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EFFECT OF ORGANIC SUBSTRATES ON THE INVASION PARAMETERS OF THE CULTIVATION OF THREE TYPES OF OYSTER MUSHROOMS IN CÔTE D'IVOIRE

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ABSTRACT

Accelerated deforestation of the vegetation cover combined with climate change is influencing the seasonal availability of carpophores in different regions of the country. This study aims to improve mushroom production in Côte d'Ivoire through the use of different types of organic substrates. The methodology consisted in using three types of oyster mushroom (Pleurotus cornucopiae, Pleurotus ostreatus and Pleurotus citrinopileatus) subjected to different types of organic substrates (sawdust and banana leaves) in a split-plot system in which three treatments (Sb, Sc and Fb) compared with a control (Sa) were stored in a dark chamber until the culture bags were fully invaded, in order to determine the percentage, height, speed and volume of substrates colonized. The results showed that the different oyster mushroom species significantly influenced all invasion parameters (P=0.00***), unlike the different substrates (P=0.59) considered. Similarly, species-substrate interaction had a significant effect on the evolution of the different oyster mushroom species. This study shows that the evolution of the invasion parameters of oyster mushroom cultivation, particularly that of Pleurotus cornucopiae, had a good mycelial development on the various substrates and can therefore be integrated into the production circuit in Côte d'Ivoire.

Keywords: Substrates, Invasion Parameters, Oyster Mushroom Type.

1. INTRODUCTION

The fungi kingdom is an organic world in its own right. Nearly 70,000 species have been catalogued by scientists, but this figure is far from representative. As a result of their proliferation in all kinds of habitats (fresh or salt water, soil, air, living or decomposing beings), their number can be extrapolated to over a million, of which only 10% are perfectly known (Taithe, 2016). These superior fungi, classified into three groups (saprophytes, parasites and symbiotics), have been used for decades in Asia in the health and food sectors (Cassar, 2016). In Africa, edible wild mushrooms are vitally important non-timber forest products, both nutritionally and economically (Ndoye *et al*., 2007). Indeed, edible wild mushrooms are exploited by local populations for their well-being (Boot, 1997; Dossou *et al*., 2012) and provide an important source of nutrition during lean periods (Härkönen et al., 2003; Eyi Ndong *et al*., 2014; Degreef et al., 2016), as well as a source of household income (De Kesel et al., 2002). However, in recent years, accelerated deforestation of the vegetation cover, the alteration of biodiversity and the effects of climate change have influenced the seasonal availability of carpophores (De Kesel et al., 2002; Mpulusu et al., 2010). These factors lead to a scarcity of mushrooms and influence harvests and sales on local markets around the world (Oei, 1993; Nieuwenhuijzen, 2007). In Africa, most cultivated strains are of European and Asian origin,

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representing only 1% of world production during the period 1987-1997 (Lushiku, 2012). However, the diverse climatic and edaphic conditions are an asset for oyster mushroom cultivation in the different regions of Africa. In Côte d'Ivoire, apart from the work of Pitta et al. (2020) on seed production and carpophore growth tests on different organic substrates, mushroom cultivation is little known and remains under-exploited. Consequently, mushroom cultivation is proving to be a promising and profitable activity for farmers. It was against this backdrop that the study entitled "Effect of organic substrates on invasion parameters for the cultivation of three types of oyster mushroom in Côte d'Ivoire" was initiated. The aim is to improve mushroom production in Côte d'Ivoire through the use of different types of organic substrates.

2. METHODOLOGY

2.1 Study area

This study was carried out in Courandjourou (6° 13'47" N, 5° 6'57" W), a village in the locality of Taabo (figure 1), chief town of the department belonging to the Agnéby-Tiassa Region. This area is characterized by a transitional tropical climate influenced by the Baouleen climate, with four seasons and average monthly rainfall ranging from 140 to 170 mm, and the Atelean climate, also with four seasons and average monthly rainfall ranging from 150 to 190 mm. Average annual temperature and humidity are 32.18°C and 78% respectively (Groga, 2012). The Taabo region belongs to the mesophilic sector of the Bandama basin, characterized by semi-deciduous vegetation (Guillaumet and Adjanohoun 1971). The predominant soil formations are ferralitic soils interspersed with a few patches of eutrophic tropical brown soils derived from basic rocks (Perraud, 1971).

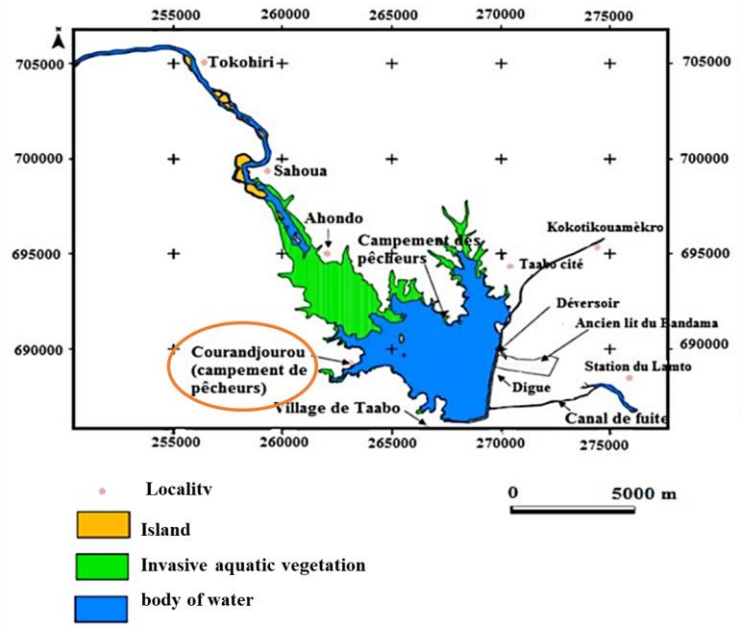

Figure 1: Map of the study area (Groga, 2012)

2.2 Fungal material

Three strains of edible fungi were used in this study. They are :

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-*Pleurotus ostreatus* (local strain). The local strain was obtained from a myciculturist living in the town of Bouaké.

-*Pleurotus cornucopiae* (grey oyster mushroom) and *Pleurotus citrinopileatus* (yellow oyster mushroom) were imported from France.

Pleurotus cornucopiae | *Pleurotus citrinopileatus* | *Pleurotus ostreatus*

Figure 2: types of oyster mushrooms

2.3 Fruiting substrates

The substrates used consisted of forestry and agricultural waste. These included sawdust from the sawmill in the village of Taabo and dried banana leaves from a banana plantation near the study site. They were chosen for their wide availability in Côte d'Ivoire and for their lignin composition, which fungi need in their development process.

2.4. Collection and conditioning of agricultural and forestry waste

The agricultural and forestry wastes selected for this study were collected separately in the town of Taabo. Dried banana leaves were collected from the cultivation site and cut with a machete into small pieces of 1 to 5 cm to facilitate their use. Sawdust and rice bran (as an additive) were collected respectively from the sawmill and the mill in the village of Taabo in 100 kg bags for storage.

Once the substrates had been collected, they underwent various treatments, including composting for forestry waste. Composting was carried out for sawdust-based substrates. Composting was carried out on a non-concreted area lined with black tarpaulin, which was used to cover the substrates. The type of composting adopted in this study was aerobic heap composting. They were installed in a shaded, non-floodable area. Rice bran and calcium carbonate were mixed by hand and added to the sawdust pile. Water was added to achieve a humidity level of 50-80%. The substrate underwent a 40-day composting period, during which it was turned over several times.

The banana leaves were prepared according to the modified methodologies of Pitta et al. (2020) and Kiyuku et al. (2008). Harvested dry banana leaves were finely chopped (1-5 cm), then placed in 120 kg bags and immersed in water, which was boiled for 1h30 at high heat. The leaves were then drained for 24 hours. Once drained, the leaves were weighed and tipped onto a black, well-spread plastic sheet. Rice bran was added at a rate of 10% of the total weight of the leaves, and calcium carbonate at 1%. The mixture was thoroughly mixed by hand. Once the substrates had been prepared, the polypropylene, heat-resistant bags (33cm x 12cm) were filled with additives prior to sterilization. For 20kg of substrate, 1kg of rice bran and 5g of $CaCO_3$ were added. Sterilization was carried out using steam in a 200 L drum. A 20 cm-high wooden

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tripod support was placed at the bottom of the barrel and filled with water up to the height of the support. Closed substrates were placed vertically on the support and stacked on top of each other until the barrel was full. It took 3 hours after the first vapors appeared. Once the bags had cooled down completely, they were divided into three groups according to the type of oyster mushroom species we had available for each substrate. Before any handling, it was essential to disinfect hands and equipment. Inoculation was carried out under aseptic conditions in an "inoculation room" very early in the morning, away from direct sunlight. About two tablespoons of spawn were applied to the front of the substrate, taking care to reseal the culture bags.

2.5. Formulation of growing substrates

In this study, four (04) compost formulations were developed from the collected waste, three of which were based on sawdust and one on banana leaves. For this study, the standard formulation (Sa) considered was that used by Ivorian myciculturists. This was taken as the control formulation. We have the following substrates:

- Substrate Sa (control) : 70% sawdust+10% rice bran+31% CaCo,
- Substrate Sb: 85% sawdust +13.5% rice bran + 1.5% CaCo3,
- Substrate Sc: 90% sawdust + 8.5% rice bran + CaCo3 1.5%.
- Substrate Fb: Banana leaves + 10% rice bran + CaCo31%.

2.6. Experimental set-up

The experimental set-up used in this study is a split plot of three blocks constituting the three species, in which four microplots corresponding to the different treatments are distributed (Figure 3). Each treatment consists of 15 mushroom culture bags separated by 1 cm.

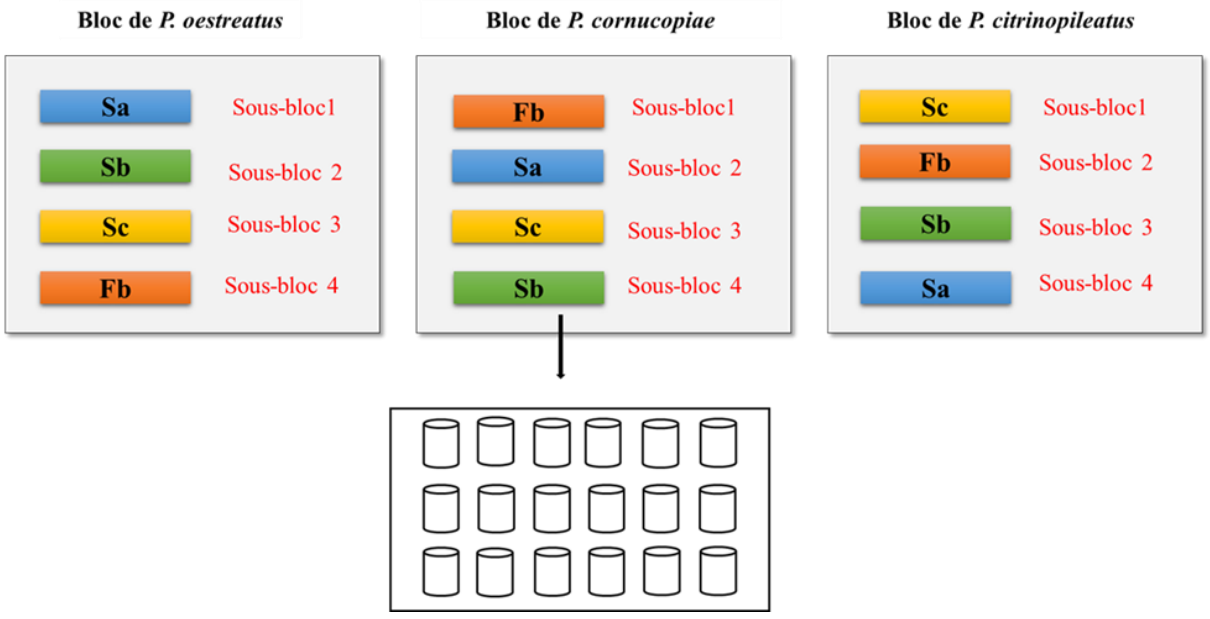

Figure 3: Experimental setup

2.7. Data collection and analysis

During the incubation process of the culture bags, the following parameters were collected

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- Percentage of colonization: The percentage of colonization is the ratio of bags totally invaded by mycelium to the total number of bags sown. This parameter was determined at the end of the incubation process. It is expressed as a percentage.

PC = (number of colonized bags/total number of seeded bags) X 100 (1)

- Colonization height: The colonization height is the distance covered by the mycelium on the substrate from the front to the base of the bag. This height is measured using a 30 cm ruler from the point of inoculation to the mycelium front. It is expressed in centimetres (cm).

- Colonization rate: The colonization rate is obtained by dividing the mycelial colonization height by the measurement time interval. It is expressed in centimetres per day (cm/d).

VCM= colonization height/ time (cm/d) (2)

- Volume of substrate colonized: The volume of substrate colonized was obtained by multiplying the colonization height by the area of the base of the bag. Since the base of the bag forms a circle, the area was obtained using the following formula:

Area = pi * R2

$$\boldsymbol{VSC}\ (\boldsymbol{cm3}) = \boldsymbol{Hauteur\ de\ colonisation}\ (\boldsymbol{cm}) \times \boldsymbol{Aire\ de\ la\ base\ du\ sachet}\ (\boldsymbol{cm2}) \quad (3)$$

The data collected was entered using EXCEL 2013 spreadsheet software. It was used to construct evolution curves, graphs by factor as a function of time. These curves and graphs made it possible to compare the various parameters on each substrate over time. Analyses of variance (Anova) and comparisons of means using the FISHER LSD test were carried out using STATISTICA version 7.1 software. Differences were considered significant at the 5% level (means followed by different letters). This difference is affirmed when the probability (P-value) obtained for one factor or for the combination of the two factors is less than 5% (our significance threshold). Thus, when P-value is less than 0.05, the difference is said to be significant. If P-value is less than 0.01, the difference is said to be highly significant, and if P-value is less than 0.001, it is said to be very highly significant.

3. RESULTS

3.1 Influence of fruiting substrates on crop invasion parameters

3.1.1. Colonization percentage

The sawdust-based substrates induced the most colonization of the culture bags, with rates of 45.34% for Sa, 46.08% for Sc and 41.91% for Sb respectively. Banana leaf substrate (Fb) recorded the lowest rate (32.71%). Colonization of the culture bags increased over time on all the fruiting substrates considered (Sa, Sb, Sc and Fb) (figure 4). Colonization of sawdust was rapid. Indeed, on the 7th day after inoculation on the Sb and Sc substrates, respectively 23 and 21% of bags had already begun the colonization process, whereas colonization of banana leaves was slow, with only 16% of bags having begun the process.

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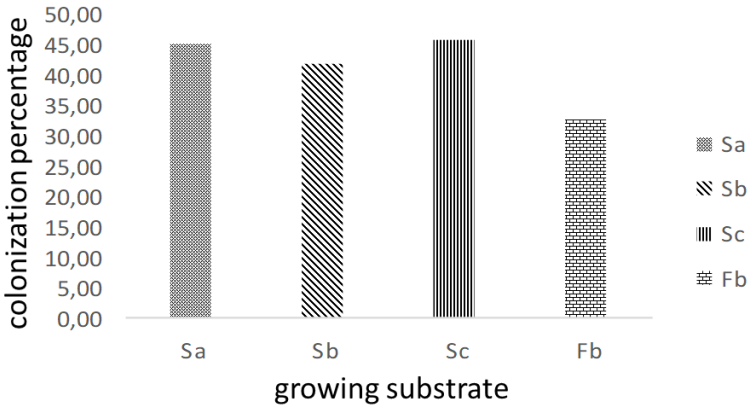

Figure 4: Percentage of colonization depending on growing substrates

3.1.2. Colonization height

The variation in mycelial colonization height as a function of substrate is shown in Table (1). Colonization height ranged from 6.07 cm with substrate Fb to 8.41 cm with substrate Sb. Substrates Sa and Sc recorded approximately the same colonization heights of 7.11 and 7.48 cm respectively. The different substrates considered in this study did not influence the colonization height of oyster mushrooms ($p > 0.05$).

3.1.3. Colonization speed

The speed of mycelial colonization as a function of culture substrate is shown in Table (1). The speed ranged from 1.21 cm/d to 1.68 cm/d cm, with the minimum recorded on the Fb substrate and the maximum on the culture bags containing the Sb substrate. The results of the analysis of variance indicate that there was no significant difference between the culture substrates ($P > 0.05$).

3.1.4. Volume of substrates colonized

Table (1) shows the mean values for mycelial colonization volume as a function of culture substrates. The volume varied from 686.90 cm3 in culture bags containing Fb substrate to 951.42 cm3 in culture bags containing Sb substrate. Statistical analysis shows that culture substrates had the same effect on mycelial colonization volume ($P > 0.05$).

Table 1: variation of invasion parameters depending on the growing substrates

Substrates	Invasion settings		
	Colonization height	**Colonization speed**	**Colonization volume**
Sa	7,11 ± 5,06[a]	1,42 ± 1,01[a]	804,75 ± 572,65[a]
Sb	8,41 ± 3,44[a]	1,68 ± 0,68[a]	951,42 ± 389,87[a]
Sc	7,48 ± 5,52[a]	1,49 ± 1,10[a]	846,62 ± 624,23[a]
Fb	6,07 ± 4,46[a]	1,21 ± 0,89[a]	686,90 ± 504,80[a]
F	0,638595	0,638595	0,638595
P	0,593	0,595	0,593

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The means of a column followed by the same letter are not significantly different at the 5% threshold; F: frequency; P: probability

3.2 Influence of oyster mushroom types on crop invasion parameters

3.2.1. Percentage of colonization

The percentage of culture bag colonization by oyster mushroom species is shown in figure (5). The PG species colonized the culture bags the most, with a percentage of 79.82%, followed by the PJ species (24.49%) and the PL species (20.22%). When the colonization percentage is materialized over time, the results show a clear variation. It ranged from 2.94% at 7 JAI with PL to 89.93% with PG on the 42nd day after inoculation. Whatever the observation period, the highest values were obtained in culture bags inoculated with Pleurotus cornucopiae (PG) followed by Pleurotus citrinopileatus (PJ) and Pleurotus ostreatus (PL) respectively.

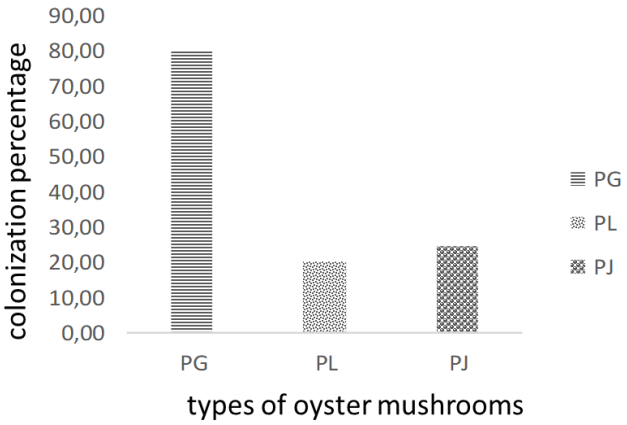

Figure 5: Percentage of colonization depending on the types of oyster mushrooms

3.2.2. Height of mycelial colonization

Table (2) shows the mycelial colonization height for the different types of oyster mushroom. It ranged from 2.84 cm to 10.97 cm. The minimum height of 2.84 cm was recorded for Pleurotus ostreatus (PL), the local strain, and the maximum height of 10.97 cm for bags seeded with Pleurotus cornucopiae (PG). The mycelium of the imported species (PG and PJ) developed better than that of the local species. The analysis of variance performed on the results indicates that the different oyster mushroom species had a very highly significant effect on the height of mycelial colonization in the culture bags ($P<0.001$). Three homogeneous groups were identified following FISHER's LSD test. The first group is composed of PG species, the second of PJ species and the last of PL.

3.2.3. Colonization speed

The speed of mycelial colonization of the different types of oyster mushroom is shown in Table (2). This speed ranged from 0.56 cm/d to 2.19 cm/d cm, with the minimum recorded for Pleurotus ostreatus (PL) and the maximum observed for bags seeded with Pleurotus cornucopiae (PG). The results of the analysis of variance indicate that the different types of oyster mushroom significantly influence the rate of mycelial colonization in the culture bags ($P<0.001$). Three

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homogeneous groups were also identified. The first group was made up of PG species, the second of PJ species and the last of PL.

3.2.4. Colonized substrate volume

The volume of substrate colonized by the different oyster mushroom types is shown in Table 2. The results of the statistical analysis show that the different types of oyster mushroom had a very highly significant effect on the colonization volume of the culture bags ($P<0.001$). The space occupied by the mycelium in the culture bags varied from 321.67 cm3 to 1240.86 cm3. The minimum volume was observed with Pleurotus ostreatus (PL) and the maximum volume recorded with Pleurotus cornucopiae (PG). Three homogeneous groups were obtained. The first group is composed of PG species, the second of PJ species and the last of PL.

Table II: variation of invasion parameters depending on the types of oyster mushrooms

Species	Invasion settings		
	Colonization height	**Colonization speed**	**Colonization volume**
PG	$10,97 \pm 0,78^{c}$	$2,19 \pm 0,26^{c}$	$1240,86 \pm 152,45^{c}$
PJ	$8,00 \pm 4,40^{b}$	$1,60 \pm 0,88^{b}$	$904,74 \pm 497,66^{b}$
PL	$2,84 \pm 3,19^{a}$	$0,56 \pm 0,63^{a}$	$321,67 \pm 361,34^{a}$
F	32,32672	32,19985	32,32672
P	0,000000	0,000000	0,000000

The means of a column followed by the same letter are not significantly different at the 5% threshold; F: frequency; P: probability ; PG: Pleurotus cornucopiae; PJ: Pleurotus citrinopileatus; PL: Pleurotus estreatus

3.3 Effects of oyster mushroom and substrate interaction on culture incubation parameters

3.3.1. Colonization percentage

The results of the species-substrate interaction (figure 6) show that the different substrates considered favored high colonization rates with PG over all observations, with the highest value of 82.50% on the Fb substrate. Substrates Sa and Sc, on the other hand, had a greater influence on PL colonization, with rates of 52.21 and 28.68% respectively. Finally, substrates Sb, Sc and Fb were the most favorable for PJ colonization, with a higher rate on Sc of 57.35%.

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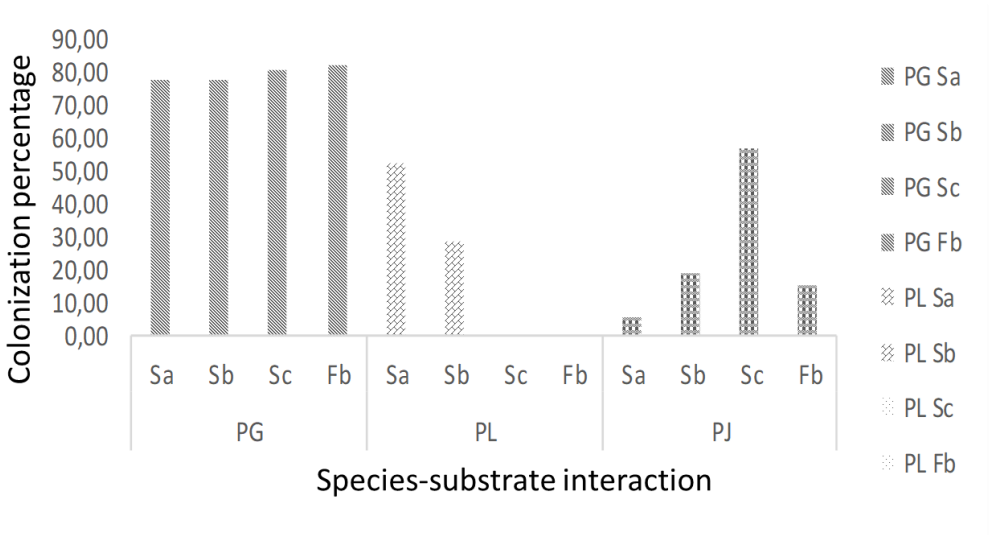

Figure 6: Percentage of colonization depending on the oyster mushroom-culture substrate interaction

3.3.2. Colonization height

Table 3 shows average mycelial colonization heights as a function of species-substrate interaction. Colonization heights ranged from 0.00 with species PL on substrates Sc and Fb to 11.86 cm with species PG on substrate Sa. Statistical analysis of the results showed that species-substrate interaction had a highly significant influence on mycelial colonization height ($P<0.001$). Substrates Sa, Sb and Sc, with high values of 11.86, 11.46 and 11.60 cm respectively, had the greatest influence on colonization heights for species PG, compared with PJ and PL. The highest values of colonization height with PJ species were recorded with Sb, Sc and Fb substrates (9.25; 10.86 and 9.25 cm) compared with PL. As for PL species, its mycelial growth was influenced by Sa and Sb substrates. Several homogeneous groups were obtained following the LSD test. The first group is made up of PL-Sc and PL-Fb; the second of PJ-Sa; the third of PL-Sb; the fourth of PL-Sa; the fifth of PG-Fb; the sixth of PJ-Fb and PJ-Sb; the seventh of PG-Sb and PJ-Sc; the eighth of PG-Sc and the last of PG-Sa.

3.3.3. Colonization speed

Average mycelial colonization rates as a function of species-substrate interaction are shown in Table 3. They ranged from 0.00 cm/d with species PL on substrates Sc and Fb to 2.37 cm/d with species PG on substrate Sa. The results of the analysis of variance show that species-substrate interaction has a highly significant effect on average mycelial colonization rates ($P<0.001$). The mycelium of PG species evolved more rapidly on Sa, Sb and Sc substrates than that of PJ and PL species. The values recorded were 2.37 cm/d on Sa, 2.29 cm/d on Sb and 2.29 cm/d on Sc, respectively. High values for colonization rate with PJ species were recorded in culture bags containing Sb, Sc and Fb substrates (1.85; 2.17 and 1.85 cm/d), but Sc substrate was more effective on PJ rate. As for PL species, its mycelial velocity was influenced by Sa and Sb substrates compared with Sc and Fb substrates. Several homogeneous groups were obtained following the LSD test. The first group is made up of PL-Sc and PL-Fb; the second of PJ-Sa; the

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third of PL-Sb; the fourth of PL-Sa; the fifth of PG-Fb; the sixth of PJ-Fb and PJ-Sb; the seventh of PG-Sb and PJ-Sc; the eighth of PG-Sc and the last of PG-Sa.

3.3.4. Volume of substrate colonized

Variations in mean colonized substrate volumes according to species-substrate interaction are shown in Table 3. Volumes ranged from 0.00 cm3 with species PL on substrates Sc and Fb to 1341.22 cm3 with species PG on substrate Sa. The results of the analysis of variance (ANOVA) show that species-substrate interaction has a highly significant effect on mean colonization volumes ($P<0.001$). The mycelium of species PG colonized more space on substrates Sa, Sb, Sc compared to that of species PJ and PL. The values recorded are 1341.22 cm3 for Sa; 1295.72 cm3 for substrate Sb and 1311.97 cm3 on Sc, respectively. The highest colonization volume values for PJ species were recorded in culture bags containing Sb, Sc and Fb substrates (1045.62; 1227.89; 1046.18 cm3), but Sc substrate was more effective than Sb and Fb. As for the PL species, its mycelial colonization volume was influenced by the Sa and Sb substrates compared with the Sc and Fb substrates. Several homogeneous groups were obtained following the LSD test. The first group was made up of PL-Sc and PL-Fb; the second of PJ-Sa; the third of PL-Sb; the fourth of PL-Sa; the fifth of PG-Fb; the sixth of PJ-Fb and PJ-Sb; the seventh of PG-Sb and PJ-Sc; the eighth of PG-Sc and the last of PG-Sa.

Table III: variation of parameters depending on the oyster mushroom-culture substrate interaction

		Invasion settings		
Species	**Substrates**	**Colonization height**	**Colonization height**	**Colonization height**
PG	**Sa**	$11,86±0,35^{g}$	$2,37±0,07^{g}$	$1341,22±40,10^{g}$
	Sb	$11,46±1,02^{efg}$	$2,29±0,20^{efg}$	$1295,72±116,04^{efg}$
	Sc	$11,60±0,65^{fg}$	$2,32±0,13^{fg}$	$1311,97±74,24^{fg}$
	Fb	$8,97±0,49^{de}$	$1,79±0,09^{de}$	$1014,53±55,76^{de}$
PJ	**Sa**	$2,64±5,91^{b}$	$0,53±1,20^{b}$	$299,27±669,19^{b}$
	Sb	$9,25±2,44^{def}$	$1,85±0,48^{def}$	$1045,62±276,71^{def}$
	Sc	$10,86±0,88^{efg}$	$2,17±0,17^{efg}$	$1227,89±99,83^{efg}$
	Fb	$9,25±0,52^{def}$	$1,85±0,10^{def}$	$1046,18±58,91^{def}$
PL	**Sa**	$6,84±1,18^{cd}$	$1,36±0,23^{cd}$	$773,75±134,17^{cd}$
	Sb	$4,53±1,82^{bc}$	$0,90±0,36^{bc}$	$512,92±205,77^{bc}$
	Sc	$0,00±0,00^{a}$	$0,00±0,00^{a}$	$0,00±0,00^{a}$
	Fb	$0,00±0,00^{a}$	$0,00±0,00^{a}$	$0,00±0,00^{a}$
	F	14,8010	14,3017	14,8010

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P	0,000000	0,000000	0,000000

The means of a column followed by the same letter are not significantly different at the 5% threshold; F: frequency; P: probability PG: Pleurotus cornucopiae; PJ: Pleurotus citrinopileatus; PL: Pleurotus estreatus

4. DISCUSSION

The aim of the present study was to evaluate the production potential of different oyster mushroom species, including P. cornucopiae, P. citrinopileatus and P. ostreatus, on various formulations of sawdust (Sa, Sb and Sc) and banana leaf substrates. This section focuses on the evolution of oyster mushroom invasion parameters during the incubation phase of the culture bags. The invasiveness of a substrate is extremely important in determining the production quality of mushrooms. The parameters evaluated in this section are colonization percentage, infection rate, colonization height, colonization speed and colonized substrate volume. The study showed that variations in invasion parameters were a function of oyster mushroom species and not of fruiting substrates. All three oyster mushroom species influenced the evolution of the different invasion parameters considered. However, the highest values were obtained with the PG species (P. cornucopiae). These were 79.82% for colonization percentage, 10.97 ± 0.78 cm for mycelial colonization height, 2.19 ± 0.26 cm/d for speed and 1240.86 ± 152.45 for colonized substrate volume. On the other hand, PG recorded the lowest infection rate of 10.07%, while the maximum value of 69.12% was obtained with the local species (P. ostreatus). This better evolution with PG could be explained by the age of the seedling spawns. As the seed is a commercial seed, it could come from a batch of seed of a different age, which could have an impact on the evolution of the mycelium. Indeed, Soko et al (2019) have shown that substrate invasion by seed blanks older than 30 days is much more effective than by seed blanks of 30 days or less. This may be due to the concentration of mycelium. Indeed, Trinci and Righelator (2007) have shown that the specific growth rate, which is the quantity of organism produced per unit of time and per unit of organism, is a constant characteristic of both strain and medium. In other words, growth rate is proportional to organism concentration. So, the higher the concentration of mycelium in the medium, the better the mycelium's invasion of the substrate.

High values of the colonization percentage were observed on all substrates with the PG species unlike the PL and PJ species which saw their high values on Sa, Sb and Sc only for PJ. Regarding the height, speed and volume of colonization PG began its growth from the 12th day on Sa, Sb and Fb compared to PJ and PL which saw their parameters influenced by the substrates from the 22nd day incubation. All these results could be justified by the composition of the substrates. According to Chandy (1997), the vigor of mushrooms is mainly linked to the richness of the substrate in available essential nutrients. The results of the study conducted by Manirakiza et al. (2014) on the effect of Pennisetum sp. enriched with crushed avocado pits on the yield of Pleurotus ostreatus strains, emphasize that the variation in mycelium growth is influenced by the composition of the substrate. Because according to Oei (1993) and Mondo et al. (2016), the more nutrient elements such as nitrogen available in the substrate, the faster the colonization. Most species of oyster mushrooms develop optimally on substrates with a C/N ratio = 50 (Inera, 1995). Generally speaking, the speed of colonization of the substrate depends on its chemical

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composition and the way in which it has been aerated to allow the development of the mycelium. This speed is also a function of the density of the substrate which promotes mycelial respiration.

5. CONCLUSION

The study on the effect of substrates based on sawdust and banana leaves on the invasion parameters of the culture of three types of oyster mushroom is part of the dynamic of improving the productivity of the mushroom cultivation in Ivory Coast. The evolution of the invasion parameters of the oyster mushroom culture shows that Pleurotus cornucopiae had better adaptation and good mycelial development on substrates based on sawdust and banana leaves.

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