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Elucidation of Fruit Body and Lovastatin Yield Dynamics of Oyster Mushroom Components Cultivated on Two Lignocellulosic Substrates

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ABSTRACT

Background and Objective: Lovastatin is a lipid-lowering medication that occurs naturally in food such as red yeast, rice, etc. Some of the medicines in the statin class include pitavastatin, fluvastatin, atorvastatin and many more. This study was designed to investigate the lovastatin yield dynamics in white rot fungi cultivated on lignocellulosic substrates. The test mushrooms were *Pleurotus ostreatus*, *Pleurotus Pulmonarius* and sclerotia of *Pleurotus tuber-regium*. **Materials and Methods:** *Andropogon gayanus* substrate was weighed into three (3) portions; the first two were 12500 g each, for mature fruit bodies of *P. ostreatus* and *P. pulmonarius* while the third (17,500 g) for immature *P. ostreatus*. Another portion of sawdust (12500 g) was exclusively used for *P. pulmonarius* and *P. tuber-regium*. Spawns of the former were inoculated into 300 g sawdust while sclerotial crumbs of the latter were sown in same amount of sawdust, under favorable conditions. Data were analyzed by ANOVA, IBM SPSS version 21 and by Tukey's HSD at $p<0.05$. **Results:** *Pleurotus ostreatus* cultured on *Andropogon gayanus* substrate had the highest yield of mature sporophore (11,456.20±0.11g) with bio-efficiency (91.65%), followed by sawdust (10,297.10±0.10) while immature *P. ostreatus* yielded 7,056.00±0.18 g with BE (40.32±0.12%). Stipe length of *P. tuber-regium* was significant (5.600±0.17), cap diameter (18.60±0.10) and weight (52.30±0.11). Highest concentration (40.04%) of lovastatin was recorded in mature *P. ostreatus* sporophores grown on *A. gayanus*. **Conclusion:** *Andropogon gayanus* is strongly recommended for large-scale production of *P. ostreatus* fruit bodies for commercial production of lovastatin in Nigeria.

KEYWORDS

Lovastatin, *Pleurotus ostreatus*, *Pulmonarius tuber-regium*, *sclerotia andropogon gayanus*

INTRODUCTION

Lovastatin (mevinolin) also known as monocolin k is a fungal polyketide that occurs naturally in food such as red yeast rice[1] or "koji" in Japanese (*Monascus purpureus* inoculated rice) etc.[2]. Lovastatin is among the

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seven statins of biochemical inhibitors of 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) and a very important step in cholesterol biosynthesis[3]. Ravuri and Shivakumar[1] reported that lovastatin catalyzes the biochemical conversion of HMG-CoA to mevalonate. Mevalonate is an essential building block for cholesterol biosynthesis and lovastatin interferes with its production which acts as a reversible competitive inhibitor for HMG-CoA which binds to the HMG-CoA reductase[2].

Pharmacologically, lovastatin is a pro-drug, usually administered as an inactive lactone in its natural form. The gamma-lactone closed ring form is hydrolyzed *in vivo* to the β-hydroxy acid open ring form; which is the active drug molecule. However, the compound is clinically used in both free acid and lactone forms; depending on the formulation. The β-hydroxic acid forms of lovastatin are insoluble in water, whereas it is water soluble in the lactone ring form.

Statins have been widely used as drugs and have been demonstrated to have anti-inflammatory, antioxidant, pro-fibrinolytic and other properties. Lovastatin and other statin derivatives have provoked great interest because of their chemo-preventive and chemo-therapeutic effects[4]. Although earlier studies were focused on their blood lipid-lowering effects, recent investigations have shown some chemo-preventive and therapeutic effects against certain types of cancer; especially in the combination of statins with other anticancer drugs[5]. It has widely been suggested that anticancer effects of statins could be due to their ability to reduce proteasome activity, which leads to an accumulation of cyclin-dependent kinase inhibitors p21 and p27 and to subsequent G1-phase arrest, as seen in cells of different cancer lines[6].

The major use of lovastatin, however, remains its enormous value in managing cardiovascular diseases. Considering the global rapid increase in cardiovascular diseases traced to hypercholesterolemia and dysfunctional lifestyles, there is an urgent need to harness alternative sources to bridge the gaps in lovastatin production and supply. Therefore, the main aim of this study is to identify the best, among the studied oyster mushrooms and substrate for commercial production of lovastatin in Nigeria.

MATERIALS AND METHODS

Collection and preparation of mushroom samples: The study was carried out from April 2017 to September 2022. Three healthy fruit bodies of *Pleurotus pulmonarius* were collected from the mushroom research section, Department of Plant Science and Biotechnology, Michael Okpara University of Agriculture, Umudike Abia State. Pure culture of *Pleurotus ostreatus* was obtained from the Tropical Mushroom Farm and Research Consults (TROMFARC) while *P. tuber-regium* sclerotia (Fig. 1a) samples were collected from two different locations of Ubani Ibeku Market, in Umuahia Abia State and were cultivated to raise both the fruit bodies and sclerotia, while the second sample was obtained within Nsukka-Benue axis.

Collection and identification of mushroom samples: Sample of *P. tuber-regium*, *P. ostreatus* and *P. pulmonarius* were taxonomically identified by a curator, Mr. Alfred Ozioko of the International Center for Ethnomedicine and Drug Development (InterCEDD), Nsukka; with voucher numbers: InterCEDD/970, InterCEDD/971 and IntercEDD972, respectively.

Experimental procedure

Production of mother spawn culture: During spawn production, tissues of healthy fruit bodies of *P. ostreatus*, *P. tuber-regium* and *P. pulmonarius* were collected and aseptically inoculated onto petri-plates of Potato Dextrose Agar (PDA) and incubated at 30°C for nine days[7]. Pure mycelia cultures of the three white rot fungi were prepared by boiling sorghum grains in tap water, for 10-15 min, using an improvised industrial gas heater[7]. Mildly parboiled grains were thoroughly drained of excess moisture and mixed with 2% (w/w) $CaCo_3$ and 4% $CaSO_4$ for pH optimization and prevention of kernel clumping, respectively[8]. They

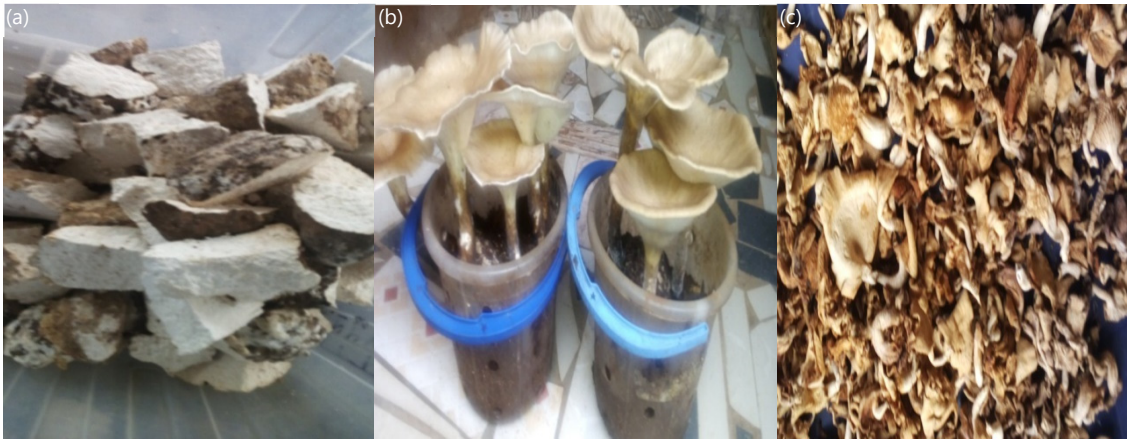

Fig. 1(a-c): Sclerotia and fruit body samples of the test mushrooms, (a) Crumbs of sclerotia of *P. tuber-regium* before inoculation, (b) Mature fruit bodies of *P. tuber-regium* in a plastic container and (c) Dried fruit bodies of *P. ostreatus*, ready for processing

were subsequently stuffed into heat-resistant bottles (HRB); tightly sealed with aluminium foil and autoclaved at 121°C and 15 psi for 30 min (Fig. 1b). The bottles were allowed to cool before they were aseptically inoculated with actively growing mycelia of the oyster mushrooms. They were subsequently incubated in the dark (at 27±2°C) until the grains were fully colonized by the mycelia[9]. The same protocol was followed for spawn multiplication[8,10].

Cultivation of *P. ostreatus* and *P. pulmonarius* on *A. gayanus*: A total of 50 kg dry dry-weight *Andropogon gayanus* straws were collected from local farmlands in Okofia Community in Nnewi, Amambra State. The substrate was chopped into pieces of 2-4 cm and further weighed into three portions. The first two were 12500 g each for mature fruit bodies of both oyster mushrooms while the third portion was 17,500 g for cultivation of *P. ostreatus* that was harvested 2 days, after primordial initiation (immature) (Fig. 1c).

The three substrate portions were separately steeped in tap water for 24 hrs and drained of excess moisture[11]. The three straw portions were steam-pasteurized at 95°C in an improvised metallic drum for 4 hrs and allowed to cool overnight, according to the method of Muswati *et al.*[10] and Okwulehie and Okwujiako[11] and Besufekeda *et al.*[12]. After cooling, the multi-layer technique of spawning was adopted to ensure quick mycelia colonization[13]. *Andropogon gayanus* substrate measuring 300 g was stuffed into 3-litre plastic buckets, randomly perforated from the bottom to the top. The substrate in each bucket was inoculated with spawns of *P. ostreatus* and *P. pulmonarius* and kept in a wooden rack, covered with a black polyethylene sheet[10,14]. The covering was necessary to reduce contamination, optimize humidity and provide a completely dark environment to stimulate vegetative growth[7,11]. Primordia formation in both oyster mushrooms was visible, 15 days after inoculation (DAI)[11,15] and was harvested at maturity, while the third portion (immature) *P. ostreatus* was harvested 2 days after primordial initiation DAPI[16].

Cultivation of oyster mushroom fruit bodies and *P. tuber-regium* sclerotia: Sawdust of an undetermined tree was obtained from the Umuahia Timber Market and allowed to compost for one more week[17]. Sawdust was thoroughly amended with 4% $CaSO_4$ and 2% (w/w) $CaCO_3$, pasteurized at 96°C for 4 hrs and allowed to cool overnight, according to the methods of Okwulehie and Okwujiako[11] and Besufekeda *et al.*[12].

Actively growing (mycelia) spawns of both oyster mushrooms were aseptically and separately inoculated at multi-layer of 300 g sawdust, stuffed into 2.5 L perforated plastic buckets while crumbs of

P. tuber-regium sclerotia ranging between 13-18 g were sown into the same quantity of sawdust. Favourable conditions of humidity (70-85%), temperature (25-32°C and light (450-500 lux) needed for quality fruit body production were maintained[7,18]. *Pleurotus ostreatus* and *P. pulmonarius* mycelia fully colonized the sawdust, 18 DAI while those of *P. tuber-regium* completed its vegetative phase within 10 weeks[19]. Fully mycelia colonized sawdust was seen producing fruit body primordia of the respective mushrooms after the observed durations and were harvested at maturity[14]. Fruit bodies of *P. tuber-regium* were observed to be emerging directly from underlying sclerotia formed within the sawdust[7,20].

Measurement of morphological characters

Stipe sizes of fruit bodies: Pileus and stipe length of fruit bodies were determined at maturity, excluding the immature *P. ostreatus*, harvested 2DAPI. The mushrooms were harvested accordingly while Pileus and stipe sizes were measured in cm using meter rule[14].

Cap/pileus diameter: This was obtained by placing a metre ruler across the centre of the cap and recording the diameter[14].

Fruit body number of the mushrooms: Fruit body number of all mushrooms was determined by harvesting the mushrooms, counting and recording their number and later comparing their values[10].

Yield and biological efficiency: Mushroom fruit bodies were harvested at maturity, fresh weight of fruit bodies was determined using a digital weighing scale while biological efficiency (BE) was calculated following the method of Besufekeda *et al.*[12]:

$$BE = \frac{FWm}{DWs} \times 100$$

Where:
FWm = Fresh weight of mushrooms
DWs = Dry weight of the substrate

Preparation of mushroom extracts: Fruit bodies from all test mushrooms and sclerotia of *P. tuber-regium* were sun-dried to brittle and ground into powdered samples, using a Infitek, HWM series laboratory electric grinding machine (Lixian District, Jian, China). These were stored air-tight in polyethylene bags before lovastatin isolation.

One kilogram of each of ground samples of mushroom species was macerated in 2000 mL of ethyl acetate for 72 hrs. The extract was filtered using Whatman filter paper; and was recovered in a rotary evaporator (Model RE-5299, ZZKD, Henan, China) to produce concentrated mushroom extract.

Preparation of calibration curve: One hundred milligrams of a pure sample of lovastatin were dissolved in 1 L of ethyl acetate to give the stock solution (100 ppm). The stock solution was filtered and scanned using a Shimazu Ultraviolet spectrophotometer (UV-1900, Shimazu Europa GMbH) to obtain the wavelength of maximum absorption (λ_{max} = 280 nm). Various volumes (0.20, 0.40, 0.60, 0.80 and 1.0 mL) of the stock solution were transferred to 100 mL volumetric flasks and made up to mark with ethyl acetate to obtain the diluted stock solutions.

The absorbance readings of the diluted stock solutions were obtained at λ_{max} = 280 nm and used to plot the calibration curve shown.

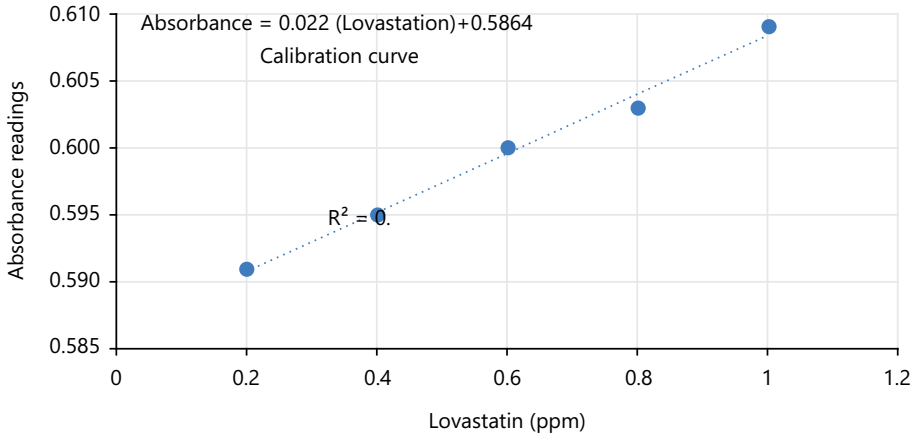

Fig 2: Calibration curve of lovastatin

Table 1: Absorbance readings of the diluted stock solutions

Lovastatin (ppm)	Average absorbance readings
0.2000	0.591
0.4000	0.595
0.6000	0.600
0.8000	0.603
1.0000	0.609

Determination of the lovastatin concentration in the mushroom extracts: Lovastatin concentration was estimated using spectrophotometric method. Two hundred milligrams of the extracts were dissolved in 200 mL of ethyl acetate to obtain a stock solution of 1,000 ppm stock solution (Table 1). The absorbencies of these stock solutions were obtained using an Ultraviolet spectrophotometer at λ_{max} = 280 nm. The lovastatin concentration in the sample extracts was interpolated from the calibration curve (Fig. 2).

Isolation, purification and structure elucidation of lovastatin from *P. tuber-regium* fruiting bodies

Thin layer chromatography: The concentrated mushroom extract was subjected to a thin layer of chromatography. Both the standard and sample spotted on the sample line were developed using cyclohexane, chloroform and isopropanol in the ratio of 5:2:1 while the mobile and silica phases were stationary.

Isolation of lovastatin using column chromatography: Under a typical laboratory process, the sun-dried powdery sample of *P. tube-regium* (10.5 kg) was macerated in ethyl acetate for 72 hrs. Removal of the solvent in vacuum in a rotary evaporator provided an organic extract (52 g). Add the flour extract slurry to 60-120 mesh silica gel, put it on a porcelain plate and stir constantly until it is completely absorbed into the silica gel and completely dried. The column elution protocol was carried out in a stepwise manner, starting with 70 mL of 100% dichloromethane, followed by various ratios of dichloromethane-ethyl acetate, i.e. 100 mL of 100% dichloromethane 20:1, 10:1, 6:1, 3:1 and 1:1 v/v (Fig. 2).

Samples based on relative mobility were mixed and evaporated to dryness. Add acetonitrile dropwise until a solution is formed. The solution was stored in the refrigerator at 4°C for crystallization. After crystallization, petroleum ether (in which the desired compound is insoluble) is added and evacuated to obtain lovastatin crystals. Use petroleum ether to remove impurities from the crystals. Finally, the crystals were dried in a desiccator, weighed as pure lovastatin crystals and subjected to NMR analysis.

Structure elucidation of lovastatin: The structure was identified using ^{1}H NMR and ^{13}C NMR. The purified lovastatin was dissolved in chloroform for NMR experiments, carried out as described by Vizini *et al.*[21]. The NMR spectrum was recorded using a Varian Mercury plus 500 MHz.

Statistical analysis: Data obtained in the course of this investigation were subjected to statistical analysis, using Analysis of Variance (ANOVA) IBM SPSS statistical version 21 and mean separation was carried out by Tukey's Honestly Significant Difference (THSD) at 95% level of significance[22,23].

RESULTS AND DISCUSSION

Yield and biological efficiency of various oyster mushrooms: Results revealed that *P. ostreatus* cultivated on *A. gayanus* substrate (Table 2) gave the highest (11,456.20±0.11g) fruit body yield and biological efficiency (91.65%) at maturity, followed by the same oyster mushroom cultivated on sawdust (10,297.10±0.10g). *Pleurotus tuberregium* sclerotia cultivated on sawdust gave a relatively high yield of 10,253.80±0.11g. However, sclerotia are in a different mycological category and cannot be regarded as fruit body (Fig. 1a). These observations were consistent with the works of Muswati *et al.*[10], who cultivated *P. ostreatus* on the straws of *A. gayanus*, *Pennisetum* and *Oryza sativa* and observed that amongst these substrates, *A. gayanus* straws supported significantly higher fruit body yield and fresh weight than all other straws while noting that *Pennisetum* straws produced the lowest quantity of fruit bodies. Immature *P. ostreatus* fruit bodies cultivated on *A. gayanus* gave the lowest yield (7,056.00±0.18 g) and BE (40.32±0.12%) compared to mature fruit bodies harvested from both *A. gayanus* and other substrates. This is evident by the fact that mature mushrooms have more densely packed biomass than immature ones[24].

Results on yield and biological efficiency (Table 3) of all test mushrooms cultivated on various substrates were significant at $p \leq 0.05$. The disparity in both sclerotial and fruit body yield was observed in the works of Barros *et al.*[17], Adejoye and Fasidi[25], Selvi *et al.*[26] and Mintesnot *et al.*[27] which revealed that the nutritional composition of substrate affects fruit body production as well as biological efficiency, as mushrooms are able to carry out extra-cellular digestion of the decomposed substrate during cultivation[28].

Macro-morphological characteristic of fruit bodies: Results of the macro-morphological characteristics of various oyster mushrooms (Table 4) revealed that among the cultivated oyster mushrooms, *P. tuber-regium* produced fruit bodies with the highest SL (5.600±0.17 cm), CD (18.60±0.10 cm), weight (52.30±0.11 g) but the lowest (11,543) fruit body number. The large sizes of fruit bodies were more natural factors, than environmental. Naturally, *P. tuber-regium* has an average fruit body CD, SL and weight of 10 cm, 18 cm and 48 g, respectively[7]. Its low FBN was complemented by their long stipe (5.600±0.17cm), large cap diameter (18.60±0.10g) as well as weight (52.30±0.11 g). *Pleurotus pulmonarius* cultivated on *A. gayanus* gave the lowest SL (2.10±0.14) CD (2.01±0.10) and fruit body weight (3.20±0.10 g).

In their separate experiments to ascertain the role of substrates on the variation of some morphological features of oyster mushrooms[29], maintained that stipe length and cap diameter of fruiting bodies of mushrooms depends on the supply of oxygen. On the other hand[10], in an experiment involving the use of local Nigerian substrates (*A. gayanus, Pennisetum* and *Oryza sativa*) for the production of *P. ostreatus* noted substrate is one of the major factors affecting fruit body morphology in various basidiomycetes species. They reported that *A. gayanus* substrates supported significantly higher fruit body yield and fresh weight than all other straws while *Pennisetum* straws yielded fruit bodies with lowest weight, shortest stipe and widest cap. Cap diameter and stipe length of *P. ostreatus* and *P. pulmonarius* grown on various substrates were not significant ($p \geq 0.05$) while those of *P. tuber-regium* fruit bodies as well as sclerotial weight were significantly different at $p \leq 0.005$.

Table 2: Yield and biological efficiency of various ouster mushrooms

Mushroom	Substrate	DWS	GS	Yield (g)	BE (%)
P. tuber-regium (Sclerotia)	Sawdust	12,000.00^{a}	Mature	10,253.80±0.11^{bc}	85.44±0.10^{c}
P. tuber-regium	Sawdust	12,000.00^{a}	Mature	9,185.40±0.01^{c}	76.55±0.00^{e}
P. ostreatus	*A. gayanus*	12,500.00^{a}	Mature	11,456.20±0.11^{a}	91.65±0.12^{a}
P. ostreatus	*A. gayanus*	17,500.00^{a}	Immature	7,056.00±0.18^{d}	40.32±0.12^{e}
P. ostreatus	Sawdust	12,000.00^{a}	Mature	10,297.10±0.10^{ab}	85.81±0.10^{b}
P. pulmonarius	*A. gayanus*	12,500.00^{a}	Mature	6,259.50±0.00^{ab}	50.076±0.10^{d}

DWS: Dry weight substrate, GS: Growth stage, BE: Biological efficiency, Means followed by the same alphabet within column are not significantly different ($p \geq 0.05$) by DMRT and Means SEM (n = 3)

Table 3: Some macro-morphological characteristics of fruit bodies

Mushroom	Subsrate	SL (cm)	CD (cm)	Sclerotia shape and size	WT (g)	FBN
P. tuber-regium (Sclerotia)	Sawdust	-	-	Spherical-oval 4-6 cm in diameter	65.67±0.11^{a}	103.00
P. tuber-regium	Sawdust	5.60±0.17^{a}	18.60±0.10^{a}	-	52.30±0.11^{b}	11,543
P. ostreatus	*A. gayanus*	2.10±0.12^{bc}	2.60±0.12^{b}	-	3.60±0.01^{cd}	15,556
P. ostreatus	*A. gayanus*	2.20±0.16^{bc}	2.40±0.16^{bc}	-	3.50±0.12^{cd}	18,076
P. ostreatus	Sawdust	2.30±0.18^{b}	2.20±0.18^{bc}	-	3.10±0.10^{d}	17,875
P. pulmonarius	*A. gayanus*	2.10±0.14^{bc}	2.01±0.10^{c}	-	3.20±0.10^{d}	14,556

SL: Stipe, CD: Cap diameter, Wt: Weight, FBN: Fruit body number, Means followed by the same alphabet within column are not significantly different ($p \geq 0.05$) by DMRT and Means SEM (n = 3)

Table 4: Yield (%) of extracts of mushrooms

Mushroom	Status	Substrate	Growth stage	Component	Yield (%)
P. tuber-regium	Cultivated	Sawdust	Mature	Sclerotia	11.00
P. tuber-regium	Cultivated	Sawdust	Mature	fruiting bodies	0.60
P. tuber-regium	Wild	Nd	Mature	Sclerotia	1.02
P. ostreatus	Cultivated	*A gayanus*	Mature	Fruiting bodies	40.04
P ostreatus	Cultivated	*A. gayanus*	Immature	Fruiting bodies	10.09
P. ostreatus	Cultivated	Sawdust	Mature	Fruiting bodies	35.00
P. Pulmonarius	Cultivated	*A. gayanus*	Mature	Fruiting bodies	2.9.00

ND: Determined

Table 5: Percentage (%) yield of lovastatin

Mushroom specie	Source	Substrate	Growth stage	Component	Lovastatin (%)
P. tuber regium	Cultivated	Sawdust	Mature	Sclorotia	55.60
P. tuber regium	Cultivated	Sawdust	Mature	fruiting bodies	62.54
P. tuber regium	Wild	-	Mature	Sclerotia	55.0 1
P. ostreatus	Cultivated	*A gayanus*	Mature	Fruiting bodies	76.16
P. ostreatus	Cultivated	*A. gayanus*	Immature	Fruiting bodies	45.15
P. ostreatus	Cultivated	Sawdust	Mature	Fruiting bodies	40.10
P. Pulmonarius	Cultivated	*A. gayanus*	Mature	Fruiting bodies	47.22

The results of this experiment however, agreed with the findings by Besufekeda *et al.*[12], in an experiment involving the use of local Nigerian substrates (*A. gayanus, Pennisetum* and *Oryza sativa*) for the production of *P. ostreatus*, they noted that *A. gayanus* substrates supported significantly higher fruit body yield and fresh weight than all other straws while *Pennisetum* straw produced the lightest and shortest fruit bodies but the widest and longest Pileus[30]. Therefore, the fruit body morphology of oyster mushrooms depends on a combination of genetic, substrate and climatic factors as recorded in this study.

Lovastatin production: In this study, *P. ostreatus* fruit bodies cultivated on *A. gayanus* gave an appreciable yield of lovastatin (Table 5), compared to those from sawdust. This elevated yield in lovastatin was recorded in mature *P. ostreatus* fruit bodies (76.16%), which was significantly higher than that from mature *P. tuber-regium* (62.54%) and *P. pulmonarius* (47.22%). These results conformed to the works of previous studies[31-34], who extracted lovastatin from various organic sources, including fungi. The results also indicated that lovastatin (Fig. 2) was in lower concentration in immature fruit bodies of *P. ostreatus*.

The observed variations in lovastatin concentration (Table 5) among the three oyster mushrooms could be attributed to two main factors. One is the genetic variability of the individual species while the other is the environment, especially the substrate where the mushrooms have been cultivated[13,35]. Similarly, the percentage yield of lovastatin in cultivated *P. tuber-regium* sclerotia (55.60%) showed no significant difference compared to wild strain (55.01%). This authenticates the report that in the wild, *P. tuber-regium* grows attached to dead wood, which are most source of sawdust, while the sclerotium buries itself in the surrounding soil as it gets bigger and matures[7]. These results conformed to the works of Mane *et al*.[32] and Alarcon *et al*.[35] that basidiomycetes have appreciable concentrations of lovastatin, which may vary according to species. Other researchers have also indicated that black gram husk (12.63 mg/g), green gram husk (4.8 mg/g), rice bran (9.2 mg/g), orange peel (3.4 mg/g) etc., are suitable for high yield of lovastatin[30,32].

CONCLUSION AND RECOMMENDATIONS

Andropogon gayanus straws gave highest yield of mature *P. ostreatus* fruit bodies, compared to sawdust. Moreover, the concentration of lovastatin in mature *P. ostreatus* fruit bodies cultivated on *A. gayanus* was found to be significantly higher than those of other species investigated. The significance of this study is that a nutriceutical with a sufficient amount of lovastatin will offer the known therapeutic effects of the pure substance without possible adverse effects. This study confirmed through spectroscopic and chromatographic analyses indicated that the pure lovastatin as obtained was identical to standard commercial lovastatin. It follows therefore that the mother-liquor from the lovastatin production can be characterized and standardized as nutriceuticals and functional foods. Based on the above findings, we recommend that large-scale production of *P. ostreatus* be adopted for the commercial production of lovastatin to help tackle the challenges of hypercholesterolemia. In so doing, *A. gayanus* substrates should be used for the cultivation of the oyster mushrooms, for yield optimization. Critical stakeholders (BDG/RMRDC) in the ongoing lovastatin project should consider the commercialization of lovastatin production in Nigeria to help cub the huge annual capital flight as a result of lovastatin importation. This will not only generate more income but create jobs for the taming unemployed youth.

SIGNIFICANCE STATEMENT

The administration of lovastatin medications in patients with high blood cholesterol has significantly reduced the risk factors associated with cardiovascular diseases. The major challenge faced with its use in Nigeria is the huge capital flight associated with its importation which has made it inaccessible to most Nigerians. This study aims to bridge the production and supply gap currently faced by Nigerian Government, production of the anti-cholesterol active pharmaceutical ingredient (API) from cultivated oyster mushrooms. This move is a welcome development for a country of over two hundred million (200 million inhabitants with adequate manpower and favorable environment that will guarantee a hitch-free production and distribution of lovastatin.

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