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Research Article

Oyster Mushroom Cultivation Through Agricultural Waste Amendment and Application of Misting Concoctions

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ABSTRACT

Despite extensive studies on mushroom cultivation using agricultural residues, the influence of integrating agricultural waste substrates with natural misting treatments on growth performance, product quality, and sustainability has not been thoroughly explored. This study was therefore conducted to compare the yield performance of two oyster mushroom species, *Pleurotus ostreatus* and *Pleurotus sajor-caju*, grown on substrates supplemented with local agricultural wastes. It also explored the use of organic misting concoctions to enhance quality and yield. The study was conducted at San Martin, Pangantucan, Bukidnon from August 2022-2023. Results revealed notable differences in the cap diameter of the two species, with *P. ostreatus* (A1) exhibiting the largest cap size. However, varying agro-waste materials and misting concoctions did not significantly impact cap diameter. In terms of fruiting bodies, *P. ostreatus* (A1) produced the highest number, with substrates amended with corn stalks (B4) yielding the most fruiting bodies, followed by corn cobs (B3). Despite this, misting concoctions did not show a significant effect on fruiting body production. While yield did not show significant differences between species, *P. ostreatus* (A1), however, achieved the highest yield weight. The different agricultural wastes also did not significantly influence yield. The interaction between agricultural waste materials and misting concoctions did not affect cap diameter and yield but significantly influenced the number of fruiting bodies. The best results were obtained when *P. ostreatus* was grown on corn cob amended substrates and misted with Indigenous Microorganism (IMO) (A1xB3xC1), resulting in larger caps, more fruiting bodies, and higher yield and Return of Investment (ROI).

Keywords: Pleurotus ostreatus, *Pleurotus sajor-caju*, agricultural wastes, misting, concoctions

1. INTRODUCTION

Oyster mushrooms (*Pleurotus* spp.), commonly known as pearl oyster mushrooms, are among the most widely cultivated mushroom varieties globally. These fungi are efficient lignin degraders and are found across the world, particularly thriving in subtropical and temperate forest regions. In the Philippines, mushroom farming has been practiced since the 19th century, and many other countries have also embraced mushrooms as both a flavorful and nutritious food ingredient.

Today, mushroom producers use a variety of mushroom culture tactics to boost oyster mushroom development. Mushroom cultivation can be a big source of income through rural development programs for farmers if made aware of its cultivation process and its importance.

Additionally, it is highly adaptable to a variety of agro-climatic situations on a variety of agricultural wastes. The substrates used to grow the mushrooms can also be used as biofertilizers to improve soil fertility, as animal feed, and as fuel for the production of biogas. For this reason, mushroom cultivation is known to be environment-friendly because it has no negative effects on the environment when compared to the cultivation of other crops. Temperature, humidity, and the sterility of the substrates are just a few of the variables that affect mushroom cultivation and can work alone or in conjunction with one another.

Oyster mushroom has been cultivated using various agricultural wastes such as rice straw and wheat straw (Yang et al., 2013; Rezania et al., 2017), date-palm leaves (Alananbeh et al., 2014), empty fruit bunch (Marlina et al., 2015), olive cake (Ananbeh and Almomany, 2005), tomato tuff (Ananbeh and Almomany, 2008), banana leaves and pine needles (Ananbeh, 2003), and sugarcane bagasse (Hasan et al., 2015). In mushroom cultivation, the typical commercial industry focuses on profit in terms of the most effective, low-cost, and locally available mushroom substrate materials (Fatriasari et al., 2016).

Mushroom cultivation not only helps to reduce protein deficiency, especially in developing countries but also increases the income of the rural poor people. By taking into consideration food and nutrition security problems in some countries, mushroom production could be an alternative source to overcome these problems. In addition, a livelihood can be improved because the demand for mushrooms has been increasing due to increasing population, market expansions, and changing consumer behavior (Celik and Pekker, 2009).

This research was intended to search for locally available substrates suitable for the cultivation of *Pleurotus ostreatus* and *Pleurotus sajor-caju* and determine the organic concoction for misting oyster mushroom fruiting bags that will provide quality and high yield to help rural communities in the Philippines.

Specifically, this study aimed to evaluate the yield performance of two oyster mushroom species grown on substrates amended with locally available agricultural wastes, determine the efficacy of organic concoctions for misting the oyster fruiting bags that will provide quality and high-yielding mushrooms, and determine the cost and economic return of mushroom production.

2. METHODOLOGY

Experimental Design and Treatments

The research was conducted using a 2 x 4 x 4 factorial experiment arranged in Completely Randomized Design (CRD). The two species of oyster mushroom were assigned as Factor A (A_1 - *Pleurotus ostreatus* and A2 - *Pleurotus sajor-caju*), the different agricultural waste amendments were assigned as Factor B (B0 - Sawdust-Rice bran substrate as Control, B1 - rice straw, B2 - corn cobs, B3 - corn stalks), while the different misting concoctions were for factor C (C1 - 20 ml of Indigenous Microorganism/L water, C2 - 20 ml of Fermented Fruit Juice /L water, C3 - 20 ml of Fermented Plant Juice/L water, and C4 - tap water as Control).

Isolation of *Pleurotus* species

Newly collected, healthy fruiting bodies of oyster mushrooms *(P. ostreatus* and *P. sajor*-caju) were disinfected with 70% ethyl alcohol before being cut into several pieces. The tissue between the cap and the stalk was cut into 1 cm cubes (1 cm^3) with the use of a sterilized scalpel and placed in the middle of a Potato Dextrose Agar (PDA) plate. PDA plates for each species were subjected to incubation at room temperature until full mycelial growth was observed.

Preparation of Grain Spawn and Inoculation of *P. ostreatus/P. sajor-caju*

The manually cleaned grains of sorghum were boiled until the grains were about to burst. The boiled sorghum seeds were transferred to sterilized flat bottles of about 2/3 full. The bottles were sealed using cotton, together with aluminum foil. Thereafter, the bottles with grains were

sterilized using an autoclave for about 1 hour at 15 PSI (pounds per square inch) and then allowed to cool down. The bottles with sorghum seeds were used for the inoculation of the pure culture of *P. ostreatus* and *P. sajor-caju*. These were incubated until the grains were fully covered with white mycelia.

Preparation of the Different Agricultural Wastes

The different agricultural wastes, namely rice straw, corn cobs, and corn stalks, were separately collected and air-dried, then chopped into small pieces (1/2 inch). These were stored separately in clean sacks and then set aside.

Preparation of Sawdust-Rice Bran Mixture (standard substrate)

A sawdust-and-rice bran mixture was used as the main component mixture for the mushroom fruiting bag. It is composed of 20% rice bran, 1% sugar, 1% lime, and 78% sawdust. The different agricultural wastes, previously chopped, were added (as 20%) and mixed into the sawdust-rice bran mixture. The basis for this amount was the study conducted by Zervakis et al. (2013). The mixture was moistened and covered with a clean canvas. The heap was mixed and turned every 2 days. After 7 days, the mixture was ready for bagging.

Filling the Bags

Propylene plastic bags (6" x 12" x 0.02 mm) were used for bagging the substrates. The substrate mixture was packed and placed inside the bag, then closed tightly with a rubber band.

Sterilization of the Fruiting Bags Substrate

Mushroom fruiting bags were carefully piled inside the aluminum drum (as an improvised sterilizer) for 8 hours. After sterilization, the substrates were allowed to cool down at room temperature for 24 hours.

Inoculation of the Two Oyster Mushroom Species on the Fruiting Bags

Inoculation of the different species of oyster mushrooms spawn into fruiting bags was done aseptically. First, the grain spawns in the bottle were stirred using a long, flat-end needle previously flame-sterilized. The sterilized fruiting bags were gently opened and slowly filled with approximately 10 g of the grain spawn. The newly inoculated bags were slightly tilted to distribute the spawn equally in the shoulder area of the bag around the neck. A cotton plug and a rubber band were used to seal the bag.

Preparation of the Fruiting Bags Shelf

After spawning, the mushroom fruiting bags were transferred to the wooden shelves for incubation while waiting for the fruiting bags to be fully covered with mycelia. The fruiting bags were arranged following the experimental layout. The shelves with the fruiting bags were separated according to treatments and replications to control the spread of contaminants, as well as prevent mixing up of concoctions during misting. This was aided by using a plastic material that served as a barrier between treatments.

Preparations of the Different Concoctions for Misting Indigenous Microorganism (IMO)

A kilo of cooked rice was placed into a clean container. The mouth of the container was entirely covered with clean paper and sealed with a rubber band to prevent water or small insects from getting in. The covered containers were placed under a bamboo grove and left for three days. The entire contents of the container were transferred to a large jar that was added with one kilo of molasses and thoroughly mixed using a wooden spoon. The container was covered with a clean cloth and sealed with a rubber band. The container was kept in a dark, cool place and was fermented for seven days.

Fermented Fruit Juice (FFJ)

The Fermented Fruit Juice (FFJ) was prepared from 1 kilogram of squash fruit. The squash fruit was first washed with clean water before chopping into small cubes. The chopped squash was placed in a container and mixed with 1 kilogram of molasses. The mixture was placed in a cloth bag. This was done so that the extracted juice would ooze out from all sides of the bag. The container was covered with paper and tied with a rubber band. The container with the bagged mixture was stored for 7 days in a cool, dry shady place. After 7 days, the plant juice was extracted and fermented for 7 days.

Fermented Plant Juice (FPJ)

Fermented Plant Juice (FPJ) was made from sweet potato leaves. The sweet potato leaves were first cleaned in tap water and weighed. The leaves were chopped into small pieces and mixed with molasses at a 2:1 ratio. The juice was extracted and fermented after storage for a period of 7 days. The container was stored in a cool, dry, shady place. The container was covered with paper to allow the gas to escape during further fermentation.

Opening of Fruiting Bags and Application of the Different Misting Concoctions

The opening of the fruiting bags was done after the fruiting bags were fully colonized with the mycelia. Each bag was opened using a sharp blade to cut the neck portion of the fruiting bag. The application of different misting concoctions was done by spraying once a week at three times application (early morning, noontime, and afternoon). Succeeding applications within the week were done by spraying tap water on the fruiting bags daily to maintain the required moisture. The different misting concoctions were diluted at 2 ml per liter of water. This was measured at 250 ml and sprayed on each of the replications using a hand sprayer.

Harvesting

Matured mushroom fruiting bodies were harvested manually (handpicked) and placed in properly labeled containers. Fruiting bodies were gathered when the caps were fully grown or developed. The number of fruiting bodies was counted per bag, and mushroom cap samples were collected for each treatment. The total yield for each treatment was recorded within two months of flushing.

Data Gathered and Statistical Analysis

Data gathered include cap diameter (mm) using a ruler, number of fruiting bodies, mushroom yield (g) using a digital weighing scale, and Return of Investment (ROI). All the data gathered were organized and tabulated accordingly and subjected to Analysis of Variance (ANOVA). The treatment means were compared using Tukey's HSD Test procedure.

3. RESULTS AND DISCUSSION

Yield performance of *P. ostreatus* and *P. sajor-caju* grown on substrate amended with agricultural wastes and misted with different organic concoctions

Table 1 summarizes the mean cap diameter, number of fruiting bodies formed, and the fresh mushroom weight produced at 2 months of flushing. Statistical analysis revealed a highly significant difference in the cap diameter produced by the two oyster mushroom species (A). However, no significant difference was observed between the different substrates supplemented with various agricultural wastes (B) and the use of different concoctions (C).

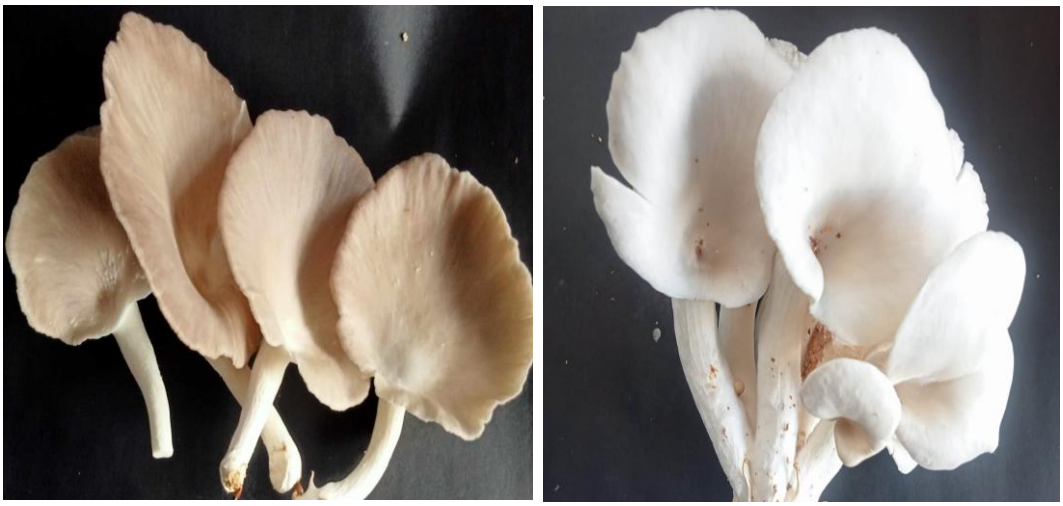
Table 1. Performance of oyster mushroom species (P. oystreatus and P. sajor caju) grown on different substrates supplemented with different waste materials and applied with different misting blends.

TREATMENTS	CAP DIAMETER (mm)	NUMBER OF FRUITING BODIES	WEIGHT (g)
A (Mushroom species)			
A1- *Pleurotus ostreatus*	63.12a	112.06a	678.38
A2- *Pleurotus sajor-caju*	55.47b	74.10b	589.44
F-test	**	**	ns
B (Waste Materials)			
B1 –Control (Standard Substrate)	59.80	82.08ab	634.33
B2- Rice Straw	59.88	78.83b	568.33
B3- Corn Cobs	57.17	103.96ab	679.00
B4- Corn Stalks	60.34	108.46a	653.96
F-test	ns	**	ns
C (Concoctions)			
C1 - IMO	58.74	103.36	663.92
C2- FFJ	60.06	85.58	561.79
C3 - FPJ	58.99	92.12	690.42
C4 – Water (Control)	59.40	91.25	619.50
F-test	ns	ns	ns

Means in a column followed by the same letter are not significantly different at 5% level of probability (HSD).

** highly significant

ns non-significant



(A) (B)

Figure 1. Fresh samples of oyster mushroom caps of *P. ostreatus* (A) and *P. sajor caju* (B)

Cap Diameter (mm)

The freshly harvested mushroom caps were collected from each treatment and each cap diameter was measured. The representative cap is shown in Figure 1. The mean cap diameter of the mushrooms is presented in Table 1. The two mushroom species (Factor A) exhibit significant main effects on cap diameter. The different agricultural wastes (Factor B) and concoctions (Factor C) did not demonstrate a significant main effect.Results showed that the cap diameter of *P. ostreatus* (A1) significantly exhibited the biggest cap size with a mean value of 63.12 mm, while the smallest cap was observed in *P. sajor-caju* (A2) with 55.47 mm in diameter. Conversely, the cap diameter of mushroom grown from substrates supplemented with different agricultural wastes showed no significant difference. This further implies that the cap diameters of the different mushroom species, respectively, were not influenced by the different substrates supplemented with agricultural wastes. The average cap diameter ranges from 57.17 mm (B3-Corn cobs) to 60.34 mm (B4-Corn stalks). Likewise, the use of the different misting blends did not influence the cap diameter sizes of the mushroom. Cap diameter ranges from 58.74 mm (C1-IMO) to 60.06 mm (C2-FFJ).

Number of Fruiting Bodies

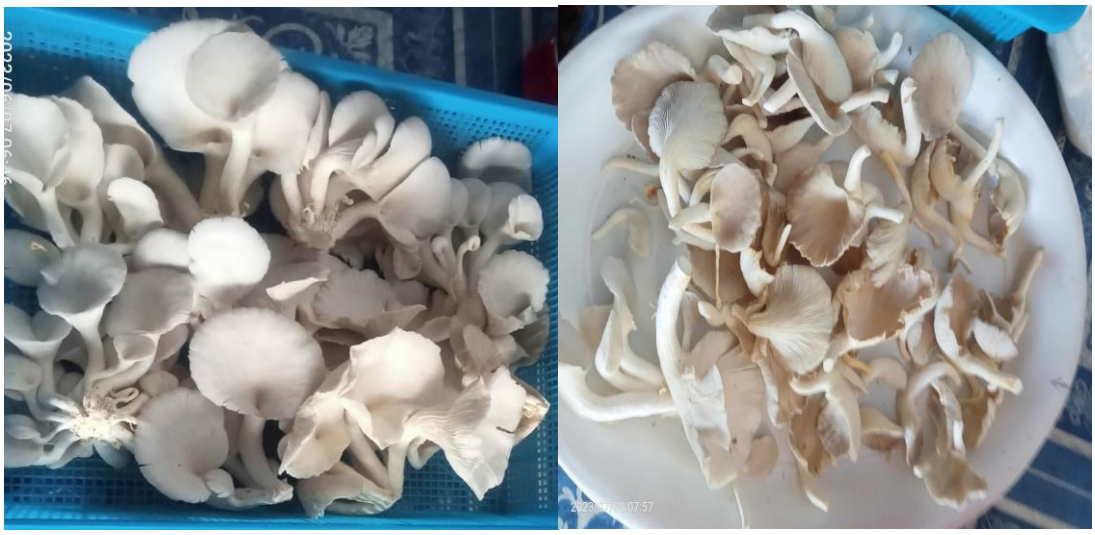
On the average number of fruiting bodies from the two oyster mushroom species (A), a significant main effect was exhibited, indicating that the two different mushroom species have a statistically significant impact (Figure 2). Likewise, the different agricultural wastes (B) also showed highly significant variations. On the other hand, different concoctions (C) did not show significant main effects on the production of mushroom fruiting bodies.

The data show that *P. ostreatus* (A1) produced the most number of fruiting bodies with a mean value of 112.06, while *P. sajor-caju* (A2) produced the least number with a mean of 74.10. On the other hand, amongst different substrates, the most number of fruiting bodies produced was observed on fruiting bags amended with corn stalks (B4) with a mean of 108.46 fruiting bodies, followed by fruiting bags amended by corn cobs (B3) with a comparable mean of 102.96. This was followed by the Control (B1) and rice straw (B3) with means of 82.08 and 78.83, respectively. The observable difference among the set-ups of Factor (B) on the number of fruiting bodies formed may be due to the composition of the substrate.

On the other hand, different concoctions (C) did not show any significant main effects, though the use of the IMO concoction obtained the largest number of fruiting bodies produced.

(A) (B)

Figure 2. Fruiting bags with fruiting bodies of *P. ostreatus* (A); *P. sajor-caju* (B)



(A) (B)

Figure 3. Freshly harvested oyster mushroom; *P. ostreatus* (A); and *P. sajor caju* (B)

Mushroom Yield (g/bag)

Analysis of variance showed no significant difference on the yield of the two mushroom species. However, *P. ostreatus* (A1) obtained the heaviest weight with a mean value of 678.38 g/bag (Figure 3). Similarly, no significant difference was observed among the different agricultural wastes used in the supplementation of the substrates (B). However, among the different agricultural wastes used, corn cob (B3) was observed to have the highest yield, with a mean of 679.00 g/bag, while the lowest yield was observed in rice straw (B2). Likewise, the different concoctions (C) failed to show any significant difference in the yield of mushrooms. The yield ranges from 561.79 g/bag (C2-FFJ) to 690.42 g/bag (C3-FPJ). The result implies that the application of the different concoctions did not influence the yield of the two species of oyster mushrooms.

Yield performance of *P. ostreatus* and *P. sajor-caju* as affected by the interaction of the different agricultural wastes as substrate amendments and misted with different organic concoctions

Table 2 presents the interaction of the different agricultural wastes and concoctions on the yield of the different species of oyster mushroom, specifically on cap

diameter (cm), number of fruiting bodies formed, and mushroom yield (g/bag).

Cap Diameter (mm)

Analysis of variance reveals no significant difference on cap diameter among the two oyster mushroom species grown on substrates amended with different agricultural wastes (Factor AxB). The cap diameter ranges from 54.15 mm (A2xB3) to 64.58 mm (A1xB4). Likewise, analysis of variance showed no significant variation on the mushroom species and concoctions (AxC).

The interaction effect between different agricultural wastes and the different concoctions (BxC) on the cap diameter of mushroom failed to show any significant difference. This further indicates that the mushroom grown on substrates amended with different agricultural wastes and the use of different concoctions did not respond significantly in terms of cap diameter. Cap diameter ranges from 55.39 mm (B3xC3) to 62.13 mm (B2xC4).

The analysis of variance on the interaction effect of mushroom species, the different agricultural wastes, and the concoctions (AxBxC) also did not vary significantly. The average mushroom cap diameter ranges from 53.02 mm (A2xB3xC3) to 67.60 mm (A1xB2xC4).

Number of Fruiting Bodies

On the number of fruiting bodies produced by the different mushroom species as influenced by the different substrates amended with different agricultural wastes, the interaction of factors AxB demonstrates a significant interaction. Results show that the highest mean number of fruiting bodies was observed in A1xB4 with a value of 144.25. This was followed by A1xB3 with a mean value of 113.17. However, no significant difference was observed between these 2 factors. The least number of fruiting bodies produced was recorded in A2xB2 with a mean value of 59.83.

The effect of the different mushroom species and concoctions (AxC) on the number of fruiting bodies produced showed no significant difference. The mean number of fruiting bodies ranges from 67.42 to 118.75.

The effect of the interactions of different agricultural wastes and concoctions (BxC) had a significant interaction effect. Results showed that B4xC1 obtained the most number of fruiting bodies formed with a mean value of 132.17, while B2xC2 showed the least number of fruiting bodies of 63.17.

Mushroom Yield (g/bag)

Statistical analysis showed highly significant differences on the mushroom yield (g/bag). The study revealed that the two species of mushroom grown on substrates amended with different agricultural wastes influenced the yield of fruiting bodies harvested. The treatment combination A1xB3 obtained the highest yield of 888.33 g/bag. This was followed by factor combinations A1xB4, A1xB1, A2xB2, and A2xB4 with comparable means of 674.58 g, 653.91 g, 640.00 g, and 633.33 g, respectively. The least yield was recorded in A2xB3 with a mean yield of 469.67 g. In the study of Chitamba et al. (2012) and Sanchez et al. (2002) on the growth of oyster mushroom on these agricultural wastes (corn cob, corn husk, rice straw, and cotton waste) which have not been in use on a commercial scale suggests that usage of these substrates if explored on commercial scale by mushroom farmers could have triple advantage on food production, availability of mushrooms, reduction of agricultural wastes load on the environment (environmental health) and increase in livelihoods of farmers since there is an increase in the choice of substrates. Furthermore, Estrada et al., (2009) reported that using the right substrate is important to maximize mushroom yields.

On the other hand, the interaction of factors AxC, factor BxC, and the three-way interaction (AxBxC) failed to show any significant variations. Unpredictable yields due to the use of unsuitable substrates have discouraged most small-scale farmers who are often unable to keep on with the cultivation of the mushroom (Kazige OK, Chuma GB, Lusambya AS, et al (2022).

Table 2. The effect of amending different waste materials on the substrates, with the combination of the application of the different concoctions, on the performance of the two mushroom species.

TREATMENTS	CAP DIAMETER (mm)	NUMBER OF FRUITING BODIES	WEIGHT (g)
AXB (Mushroom species: Agricultural Waste)			
A1B1 (*P. ostreatus* X Control))	63.89	93.00bc	653.91ab
A1B2 (*P. ostreatus* X Rice Straw)	63.82	97.83bc	496.67b
A1B3 (*P. ostreatus* X Corn Cob)	60.18	113.17ab	888.33a
A1B4 (*P. ostreatus* X Corn stalk)	64.58	144.25a	674.58ab
A2B1 (*P. sajor caju* X Control)	55.72	71.17bc	614.75ab
A2B2 (*P. sajor caju* X Rice straw	55.94	59.83c	640.00ab
A2B3 (*P. sajor caju* X Corn Cob	54.15	92.75bc	469.67b
A2B4 (*P. sajor caju* X Corn straw	56.09	72.67bc	633.33ab
F-test	ns	*	**
A X C (Mushroom species: Concoctions)			
A1C1 (*P. oystreatus* X IMO)	63.08	118.75	770.92
A1C2 (*P. oystreatus* X FFJ)	64.14	103.75	569.25
A1C3 (*P. oystreatus* X FPJ)	63.28	112.42	726.25
A1C4 (*P. oystreatus* X Water)	62.04	113.33	647.08
A2C1 (*P. sajor caju* X IMO)	54.46	88.00	556.92
A2C2 (*P. sajor caju* X FFJ)	55.99	67.42	554.33
A2C3 (*P. sajur caju* X FPJ)	54.06	71.83	654.58
A2C4 *(P. sajor caju* X Water)	56.76	69.17	591.92
F-test	ns	ns	ns
BXC (Agricultural Waste : Concoctions)			
B1C1 (Control X IMO)	59.88	88.00cde	702.00
B1C2 (Control X FFJ)	60.05	69.50e	564.50
B1C3 (Control X FPJ	60.28	77.00de	592.50
B1C4 (Control X Water)	59.00	93.83a-e	678.33
B2C1 (Rice Straw X IMO)	57.61	65.17e	460.00
B2C2 (Rice Straw X FFJ)	60.84	63.17e	441.67
B2C3 (Rice Straw X FPJ)	58.94	111.50a-d	775.00
B2C4 (Rice Straw X Water)	62.13	75.50de	596.67
B3C1 (Corn Cob X IMO)	58.28	128.17ab	848.67
B3C2 (Corn Cob X FFJ)	58.53	83.17de	566.83
B3C3 (Corn Cob X FPJ)	55.39	89.33b-e	659.17
B3C4 (Corn Cob X Water)	56.46	111.17a-d	641.33
B4C1 (Corn Stalk X IMO)	59.17	132.17a	645.00
B4C2 (Corn Stalk X FFJ)	60.84	126.50abc	674.17
B4C3 (Corn Stalk X FPJ)	61.35	90.67b-e	735.00
B4C4 (Corn Stalk X Water)	59.99	84.50de	561.67
F_test	ns	*	ns
AXBXC (Mushroom species : Agricultural Waste: Concoctions)			
F-TEST	ns	ns	ns
CV (%)	7.59	37.21	37,65

Means in a column followed by the same letter are not significantly different at 5% level of probability (HSD).

* significant

** highly significant

ns non-significant

Cost and Return Analysis

The cost and return analysis of oyster mushroom yield as influenced by the amendment of different agricultural wastes on the substrate and the application of different concoctions is presented in Table 3. Statistical analysis revealed significant differences among the treatment combinations on the Return of Investment (ROI).

The computation of return of investments (ROI) revealed that A1B3C1 - *P. ostreatus* x Corn Cob x IMO obtained the highest ROI of 1279.67%. The lowest ROI was computed in A1B2C2 - *P. ostreatus* x Rice Straw x FFJ with 216.22%. The high return of investment could be attributed to the yield performance based on the agricultural wastes supplemented in the substrates and the concoctions applied during the production of the mushrooms.

Table 3. Return of investment of *P. ostreatus*, and *P. sajor caju* as influenced by the amendment of different agricultural waste and concoctions.

TREATMENT	WEIGHT OF FRUITING BODIES (g/bag)	GROSS INCOME (PHP)	TREAT MENT COST (cost/bag)	NET BENE FIT	ROI (%)	
A1B1C1(*P. ostreatus* X Control X IMO)	705.67	141.13	15.55	125.58	807.61	abc
A1B1C2(*P. ostreatus* X ControlX FFJ)	538.33	107.67	15.22	92.45	607.40	abc
A1B1C3(*P. ostreatus* X Control X FPJ)	531.67	106.33	15.08	91.25	604.98	abc
A1B1C4(*P. ostreatus* X ControlX Water)	840.00	168.00	13.62	154.38	1133.78	ab
A1B2C1(*P. ostreatus* X Rice Straw X IMO)	403.33	80.67	16.88	63.78	377.78	abc
A1B2C2(*P. ostreatus* X Rice Straw X FFJ)	261.67	52.33	16.55	35.78	216.22	c
A1B2C3(*P. ostreatus* X Rice Straw X FPJ)	805.00	161.00	16.42	144.58	880.71	abc
A1B2C4(*P. ostreatus* X Rice Straw X Water)	516.67	103.33	14.95	88.38	591.20	abc
A1B3C1(*P. ostreatus* X Corn Cob X IMO)	1164.67	232.93	16.88	216.05	1279.67	a
A1B3C2(*P. ostreatus* X Corn Cob X FFJ)	805.33	161.07	16.55	144.52	873.21	abc
A1B3C3(*P. ostreatus* X Corn Cob X FPJ)	810.00	162.00	16.42	145.58	886.80	abc
A1B3C4(*P. ostreatus* X Corn Cob X Water)	773.33	154.67	14.95	139.72	934.56	abc
A1B4C1(*P. ostreatus* X Corn Stalk X IMO)	810.00	162.00	16.88	145.12	859.53	abc
A1B4C2(*P. ostreatus* X Corn Stalk X FFJ)	671.67	134.33	16.55	117.78	711.69	abc
A1B4C3(*P. ostreatus* X Corn Stalk X FPJ)	758.33	151.67	16.42	135.25	823.85	abc
A1B4C4(*P. ostreatus* X Corn Stalk X Water)	458.33	91.67	14.95	76.72	513.15	abc
A2B1C1 (*P. sajor caju* X Control X IMO)	698.33	139.67	15.55	124.12	798.17	abc
A2B1C2 (*P. sajor caju* X Control X FFJ)	590.67	118.13	15.22	102.91	676.18	abc
A2B1C3 (*P. sajor caju* X Control X FPJ)	653.33	130.67	15.08	115.58	766.29	abc
A2B1C4 (*P. sajor caju* X Control X Water)	516.67	103.33	13.62	89.72	658.88	abc
A2B2C1(*P. sajor caju* X Rice Straw X IMO)	516.67	103.33	16.88	86.45	512.05	abc
A2B2C2(*P. sajur cajo* X Rice Straw X FFJ)	621.67	124.33	16.55	107.78	651.26	abc
A2B2C3(*P. sajur cajo* X Rice Straw X FPJ)	745.00	149.00	16.42	132.58	807.61	abc
A2B2C4(*P. sajur cajo* X Rice Straw X Water)	676.67	135.33	14.95	120.38	805.24	abc
A2B3C1(*P. sajur cajo* X Corn Cob X IMO)	532.67	106.53	16.88	89.65	531.00	abc
A2B3C2(*P. sajur cajo* X Corn Cob X FFJ)	328.33	65.67	16.55	49.12	296.77	bc
A2B3C3(*P. sajur cajo* X Corn Cob X FPJ)	508.33	101.67	16.42	85.25	519.29	abc
A2B3C4(*P. sajur cajo* X Corn Cob X Water)	509.33	101.87	14.95	86.92	581.38	abc
A2B4C1(*P. sajur cajo* X Corn Stalk X IMO)	480.00	96.00	16.88	79.12	468.61	abc
A2B4C2(*P. sajur cajo* X Corn Stalk X FFJ)	676.67	135.33	16.55	118.78	717.73	abc
A2B4C3(*P. sajur cajo* X Corn Stalk l X FPJ)	711.67	142.33	16.42	125.92	767.01	abc
A2B4C4(*P. sajur cajo* X Corn Stalk X Water)	665.00	133.00	14.95	118.05	789.63	abc
F-test					*	
CV (%)					23.74	

Means in a column followed by the same letter are not significantly at 5% level of probability (HSD)

*significant

PhP200.00/kl

4. CONCLUSION

Based on the results, the researchers conclude that the most successful oyster mushroom species was *Pleurotus ostreatus*, especially when cultivated on substrates enriched with corn straw or corn cobs. Among the various organic concoctions used for misting the fruiting bags during the growing phase, the application of IMO exhibited a notable increase in yield performance. The synergy of three critical factors, mushroom species (A), the choice of agricultural wastes (B), and the specific concoctions (C), demonstrated that *P. ostreatus* cultivated on corn cob amended substrates and misted with IMO (A1xB3xC1) yielded remarkable outcomes, including larger cap diameter, the highest number of fruiting bodies, and enhanced overall yield and return of investment (ROI).

Based on these findings, it is worthwhile to conduct further exploration on the growth and yield potential of oyster mushrooms using various agricultural wastes amended on substrates, both individually and in combination, along with diverse organic concoctions for misting. These investigations should aim to promote sustainable oyster mushroom production, particularly in the southern Philippines.

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5. REFERENCES

Ananbeh, K.M. (2003). Production of oyster mushroom on different agricultural wastes available in Jordan, M. Sc. Thesis, Jordan University, Jordan.

Ananbeh K M, Almomany A R (2005). Production of oyster mushroom *Pleurotus ostreatus* on olive cake agro waste. Dirasat Agric. Sci 32, 64–70.

Alananbeh, K M, Bouqellah N A, Kaff N S (2014). Cultivation of oyster mushroom Pleurotus ostreatus on date-palm leaves mixed with other agro-wastes in Saudi Arabia. Saudi. *J. Biol. Sci.* 21 (6), 616–625.

Celik Y, Pekker K (2009). Benefit/Cost analysis of mushroom production for diversification of income in developing countries. *Bulgarian Journal of Agricultural Science* 15(3): 228-237

Chitamba, J., Dube, F. Chiotaand, W.M. and Handiseni, M. (2012). Evaluation of substrate productivity and market quality of oyster mushroom (*Pleurotus ostreatus*) grown on different substrates. Int. J. Agric. Res., 7: 100-106.

Fatriasari W, Syafii W, Wistara N, Syamsu K, Prasetya B, Anita S H, Risanto L (2016). Fiber disruption of betung bamboo (Dendrocalamus asper) by combined fungal and microwave pretreatment. *BIOTROPIA-The Southeast Asian. J. Trop. Biol*. 22 (2), 81–94.

Hasan M T, Khatun M H A, Sajib M A M, Rahman M M, Rahman M S, Roy M, Ahmed KU (2015). Effect of wheat bran supplement with sugarcane bagasse on growth, yield and proximate composition of pink oyster mushroom (*Pleurotus djamor*). *Am. J. Food. Sci. Technol.* 3 (6), 150–157.

Kazige OK, Chuma GB, Lusambya AS. (2022). Valorizing staple crop residues through mushroom production to improve food security in eastern Democratic Republic of Congo. *J Agric Food Res*. 2022;8:1–11. doi: 10.1016/j.jafr.2022.100285

Marlina L, Sukotjo S, Marsudi S (2015). Potential of oil palm empty fruit bunch (EFB) as media for oyster mushroom, Pleurotus ostreatus cultivation. Procedia Chemistry Vol. 16, 427-431.

Rezania S, Din M F M, Taib S M, Sohaili J, Chelliapan S, Kamyab H, Saha B B (2017). Review on fermentative biohydrogen production from water hyacinth, wheat straw and rice straw with a focus on recent perspectives. Int. *J. Hydrog. Energy* 42 (33), 20955–20969.

Rodriguez Estrada AE, Jimenez-Gasco M del M, Royse DJ (2009). Improvement of yield of *Pleurotus eryngii* var. *eryngii* by substrate supplementation and use of a casing overlay. Bioresour Technol. 2009;100(21):5270–5276.

Sanchez, A., Ysunza, F., Beltran-Gracia, M.J. and Esqueda, M. (2002). Biodegradation of viticulture wastes by *Pleurotus*: A source of microbial and human food and its potential use in animal feeding. *J. Agric. Food Chem*., 50: 2537-2542

Yang W, Guo F, Wan Z (2013). Yield and size of oyster mushroom grown on rice/ wheat straw basal substrate supplemented with cotton seed hull. Saudi. *J. Biol. Sci*. 20 (4), 333–338.