Project 01

Mycelium Bird's Nest

This is a mycelial bird nest grown by inoculating flat mushroom cultivar with cottonseed hulls, which is fireproof and insulated, and can protect birds and eggs from forest fires to some extent. At the same time, the soft texture is suitable for birds to live in.

Area	Nature Protection
Feature	Nature Disaster
Duration	5 Weeks
Team Project	By Jiang Mengyi & Yang Xiaowei

Background

Impact of forest fires

Forest fires put some **rare birds at risk of extinction.** Although individual birds may fly away, they often have to **abandon their birds and eggs.** Especially for insectivorous birds that rely on a humid, warm environment, they need a soft and humid environment so that they can quietly find food. However, the dry forest floor and bare branches after the fire severely **damaged their habitat and threatened their survival.**

Introduction of Mycelium

The mycelium is **the root of the mushroom.** It is a group of hyphae formed by spreading and spreading in the matrix or on the culture medium, repeatedly branching into a network. It is also **a natural fireproof material.**

The Experiment Process

This is a mycelial bird nest grown by inoculating flat mushroom cultivar with cottonseed hulls, which is fireproof and insulated, and can protect birds and eggs from forest fires to some extent. At the same time, the soft texture is suitable for birds to live in.

Display of five kinds of farm waste and Pleurotus ostreatus cultivated species

Fail Experience

Inoculation process (The following picture takes wheat bran as an example. The other four farm waste products are also processed.)

Disinfects wheat bran.

Soak wheat bran in pure water, then filter the water several times.

Mix the bran with the oyster mushroom and pour into the tin foil box.

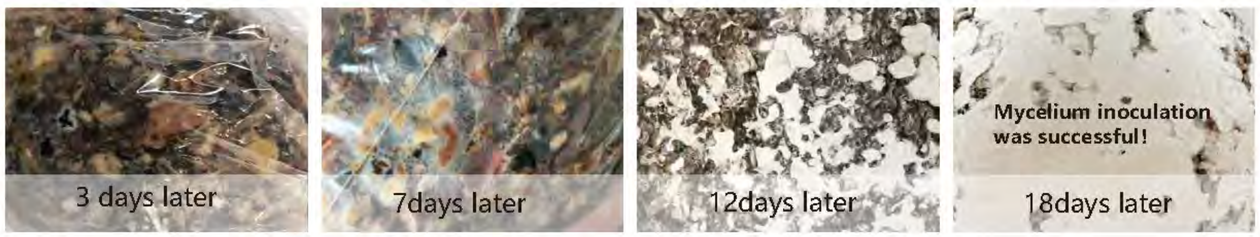
Mark and spray water.

Medium growth process

The following is a 12-day photographic record of five farm wastes and mycelium inoculation growth.

Cottonseed husk inoculation process

Cottonseed husk inoculation mycelium growth process



Performance Testing

Test I. Fire test

1. Zoom in on internal material details.
2. Cut a small piece of mycelium with a knife.
3. Put the mycelium block on the fire for 30 seconds and observe.
4. Compare the unburned mycelium and the burned mycelium.

Experimental Results & Conclusion

Sequencing of mycelium formation of five kinds of farm wastes

Ranking of mycelium hardness and softness of five kinds of farm wastes

Weight sequencing of five kinds of farm waste mycelium with the same volume

Choose cottonseed hulls mycelium block to dry.

After baking the material is loosely structured.

Summary

Due to the lack of strict sterilization and the mycelium growth environment is not sealed enough, the colour of mycelium is not white. Therefore, **we selected cottonseed hulls mycelium** based on the failed experience and the five types of assembly, quality, softness and hardness of farm waste and **to improve the experimental procedures and further research.**

Conclusion of Test I

The material is difficult to burn in the flame. If it is ignited, it will be automatically extinguished soon after leaving the flame, and the flame will not scatter the internal structure of the material, then **the material belongs to the refractory material.**

Test II. Fire resistance test

1. Cotton seed shell mycelium blocks were cut into sheets with different thickness of 1cm, 2cm and 3cm respectively.

2. Put the mycelium block on the flame, respectively record the scorch degree of their tops.

Conclusion of Test Ⅱ

Thickness	Fire center temperature	Surface temperature of mycelium	Surface coking degree	Smoke or not	Is it resistant to burning
1cm	260°C	103°C	High	A little	Relatively resistant to burning
2cm	260°C	85°C	General	Not	Resistant to burning
3cm	260°C	67.5°C	General	Not	Resistant to burning

The 3cm thickness at the same ignition source temperature **showed superior performance in all tests**, and the greater the thickness, the more effective the insulation.

Test III. Insulation test

1. Select the 3cm thickness of the mycelium block for high temperature test.

2. Place beeswax on the mycelium block and measure the temperature of the fire.

3. Observe the beeswax, and measure the temperature above the block.

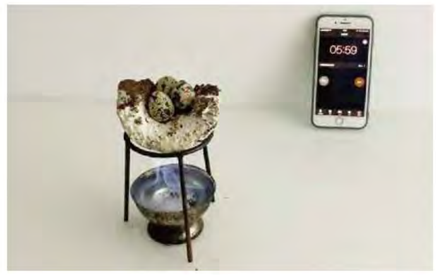
Conclusion of Test III

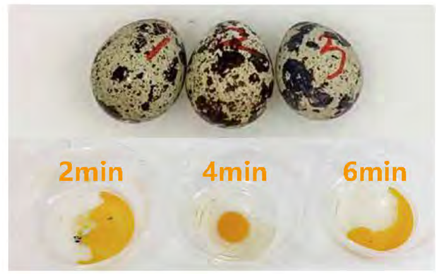
Time	Wax melting speed	Wax water temperature	Fire source temperature
1min	No significant changes	35°C	250°C
2min	Soften slowly	50°C	250°C
3min	Start to melt	67°C	250°C

The mycelium block with a thickness of 3cm has **a certain blocking effect on the temperature of fire source.**

Test IV. The simulation experiment of 3cm thick mycelium bird’ s nest on fire

We used mycelium to make a simple nest to simulate whether the eggs could survive a fire. Mark the eggs, No. 1, No. 2, and No. 3, and take one egg off during the second, fourth, and sixth minutes to see what's going on inside the egg.

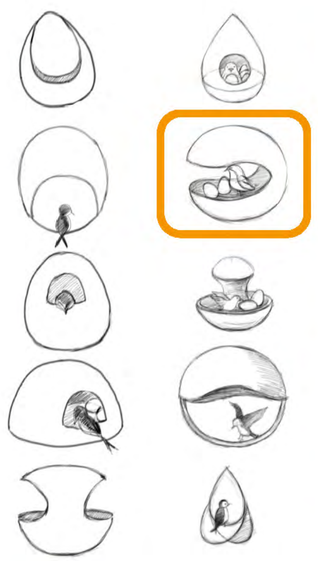




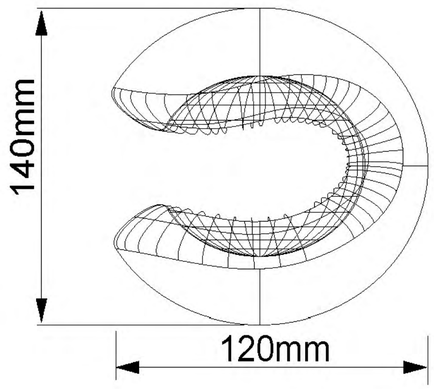
Conclusion of Test IV

After testing, all three eggs were intact, and it was feasible for mycelium block to be used as a nest to delay the fire of the nest.

Concept



Size



1. Fill the pieces of mycelium into the sterilized 3D printing mold.

2. The filled mycelium pieces of the model sealed with plastic wrap to prevent the entry of air.

3. Wait for about 2 weeks to remove the mycelial bird nest from the model.