



FROM HUMBLE BEGINNINGS TO GROWING PROSPERITY: THE MUSHROOM STORY IN CHHATTISGARH

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ABSTRACT

Mushrooms have emerged as a vital economic asset in Chhattisgarh, offering diverse opportunities for income generation and market growth. Despite being relatively underexplored, mushroom cultivation has gained momentum in the region, contributing significantly to livelihoods and economic development. Mushrooms in Chhattisgarh are valued not only for their culinary appeal but also for their medicinal properties and industrial applications. They serve as a nutritious food source, rich in essential nutrients, and are integrated into local cuisines and traditional recipes. Certain species of mushrooms are utilized in traditional medicine, enhancing healthcare practices in the region. Moreover, mushrooms find industrial uses in sectors such as packaging, biodegradable materials, and bio fuels, expanding their applications beyond the kitchen. The growing demand for mushrooms reflects changing consumer preferences towards healthier and sustainable food options in Chhattisgarh. Local markets, as well as interstate and international trade channels, provide avenues for mushroom producers to access diverse consumer segments. Government initiatives and support programs aimed at promoting mushroom cultivation further stimulate market growth and market access for local producers. However, the mushroom sector in Chhattisgarh faces challenges such as limited awareness, technical know-how, and infrastructure constraints. Addressing these challenges through capacity building, technology transfer, and infrastructure development presents opportunities for overall growth and market expansion. Collaboration between government agencies, research institutions, and the private sector can drive innovation and market-driven approaches to enhance the competitiveness of Chhattisgarh's mushroom industry. Mushrooms play a crucial role in Chhattisgarh's economy, offering a wide range of benefits including income generation, nutritional enhancement, and industrial innovation. By leveraging its versatile uses and addressing existing challenges, the mushroom sector in Chhattisgarh can unlock its full economic potential and contribute to sustainable development in the region.

KEYWORDS: Mushroom, Economic Significance, Diversified Utilization, Decomposition Dynamics, Innovative Applications, Economic Opportunities

1. INTRODUCTION

The word "mushroom" finds its origin in the French term for fungi and molds. Over time, advancements in cultivation methods have led to a significant increase in mushroom production worldwide. The Netherlands has emerged as the largest mushroom producer in the European Union over the past 50 years, with an annual production of 270 million kilograms and more than 10,000 associated jobs. China leads the global mushroom production market, followed by Italy and the United States. Poland stands out as the largest exporter of mushrooms globally, while the Netherlands leads in per capita consumption at 11.62 kg per head per annum. Throughout history, mushrooms have been revered for their nutritional value. Ancient Greeks believed mushrooms provided strength to warriors, while Romans considered them the "Food of God." Initially gathered from natural habitats, efforts to domesticate mushrooms under controlled conditions have led to the cultivation of over 2,000 edible fungal species worldwide. However, only a handful, including *Agaricus bisporus*, *Pleurotus* spp., *Volvariella volvacea*, *Calocybe indica*, and *Lentinula edodes*, are commercially cultivated in India. Mushrooms are recognized as valuable natural resources due to

their ability to convert inputs into highly nutritious protein-rich food. They offer a promising nutritional source, particularly in times of food scarcity, as they are rich in minerals and vitamins. Presently, three main mushroom varieties dominate global cultivation: the button mushroom (*Agaricus bisporus*), paddy straw mushroom (*Volvariella* spp.), and oyster mushrooms (*Pleurotus* spp.). Among these, *Agaricus bisporus* is cultivated on a commercial scale worldwide. The global mushroom trade predominantly involves processed forms of mushrooms.

2. LITERATURE REVIEW

Mushrooms are indeed recognized as a highly nutritious food source, containing essential components for a balanced diet. They are considered a potential substitute for muscle protein due to their high digestibility [7]. Additionally, mushrooms are rich in quality proteins, providing most of the essential amino acids that are often deficient in many vegetables and cereals, particularly lysine [6]. Furthermore, mushrooms are an excellent source of vitamin D, a nutrient not readily available in other food supplements [8]. In many Asian countries, mushrooms are consumed not only as food but also for their medicinal properties. Research has explored the medicinal aspects of

mushrooms [3], and they are used in traditional systems of medicine such as Ayurveda in India [1][4]. Studies suggest that mushroom consumption can promote immune function, potentially reducing the risk of cancer and inhibiting tumor growth [9]. Mushrooms are particularly favored by individuals with diabetes and hypertension due to their low caloric value, low sugar and fat content, and absence of cholesterol [2]. Fresh button mushrooms have high moisture content but are still rich in protein, fiber, ash, carbohydrates, and essential minerals and vitamins. They contain calcium, phosphorus, sodium, iron, potassium, thiamine (B1), riboflavin (B2), ascorbic acid (C), and niacin (B3) [5]. In recent years, mushrooms have gained recognition as a “super food” due to their impressive nutritional profile. They are packed with key nutrients like selenium, vitamin D, glutathione, and ergothioneine, which help combat oxidative stress and reduce the risk of chronic conditions such as cancer, heart disease, and dementia. Moreover, mushrooms impart a strong natural flavor, allowing consumers to reduce salt intake in mushroom-based meals, further benefiting health outcomes.

The study lacks detailed exploration of various mushroom species’ nutritional and medicinal properties, potentially overlooking differences in nutrient composition and health benefits among different varieties. Additionally, it falls short in examining how bioactive compounds in mushrooms interact with biological processes to provide health benefits, leaving a gap in understanding their mechanisms of action. Furthermore, there’s a dearth of robust clinical evidence supporting claims about the efficacy and safety of mushroom-based interventions for immune function, cancer prevention, and other health outcomes. While the study briefly mentions traditional uses of mushrooms, it fails to delve into their cultural significance or indigenous knowledge, which could offer valuable insights. Moreover, it neglects to address factors influencing consumer preferences and behaviors, such as taste preferences and cultural norms, crucial for promoting mushroom consumption and improving public health. Lastly, the study overlooks considerations for sustainable mushroom cultivation practices and their environmental impact, including resource use efficiency, waste management, and ecological footprint, which are vital for long-term sustainability.”

3. OBJECTIVES OF THIS PAPER

The objective of this paper is to analyze the economic importance of mushrooms in Chhattisgarh, focusing on their versatile uses and market impact. The paper aims to explore how mushrooms contribute to the state’s economy, including income generation, employment opportunities, and market growth. Additionally, it seeks to examine the various uses of mushrooms, both traditional and emerging, such as culinary, medicinal, and cosmetic applications. Through this analysis, the paper aims to highlight the potential of mushrooms as a valuable agricultural commodity and advocate for their further development and promotion in Chhattisgarh.

4. ECONOMIC SIGNIFICANCE OF MUSHROOMS: A MULTIFACETED PERSPECTIVE

Mushrooms, often celebrated for their culinary allure and

distinctive flavors, possess a wealth of economic value that extends far beyond their gastronomic appeal. While their reputation as delicacies remains prominent, their nutritional richness and medicinal properties underscore their potential to address malnutrition and disease, offering a holistic solution to health challenges.

Diversified Utilization: From Food Source to Environmental Catalyst

Beyond their role as a sought-after food item, mushrooms find diverse applications across various industries, contributing to economic prosperity and ecological sustainability. Their ability to decompose dead organic matter, such as fallen timber and bark, not only facilitates nutrient cycling in forests but also generates fertile soil for the growth of new vegetation, thus enhancing the productivity of forest ecosystems.

Key Players in Decomposition Dynamics

Mushrooms play a pivotal role in the decomposition of organic material, acting as primary, secondary, and tertiary decomposers in the natural cycle of nutrient recycling. Species like Shiitake, Oyster, and Wine Cap mushrooms initiate the breakdown of lignin and cellulose, while others, including White Button and Portobello mushrooms, thrive on compost substrates, further enriching the soil with essential nutrients. Their vigorous mycelium and adaptability to cultivation make them ideal candidates for commercial production, thereby contributing significantly to agricultural economies.

Innovative Applications and Economic Opportunities

The economic potential of mushrooms extends beyond traditional uses, with innovative applications emerging in diverse sectors. For instance, the deliquescent properties of the Inky Cap mushroom make it a valuable source of writing ink, while the robust fruit bodies of Polyporus species serve as eco-friendly alternatives to conventional flower pots. Moreover, the luminosity exhibited by certain fungal species, such as *Armillaria mellea* and *Pleurotus japonicus*, presents opportunities for niche markets and specialized industries, catering to the unique demands of sectors like forestry and mining. Mushrooms stand as multifaceted agents of economic growth and environmental stewardship, embodying the principles of sustainability, innovation, and resourcefulness. By harnessing their diverse potential and embracing their ecological significance, societies can unlock new pathways to prosperity and resilience in an ever-changing world.

5. MEDICINAL MARVELS OF MUSHROOMS

Mushrooms, often revered for their culinary allure, also boast a rich history of medicinal use, spanning cultures and civilizations across the globe. From ancient remedies to modern pharmacology, these fungal wonders have been valued for their therapeutic properties, offering a diverse array of health benefits.

Immune Modulation and Wellness Enhancement

One of the most renowned medicinal attributes of mushrooms is their ability to modulate the immune system, bolstering its defenses against pathogens and promoting overall wellness.

Species like Reishi (*Ganoderma lucidum*), Turkey Tail (*Trametes versicolor*), and Shiitake (*Lentinula edodes*) contain bioactive compounds that stimulate immune function, making them valuable allies in the fight against infections and chronic diseases.

Anti-inflammatory and Antioxidant Effects

Mushrooms are also prized for their potent anti-inflammatory and antioxidant properties, which play a crucial role in mitigating oxidative stress and reducing the risk of chronic conditions such as heart disease, cancer, and neurodegenerative disorders. Compounds like polysaccharides, beta-glucans, and polyphenols found in mushrooms like Maitake (*Grifola frondosa*), Cordyceps (*Cordyceps sinensis*), and Lion's Mane (*Hericium erinaceus*) exhibit remarkable anti-inflammatory and antioxidant activities, offering natural alternatives to conventional pharmaceuticals.

Support for Cognitive Health and Brain Function

Certain mushrooms have gained recognition for their neuroprotective effects and potential in supporting cognitive health and brain function. Lion's Mane mushroom, in particular, contains compounds known as hericenones and erinacines, which have been shown to stimulate nerve growth factor (NGF) production and enhance cognitive function. Research suggests that Lion's Mane may hold promise in the treatment of neurodegenerative diseases like Alzheimer's and Parkinson's.

Adaptogenic Properties for Stress Management

Many mushrooms possess adaptogenic properties, helping the body adapt to stress and maintain homeostasis. Adaptogens like Reishi, Cordyceps, and Chaga (*Inonotus obliquus*) exert balancing effects on the endocrine system, supporting adrenal function and promoting resilience to stressors. By modulating stress response pathways, these mushrooms offer natural support for mental and physical well-being in an increasingly demanding world.

Harnessing the Healing Potential of Mushrooms

Mushrooms represent a treasure trove of medicinal compounds and therapeutic potential, offering a holistic approach to health and wellness. From immune modulation and inflammation reduction to cognitive support and stress management, the diverse array of bioactive constituents found in mushrooms holds promise for addressing a wide range of health concerns. As scientific research continues to unveil the secrets of these fungal allies, integrating mushrooms into our wellness routines may offer new avenues for promoting vitality and longevity. For millennia, mushrooms have held a revered status in folk medicine, revered for their remarkable health benefits and therapeutic properties. Laden with specific bioactive compounds such as polysaccharides, triterpenoids, low molecular weight proteins, glycoproteins, and immune-modulating agents, medicinal mushrooms have been hailed for their multifaceted contributions to human health and well-being.

Immune Support and Disease Prevention

Mushrooms emerge as formidable allies in fortifying the immune system, warding off diseases, and promoting overall health.

Their immune-boosting properties, attributed to compounds like beta-glucans, bolster the body's defenses, inhibit tumor growth, and mitigate the risk of cancer. Moreover, mushrooms exhibit antiviral, antibacterial, and antifungal activities, providing comprehensive protection against pathogens and bolstering the body's natural defense mechanisms.

Heart Health and Metabolic Balance

The nutritional composition of mushrooms renders them beneficial for cardiovascular health and metabolic balance. With their low-fat content, high proportion of unsaturated fatty acids, and absence of cholesterol, mushrooms support heart health and aid in weight management. Additionally, their potassium-rich, sodium-minimal profile promotes optimal blood circulation and salt balance, making them suitable for individuals with hypertension.

Diabetes Management and Weight Control

Mushrooms emerge as ideal dietary choices for individuals with diabetes and obesity, owing to their low-calorie content, absence of starch, and minimal sugars. The fermentable dietary fiber found in mushrooms promotes healthy digestion and enhances bowel function by serving as a substrate for beneficial gut microbes. By regulating blood sugar levels and promoting satiety, mushrooms play a pivotal role in diabetes management and weight control.

Antioxidant Defense and Anti-Aging Properties

Rich in antioxidants like ergothioneine and other bioactive compounds, mushrooms combat oxidative stress, scavenge free radicals, and mitigate cellular damage, thus serving as potent anti-aging agents. Ergothioneine, specifically abundant in certain mushroom species, supports various physiological functions, including eye health, kidney function, bone marrow health, liver detoxification, and skin vitality.

Varietal Benefits: From White to Porcini Mushrooms

Different mushroom varieties offer unique health benefits tailored to specific needs and conditions:

- White Mushroom: Rich in selenium supports weight loss and prostate health.
- Shiitake Mushroom: Contains lentinan, an antitumor compound, and boosts immunity.
- Oyster Mushroom: High in nutrients, antioxidants, and immune-boosting compounds.
- Reishi Mushroom: Exhibits anti-cancer, anti-inflammatory, and cholesterol-lowering properties.
- Shimeji Mushroom: Fights tumors, enhances immunity, and aids in diabetes management.
- Maitake Mushroom: Prevents breast cancer and supports immune health.
- Chanterelle Mushroom: Promotes eye and lung health, and strengthens the immune system.
- Porcini Mushroom: Anti-inflammatory, bone-strengthening, and aids in digestion.

Incorporating mushrooms into daily dietary practices not only cleanses the body but also fortifies the immune system, offering a holistic approach to health maintenance and disease

prevention. With their diverse array of medicinal properties and nutritional benefits, mushrooms stand as nature's potent allies in promoting vitality, longevity, and overall well-being.

6. NUTRITIONAL POWERHOUSE OF MUSHROOMS

Mushrooms stand as nature's complete health food, catering to the nutritional needs of individuals across all age groups, from children to the elderly. Their nutritional value is influenced by a myriad of factors, including species, variety, developmental stage, and environmental conditions. Rich in protein, dietary fiber, vitamins, and minerals, mushrooms offer a diverse array of essential nutrients in optimal proportions, making them a valuable addition to any diet.

Protein and Fiber-Rich Delights

Mushrooms boast a robust protein profile, comprising essential amino acids like threonine and valine, albeit deficient in sulfur-containing amino acids such as methionine and cysteine. Their carbohydrate content is primarily composed of dietary and fermentable fibers, devoid of starch and with minimal sugars, making them ideal for individuals seeking low-glycemic options. The presence of dietary fiber promotes healthy digestion and contributes to satiety, supporting weight management and gastrointestinal health.

Heart-Healthy Fats and Vitamin D Enrichment

With their low lipid levels, absence of cholesterol, and higher proportion of polyunsaturated fatty acids, mushrooms offer heart-healthy fats that promote cardiovascular well-being. Moreover, mushrooms serve as unique sources of ergosterol, a precursor for vitamin D synthesis in the human body. Exposure to ultraviolet (UV) light, whether natural or artificial, triggers the conversion of ergosterol into vitamin D₂, enhancing the nutritional value of mushrooms and offering a natural source of this essential vitamin.

Abundant Vitamin and Mineral Bounty

Mushrooms emerge as veritable treasure troves of vitamins and minerals, providing essential nutrients vital for optimal health and vitality. They are particularly rich in vitamin C and various B vitamins, including folic acid, thiamine, riboflavin, and niacin, which play key roles in metabolism, energy production, and immune function. Minerals such as potassium, sodium, and phosphorus abound in mushroom fruit bodies, along with trace amounts of copper, zinc, and magnesium. While mushrooms may be deficient in iron and calcium, their diverse nutrient profile compensates for these shortcomings.

Holistic Nutritional Complexes

In addition to their macronutrient and micronutrient content, mushrooms harbor a wealth of growth-promoting substances, including enzymes, alkaloids, sterols, antioxidants, and other organic complexes. These bioactive compounds exert multifaceted health benefits, ranging from immune modulation and inflammation reduction to cellular protection and anti-aging effects, further enhancing the nutritional value and therapeutic potential of mushrooms. It represents nature's nutritional powerhouse, offering a holistic array of essential nutrients, bioactive compounds, and health-promoting properties.

By incorporating mushrooms into daily dietary practices, individuals can harness their unparalleled nutritional benefits and support overall health and well-being.

7. ENVIRONMENTAL IMPORTANCE OF MUSHROOMS

In the intricate web of life on Earth, mushrooms emerge as unsung heroes, playing vital roles in maintaining ecological harmony and fostering environmental sustainability. With their unique ability to degrade complex lignin-rich compounds, mushrooms serve as nature's recyclers, facilitating the decomposition of organic waste materials and promoting clean environmental conditions.

Natural Waste Managers

Mushrooms excel in breaking down lignin-rich organic waste materials, such as fallen leaves, wood debris, and agricultural residues, through the action of their mycelium. By decomposing these materials, mushrooms not only recycle nutrients back into the soil but also prevent the accumulation of organic waste, thereby reducing the risk of environmental pollution. In regions like India, where wheat and paddy straw residues are abundant, mushroom cultivation offers a sustainable alternative to burning agricultural residues, mitigating air pollution and conserving natural resources.

Bioremediation Allies

Beyond waste management, mushrooms demonstrate remarkable potential in bioremediation programs aimed at remedying environmental contamination. Certain mushroom mycelia possess the ability to break down toxic substances and pollutants, such as petroleum hydrocarbons, heavy metals, and industrial chemicals, through processes like mycoremediation. By harnessing the natural detoxification capabilities of mushrooms, bioremediation initiatives can effectively restore ecosystems affected by pollution, revitalizing soil, water, and air quality.

Ecosystem Restoration and Conservation

Mushrooms contribute to the restoration and conservation of diverse ecosystems, from forests and grasslands to wetlands and urban environments. As integral components of soil microbiota, mushrooms play crucial roles in nutrient cycling, soil structure formation, and plant health, fostering biodiversity and ecosystem resilience. Moreover, certain mushroom species form symbiotic relationships with plants, enhancing their nutrient uptake and promoting mutualistic interactions essential for ecosystem stability.

Promoting Sustainable Practices

By promoting sustainable practices such as agroforestry, organic farming, and permaculture, mushroom cultivation offers holistic solutions for environmental stewardship and resource conservation. Through the integration of mushrooms into agroecological systems, farmers can enhance soil fertility, reduce chemical inputs, and minimize environmental impact, thereby fostering resilient and regenerative agricultural practices. In essence, mushrooms epitomize the symbiotic relationship between organisms and their environment,

embodying the principles of ecological balance, resource efficiency, and resilience. As advocates for sustainable living and guardians of biodiversity, mushrooms inspire us to embrace practices that nurture and protect the natural world, ensuring a healthy and thriving planet for generations to come.

8. ECOLOGICAL SIGNIFICANCE OF MUSHROOMS: GUARDIANS OF ECOSYSTEM HARMONY

In the intricate tapestry of ecosystems, mushrooms emerge as indispensable players, orchestrating diverse nutrient cycles, fostering symbiotic relationships, and supporting the intricate web of life on Earth. Their multifaceted roles encompass decomposition, mycorrhizal associations, wildlife habitat provisioning, and ecological balance maintenance, shaping the health and resilience of ecosystems worldwide.

Decomposition Dynamics and Nutrient Cycling

Mushrooms serve as nature's recyclers, catalyzing the decomposition of organic debris and returning essential nutrients to the soil. By breaking down complex organic compounds like lignin and cellulose, mushrooms facilitate nutrient cycling, enriching soil fertility and supporting plant growth. Their role in decomposing organic matter is crucial for maintaining ecosystem productivity and resilience, ensuring the efficient recycling of nutrients and the sustenance of life.

Symbiotic Mycorrhizal Associations

Many mushrooms form symbiotic mycorrhizal associations with plants and trees, establishing mutually beneficial relationships that enhance nutrient uptake, water absorption, and overall plant health. Through these associations, mushrooms facilitate the exchange of nutrients between plants and soil, promoting ecosystem stability and resilience. Mycorrhizal fungi play a vital role in maintaining the health of forests, grasslands, and other terrestrial ecosystems, contributing to plant growth, diversity, and adaptation.

Wildlife Habitat and Food Source

Wild mushrooms serve as essential food sources for a myriad of wildlife species, including insects, slugs, rodents, and larger mammals like deer and squirrels. These fungi provide sustenance and shelter for diverse organisms, supporting intricate food webs and biodiversity. By serving as primary consumers or decomposers in ecosystems, mushrooms play a crucial role in regulating population dynamics and maintaining ecological balance.

Ecosystem Health Maintenance

Mushrooms contribute to soil health maintenance, bioremediation, and pollution reduction through processes like mycoremediation. Certain mushroom species possess the ability to break down pollutants and contaminants, detoxifying soil and water environments. By enhancing soil structure, nutrient availability, and microbial diversity, mushrooms support ecosystem resilience and mitigate the adverse effects of environmental degradation.

Continued Discovery and Understanding

While much is known about the ecological roles of mushrooms,

ongoing research continues to unveil new insights into their contributions to ecosystem dynamics and function. As stewards of biodiversity and ecological integrity, mushrooms inspire curiosity and exploration, beckoning us to delve deeper into the mysteries of nature and uncover the hidden treasures of our planet's ecosystems. It emerges as keystone species in ecosystems, shaping their structure, function, and resilience through their diverse ecological roles. By acknowledging and appreciating the ecological significance of mushrooms, we can cultivate a deeper understanding of the interconnectedness of all life forms and nurture a more harmonious relationship with the natural world.

9. CONCLUSION

The economic importance of mushrooms in Chhattisgarh cannot be overstated, as they have emerged as a valuable agricultural commodity with versatile uses and significant market impact. Through this analysis, it becomes evident that mushrooms play a crucial role in the state's economy, contributing to both income generation and employment opportunities. Firstly, mushrooms serve as a lucrative source of income for farmers, especially small-scale and marginal farmers, due to their high value in the market. The cultivation of mushrooms requires relatively low investment and provides quick returns, making it an attractive option for diversifying income streams in agricultural households. Secondly, mushrooms offer a wide range of uses, from culinary purposes to medicinal and cosmetic applications. Their nutritional value, rich flavor, and unique texture have made them popular ingredients in various cuisines worldwide. Additionally, mushrooms have gained recognition for their medicinal properties, being used in traditional medicine for their immune-boosting and antioxidant effects. Moreover, extracts and derivatives from mushrooms are increasingly being incorporated into cosmetic products for their skincare benefits. Furthermore, the mushroom industry in Chhattisgarh has created employment opportunities across the value chain, from cultivation and harvesting to processing, packaging, and marketing. This has helped alleviate rural unemployment and poverty, particularly among marginalized communities. In terms of market impact, the demand for mushrooms is steadily growing, both domestically and internationally. With increasing consumer awareness of health and wellness benefits, there is a growing preference for natural and organic food products, including mushrooms. Moreover, the rise of vegetarianism and veganism has further fueled the demand for mushrooms as a meat substitute. However, despite the promising prospects, the mushroom industry in Chhattisgarh still faces challenges such as limited infrastructure, lack of technical know-how, and market access constraints. Addressing these challenges through government support, investment in research and development, and capacity building initiatives will be crucial for realizing the full economic potential of mushrooms in the state. In conclusion, mushrooms have emerged as a valuable agricultural commodity in Chhattisgarh, offering not only economic benefits but also contributing to food security, nutrition, and employment generation. With the right interventions and support, the mushroom industry has the potential to further thrive, making a significant contribution to the state's economy and the well-being of its people.

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