

REVIEW ON TRADITIONAL AND MODERN TECHNIQUES IN
COMMERCIAL CULTIVATION OF MUSHROOMS

By

D. Isuru Dananjaya

EU/IS/ 2016/BST/055



Research Project Report is submitted in Partial Fulfilment of The Requirements
for The Bachelor of Biosystems Technology Honours in Agricultural Technology
and Entrepreneurship

Department of Biosystem Technology

Faculty of Technology

Eastern University, Sri Lanka

Chenkalady

2024



FTC173

Project Report
Main Library, Eastern University, Sri Lanka

Approved by

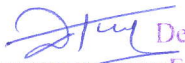

.....

Head

Dep. Of Biosystems Technology,

Eastern University Sri Lanka

Date: 13/9/2024


.....
HEAD
Dept. of Biosystems Technology
Faculty of Technology, Eastern University, Sri Lanka

Dr. (Mrs.) Dulangana Hunupolagama

Supervisor

Dep. Of Biosystems Technology,

Eastern University Sri Lanka

Date: 13/9/2024

ABSTRACT

This study was conducted to review the traditional as well as modern techniques of commercial cultivation of mushrooms that were studied and emphasized by previous researchers worldwide. According to the previous researchers, mushrooms are commonly known as functional foods because of their substantial nutritional, culinary, and bioactive properties, and have a historical record of consumption that stretches back to ancient eras. Around 300 species are suitable for consumption, of which almost 30 have been domesticated and 10 are grown for commercial purposes. Several types of mushrooms are cultivated worldwide. In parallel several different types of commercial mushroom species are currently being grown in Sri Lanka. The main varieties of mushrooms cultivated in the country consist of button mushrooms (*Agaricus bisporus*) and oyster mushrooms (*Pleurotus ostreatus*). In addition, a recently introduced commercial species called Makandura white (MK-white; *Calocybe sp.*) is also being produced. Furthermore, the medicinal Reishi mushroom (*Ganoderma lucidum*) has been effectively cultivated in Sri Lanka. Previous researchers have analyzed many modern and traditional mushroom cultivation techniques and the different methods used in each step of commercial mushroom production and how they differ from each other and through this study, good knowledge can be obtained separately. According to the researches most of the people use log culture, bag culture, and tray culture mainly for the traditional cultivation of mushrooms and use different traditional techniques for each step. Tray culture, bag culture, log culture were widely used as traditional techniques and various traditional techniques were used in different stages of mushroom processing. Modern techniques such as climate controlled growing rooms, tissue culture techniques, molecular biotechnology techniques have achieved economic advantages over traditional techniques. Mushroom cultivation involves a range of specialized techniques, such as sterilizing the substrate, inoculating spores, and using growth chambers etc. Modern techniques are separate from traditional techniques. Mushroom cultivation involves a range of specialized techniques, such as sterilizing the substrate, inoculating spores, and using growth chambers etc.

TABLE OF CONTENT

| | |
|---|---|
| CHAPTER 01 | 1 |
| 1. INTRODUCTION | 1 |
| 1.1 Background | 1 |
| 1.2 General objective..... | 2 |
| CHAPTER 02 | 3 |
| METHODOLOGY | 3 |
| CHAPTER 03 | 4 |
| REVIEW ON TRADITIONAL AND MODERN TECHNIQUES IN COMMERCIAL CULTIVATION OF MUSHROOMS | 4 |
| 3.1. Mushrooms..... | 4 |
| 3.1.1 Definition of mushrooms..... | 4 |
| 3.1.2 Classification of edible mushrooms | 4 |
| 3.1.3. Main edible mushrooms worldwide | 5 |
| 3.1.3.1 Agaricus | 5 |
| 3.1.3.2. <i>Lentinus edodes</i> / Shiitake mushrooms..... | 5 |
| 3.1.3.3. Pleurotus | 6 |
| 3.2. Nutritional value of mushrooms..... | 6 |
| 3.3. Traditional Techniques in Mushroom Cultivation | 7 |
| 3.3.1. Tray Culture..... | 7 |

| | |
|--|----|
| 3.3.1.2. Advantages of Tray Culture..... | 8 |
| 3.3.2. Bag Culture..... | 8 |
| 3.3.3. Log Culture..... | 9 |
| 3.4. Traditional mushroom cultivation steps and techniques..... | 10 |
| 3.4.1. Substrate preparation..... | 10 |
| 3.4.1.2. Selection of Substrate..... | 11 |
| 3.4.1.3. Pasteurization..... | 11 |
| 3.4.1.4. Enrichment/ Supplementation of Substrates..... | 11 |
| 3.4.1.5. Traditional Substrates and Techniques:..... | 12 |
| 3.4.2. Spawn Production..... | 12 |
| 3.4.2.1. Traditional spawn techniques..... | 13 |
| 3.4.3 Isolation..... | 14 |
| 3.4.3.1. Traditional Isolation Techniques in Mushroom Cultivation..... | 14 |
| 3.4.4. Traditional Sterilization Techniques..... | 14 |
| 3.4.4.1. Boiling Water Sterilization..... | 15 |
| 3.4.4.2. Solar Sterilization..... | 15 |
| 3.4.4.3. Lime Treatment..... | 15 |
| 3.4.5. Inoculation..... | 15 |
| 3.4.5.1. Spore-Based Inoculation..... | 15 |
| 3.4.5.2. Grain Spawn Inoculation..... | 16 |

| | |
|---|----|
| 3.4.5.3. Plug Spawn Inoculation | 16 |
| 3.4.5.4. Liquid Inoculation..... | 16 |
| 3.4.5.5. Sawdust Spawn Inoculation..... | 16 |
| 3.4.6. Incubation | 16 |
| 3.4.6.1. Traditional Incubation Techniques | 17 |
| 3.4.7. Fruiting | 17 |
| 3.4.8. Harvesting and Post-Harvest Handling | 18 |
| 3.4.8.1. Timing and Methods..... | 18 |
| 3.4.8.2. Tools and Equipment | 18 |
| 3.4.9. Post-Harvest Handling techniques..... | 18 |
| 3.4.9.1. Cleaning and Sorting..... | 18 |
| 3.4.9.2. Packaging and Storage..... | 18 |
| 3.4.9.3. Transportation..... | 19 |
| 3.5. Modern techniques of commercial cultivation of mushrooms..... | 19 |
| 3.5.1. Climate-controlled growing rooms..... | 19 |
| 3.5.2. Tissue Culture Technique..... | 20 |
| 3.5.3. Molecular Techniques | 20 |
| 3.5.2. Steps and techniques of modern cultivation of Mushrooms..... | 21 |
| 3.5.2.1. Substrate Preparation | 21 |
| 3.5.2.1.1. Modern Techniques in Substrate Preparation | 21 |

| | |
|---|----|
| 3.5.2.2. Spawn production | 23 |
| 3.5.2.2.1. Modern Techniques in Spawn Production | 23 |
| 3.5.2.3. Inoculation | 25 |
| 3.5.2.4. Incubation | 26 |
| 3.5.2.4. Modern fruiting techniques of mush room cultivation | 28 |
| 3.5.2.5. Modern harvesting techniques | 29 |
| 3.5.2.5. Modern post-harvesting techniques | 31 |
| 3.6 Other modern techniques use in commercial cultivation of mushrooms | 32 |
| 3.6.1. Modern Humidification Techniques..... | 32 |
| 3.6.1.2. Ultrasonic Humidifiers..... | 32 |
| 3.6.1.3. High-Pressure Fog Systems | 32 |
| 3.6.1.4. Evaporative Coolers..... | 32 |
| 3.6.2. Modern Ventilation Techniques | 33 |
| 3.6.2.1. Forced-Air Ventilation..... | 33 |
| 3.6.2.2. Automated Environmental Control Systems | 33 |
| 3.6.2.3. Positive Pressure Ventilation | 33 |
| 3.6.2.3. Integration of Humidification and Ventilation | 33 |
| 3.6.3. Modern Techniques in Commercial Cultivation of Mushrooms with a Focus on Casing Layer..... | 34 |
| 3.6.3.1. Optimization of Physical and Chemical Properties | 34 |

| | |
|---|----|
| 3.6.3.2. Impact of Additives and Supplements | 35 |
| 3.6.3.3. Technological Innovations | 35 |
| 3.7. Hygienic Practices in Mushroom Cultivation | 35 |
| CHAPTER 04 | 39 |
| CONCLUSION | 39 |
| CHAPTER 05 | 40 |
| REFERENCES | 40 |