in the modern world of mycology. However, these areas mentioned in the text are marked as dangerous locations producing poisonous mushrooms. Dioscorides, in his work, explains a method for identifying dangerous mushrooms by reading certain spatial cues, even for antiquity.

These findings from the *Muketes* section elevate the risk of mushroom poisoning beyond a purely biological risk, creating a new risk landscape incorporating spatial symbols such as rust, decay, and snake holes. This landscape reveals, from a cultural-geographical perspective, how ancient knowledge of mushrooms was geographically encoded.

e) Mushrooms, Their Bodily Effects, and Danger Language

In the work "De Materia Medica," the section on mushrooms discusses their physical effects on humans. The book states that poisonous mushrooms can cause serious physical problems, while even harmless mushrooms can pose problems if consumed in excess. It also notes that consuming too many harmless mushrooms can be very difficult, cause a feeling of suffocation, and increase bile production. Furthermore, it mentions that edible mushrooms are quite nutritious but are difficult to break down in the body, with the remaining undegraded parts usually being excreted in the feces. Interestingly, this section not only categorizes mushrooms into harmful and harmless groups but also includes observations on their physical and digestive effects. Moreover, the determination of a "dose" (the need to avoid excessive consumption) for edible mushrooms is quite noteworthy, reflecting the modern medical relationship between food and medicine.

The bodily observations made regarding mushrooms demonstrate the production capacity and reach of ancient natural knowledge. This ancient relationship between the human body and mushrooms is significant in ancient natural knowledge. It is clear that ancient natural knowledge did not view mushrooms merely as food sources. Mushrooms were also organisms capable of causing problems when they entered the human body. Therefore, it can be said that spatial observations, findings, and human experience constructed ancient natural knowledge through mushrooms. And this nourished traditional ecological knowledge, extending from the geographical landscape to the depths of the human body.

f) Precautions and Intervention Methods Against Mushroom Poisoning

After making his observations on mushroom species in his work, Dioscorides also discusses in detail the potentially harmful effects of mushroom poisoning. In the section titled *Muketes* (it is a word of Greek origin, meaning mushrooms/fungi), substances that can be used against mushroom poisoning and how to use them are described. The text states that in cases of mushroom poisoning, the body can be moistened with *nitrate* (niter or nitre / It comes from the Greek root "natron/nitron". This substance is used elsewhere in the text under the name "Saltpetre or Saltpeter") and oil, a strong brine can be used, *thymbra* (upon examining other parts of the text, it is believed that this is a plant species, specifically a type of wild thyme that currently grows in the Mediterranean region of Türkiye) can be boiled, *origanum* (it is thought to be a plant species and corresponds to a wild aromatic species belonging to the Marjoram plant family) can be used, chicken dung can be used, vinegar can be used, or honey syrup can be used to alleviate the poisoning.

The editor of the text, in other parts of the work, explains the term "nitre" with the parenthetical explanation "saltpetre." Later, this "saltpetre" is further explained as "potassium nitrate," also in parentheses. From this, it appears that in this version of the text, the term "nitre" is explained as "potassium nitrate." However, the word "nitre" is known to originate from the Greek word "natron/nitron/nitrum." The word "natron" is known to have been used in ancient Greek to mean "alkaline soda salts." Therefore, it is possible that the word "nitre" used here refers not to potassium nitrate, but to various alkali salts corresponding to sodium carbonate or sodium bicarbonate. For this reason, it is thought that the word "nitre" here most likely refers to a salt mixture composed of alkaline minerals.

The word "*Thymbra*" appears frequently in the text, as well as in other parts. In some places, it is also used as "wild thyme," "mother of thyme," and "creeping thyme." These expressions suggest it refers to a type of thyme, most likely the wild thyme species *Thymus serpyllum*. However, another section of the text provides a list for preparing "Thymbra wine/Thymbrites," which refers to thyme wine. This list includes several plant species: *Thymus tragoriganum*, *Satureja thymbra*, *Micromeria thymbra*, and *Thymus graveolens*. It is known that *Satureja thymbra* corresponds to the small shrub form of what is now known as "Cretan thyme." The name *Thymus tragoriganum* is listed in the literature as a synonym for *Satureja thymbra* (URL-2). It is also stated that the species *Thymus tragoriganum* corresponds to *Thymus vulgaris*, known as "Garden Thyme" or "Common Thyme". The name *Micromeria thymbra* is also mentioned in the

literature as synonymous with *Satureja thymbra*. The names "Savory of Crete" and "Canadian Savory" are used after these plant species names in the text. This confirms the names "Cretan thyme" and "Canadian savory". The species *Origanum* mentioned in the text does not refer to a single species. The name *Origanum* refers to various species with aromatic properties belonging to a group of plants now called "marjoram."

It appears that the name *Thymus graveolens* is not a currently accepted or valid plant species name. Its modern equivalent is *Clinopodium graveolens*. *Thymus graveolens* is considered an older and abandoned form of the name *Clinopodium graveolens*. This plant belongs to the *Lamiaceae* family (mint family) and is known today by various names such as "Kuntze/Filiskin/Wild Basil." Possessing a very sharp and strong odor, this plant is distributed across a wide geographical area, primarily in Anatolia, the Balkans, the Caucasus, and the Middle East. Literature indicates that the essential oils of this plant family have antifungal effects, are used in the fight against infections, and have anti-inflammatory properties (Gezici et al., 2022). This is noteworthy, as it shows that similar benefits of this plant were identified in ancient times and it was used against various ailments, including mushroom poisoning.

Another section in the work that provides information on mushroom poisoning is the section titled *Honey* (2-101). This section focuses on the relationship between honey and poisoning. It states that honey should

be used by licking or drinking it in cases of mushroom poisoning. In the section titled *Wormwood*

(3-26), it is stated that drinking vinegar is effective in treating the bodily constriction and suffocation sensation caused by mushroom poisoning. In the fifth book of the work, the use of salt in mushroom poisoning is discussed. It is stated that eating salt or using salt together with vinegar and honey yields good results against mushroom poisoning. This section also mentions that drinking poppy seed water is beneficial against mushroom poisoning. These statements show us that this ancient text provides what are essentially ancient remedies for mushroom poisoning. It is thought that these ancient remedies aimed not so much to completely neutralize the mushroom poison, but rather to alleviate the symptoms of poisoning, at least to restore balance in the stomach and intestines, to speed up elimination, and to relieve the constriction/suffocation sensation.

The intervention methods presented here demonstrate that in antiquity, the threat of fungi was not only seen as a medical problem, but also how daily life experience based on geographical knowledge was managed. The use of some materials that were readily available in antiquity (vinegar, honey, salt, chicken droppings, etc.) shows the ancient connection between ecological knowledge and daily life, even in antiquity, and proves the spatial applicability of ecological knowledge (Figure 3).

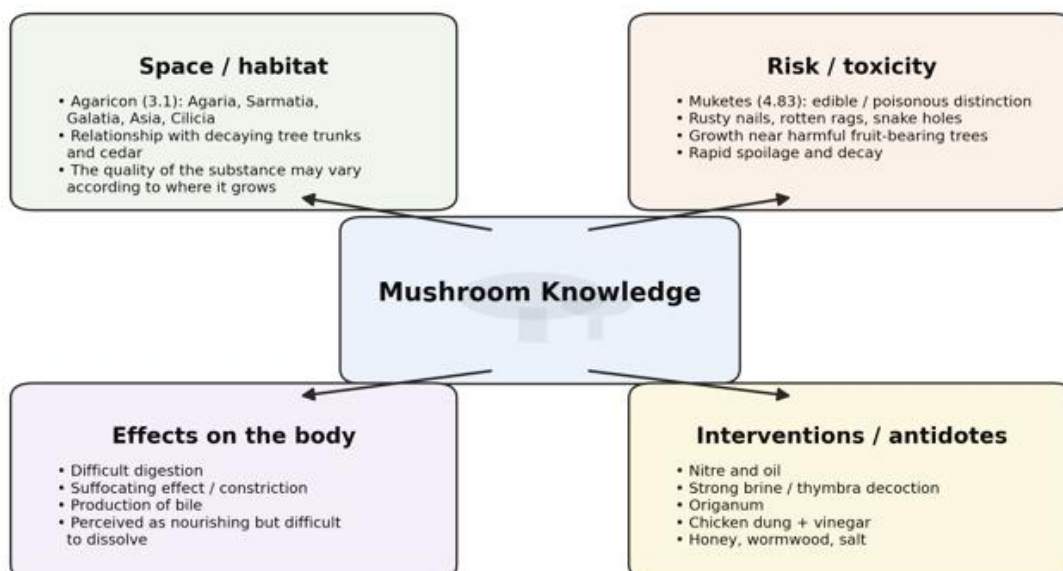


Figure 3. Conceptual framework of mushroom knowledge in Dioscorides's *De Materia Medica*

Conclusion

This study reveals the fragmented structure of the knowledge about mushrooms in Dioscorides's *De Materia Medica*, a work by an ancient philosopher. Despite this fragmented structure, the text as a whole establishes a relational network regarding mushrooms. This relational network demonstrates how ancient natural knowledge, specifically regarding mushroom knowledge, was systematically produced within a spatial and ecological framework.

The second conclusion drawn from the study is that the information contained in the work, especially the information on mushrooms, has a spatial character. The constitutive element in the work is precisely geography. The areas where information on mushrooms is given are dealt with in the context of a specific location in the text, describing the places where mushrooms grow and the conditions under which they grow. The text provides information about mushroom species, groups these species, explains which species are intertwined with which natural or human factors, and reveals environmental differences related to mushrooms.

The third conclusion drawn from the study is that the work does not merely discuss mushrooms as an element of nature, but rather presents knowledge about mushrooms in terms of danger and preventative measures. The study describes poisonous and non-poisonous mushroom species, provides detailed spatial information about their habitats, and even explicitly outlines everyday precautions against mushroom poisoning. This is quite remarkable, as it shows that an ancient work not only provides a simple description of mushrooms but also offers solutions to the complex issues of mushroom poisoning.

In conclusion, Dioscorides's *De Materia Medica*, besides being a pharmacological work of the ancient world, is also a traditional ecological record of reading nature, recognizing and identifying its dangers, taking

precautions against them, developing solutions, applying these solutions in daily life, and passing them on to future generations. From the perspective of natural knowledge, the information on mushrooms in Dioscorides' *De Materia Medica* is not only ecological knowledge but also a strong reflection of the relationship established with place. For all these reasons, the work can be considered a useful resource for understanding ancient ecological knowledge and the geography in which this knowledge originated.

This study has limited the construction of an ancient geography to Dioscorides' *De Materia Medica*, specifically focusing on fungi and their related natural knowledge. Future research could apply the cultural geography perspective used in this study to other botanical elements found in the work. Furthermore, by comparing this work with other similar ancient texts, a broader spatial map of ancient ecological knowledge could be created. This comparative analysis would thus provide a holistic understanding of the ecological knowledge, environmental perceptions, production methods, and spatial practices of ancient societies.

Author contributions

This study was prepared as a single-authored work. The entire study was conducted by the author.

Conflicts of interest

The author declares that there is no conflict of interest.

Ethical Statement:

This study does not require ethical permission. The preparation and writing process of this study adhered to the principles of scientific research and publication ethics. All sources used are properly cited in the text and bibliography (Bekir DERİNÖZ).

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