I. INTRODUCTION

1.1. Background

Indonesia is a country having considerable potential to develop agricultural products, especially food and horticultural products. One type of horticultural product is white oyster mushroom cultivable and manageable to increase people's income and improve nutritional conditions through diversification of food ingredients. In Indonesia, mushroom cultivation is relatively new. Introduction to mushroom commodities, especially edible mushrooms was in the 1960s. However, its development and commercial cultivation began and was known by the public from the 1970s, while the public knew the oyster mushroom more recently. Since the 1980s, it has started to cultivate in several areas of the island of Java (Maulana, 2012). Oyster mushroom is an edible mushroom coming from the *Basidiomycetes* group, called oyster mushroom, because the hood is circular like an oyster shell (Meinanda, 2013).

White oyster mushroom (*Pleurotus ostreatus*) is one type of consumable mushroom containing high enough vegetable protein than other types of consumable mushrooms, so that it has an impact on the high demand for the product. The high market demand for white oyster mushrooms is sometimes not followed by the excellent stock and quality of the produced products. Many oyster mushroom products are found, where quality is not up to standard, such as too thin and small fruit hoods, abnormal hood shapes, and uneven fruit hoods (Maulidina, 2014).

In line with high market demand and the large potential of oyster mushrooms are useable as food and as medicine. Indonesia is one of the countries having an opportunity to export mushrooms to America, Canada, Germany, Japan, Hong Kong, Belgium, England, the Netherlands and Italy. Several factors improvable to penetrate the market both at domestic and abroad levels are optimizations of technical culture and post-harvest treatment ensuring uniformity of mushrooms (Suryani, 2017). In addition, the cultivation of white oyster mushroom is considered as a profitable business because of the fast harvest time of about 3 months, so that the capital also quickly returns. Raw materials for cultivation of white oyster mushroom are easy to obtain and the land for oyster mushroom cultivation is not too wide (Agus et al, 2001 in Suryani, 2017). The quality of the seeds, the cultivation process, the temperature and humidity of the supportive environment determine the success of white oyster mushroom cultivation (Cahyana, 2002).

The white oyster mushroom (*Pleurotus ostreatus*) is an organism that is heterotrophic so that it cannot synthesize food. To obtain food, fungi secrete digestive enzymes and absorb the breakdown products of organic matters from the environment through the mycelium. Oyster mushroom cultivation can use wood sawdust obtained from wood processing factories. Suriawiria (2006) stated that the growing media of white oyster mushroom generally uses sawdust with the addition of bran, lime (calcium carbonate), and water. Good sawdust is usable as a growing medium for

oyster mushrooms from complex wood species, containing high cellulose needed by oyster mushrooms in large quantities.

To increase the growth, development, and acceleration of white oyster mushroom production, it is necessary to give a growth regulator in atonic (IBA 0.57%) with the correct application time and concentration. Atonic is one of the trademarks containing a growth regulator auxin possibly stimulating root growth, cell division and accelerating seed germination. This atonic is only effective at a certain immersion time. Way to give growth regulators can use immersion or soaking, spraying, smearing, injection and others. Given IBA can affect cell division, because use of IBA in a certain concentration can cause additional roots caused by the more stable chemical content of IBA and its working power is more extended (Wudianto, 2005). After discovering IAA (*Indole Acetic Acid*) as one of the important phytohormones, similar compounds were synthesized and the biological activity of these compounds was tested (Harahap, 2012).

Based on the description above, a study was conducted on the effect of application time and atonic concentration on the growth and production of white oyster mushroom (*Pleurotus ostreatus*). Therefore, it is necessary to develop new cultivation technologies and innovations applicable directly to white oyster mushroom farming to accelerate production and improve the quality of white oyster mushroom products.

1.2. Question

Based on the description above, This study has the following questions:

1. How does the time of atonic application affect the growth and production of white oyster mushroom (*Pleurotus ostreatus*)?
2. What is the effect of atonic concentration on the growth and production of white oyster mushroom (*Pleurotus ostreatus*)?
3. How does the combination of application time and atonic concentration affect the growth and production of white oyster mushroom (*Pleurotus ostreatus*)?

1.3. Objectives of Experiment

1. To determine the effect of atonic application time on growth and production of white oyster mushroom (*Pleurotus ostreatus*).
2. To determine the effect of atonic concentration on growth and production of white oyster mushroom (*Pleurotus ostreatus*).
3. To determine the effect of the combination of application time and atonic concentration on the growth and production of white oyster mushroom (*Pleurotus ostreatus*).

1.4. Hypothesis

1. The time of atonic application had a significant effect on the growth and production of white oyster mushroom (*Pleurotus ostreatus*).

2. Atonic concentration significantly affected the growth and production of white oyster mushroom (*Pleurotus ostreatus*).
3. The interaction between the combination of application time and atonic concentration significantly affected the growth and production of white oyster mushroom (*Pleurotus ostreatus*).

1.5. Benefit of Experiment

1. The experiment determines the growth rate and production of white oyster mushroom (*Pleurotus ostreatus*) with the treatment of application time and atonic concentration.
2. The experiment is one of the requirements to get a bachelor's degree at the Faculty of Agriculture, Medan Area University.

II. LITERATURE REVIEW

2.1. White Oyster Mushroom (*Pleurotus ostreatus*) Botany

White oyster mushroom is one of the high-value consumption mushrooms. Several types of oyster mushrooms commonly cultivated by the Indonesian people are white oyster mushrooms (*P. ostreatus*), pink oyster mushrooms (*P. flabellatus*), gray oyster mushrooms (*P. sajor caju*), and abalone/brown oyster mushrooms (*P. cystidiosus*). Basically, all types of these mushrooms have almost the same characteristics, especially in terms of morphology, but roughly speaking, the color of the fruiting bodies can be distinguishable from one type to another, especially in a new state (Susilawati, 2010).

In the wild area, oyster mushrooms are saprophytic plants living in soft woods and obtaining food by using the remains of organic matter. Oyster mushrooms are plants containing no chlorophyll (no green leaf substance) so that they cannot process their own food ingredients. To meet the needs of life, oyster mushrooms are very dependent on organic materials absorbed for the purposes of growth and development. The main nutrient needed by oyster mushrooms is a carbon source provided through various sources such as sawdust and various other organic wastes (Susilawati, 2010).

According to Armawi (2009), the complete classification of white oyster mushrooms is as follows:

Kingdom : *Mycetea*

Division : *Amastigomycotae*

Phylum : *Basidiomycotae*

Class : *Hymenomycetes*

Ordo : *Agaricales*

Family : *Pleurotaceae*

Genus : *Pleurotus*

Species : *Pleurotus ostreatus*

Figure 1. Morphology of White Oyster Mushroom
Source: Personal Documentation.

In terms of morphology, white oyster mushroom (*Pleurotus ostreatus*) is a mushroom having a fruiting body on the hood resembling a shell (oyster). This mushroom is a type of wood rot fungus. The growth of this fungus is lined up sideways on the rotten logs. This fungus form clumps with many branches on the fruiting body and unites in the media. The fruiting body of *P. ostreatus* consists of a hood (*pileus*) and a stalk (*stipe* or *stalk*). The hood shape is like an oyster shell with 5-15 cm in size. The mushroom fruit stalk is not located right in the middle of the hood, but its position is slight to the edge. The stalk can be short or long (2-6 cm) depending on environmental and climatic conditions affecting its growth. The underside of the hood is called *lamella* (*gills*) having shapes like gills which are white and soft. The *lamella* has white spores, microscopic 5.5 – 8.5 x 1 – 6.6 microns, oval and smooth (Parjimo, 2007).

2.2. Economic Value of White Oyster Mushroom (*Pleurotus ostreatus*)

The prospect of white oyster mushroom as one of the non-oil and gas export commodities continues to increase. Because mushroom cultivation is very easy to develop domestically, moreover the land required is not so wide so that, in Indonesia, it is also necessary to make efforts to increase the production of white oyster mushrooms. Based on food consumption data in 2019, the period 2013-2017 mushroom consumption in Indonesia was 0.5720 kg/capita/year, 0.8840 kg/capita/year, 0.0000 kg/capita/year, 0.0000 kg/capita/year, 1.7680 kg/capita/year (Directorate General of Horticulture Indonesia, 2019). Based on these data, in Indonesia, mushroom consumption tends to increase every year. Although it experienced a decline in 2015 and 2016, it increased again in 2017. The increase in consumption in 2017 was twice as much as mushroom consumption in 2014 (Mudzakiroh, 2019).

According to Kahar (2013) in Mufarrihah (2009), oyster mushroom is a commodity having excellent prospects to develop for the domestic market and the export market. Export data of agricultural commodities in the horticulture sub-sector in 2015-2016 showed that mushroom export in 2015 amounted to 186,427 kg in an export value of US$ 1178,044. In 2016, it was 1397,358 kg in an export value of US$ 679,849 (Directorate General of Horticulture, 2016).

2.3. Terms of Growing White Oyster Mushroom (*Pleurotus ostreatus*)

The growth of oyster mushrooms is highly dependent on physical factors such as planting media, water, temperature, humidity, light intensity, aeration, media acidity (pH), and altitude, as explained by Susilawati (2010).

2.3.1. Planting media

Sawdust becomes a place to grow fungi that can decompose and can be used as a source of nutrition. According to Wijayanti (2018), mahogany consists of complex compounds with a composition of 35-50% cellulose, 20-30% hemicellulose, and 25-30% lignin. Another reason to choose mahogany is that this wood is one of the most popular types of hardwood in Indonesia, so it has the potential to produce an abundance of sawdust waste. Other planting media materials, namely bran, corn flour, and rice flour, are parts of the growth and development of mushroom mycelia and triggering the growth of mushroom fruiting bodies. Lime is useful for adjusting the pH of the mushroom growth media to be close to neutral or alkaline, in addition to increasing the minerals needed by mushroom for growth (Lailatul, 2009).

2.3.2. Water

The water content in the substrate is around 60 - 65%. In dry conditions, the growth will face disruption or stop and vice versa if the

water content is too high, the mycelium will rot and die, indoor water spraying can be done to regulate temperature and humidity.

2.3.3. Temperature

The incubation temperature or the form of oyster mushroom mycelium was maintained between 60 – 70%. The temperature at the formation of the fruiting body ranged from 16 – 22ºC.

2.3.4. Humidity

Air humidity during the growth of the mycelium was maintained between 60-70%, air humidity in the growth of fruiting bodies was maintained between 80-90%.

2.3.5. Light intensity

Mushroom growth is very sensitive to direct sunlight. Indirect light (regular reflected light ± 50 – 15000 lux) is helpful in early stimulation of the formation of fruit bodies. In mycelium growth, light is not needed, the light intensity needed for mushroom growth is about 200 lux (10%).

2.3.6. Aeration

Two important components of the air affecting the growth of mushroom are oxygen (O_2) and carbon dioxide (CO). Oxygen is an important element in cellular respiration. The source of energy in the dioxide cell becomes carbon dioxide. Too much concentration of carbon dioxide (CO) in *kumbung* causes abnormal mushroom growth. Inside the mushroom *kumbung*, the CO_2 concentration should not be more than 0.02%.

2.3.7. Media Acidity Level (pH)

The acidity of the growing media affects the growth and development of white oyster mushrooms. The too high or too low pH will affect the absorption of water and nutrients. It is even possible that other fungi will grow, which will interfere with the growth of the oyster mushroom itself. The optimum pH in the growing media ranges from 6 -7.

2.3.8. Altitude

The altitude suitable for the cultivation of white oyster mushrooms is 400-800 meters above sea level, but it can grow in lowland types with a cool climate or under shady trees (Soenanto, 2000). Oyster mushrooms in the lowlands can also grow as long as the temperature of the storage room can be regulated and adjusted to the needs of the mushroom (Nugraha, 2013).

2.4. Plant Hormones

Plant hormone is defined as non-nutritive organic compounds active in small quantities (10^{-6} - 10^{-5} mM). It is synthesized in certain parts of the plant. Generally, it is transported to other parts of the plant where they elicit biochemical, physiological and morphological responses. (Harahap, 2012).

Most plant physiologists use the term *plant growth substance* rather than *plant hormone*. Because the term can include both endogenous and exogenous (synthetic) substances that can change plant growth. Plant growth regulators (ZPT) produced by plants are called *phytohormones*,

while synthetic ones are called *synthetic plant growth regulators* (Harahap, 2012). Growth regulators are non-nutrient organic compounds that, in small amounts (l mM), can stimulate, inhibit and influence plant growth and development patterns (Wattimena, 2000).

Some growth regulators come from the plant itself (endogenous growth regulators) and are natural and some come from outside the plant and are called *synthetic*. Growth regulators are indispensable as a component of the medium for cell growth and differentiation. Without growth regulators, the growth of explants will be inhibited, maybe even not grow at all. According to the definition above, plant hormones must meet the following requirements, namely: organic compounds produced by plants themselves must be translocated, synthetic sites and work differently, active in low concentrations (Harahap, 2012).

2.4.1. Auxin

Auxin is defined as a growth substance that promotes elongation of coleoptile tissue in bio-assay experiments with *Avena* or other plants. Indole Acetic Acid (IAA) is an endogenous auxin or auxin found in plants. Auxin is a group of growth regulators that are very important in the cultivation of plant tissue. The more commonly used auxin groups are 2,4-D, IAA, NAA, and IBA. The most effective auxin to induce cell division and callus formation is 2,4-D with a concentration ranging 0.2-2 mg/1 for most plant tissues. NAA and 2,4-D are more stable than IAA, which are not easily decomposed by enzymes released by cells or due to heating during

the sterilization process. IAA is also less profitable because it quickly damage due to light and enzymatic oxidation. IAA and other Auxins play a role in various aspects of plant growth and development. Several aspects are briefly described as cell enlargement, inhibition of side shoots (at high concentration), abscission (leaf drop), activity of the cambium, and root growth. All of these effects are discussed as if IAA is the only phytohormones influencing these processes. It is now known that IAA interacts with other phytohormones such as gibberellins, cytokinins, ethylene and ABA in influencing various physiological processes (Harahap, 2012).

2.4.2. Synthetic Auxin

Hundreds of other compounds have been synthesized and tested for their auxin activity. Only a few compounds have biological activity. What is most necessary for a compound to have auxin activity? If you look at these compounds, they have the same size and shape. Furthermore, these compounds have a similar electron structure, where certain parts are more negative electrons than the other ones. The above properties are important for these compounds to arrange their molecules at certain parts in the cell. In addition to the things mentioned above, other factors affecting the activity of synthetic auxins are the ability of these compounds to penetrate the waxy cuticle or epidermis layer. The nature of translocation in plants, conversion of auxin to inactive compounds in plants (destruction or binding), interacts with other growth hormones, plant

species, growth phase, and environment (temperature, radiation, and humidity) (Harahap, 2012).

2.4.3. Atonic

One of the synthetic growth regulators is Atonic. Atonic contains active ingredients. Sodium para-nitrophenol 3.0 g/l, Sodium ortho-nitrophenol 2.0 g/l, Sodium 5-nitroguaiacol 1.0 g/l, Sodium 2-4 dinitrophenol 0.5 g/l, Indole Butyric Acid (0.057%) play an important role in the process of stimulating growth, increasing fruit weight and disease resistance (Agussalim et al, 2003).

The results of study by Azwar et al (2016) showed that the atonic concentration of 2.0 ml/liter of water had a significant effect on the growth and yield of shallots. It was best shown by an average plant height of 23.17 cm; an average number of leaves, 24.40-strands; number of tillers, 5.67-clumps; total dry weight of planting, 1.70-g ; number of bulbs per clump, 5.40; tuber weight per clump, 25.48 g; weight per tuber, 3.35 g; and tuber yield per hectare, 3.77 tons/ha.

Study by Lestari (2011) stated that there is an interactive effect between concentration treatment and atonic spraying interval on the diameter of shallot bulbs. Atonic with a concentration of 0.25 cc/l sprayed at the age of 15-20-25-30 days after planting can increase the diameter of shallot bulbs.

III. METHODOLOGY

3.1. Place and time of study

This study was performed at the Pondok Nusantara Experimental Garden, having address at Pondok Nusantara Housing, Jalan Balai Desa, Marindal Dua Village, Patumbak Sub-district, Deli Serdang District. It has height of 25 meters above sea level (masl). The study time started from March 2020 to June 2020.

3.2. Materials and Tools

The materials used in this study included F2 seeds of white oyster mushroom, atonic as a synthetic auxin (IBA 0.057%), mahogany sawdust, rice bran, corn flour, rice flour, lime (dolomite), cotton, and aquadest.

The tools used in this study were autoclave, Bunsen lamp, 1-ml dropper pipette, spatula, 2-kg polypropylene (PP) plastic, baglog ring, rubber band, kumbung building, drum (sterilizer), polyvinyl chloride (PVC) plastic), 3-kg LPG furnace and gas, 10-mesh sand sieve, knife, scissors, sprayer, measuring cup, syringe (10-ml size syringe), plastic bottle, newsprint, meter, shovel, 50-kg sack, baglog pressing tool, digital scales with a capacity of 10 kg, treatment and replication labels, camera devices, rulers, and stationery.

3.3. Method

This study was conducted by using a factorial completely randomized design (CRD) with two treatment factors, namely:

1. Atonic application time factor (A) with 4 levels, namely:

   A0: application at the time after inoculation

   A1: application 7 days after inoculation

   A2: application 14 days after inoculation

   A3: application 21 days after inoculation

2. Atonic concentration factor (K) with 4 levels, namely:

   K0 : aquadest 40 ml

   K1 : atonik 250 ppm

   K2 : atonik 500 ppm

   K3 : atonik 750 ppm

Thus, the number of treatment combinations is 4 x 4 = 16 treatment combinations, namely:

A0 K0	A1 K0	A2 K0	A3K0
A0 K1	A1 K1	A2 K1	A3K1
A0 K2	A1 K2	A2 K2	A3K2
A0 K3	A1 K3	A2 K3	A3K3

Based on the treatment combinations obtained, namely 16 combinations of treatments, the replication used in this study was calculated according to the minimum replication in a Factorial Completely Randomized Design (CRD) as follows:

$t (r - 1) \geq 15$

$16 (r - 1) \geq 15$

$16r - 16 \geq 15$

$16r \geq 15 + 16$

$16r \geq 31$

$r \geq 31 : 16 = 1,9$

so, r = 2 replications

Based on the description above, the study findings include:

Number of treatments	: 16 treatments
Number of repetitions	: 2 replications
Number of baglogs per treatment	: 3 baglogs
Number of sample baglogs per treatment	: 2 baglogs
Total number of sample baglogs	: 64 baglogs
Total number of baglogs	: 96 baglogs

3.4. Analytic Method

After the study results were obtained, data analysis was performed by using a Factorial Completely Randomized Design (CRD) with the linear method formula assumed for a Factorial Completely Randomized Design (CRD) as follows:

$Yijk = \mu + \alpha i + \beta j + (\alpha\beta)ij + \Sigma ijk$

(i = 1,2,3.....; j = 1,2; k = 1,2,3.....)

Where:

$Yijk$ = observed white oyster mushroom response

μ = general mean

αi = i-level influence of factor A

βj = j-th level effect of factor B

(αβ)ij = the interaction effect of the i-level of factor A and the j-th level of factor B

ijk = residual effect (experimental error) level i of factor A and level j-th of factor B on the k-th replication

If the treatment results of this study have a significant and very significant effect, then further testing would be done by the Duncan distance test (Gomez and Gomez, 2010).

3.5. Performance

3.5.1. Kumbung Preparation

In preparing the kumbung, the thing to consider was that the condition of the kumbung had to have a strong and closed foundation and wall to avoid external disturbances such as wind and white oyster mushroom pests. In this study, the kumbung used was quite well available. The walls were made of bamboo booths with the top of the wall connected to a *paranet* aiming to ensure good air circulation in the kumbung. The roof of the kumbung used corrugated zinc. Shelves for laying Mushrooms made of bamboo were arranged lengthwise as many as 6 sides of the shelves with a capacity of 160-200 baglog/side of the shelves with the baglog position arranged in the same direction without a pile of baglogs and the ground floor.

3.5.2. Making of Planting Media

The growing media of white oyster mushroom was made systematically through several stages, including:

To make the growing media of white oyster mushroom (substrate), it was necessary to provide some mixed materials consisting of 100-kg mahogany sawdust, 15-kg rice bran, 5-kg corn flour, 5-kg rice flour, and 3-kg lime. Figure 2 shows the provided materials.

Figure 2. Materials to Make the Planting Media of White Oyster Mushroom, Description: A. Sawdust Mahogany, B. Bran, C. Corn Flour, D. Rice Flour, E. Lime
Source: Personal Documentation

The used mahogany sawdust was waste of the processing of the furniture factory taken in a smooth state, cleaned of unwanted foreign objects and put in a 50-kg capacity sack, if the condition was still wet, it had to be dried first. After that, the mahogany sawdust was sieved by using a 10-mesh sand sieve. In principle, sieving was done to uniform the size of mahogany sawdust. This was done so that the mixing of mahogany sawdust with other ingredients could be mixed evenly. Besides that, it was

expectable that the growth of mycelia on the planting media after inoculation could grow well and evenly.

Sawdust of mahogany wood sifted as much as 100 kg was then mixed with 15 kg of rice bran, 5 kg of corn flour, 5 kg of rice flour, 3 kg of lime on a ceramic floor, stirred by using a shovel and added water until the mixture was evenly distributed and did not crumble when gripped. (Figure 3).

Figure 3. Mixing the Planting Media of White Oyster Mushroom
Source: Personal Documentation.

After mixing evenly, the planting media (substrates) were covered with a tarp for 3 days.

3.5.3. Filling of Plant Media into Polypropylene Plastic (PP)

Planting media (substrates) already covered with a tarp for 3 days were opened. Then, as much as 2 kg of mixed planting media were taken

by using a piece of pipe already modified and then the planting media were inserted into polypropylene plastic (PP). Figure 4 shows it.

Figure 4. Filling of Planting Media of White Oyster Mushrooms into Polypropylene (PP) Plastic.
Source: Personal Documentation

Furthermore, the planting media already put into polypropylene (PP) plastic was placed. It was also pressed on the baglog pressing tool to compact the planting media. Figure 5 shows it. Then, the polypropylene (PP) plastic neck was given a ring made of cut hose on the plastic mouth given a piece of newsprint and tied by a rubber band.

Figure 5. Pressing the Planting Media of White Oyster Mushroom into Baglog, Description: A. Laying Baglog on Pressing Equipment, B. Pressing is done on Planting Media into Baglog.
Source: Personal Documentation

3.5.4. Sterilization and Cooling

After filling the planting media, the baglog was sterilized. Sterilization was performed by using a drum-shaped device with a capacity of 149 baglog/drum attached to an iron filter or bulkhead to separate the water (bottom) and baglog (top). Then, the sterilizer was covered with polyvinyl chloride (PVC) plastic as shown in Figure 6 (A). Sterilization was performed at 100 °C for 8 hours using hot water. The sterilized media were cooled for 24 hours in a tiled-floored room as shown in Figure 6 (B).

Figure 6. Sterilization and Cooling, Description: A. Planting Media Sterilization Process, B. Planting Media Cooling Process.
Source: Personal Documentation

3.5.5. Inoculation

Inoculation is the process of planting the mycelium F2 of white oyster mushrooms bred on corn media into baglog media. Figure 7 shows it.

Figure 7. Inoculation, Description: A. F2 Seed of White Oyster Mushroom, B. Process of Inoculation of Seeds on Planting Media.
Source: Personal Documentation.

This was done by moving a small portion of the mycelium to the top of the baglog using a spatula and in the inoculation room. Tools and rooms used to transfer seedlings had to be sterilized first so that the media already inoculated was not contaminated. Sterilization of tools used 96% alcohol.

3.5.6. Incubation

Incubation is the process of storing baglog already inoculated and placed in a closed room condition so that the fungal mycelium could grow and propagate on the substrates. After inoculating, the white oyster mushroom baglog was transferred to the study location at the Pondok Nusantara Experimental Garden for incubating. Figure 8 (A) shows it. Incubation was performed by arranging baglogs on a shelf in a kumbung

with baglogs arranged in one direction and not stacked and then there was a distance between treatments. Figure 8 (B) shows it.

Figure 8. Incubation of White Oyster Mushroom Baglog, Description: A. Transfer of Baglog to the Study Location, B. Incubation of White Oyster Mushroom after transferring to the Study Location.
Source: Personal Documentation.

Substrate media in baglog would appear white evenly between 28-38 days after inoculating. Mycelium that did not grow could be seen if, after 2 weeks, the media was incubated, there were no signs of white mushroom mycelium creeping, then the inoculation was not successful. Baglog whose mycelium was already white and had thickening then the ring was opened/bonded so that the mushroom could grow and emerge from the baglog. The ring opening was done 41 days after the inoculation/substrate media had been filled with mycelium. White oyster mushroom incubation during the study can be seen in Appendix 48, Figure 5.

3.5.7. Atonic Application

Synthetic auxin was administered after inoculation (A0), application 7 days after inoculation (A1), application 14 days after inoculation (A2), and application 21 days after inoculation (A3) in a concentration of 40 ml of distilled water (K0), atonic 250 ppm (K1), 500 ppm atonic (K2), and 750 ppm atonic (K3) dissolved in 1 liter of aquadest. Figure 9 shows direction of application.

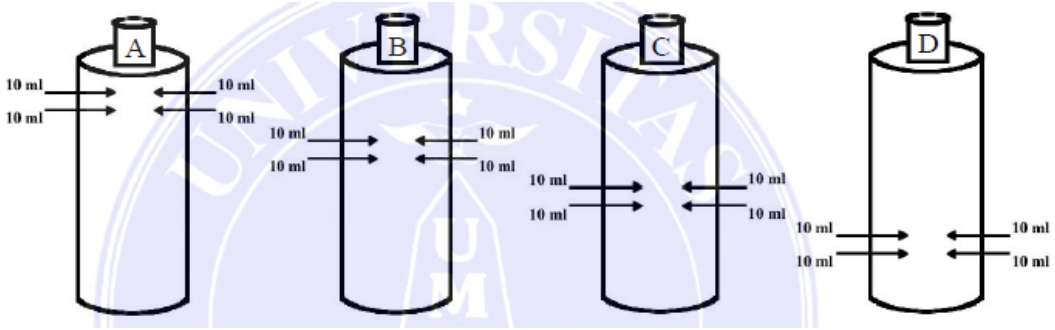

Figure 9. Direction of Atonic Application on White Oyster Mushroom Baglog, Description: A. Application After Inoculation, B. Application 7 Days After Inoculation, C. Application 14 Days After Inoculation, D. Application 21 Days After Inoculation.
Source: Personal Documentation.

Atonic application was given only once for each treatment by injecting 4 points of syringe into baglog in a solution volume of 10 ml at each point (total 40 ml/baglog) on each side of baglog that had not been covered with mycelium using a syringe (10 ml syringe). Appendix 48, Figure 2 shows atonic application during the study.

3.5.8. Watering and Fogging

Watering was done by flushing the kumbung mushroom floor in water using hoses and buckets (6 buckets during the day and 4 buckets in

the afternoon). It aimed to maintain the temperature and humidity in the kumbung room. Fogging was done by spraying clean water around the baglog and kumbung roof location using a sprayer (2-liter size).

3.5.9. Insertion

To overcome the occurrence of several failures to grow on the planting media (baglog), a backup planting media (baglog) were needed in accordance with the treatment of growing media of oyster mushroom. Therefore, it took as many as 32 baglog of backup plants. Insertion was done until the baglog was 6 weeks old.

3.5.10. Pest and Disease Control

Pest control was performed in a preventive way, namely by maintaining the cleanliness of the kumbung, baglog and baglog laying racks. Then, put some scent traps and bits of rat poison. Disease control was performed by manually removing baglogs suspected of being contaminated by disease.

3.5.11. Harvesting

Harvesting was done on the fruit body that had been 3 days old from the beginning of *pin-head* with the characteristic of the curled tip of the lid but the lid was not yellow. Figure 10 (A) shows it.

Harvesting could be done by holding from the base of the fruiting body then turning it to the side and pulling it slowly. After that, making sure that there were no remaining mushrooms left in the baglog, harvesting can

be seen in Figure 10 (B). The harvesting process during the study on the 1st and 2nd harvests can be seen in Appendix 48, Figure 4.

Figure 10. Harvesting, Description: A. White Oyster Mushroom at Age 3 Days After Pinhead Appeared, B. Harvesting White Oyster Mushroom.
Source: Personal Documentation

3.6. The Observed Parameters

3.6.1. Mycelium Time Covered the Entire Baglog (DAI)

The time of mycelium covering the entire baglog was counting the full days of the mycelium covering the substrate in the baglog (100%) since the inoculation had been performed. It was carried out by counting the total number of baglogs in each of treatments, which were entirely overgrown with white oyster mushroom mycelium. The time of mycelium covering the entire baglog was calculated when the white oyster mushroom mycelium was 6 weeks old (42 days after inoculation) or when

the baglog was completely covered with 100% mycelium. The full time of baglog covered with mycelium was calculated by the following formula:

$$\text{Full time baglog covered with mycelium} = \frac{\text{Number of baglogs covered with mycelium}}{\text{Total number of oyster mushroom baglog}} x\,100\%$$

3.6.2. Mycelium Growth Covering the Substrate (cm/sample)

The growth of white oyster mushrooms covered the length of the mycelium. At first a small portion of the mycelium already inoculated on the front of the baglog would propagate and gradually fill the substrate to the bottom of the baglog. It was marked by a white substrate due to being covered by the white oyster mushroom mycelium.

This observation was carried out by measuring the length of the mycelium from the top of the baglog to the growth limit (bottom of the baglog). Measurements were made on each side of the baglog (4 sides) and then calculated the average. Measurement of this mycelium used a ruler with units of centimeters (cm). The first observation was carried out 7 days after inoculation in the distance between subsequent observations every 7 days until the mycelium growth filled the baglog. Mycelium growth was observed until the mycelium covered the entire baglog in each treatment. Appendix 48, Figure 3 shows observation of the growth parameters of the mycelium covering the substrate.

3.6.3. Age of Emergence of Fruiting Body (*pin head*) (DAI/sample)

The prospective fruiting bodies or *primordia* (*pin head*) were small circles appearing around the mouth of the baglog. The day the fruiting body would appear was counted from the time of inoculation until the

formation of the fruit body (*pin head*). The time of emergence of the ovules at the first harvest was 51 days after inoculation (DAI) and at the second harvest 66 days after inoculation (DAI).

3.6.4. Number of Fruiting Body (fruit/sample)

The number of fruiting bodies was counted at harvest for each treatment. It included large, medium and small fruit bodies.

3.6.5. White Oyster Mushroom Fruit Size (*Pleurotus ostreatus*)

3.6.5.1. Lid Diameter (cm/sample)

The measurement of the diameter of the hood was carried out at harvest by measuring the hood from the mushroom sample. The measurement of the diameter of the cap of the white oyster mushroom was carried out horizontally from right to left, then vertically from top to bottom and then the average value of the two was taken. This diameter measurement was carried out on three white oyster mushroom caps seen visually and selected to have good size.

3.6.5.2. Stem Length(cm/sample)

Stalk length was measured at harvest by measuring the length of 3 stalks of white oyster mushrooms with good visual form. The length of the stalk was measured from the base to the tip of the stalk intersecting with the white oyster mushroom hood in centimeters (cm).

3.6.6. Harvest Wet Weight (g/sample)

Harvesting was done when the mushroom growth reached the optimal level, which was quite large and the tip of the hood had curled but

the hood was not yet yellow. The first harvest was carried out at 54 days after inoculation (DAI) and the second harvest was carried out at 69 days after inoculation (DAI). The harvested wet weight included the overall physical form of the mushroom, starting from the base of the fruiting body with a bit of mycelium to the fruit hood cleaned of the remnants of the substrate media and then weighed. The weighing process can be seen in Appendix 48, Figure 6.

V. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

1. The effect of atonic application time had no significant effect on the growth of mycelium covering the substrate, age of emergence of fruiting bodies, number of fruit bodies, cap diameter, stalk length, and wet weight of harvest, but the length of time mycelium covered the entire baglog was different in several treatments with mycelium closure reaching 100%.
2. The effect of atonic concentration had no significant effect on the growth of mycelium covering the substrate, age of emergence of fruiting bodies, number of fruiting bodies, hood diameter, stalk length, and wet weight of harvest, but the length of time the mycelium covered the entire baglog was different in several treatments with mycelium closure reaching 100%.
3. The effect of the combination of treatment factors, application time and atonic concentration had no significant effect on the growth of mycelium covering the substrate, age of emergence of fruiting bodies, number of fruit bodies, hood diameter, stalk length, and wet weight of harvest. However, the length of time the mycelium covered the entire baglog was different in some treatments with mycelium closure reaching 100%.

5.2. Recommendation

1. In relation to production, the author recommends use of atonic as a synthetic auxin with an application time of 21 days after inoculation (DAI) (A3 treatment) and can use atonic with a concentration of 750 ppm (K3 treatment).
2. It is recommendable to do further studies on use of atonic as a synthetic auxin in concentration lower or below 250 ppm and control of *Cocyra cephalonica* pests attacking white oyster mushrooms.

5.3.

PROOFREADING

1.	good	:	excellent
2.	right	:	correct
3.	hard	:	complex
4.	longer	:	more extended
5.	a fresh	:	a new
6.	very good	:	excellent
7.	useful	:	helpful
8.	little	:	bit of
9.	quite	:	relatively
10.	greater	:	more significant
11.	started	:	has started
12.	a edible	:	an edible
13.	large	:	the large
14.	opportunity	:	an opportunity
15.	cultivation	:	the cultivation
16.	considerable	:	considered
17.	White	:	The white
18.	treatment	:	the treatment
19.	high value	:	High-value
20.	unite	:	unites
21.	slightly	:	slight
22.	shape	:	shapes
23.	hormone	:	hormones
24.	substances	:	substance
25.	promote	:	promotes
26.	concentration	:	a concentration
27.	growth	:	a growth
28.	these have	:	they have