An Ethnobotanical Study Of Mushroom Germplasm And Its Domestication In The Bia Biosphere Reserve

By

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SUMMARY

There are several species of edible and medicinal mushrooms, which remain unknown and unidentified in the forest reserves of Ghana. In the Bia Biosphere Reserve, there are twenty-four (24) different species of mushrooms. The Bia Biosphere Reserve is situated in the Juabeso-Bia district in the north-western part of the Western region. The reserve covers an area of 355.62 sq. km. It is divided into two namely: the National Park, which represents the core zone covering an area of 77.7 sq. km and the resource reserve, covering an area of 277.92 sq. km. The twenty-four mushroom species are made up of eighteen (18) edible and six (6) medicinal mushrooms. Some of the identified varieties are the Termite mushroom (*Termitomyces spp),* Oil-palm mushroom *(Volveriella spp),* the Ink cap mushroom *(Coprinus micaceus), Psathyrella, Cantharellus aurantiacus, Mycena flarescens, Schizophyllum commune,* Woodear mushroom *(Auricularia auricula)* and Button mushroom (*Agaricus spp.*), which belong to the order Agaricales, Cantharellales Tricholomatales, Schizophyllales and Auriculariales.

The medicinal mushrooms are *Schizophyllum commune, Pleurotus tuber-regium, Auricularia auricula, Ganoderma lucidum, Clavatia sp.* and *Daldina concentrica,* which belong to the order Schizophyllales, Poriales, Auriculariales, Agaricales, Lycoperdales, and Xylariales.

Eleven other mushrooms were picked, which included *Lactarius, Conolopsis* and *Clitocybe spp.*, among others.

At least five people were interviewed from each of the 14 communities. The communities were Abosi, Adjoafoa, Aberewakrom, Benkasa, Debiso, Henneh, Kumkunso, Kwamebikrom, KwameTawiakrom, New Abesim, New Wenchi, Nkwanta, Pitokrom, Teacherkrom and Osonokrom.

54.8% of the respondents were males with the majority (24.6%) being within the age group of 41-50 years. The interviews revealed that a total of 19 species of mushrooms were known/available to the respondents in the communities, and most of these mushrooms were found in the reserve. These mushrooms were picked between February and November. The

three most preferred species in the communities were *Volvariella volvacea* (85.7%) in twelve communities, *Termitomyces* (50%) in seven communities, and *Coprinus micaceus* (21.4%) in three communities.

Some of the reasons for which they preferred these mushrooms were for their sweet taste, that they could be used in place of meat/fish, their aesthetic appeal, their nutritional value, their medicinal value, and also for their long storage period.

Most of the mushrooms were picked on dead trees (49-64%), forest land (soil) (32-48%) and on anthills (5-11%). The dead trees included *Ceiba pentandra* (39.3%), *Elaeis guineensis* (25%) and *Triplochiton scleroxylon* (21.4%).

The medicinal uses for some of the mushrooms included *Pleurotus tuber-regiom* for the treatment of asthma and for fattening underweight children, *Coprinus micaceus* - as a purgative for both children and adults, *Schzophyllum commune* for the treatment of infections, used as a blood tonic and also to aid delivery in pregnant women, and *Daldina concentrica* for the treatment of hernia.

Other relevant information gathered indicated that *Cantharellus aurantiacus* generates a lot of laughter/happiness when consumed.

The proximate and mineral composition of four selected mushrooms picked from the reserve were comparable to those reported by most authors. *Coprinus micaceus*, however, recorded a protein content of 23.6% per 100g of sample, which is higher than that of the oyster mushroom currently produced in the country. Although *Coprinus* has a high protein content its sandy nature affected its mouthfeel.

On the domestication trials, four (4) mushrooms were considered - two medicinal mushrooms (*Ganoderma lucidum* and *Daldina concentrica*) and two edible ones (*Coprinus micaceus* and *Volvariella bombycina*).

Some of the physiological factors considered included media, pH and temperature variations, which greatly affected the mycelia growth of the mushrooms. Potato dextrose agar was found to be the best media for the mycelia growth of *Volvariella bombycina* and *Daldina concentrica*, whilst malt extract and cassava dextrose agar were appropriate for *Coprinus micaceus* and *Ganoderma lucidum* after five (5) days of incubation.

Ganoderma lucidum and *Coprinus micaceus* were found to grow well in all the pH range tested i.e. pH 4-8, but better in a weak acidic environment of pH 4-6. *Volvariella bombycina* grew best in pH 5.5 - 8.0 whilst *Daldina concentrica*, on the other hand, showed relatively good growth in all the pH range studied.

The best temperature for the optimum mycelia growth was 28 $\pm$ 2°C for *Gonoderma lucidum*, *Coprinus micaceus* and *Daldina concentrica*, whilst 35°C was the optimum for mycelia growth of *Volvariella bombycina.*

The spawn run period for *Ganoderma lucidium* varied from substrate to substrate with banana leaves being the best with a spawn run period of 16 days and 40 days for cotton waste. Within the cropping period *Ganoderma lucidium* flushed twice off the sawdust with a total weight of 21 kg.

In the case of *Coprinus micaceus*, the mycelia growth on the substrate (sawdust of *Triplochiton scleroxylon*, banana leaves, corn husk and cotton waste) was just running growth. The spawn run period ranged between 17 to 21 days.

Total fresh mushroom yield of *Volvariella sp.* on cotton waste was 446.5g over a one month period.

1.0 BACKGROUND

1.1 Introduction

Mushrooms, a non-traditional horticultural crop, are the delight of most Ghanaians. The collection of the edible mushrooms in the rural areas and their subsequent sale at the urban centers is an old tradition and is a well-established activity by some traders.

Mushrooms, which were initially consumed for their flavour, are now consumed because of their rich nutritional value in terms of protein, minerals and vitamin content and also medicinal properties (Garcha *et al*, 1993).

In the Bia Biosphere Reserve is a rich flora of edible mushrooms. During the rainy season (May to October) when mushrooms are abundant, the inhabitants being lovers of mushrooms, collect them from and around the reserve, use them in their soups and stews and sell the rest for extra income. To date, however, no systematic attempt has been made to collect, identify, and domesticate any of these edible mushrooms in the reserve, and its environs, thus preserving the biodiversity of the reserve.

Indigenous knowledge of both the edible and medicinal mushrooms and their uses is an aspect that has received very little attention.

This report presents:

- The identification of mushrooms in the reserve collected during three (3) field visits
- The indigenous knowledge of mushrooms from residents in fourteen (14) communities around the Biosphere reserve.
- The biochemical and sensorial preferences of some mushrooms
- Domestication trials of some of the mushrooms using the plastic bag and low-bed methods (Oei,1996).

1.2 Natural characteristics of the Bia Biosphere Reserve

The Bia Biosphere Reserve is situated in the Juabeso-Bia district in the north-western part of the Western region. The reserve covers an area of 355.62 sq. km. It is divided into two namely: the National Park, which represents the core zone covering an area of 77.7 sq. km and the resource reserve, covering an area of 277.92 sq. km. The entire area falls within the transition zone between the 'moist evergreen' and the moist 'semi-deciduous' north west sub-type vegetation zones (Hall et .al 1981).

In the moist semi-deciduous forest type are several tree species, which are rarely found elsewhere in Ghana. They include the very valuable timber species such as *Pericopsis elata* and *Khaya anthotheca* (Asibey et. al., 1982).

1.3 Physical and Climatic Characteristics

The biosphere reserve occupies generally undulating terrain with an elevation of between 170m to 240m above sea level (Martin, 1982). The major drainage on the eastern part of the reserve are the Chirabra, Proproy, Ntronsue and Awiafutu rivers, which are all tributaries of the Bia river and the Sukusuku river, a tributary of the Manzan River, which flows into the Komoe River in the La Cote d'Ivoire. A few of the streams and rivers that drain the Bia Biosphere Resrve are perennial. The soils are classified as forest ochrosols; they are moderately acidic and relatively fertile.

Rainfall is bimodal, with the more intense precipitation occurring from May to August and the other from September to October. There is a noticeable dry spell between November and January. Average annual rainfall is about 1,700mm. Humidity is very high, between 75% to 95%, while mean monthly temperatures, typical of tropical lowland forests, is from 24.0°C to 28.O°C (Martin, 1982).

1.4 Socio-economic characteristics of the biosphere reserve

The total population of the area surrounding the Bia Biosphere reserve is estimated between 21,000 to 27,000 persons. According to Agyare (1996), these figures are only indicative. This is because a substantial number of migrant farmers return to their

families after the annual crop seasons. It is estimated that 44.8% of the population is below 15 years. The median age of 16 years constitutes 2%. Females in the reproductive bracket (16-38 years) form about 22.7%.

The main economic activity currently undertaken around the biosphere reserve is agriculture, with cocoa serving as the major cash crop. This is supported with tree crops, cereals, roots and tuber cultivation. These crops are cultivated on shifting basis and on subsistence level with the family serving as the basic labour force. Income from these farming activities is supplemented by lumbering by chain saw operators, illegal game hunting, small scale trading, small scale soap making, domestic poultry and livestock rearing and seasonal hunting of snails and mushrooms. Most of the cocoa farms are owned by migrant farmers, who repatriate their earnings home annually without undertaking any investment in the area, thereby leaving the area deprived (Agyare, 1998).

2.0 OBJECTIVES

The objectives of the study included the following:

- To collect, identify and document the edible and medicinal mushrooms in the Bia biosphere reserve
- To document the wealth of indigenous knowledge of both the edible and medicinal mushrooms in the reserve
- To establish the nutritional and sensorial properties of the selected mushrooms
- To determine the growth parameters of the selected mushrooms on various agar media etc.
- To cultivate the selected mushrooms using the plastic bag method, and low-bed methods (Oei, 1996) on selected agricultural wastes.

3.0 RESEARCH METHODS

3.1) Identification of the edible and medicinal mushrooms

i) Several specimens of fruiting bodies of fungi at different stages of development were collected. Notes were taken on ephemeral characters such as veil remains, removable scales, fibrils, volva etc. which may be transient.

ii) Notes were also taken on location (forest floor, termite mound etc.) as well as on their diagnostic features.

iii) The specimens were carried separately inside baskets to the laboratory /place of work.

iv) Descriptions were compared to literature and the genus and species identified.

v) The following features were examined using hand lens and microscopes:

Cap- shape, margin and size in LS and from above, colour and ornamentation

Hymenophore (gills, or pores)- shape from below, attachment, edge of gills, colour and spore print

Stipe-insertion, consistency, size, shape, colour and ornamentation

Flesh- thckness, colour, smell, taste

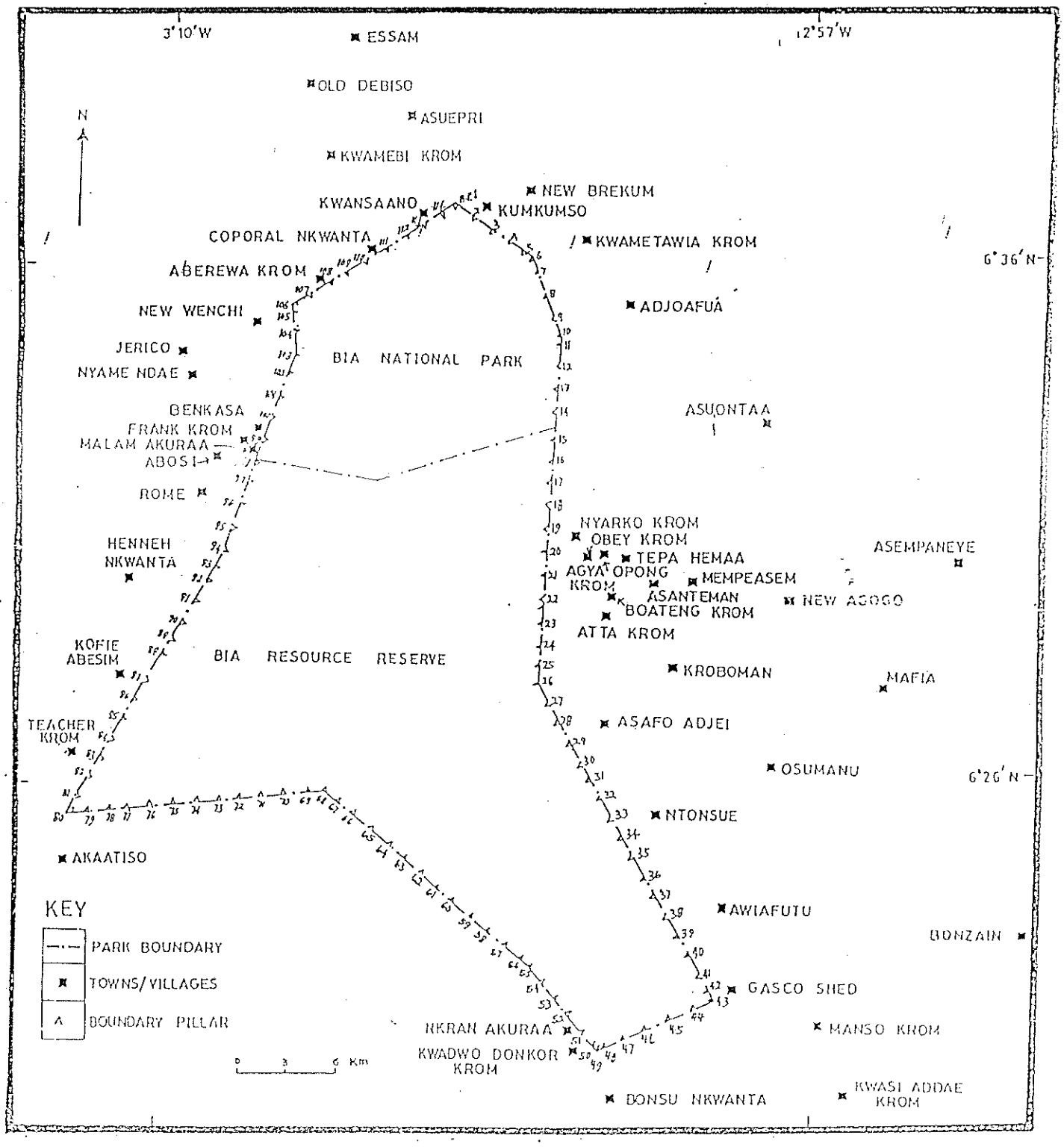
Identifications were based on the following literature used for the identifications:
Pegler (1977), Phillips (1981), Courtecuisse and Duhom (1995), Laessoe (1998) and Ryvarden and Johansen (1980)

3.2) Documentation of indigenous knowledge of wild mushrooms

Questionnaires were used for this study.

At least five (5) people from fourteen (14) communities namely: Kumkumso, New Wenchi, Abosi,, Adjoafua, KwameTawiakrom, Osonokrom, Debiso, Kwamebikrom, Aberewakrom, Benkasa, Pitokrom, Henneh Nkwanta, New Abesim and TeacherKrom were interviewed see Fig.1 (Locations of the communities around the reserve.)

Fig.1: Location of communities around Bia Biosphere Reserve



3.3) Compositional and nutritional studies on some selected mushrooms

3.3.1) Sample collection

The fresh mushrooms, *Termitomyces* sp.(Kyikyirikye), *Termitomyces* sp. (Sibre), *Coprinus micaceus*, *Pluteus cervinus* and *Auricularia* sp. were collected /bought in /around the reserve, placed in plastic bags and transported to CSIR-Food Research Institute in Accra. The whole mushrooms (ie. pileus and stipe) were dried and powdered for analysis.

3.3.2) Chemical analysis

Proximate analysis, including moisture, crude fat, crude protein (Nx 4.38),and ash were performed according to AOAC (!990) and Pearson's methods (5^{th} Edition). Total carbohydrates and energy value were calculated. Minerals were determined by the single beam visible spectophotometer (Model 295E) after dry-ashing the samples. Calcium was determined by Permanganate titration.

3.4) Sensorial Preference tests

Hendonics scale method was used in this test. Fifteen (15) trained panalists were used in evaluating 4 samples of fresh mushrooms (*Auricularia* sp. *Coprinus* sp. *Pluteus* sp. and *Termitomyces* sp.) in terms of :

- Taste
- Aroma
- Mouthfeel
- Texture
- Appearance
- Overall acceptability

3.5) Domestication trials

3.5.1) Maintenance of stock cultures

Mushrooms collected from the reserve were maintained on either potato dextrose agar (PDA) or malt extract agar in petri dishes and subcultured fortnightly.

Spawns of the cultures were prepared using sorghum grains (Zadrazil F., 1978). Both cultures and spawn were incubated at $28 \pm 2°C$.

3.5.2) Assessment of vegetative growth.

Vegetative growth of the mycelium of the mushrooms were assessed by measuring growth of the fungus along two diameters drawn at right angles at the bottom of the petri plates prior to inoculation. Measurements were made daily and the period of incubation varied from one experiment to the other. The incubation periods are mentioned at the appropriate places in the text.

3.5.3) Influence of five (5) different media on mycelial growth of selected mushroom

The influence of nutrients on growth of mushrooms is a well-known phenomenon. Five different media (potato dextrose agar, malt extract agar, rice dextrose agar, maize dextrose agar and cassava dextrose agar) were tested for their ability to support radial growth of the four selected mushrooms from the reserve. Daily measurements were carried out as in (3.5.2) for 12 days.

3.5.4) Composition of Media

Maize meal dextrose agar

About 200g of milled maize was boiled at 60°C for 30min. in 500ml distilled water, strained and made up to 1 litre; 20g of glucose and 15g of agar added.

Rice meal dextrose agar

About 200g of milled maize was heated at 60°C for 30min. in 500ml distilled water, strained and the liquid made up to 1 litre; 20g of glucose and 15g of agar added.

Cassava dextrose agar

Exactly 200g of cassava were peeled, boiled in 500ml distilled water, strained and the liquid made up to 1 litre; 20g of glucose and 15g of agar were added.

Potato dextrose agar

Exactly 200g of peeled Irish potatoes was boiled in 500ml distilled water, strained and the liquid made up to 1 litre; 20g of glucose and 15g of agar were added.

Malt extract agar

About 33.6g of malt extract agar was dissolved in 1 litre of distilled water, and autoclaved at 121°C for 15 minutes.

3.5.5) Effects of pH on radial growth of selected mushrooms.

The mycelial growth rate of mushrooms is affected by conditions such as temperature, humidity, media and pH. Nine pH values (4.0. 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5 and 8.0) were tested for their ability to support radial of five selected mushrooms from the reserve. Daily measurements were carried out as in (3.5.2) for 18 days.

3.5.6) Effect of temperature on radial growth of selected mushrooms

The optimum temperatures for mycelium growth of five selected mushrooms (*Volvariella volvacea, Volvariella bombycina, Coprimus* sp. *Ganoderma lucdium, Daldina concentrica* were investigated. Potato dextrose agar plates (9.0 diameter) were inoculated with 2mm discs of these mushrooms. The petri plates were incubated at 25, 28±2 and 35°C. There were 2 replicates for each temperature. Daily measurements of diameters of the colony were recorded over 26 days as outlined in section 3.5.2.

3.5.7) Influence of agricultural/ forestry or wood wastes on radial growth and yield of five selected mushrooms.

Four (4) agricultural wastes were used namely sawdust of *Triplochiton scleroxylon,* banana leaves, corn husk and cotton waste from the textile factory.

Two (2) cultivation methods were also used namely the plastic bag and low-bed methods.

a) Plastic bag method

This method is used in the production of *Pleurotus* (Oyster), *Auricularia* (Woodear) and *Ganoderma* (Monkey seat) mushroom species.

i) Preparation of sawdust medium.

Sawdust compost prepared from either *Triplochiton scleroxylon* was used. Freshly milled sawdust of *Triplochiton scleroxylon*, moisture content 30% on wet basis, was thoroughly mixed with rice bran (12%) and 0.05% of calcium oxide. Water was sprinkled on the mixture

until moisture content was about 70% wet basis. The mixture was piled up into a pyramidal heap and allowed to ferment, for 21-28 days. It was turned every four day to ensure proper aeration and to uniform composting. One kg quantities of the composted sawdust were put into 33 x 18 cm heat-resistant, 0.1 μm polypropylene bags (Auetrugal, 1984). Each bag was closed with a plastic neck, steam-sterilised for 2.5 h, inoculated with 5g sorghum spawn and incubated at 28 ± 2°C and 65 ± 5 % RH for 17 - 21 days in a well ventilated, semi-dark room.

ii) Preparation of other substrates.

Freshly cut banana leaves and corn husk were chopped into small parts (about 3cm in length). This was soaked inn water for 3 hours. The water was squeezed out and bagged as above. The cotton waste used was shredded and soaked for I hour before bagging. The spawn run period for the different substrates are stated in the appropriate parts of the text.

The spawn run period was the number of days from inoculation to complete colonisation of the compost bag by the mycelium. After completion of the spawn run, the bags were transferred to a cropping house, at 26 ± 2 °C and 90 ± 5 % RH, and opened to induce fruiting body formation.

b) Low bed method

This method is used in the cultivation of the oil-palm mushroom (*Volvariella* spp.).The substrate used in this method was cotton waste and banana leaves. Other wastes that could also be used are banana pseudostems, oil palm pericarp fibre and empty bunches, peelings from root tubers such as cassava (*Manihot esculenta)*, cocoyam (*Xanthosoma* sp.) and yam (*Discorea* sp).

The method is as follows:

A bed was made with the help of a wooden trapezoid mould frame with both ends opened. The dimensions being, base 35mm, top 30cm,the height 35cm and a length of 91cm or more.

Dry bedding materials such as cotton wastes were soaked, shredded and used immediately.

The wooden mould was placed on the cemented floor with the base downwards. The soaked cotton waste was put into the mould, up to one-third of the height and compacted.

The mushroom spawn was dispersed into pieces by shaking the bottle. This was then sprinkled on top of the materials, along the periphery inside of the mould to form the first layer. Two more layers were made in the same manner. With the top-most layer the entire surface was inoculated with the spawn.

The wooden mould was then removed and used to make more beds. The beds were spaced about 10-15 cm apart. In between the beds a layer of composted sawdust of *Triplochiton scleroxylon* was placed. At least 3 beds were made in a row parallel to each other. The beds were then covered with transparent plastic sheets and woven mats placed on top of them to prevent the beds from drying up by sunlight or wind. The beds were left for one week, after which the polythene and woven mats, which had been used to cover them, were raised off the beds to a height of 15cm. This was to allow for aeration, and also to allow enough space for the growing mushrooms.

4.0 RESULTS AND DISCUSSIONS

A. Identification of Mushrooms collected from and around the Reserve

Mushrooms collected from the reserve are listed in Table 1 below:

Table 1: Types of Edible/Medicinal Mushrooms collected from the reserve

Scientific Name	Local Names Dialects	
	Sefwi	**Asante Twi**
Coprinus micaceus	Nsasea/Nynbre/Nidua	Asasea/Mfumtum
Pluteus subcervinus	Nkankuma	Nkankum
Volvariella volvacea	Domo/ Mbre	Domo
V. bombycina	Ahimire	Ahinimire
Termitomyces letestui	Atwe	Nsusua /Tweaworodo
Termitomyces sp 2	Siemire	Sibre
Termitomyces sp 1	Trea	Kyekyekyi
Not known	Atroka	Atroka
"	Nkundre	Not Known
"	Mpempena	Mpempena
Cantharellus aurantiacus /Hygrophoropsis aurantiacus (False Cantherelle)	Not known	Awiawi /Kofi korku
Not known	Tuegyamigya	Not known
"	Egyamerisu	"
Mycena flavescens	Not known	Kwartemaa
Schizophyllum commune	"	Niwidia
Not known	Not known	Ntrotrowa/Adeabronsa
Pleurotus tuber regium	Mirefofuo	Not known
Auricularia sp.	Not known	Asuntoku
Ganoderma lucidum	"	Not known
Psathyrella sp.	"	"
Clavatia excipliformis	"	"
Agaricus sp.	"	"
Daldina concentrica	"	"

Twenty four (24) different mushrooms made up of eighteen (18) edible and six (6) medicinal mushrooms were picked from the reserve (Table 1). The family and order of the identified edible and medicinal ones are listed in Tables 2a and 2b. Other mushrooms from the reserve are listed in Table 2c.

Table 2a: Identified Edible Mushrooms of the reserve

Order	Family	Scientific names
Agaricales	Amanitaceae	Termitomyces spp.
Agaricales	Pluteaceae	Volvariella spp.
Agaricales	Pluteaceae	*Pluteus subcervinus*
Agaricales	Coprinaceae	*Psathyrella* sp
Agaricales	Coprinaceae	*Coprinus micaceus*
Agaricales	Agaricaceae	*Agaricus* sp.
Schizophyllales	Schizophyllaceae	*Schizophyllum commune*
Auriculariales	Auriculariaceae	*Auricularia* sp.
Tricholomatales	Marasmiaceae	*Mycena flavescens*
Cantharellales	Cantharellaceae	*Cantharellus aurantiacus*

Table 2b: Identified Medicinal Mushrooms of the reserve

Order	Family	Scientific name
Schizophyllales	Schizophyllaceae	*Schizophyllum commune*
Poriales	Polyporaceae	*Pleurotus tuber regium*
Auriculariales	Auriculariaceae	*Auricularia* sp.
Agaricales	Pluteaceae	*Ganoderma lucidum*
Lycoperdales	Lycoperdaceae	*Clavatia excipliformis*
Xylariales	Xylariaceae	*Daldina concentrica*

Table 2c. Other Mushrooms from the Bia Forest Reserve

ORDER	FAMILY	SCIENTIFIC NAMES
Lycoperdales	Geastaceae	*Geastrum triplex*
Pezizales	Pezizaceae	*Peziza* sp
Pyrenomycetetideae	-	*Geoglossum cookeinianum*
Polyporales	Coriolaceae	*Coriolopsis polyzona*
Polyporales	Coriolaceae	*Trametes cingulata*
Polyporales	Coriolaceae	*Pycnoporus sanguineus*
Polyporales	Coriolaceae	*Lenzites elegans*
Polyporales	Coriolaceae	*Gloeophyllum striatum*
Agaricales	Agaricaceae	*Cystolepiota procera*
Russulales	Russulaceae	*Lactarius* sp
Marasmiaceae	Myceneae	*Mycena* spp.
Tricholomataceae	Clitocybe	*Clitocybe* sp.

Descriptions of the identified edible mushrooms

***Volvariella volvaceae* (Bull. Fr) Singer (Domo)**

It grows uniformly throughout the year. Basidiocarp 4-10cm with grey, brown or blackish, olivaceous colour and paler at the margin. The stipe length varies between 4-10 cm., is white to silky in colour, has a large volva. Gills are salmon with purplish brown spores, which are smooth and ellipsoid. It is generally found growing on felled oil palm and often on sawdust and decay logs of *Triplochiton scleroxylon, Ceiba pentandra* and felled oil palm

***V. bombycina* (Sch.Fr) Singer (Domo/ahimire)**

It has a silky to pale yellowish ochraceous basidiocarp of less than 20cm broad. The stipe length varies between 10-20cm with white to yellowish cream colour. It has a large volva and normally found on logs, stumps and woodwaste of *Ceiba pentandra.*

***Termitomyces* sp. 1 (Sibre)**

It has a large cap of about 10-25cm wide, a cream surface, becoming rust brown towards the centre except for the top, which is covered by small dark brown, granular scales. The gills are free, whitish to cream. The stipe is white of 4-20 cm long, cylindrical and scaly above ground level, attenuate as an elongate pseudorrhiza. The stipe is also corky when young but chalky with age. It has white flesh, a firm and solid Veil present as membranous annulus. Its spore print is light pinkish. The spores are ellipsoid, hyaline and smooth and are normally found on termite mounds.

***Termitomyces letestui* (Tweaworodo)**

The basidiocarp surface is cream at the margin becoming greyish-black, dark brown toward the centre with a disk which is covered by small granular squamules of about 3-35 cm diameter. The stipe is about 4-20cm long, cylindrical, white prolonging below into a tapering pseudorrhiza of over 1meter in length. It has free gills which are cream coloured and a persistent veil. Its spore print is pinkish cream. The spores are ovoid, ellipsoid to oblong in shape and are found on termite mounds or on combs of termites.

***Coprinus micaceus* (Bull ex Fr.) Fr. (Asasea)**

It has a basidiocarp of about 1-5cm high which is ovoid, expanding bell shaped, ochraceus becoming cinnamon toward the centre. The stipe is 4-10 cm long, discolouring buff in lower part with fibrils. It has gills becoming date brown and finally black. Its spores are mitriform. The spore print is date brown. It has a partial veil present when young. They are densely tufted on stumps and bark of trees

***Pluteus subcervinus* (Schaeff.ex Fr) Kummer (Nkankum)**

The basidiocarp is ochre to brown, convex to flattened of about 5-9.5cm. The stipe is central, cylindric of about 5-18cm long. Its spore print is pink. The spores are globose to ellipsoid and smooth. The basidia are clavate while the veil is absent. It occurs singly or in small groups in parks, gardens and woodlands at onset of rains.

Mycena flavescens **Vel. (Kwartema)**

The basidiocarp is conical, yellowish grey, but paler when dry. The stipe is fine white. The gills are whitish with a yellow edge. Its spore print whitish yellow. The spores are ellipsoid. They are found on leaf litter, decay wood on forest floor.

Schizophyllum commune **Fr. (Niwidia)**

The basidiocarp is 1-4cm in lenghth, fan shaped, semi-circular to kidney shaped often fused with others, white to grey in colour. It is sessile or has a short stem-like base. Hymenium gilled. It has split gills radiating from the point of attachment, leathery or flexible. Its spore print is white, with cylindrical spores. Found on decaying wood, forest floors and oil palm trees,.

Hygrophoropsis aurantiaca **(Ivon Wielf. Fr.) Maire apud Martin Sans (False Cantherelle)**

The basidiocarp is 2-8cm wide, convex to shallowly funnel shaped with orange- yellow colour. It's stipe is 30-50mm long with deccurrent yellow gills. Spore print white and elliptic. It is found growing on oil palm and decaying wood of Otie. Cause alarming symptoms like laughter/cheerfulness (hallucinations) after eating

Below are pictures of some of the species collected.

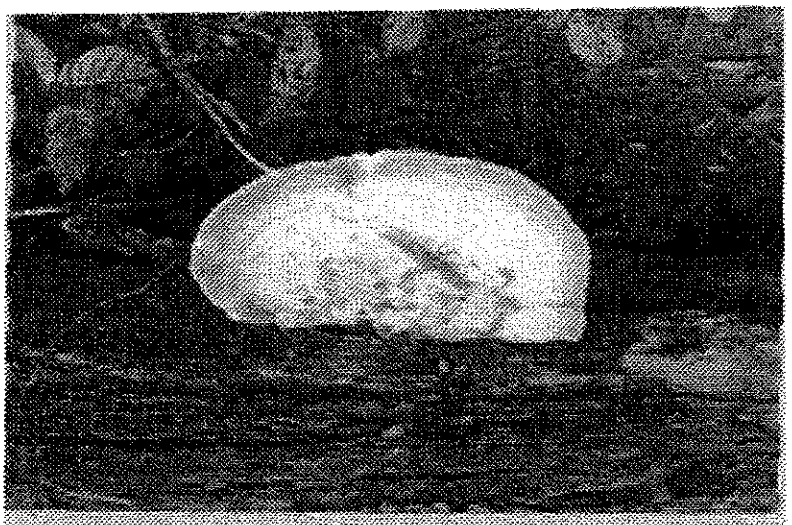


Fig.2: *Lenzites elegans* a polypore growing on a felled *Celtis mildbraedii* tree

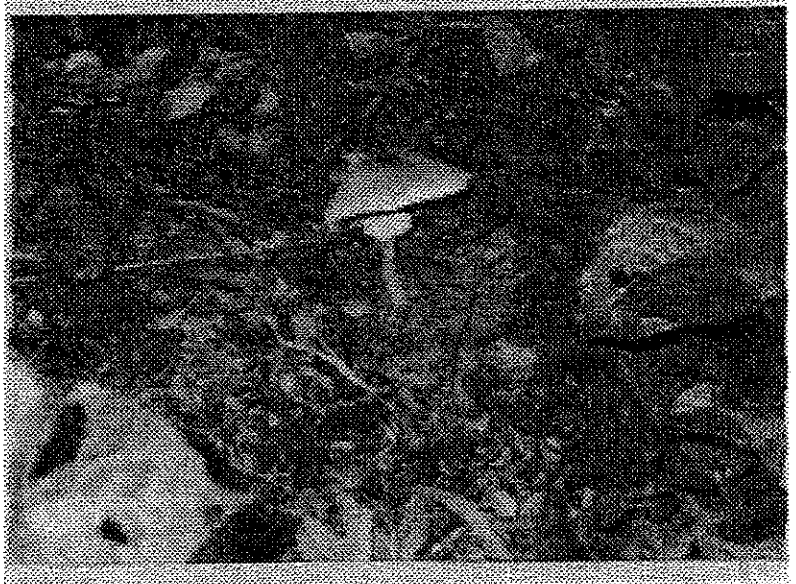


Fig.3: a button mushroom (*Agaricus* sp) growing on the forest floor.

Fig.4: a woodear (*Auricularia auricula*) mushroom growing on a felled tree

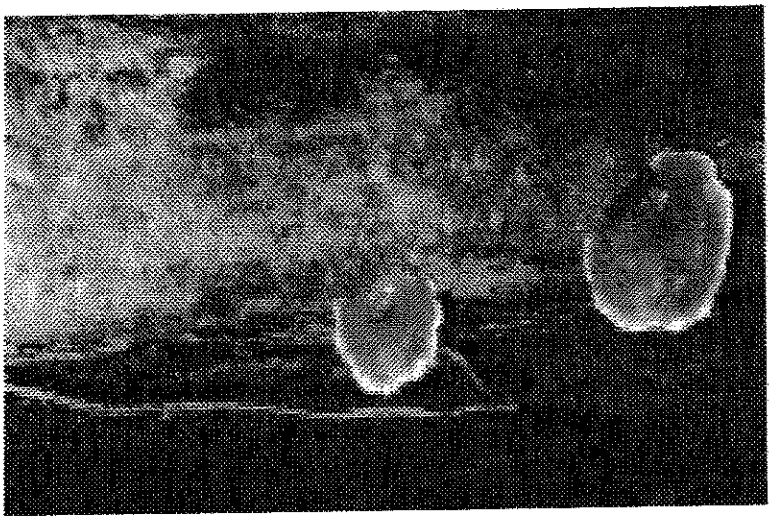


Fig.5 *Pycnoporus sanguineus*

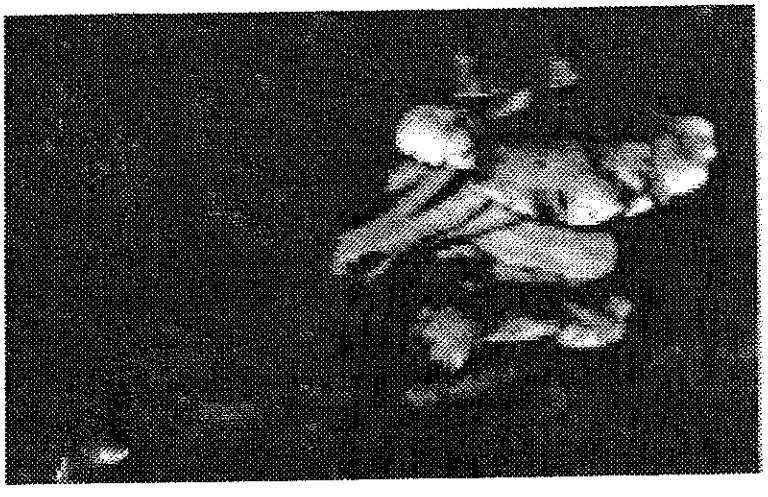


Fig.6 *Lactarius* sp.

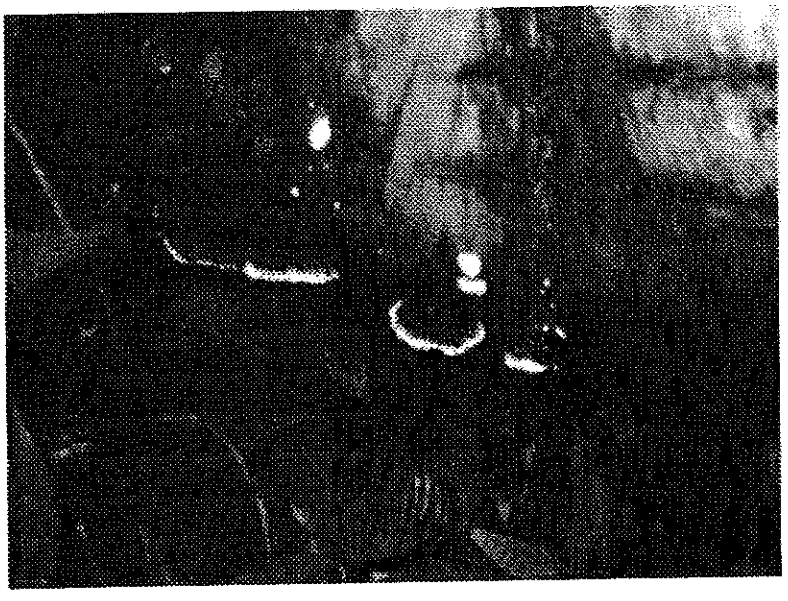


Fig.7 *Gloeophyllum trabeum*

Fig.8 *Coprinus micaceus.*

Fig.9 *Termitomyces letestui.*

B. Documentation of indigenous knowledge

The summary of the responses are presented in the tables below:

Table 3a: Age group distributions of respondents in the fourteen communities

Communities	Age groups					
	11-20	21-30	31-40	41-50	51-60	Above 60
Abosi					3	2
Adjoafoa	2	5	5	1		3
Aberewakrom		1	3	1	3	3
Benkasa				5	1	4
Debiso	7	5	5	7	1	3
Kumkumso		1	3	1	2	
KwamebiKrom		1	1	2	1	3
KwameTawiaKrom			3	2	3	4
New Wenchi			1	2	1	
Osonokrom	2	1	1	1		
Henneh Nkwanta	1	3	5	7	2	-
Pitokrom	-	3	1	4	-	-
Teacherkrom	-	1	1	1	1	1
New Abesim	-	-	-	1	-	1
Total	12	21	29	34	18	24
Percentage	8.7	15.2	21.0	24.6	13.0	17.5

Table 3b: Sex distribution of respondents in the fourteen communities

Communities	Sexes		Total
	Male	Female	
Abosi	4	1	5
Adjoafoa	5	10	15
Aberewakrom	7	4	11
Benkasa	7	3	10
Debiso	13	11	24
Kumkumso	5	2	7
KwamebiKrom	5	3	8
KwameTawiaKrom	7	5	12
New Wenchi	4	1	5
Osonokrom	3	2	5
Henneh Nkwanta	6	12	18
Pitokrom	3	5	8
Teacherkrom	3	2	5
New Abesim	2	-	2
Total	74	61	135
Percentage	54.8	45.2	100

54.8% of the respondents were males (Table 3b) and also majority of respondents were within the age groups of 41-50 years.

Table 4a: List of common names of edible mushrooms and their period of occurrence

Scientific name	Dialects Sehwi	Twi	Asante	Period of occurrence
Coprinus micaceus	Nsasea'/'Nyinibre' 'Nidiwa'			Mar-Dec
Termitomyces sp.	'Kyekyekyi'/'Trea		Kyekyekyi	Mar-April /Sept-Nov.
Volvariella volvacea	'Domo'/'Mbre'			Feb-April/ June-Sept
Pluteus cervinus	'Nkankuma'			Feb-May
Not known	'Atroka'			Aug-Oct.
"	'Nkundre'			Feb-April
"	Ntrotrowa'	'Zali' (B.A)	'Adiabrosa'	Aug-Oct.
Pleurotus sp.	Mewedee			Sept-Nov.
Not known	Peperpeper			Mar-Nov
"	Tuegyamigya			April-Oct.
"	'Mpempena'			Mar-Nov.
"	'Egyamerisu'			May-July
"	Amagyamgya			April-Oct.
V. bombycina	'Ahimire'			Mar-May
Auricularia sp.	Asuntoku			
Pleurotus tuber-regium	'Mirefufuo'			Jan-Dec.
Mycena flavescens	-	Kwartemaa		May-June
Schizophyllum commune	-	Niwidia		May-June
Cantharellus aurantiacus (False Cantherelle)	-	Awiawi /Kofi korku		April-Nov.

Most of the mushrooms are collected at the onset of the rainy season (Feb.- May) (Table 4a), while others are collected throughout the year (March - Dec.). Only a few are collected during the rainy season (May - July).

Table 4b: Number of edible mushrooms known in each community

Communities	Frequency	%
Abosi	5	4.6
Adjoafoa	8	7.4
Aberewakrom	6	5.6
Benkasa	5	4.6
Debiso	16	14.8
Kumkumso	5	4.6
Kwamebikrom	9	8.3
KwameTawiakrom	9	8.3
New Wenchi	6	5.6
Osonokrom	6	5.6
Henneh Nkwanta	12	11.1
Pitokrom	7	6.5
Teacherkrom	10	9.3
New Abesim	4	3.7
Total	**108**	**100**

A total of 19 different species of mushrooms were known/available to the respondents in the fourteen communities (Table 4a). Respondents in the Debiso community knew sixteen (16) species, which accounted for 14.8%. This was followed by those of Henneh Nkwanta (11.1%) and Teacherkrom (9.3%). Respondents in New Abesim, however, knew only four (4) of the species (3.7%) (Table 4b).

Table 5a: List of the three most preferred mushrooms in the communities

Communities	First	Second	Third
Abosi	*Termitomyces* sp.	*Termitomyces* sp.	*Volvariella sp.*
Adjoafoa	*Volvariella sp.*	*Termitomyces* sp.	
Aberewakrom	*Volvariella sp.*	*Termitomyces* sp.	'Mpenpena'
Benkasa	*Termitomyces* sp.	*Volvariella sp.*	
Debiso	*Volvariella sp.*	*Termitomyces* sp.	
Kumkumso	*Volvariella sp.*	*Coprinus micaceus*	*Termitomyces* sp.
KwamebiKrom	*Volvariella sp.*	*Termitomyces* sp.	*Termitomyces* sp.
KwameTawiaKrom	*Volvariella sp.*	*Termitomyces* sp.	
New Wenchi	*Volvariella sp.*	'Mpenpena'	*Coprinus micaceus*
Osonokrom	*Volvariella sp.*	*Pluteus cervinus*	
Henneh Nkwanta	*Volvariella sp.*	*Coprinus micaceus*	*Termitomyces* sp.
Pitokrom	*Volvariella sp.*	*Coprinus micaceus*	*Pluteus cervinus*
Teacherkrom	*Volvariella sp.*	*Termitomyces* sp.	*Auricularia sp.*
New Abesim	*Volvariella sp.*	*Pluteus cervinus*	*Coprinus micaceus*

The two most preferred species in the communities were V*olvariella volvacea* 'domo' (85.7%) in twelve communities and *Termitomyces sp.(*50.0%) in seven communities . *Coprinus micaceus* ranked second in three communities (21.4%) (Table 5a). The percentage preferences differed from community to community. For example in Henneh Nkwanta *Volvariella sp.* preference rate was 40.91%and *Coprinus micaceus* was 27.27% whilst in Pitokrom the preference rate was 40.00 % and 20.0% respectively (Figs 10 & 11).

Fig 10 PREFERENCES IN HENNEH NKWANTA

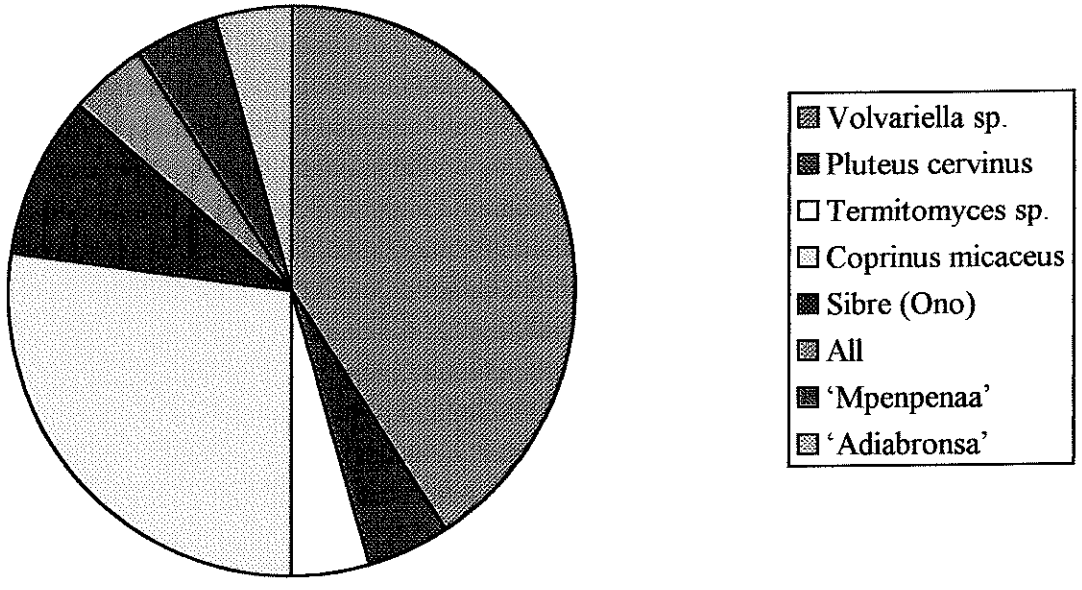
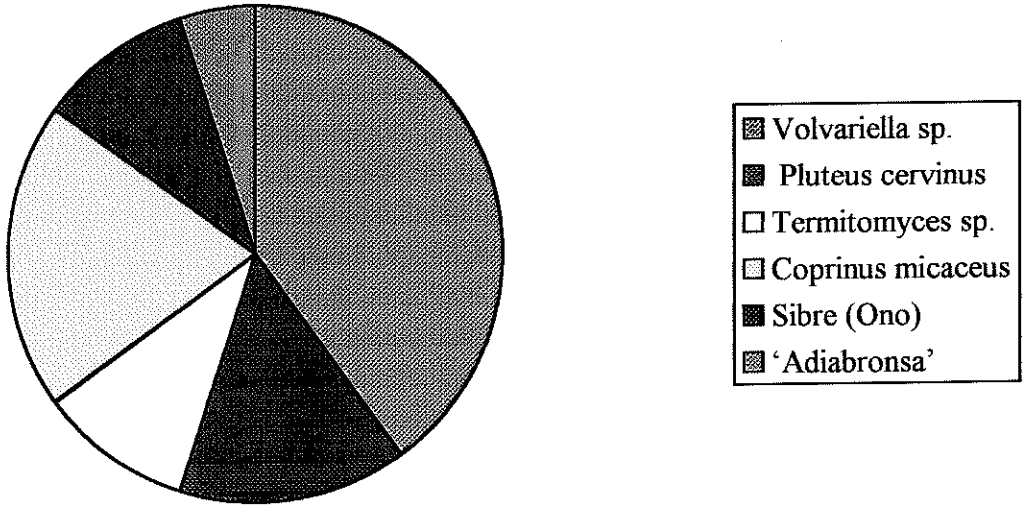


Fig. 11 PREFERENCES IN PITOKROM



Some of the reasons for which they preferred these mushrooms are:

- They are tasty/sweet.
- They can be used in place of meat/fish.
- They look very attractive when in season.
- They do not become flaccid in soups and stews as the others.
- They are a source of protein to them (Nutritional value).
- They have medicinal value.
- They can be stored for a long time.

The main reasons assigned for their preferences are for example in Henneh Nkwanta Taste (47.83%), Nutritional value (17.39%) and Medicinal (21.17%) (Fig.12). In Pitokrom - Nutritional value (96.3%) and Medicinal (3.7%) (Fig 13).

Fig. 12 REASONS GIVEN IN HENNEH NKWANTA

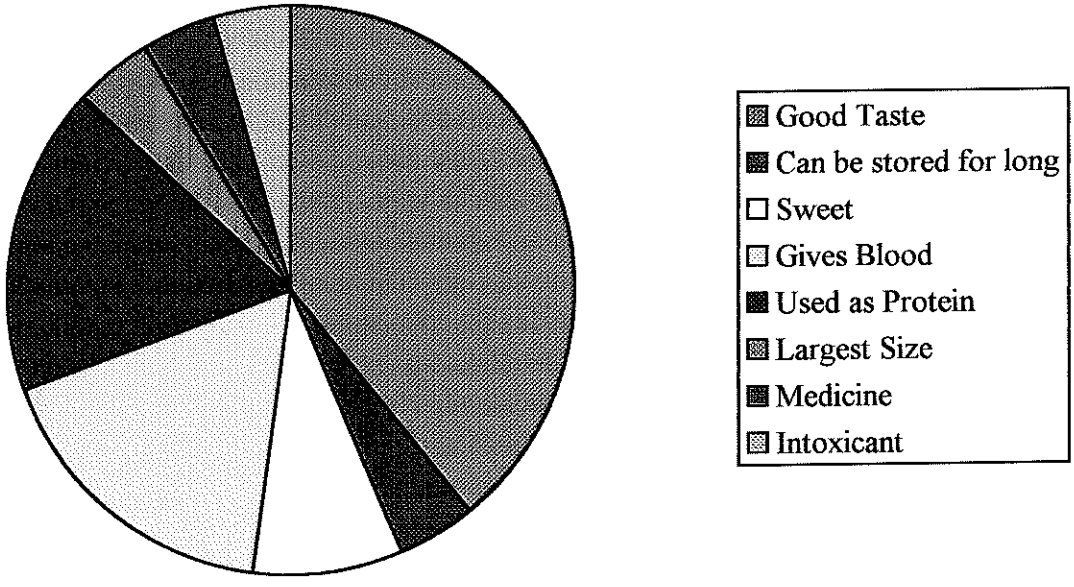
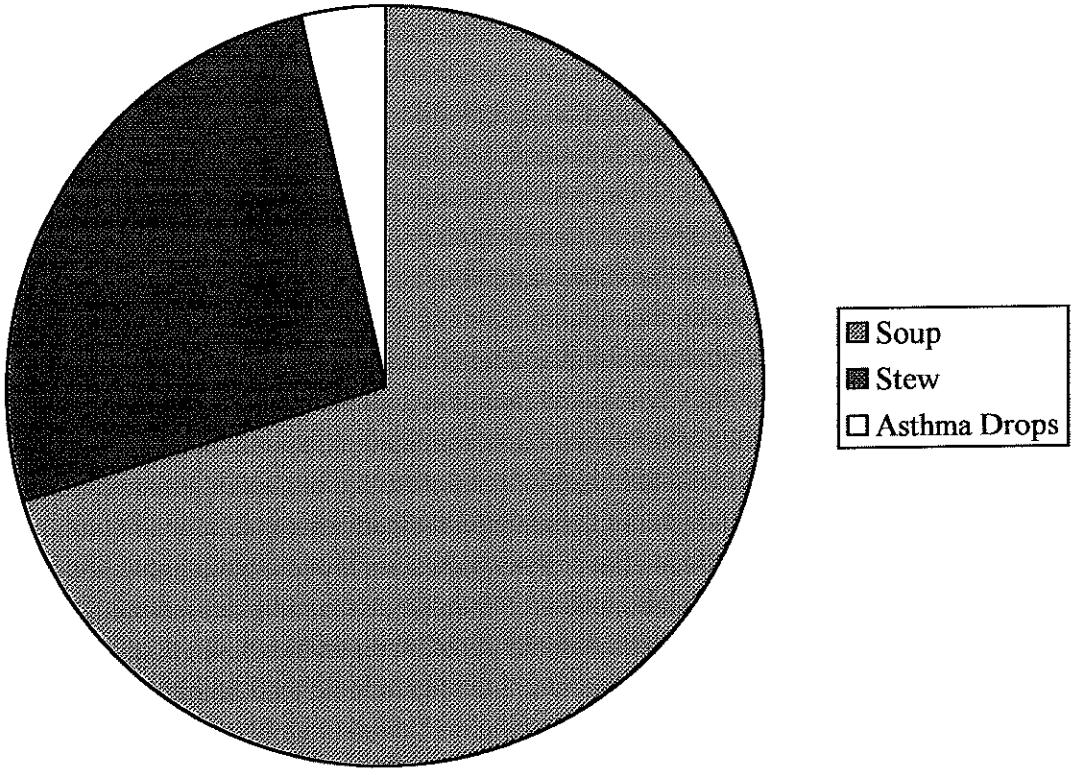


Fig. 13 USES OF MUSHROOMS IN PITOKROM



Most of the people in Pitokrom use mushrooms for soup, while others prepared stew with them. Mushrooms are considered the best substitute for meat and fish products. They know the high nutritional value associated with mushrooms.

Table 6: Picking sites of some of the edible mushrooms

Mushroom species	Soil	Tree species
Coprinus micaceus		*Anacardium occidentale* 'Atea',*Celtis mildbraedii* 'Esa', *Pycnnanthus angolensis* 'Otie',*Ceiba pentandra* 'Onyina', *Cigelia africana* 'Nfuntum', *Sterculia tragacantha* 'Sofo',*Antiaris toxicanria* 'Kyenkyen',*Triplochiton scleroxylon* 'Wawa'
Termitomyces sp.	Termite mound	Under *Theobroma cacao* 'cocoa' tree
Volvariella sp.		*Elaeis guinensis* 'Oilpalm', *Ceiba pentandra* 'Onyina', *Antiaris toxicanria* 'Kyenkyen',*Milicia excelsa* 'Odum', *Triplochiton scleroxylon* 'Wawa',*Manihot esculenta* ,Cassava' peels
Termitomyces sp.	Termite mound	
'Nkankuma'	Near termite mound	
'Atroka'	Termite mound	
'Nkundre'	"	
Peperpeper		Log of *Leoseneriella rowlandii* 'Ntwea'
Tuegyamigya	Forest floor	
'Mpenapena'	Termite mound	
'Egyamerisu'		Decayed log- *Ceiba pentandra* Onyina, *Antiaris toxicanria* kyenkyen, *Elaeis guinensis* 'oil palm'
Amagyamgya	Forest floor	
'Ahimire'	"	
'Ntrotrowa'		

Most people knew the areas where could harvest specific types of mushrooms using knowledge acquired from their ancestors. Most of the documented areas are in the forest lands, around termite mounds, in abandoned farm lands or fallow fields, as well as in fields under cultivation. The mushrooms were picked on the following: Forest land (soil) 32-48%, Dead trees 49-64% and on anthills 5-11%. Most of the mushrooms picked on the dead trees were either 'Onyina' *Ceiba pentandra* (39.29%), Dead Palm trees, *Elaeis guinensis* (25%)and 'wawa' *Triplochiton scleroxylon* (21.43%).

Table 7: Medicinal Uses of some mushrooms

Mushroom sp.	Uses
Pleurotus tuber-regium	For the treatment of Asthma, for fattening underweight children
'Ntrotrowa'	For the treatment of hypertension
Coprinus micaceus/ Schizophyllum commune	As purgative for children and adults. For the treatment of stomach troubles and eye infections; used as a blood tonic and also to aid delivery in pregnant women.
Volvariella sp.	For energy
'Gonomre'	Used as blood tonic for anaemic patients
Daldinea concentrica	Used for the treatment of hernia

Some edible mushrooms were reported as having medicinal values. These medicinal uses are shown in Table 7.

Other relevant information:

Mushroom species:

Ediabronsa - Edible but causes severe intoxication if alcohol is taken after its consumption.

Cantharellus aurantiacus - Edible. It is believed that after its consumption it creates a lot of happiness due to its sweet taste resulting in a lot of laughter.

Table 8: Methods of Mushroom Preservation

Method	Type of mushroom
Sun drying	*Termitomyces* sp. Volvariella sp. *Coprinus micaceus*,
Smoke drying	Termitomyces sp. Volvariella sp. *Coprinus micaceus*, Nkundre
Kept in bowl of water	*Termitomyces* sp
Refrigeration	*Termitomyces* sp. Volvariella sp.
Blanching	*Termitomyces* sp.
Boil and mash	
Blanching before drying	*Coprinus micaceus*

Mushrooms are preserved at all sites. Similar methods are used in the communities. Fresh *Termitomyces sp., Volvariella sp.,* and *Coprinus micaceus* are dried in the sun or on fire as shown in Table 8. *Ttermitomyces sp.* can be kept in a bowl of water in the fridge.

C. Compositional and nutritional studies

Proximate analyses were carried out using the whole mushroom (Pileus and stipe). Results are presented below

Table 9: Proximate and mineral composition of mushrooms from the reserve. (per 100g sample)

Composition (%)	**Mushroom species**					
	Termitomyces sp.(***Kyikyirikyi***)	Termitomyces *sp.* (Sibre)	***Coprinus*** sp.	***Pluteus*** sp.	***Auricularia*** sp.	Average
Moisture	87.9	88.4	75.7	86	71.9	81.9
Ash	9.8	4.1	24.2	21.4	2.9	12.5
Fat	2.9	3.4	9.4	9.0	10.8	7.1
Protein	19.6	15.2	23.6	20.2	6.2	16.9
Total carbohydrate	36.7	27.1	60.9	54.9	23.5	40.6
Energy value ((Kcal)	229.8	182.1	396.3	358.8	205.3	274.5
Phosphorus (mg)	239.4	N/A	247.0	205.8	103.2	198.9
Iron (mg)	7.7	N/A	7.6	11.1	9.6	9.0
Calcium (mg)	99.3	N/A	146.1	128.4	195.6	142.4

N/A - Not available

The average value of the moisture content is 89.9% with a maximum of 87.95 for *Termitomyces* sp. (Kyikyirikyi). This average is comparable with results obtained by

Parent et. al., 1977. The average value for protein is 16.9% with the highest of 23.6% recorded by *Coprinus micaceus* (Table 9) which is higher than most oyster mushrooms currently being produced in the country. *Auricularia auricula* recorded the highest value for fat(10.8%) whilst *Termitomyces* sp. (Kyikyirikyi) recorded the lowest of 2.9%

D. Sensorial Preferences

Table 10: Sensorial preferences of mushrooms

Mushroom spp.	**Taste**	**Aroma**	**Mouthfeel**	**Texture**	**Appearance**	**Overall acceptability**
Auricularia sp.	6.067±1.57	6.33±1.632	5.666±1.543	5.733±1.791	5.666±1.914	6.733±1.944
Coprinus sp.	6.666±1.543	7.0±1.309	5.866±2.131	5.8±2.077	5.733±2.052	6.0±2.236
Termitomyces sp.	7.6±0.910	7.8±0.941	7.6±1.044	7.4±1.556	7.8±0.639	7.8±0.833
Pluteus sp.	7.6±0.056	7.6±0.910	7.2±0.941	7.0±1.195	7.2±1.090	7.266±1.033

Interpretation of Table 10:

9	= Like Extremely	8	= Like Very Much
7	= Like Moderately	6	= Like Slightly
5	= Neither Like nor Dislike	4	= Dislike Slightly
3	= Dislike Moderately	2	= Dislike Very Much
1	= Dislike Extremely		

Results indicate that out of the four (4) fresh mushroom samples, *Termitomyces* sp." is best accepted and preferred. *Pluteus* sp. follows in preference and *Auricularia* sp.is least preferred and accepted. *Coprinus* sp. had high marks and positive comments for its aroma alone. The sandy nature of the *Coprinus* sample affected its mouthfeel seriously.

General comments indicate that *Termitomyces* sp. is popular in most Ghanaian homes more than any other fresh mushroom hence its high preference and acceptability.

E. Domestication trials

i) Influence of five (5) different media on radial growth of four mushroom species

It was assumed that the mycelial growth of four mushroom species (*Ganoderma lucidum*, *Volvariella bombycina*, *Coprinus micaceus*, and *Daldina concentrica*) from the reserve would be different on different mycological media used (maize meal agar, cassava dextrose agar, malt extract agar, rice meal agar and potato dextrose agar).

Fig.14: *Coprinus micaceus* culture growing on malt extract agar after five (5) days of incubation.

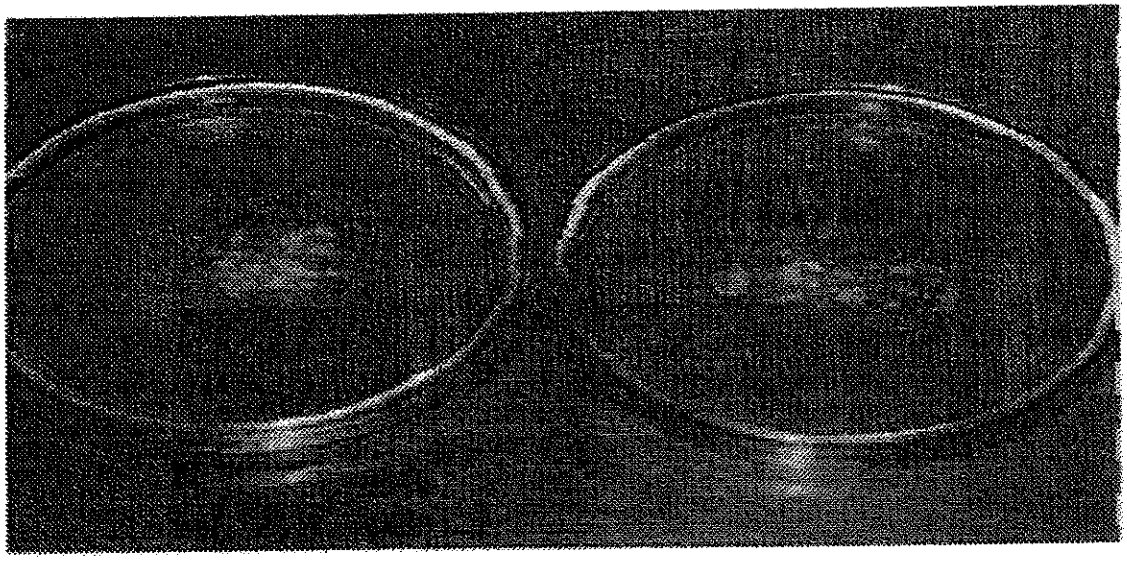


Fig 15 to Fig.18 indicates that potato dextrose agar for *Volvariella bombycina and Daldina concentrica* was the best medium for growth whilst in the case of *Coprinus* micaceus and *Ganoderma lucidum* malt extract agar and cassava dextrose were the best respectively.

Fig. 15 Growth rate (mm/h) of Coprinus micaceus on 5 different media at 28±2 C for 5 days

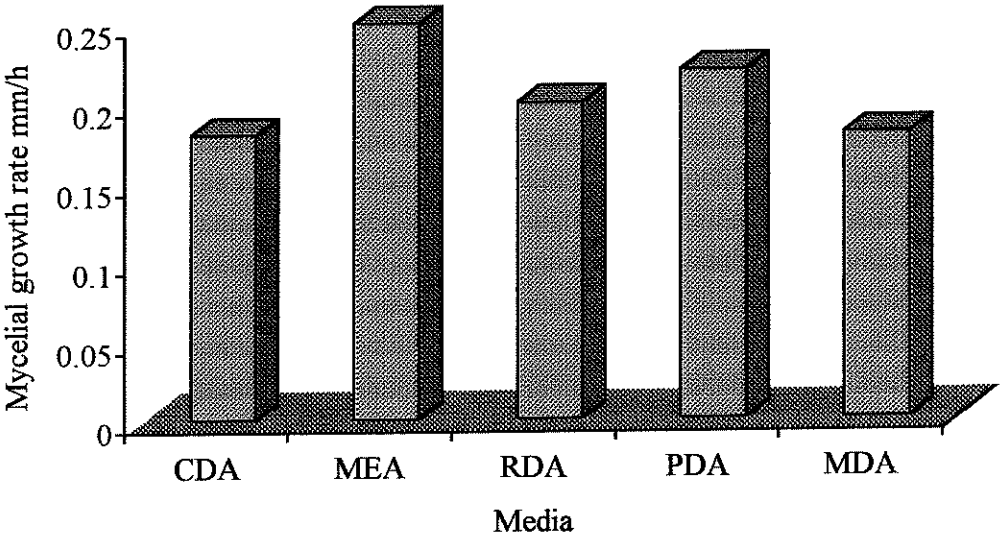


Fig. 16 Growth rate (mm/h) of Ganoderma lucidum of 5 different media at 28+ 2 for 5 days

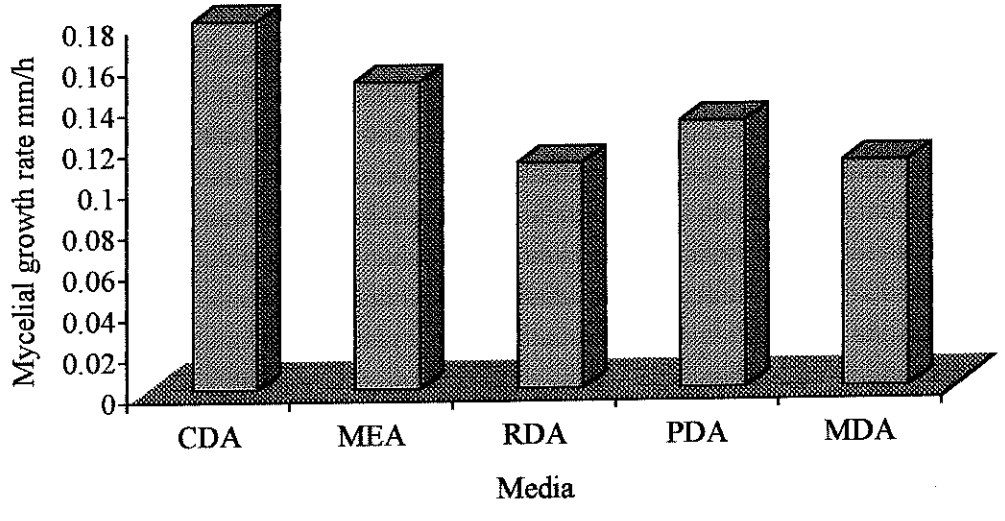


Fig 17 Growth rate(mm/h) of Volvariella bombycina on 5 different media at 28±2 C for 5 days

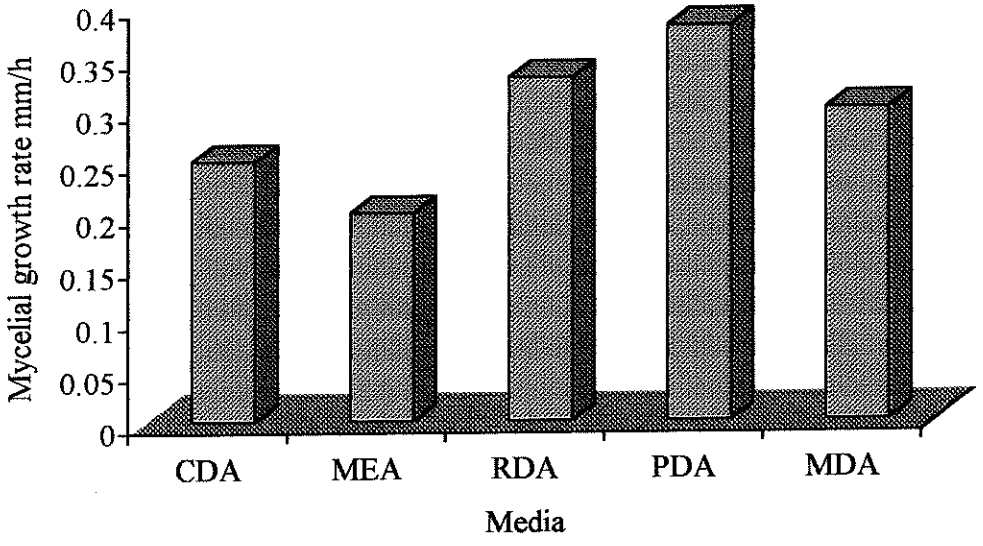
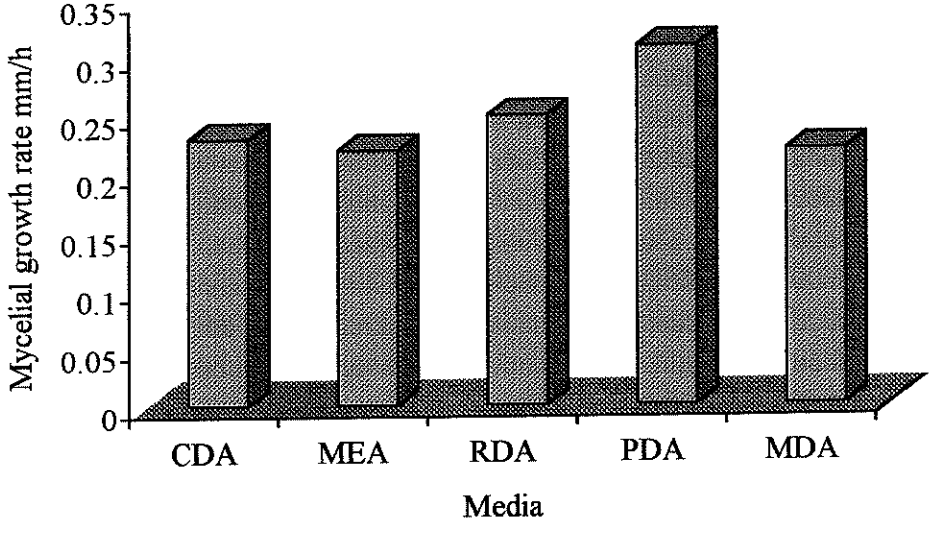


Fig.18 Growth rate (mm/h) of Daldina concentrica on 5 different media at 28+ 2 C for 5 days



ii) Influence of pH on the growth rate of mushrooms

Ganoderma lucidum showed relatively good growth in all the pH range studied, however, it grew better in a weak acidic environment pH 4-6 (fig. 19 & 20), this is comparable with Stamets (1983). Growth rate for *Volvariella bombycina* was found to optimum between pH 5:5and 8 (fig.21 & 22). *Coprinus micaceus* like *Ganoderma* preferred a more acidic medium, best growth was obtained at pH4-6 (fig. 23 & 24). *Daldina concentrica* showed good growth in all the pH range studied.(fig. 25 & 26).

Fig.19 Effect of pH on mycelial growth rate of Ganoderma lucidum for 5 days

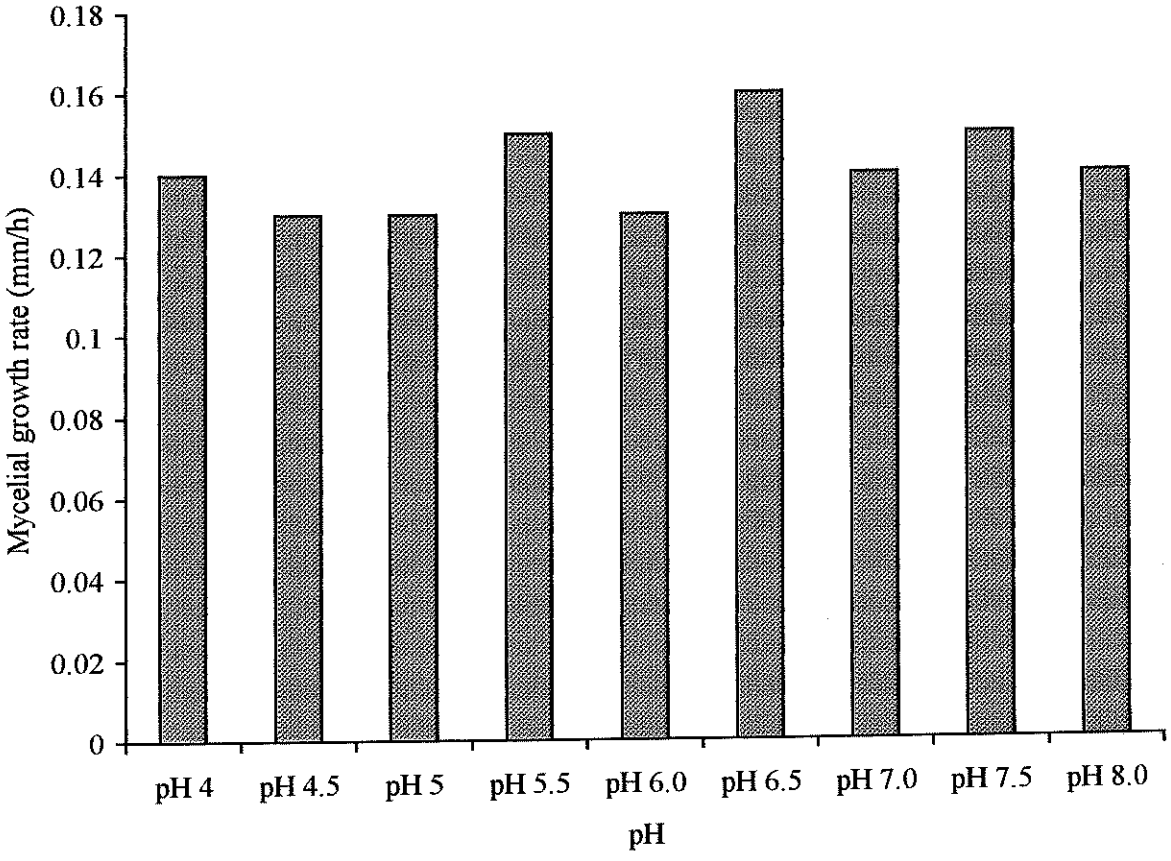


Fig.20 Effect of pH on the total colonization (days) of Ganoderma lucidum

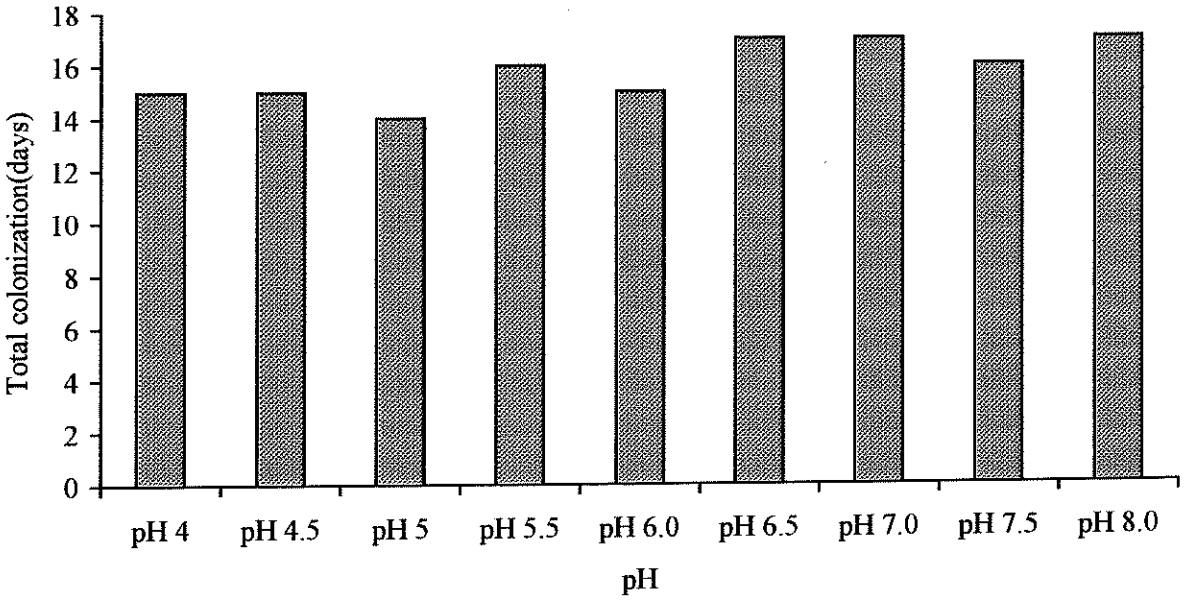


Fig.21 Effect of pH on mycelial growth rate of Volvariella bombycina for 5 days

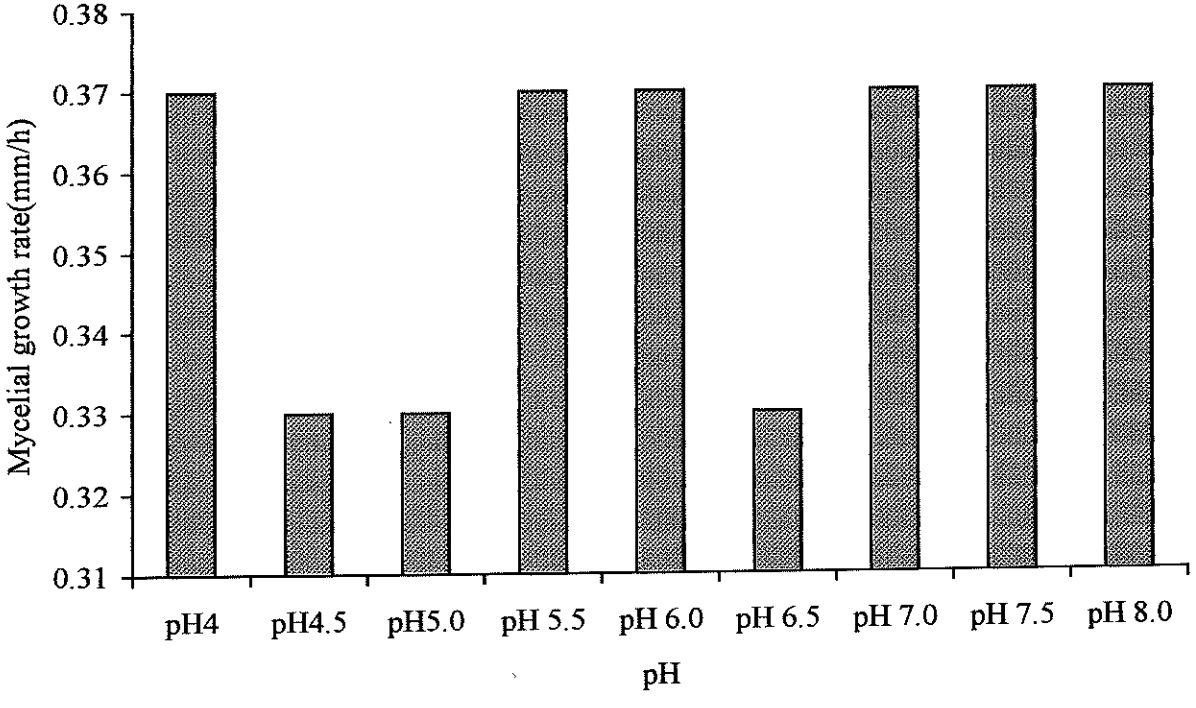


Fig. 22 Effecf of pH on total colonizationof Volvariella bombycina

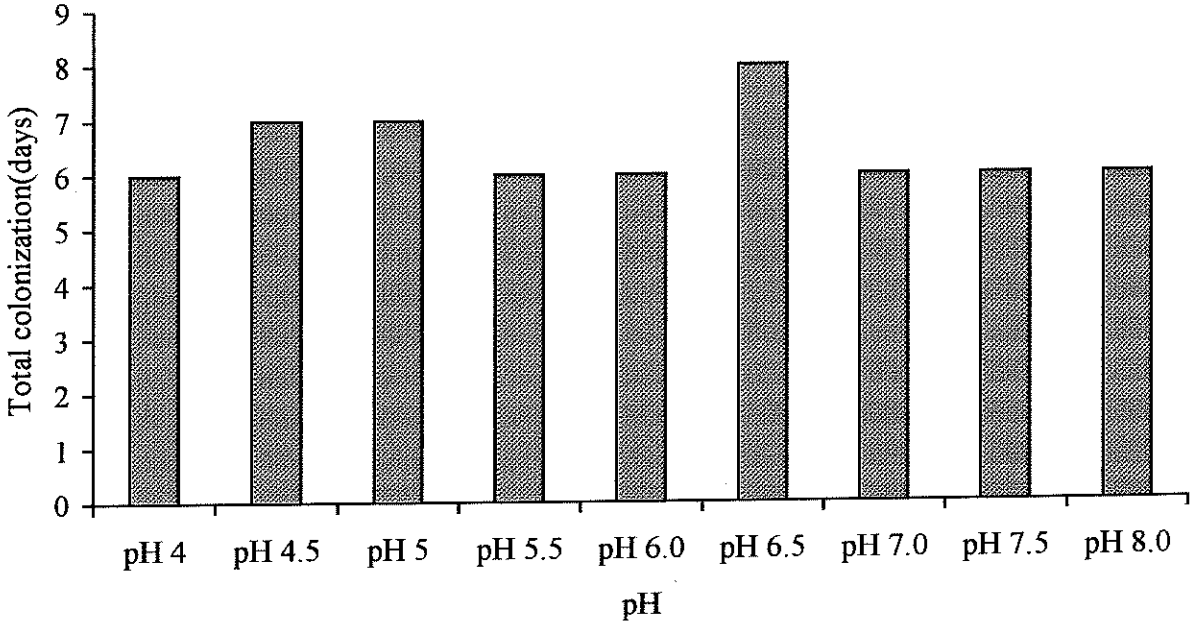


Fig.23 Effect of pH on mycelial growth rate of Coprinus micaceus for 5 days

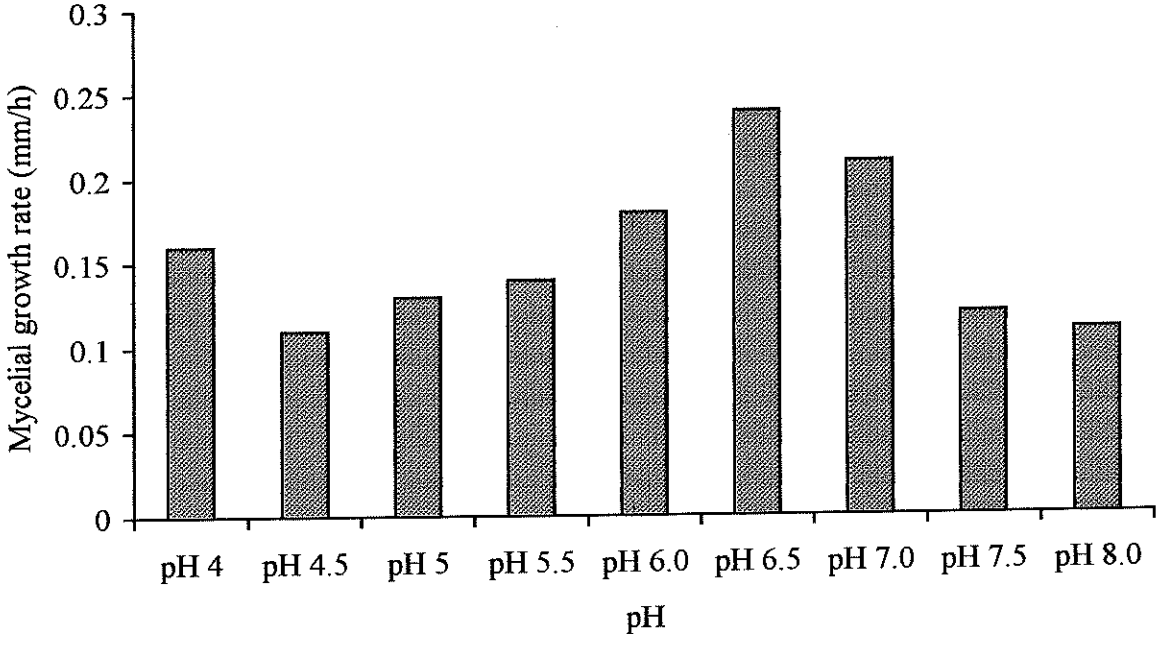


Fig.24 Effect of pH on total colonization(days) of Coprinus micaceus

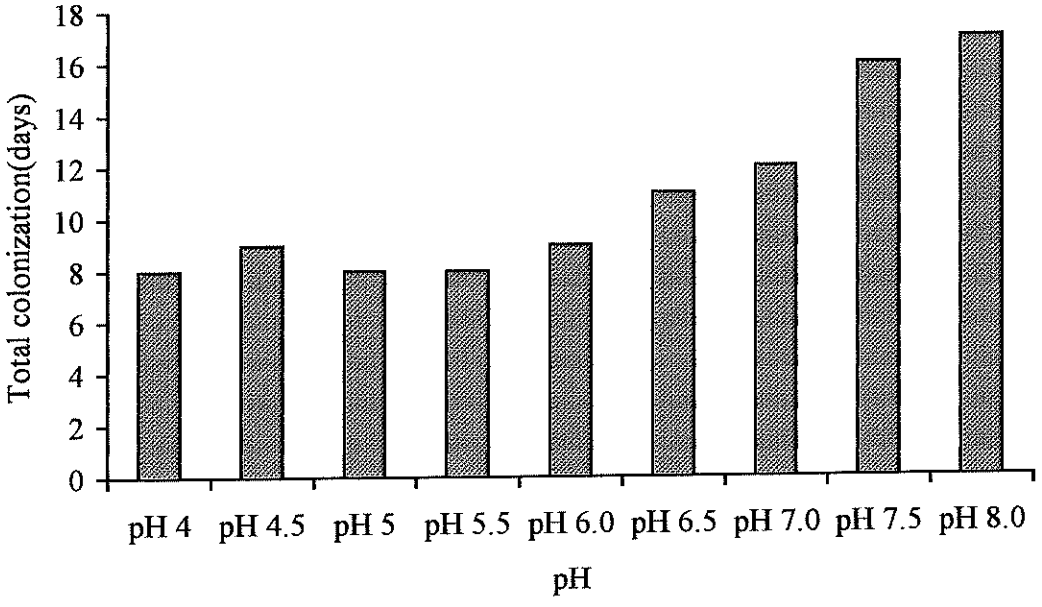


Fig.25 Effect of pH on mycelial growth rate of Daldina concentrica for 5 days

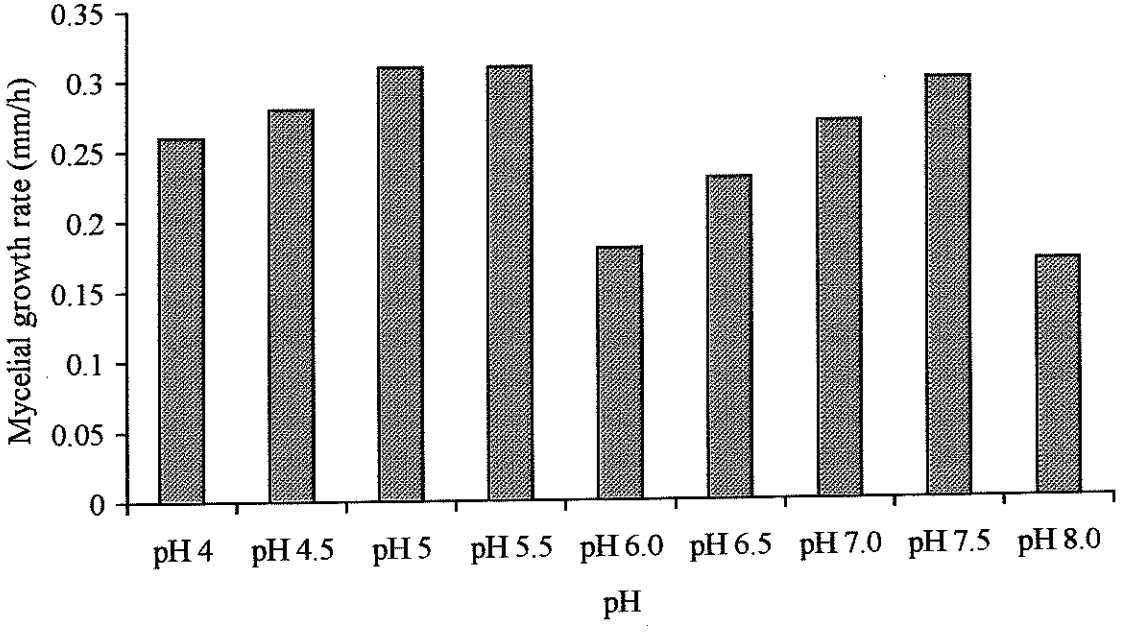
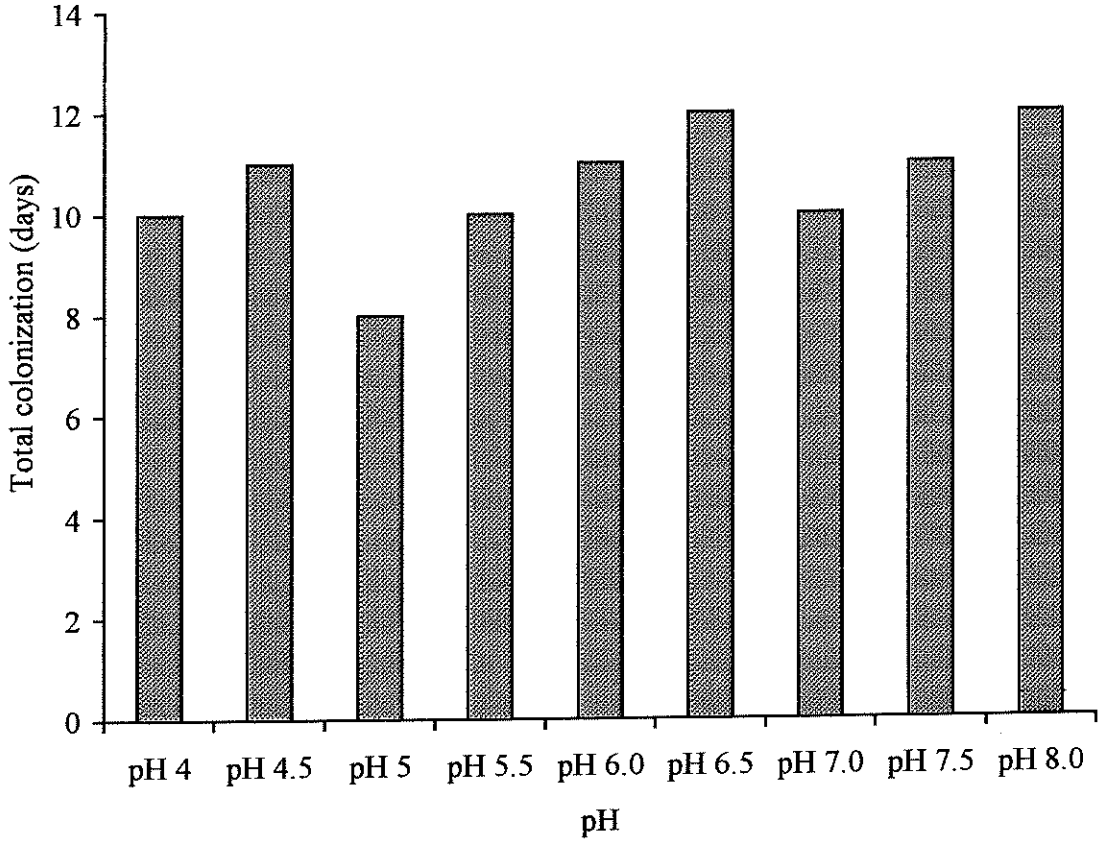


Fig.26 Effect of pH on total colonization (days) of Daldina concentrica



iii) The influence of temperature on the mycelial growth rate of some mushrooms

The best temperature for the optimum growth for three of the species (*Ganoderma lucidum*, *Coprinus micaceus*, and *Daldina concentrica*) was at 28+ 2°C (figs. 27 - 29). The best temperature for *Volvariella bombycina* was at 35°C (Fig.30).

Fig.27 Effect of temperature on the mycelia growth rate of Ganoderma lucidum

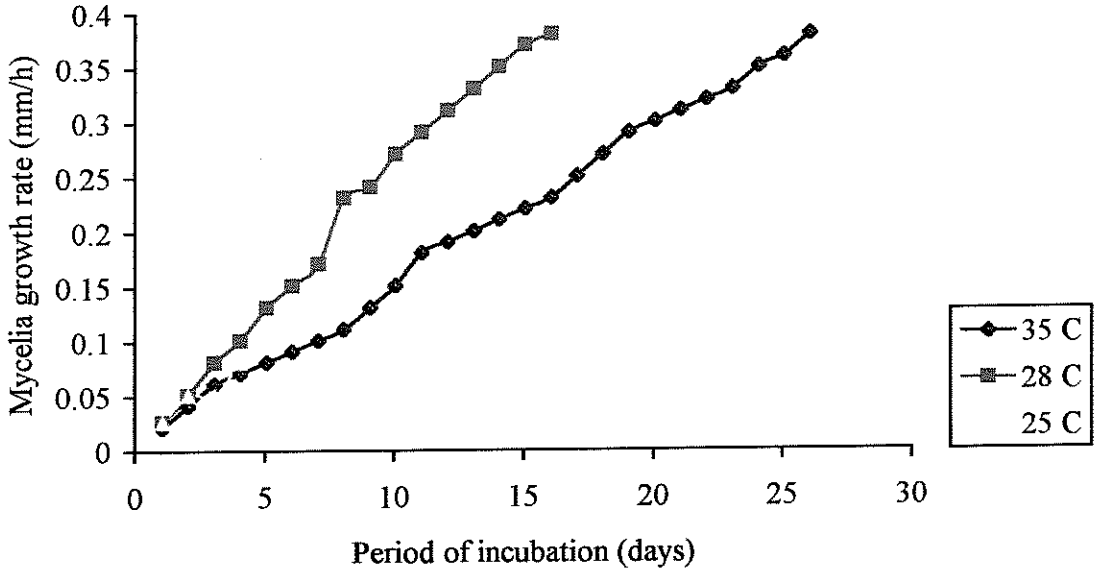


Fig.28 Effect of temperature on the mycelia growth rate of Coprinus micaceus

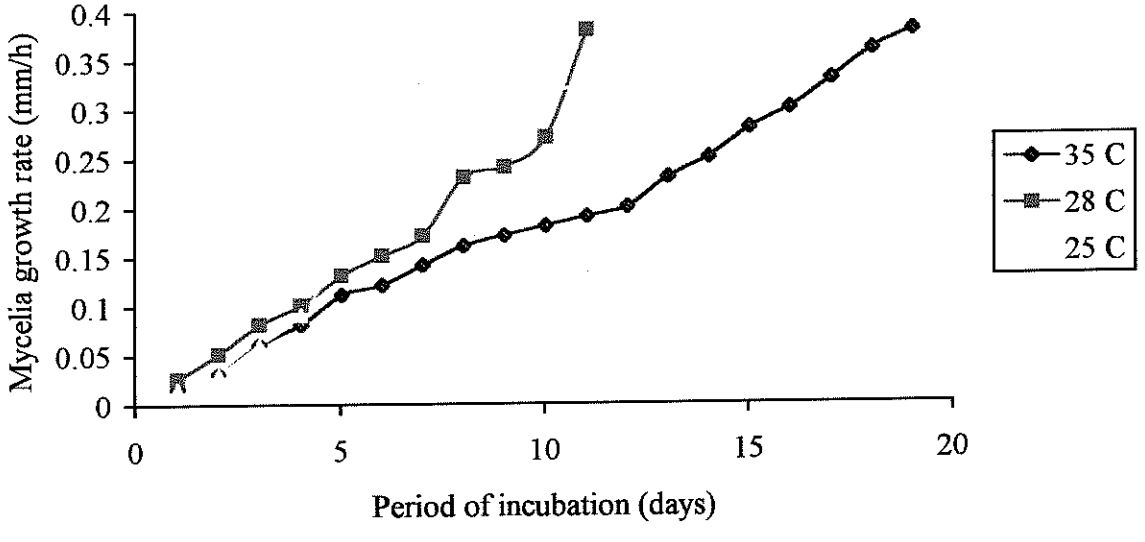


Fig.29 Effect of temperature on the mycelia growth rate of Daldina concentrica

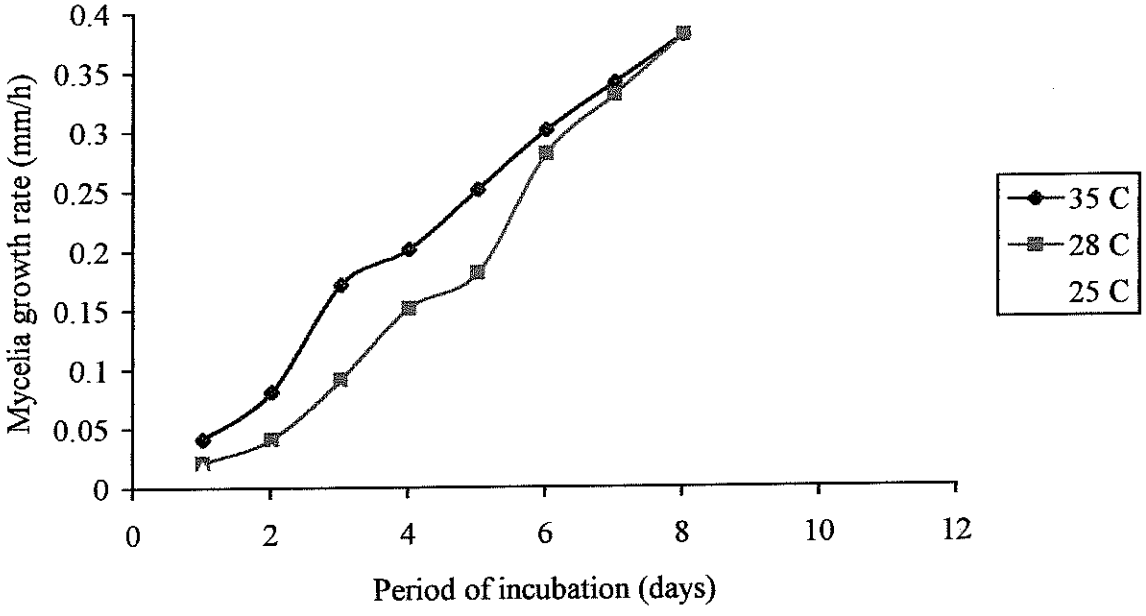
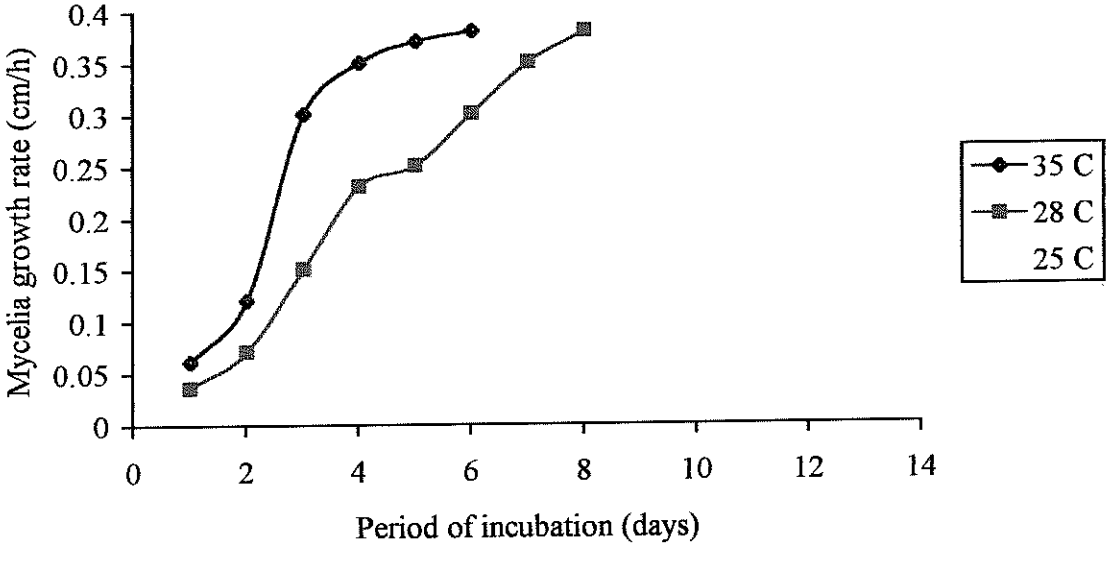


Fig.30 Effect of temperature on the mycelia growth rate of Volvariella bombycina



iv) Influence of agricultural wastes on radial growth and yield of *Ganoderma lucidum* and *Coprinus micaceus*

Growth rate of Ganoderma lucidum on composted sawdust of *Triplochiton scleroxylon* , banana leaves and corn husk was thick and uniform and the spawn run period ranged between 16 to 25 days. Growth on cotton waste was the slowest and its spawn run period was 40 days (Table 11). The mycelial growth rate per week (mm) varied from 5.7 (banana leaves) to 2.3 (cotton waste). This could probably have been due to the fact that too much heat had been generated in the cotton waste and thus the mycelial could not grow properly (Vedder, 1978)

Table 11: Mycelia growth rate of *Ganoderma lucidum* on different agricultural wastes

Substrate	Surface mycelial density[1]	Mycelial growth rate/week	Spawn run (days)
Sawdust	+++	4.5	20
Banana leaves	+++	5.7	16
Corn husk	+++	3.7	25
Cotton waste	+	2.3	40

[1]Degree of mycelial density when the mycelial fully colonises the substrate

+++ = When mycelium totally runs through bag and uniformly white

+ = Poor patchy/running growth

Mycelial growth however in Coprinus micaceus was so poor (Table12) probably because the pH of the substrates was too alkaline (above pH7). As stated above Coprinus micaceus preferred a weak acidic medium for best growth (Fig 23). The mycelial growth rate although better than *Ganoderma lucidium* (4.4 - 5.3), the surface mycelial density was very poor (Table 12).

Table 12: Mycelia growth rate of *Coprinus micaceus* on different agricultural wastes

Substrate	Surface mycelial density[1]	Mycelial growth rate /week	Spawn run (days)
Sawdust	+	5.3	17
Banana leaves	+	4.4	21
Corn husk	+	5.2	18
Cotton wastes	+	5.2	18

[1]Degree of mycelial density when the mycelial fully colonises the substrate

+ = Poor patchy/running growth

Within the period of cropping, there were two flushes of the *Ganoderma lucidum* grown on sawdust with a total yield of 21g (Table 13). Whilst the banana leaves and corn husk flushed only once.

Yield of these mushrooms were however very low because of lack of nutrients in the substrates. Further work will be carried out with increase of rice bran at bagging.

Table 13: Yield performance of *Ganoderma lucidum* on four agricultural wastes

Substrates	Duration between bag opening and first flush	First flush	Second flush	Yield/g
Sawdust	14	11.0	10	21
Banana leaves	18	7.0	nd	7
Corn husk	18	8.0	nd	8
Cotton wastes	nd	nd	nd	nd

nd = no data during the period of cropping.

Below is a picture of *Ganoderma* mushroom growing on sawdust, banana leaves and corn husk.

Fig. 31: *Ganoderma* mushroom growing on sawdust, banana leaves and corn husk.

The yield of *Corprinus micaceus* on the three agricultural wastes studied was very low (Table 14) within the period of cropping. Only one flush of mushrooms was harvested on sawdust, banana leaves and corn husk with weights of 10g, 5g, and 6g respectively.

Table 14: Yield performance of *Coprinus micaceus* on four agricultural wastes

Substrates	Duration between bag opening and first flush	First flush	Second flush	Yield/g
Sawdust	18	10.0	nd	10
Banana leaves	18	5.0	nd	5
Corn husk	17	6.0	nd	5
Cotton wastes	nd	nd	nd	nd

nd = no data during the period of cropping.

v) Influence of agricultural wastes on yield of *Volvariella spp.*

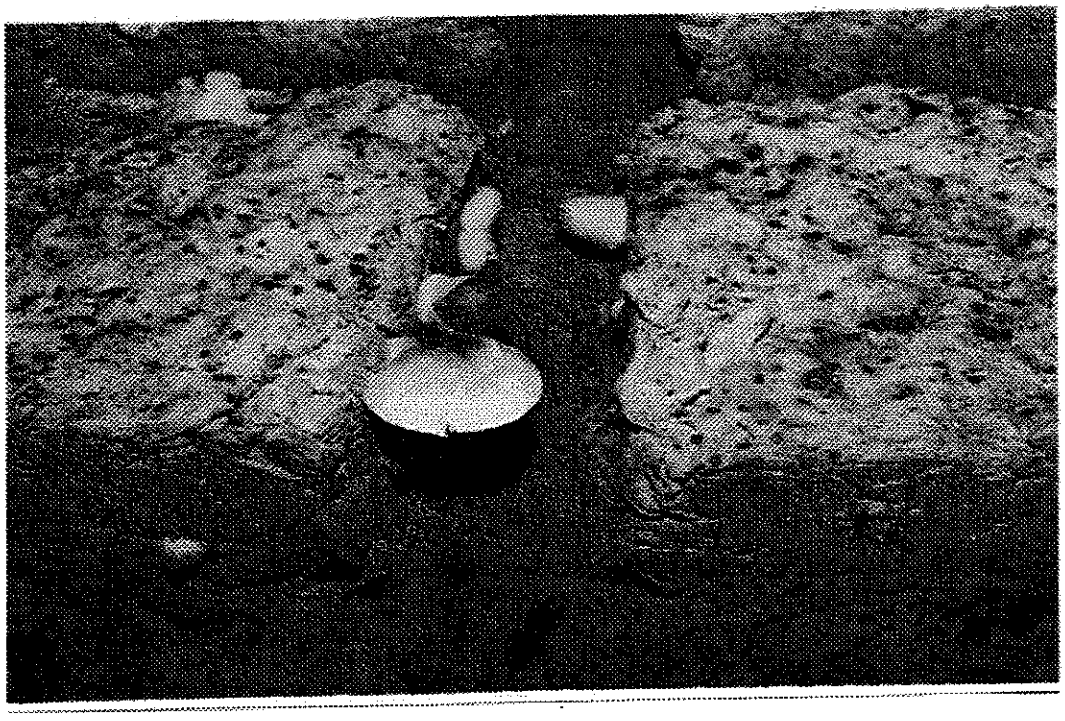
Total fresh weight of *Volvariella* harvested for one month of cropping on cotton waste was 446.5g. There was, however, no yield on the banana leaves used. (Table 15).

Table 15: Yield performance of *Volvariella spp.* on agricultural wastes

Substrate	Flushes			Total Yield (g)
	1st	2nd	3rd	
Cotton waste	270	88	88.5	446.5
Banana leaves	nd	nd	nd	nd

nd. - no mushrooms harvested during the cropping period.

Fig. 32: *Volvariella sp.* growing on cotton waste.



5.0 CONCLUSIONS AND RECOMMENDATIONS

Twenty-four mushroom species were collected from the reserve. These were made up of eighteen (18) edible and six (6) medicinal mushrooms. These include edible mushrooms such as *Agaricus sp.* 'button mushroom', *Auricularia auricula* 'woodear mushroom' and T*ermitomyces sp.* 'termite mushroom'; and medicinal mushrooms such as *Ganoderma lucidum* 'monkey seat mushroom' and *Clavatia sp.* 'puffball'

The survey conducted revealed that a total of nineteen edible mushroom species were known to the respondents from the fourteen communities. It was also evident that the two most preferred species in the communities were V*olvariella volvacea* 'domo' and *Termitomyces sp.* 'Kyekyekyi'.

Further research on the domestication of mushrooms from the biosphere should be carried out using other agricultural wastes such as rice straw, maize stover, corn cobs and cassava peels; since these substrates are abundant in the area around the reserve.

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APPENDIX

QUESTIONAIRE

1. a) Age b) Sex

2. What type of mushroom is eaten/available here?

3) What is it's local name? Sehwi, Ashanti/Twi

4) Which type do you prefer and why?

5) Where do you pick them from? Soil (ground), Tree (Name the tree)

6) Name the month of occurrence for the different mushrooms

7) Do you know of its possible uses?

8) Does it have any medicinal uses?

9) How is it used for the various ailments

10) Any other relevant information?

11) How is it preserved?

12) How is it prepared?