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Article

A Study on the Fungus *Agaricus bisporus* and Observing the Effect of Cultivation Periods and Cultivation Media on the Growth of This Fungus

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Abstract: The study aimed to know the effect of different culture media and cultivation period on the growth of fungus *Agarigus bisporus*, and cultivation was done on Petri dishes using different culture media containing nanomaterials (PDA medium (comparative), medium containing wheat bran, medium containing wheat bran nanoparticles, Cultivation medium containing compost extract, culture medium containing nanocompost extract). The results showed an increase in the growth of the fungus *Agaricus bisporus* during 15 days of the experiment period, and the growth increased due to the superiority of all treatments with significant differences, and the use of these media led to an increase in the productivity of the fungus in all types of culture media used under study. No significant differences appeared between the average cultivation period for the samples under cultivation in the period 5 and 10 days, while they appeared on the 15th day.

Keywords: culture media, *Agaricus bisporus* growth, compost, growth, PDA

1. Introduction

The world, especially developing countries, is going through serious problems in order to face the problem of food availability due to population increase, and therefore it was necessary to provide alternative ways to provide it. Mushrooms are among the important vital components of the ecosystem, as they rank second in terms of biodiversity, because they do not contain chloroplasts. Thus, they do not perform photosynthesis, and must be provided with food in the form of simple particles, and thus they enter the cycle of organic matter and contribute to increasing nitrates in the soil and improving its texture and physical and chemical properties [1].

Currently, more than 2,000 types of edible fungi are known in the world, 200 of which are used in food, and 30 of them are grown worldwide as a commercial material. ostreatus, which represents 14% of world production [2].

The common mushroom has a complicated taxonomic history. It was first described by English botanist Mordecai Cubitt Cooke in his 1871 *Handbook of British Fungi*, as a variety (var. *hortensis*) of *Agaricus campestris*. Danish mycologist Jakob Emanuel Lange later reviewed a cultivar specimen, and dubbed it *Psalliota hortensis* var. *bispora* in 1926. In 1938, it was promoted to species status and renamed *Psalliota bispora* [3]. Emil Imbach (1897–1970) imparted the current scientific name of the species, *Agaricus bisporus*, after the genus *Psalliota* was renamed to *Agaricus* in 1946. The specific epithet *bispora* distinguishes the two-spored basidia from four-spored varieties [4].

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The mushroom, *A. bisporus*, is characterized by its low content of calories and sugars, in addition to containing a large amount of protein. Which makes it a good choice for people who follow a vegetarian diet, as it is a natural source of vitamin D2 due to its exposure to ultraviolet rays or sunlight, which contributes to raising vitamin D levels in the blood, and it should be noted that the body converts vitamin D2 into an effective form. Of vitamin D, which helps absorb calcium and maintain bone strength, and white mushrooms also contain many other nutrients such as: essential amino acids, peptides, polysaccharides, and lipopolysaccharide compounds. Glycoproteins, nucleosides, triterpenoids, fatty acids, and lectins, in addition to being rich in antioxidants, have antimicrobial activity, and may contribute to reducing the risk of certain diseases such as high blood pressure, diabetes, and cancer [5].

Food fungi are divided into two types according to the nature of their first feeding, primary decomposing fungi, which grow on media and agricultural residues that contain a percentage of cellulose and lignin, and are characterized by having an enzyme system that has the ability to analyze the components of the medium to feed on it, as in the types of oyster mushrooms *Pleurotus* spp. The second category is the secondary decomposing fungi, as in the agricultural mushrooms of the genus *Agaricus*, that live on agricultural media decomposed by microorganisms called compost.

The study aimed to study the effect of different culture media and for different periods of time on the growth of the fungus *Agarigus bisporus*.

2. Materials and Methods

1. Collecting samples: The study was conducted in the fungi laboratory in (Department of Life Sciences / College of Education for women/ University of Tikrit), and mushroom samples were collected from the local market and diagnosed in (University of Tikrit / College of Agriculture / Department of Field Crops).
2. Cultivation was carried out on Petri dishes (tissue culture and spores) using different culture media containing the following nanomaterials: (PDA medium (comparison), medium containing wheat bran, medium containing wheat bran nanoparticles, culture medium containing compost extract, medium My seed contains nanocompost extract).

   Total number of transactions: 2 * 7 = 14 transactions

   Each treatment is repeated five times

3. Growth indicators, including: success rate of transplants, speed of spread and growth, fungal colony diameter.
4. Statistical analysis: Experiments were carried out according to CRD design, and averages were tested according to ANOVA analysis using Tukey's test.

3. Results and Discussion

Table 1 shows an increase in the growth of the fungus *A. bisporus* during 15 days of the experimental period using different culture media (Figure 1, 2, 3, 4, 5). The growth increased due to the superiority of all treatments with significant differences. The use of these media led to an increase in productivity. fungus in all types of culture media used under study. In general, no significant differences appeared between the average cultivation period for the samples under cultivation in the period 5 and 10 days, while they appeared on the 15th day.

The increase in mushroom productivity when using different types of culture media can be attributed to the high content of protein and oils, and this is consistent with studies

that indicated the stimulating effect of these substances on fruiting and increased production either through increasing the number of primordial fruiting bodies, or through increasing the size of bodies fruits [6], [7]. This is consistent with studies conducted on various carbon sources, from complex to simple, of mycelium growth media for food fungi *Lentinus tuberregium, Agaricus bisporus*, indicating that monosaccharides of glucose, fructose, and dextrose gave the largest biomass of mycelium [8], [9].

Also, the reason for the increase in the success rate of tissue culture may be due to synthetic media that contain the nutrients necessary for the growth of fungi. And it agrees with Sati and Bisht (2006) when they used a group of carbon sources in the culture media to isolate four types of fungi: *Tetracheatum elegans, Marshalianum Tetracladium, Pestalotiopsis submerses,* and *Flagellospora penicillioides*, and the sugars were glucose, fructose, sucrose, xylose, cellulose, dextrin, and Lactose [10].

It also agrees with Fasidi *et al*. (1994) when testing a range of carbon sources in the culture medium of mono, poly, poly and alcoholic sugars, which included glucose within the group of monosaccharides, starch and extract Malt within the polysaccharides on the trophic fungus rigem-tuber Pluerotus, where it was found that the medium Which contains glucose, in which the growth density of mycelium reached 110/30 ml on the basis of dry weight, while the growth density of this fungus for each of the media containing starch and extract Malt reached 7.56/30 ml on the basis of dry weight [11].

Table 1. The effect of different culture media and cultivation period on the growth of *Agarigus bisporus* for different periods of time

Culture Media	**Cultivation Period**			**Mean of Culture ype**
	5 day	**10 day**	**15 day**	
PDA	12 c A	16 b A	20 a A	16.0 A
The planting medium contains 25 gm crushed compost	11 b A	13 b B	16 a B	13.3 B
The culture medium contains 5g of crushed nanocompost	c B8	2 b B1	a B16	12.1 B
The culture medium contains 2.5 gm of crushed nanocompost	7 c B	10 b C	14 a C	10.3 C
The culture medium contains 0.25 gm of crushed nanocompost	5 c C	8 b D	12 a D	8.3 D
Average duration of cultivation	10.6 b	11.8 b	15.7 a	

- Small letters that are similar horizontally mean that there are no significant differences between them
- Similar capital letters in one column mean that there are no significant differences between them

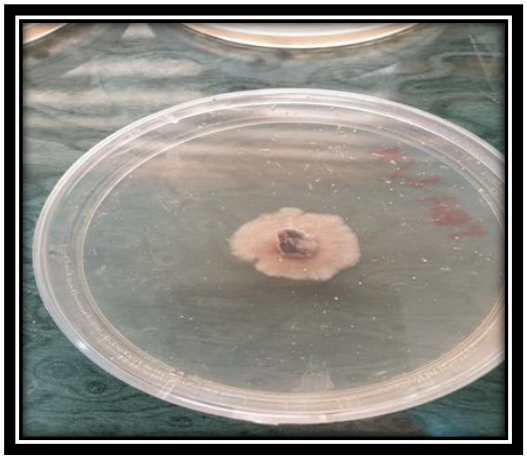

Figure 1. PDA media

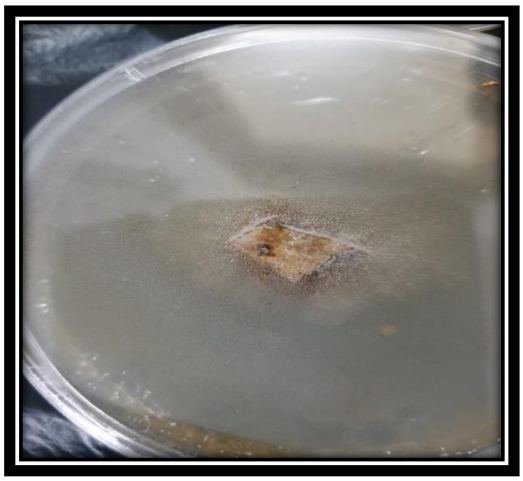

Figure 2. Media contains 0.25 gm of crushed nano-compost

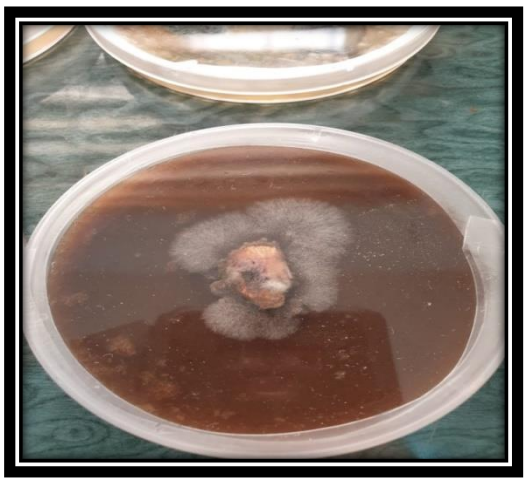

Figure 3. Media medium contains 25 gm crushed compost

Figure 4. Media contains 5g of crushed nano-compost

Figure 5. Media medium contains 2.5 gm of crushed nano-compost

4. Conclusion

The study highlights the significance of culture media composition and cultivation period in enhancing *A. bisporus* growth and productivity. These insights contribute to understanding optimal conditions for mushroom cultivation, potentially improving agricultural practices and addressing food availability challenges.

Further research could focus on refining culture media formulations and investigating additional factors affecting mushroom growth to maximize productivity and meet the increasing demand for food resources.

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