Resolution

March-2022. 01-03-2022

Department of Botany, GDC(M), Srikakulam conducted meeting to discuss the below issues on 01-03-2022.

Agenda:-

1. Discussed about certificate course on Mushroom culture.
2. Discussed about projects for VII th & clusters of sem-VI.
3. Discussed about Jagananna Suacha Sankalp
4. Discussed about the "Plant of the day" concept.
5. Discussed about conduction of Prefinal exams for Sem-I & Sem-III students

Dept. In charge

1. [illegible] & 01-03/2022.
2. D. Ravindra → D. Ravi
3. [illegible] Padmavathi
4. G. Ramakrishna.

Incharge 01-03-2020

PRINCIPAL
Govt. Degree College (Men)
SRIKAKULAM.

Request Letter

From

Sri. Dr. P. Ramarao,
In charge,
Department of Botany,
Govt. Degree College for Men,
Srikakulam.

To

The Principal,
Govt. Degree College for Men,
Srikakulam.

Madam,

The Department of Botany in its meeting held on 01.03.2022 at 4.00 pm passed a resolution to commence Certification Course on "Mushroom Cultivation" during the academic year 2021-22 for final year students from first week of March 2022. Hence, I request you kindly grant permission to organize the program.

Thanking you Madam,

Yours Sincerely,

PRINCIPAL
Govt. Degree College (Men)
SRIKAKULAM.

(Dr. P. Ramarao)
Lecturer In Charge
Department of Botany
Govt. Degree College
SRIKAKULAM.

CIRCULAR

Srikakulam
02-03-2022.

All the students of III CBZ & III CBMB students are informed that Department of Botany, GDC(M), Srikakulam will be introduced the Certificate course on "Mushroom Cultivation" during the academic year 2021-22. So all the students those who have interest to join in this course can give your names to the In-charge, Department of Botany on or before 03-03-2022.

PRINCIPAL
Govt. Degree College (Men)
SRIKAKULAM.

Signatures 1.

2.

3.

4.

GOVERNMENT DEGREE COLLEGE FOR MEN, SRIKAKULAM

DEPARTMENT OF BOTANY

BROCHURE (2021-2022)

CERTIFICATE COURSE

ON

MUSHROOM CULTIVATION

Academic year – 2021-22

No of Students – 30

Instructions to the Candidates:-

1. Duration of Course -30 Days
2. Course Fee – Free
3. 90% of attendance is compulsory for the completion of course.
4. Certificates will be issued to the candidates based on their performance.

Course Coordinator :- Dr. P. Ramarao (In-charge, Dept of Botany)

Resource persons:-
1. Dr. P. Ramarao
2. D. Ravindra
3. Dr. R. Prameela
4. G. Ramakrishna Rao

GOVERNMENT DEGREE COLLEGE FOR MEN, SRIKAKULAM

DEPARTMENT OF BOTANY

(2021-2022)

CERTIFICATE COURSE

ON

MUSHROOM CULTIVATION

OBJECTIVES :-

1. Enable the students to learn about the Cultivation of Mushrooms.
2. Enable the students to develop skills in Mushroom cultivation.
3. To learn about the Nutritional & Medicinal values of Mushrooms.
4. To learn about the storage & Recipes of Mushrooms.

OUT COMES:-

1. To know about the types of Mushrooms.
2. To know about the Nutritional values of Mushrooms.
3. To know about the Medicinal values of Mushrooms.
4. To gain skills on Mushroom culture for Self employment.
5. To know the preparation of recipes from Mushrooms.

SYLLABUS :-

1. Introduction & Morphology of Edible Mushrooms.
2. Cultivation of Edible Mushrooms.
3. Diseases of Mushrooms.
4. Nutritional & Medicinal importance of Edible Mushrooms.
5. Storage & Recipes of Mushrooms.

Reference Books :-

1. “The Essential Guide to Cultivating Mushrooms” by Stephen Russel
2. “Radical Mycology” by Peter McCoy
3. “The Text book of Fungi’ by Malhotra

Government Degree College for Men, Srikakulam

Department of Botany

Certificate Course on "Mushroom Cultivation"- 2021-22

Day wise schedule

S.NO	DATE	TOPIC
1	07-03-2022	Inauguration of CC on Mushroom Cultivation
2	08-03-2022	Introduction of Mushrooms
3	09-03-2022	Types of Edible Mushrooms
4	10-03-2022	Types of Poisonous Mushrooms
5	11-03-2022	Nutritive Value of Mushrooms
6	14-03-2022	Medicinal Value of Mushrooms
7	15-03-2022	Advantages of Mushrooms
8	16-03-2022	Harmful effects of Mushrooms
9	19-03-2022	Morphology of Button Mushrooms
10	21-03-2022	Morphology of Paddy straw Mushrooms
11	22-03-2022	Morphology of Oyster Mushrooms
12	23-03-2022	Assignment on Completed syllabus
13	24-03-2022	Cultivation of Button Mushrooms
14	25-03-2022	Cultivation of Button Mushrooms
15	26-03-2022	Cultivation of Paddy straw Mushrooms
16	28-03-2022	Cultivation of Paddy straw Mushrooms
17	29-03-2022	Cultivation of Oyster Mushrooms
18	30-03-2022	Cultivation of Oyster Mushrooms
19	31-03-2022	Assignment on Completed syllabus
20	01-04-2022	Sterilization techniques of Substrates
21	02-04-2022	Preparation of Spawn
22	04-04-2022	Maintenance of Mushroom beds
23	05-04-2022	Harvesting methods
24	06-04-2022	Field visit to KVK, Amadalavalasa
25	07-04-2022	Storage methods of Mushrooms
26	08-04-2022	Marketing of Mushrooms
27	09-04-2022	Diseases of Mushrooms
28	11-04-2022	Recipes of Mushrooms
29	12-04-2022	Assignment on Completed syllabus
30	13-04-2022	Exam on Entire syllabus

Signature of the In-charge

Lecturer In Charge
Department of Botany
Govt. Degree College
SRIKAKULAM.

Government Degree College for Men, Srikakulam

DEPARTMENT OF BOTANY

Event Photo Gallery – 2021-22

GOVERNMENT DEGREE COLLEGE FOR MEN, SRIKAKULAM

DEPARTMENT OF BOTANY

CERTIFICATE COURSE

ON

"MUSHROOM CULTIVATION" - 2021-22

GOVERNMENT DEGREE COLLEGE FOR MEN, SRIKAKULAM

DEPARTMENT OF BOTANY

CERTIFICATE COURSE

ON

"MUSHROOM CULTIVATION" - 2021-22

Department of Botany, GDC(M), Srikakulam.

Certificate course on "Mushroom Cultivation" (2021-22)

List of Aspirants (III-CBZ & III-CBMB)

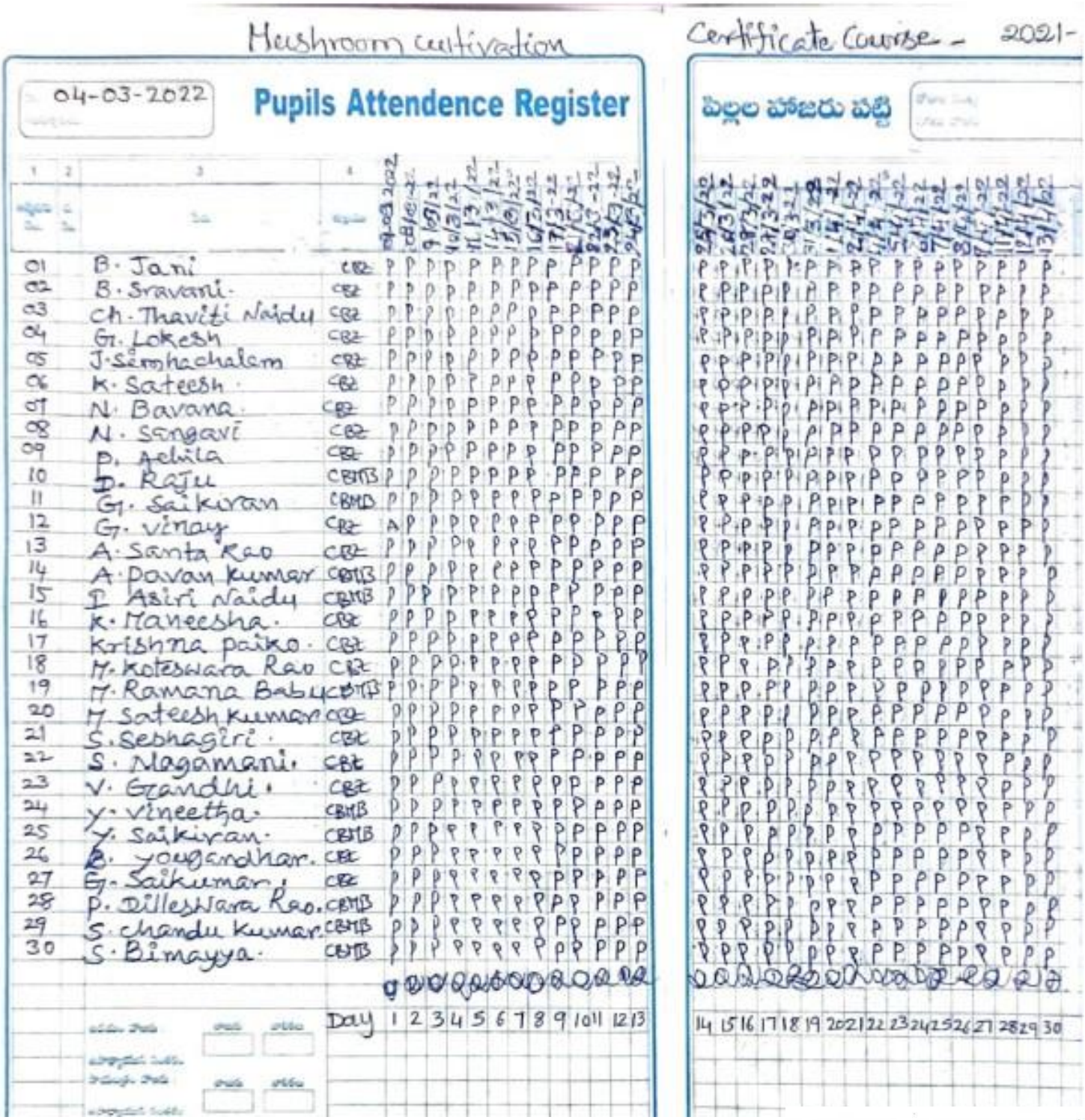
S.No	Registered Number	Name of The Student	Group	Signature
1	1900135004	A. Pavan Kumar	CBZ	A. pavan kumar
2	1900135005	B. Jani	CBZ	B. Jani
3	1900135006	B. Santharao	CBZ	B. santharao
4	1900135007	B. Yugandhar	CBZ	B yugan
5	1900135014	G. Vinay	CBZ	G. vinay
6	1900135013	G. Saikiran	CBZ	G. Saikiran
7	1900135015	G. Saikumar	CBZ	G. Saikumar
8	1900135017	I. Asirinaidu	CBZ	I. Asirinaidu
9	1900135019	J. Simhachalam	CBZ	J. simhachalam
10	1900135022	K. Manisha	CBZ	k. Manisha
11	1900135025	Krishna paiko	CBZ	Krishna paiko
12	1900135028	M. Koteswara Rao	CBZ	M. koteswarao
13	1900135029	M. Ramana Babu	CBZ	M. RamanaBabu
14	1900135030	M. Satish Kumar	CBZ	M. Sathish kumar
15	1900135036	P. Dilleswara Rao	CBZ	P. Dilleswara
15	1900135048	S. Seshagiri	CBZ	S. Seshagiri
16	1900135051	S. Chandu kumar	CBZ	S. Chandu kumar
17	1900135053	S. Simmayya	CBZ	S. simmayya
18	1900135054	S. Nagamani	CBZ	S. Nagamani
19	1900135057	V. Gandhi	CBZ	V. Gandhi
20	1900135060	Y. Vineetha	CBZ	Y. Vineetha
21	1900135061	Y. Sai kiran	CBZ	Y. Sai kiran
22	1900134003	B. Sravani	CBZ	B. Sravani
23	1900134004	Ch. Thavitinaidu	CBMB	Ch. Thavitinaidu
24	1900134005	D. Raju	CBMB	D. Raju
25	1900134006	G. Lokesh	CBMB	G. Lokesh
26	1900134009	K. Satish	CBMB	N. Satish
27	1900134013	N. Bhavana	CBMB	N. Bhavana
28	1900134014	N. Sanghavi	CBMB	N. SANGHAVI
29	1900134016	P. Akhila	CBMB	P. Akhila
30	1900134017	P. Somasekhar	CBMB	P somasekhar

Lecturer In Charge
Department of Botany
Govt. Degree College
SRIKAKULAM.

Department of Botany

Certificate course on “Mushroom Cultivation”-**2021-22**

Attendance



Lecturer In Charge
Department of Botany
Govt. Degree College
SRIKAKULAM.

Government Degree College for Men, Srikakulam

Certificate course on
"Mushroom Cultivation"-2021-22
Student Feedback Form

Name of the event	**Certificate course on Mushroom Cultivation -2022**
Department	**Department of Botany**
Date	**07.03.2022 to 13.04.2022 (30 days)**
Name of student	**B. Jani**
Class	**III CBZ**
Mobile no.	**9841639369**

1. Did the programme fulfil it's objectives?
   ✓Yes/ No

2. How useful was the programme for you? (0 being Not useful and 5 Most useful)

0	1	2	3	4	5 ✓

3. Rate the overall success of the programme (0 being Not useful and 5 Most useful)

0	1	2	3	4	5 ✓

4. List the key takeaway points from the program :-
   All the faculty of Botany department guide us very well by giving good material, conducting classes & explained in detail from fundamentals about Mushroom cultivation & clarified our doubts by using Internet & Images. Finally We got good knowledge & confidence to establish a Mushroom cultivation unit as a part of Entrepreneurship. We are very thankful to Department of Botany to gave us this excellent opportunity.
5. Suggestions if any: **It should be continued for the next batches as usual**.

B. Jani

Signature of the Student

Government Degree College for Men, Srikakulam

Certificate course on
"Mushroom Cultivation"-2021-22
Student Feedback Form

Name of the event	**Certificate course on Mushroom Cultivation -2022**
Department	**Department of Botany**
Date	**07.03.2022 to 13.04.2022 (30 days)**
Name of student	**K. Satish**
Class	**III CBMB**
Mobile no.	**8077120048**

1. Did the programme fulfil it's objectives?

   ✓Yes/ No

2. How useful was the programme for you? (0 being Not useful and 5 Most useful)

0	1	2	3	4	5 ✓

3. Rate the overall success of the programme (0 being Not useful and 5 Most useful)

0	1	2	3	4	5 ✓

4. List the key takeaway points from the program :-
   All the faculty of Botany department guide us very well by giving good material, conducting classes & explained in detail from fundamentals about Mushroom cultivation & clarified our doubts by using Internet & Images. Finally We got good knowledge & confidence to establish a Mushroom cultivation unit as a part of Entrepreneurship. We are very thankful to Department of Botany to gave us this excellent opportunity.
5. Suggestions if any: **It should be continued for the next batches as usual**.

K. Satish

Signature of the Student

Government degree college for Men, Srikakulam

Department of Botany

Certificate course on "Mushroom Cultivation"

Question paper Max Marks-50

I. Answer any 3 Questions from the following. 3X10=30 M

1. **Explain the morphology of White Button Mushroom.**
2. **Mention the Nutritional Values of Edible mushrooms.**
3. **Mention the Medicinal values of Edible mushrooms.**
4. **Explain the preparation of Spawn.**
5. **Explain the storage methods of edible mushrooms.**

II. Answer All the questions. 2X10=20M

6. **Mention the Botanical names for two edible mushrooms.**
7. **Mention the Botanical names for two poisonous mushrooms.**
8. **Define the terms "Spawn" & "Seed".**
9. **Mention any two diseases of Mushrooms.**
10. **Mention any two recipes of mushrooms.**
11. **Mention any two advantages of mushroom cultivation.**
12. **Mention any two symptoms of mushroom poisoning.**
13. **Mention any two methods for mushroom cultivation.**
14. **Name the Fruiting body of the mushrooms. Mention its parts.**
15. **Define the term "Flush".**

Lecturer In Charge
Department of Botany
Govt. Degree College
SRIKAKULAM.

Department of Botany, GDC(M), Srikakulam.
Certificate course on "Mushroom Cultivation" (2021-22)
List of Aspirants (III-CBZ & III-CBMB)

S.No	Registered Number	Name of The Student	Group	Grade Obtained
1	1900135004	A. Pavan Kumar	CBZ	B
2	1900135005	B. Jani	CBZ	A
3	1900135006	B. Santharao	CBZ	A
4	1900135007	B. Yugandhar	CBZ	B
5	1900135014	G. Vinay	CBZ	A
6	1900135013	G. Saikiran	CBZ	A
7	1900135015	G. Saikumar	CBZ	B
8	1900135017	I. Asirinaidu	CBZ	A
9	1900135019	J. Simhachalam	CBZ	A
10	1900135022	K. Manisha	CBZ	A
11	1900135025	Krishna paiko	CBZ	B
12	1900135028	M. Koteswara Rao	CBZ	A
13	1900135029	M. Ramana Babu	CBZ	A
14	1900135030	M. Satish Kumar	CBZ	A
15	1900135036	P. Dilleswara Rao	CBZ	A
15	1900135048	S. Seshagiri	CBZ	B
16	1900135051	S. Chandu kumar	CBZ	A
17	1900135053	S. Simmayya	CBZ	B
18	1900135054	S. Nagamani	CBZ	A
19	1900135057	V. Gandhi	CBZ	A
20	1900135060	Y. Vineetha	CBZ	A
21	1900135061	Y. Sai kiran	CBZ	A
22	1900134003	B. Sravani	CBZ	A
23	1900134004	Ch. Thavitinaidu	CBMB	B
24	1900134005	D. Raju	CBMB	A
25	1900134006	G. Lokesh	CBMB	A
26	1900134009	K. Satish	CBMB	A
27	1900134013	N. Bhavana	CBMB	A
28	1900134014	N. Sanghavi	CBMB	A
29	1900134016	P. Akhila	CBMB	A
30	1900134017	P. Somasekhar	CBMB	A

Lecturer In Charge
Department of Botany
Govt. Degree College
SRIKAKULAM.
SRIKAKULAM.

39. Mushrooms

Mushrooms are that fast growing basidiomycetous fungi which produce fleshy fruit bodies. However, in general the word 'mushrooms' denotes fruit bodies of such fungi. The mushrooms may be button-like or fan-like or umbrella-shaped. They are rich in proteins, vitamins and minerals. So they are consumed as energy rich food.

These fungi live as saprophytes in dead organic matter in the form of a mat of interwined hyphae. The hyphae produce white tiny balls of hyphae called ***buttons***. The buttons consist of a short ***stalk*** and a cap called ***pileus***. The bottons get opened towards maturity and forms mature ***fruit bodies*** or ***basidiocarps*** or ***mushrooms***.

There are about 100 species of edible mushrooms all over the world. However, a few following species are being cultivated in large scales:

Agaricus bisporus (White button mushroom)

Lentinus edodes (Shiitake or Japanese mushroom)

Volvariella volvacea (Paddy straw mushroom or Chinese mushroom)

Pleurotus sajor-caju (Dhingri or Indian oyster mushroom)

Pleurotus ostreatus (American oyster mushroom)

Auricularia polytricha (Jew's ear mushroom or woodear)

Flammulina velutipes (Winter mushroom)

Pholiota nameko (Nameko mushroom)

Nutritive Value of Edible Mushrooms

Mushrooms are superior to many vegetables and beans in their nutritive value. Fresh mushrooms contain about 88.5% water and 3.2% protein. But in dried mushrooms water contents is low and protein level is as high as 34-44%. This protein level is superior to that in most vegetables, beans, peas, fruits, fishes, goat's meat and chicken.

Mushroom protein has all essential amino acids in large proportions. The digestibility of mushroom protein is also high (70%).

Mushrooms contain about 4.2%-4.4% carbohydrates. The carbohydrates contents is very low when compared to that in beans, peas and vegetables. Crude fibre contents is as high as in vegetables. So it can be provided to diabetic patients.

The fat content is less than 0.3%. It is less than that in fish, meat, egg and milk. The fat is rich in ***ergosterol*** which is involved in the biosynthesis of vitamin D in human body.

Mushrooms contain high proportion of thiamin, riboflavin, niacin and ascorbic acid. They are also rich in minerals such as Ca, P, Fe, Na and K.

Daily intake of 100g dried mushrooms meets the need of proteins, vitamins and minerals for an adult man.

As the nutritional value is high, FAO has recommended dried mushrooms as a source of protein in human diet. Mushrooms can be substituted for fish, meat and egg which are too expensive in the markets today.

Medicinal Value of Mushrooms

1. Fresh mushrooms contain least amount of fat so they can be given to patients suffering from ***hypolipideamia*** (High blood lipids) and ***hypercholesterolemia*** (High blood cholesterol).

2. They have less carbohydrates so they are believed to be suitable for diabetic patients.

3. The mushroom ***Lentinus edodes*** has antitumour property as well as antiviral property. These properties are due to the presence of ***lentinans*** and ***emitanin-I*** in the mushrooms. ***Pleurotus sajor-caju*** also shows some antitumour activity.

4. ***Lentinus edodes*** reduces high blood pressure, gall stones and numbness of hands and feet.

Advantages of Mushrooms

Mushrooms have the following advantages over conventional protein sources and single cell proteins-

i) Mushrooms can be cultivated in agrowastes, black soils, paper wastes and so on.

ii) They can be cultivated in a small space without sophisticated instruments, fermenters and complicated chemicals.

iii) Simple guidance is enough for mushroom culture. Farmers can grow mushrooms in their own land without much skill.

iv) Mushrooms can be substituted for conventional protein sources such as fish, meat and eggs which are too expensive. They are suitable source of protein for undernutritioned poor people.

v) Mushroom cultivation converts agrowastes into a good quality manure to enrich the fertility of the soil.

How to Avoid Discomfort While Eating Mushrooms?

Edible mushrooms generally do not cause discomfort to the consumers. However, some species cause indigestion and allergy to some healthy people while they are harmless to many people. Mushroom lovers are advised to take the following precautions to avoid discomforts while eating mushrooms-

i) Indigestible food should be avoided while eating mushrooms.

ii) Alkaholic drinks should be avoided while eating mushrooms as they cause illness to the consumers.

iii) Before going to eat a species for the first time, a small piece should be eaten to observe its acceptability. Eating bulk amount for the first time should strictly be avoided.

Table 39-1: Distinctive features of Agaricus, Volvariella and Pleurotus.

No.	*Agaricus*	*Vovariella*	*Pleurotus*
1.	Umbrella-shaped fruit body	Umbrella-shaped fruit body	Fan-like fruit body
2.	Pileus is 5-10cms diameter.	Pileus is 6-12cms in diameter	Pileus is 5-10cms in diameter.
3.	Pink or brown coloured gills	Pink coloured gills	White or grey coloured gills.
4.	Stipe is central and long.	Stipe is central and long.	Stipe is lateral and indistinguishable.
5.	Annulus present on the stipe.	Annulus is absent	Annulus absent.
6.	Vulva absent	A cup-shaped persistent vulva at the base of the stipe	Vulva absent
7.	Example: *Agaricus bisporus.*	Eg. *Volvariella volvacea*	Eg. *Pleurotus sajor-caju.*

1. Agaricus Bisporus*

Agaricus bisporus is commonly known as ***white button mushroom*** or ***temperate field mushroom*** (Fig.39-1). The young fruit body of this fungus looks like a large white button with a short stalk. It consists of a weft of hyphae. The button stage mushrooms are used for human consumption.

Mature basidiocarp consists of a fleshy stalk called ***stipe*** and a large circular, umbrella-like expansion called ***cap*** or ***pileus***. Before maturity, the edge of the cap remains attached with the stipe by a membrane called ***veilum*** or ***partial veil***. The veilum gets ruptured during expansion of the cap. It leaves a rugged fringe of tissue called ***annulus*** at the top of the stipe.

* *Agaricus bisporus= Agaricus compestris, Agaricus hortensis, Agaricus compestris var bisporus & Agaricus brunnescens.*

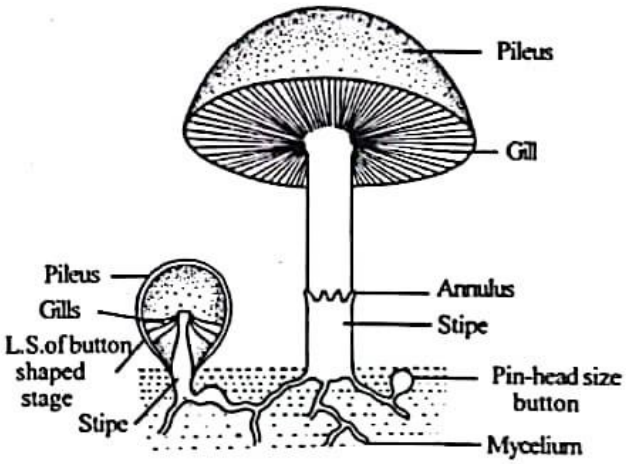


Fig.39.1: Agaricus bisporus.

The cap is 8-10 cms in diameter. Its colour may vary from white to brown. The upper surface of the cap is slightly convex. From the lower surface of the cap many vertical plates of fertile tissue arise and run in radiating rows. Such vertical plates are called ***gills*** or ***lamellae***.

The gills bear many haploid reproductive spores called ***basidiospores***. The colour of basidiospores vary according to the strains. The basidiospores germinate and give rise to mycelia that produce basidiocarps.

The base of stalk is slightly hard and brown in colour.

2. Volvariella volvacea

Volvariella volvacea is popularly known as ***Chinese mushroom*** or ***paddy straw mushroom*** or ***tropical mushroom***. It is included under the family ***Pluteaceae*** of the order ***Agaricales*** in Basidiomycetes.. It is common in tropical and sub-tropical zones. It should be eaten fresh.

The fruit body arises from mycelium in dead organic matter. The young fruit body called sporophore is ***egg-shaped*** and dark grey in colour. It is covered by a coat called ***universal***

veil. Towards maturity the universal veil ruptures and leaves *vulva* at the base of the stipe.

The mature sporophore consists of a fleshy ***stipe*** and a grey coloured ***cap***. The stipe is 3-8 cms height, and has a conspicuous cup-like structure called ***vulva*** at the base. It has no annulus.

The cap or pileus is 6-12 cms in diameter. The upper surface is slightly convex and the lower surface is slightly concave. Many radiating rows of ***gills*** occur on the lower surface of the cap. The gills are brownish-pink in colour and they bear numerous pink-coloured ***basidiospores***.(Fig.39.2).

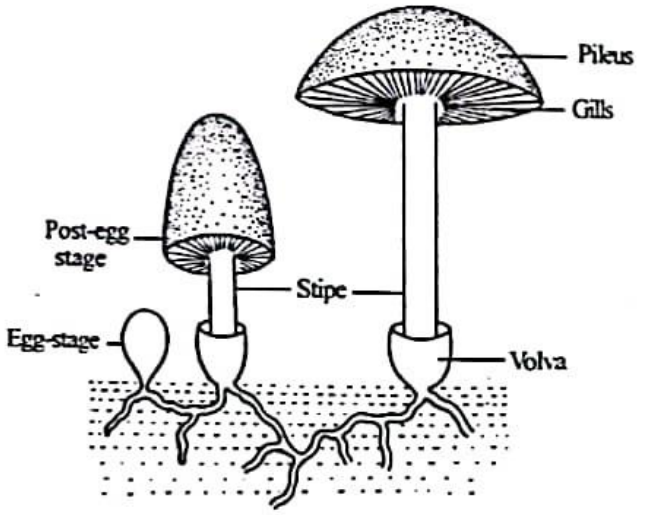


Fig.39.2: Volvariella volvacea.

3. Pleurotus Sajor-caju

Pleurotus sajor-caju is known as ***Indian oyster mushroom*** (Fig.39.3). It grows well in most cellulosic wastes rich in lignin. The young sporophore is small, white and button-like. The stipe is inconspicuous.

The mature sporophore (fruit body) is fan-like and expanded. Its margin is entire but in old mushrooms it is

deeply lobed. On the lower side of the cap, there are numerous gills running from the stipe to the margin of the pileus.

The gills are of three types namely ***long gills, medium gills*** and ***short gills.*** They are arranged alternatively. Each of the gills bears numerous haploid ***basidiospores***.

The stipe is short , lateral and grey or white in colour.

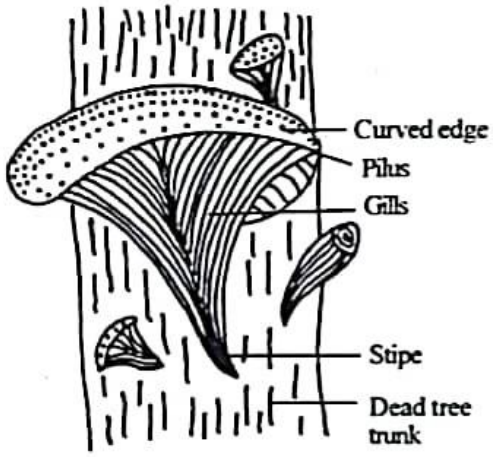


Fig. 39.3: Pleurotus sajor-caju.

Cultivation of Paddy Straw Mushroom

Three species of *Volvariella* are cultivated in India. They are *Volvariella volvacea*, *Volvariella esculenta* and *Volvariella displasia.* They grow well in areas where the temperature is between 30-45°C.

Paddy straw mushrooms can be grown in green houses, shaded rooms and open lands in gardens. However, they give maximum yield in green houses.

The Substrates

A wide variety of waste materials rich in cellulose and lignin are used for growing paddy straw mushrooms. Among them, paddy straw gives the maximum yield. Wheat straw, water hyacinth, oil palm bunch, oil palm pericarp waste, banana leaves, saw dust, sugarcane bagasse, waste cotton, waste paper, etc. are also used for cultivation.

The Spawn Making

The fungal mycelia of a mushroom grown on suitable grains is called ***spawn.*** It is used as inoculum to grow the mushroom. It is often called ***seed.***

i) The grains such as sorghum, wheat, rice and rye are used to make spawns. Sorghum grains, say for example, are washed well and soaked in water over-night.

ii) The grains are cooked in water until they swell but firm.

iii) The cooked grains are spread on a cheese cloth in a sterile room for decanting the excess of water.

iv) The grains are then mixed with 2% calcium carbonate powder.

v) About 200 gm of grains is filled in glass bottles and mouth of the bottles are plugged with cotton.

vi) The bottles are autoclaved at 121°C for 30 minutes and then cooled down.

vii) Pure mycelial growth of the mushroom is aseptically inoculated into the bottles. Sometimes, the spores are directly inoculated into the bottles to make spawns.

viii) The bottles are incubated at 25°C for 10-12 days. During incubation, the mycelium grows and infests numerous grains to form a dense growth of mycelia.

ix) The mycelial growth on the sorghum grains is the spawn. It is used for cultivation of the mushroom.

Bed Method

i) Paddy straw is made into small bundles and the bundles are soaked in water in a small tank for about 18-24 hours.

ii) The bundles are taken from the tank and the excess of water is drained off.

iii) A square bed of 1M x1M is made on a bamboo frame by layering the paddy straw for 30 cm height. A second layer is placed over the layer, but in opposite direction.

iv) The spawn is put into small pits 10 cms inside the margin of the layer.

v) The third layer of straw is placed over the second layer at right angles to the second layer. A fourth layer is placed over the 3rd layer, with opposite direction.

vi) This layer is spawned as done previously.

vii) Then a fifth layer is placed over the 4th layer at right angles to the 4th layer (Fig.39.4).

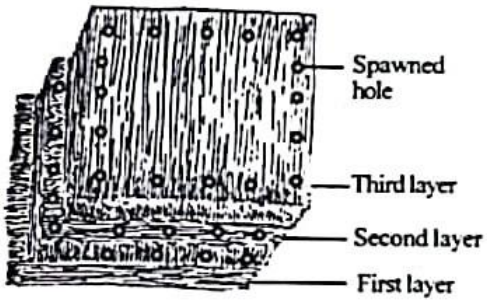


Fig.39.4: Paddy straw bed for growing Volvariella sps.

viii) The 5th layer is spawned all over and then covered with loose straw.

ix) The bed is pressed with hands and covered with a polytene sheet.

x) It is kept in a green house and watered properly. The temperature is maintained between 30-40°C.

xi) The polytene sheet is removed after 7-10 days of spawning. Small buttons appear within 10 days after spawning.

xii) Paddy straw mushroom is harvested when the vulva is about to rupture or just ruptured.

Polytene Bag Method

N.Bahl (1982) has introduced this method for growing paddy straw mushrooms. It involves the following steps:

i) Paddy straw is cut into small bites of 2-5cm long.

ii) It is soaked in water for 24 hours.

iii) The paddy straw is allowed to drain off the excess water.

iv) It is mixed with the spawn.

v) This mixture is then filled in polytene bags and the mouth of the bag is tied.

vi) Small holes are made in the polytene bags using a needle for gaseous exchange.

vii) The bags are kept in a glass house. The temperature and humidity are regulated properly.

viii) After a week, the polytene bag is removed carefully and the contents is watered with a flower-can.

ix) Small pin-heads appear within 10 days and grow into mature fruit bodies.

Field Cultivation

In European countries paddy straw mushrooms have been grown in agriculture fields after harvesting the crops. Agrowastes are dumped in the field in the form of small ridges. Spawn is then spread over the ridge and covered slightly with losse field soil. Leaf litter is spread over the ridges in order to avoid drying. The field is watered by using sprinkler.

This method gives low mushroom yield, but it gives a good quality compost to the field.

Cultivation of Oyster Mushrooms

Pleurotus sajor-caju is a popular oyster mushroom grown in India. It can be grown in any available room with little ventilation and light. However, for large scale productions, thatched sheds are used for cultivation.

The Spawn

[Refer to cultivation of paddy straw mushrooms].

The Substrates

Agrowastes rich in cellulose and lignin are used for growing oyster mushrooms. Among them, paddy straw gives the maximum yield. Wheat straw, water hyacinth, oil palm bunch, oil palm pericap waste, banana leaves banana

pseudostem, saw dust, sugarcane bagasse, waste cotton, waste paper, ragi straw, sunflower stalks, rice husk, etc. are also used for cultivation. ***B.J. Karthijayani*** et al. (1996) have grown oyster mushrooms in vermicompost along with a quarter of paddy straw.

Pre-treatment of the Substrate

The substrate, say for example paddy straw, is cut into small pieces of 3-5 cm long and soaked in water overnight. The straw is then cooked in a drum containing boiling water for 30-45 minutes. After cooking, excess water is drained off by spreading the straw over a gunny cloth or a raised wire-mesh in a room.

The water content of the straw is checked by squeezing the straw in between hands. At the right stage we shouldn't get a drop of water from the straw. Now the straw has approximately 75-78% moisture. This straw is used for cultivation.

Some workers have been cooking the substrate along with 2% lime. Such treatment is known to have increased the yield of the mushrooms.

Spawning

i) One bottle of spawn (about 200 gm) is divided into four equal parts.

ii) The base of a polytene bag (60 x 30 cm) is tied with a thread. Two holes of 1 cm diameter are made at the base of the bag.

iii) The paddy straw is added into the polytene bag to a height of 5 cms.

iv) One part of the spawn is spread over the paddy straw.

v) A second layer of paddy straw is placed over the first layer for about 10 cm height. The second part of spawn is spread over it.

vi) A third layer of paddy straw is placed over the second layer. The third part of the spawn is spread over it.

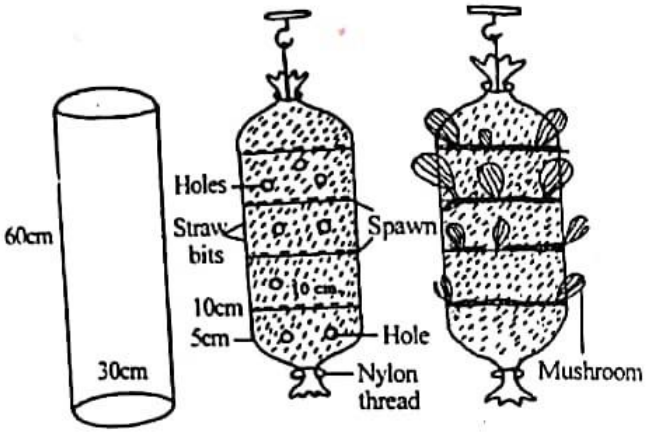


Fig.39.5: Mushroom cultivation.

vii) A fourth layer of paddy straw is placed over the 3rd layer. The fourth part of spawn is spread over it.

viii) Paddy straw is added over the fourth layer to a height of 5 cm. The mouth of the bag is tied with a thread.

ix) Many small holes are made along the surface of the bag to facilitate good aeration and to reduce any rise in temperature.

Maintenance of Mushroom Beds

The spawned substrate in a polytene bag is called ***mushroom bed.*** Mushroom beds are kept either on racks in a mushroom shed or hanging under a gunny screen. Sprinkling of water on the floor helps to keep a suitable moisture condition (80-85%) inside the mushroom shed.

Usually, fungal mycelium grows and forms a compact bed inside the polytene bag within 12-15 days after spawning. The polytene bag is removed after 15 days.

The mushroom beds are watered twice a day so as to keep the temperature between 20 and 30°C. At the time of removing the polytene bag, many small fungal knots appear on the surface of the mushroom bed. These knots are called

pin-head stage. Small lobed mushrooms develop from the pin heads within 4 days after removing the polytene bag. They will attain full maturity within two more days.

Harvesting

The first harvest is done in 20-22 days after spawning. The mushrooms are simply picked by hand and used for cooking. The subsequent harvests are done at a weekly intervals. In this way 4 or 5 harvests can be done from a mushroom bed. The crop yield is approximately 80% of the dry weight of the substrate.

Cultivation of White Button Mushroom

White button mushroom is grown indoor in areas where the temperature is less than 25°C. This crop does not grow in higher temperatures. Usually it is cultivated in areas with cool climate.

Spawn

[Refer to cultivation of paddy straw mushroom.]

Composting

The process of making compost from wastes is called ***composting.*** The compost forms a rapid growth medium for the mycelium. There are different types of composts for growing button mushrooms.

The National Centre for Mushroom Research and Training, Solan (HP) has recommended a combination for growing white button mushrooms. This compost is a mixture of wheat straw (1000 kg), chicken manure (400 kg), Brewer's grain (72 kg), Urea (14.5 kg) and gypsum (30 kg).

The Tamilnadu G.T.Naidu Agriculture University has proposed another type of compost for white button mushrooms. This compost is a mixture of paddy straw (100 kg), urea (70 kg), cotton seed (12 kg), rice bran (100 kg) and gypsum (24 kg).

The formulated compost is filled in small trays or wooden boxes or in plastic bags and kept in a room where the temperature is between 50-55°C. After 6-10 hours, the compost is taken from the room and cooled for spawning.

Spawning of Compost

The compost is filled in small trays or plastic bags for about 15-20 cm height. A handful of spawn is spread over the compost and a small amount of compost is spread over the spawn. This step is called *spawning*.

After spawning, the compost is sprinkled with water so as to maintain the relative humidity between 70 and 80%. The mushrooms reach pin-head stage within 5-15 days after spawning. These pin-heads take 7-8 days to become the button stage.

Harvesting

The white button mushrooms are harvested when the cap is still tight with its stalk. The mushroom is slightly pressed to the compost and twisted gently to harvest it. The soil particles adhering on the mushroom may be removed with a sterile knife. The harvested mushrooms are either used for cooking or stored at 4°C for future use.

Diseases of Mushrooms

Mushrooms have been attacked by fungal, bacterial and viral pathogens. These pathogens affect the crop yield and make the mushrooms useless. So these are the serious menace for mushroom growers. The following are the dangerous diseases in mushrooms:

i) Soft mildew (Caused by *Dactylium dendroides*)

ii) Brown plaster mould (Caused by *Papulospora byssina*)

iii) White plaster mould (Caused by *Scopulariopsis fumicola*)

iv) Olive green spot (Caused by *Chaetomium olivacearum*)

v) Inky cap (Caused by *Coprinus lagopus*)

vi) Green mould (Caused by *Trichoderma viride*)

vii) Truffle disease (Caused by *Pseudobalsamia microspora*)

viii) Wet bubble disease (Caused by *Mycogone perniciosa*)

ix) Dry bubble or Brown spot (Caused by *Verticillium* sps.)

x) Bacterial blotch (Caused by *Pseudomonas tolaassi*)

xi) Brown disease (Caused by virus)

xii) Watery stipe (Caused by virus)

xiii) Dieback (Caused by virus)

Once a disease appeared in a mushroom farm, it may be disseminated to various mushroom sheds by air or water. If any contaminated bed is noticed, it should be removed and destroyed in flame. This will keep the disease in control.

In some cases nematodes infest mushrooms and reduce the yield. This problem can be solved by adding neem extract, castor, *Calotropis* or *Chrysanthemum* to the compost.

Storage of Mushrooms

Mushrooms are very soft type of plant materials liable to perish immediately after harvest. This is mainly due to enzymatic actions and high rate of respiration. Because of these reasons, mushrooms develop brown colour on their surface and emit an unpleasent odour. Therefore, mushrooms are cooked in fresh.

The following methods are adopted to preserve mushrooms for future use:

1. Blanching

In this method fresh mushrooms are kept immersed in a liquid mix containing rice starch, xanthan gum, egg white and water for a few minutes. Then they are immersed in boiling water for 2 minutes . Boiling destroys the enzyme activity. Meantime, the liquid mix adds taste, odour and texture to the mushroom. In this method mushrooms can be preserved in a refrigerator for more than a week.

2. Steeping

J.S. Pruthi et al.(1978) have formulated a steeping solution having 1% Potassium metasulphite (KMS) and 0.2%

citric acid. The blanched mushrooms are immersed in the steeping solution overnight and dried in the sun. In this method mushrooms can be preserved for more than 6 months.

3. Sun Drying

Mushrooms are directly dried in the sun until they attain 12% moisture. Then they are preserved in air tight metal containers. By this method mushrooms can be stored upto a year.

4. Canning

The preservation of mushrooms by canning is called ***appertization.*** The harvested mushrooms are washed with a wash solution containing 0.1 citric acid and 0.3% sodium metasulphite.

The washed mushrooms are kept immersed in boiling water for 2 minutes. After blanching, the mushrooms are dipped in a solution containing 1% sodium chloride and 0.5% citric acid. This chemical treatment reduces the weight of the mushrooms.

The mushrooms are later placed into a metal can containing salt solution and the can is kept in boiling water for some time. The can is then sealed and kept dipped in cool water. Such cans can be stored for about 6 months.

5. Pickling

Y.T. Zhunk and collegues (1991) have adopted pickling method to preserve mushrooms. The harvested mushrooms are washed and blanched in boiling water for 5 minutes. They are cooled and placed in 60% brine solution. The temperature of the vessel is maintained at 15-20°C for 10-15 days. Then about 3.3% sugar is added to the brine salt solution. By this method, mushrooms can be stored for 3 months.

6. Freeze Drying

Harvested mushrooms are kept in a refrigerator at -20°C for one day and then immersed in salt solution for dehydration. The mushrooms are gently heated for 12-16 hours to remove about 90% water from them. Then they are kept in a refrigerator for future use.

The freeze dried mushrooms seem to be fresh, but light in weight.

Recipes of Mushrooms

Mushrooms are used to prepare some delicious recipes as they have a characteristic taste, odour and nutritive value. They form good diets for patients too. They have been consumed by both the vegetarians and non-vegetarians. The fresh or dried mushrooms are being used to prepare the following food items-

i) Mushroom puree
ii) Mushroom paneer
iii) Mushroom rice (Pulao)
iv) Mushroom omelette
v) Mushroom soup
vi) Chicken curries.

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MUSHROOM CULTIVATION

This is to Certify that Mr. ***P. DILLESWARA RAO*** *of III BSc (CBMB) got registered himself for the Certificate Course on* ***Mushroom Cultivation*** *organized by the* ***Department of Botany*** *and completed the course from* ***07-03-2022 to 13-04-2022.*** *His performance is credited with* ***A*** *Grade.*

Head Of the Department of Botany

Principal

GOVERNMENT DEGREE COLLEGE FOR MEN, SRIKAKULAM

(Affiliated to Dr. BR. Ambedkar University, Srikakulam. AP)

DEPARTMENT OF BOTANY (2021-2022)

Certificate Course

On

MUSHROOM CULTIVATION

This is to Certify that Mr. ***S. CHANDU KUMAR*** *of III BSc (CBZ) got registered himself for the Certificate Course on* ***Mushroom Cultivation*** *organized by the* ***Department of Botany*** *and completed the course from* ***07-03-2022 to 13-04-2022.*** *His performance is credited with* ***A Grade.***

Head Of the Department of Botany

Principal

GOVERNMENT DEGREE COLLEGE FOR MEN, SRIKAKULAM

(Affiliated to Dr. BR. Ambedkar University, Srikakulam. AP)

DEPARTMENT OF BOTANY (2021-2022)

Certificate Course

On

MUSHROOM CULTIVATION

This is to Certify that Mr. ***S. SIMMAYYA*** *of III BSc (CBZ) got registered himself for the Certificate Course on* ***Mushroom Cultivation*** *organized by the* ***Department of Botany*** *and completed the course from* ***07-03-2021 to 13-04-2022.*** *His performance is credited with* ***B*** *Grade.*

Head Of the Department of Botany

Principal