

A GUIDE TO MUSHROOM SPAWN MULTIPLICATION



MINISTRY OF
FOOD & AGRICULTURE
REPUBLIC OF GHANA



FOREWORD

This is a training manual prepared from the extensive research work conducted by researchers of the Mushroom Unit at the Council for Scientific and Industrial Research-Food Research Institute (CSIR-FRI), Accra.

This manual exclusively captures the technologies involved in the multiplication of mushroom spawns to bridge the gap in the mushroom industry of Ghana. It is designed to enable mushroom spawn producers multiply their spawns to sustain their production. In other words the farmers will have the requisite skills to help them manage, expand and improve their farm production.

The mushroom spawn multiplication manual is sponsored by the Modernizing of Agriculture in Ghana (CIDA/CSIR/MOFA-MAG) Project, Ghana.

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EDITORS

Matilda Dzomeku

Richard Takli

Mary Obodai (Prof)

CSIR-Food Research Institute
P. O. Box M20 Accra, Ghana

December 2017

TABLE OF CONTENT

FOREWORD.....	2
INTRODUCTION.....	5
MUSHROOM LIFE CYCLE.....	7
WHAT IS A MUSHROOM SPAWN?	9
MATERIALS REQUIRED	10
STEPS IN MUSHROOM SPAWN MULTIPLICATION.....	11
QUALITY MEASURES IN SPAWN MULTIPLICATION..	19
CONCLUSION.....	20
REFERENCE.....	21

INTRODUCTION

MUSHROOMS

Commercial mushroom cultivation in Ghana started in 1990 under the National Mushroom Development Project (NMDP), which was a joint collaborative effort of the Food Research Institute of the Council for Scientific and Industrial Research, Ghana Export Promotion Council and the Ministry of Food and Agriculture.

A mushroom is the fleshy, spore-bearing fruiting body of a fungus, typically produced above ground on soil or on a suitable substrate.

Mushrooms can grow on various agricultural wastes spanning from sawdust, plantain leaves, cocoa husk and water hyacinth among others.

Mushrooms have numerous nutritional and health benefits which include:

- ◆ Weight Management
- ◆ High levels of Vitamin D
- ◆ Presence of antioxidants e.g. Selenium
- ◆ Immune system builder
- ◆ Presence of Iron

SOME GHANAIAN MUSHROOMS



Auricullaria sp.
(Asuntoku)



Termitomyces sp.
(Twearodo)



Ganoderma sp.



Pleurotus tuber-regium
(Anyigbadzi/Fuo,
Fufufu)



Pleurotus ostreatus



Volvariella volvacea
(Domo/Anagba)

MUSHROOM LIFECYCLE

Mushrooms belong to the kingdom Fungi. What we commonly call the “mushroom” is the **‘fruiting body’** of the fungus which normally consists of a stipe and a cap.

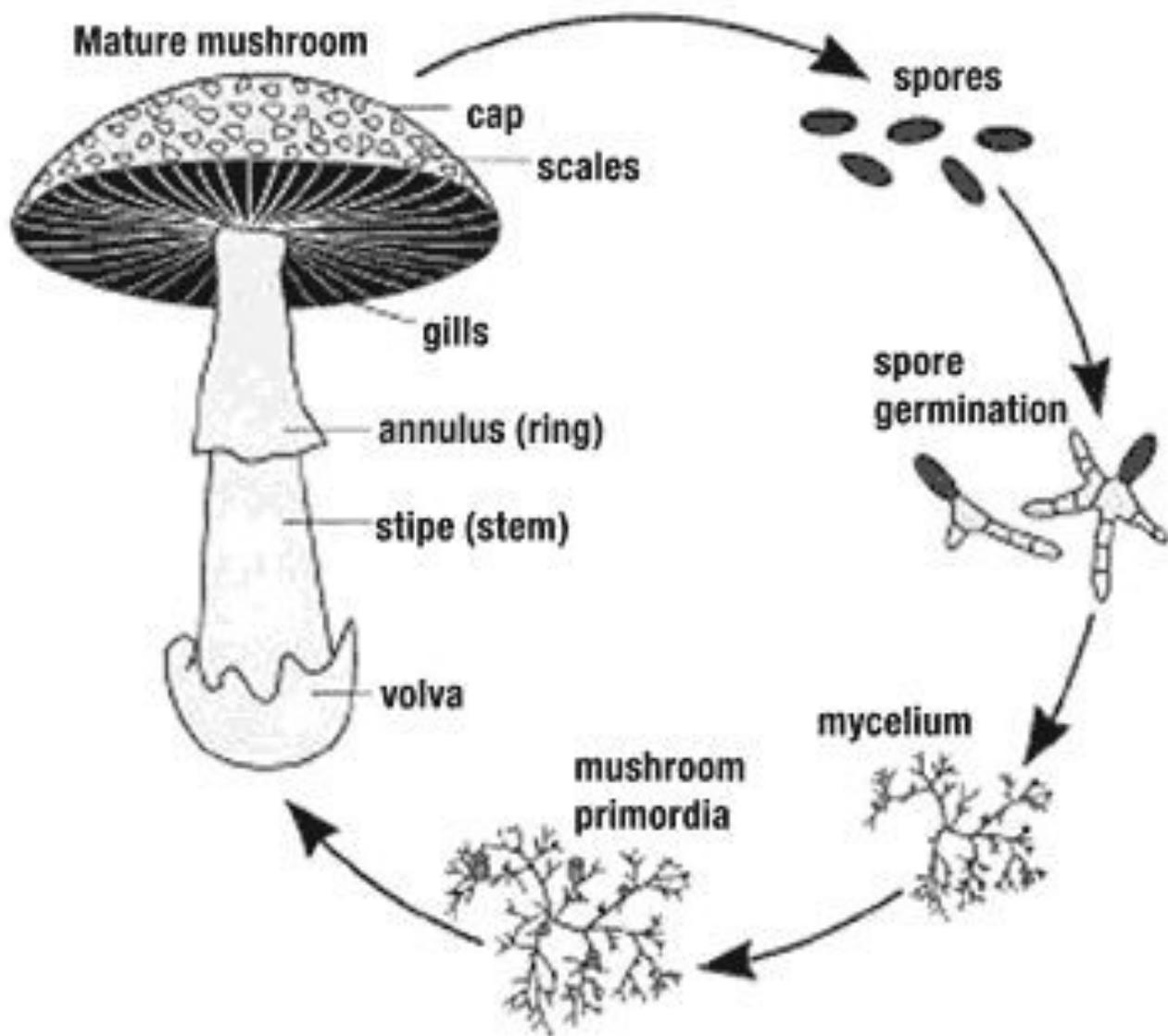
There exists an entire network of **mycelium** beneath the mushroom. Mycelium is a tight network of cells under the ground. The mycelium underground is the vegetative part of the fungus. During its life cycle the mycelium has only one goal and this is to reproduce its species. The mycelium does so by growing mushrooms. These mushrooms produce spores and drop them on favorable grounds when they reach maturity.

The life cycle is as follows (Picture 1) :

- a mature mushroom releases spores
- spores fall on favorable grounds – spores germinate
- they meet compatible spores and fuse
- mycelium forms – pinheads forms
- primordia forms– growth of mushroom – mature spores are dropped

End of one circle.

MUSHROOM LIFE CYCLE



Picture 1: The Life cycle of a typical Mushroom

Source: <http://shroomcity.com/2016/03/09/mushroom-life-cycle/>

WHAT IS A MUSHROOM SPAWN?

Mushroom spawn represents any material that has been inoculated with **mycelium**. It can literally be referred to as the ‘SEED’ of mushrooms.

Mushroom spawn (seed) is used to transfer mycelium onto any material on which mushrooms will grow. These nutritive material is called a **substrate**. There are many different kinds of substrates for example sawdust, straw, cotton, cardboard, logs, cereal grains etc.

Grain spawn is sterilized grain that has been inoculated with spores or a sterile culture of mycelium. Many types of grains can be used with sorghum and millet being some of the most common.

MATERIALS REQUIRED FOR SPAWN MULTIPLICATION

1. Cereal grain
2. Clean water
3. Bowl
4. Autoclave
5. Mesh table for drying
6. Transparent glass bottles (350ml)
7. Quicklime/white wash (CaCO_3)
8. Cotton waste
9. Old newsprint
10. Rubber band
11. Laminar flow hood

STEPS IN MUSHROOM SPAWN MULTIPLICATION

Cereal Grain Preparation

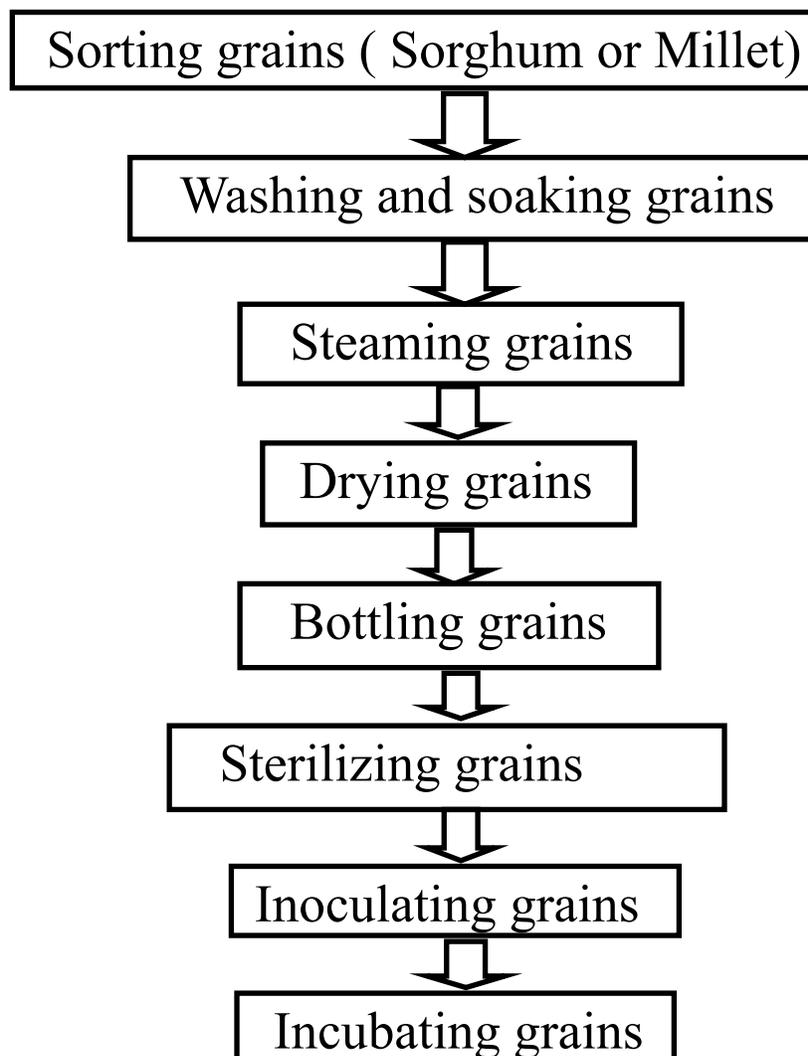


Figure 1: Flow of Mushroom spawn preparation

SORTING , WASHING AND SOAKING GRAINS

Sort out grains to remove any foreign material and soak grains overnight in clean water (Picture 2).



Picture 2: Soak sorghum grains in clean water

STEAMING GRAINS

Put grains in a mesh and steam in a pot/metal barrel/autoclave for 30mins (Picture 3).



Picture 3: Steaming of grains.

DRYING GRAINS

Dry steamed grains on a mesh table and turn with a rod at intervals to allow grains to dry evenly (Picture 4).



Picture 4: Steamed grains being dried on mesh table.

BOTTLING GRAINS

Portions (62.5g) of quicklime is added to the dried grains and mixed thoroughly with a wooden pallet/stick and this is bottled in clean transparent bottles (Picture 5).



Picture 5: Bottling of dried grains.

STERILIZING GRAINS

Grains are sterilized in either metallic oil drums or autoclaves. This procedure is to destroy any other microbes that are present in the bottled grain (Picture 6).



Picture 6: Sterilization of grains .

INOCULATING GRAINS

Viable grains of a first transfer spawn are introduced/poured into sterile grain bottles and are covered with old news print (Picture 7).



Picture 7: Inoculation of sterile grains.

INCUBATION

The spawns are labelled and dated. They are then kept in a very clean sterile room, and they are ready for use after two weeks (Picture 8).



Picture 8: Spawns during incubation.

QUALITY MEASURES IN SPAWN MULTIPLICATION

1. **GRAIN** : Good quality and insect-free grains are ideal. The different types of grain that can be used to multiply spawn are as follows: Millet and Sorghum.
2. **WATER**: The water to be used in washing and soaking of the grain must be clean and clear. Devoid of any offensive smell.
3. **DRYING SURFACE**: This has to be clean and devoid of materials used from previous work.
4. **SPAWN**: The spawn to be multiplied must be viable and devoid of contaminants.
5. **PERSONNEL** : The personnel working on the spawn must wear clean working gears (coats, nose mask, head cover, shoes)
6. **A STERILE ROOM**: To inoculate the grains, one requires a sterile environment. This could be possible by providing a clean room solely for inoculation and this room must be regularly cleaned. Clean circulation of air could be achieved by installing a HEPA filter in this room.

CONCLUSION

Mushroom spawns are very delicate and requires careful handling. They should be multiplied only by trained staff.

Mushroom spawns are prone to contamination if not handled with care and this contamination eventually affects the mushroom yields.

REFERENCE

1. <http://shroomcity.com/2016/03/09/mushroom-life-cycle/>
2. <http://mushplanet.com/basic-cultivation/the-life-cycle-of-the-mushroom/>.
3. Peter Oei. (2016) Mushroom Cultivation IV Appropriate technology for mushroom growers.
4. Obodai, M., Dzomeku, M., Narh, D. (2011). Growth and yield performance of different exotic strains of eight *Pleurotus* species cultivated on *Triplochiton scleroxylon* in Ghana. International Research Journal of Applied and Basic Science 2(4): 145-154.