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Chapter

Wild Medicinal Mushrooms: Potential Applications in Phytomedicine and Functional Foods

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Abstract

The accumulated secondary metabolites in medicinal mushrooms have been widely accepted as sources of safe and effective nutraceuticals, cosmeceuticals, and pharmaceuticals. Medicinal and edible mushrooms are foods appreciated for their exquisite flavor and medicinal properties. The nutritional values and biologically active compounds in mushrooms have immense potentials for producing new drugs of great health benefits to mankind. In recent times, medicinal mushrooms are being exploited for new and natural compounds that could modulate immune cell's response, and possess antimicrobial, antioxidants, and anticancer properties. In Nigeria, where there is vegetation that supports the luxuriant growth of varieties of naturally occurring macrofungi, some of the wild macrofungi have not been properly identified, adequately studied, and fully harnessed for their potentials as food and medicine. It is therefore pertinent to bring to limelight the nutraceutical potentials of some of these wild macrofungi that are currently underutilized.

Keywords: Nutraceuticals, medicinal mushrooms, mycochemicals, basidiomycetes

1. Introduction

Medicinal and edible mushrooms are mostly found in the higher basidiomycetes, and they usually have a saprophytic and aerobic growth habit, which allows them to grow on different lignocellulosic materials [1]. Fungi as a kingdom have very diverse group of living organisms found across all ecosystems [2]. Fungi are eukaryotes; they have microscopic organelles within their cells called nuclei which contain genetic materials in the form of threadlike chromosomes and enable hereditary characters to be passed on to subsequent generations [3]. The Basidiomycetes make up a colossal variety of fungi. Their taxonomic determination has been controversial and sometime challenging due to limited distinguishing characters and disagreement in features characteristics to be adopted for separating the different species [4]. The use of fruit body morphological characteristics such as appearance, color, dimension, spores and form of the fungus on pure culture, physiological factors, and environmental growth preferences can often mislead the identification

of macrofungi without the use of microscopic examination coupled with molecular tools [5]. Therefore, the advancement and upsurge in the use of Deoxyribonucleic Acid (DNA) technology has proven to be a powerful tool for traditional taxonomic methods by solving the challenges of taxonomic chaos [6]. The rapid development with the use of versatile molecular techniques has provided easy approach, which is already being used to identify unknown basidiomycete isolates by comparing their DNA profiles with those fruit bodies that have been authenticated in GenBank. DNA techniques for the identification of fungi have been widely used in human and veterinary medicine; it is rapid and displays the accurate identity of pathogenic fungi in order to select appropriate treatment. They have also been applied to food quality control for the detection of contaminants [7]. The body or thallus of the basidiomycete fungus (the mycelium) is normally hidden within the substrate, and it is generally only the fruit body or basidiocarp that is visible at the surface. For this reason, the fruit body tends to show the greatest morphological variation. Conventional mycologists rely on a number of macroscopic and microscopic features of the fruit body to distinguish between macrofungi species [5].

2. Mushrooms

Mushrooms are foods that are commonly consumed since earliest history; ancient Greeks believed that mushrooms are a source of strength for warriors in battle; the Romans regard mushrooms as the “Food of the Gods” served them only on festive occasions. For centuries, the Chinese culture has treasured mushroom as a health food, an “elixir of life” [8]. Mushrooms are originally defined as macrofungi with a distinctive fruiting body, which is large enough to be seen with the naked eye and picked by hand [1]. They do not have the green pigment called chlorophyll that enables the plant to utilize energy from sunlight to change chemical into substances necessary for growth, a process commonly known as photosynthesis instead mushroom produces a wide range of extracellular enzymes [9]. This enables them to degrade complex organic matter into soluble substances, which can be absorbed for nutrition and stored as secondary metabolites [2]. The growth and fruiting of an individual mushroom species on particular substrate will depend upon their ability to produce enzymes that degrade the major component of the substrate such as cellulose, hemicelluloses, and lignin [10].

Macrofungi produce valuable enzymes and bioactive molecules with different therapeutic effects. Therefore, they are considered as flourishing organisms to develop different healthcare and biotechnological products [11]. Mushrooms have been a part of the human culture for thousands of years with considerable interest in civilization history because of their sensory characteristics and medicinal properties; they have been recognized for attractive culinary with low calories, carbohydrates, fat, and sodium with no amount of cholesterol [12, 13]. It has been estimated that there are about 140,000 species of mushrooms present on earth and only 5% are explored for uses, while 7000 were undiscovered species that could be of medicinal value to mankind [14]. With recent advances in medical and nutrition sciences, natural products from both edible and nonedible mushrooms have received extensive attention from individuals and health professionals due to the presence of biologically active compounds with denoted health benefits [15].

Owing to the increasing demand of natural bioactive compounds as an option to replace some synthetic drugs or additives in the pharmaceutical and food industries, the interest in fungi (medicinal mushrooms) has risen in recent years. The potential uses of the mushrooms have appeared as a nutraceutical, nutritional therapy, phytonutrients, phytotherapy, and pharmaceutical due to the accumulated number

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