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THE SUCCESSFUL CULTIVATION OF A NEW LUMINOUS MUSHROOM OMPHALOTUS AF. ILLUDENT

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PURPOSE OF STUDY

In this study, we examined the physiological and nutritious characteristics of this luminescent mushroom :- *Omphalotus af. illudent*.

This study has provided an important reference base for future study of this mushroom. We have successfully cultivated this mushroom experimentally as well as in large scale. The purpose is to produce the material source for extracting the anti-cancer cell substrates (illudin S and M) from this mushroom and for research on future bioluminescent mechanisms of the mushroom .

I. PREFACE

Besides fireflies and jelly-fish, we are interested in bioluminescence of mushrooms.

There are some species of mushroom that are able to emit light without energy in heat form, especially their glowing characteristic. This is very interesting to study the continuously light-emitting mechanism in mushroom. And some luminescent mushrooms contain some useful substrates such as illudin_S and illudin_M for medical faculty. These compounds inhibit cell division and have anti-cancer cell characteristic. The mushroom group Omphalotus is being studied by scientists world wide.

Besides the luminescence characteristic in this mushroom, scientists have performed studied on their medical properties. Recently, we was successful in cultivating this mushroom and we have been extracting the useful compounds _ illudin S and M for applications in medicine, to compliment a new strain or a new anti-cancer gene source into the worldwide bioluminescent mushroom collection of Mycetology as well as Pharmacy.

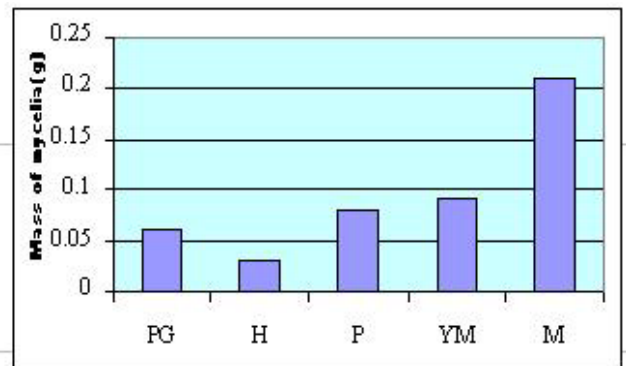
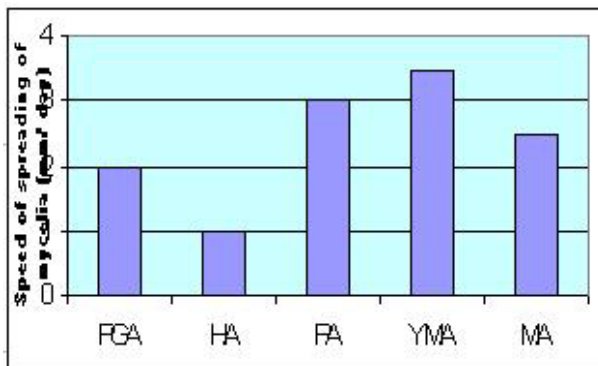
In this study, we identify the basic parameter of physiological and nutritious characteristics of this mushroom in order to control cultivating and producing a large amount of fruit-bodies for studying their luminescent and medical properties.

2. Methods for studying

- (i). Examining physiological, nutritious characteristic and its glowing capability
 - Cultivating mycelia on different nutrient media to determine the optimal media for multiplying and storing on media tube.
 - Determine their needs in Nitrogen (organic and inorganic) and minerals (K, P, Mg...)
 - Effect of temperature, pH, moisture, light (lux)....
 - Examine their capability in emitting light in the dark.
- (ii) Cultivation and Fruiting
 - Multiplying and storing strain
 - Transplanting into composting sawdust plastic in different conditions.
 - Fruiting and examining quality of fruit-body in different nutritious conditions.

Box 1: Spreading speed and mass of mycelia

Media	Speed of spreading	Mass
Potato	++	++
Potato-dextrose	++	++
Hamada	+	+
Peptone	++++	+++
Yeast-malt	+++++	++++
Malt	+++	+++++



YM (yeast-malt) media : the best result in spreading of mycelia
 M (malt) media: the quality of mycelia mass is best .

3.2 Absorbing nitrogen and mineral

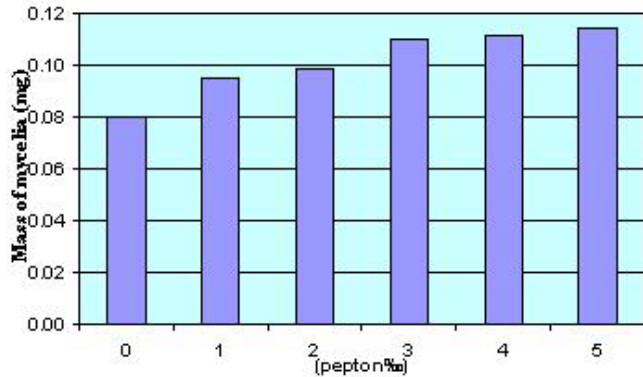
3.2.1 Nitrogen (N)

They use both organic nitrogen such as peptone, corn, soya bean and inorganic nitrogen such as NaNO₃, KNO₃, (NH₄)₂SO₄, urea.

Results:

- Peptone: Mass of mycelia achieves maximum growth in media with up to 3% peptone;
- Corn and soya bean: Mass of mycelia progresses in 30% corn or soya bean
- Inorganic nitrogen: in chart 5

Chart 3: Speed of spreading in different media



Char 3: peptone (%)

Chart 4: Mass of Mycelia in different media

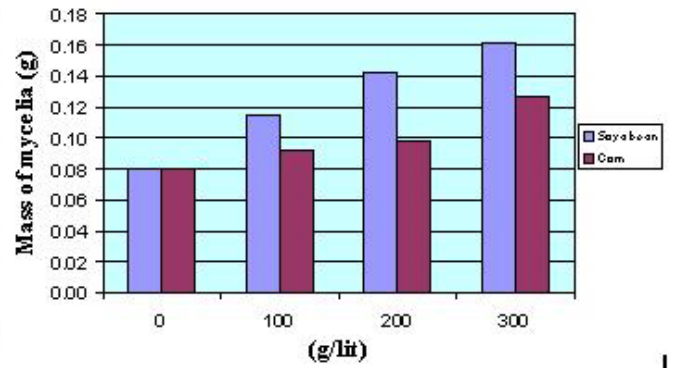
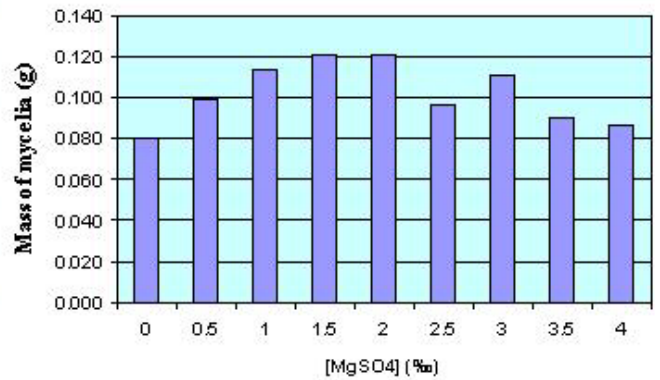
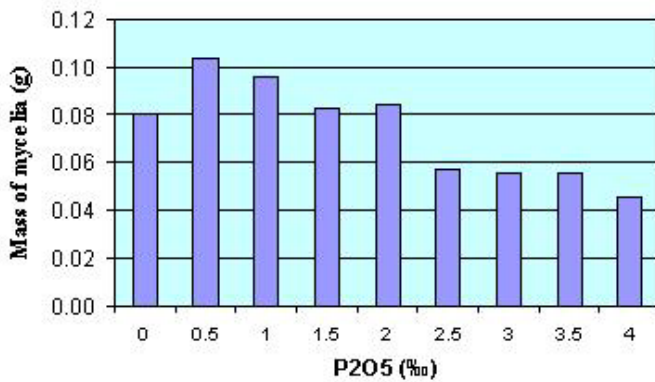


Chart 4: Soya bean and corn



most optimal MgSO4 concentration : 1,5-2

Nitrogen source	Optimal concentrate
NaNO3	6%
KNO3	5%
(NH4)SO4	5%
Urea	1%

Box 2: Mass of mycelia on different nitrogen concentrate

Nitrogen (‰)	0	1	2	3	4	5	6
Mass of mycelia (NH ₄ SO ₄) (g)	0.08 ±0.007	0.10 ±0.009	0.10 ±0.011	0.11 ±0.013	0.10 ±0.018	0.12 ±0.005	0.12 ±0.011
Mass of mycelia (NaNO ₃) (g)	0.08 ±0.007	0.09 ±0.017	0.09 ±0.005	0.09 ±0.013	0.10 ±0.001	0.10 ±0.019	0.10 ±0.012
Mass of mycelia (KNO ₃) (g)	0.08 ±0.007	0.08 ±0.007	0.09 ±0.009	0.10 ±0.011	0.10 ±0.023	0.11 ±0.017	0.12 ±0.020
Mass of mycelia (Urea) (g)	0.08 ±0.007	0.11 ±0.008	0.06 ±0.021	0	0	0	0

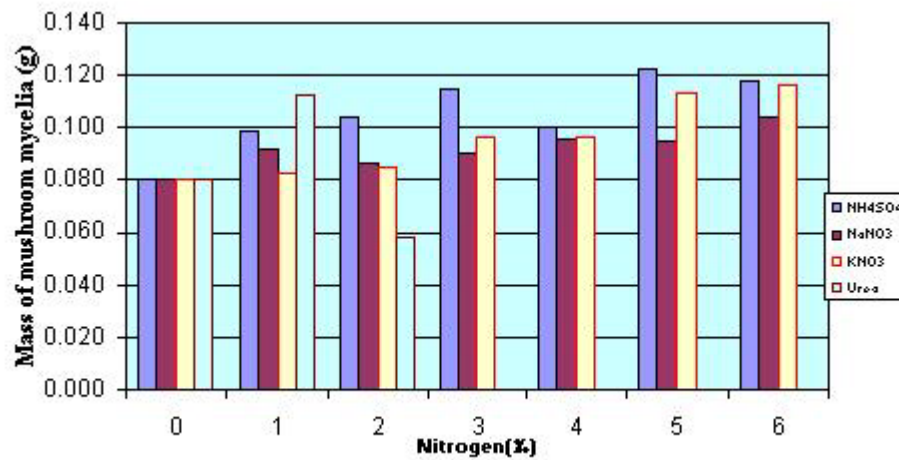
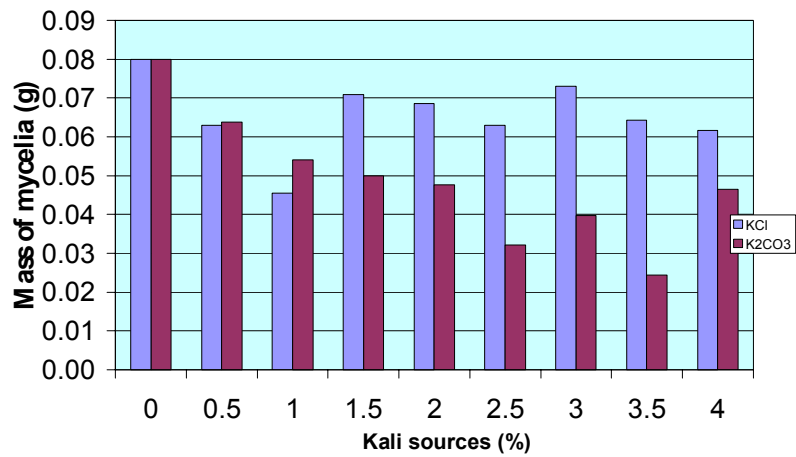


Chart 5: Effect of different inorganic nitrogen on growing of mycelia

3.2.2 Minerals (using: K, P and Mg.)

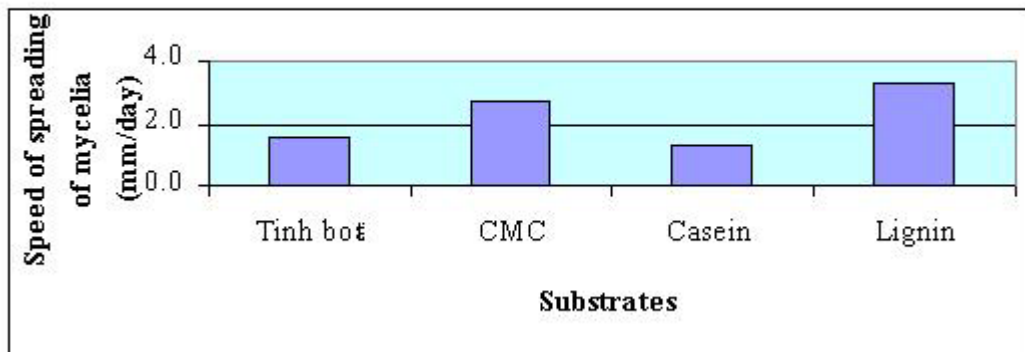
Minerals	the optimal concentrations
KCl	6‰
K ₂ CO ₃	1‰
P ₂ O ₅	0,5‰
MgSO ₄	1,5-2‰



3.2.3 Examine enzyme for decaying different substrates

This mushroom can degrade a lot of different substrates such as soluble starch, cellulose, casein, lignine. Chart 6 shows that its capability of decaying lignin is most remarkable.

Chart 6: Capability in decaying different substrates of mycelia



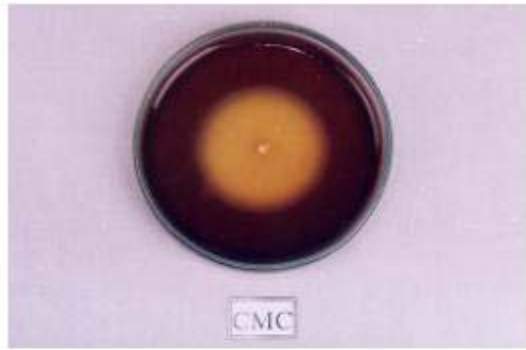


Fig 3: Mycelia on 1g/l CMC media (Carboxyl Methyl Cellulose)

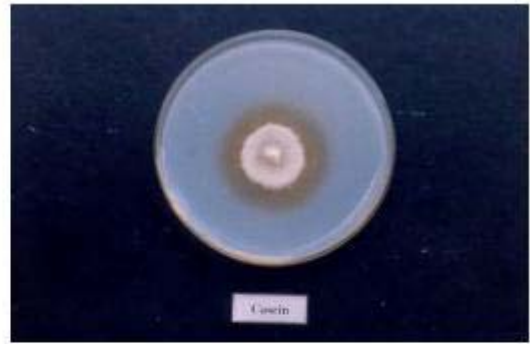


Fig 4: Mycelia on 1g/l Casein media



Fig 5: Mycelia on 1g/l starch media



Fig 6: Mycelia on 1g/l lignin media

4. Effect of environment different conditions

4.1 Temperature (chart 7)

The optimal temperature for growing this mushroom is 30°C

4.2 pH (chart 8)

The optimal pH = 5

Chart 7: Effect of temperature on growing of mycelia

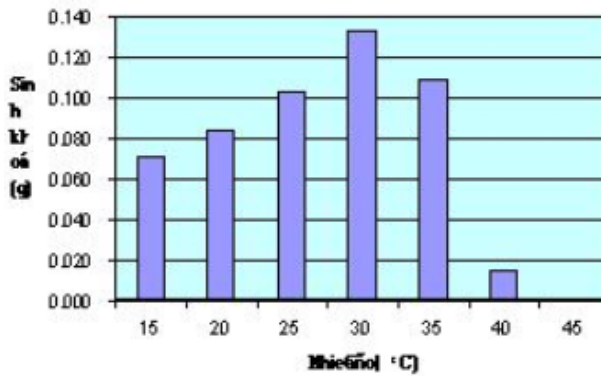
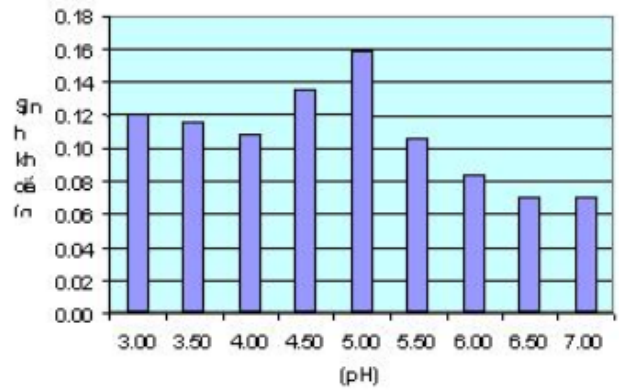


Chart 8: Effect of pH on growing of mycelia

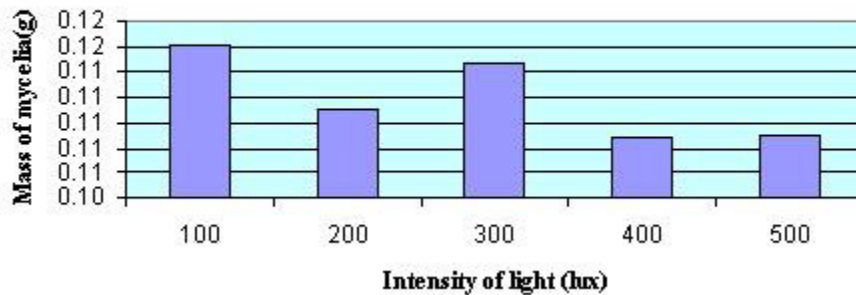


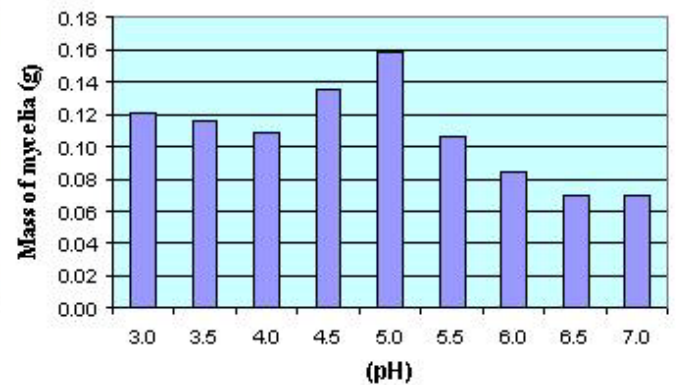
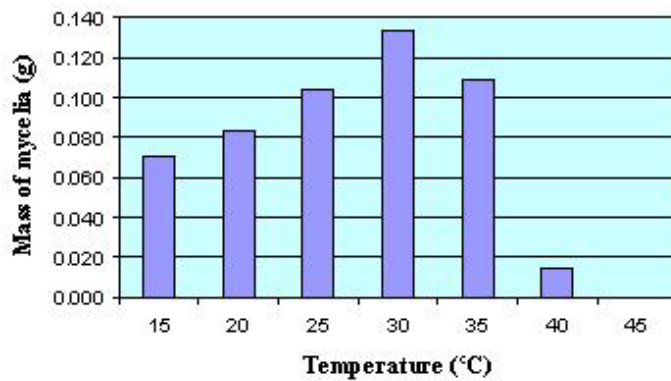
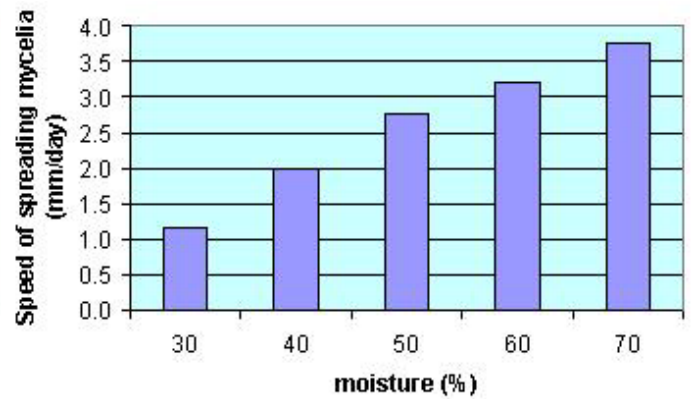
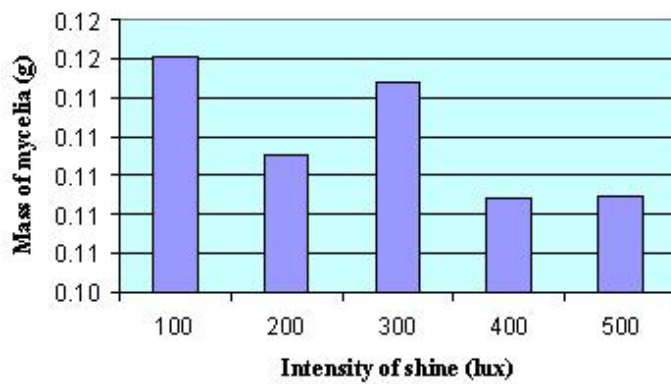
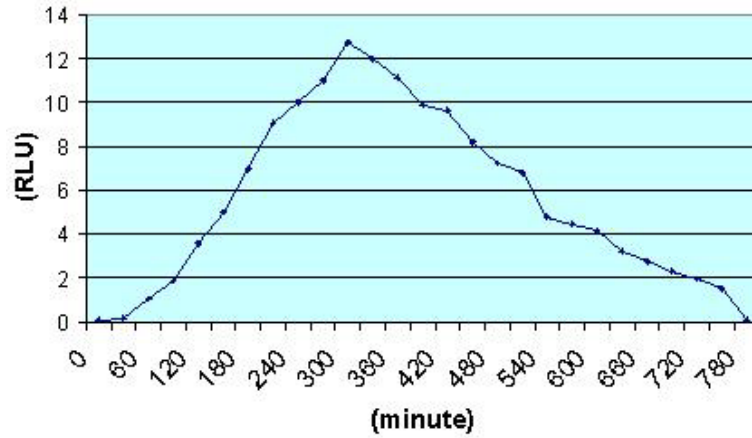
4.3 Effect of other external influences:

Light application:

Light is not important for development of mycelia, but light shining about 100 lux helps mycelia grow more rapidly and maximum in mass. The optimal intensity of light for forming fruit-body is about 500-800 lux.

Chart 9. Effect of light application on development of mycelia





- Humidity: the most optimal moisture for growing of mycelia is in range 50-70% and for forming fruit-body is 90%.

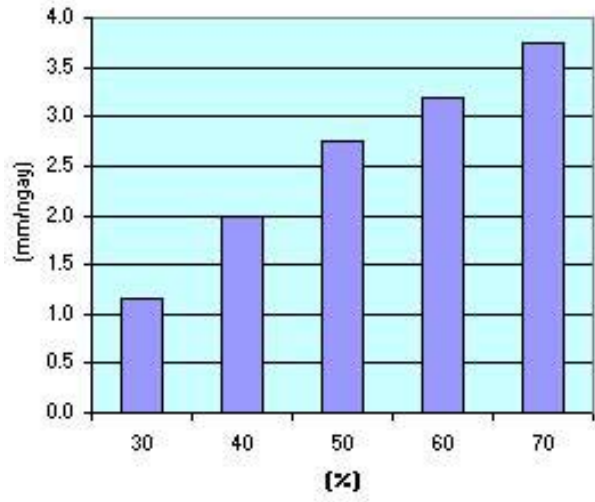


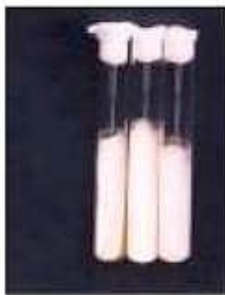
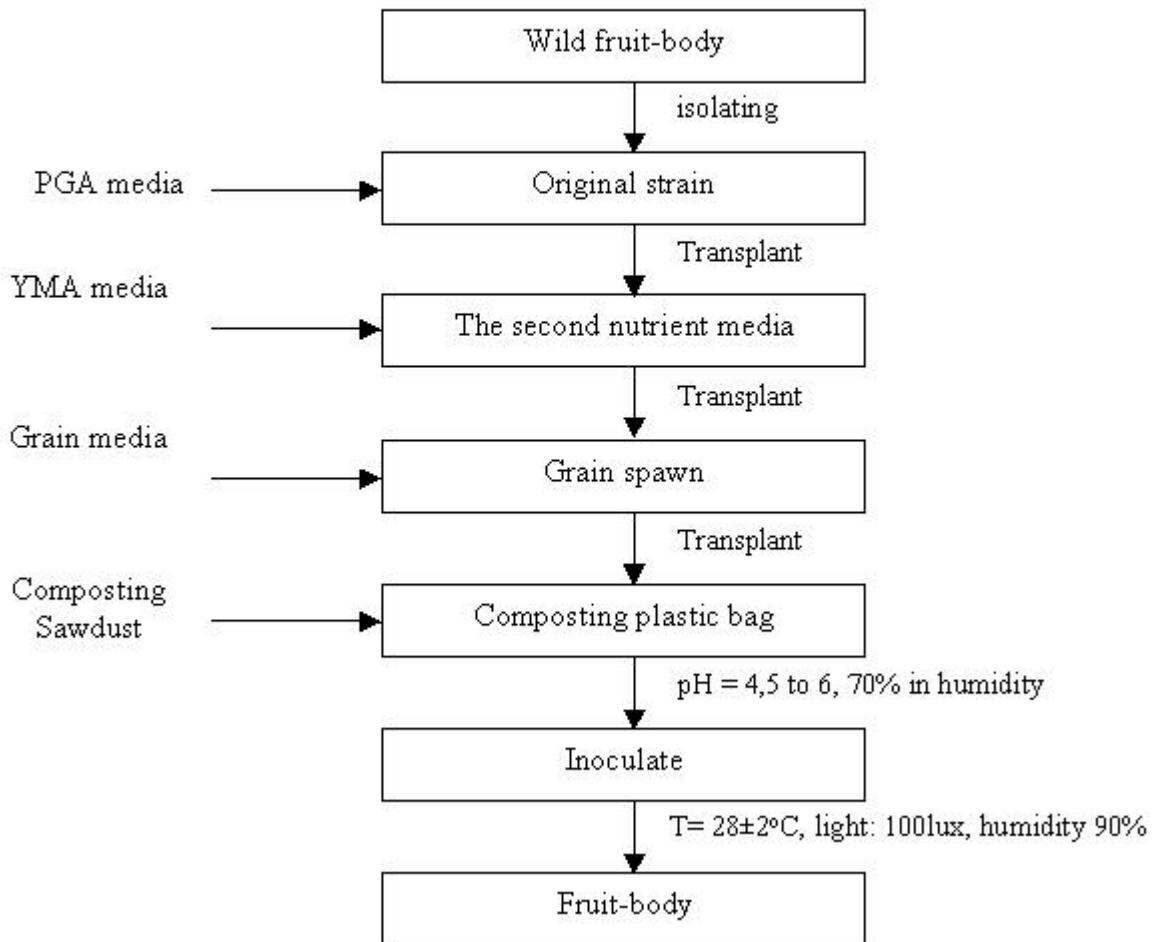
Chart 10. Effect of humidity on development of mycelia



Fig 7. Effect of humidity on development of mycelia

I. THE RESULT OF CULTIVATING PROGRESS

1. Cultivation



Pix 8: Mycelia on YMA media



Pix 9: Grain spawn



Pix 7: sawdust spawn

2. THE RESULT:



Fruit-body of luminescent mushroom (*Omphalotus* af. *Illudens*) in daylight





Fruit-body of luminescent mushroom (Omphalotus af. Illudent) in darkness.

CONCLUSION AND SUGGESTIONS

Conclusion

We were successful in cultivating a luminescent mushroom_ Omphalotus af.illudent. This is a tropical mushroom. Fruit-bodies were formed in artificial conditions. It is able to emit light continuously in the whole fruit-body, mycelia, spore. The light it emits is greenish. This mushroom produces some useful compounds such as illudin S and M for treating cancer disease. With these properties, we can use this mushroom as an ideal material for following study on its medicinal properties and its bioluminescent mechanism in the environment.

Suggestions

- Continue to examine the bioluminescent characteristic and medicinal properties of this mushroom
- Cultivating in large scale for manufacturing to produce medical material source for medicine.
- Examine enzyme Luciferase in luminescent mushroom and study the luminescent mechanism of it to apply into gene biotechnology and environment technology in the future.

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