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**MUSHROOM CULTIVATION IN GHANA**

**BY**

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# MUSHROOM CULTIVATION IN GHANA

Paper presented at the Second International training course on edible mushrooms (JUNCAO technology)

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## INTRODUCTION

Ghana is located on the Gulf of Guinea in the western part of Africa, and lies between latitude 4° and 11.5° north. It is bounded in the North by Burkina Faso, south by Gulf of Guinea, west by Cote d'Ivoire, and in the East by Togo. It occupies an area of 239,460 square kilometres, and has a population of 18 million.

Ghana is basically an agricultural country, with a tropical climate characterized most of the year by moderate temperatures (ranging from 26.1°C to 28.9°C), constant breeze and clear sunshine. There are two rainy seasons in the year, the major one in May/June and the minor one in September/October. January is the driest month of the year, and May the wettest.

Several tons of agricultural products such as rice, maize, peanuts, millet, sorghum, coconuts just to mention a few are produced annually. After harvesting, a lot of these by-products are left (about 6,573,350 metric tons, Sawyerr, 1994). They are either burnt or buried to dispose off. However, with the introduction of new technologies, edible and nutritious mushrooms can now be produced from them.

## EDIBLE MUSHROOMS OF GHANA

Traditionally in Ghana, Mushrooms are collected from the wild in forest regions during the wet season, from March to September. The mushrooms collected in large quantities among others include

1. Termite mushroom-*Termitomyces* spp. locally called 'Twenwodro', 'Onu' and 'Sibre'
2. Straw or Oil-palm mushrooms- *Volvariella* spp.

### *Termite mushroom*

In some parts of the country where these mushrooms are normally picked, the farmers artificially cultivate it, by putting bundles of dried banana leaves on top of termite mounds which are already producing this type of mushroom and allow termites to invade it. These 'infested' banana leaves are then transferred to other sites on the farm to the termites to build their mounds. It takes two years for the first production of these mushrooms. The mycelium of these mushrooms have been successfully cultured on potato dextrose bean extract agar in the laboratory, but have failed to fruit on any of the substrate that have been tried, e.g. sawdust.

### *Straw or Oil palm mushroom (Domo)*

This type of mushroom is obtained locally from felled oil palm trees which have been allowed to rot. There is however, a local method of production:

1. A large pit is dug (21cm by 5cm), in a shaded area e.g. under a tree or shed, the sides and the bottom of the pit are covered with fresh banana leaves.
2. Waste from agricultural produce such as cocoa or peeling s of cassava, cocoyam and yam are dumped into the pit to form a heap.
3. The fruitbody of the oil palm mushroom is mashed and the brown suspension of spores sprinkled all over the surface of the materials.
4. The heap is then covered with more fresh leaves.

5. Mushrooms start to appear after 3-4 weeks, especially during the wet season, and are ready for harvesting when they reach the egg stage.

With this method the yield is low and unstable.

### **Brief Description of Project**

Mushrooms were identified as one of the non-traditional horticultural crops which could be used by the country in the long term for foreign exchange, as an income earner for its people locally, to increase their nutritional status, and also to effectively use the agricultural wastes obtained after harvesting. To develop this objective, therefore, the National Mushroom Development Project (NMDP) was set up by the Food Research Institute of the Council for Scientific and Industrial Research in collaboration with the Ghana Export Promotion Council and Ministry of Food and Agriculture in 1990.

The project has two separate units: The Research and the Commercial Units.

#### **A Research Unit:**

This Unit has the following functions:

1. Collects and maintains pure cultures of indigenous and exotic mushrooms in the National Mycelium Bank. There are over 76 cultures received from 10 countries of the world kept in here. These comprise, among others, of
  - Pleurotus ostreatus* (White Oyster)
  - Pleurotus sajor-caju* (Phoenix tail)
  - Pleurotus eous* (Bhutanese oyster)
  - Pleurotus cystidiosus* (Abalone)
  - Pleurotus tuber-regium*
  - Auricularia* spp. (Jew's ear or wood ear)
  - Ganoderma lucidum* (Linchee or monkey seat)
  - Volvariella volvacea* (Straw or Oil palm)
  - Lentinula edodes* (Shiitake)
  - Agaricus* spp. (Button mushrooms)
2. Investigates efficient methods for processing and preserving mushrooms.
3. Produces and supplies improved mushroom spawn to growers for commercial cultivation.
4. Carries out training programmes and extension services for farmers.

#### **B. Commercial Unit**

1. Produces oyster mushroom spawned compost bags in commercial quantities for sale
2. Produces fresh oyster and straw mushrooms for sale to the general public.

### **Training programmes**

The mushroom industry is the first of its kind in the whole of the West Africa sub region. Since its inception over 2500 people have been trained in the different cultivation methods of the Oysters, Monkey seat, Wood ear and Oil-palm mushrooms. Each training programme usually lasts between 2 and 14 days. Trainees include, agricultural extension officers, church groups, pensioners, research workers, village communities, local farmers, students and lecturers. Trainees have also come from neighbouring countries such as Kenya, Liberia, Nigeria, Sierra Leone, Togo and Zambia. Apart from these training programmes, the project exhibits and participates in trade fairs, talk-shows on radio and television.

## **Mushroom production**

With the introduction of plastic bag and low bed methods of production of mushrooms in 1990, technologies adapted from Thailand and modified to suit Ghanaian conditions, an all year round production of Oysters, Woodear, Monkey seat and Oil palm mushroom is being carried out. Over 75 to 100kg of Oysters are produced daily. There is however a potential to produce between 375 to 500kg fresh mushrooms each day.

With the low bed method of production of the Oil palm mushroom several kilograms of these mushrooms are produced daily.

### **Cultivation methods**

#### **A. Plastic bag method**

This method is used in the production of Oysters, Woodear, and Monkey seat mushrooms. There are six steps involve in this method.

1. Composting the substrate
2. Bagging the composted substrate
3. Sterilizing the bagged substrate
4. Inoculating the sterilized bag with good spawn
5. Incubating the spawned bag
6. Cropping and harvesting

Sawdust from *Triplochiton scleroxylon* or *Chlorophora excelsa* and *Terminalia invorensis* is the substrate that is normally used. These are initially mixed with rice bran and calcium carbonate and brought to moisture content of 70% by adding water. It is then heaped on a platform, and allowed to decompose for 21-28 days (Obodai, 1992), with regular turning at 4 days intervals. The composted sawdust is then bagged in heat resistant polypropylene bags to a weight of about 1kg. The bags are sterilized in drums for 2-3hrs depending on type of mushrooms being grown. After this period the bags are allowed to cool and then sent to the inoculation room, where they are inoculated with good quality spawn. The spawned bags are then sent to the inoculation room for 30 to 45 days where the mycelium grows through the substrate. The bags are allowed to 'thicken' (form pinheads) for another week and then sent to the cropping house for cropping and harvesting. Conditions in the cropping house are maintained at a high relative humidity of 85-90%, and temperature between 24 and 28°C by watering regularly. The fruitbody yield per compost bag is between 200-250 grams every cycle of two months, depending on environmental conditions.

#### **B. Low-bed method**

The materials used in this method are rice straw, maize stover, cotton waste, banana leaves, oil palm pericarp fibre, oil palm empty bunches, and peelings from root tubers such as cassava, cocoyam and yam. The method is as follows:

A wooden trapezoid mould is constructed with both ends opened, the base 35cm, the top 30cm, the height 35cm and the length 91cm or more.

Dry bedding materials such as rice straw, maize stover, etc. are soaked overnight.. Some materials e.g. cotton waste can be soaked and used immediately. The wooden mould is placed on the ground with the base downwards. The soaked materials are put into the mould, up to one-third the height and compacted. The mushroom spawn is broken into pieces by shaking

the bottle and pouring a few grains into the palm. This is then sprinkled on top of the materials, along the periphery inside of the mould. This is the first layer. Two more layers are then removed and used to make more beds. The beds should be spaced about 10-15 cm apart. At least 5 beds should be parallel to each other in one row.

The wooden mould is then removed and used to make more beds. The beds should be spaced about 10-15 cm apart. At least 5 beds should be parallel to each other in one row. The beds are then covered with transparent plastic sheets and woven mats placed on top of them to prevent the beds from drying up from the sunlight and wind.

The beds are left for one week, after which they are raised to a height of 15cm from the ground on blocks to allow enough space for the growing mushrooms.

Mushroom pinheads appear 3-5 days later on the beds as well as the ground, and egg stage mushrooms are picked 48 hours later.

### **MUSHROOM GROWERS AND EXPORTERS ASSOCIATION OF GHANA**

In 1993, the above association was inaugurated to:

1. Provide an organisation for the promotion of the interest of mushroom producers and exporters in Ghana,
2. Encourage and promote large-scale production, processing, marketing and consumption of good quality mushrooms.
3. Ensure that good quality mushrooms are sold to the consuming public by institutions or associations having objects altogether or in part similar to those of this Association.
4. Provide facilities for consultation, communication and exchange of view among producers and exporters, and with the government, ministries, public boards and corporations as well as other non-governmental organizations.

The Association has a total membership of 30 people which comprise of trained fresh mushroom farmers and compost bag producers. In recent years, several orders for large consignments of dried oyster mushrooms have been received from Europe. Plans are on the way to meet these demands.