Straw Mushroom

Submitted By

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Preface

This report on straw mushrooms (Volvariella volvacea) reflects our group's shared passion for exploring sustainable food sources. In addition to delving into their history, nutritional value, and cultivation methods, we also consider their potential as a sustainable food option. Straw mushrooms, known for their ability to grow on agricultural by products, offer an eco-friendly and resource-efficient solution for meeting global food demands.

We express gratitude to our instructor, researchers, and collaborators for their support. This report symbolizes our commitment to understanding sustainable agriculture and food security.

Contents

1 Introduction

Straw mushrooms (Volvariella volvacea), native to Asia, have been cultivated since the 18th century, initially grown on paddy straw by Buddhist communities. Over time, their cultivation spread across China, becoming a treasured food and even a royal gift. Today, straw mushrooms are widely consumed throughout Asia and are cultivated using various substrates, such as cotton waste and compost piles.

This report explores the historical background, nutritional composition, cultivation methods, applications, and the benefits and challenges of growing and consuming straw mushrooms, presenting a comprehensive analysis of their significance in food and agriculture.

2 History

Straw mushrooms have been cultivated for thousands of years in Asia, but the earliest record of cultivation dates back to the 18th century. Buddhist monks at the Nanhua Temple in China grew the fungi on paddy straw for the mushroom's high nutritional properties and also used it in traditional medicine. Through exposure at the temple, Straw mushrooms widely increased in popularity across China and even became a gift that was given to Chinese royalty. It has been spread across Southeast Asia, remaining primarily in the areas that they are grown in due to their short shelf life and delicate nature when fresh.

In the modern-day, Straw mushrooms have remained one of the most popular varieties consumed throughout Asia and are cultivated on many different agricultural waste substrates. Besides straw, the mushrooms are grown on cotton waste known locally as 'gin trash'. This substrate is the fiber matter left after cotton is extracted for commercial use. Straw mushrooms are also grown on compost piles, grass, leaves, and wood chips, and can be found growing naturally on termite mounds in Southeast Asia. Straw mushrooms still grow wild in Asia and are also cultivated on a small scale in the Philippines, Malaysia, Thailand, Vietnam, China, and Eastern Europe. Outside of Asia, the mushrooms are available in canned and dried form in Western Europe, North America, and Australia.

Straw mushrooms, botanically classified as Volvariella volvacea, are small, edible fungi with a mild, musky flavor that belong to the Pluteaceae family. Also known as Chinese mushrooms, Paddy Straw mushrooms, and Nanhua mushrooms. Straw mushrooms are widely consumed in Asia and are valued for their neutral flavor, versatility, and high nutritional properties. Straw mushrooms are cultivated in the warm, tropical climates of Asia and are often

grown on agricultural wastes such as rice straw, which is where the mushroom also earned its name. The fungi can be harvested in its young or mature state, with the young, unopened mushrooms being labeled as unpeeled and the opened mushrooms labeled as peeled. Unpeeled mushrooms are the most popular version sold in local markets in Asia as they are believed to have higher nutritional properties and a stronger flavor. It is important to note that Straw mushrooms are primarily found in Asia, and in North America, there is a highly toxic look-alike known as the death cap or amanita phalloides that can be lethal when consumed.

3 Nutrition

Table 1: Nutritional Composition of Dried Straw Mushrooms

Nutritional Component	Percentage (%)
Moisture	88.4
Crude Protein	33.1 (on dry weight basis)
Fat	4.6 (on dry weight basis)
Total Carbohydrate	60.0 (on dry weight basis)
Fiber	11.9 (on dry weight basis)
Ash	12.6 (on dry weight basis)
Energy Value	338 kilocalories

Table 2: Nutritional Composition of Fresh Straw Mushrooms

Nutritional Component	Percentage (%)
Moisture	88.9
Crude Protein	3.4 (on fresh weight basis)
Fat	0.8 (on fresh weight basis)
Total Carbohydrate	1.8 (on fresh weight basis)
Fiber	0.6 (on fresh weight basis)
Ash	0.6 (on fresh weight basis)
Energy Value	4.4 kilocalories

Table 3: Mineral and Vitamin Content in 100g of Straw Mushrooms

Nutrient/Vitamin	Amount (mg per 100g)
Calcium (Ca)	71
Phosphorus (P)	667
Iron (Fe)	17.1
Sodium (Na)	374
Potassium (K)	3,455.00
Vitamin B1 (Thiamine)	1.2
Vitamin B2 (Riboflavin)	3.3

4 How to grow

4.1 What You Need to Grow Straw Mushrooms

4.1.1 Straw

- **Type**: Choose clean, dry, and pesticide-free straw.
    1. **Recommended options**
       Rice or wheat straw are ideal due to their readily digestible cellulose content. Other options like oat straw or barley straw can also work, but may require slightly longer soaking times.
    2. **Quantity**
       Aim for approximately 1 kg (2.2 lbs) of straw for a single cultivation cycle. This amount can be adjusted based on the size of your container and desired yield.

4.1.2 Mushroom Spawn

- **Species**: urchase high-quality *Volvariella volvacea* spawn from a reputable supplier. This ensures you're getting the specific fungal strain suitable for growing straw mushrooms.
- **Form**: pawn typically comes in various forms like grain spawn or sawdust spawn. Both options work well, but grain spawn may colonize the straw slightly faster due to its readily available nutrients.
- **Quantity**: Generally, a spawn-to-substrate ratio of 1:10 is recommended. For 1 kg (2.2 lbs) of straw, you'll need around 100 g (3.5 oz) of spawn.

4.1.3 Container

- **Type**: Choose a large container with good ventilation to allow for air circulation and prevent moisture buildup. Plastic tubs, buckets, or even large grow bags with ventilation holes can work well.
- **Size**: The size of the container will depend on the amount of straw you're using. Aim for a container that can comfortably hold the straw without being crammed, allowing for some

space for air circulation. A 50 L (13 gallons) container is a good starting point for 1 kg (2.2 lbs) of straw.

4.1.4 Hydrated Lime

- **Function**: Adding hydrated lime (calcium hydroxide) to the soaking water helps regulate the pH level of the straw, creating a slightly alkaline environment that favors the growth of *Volvariella volvacea* while suppressing potential contaminants.
- **Quantity**: Use approximately 50 g (1.75 oz) of hydrated lime per liter (gallon) of water during the soaking process.

4.1.5 Spray Bottle

- **Purpose**: A clean spray bottle filled with water will be essential for maintaining humidity inside the container throughout the growing process.

4.1.6 Thermometer

- Monitoring the temperature is crucial for optimal mushroom growth. A thermometer will help you ensure the environment stays within the ideal range for *Volvariella volvacea* (25-30°C / 77-86°F).

4.2 Step to grow

4.2.1 Prepare the Straw

- **Chopping**: Cut the straw into small pieces, ideally between 3-5 cm (1-2 inches) in length. This size provides optimal surface area for efficient fungal colonization while maintaining good air circulation within the substrate.
- **Soaking**: Submerge the chopped straw in a large container filled with lukewarm water (around 30°C / 86°F) for 24-48 hours. This process hydrates the straw, making it easier for the fungal mycelium to colonize and absorb nutrients.
- **Adding Hydrated Lime**: During soaking, add approximately 50 g (1.75 oz) of hydrated lime per liter (gallon) of water. The slightly alkaline environment created by lime helps suppress the growth of competing bacteria and fungi while favoring the growth of *Volvariella volvacea*.

- **Draining**: After the soaking period, thoroughly drain the straw using a colander or mesh sieve. Squeeze out excess water gently, aiming for the straw to be moist but not dripping. Excessive moisture can lead to contamination and hinder fungal growth.

4.2.2 Pasteurization (Optional)

- **Purpose**: Pasteurization is an optional step that helps eliminate potential contaminants like bacteria and mold spores that may be present in the straw. While not strictly necessary for all situations, it can improve the chances of successful cultivation, especially for beginners.
- **Methods**: There are two common methods for pasteurizing straw:

  1. **Submersion**
     Bring a large pot of water to a boil. Place the straw in a heat-resistant mesh bag or colander and submerge it in the boiling water for 1-2 hours. Maintain a rolling boil throughout the process.
  2. **Steaming**
     Spread the straw on a baking sheet and steam it for 1-2 hours using a steamer or pot with a steamer basket. Ensure adequate steam is generated and reaches all parts of the straw.

4.2.3 Inoculate the Straw

- **Spreading the Straw**: Evenly distribute the cooled and prepped straw in the chosen container. Aim for a loose and fluffy arrangement to allow for proper air circulation and prevent compaction.
- **Adding Spawn**: Break up the mushroom spawn into small pieces and sprinkle it evenly over the surface of the straw. Ensure good distribution throughout the substrate.
- **Mixing**: Gently mix the top layer of straw with the spawn, incorporating it slightly without disturbing the overall structure of the substrate. This ensures close contact between the spawn and the straw, facilitating fungal colonization.

4.2.4 Create a Humid Environment

- **Covering**: Cover the container loosely with a plastic bag or cloth that allows for some air exchange. This helps trap moisture inside and maintain high humidity levels necessary for fungal growth.
- **Misting**: Regularly mist the inside of the container with clean water using the spray bottle. Aim for a fine mist that creates a humid environment without saturating the straw.

4.2.5 Maintain Ideal Conditions

- **Temperature**: Place the container in a warm location with temperatures between 25-30°C (77-86°F). This temperature range is optimal for the growth of *Volvariella volvacea*. If needed, use a heat mat placed underneath the container to maintain consistent warmth.
- **Humidity**: Monitor the humidity level inside the container and maintain it around 80-90% by misting regularly and adjusting the ventilation as needed. Too much humidity can lead to mold growth, while insufficient moisture can hinder fungal development.
- **Lighting**: Avoid exposing the container to direct sunlight. Straw mushrooms do not require light for growth and may even be inhibited by excessive light exposure.

4.2.6 Incubation and Fruiting

- **Mycelial Colonization**: Allow the container to remain undisturbed for 7-10 days. During this incubation period, the fungal mycelium will colonize the straw, spreading throughout the substrate as white threads become visible.
- **Fruiting Body Formation**: Once the straw is fully colonized, small pinheads will begin to form on the surface, indicating the initiation of fruiting body development. This typically takes another 3-5 days.

4.2.7 Harvest and Enjoy

- **Maturity**: Harvest the mushrooms when the caps are fully expanded but before the veil breaks (the thin membrane con-

necting the cap to the stem). This ensures optimal flavor and texture.

- **Harvesting Technique**: Gently twist the mushrooms at the base to detach them from the substrate. Avoid pulling or cutting, as this can damage.

5 Product

5.1 Dried straw mushrooms

5.1.1 How to make

The steps involved are as follows: first, select unopened straw mushrooms, then remove the stem and cut each mushroom in half using a bamboo knife. Next, bake the halves in an oast house at a temperature of 50-70řC for 35-45 minutes. After removing them from the oast house, place the mushrooms in a cool, moist area for 3-5 minutes. Finally, return the mushrooms to the oast house until they are completely dry. This drying method helps preserve the original flavor of fresh straw mushrooms and makes them easy to store.

5.2 Straw mushrooms stir fry with mince pork

5.2.1 Ingredients

1. straw mushrooms 1 bag
2. mince pork 1 cup
3. oil
4. sugar 1 teaspoon
5. soy sauce 1 teaspoon
6. oyster sauce 2 teaspoons

5.2.2 How to make

1. pour oil into the pan
2. stir fry straw mushrooms with mince pork
3. season with soy sauce, sugar, oyster sauce
4. ready to eat!!!!!

5.3 Straw mushroom stir fry with bok choy

5.3.1 Ingredients

1. straw mushrooms 1 bag
2. bok choy
3. garlic 3-4 lobe
4. soy sauce
5. oyster sauce
6. oil
7. coconut sugar
8. peppers

5.3.2 How to make

1. pour oil into the pan
2. stir fry garlic until it smell good
3. pour straw mushrooms into the pan
4. pour bok choy into the pan and stir
5. season with soy sauce, oyster sauce, coconut sugar how you like it
6. season with a little bit of peppers
7. ready to eat!!!!!

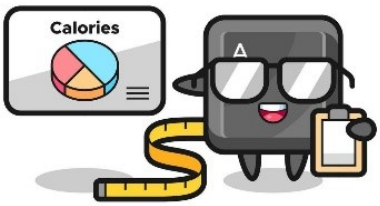
6 Pros

6.1 Rich in Nutrients

Straw mushrooms are a good source of protein, fiber, and essential vitamins like B-complex vitamins, as well as minerals such as potassium, phosphorus, and iron.

6.2 Low in Calories

They are low in fat and calories, making them a healthy choice for weight management or low-calorie diets.



6.3 Supports Heart Health

The potassium content in straw mushrooms can help regulate blood pressure, contributing to overall cardiovascular health.

6.4 Promotes Healthy Digestion

The dietary fiber in these mushrooms aids in digestion and helps maintain bowel health.

6.5 Supports Blood Sugar Control

The low glycemic index and fiber content can help stabilize blood sugar levels.

6.6 Boosts Immune System

Straw mushrooms contain antioxidants such as selenium and beta-glucans, which may help strengthen the immune system and fight free radicals.

6.7 Sustainability

Mushroom cultivation presents significant environmental and economic benefits, making it an exemplary model for sustainable agriculture. By utilizing low-value materials such as sawdust, tree branches, straw, and agricultural residues, the process turns waste into a valuable resource. This not only minimizes environmental pollution, such as that caused by incineration, but also exemplifies circular agriculture by efficiently recycling by-products into productive outputs.

Figure 6.1: https://www.saferbrand.com/media/Articles/Safer-Brand/sb_us_bale_2_iStock_000078010145_Small.jpg

The farming process has a minimal environmental footprint, as it typically avoids the use of pesticides and chemical fertilizers. This practice helps preserve soil health, reduces chemical runoff, and ensures a more eco-friendly approach to food production. Furthermore, mushroom cultivation offers economic advantages, particularly for rural and developing regions. It creates profitable opportunities by transforming inexpensive resources into marketable products, thereby supporting local economies and improving livelihoods.

Figure 6.2: https://mushroomgrowing.co.uk/wp-content/uploads/2021/10/straw-mushroom-.jpg

These combined advantages highlight the potential of mushroom cultivation to contribute significantly to sustainable development and resource management.

Figure 6.3: https://www.tamborasi.com/wp-content/uploads/2021/06/50-Most-Sustainable-Foods-main.jpg

7 Cons

Eating straw mushrooms has some very uncommon side effects. The species has a small chance of causing fungal infection in immunocompromised patients, which could lead to severe consequences such as brain abscesses.

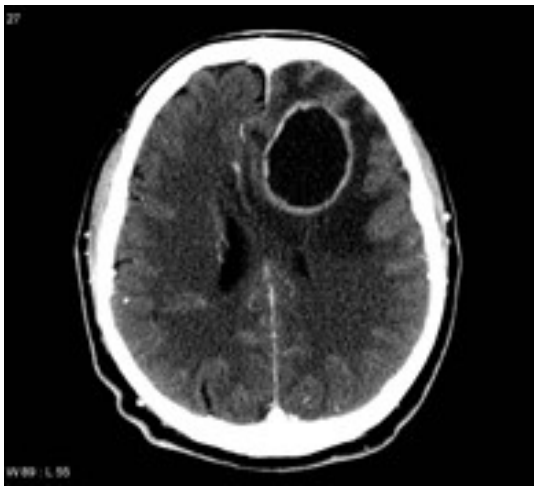


Figure 7.1: Brain abscesses

Some individuals may experience allergic reactions to straw mushrooms. Symptoms can range from mild, such as skin rashes and itching, to severe, including difficulty breathing and anaphylaxis. Those trying these mushrooms for the first time should proceed cautiously.

Figure 7.2: Allergic

Straw mushrooms are highly perishable. They have a short shelf life and require proper storage to avoid spoilage. Improper handling can lead to bacterial growth, which may cause food poi-

soning if consumed.

Canned or processed straw mushrooms often lose some of their nutritional value due to heat and chemical treatments. Additionally, preservatives added during processing may not be suitable for everyone, especially those with sensitivities or health concerns.

Figure 7.3: Canned straw mushroom

Fresh straw mushrooms can be expensive, particularly in regions where they are not cultivated locally. Import costs and their delicate nature contribute to their high price, making them less accessible to some consumers.

Figure 7.4: Fresh straw mushrooms

Commercial cultivation of straw mushrooms can have environmental implications. The use of pesticides, fertilizers, and water-intensive farming methods may contribute to soil degradation, water pollution, and resource depletion.

Common insect pests of straw mushrooms include phorids and

mites. Nematodes can also cause crop losses.

Figure 7.5: Phorids, Mites and Nematodes

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