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Oyster Mushroom Cultivation in North Eastern State Tripura: Temperature and Pest Controlling

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Abstract: This study focus on oyster mushroom cultivation in the hilly state Tripura and various difficulties faces by the farmer to cultivate mushroom. Mushroom is one of the nutritious food items and it is rich in taste. Oyster mushroom is a variety of mushroom which is easily cultivable due to its high demand and farmers also makes profit from mushroom cultivation. Tropic of cancer passes through the state which affects the climate of the state. In summer due to high temperature and low moisture, farmers see several losses in mushroom cultivation. In this paper we took different steps and techniques to mitigate the problem. By controlling the temperature and pest, farmer sees significant profit from mushroom cultivation.

Index Terms **- Oyster, profit, climate, techniques.**

I. INTRODUCTION

Hilly state Tripura is part of one of the Ashtalakshmi state of India. The state is rich in culture and cuisine. Combination of Indigenous flavor with Bengali rich culture make perfect example of unity in diversity. After independence and formation of Bangladesh, huge number of populations comes to this hilly state and started live there. With increasing population it's become necessary to generate more food product which are nutritious and rich in minerals. Mushroom is one of the alternative nutritious food items which is rich in protein and vitamin.

Mushroom easily capture the local market of Tripura. Rich flavor of mushroom easily attracts the buyer. With increasing demand many new farmers are also associate themselves with mushroom cultivation. Mushroom is profitable business and it generate many employments in the state. But the problem arises to maintain the production in harsh environment. Climate of Tripura witness Summer, winter and Rainy season. During winter the farmer sees high production but in summer the production graph goes down.

Moisture in air is good for mushroom cultivation but in summer air becomes dry and moisture content becomes low. Which directly affect the production. Also, high temperature affects the growth [1,2,3]. Thus, temperature control become necessary for high yield mushroom production. Winter is good for mushroom cultivation but also during winter small bugs attack on mushroom which severely attack on mushroom beds and feed the mycelium. Thus, it becomes necessary for farmers control the pest by using Neem oil which is costly. To mitigate the problem, it's become necessary to take alternative steps which are economic friendly.

2.OYSTER MUSHROOM

Oyster mushroom is one of mushroom variety which is found in the local market of Tripura. It is easily cultivable than other variety of mushrooms. Oyster mushroom is rich in taste and it is good protein source. The market price of oyster mushroom is also lower than other variety of mushrooms. Farmers of Tripura mainly cultivate oyster mushroom due to its easy cultivation and high demand.

Color	Humidity (%)	Ideal Temperature (°c)	Calorie (%)
White	70	15-20	33

Table 1: Basic data of oyster mushroom.

3.METHODOLOGY

3.1 ROOM PREPARATION:

First step was to prepare the room for mushroom cultivation. Room was made up of bricks, plastic net and polythene. A half wall room was built with bricks and the rest half was covered with plastic Net and bamboo sticks [4,5,6]. Ground was filled with white sand and upper portion was built with bamboo and polythene. A small gap between bamboo sticks makes air circulation inside the room. Sanitation was done with help of bleaching powder. Spreading of bleaching powder was spread outside the room environment. Proper cleanliness was checked before bed preparation.

3.2 Mushroom Bed preparation:

Preparation starts with cutting of rice straw into small pieces [7,8,9] and put them inside a tank for first stage sterilization. The tank contains water and KMnO4. Small pieces of rice straw were kept overnight inside the tank. Next day rice straw was taken out from the tank and remove the excess water from rice straw. Then second stage of sterilization process continue. An iron tank was used to sterilize the rice straw second stage is works on the principle of Autoclave. Vapor pressure was created inside the iron tank which helps to sterilize the rice straw. For bed preparation separate sterilized room was prepared. Fumigation method was used to sterilize the room. After sterilization rice straw. were taken out from the tank and spread it on the clean sterilized floor to reduce the temperature of rice straw [10,11]. After 10-15 minute of cooling, lime stone (CaCo3) was added with rice straw [12,13]. Bavistin was added as a fungicide and mix them properly. Rice straw was ready to prepare the bed. Rice straw was then poured into plastic bags [14] and seed were spread into the bed. Sealing was done with the help of rubber band. And then cotton plugs was used to continue air circulation inside the bed [15,16,17].

Number of beds	Total weight of rice straw (Kg)	Weight of each bed (Kg)	Number of seed required for each bed(kg)
1000	2500	2.5	0.100

Table 2: Requirement of raw material for 1000 number of mushroom bed preparation.

3.3 cultivation of Mushroom

Beds were then taken inside the room and placed them above the soil surface with the help of plastic thread. One column contains 6 beds. Weight of each bed was 2.5 kg. From the next day mycelium started to grow and after 15-20 days cotton plugs were removed from the bed [18,19]. During 15-20 days water was sprayed inside the room. Mushroom was Started to came out from the bed and after 2-3 days of cotton unplugging it was ready for the market.

3.4 Temperature controlling

To control the temperature and maintain the humidity inside the room, jute bags were used. Jute bags which are available in market were attach on the wall. White sand was spread on the floor. Water was sprayed inside the room by using of pipe. Banana trees and neem trees plantation was done outside of the room. Trees are covered the whole room. Water was also sprayed on the floor containing sand and on the jute bags.

Area of the room (in sq feet)	Total bed capacity	Number of jute bags required (1.5/3 feet each)
500	1000	100

Table 3: number of jute bags required for 1000 beds

3.5 Pest Controlling

Sterilization and cleanliness are the first step of pest Controlling. Spraying of neem oil after every 7 days for one month was done. Neem leaves were taken and boiling of leaves with water was done. The water containing

boiled neem leaves were sprayed on the bed after every 2-3 days. The process was continued till 1-2 months of production.

4.RESULT AND DISCUSSION

Mushroom is one of the nutritious food items. North East India is hilly region and Tripura is a part of this region. Tropic of cancer pass through this region. In summer low humidity in the air observed and in winter high humidity recorded. Temperature and moisture take a major role in mushroom cultivation. In summer high temperature makes low humidity in air which directly effect on mushroom production. Farmer sees low production of mushroom. By spreading of water create humidity inside the room and wet jute bags act as a major role in holding humidity in air. Wet jute bags make the room temperature suitable for mushroom. Also, white sand which are easily release the temperature and when water was spread sand was also become wet. Wet sand makes the room cooler and increase the humidity inside the room. Banana trees near the room provide shades which prohibits direct sun light. Thus, room become cool. Wet jute bags are easily become wet in contact of water but takes more time to become dry without sun light. Plastic green net prohibits direct sunlight. Which also make a major role to reduce the room temperature.

Figure 1

Figure 2

Figure 1&2: Jute bags hung on the wall

Changing of temperature	Temperature (Before applying jute bags) in °c	Temperature (After applying jute bags) in °c
In Day light	32	26
In Night	27	21

Table 4: Changing of temperature in summer season before and after applying jute bags.

Changing of humidity	Humidity (Before applying jute bags) in %	Humidity (After applying jute bags) in %
In Day light	35	55
In Night	60	80

Table 5: Changing of humidity in summer season before and after applying jute bags.

Reduction of temperature lead more production of mushroom. Mushrooms are very sensitive. Temperature, direct sunlight, humidity can easily control the production. It was found that after applying jute bags, water spraying on the bags and inside the room and banana plants took a major role in temperature and humidity controlling. After applying all this techniques, production of mushroom increases. Specially in summer season the rate of production is growing enough. From 1000 beds 760 kg of mushroom was recorded in summer season. Thirty five percent growth from previous year was recorded.

Year (In summer season)	Production of Mushroom (From 1000 beds) in Kg
2022 (Before applying jute bags, sands and banana plants)	572
2023(Before applying jute bags, sands and banana plants)	565
2024(After applying jute bags, sands and banana plants)	760

Table 6: Record of Mushroom production in summer season from three consecutive year (2022, 2023 & 2024)

Year (In winter season)	Production of Mushroom (From 1000 beds) in Kg
2022 (Before applying jute bags, sands and banana plants)	706
2023(Before applying jute bags, sands and banana plants)	717
2024(After applying jute bags, sands and banana plants)	875

Table7: Record of Mushroom production in winter season from three consecutive year (2022, 2023 & 2024)

Date	Production of mushroom (in Kg)	Date	Production of mushroom (in Kg)	Date	Production of mushroom (in Kg)	Date	Production of mushroom (in Kg)
17/3/2024	04	04/4/2024	12	21/4/2024	14	08/5/2024	5
18/3/2024	10	05/4/2024	10	22/4/2024	15	09/5/2024	6
19/3/2024	15	06/4/2024	8	23/4/2024	14	10/05/2024	4
20/3/2024	20	07/4/2024	7	24/4/2024	16	11/5/2024	4
21/3/2024	20	08/4/2024	8	25/4/2024	17	12/5/2024	3
22/3/2024	24	09/4/2024	6	26/04/2024	14	13/5/2024	3
23/3/2024	31	10/04/2024	5	27/4/2024	25	14/5/2024	3
24/3/2024	38	11/4/2024	5	28/4/2024	26	15/5/2024	4
25/3/2024	31	12/4/2024	7	29/4/2024	16	16/5/2024	4
26/3/2024	28	13/4/2024	9	30/4/2024	11	17/5/2024	3
27/3/2024	22	14/4/2024	7	01/5/2024	10	18/5/2024	2
28/3/2024	20	15/4/2024	8	02/5/2024	9	19/5/2024	3
29/3/2024	20	16/4/2024	8	03/5/2024	8	20/5/2024	4
30/3/2024	19	17/4/2024	11	04/5/2024	8	21/5/2024	4

01/4/2024	14	18/4/2024	9	05/5/2024	10	22/5/2024	3
02/04/2024	15	19/4/2024	4	06/5/2024	7	23/5/2024	3
03/4/2024	11	20/4/2024	5	07/5/2024	8	24/5/2024	3

Table 8: Data of Mushroom production in summer season (March, April, May) in the year 2024

Figure3.

Figure 4.

Figure 5

Figure3,4,5. Banana plants covered the mushroom room.

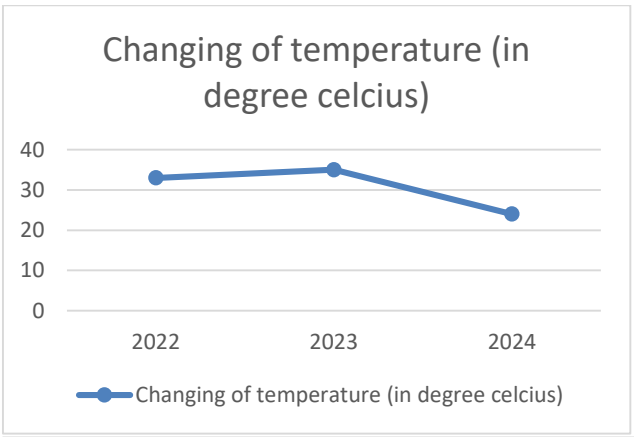
Sterilization by formation of vapor pressure inside the iron tank takes a significant role in pest Controlling. Iron tank was used an autoclave which is also an economic friendly sterilizer. Using of lime stone (CaCo3) and bleaching powder kill all pathogens from the room. Spraying of neem water sterilize the room environment. Using of neem leaves with water act as an alternative of neem oil. Neem leaves are easily available and less costly than neem oil. Spraying of boiled water containing neem leaves prohibit insects and act as an economic friendly pest controller. Also, it is found that sterilization of rice straw decreases the number of damage beds. Damage beds are those beds in which mycelium did not grow well. Damage beds look black and blue in color. More than 15% of total bed record no mycelium growth and become damage. After sterilization and using of fungicide and neem water it is found that number of damage beds reduces from previous term. Rice straw is full with pathogens and these pathogens and fungus inhibit the growth of mushroom. Hot vapor, lime stone (CaCo3) and fungicide kill those pathogens and make the rice straw suitable for mushroom cultivation.

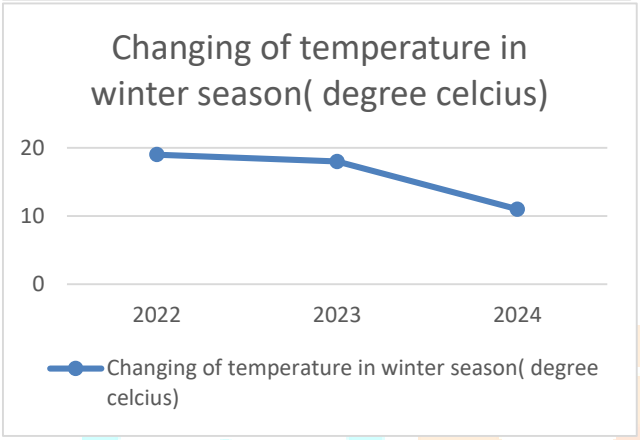
Figure 6. Damage bed

Figure 7. Normal bed

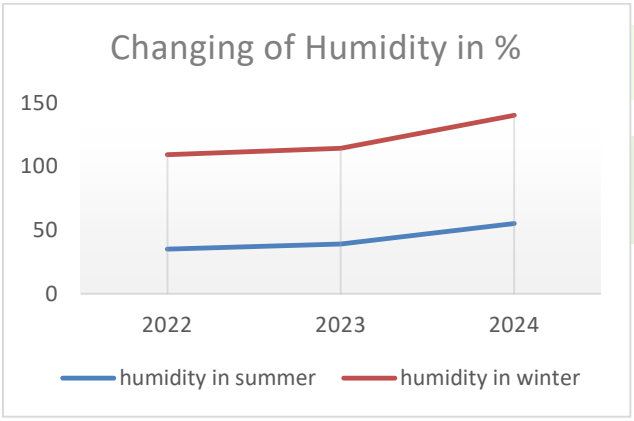
Season	Number of damage beds before sterilization (2023) from 1000 beds	Number of damage beds after sterilization (2024) from 1000 beds
Summer (April, May, June)	200	89
Winter (November, December, January)	162	68

Table 9: Difference between number of damage beds before and after applying of sterilization

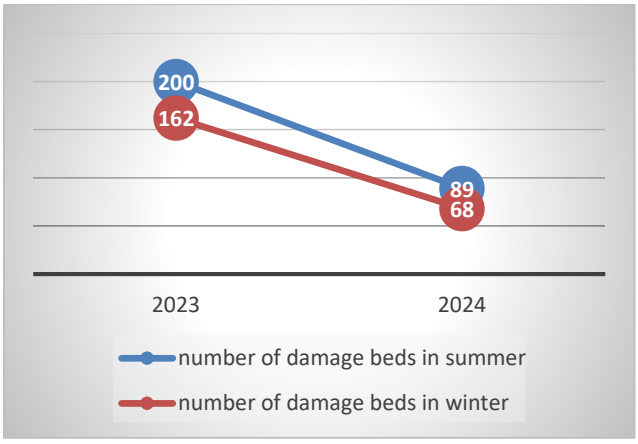




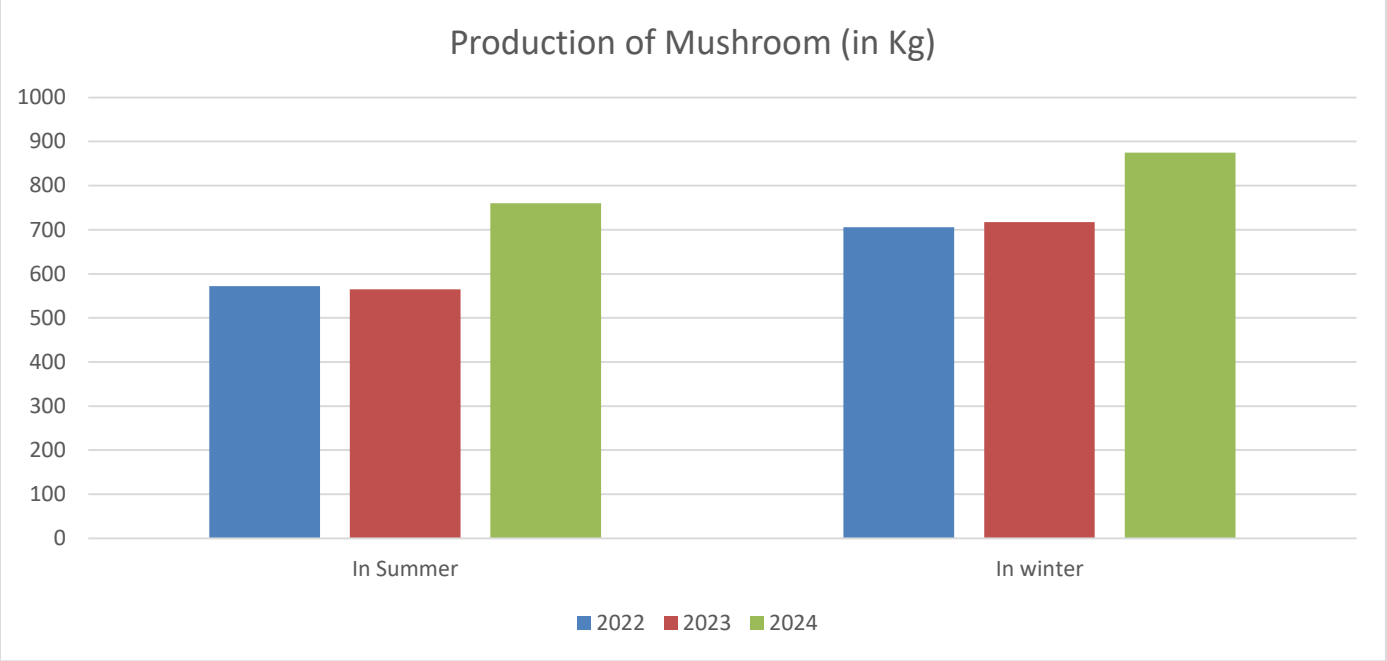
Graph 1: Changing of temperature in summer and winter season in year 2022,2023,2024



Graph2



Graph 3



Graph 4

Figure 8: Graph 2 changing of humidity, Graph 3-changing of damage beds number after sterilization, Garph 4- Changing of mushroom production.

5.CONCLUSION

Oyster mushroom is very sensitive in sunlight and directly affected by temperature and moisture. Fungus and different pathogenic microbes also attack on mushroom beds which prohibits mycelium growth. Mushroom friendly room and environment, good air circulation, proper cleanliness and sterilization control the moisture, temperature and pest which directly effect on mushroom production. By this more production of mushroom is recorded and farmers income get increase.

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