**“EFFECTS OF DIFFERENT SUBSTRATES ON THE GROWTH, YIELD AND NUTRITIONAL COMPOSITION OF OYSTER MUSHROOMS (*Pleurotus ostreatus)”***

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 **Abstract:-**

In the modern world, disposing of agricultural wastes is a major problem since they are nutrient-rich and their disposal without pretreatment might result in leaching in the field, which can lead to environmental damage. The most environmentally friendly way to lower the quantity of nutrients to an acceptable range to be used as manure is to grow mushrooms on these agricultural wastes. A well-defined mix of agricultural wastes also produces a large output of mushrooms in an economical way in addition to solving this issue.

**1.INTRODUCTION:**

The negative impacts of climate change are endangering global food production. Due to this, Sub-Saharan Africa must increase agricultural production in order to sustainably feed its expanding population and provide food security and safety . On that note, roughly 70% of Indian population is dependent on agricultural outputs and the area is facing serious issues with food due to population and the repeated use of agricultural land over a number of years has created a remarkable reduction in soil fertility , leading to subpar harvests. In order to fight the issue of food security, In Asian countries must adopt a scientific, technological, and economic strategy . To improve the nation's nutrition and food security, one method is to increase the output of mushrooms. In comparison to other field crops, oyster mushrooms (Pleurotusostreatus) have been found to grow quickly, require less area, and use less water, making them an excellent food source for reducing malnutrition in India. Due to its amazing flavour and beneficial health and nutritional qualities, oyster mushrooms are commercially grown all over the world .In Asian nations like China and Korea, they can be used to create very pricey sauces and soups. Mushrooms are regarded as a particularly rich source of non-starchy carbohydrates, dietary fibre, proteins, most amino acids, minerals, and vitamins . They are a great source of protein and are often used in vegetarian diets in place of meat. According to Stanely and Odu , oyster mushrooms have 25–30% protein, 2.5–0% fat, 17–44% sugar, 7–38% mycocellulose, and about 8–12% mineral content (potassium, phosphorus, calcium, and sodium). Additionally, mushrooms have a significant amount of dietary fibre and exhibit immunostimulatory and anticancer activities due to their chemical makeup . The mushrooms also have anticancer, antioxidant, and anti-diabetic effects.

Due to the advantages of mushroom culture, numerous indigenous and industrial cultivation techniques have been created and implemented to domesticate mushrooms. In 1917, a scientist by the name of Flack began growing oyster mushrooms experimentally on tree stumps and wood logs in Germany. Block, Tsao, and Hau later developed the developing technique in the USA . In most developing and developed nations, including the USA, Great Britain, China, Asia, Japan, Europe, South Africa, and Ghana, the cultivation of mushrooms has developed into a very lucrative commercial agribusiness. China is currently the world's largest producer, producing about 3,918,300 tonnes of mushrooms annually . Over 85% of the world's oyster mushrooms are produced in China, yet 95% of the country's entire output is consumed domestically . Despite the potential advantages of mushroom cultivation and consumption,India falls far behind in both commerce and production . Around 20 years ago, estimates put the global production of farmed edible mushrooms at 7 million tonnes and the market value of all edible and medicinal mushrooms combined at more than $30 billion . India is discovered to contribute less than 1% of this anticipated value while processing so many biological wastes. The technology for growing mushrooms is virtually nonexistent in some southern Asian nations, while it is barely produced in others.

Due to its remarkable ligninolytic characteristics, Pleurotus spp. is one of the most investigated white-rot fungus . Comparatively speaking to other mushrooms, Pleurotus species require a quick growing period. It can be produced easily and inexpensively, sporeless, with high yield, wider substrate usage, wide chemical, and temperature tolerance, as well as environmental bioremediation . Its fruiting body is hardly ever attacked by pests and diseases. Numerous variables that may work alone or in conjunction with one another affect the growth and survival of mushrooms. Chemical, physical, and biological factors related to mushroom production include chemical composition, carbon to nitrogen ratio, sources of nitrogen, surfactant, minerals, pH, water activity, moisture, particle size and amount of inoculum, antimicrobial agents, and the presence of microorganism interactions. The important environmental factors that affect the yield and quality of oyster mushrooms include brightness, humidity, temperature, and the air composition of the surrounding substrate, such as the concentration of carbon dioxide and oxygen .

Table 1: Base substrates and their composition as used in this experiment as substrate material.

|  |  |
| --- | --- |
| Treatment | Composition by weight |
| Trt1Trt2Trt3Trt4Trt5Trt6Trt7 | 100% CW100% WS100% VW33.3% CW+ 33.3% WS+ 33.3% VW� 100%50% VW + 50% CW50% VW + 50% WS50% CW+ 50% WS |

CW: compost; WS: wheat straw; VW: vegetable wastes.

Wood chips, coffee pulp, teff straw, and compost all play important roles in the formation of mushrooms because of their high lignin, cellulose, and hemicellulose contents . As a result, a few research have been conducted on the effectiveness of using agricultural byproducts in mushroom production. The purpose of the current inquiry was to evaluate the yield (bioconversion efficiency), growth, and economic viability of small-scale production of oyster mushrooms utilising locally accessible agroindustrial by-products. Currently, small-scale growers, the majority of whom are women in mushroom farming industry. According to research the decline in mushroom production in India is primarily caused by a lack of financial support, marketing issues, and a lack of production space. Other significant factors include training, the quality of spawns, temperature control, mushroom diseases, people's negative attitudes, water shortages, and substrates.

The capacity of oyster mushrooms to grow from a wide range of agricultural and forestry wastes, such as corn cobs, wheat straw, rice hulls, sawdust, and many other wastes, has led to their use as one of the environmentally friendly solutions of converting wastes into biomass of high market value. In addition, the mushroom substrate has the potential to be reused in either mushroom production again or in farming land as organic fertilisers to increase yields while minimising environmental impact. In order to increase yields and provide a low-cost supply of protein to the expanding nation, this research sought to determine the effectiveness of mixing crushed sugarcane baggase, wheat straw, and compost for the creation of oyster mushrooms.

**2.MATERIAL AND METHOD:**

The research was done at Meerut Institute Of Engineering And Technology, Meerut. It looked at how different substrate combinations affected the growth and yield of grey oyster mushrooms (Pleurotusostreatus). The Grey HK35 strain was subcultured at a university lab after being purchased on the open market. The experiment was set up with 5 replications for each substrate treatment and a fully randomised design. Four combinations produced from the three basic substrates, including compost (CW), wheat straw (WS), and vegetable wastes (VW), were also assessed (Table 1). The wheat straw was then cut into pieces that were 2-3 cm long. The vegetable wastes were purchased from Vegetable venders and used a crusher to reduce them to 2-3 cm pieces. Compost was gathered from Village.

**2.1. Substrate preparation:-**For cold pasteurisation, 7.5 kg of each treatment substrate's dry weight was soaked for 8 hours in 40 litres of water containing 100 grammes of hydrated lime (Ca (OH)2. According to Contreras et al. [35], water and Ca (OH)2 were thoroughly homogenised for 2 minutes before the substrate was soaked. After being drained of excess water, the substrates were then packed into transparent plastic standard loaf packs for spawning in accordance with the ratios provided in Table 1. The stages specified in the method presented by Zied et al. [8] were followed to produce grain spawn using sorghum seeds: choosing the mushroom, creating the subculture, creating mother spawn, and creating grain spawn. According to Tavarwisa et alexplanation .'s of the triple spawning process, it was employed [6]. Approximately 2 kg of substrate and 80 grammes of sorghum grain Grey HK35 strain spawn were used in each clear polyethylene bag. After the spawn run was over and the room temperature was kept between 18 and 21°C, the fruiting bags were hung in a dark fruiting house where moisture was continuously supplied. Following the completion of the spawn run, the plastic mushroom bags were pierced to make holes through which the mushroom grows, and the fruiting bags were then transported to the fruiting house. There are a total of 24 holes in the plastic due to the six holes that were punched along the plastic's length and on each of its four sides. The bags were hung on horizontal poles in the fruiting house, water was sprayed on them to keep them moist, the floors were also moistened to assist raise the humidity to at least 85%, and the temperature was kept between 14 and 18°C. To allow the base and smaller mushrooms to continue growing, harvesting was done by cutting the larger mushrooms off at the base.

**2.2.Determination of the Substrate Water Holding Capacity:-**200 g of the substrate were taken from each treatment and put inside a beaker with 400 ml of water. To allow the substrate to absorb as much water as possible, the combinations were left overnight. For each treatment, the setup was duplicated five times. Extra water was funnelled into a measuring cylinder after being filtered with filter paper. By deducting the volume of water collected in the measuring cylinder from the total volume of water applied to each treatment, the volume of the filtrate was measured, and the amount of water that was retained by the substrate was calculated and expressed as g of water per 200 g substrate.

Table 2: The effect of different substrate treatments on mushroom growth parameters investigated.

|  |  |
| --- | --- |
|  **Treatment** | **Time(Days)****S-CSR S-PF PF-PM DFH TNP SG QS** |
| T1 cw | 18.2a  23.2a  2.8a  26.0a  29.8a  4.7ab  9.8a |
| T2 ws | 24.2b  30.8c  3.0ab 33.8bcd  23.8bc 4.1ab 9.2ab |
| T3 VW | 21.0b  30.0bc 4.2cd 34.2 cd 25.8abc  4.5ab 9.6a |
| T4 | 20.0ab 24.0a 3.4abc  27.4a  29.2ab 5.4a  9.0ab |
| Mean | 21.43 27.69 3.7431.43 25.34 4.46 8.97 |
| *p* value | <0.001<0.001 0.006 <0.001<0.001 0.004 0.002 |
| CV% | 9.9 8.1 20.7 7.0 10.7 15.7 8.3 |
| Within the columns, means followed by the same superscript letter are not significantly different, LSD0.05. S-CSR: spawning to complete spawn run; SPF: spawning to pinhead formation; QS: quality score; DFH: days to first harvests; TNP: total number of pins; SG: stipe girth; PF-PM pinhead formation to pin maturation. |

**2.3. Data Collection:-**After two weeks of spawning, the spawned bags were checked everyday, and the number of days from spawning to the end of the spawn run was noted. Days were kept track of for the length of time it took from the end of the spawn run to the creation of pinheads, the maturation of pins, and the number of days it took from spawning to the first harvest. Based on the total number of pins created, the total number of pins (TNP) formed during the first and second flashes were noted. Both cap diameter and stipe girth (SG) were measured. By counting the amount of imperfections, deformities, size, and colour, quality (QS) was calculated. The oyster mushrooms' fresh weight (kg) served as the unit of measurement for the yield. The effectiveness of a mushroom strain and substrate was measured. Biological efficiency was calculated using the following formula:

 Biological efficiency ,BE(%) = fresh weight of harvested mushroom X 100 weight of dry substrate

**2.4. Data Analysis:-**By computing the benefit cost ratio for each treatment, the economic analysis of the various substrate treatments was determined. The above-mentioned parameters were statistically evaluated using one-way ANOVA and the Genstat statistical software programme, and mean comparisons were performed using Fisher's protected LSD at p<0.05.

**3.RESULT:**

**3.1. Days from Spawning to Full-Spawn (S-CSR):-**The number of days taken was significantly different (p<0.05) spawning to the end of the spawn run (Table 2). The spawn run for compost waste (Trt1) took the fewest days (18.20), followed by mixtures of compost and wheat straw (Trt7) and vegetable wastes (Trt3), which required 21 and 25 days, respectively. Compared to the other substrates, the spawn run on the mixture of vegetable waste and wheat straw (Trt6) took the longest (25.00 days). The average number of days required to finish a spawn run was 21.43, however it may take anywhere between 18 and 25 days.

***3.2. Days from Spawning to First Pinhead Formation (S-PF):-*** Table 2 displays the data regarding time from spawning to the first pinhead development. The data show that there was a significant difference (p<0.05) between the different substrates in the amount of time it took from spawning to the first pinhead formation. The shortest amount of time to pinhead development was found for treatment Trt1 (23.2), followed by treatment Trt5 (27.2). The most days from spawning to pinhead formation were recorded by treatment Trt6. It took between 23 and 31 days from spawning to pinhead development. Between spawning and pinhead formation, there were on average 27.7 days.

***3.3. Time Taken to Pin Maturity (PF-PM):-*** Among the several substrates examined, the amount of time required from pinhead development to pin maturation differed substantially (p<0.05). (Table 2). Trt1 pins matured in the quickest amount of time (2.8), followed by Trt5 pins (4.0). The time it took for pins in Trt6 to mature after they were formed was the longest (4.6). From pin development to pin maturation, it took somewhere between 2.8 and 4.6 days. It took an average of 3.7 days for a pin to reach maturity.

***3.4. The Number of Days to the First Harvest:-***Table 2 provides statistically significant (p<0.05) information on the number of days needed to reach the first harvest for each substrate examined. Trt1 recorded the fewest amount of days (26.0). Days higher than the mean (31.4) of all the substrate treatments under examination were recorded by treatments Trt7 (31.8), Trt2 (33.8), Trt3 (34.2), and Trt6 (35.6). From 26.0 to 35.6 days were needed to reach the first harvest.

***3.5.TheTotalNumberof Pins (TNP):-*** The total number of oyster mushroom pins from the various substrate treatments varied substantially (p<0.05), according to Table 2's findings. The most pins were registered by treatment Trt1 (29.8). The number of pins reported by treatments Trt6 (20.6), Trt5 (23.4), Trt2 (23.8), and Trt7 (24.8) was less than the mean (25.3) for all the substrate treatments being studied. The recorded number of pins varied from 20.6 to 29.8.

***3.6. Stipe Girth (SG):-***Results for stipe girth are reported in Table 2, and the parameter did not statistically significantly differ (p<0.05) amongst the investigated substrate treatments. In terms of stipe girth, only treatments Trt4 and Trt6 were significantly different from treatment Trt7. Treatment Trt4 produced the biggest (5.4) stipe girth. The mean diameter for all treatments examined was 4.5 cm, while the stipe girth ranged from 3.4 to 5.4 cm.

***3.7. Quality (QS):-***The results of the mushroom's overall quality show that the substrate treatments had significantly different (p<0.05) scores (Table 2). It is noteworthy that all base substrates showed scores that were greater than the average (9.0) of all substrate treatments considered for this study.

The outcomes also show that (p<0.05) there was no difference between the base substrates' mushrooms' quality.

***3.8. Cap Diameter (cm):-***Among the investigated substrate treatments, cap diameter was significant (p<0.05). (Figure 1). Treatment Trt1 recorded the biggest (5.5 cm) cap diameter, followed by treatment Trt5 (4.8 cm). Treatments Trt2 (4.1 cm), Trt7 (4.2 cm), and Trt3 (4.3 cm) all recorded cap diameters that were smaller than the average (4.7 cm) of all the substrate treatments being studied. Significant differences at p,0.05 are represented by bars with distinct lettering.

***3.9. Yield (kg)****:-*The yield as affected by the various substrate treatments used in this investigation varied statistically (p<0.05). (Figure 2). Trt1 (1.29 kg) and Trt7 were the treatments with the highest yields from the 2 kg of substrate material employed (0.99 kg). Notably, only treatments Trt1, Trt4, and Tr7 produced yields that were more than the average (0.96 kg) of all the substrate treatments examined.

***3.10. Biological Efficiency, BE (%):-***According to data on biological efficiency (BE) (Figure 3), treatment Trt1 had the greatest BE of all the substrate treatments examined (86.15%), followed by treatment Trt7 (66.3%). Notably, the majority of the treatments—namely, treatments Trt6, Trt5, Trt3, and Trt2—registered percentages that were below the average (63.7%) of all the substrate treatments examined (respectively, 42.5%, 48.6%, 55.0%, and 61.4%).

***3.11. Amount of Retained Water (g):-***There were noticeable changes (p<0.05) in the water holding capacity of the substrates employed in the study, according to the data (Figure 4). According to statistics, treatment Trt1 kept the most water (126.2 g/200 g substrate), while treatment Trt2 retained the least (88.8 g/200 g substrate), which did not differ (p > 0.05) from treatment Trt6's retention of 92.4 g/200 g substrate. %e water retained recorded from substrate treatments Trt7, Trt3, and Trt5 registered 106.4 g, 107.6 g, and 108.8 g per 200 g substrate, respectively, with no significant differences between them. For all substrate treatments, the average amount of water retained was 107.1 g.

(Figure 1: Graph showing the average cap diameter for mushrooms grown using different substrate combinations.)

(Figure 2: Graph showing yield of mushrooms grown using different substrate combinations)

(Figure 3: Graph showing the average biological efficiency of different substrate combinations used in the production of mushrooms)

***3.12. Economic Analysis:-***The benefit-cost (B: C) ratio of the substrate treatments was taken into account when conducting the economic analysis (Table 3). It is described as the proportion of gross sales revenue from mushrooms to all cultivation-related expenses. The project is approved when the B:C ratio exceeds 1, and vice versa. A higher B:C ratio indicates that the project is more likely to be financially successful. The use of substrate treatment Trt1 (compost) yielded the largest economic benefit (2.11), followed by the use of substrate treatment Trt4 (cotton husk, wheat straw, and crushed vegetable wastes), which had a B:C value of 1.93. Trt6 (wheat straw and vegetable wastes) had the lowest ratio (1.16).

(Figure 4: Graph showing the water holding capacity of the substrates used in the experiment)

**4.DISCUSSION:**

Due to their therapeutic qualities and great nutritional worth, mushrooms are increasingly being included in our meals on a global scale. In this study, the performance of seven alternative substrates, constructed from three base substrates—compost, wheat straw, and vegetable waste—was examined for periods of spawn development and harvesting as well as yield and quality. Because the physiochemical makeup of the growing substrate varied, so did the yield of grown mushrooms and the morphological characteristics of their fruiting bodies (p<0.05).The choice of substrate is crucial in mushroom cultivation as it significantly affects oyster mushrooms' productivity for improved growth, development, and yield. The production is worse in lignocellulosic materials-derived substrates because they typically have lower protein content. As opposed to treatment Trt1, treatments using wheat straw (Trt2) and vegetable waste (Trt3) produced less mushroom growth and yield (compost). Even when these substrates (Trt4, Trt5, and Tr7) were combined with compost, their performance either did not significantly (p > 0.05) increase or was superior to Trt1.But when compost (Trt7) was added to the wheat straw alone (Trt2), some characters, such S-CSR and S-PF, performed much better (p<0.05). The aforementioned study's findings show that productivity was unaffected for the majority of the parameters when substrates with a high C:N ratio were added to by N-rich material. As a result, while augmentation of the raw substrate is a crucial method for encouraging the use of locally accessible agroindustrial byproducts in mushroom growing, it can also have unfavourable outcomes. This could be explained by a change in the substrate's composition, which is affected by factors including pH, temperature, moisture, aeration, and the quantity and activity of bacteria.

The development of mycelia in the substrate is one of the key elements in mushroom culture. Results from Trt1 in this study demonstrated the highest mycelial growth rate since it required the least amount of time to complete a spawn run in comparison to the other substrate treatments examined. The increased C:N of compost, which encouraged high mycelial development, may be responsible for the high mycelial running rate. These results closely match those of Bhattacharjya et al. [36] who, while using sawdust as a substrate in their investigation, observed closely related mycelial growth rates on several of the treatments. It's crucial to keep in mind, though, that substrates with lower final N concentrations can produce mushrooms with lower protein levels.Conditions for mycelial growth are different from those needed for mushroom pinning [38]. Even while wheat straw (Trt2) took longer to finish colonising the media, it took much less time than other substrate treatments for pinheads to grow and mature. The substrate treatment Trt6 had the longest total mushroom growth period, but it also produced the fewest total pins overall (p 0.05) of all the substrate treatments studied. The creation, growth, and development of the fruiting body were more influenced by the C:N ratio.

Since the availability of C:N from the lignocellulose substrate is directly tied to the production of primordia or pinheads, the decline in carbon and nitrogen may be to blame for this [39, 40]. Wheat straw-containing substrate treatments (Trt2, Trt5, and Trt6) showed a longer time for mycelial growth rate but the smallest number of total pins. This was most likely caused by the high N concentration, which is known to prevent the growth of mushrooms in the substrate when present in excess amounts [41]. The results of this study demonstrate that the time between spawning and the completion of the spawn run was negatively correlated with the C:N ratio of the substrates employed.The results concur with those of Albor'es et al. [42], who found a positive association between mycelium running pace and the substrate's C:N ratio. Significant (p 0.05) differences in stipe girth, cap diameter, primordial count, and quality traits among substrate treatments imply that substrate type is one of the key determinants of oyster mushroom growth, development, fruiting, and quality. These considerable discrepancies between various substrates were also noticed by several other writers, including Besufekad et al. [30], Chukwurah et al. [43], Tsegaye and Tefera, [44], Onyeka et al. [45], and Dubey et al. [46].The cellulose, hemicelluloses, and lignin content of the substrates, which act as physical barriers and are challenging to break down without the presence of lignin-degrading enzymes, determine the size of the mushroom [47]. A faster rate of growth and development of the pins may have reduced the exposure of the mushroom caps to insects and other illnesses, explaining the changes in quality characters that have been observed. Several studies have also shown that in order to cultivate Pleurotus, nitrogen-poor substrates must be supplemented with wheat or soybean bran or mixed with other straws or grasses[48–53].

Yield is the primary goal of mushroom production. The results of the current study show that the various cultivation substrate treatments had varying effects on the yield. The biological effectiveness of the substrate treatments was also affected by the variations in yield. Substrates that produced better yields typically also produced higher BE values. The highest yield and BE values were obtained from the substrate treatments Trt1 and Trt4, whereas the lowest yield and BE values were obtained from Trt5 and Trt6. A 74.2% biological efficiency in compost was also observed by Girmay et al. [54] while a 92.9% biological efficiency for the same substrate was documented by Islam and Riaz [55].According to Wang et al. [56], there was a negative association between BE and the degradation of lignin, but a positive correlation between BE and the degradation of cellulose and hemicellulose. In terms of yield and BE compared to other substrates, substrate treatments Trt1 and Trt4 show that they are better favourable for mushroom cultivation. The variations in the physical and chemical makeup of substrate formulations, such as cellulose/lignin ratio and mineral contents, pH and EC of the substrate, especially C: N ratio, are responsible for the variations in yield and BE of oyster mushrooms grown on various substrate types [57].

In comparison to other raw substrates, the low N in substrate treatment Trt2 most likely had an impact on the total yield and BE. The N was improved, C:N ratio dropped, and the substrate supported better mushroom yield than the substrates with larger C:N ratios when the raw substrates Trt2 and Tr3 were gradually replaced by the compost in the substrate formulations Trt7 and Trt5, respectively.

The yield indicates that the substrate used more frequently by the fungal enzymatic activity provided a higher yield. The substrate water holding capacity increased with increased mycelium running rate in substrate treatments Trt1 and Trt4, and this may be related to an appropriate C:N ratio, which in turn increased yield.

This is not the case for substrate Trt5, which produced a much lower yield while having a greater mycelium running rate and water holding capacity. Due to the impact of various substrate compositions on the substrate treatments, the biological efficiency and yield differed dramatically. The changes in yield and BE might therefore be used to explain the variations in C:N composition between Trt1, Trt4, and Trt5. Similar trends were seen in studies by other authors [58, 59], and this outcome was explained by the easily metabolizable organic sources of N in the substrates for higher yield and higher BE.The outcome may also be explained by the fact that the mushroom breaks down readily biodegradable carbon sources in substrate materials more effectively than it does complex carbohydrates like lignin, cellulose, and hemicellulose in the other substrate composition. However, Gume et al. [60] found that all substrate treatments utilised in this study might be suggested for growing oyster mushrooms because they produced BE values of at least 40.0%.

According to the economic study, Trt1 and Trt4 had the highest B:C ratios. This was explained by the large yields that these substrates produced. Trt1 had a greater substrate cost than Trt6, but Trt1's B:C was higher due to the much higher yield, which translated into a larger gross income. As a result, the yield from the various substrates plays a crucial role in determining the substrate's economic value.

**5. Conclusion and Recommendations:**

The findings of this experiment indicate that the substrate from which the Pleurotusostreatus mushroom was produced had a significant impact on its performance and output. The length of mycelium running, pinhead development, the quantity of fruit bodies generated, the timing of cropping, the primordial diameter, and the biological effectiveness of oyster mushrooms were all found to be influenced by the substrates media. The study's findings demonstrate that combining different types of substrate can help to increase mushroom yield because a mixture of compost, wheat straw, and crushed vegetable wastes (Trt4) outperformed more commonly used raw substrates like wheat straw (Trt2) or less widely used raw vegetable wastes (Trt3).As a result, blending substrates that are in short supply can help farmers achieve their desired yields. This may be crucial to farmers who may not have enough of the substrates available. When substrates are mixed, compositional characteristics including porosity, which enhances water penetration and gas exchange, enhanced substrate structure, and the ideal C:N ratio, which boosts substrate efficiency, may be optimised. In order to choose the best combinations and proportions, it is crucial to first assess the N content of each raw agroindustrial byproduct utilised in the substrate mix for mushroom development.These findings may aid in the sustainable management of baobab trash by baobab growers. Based on the findings of this study, it is advised that mushroom growers employ compost and/or a mixture of compost, wheat straw, and crushed vegetable wastes, which provided the highest B: C ratio. The results of combining substrates other than those employed in this experiment and adjusting the quantities can be recommended for further research.

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