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# Evaluation of *Pleurotus* Species (*P. ostreatus* and *P. eryngii*) Fruiting Potential within the Dry and Rainy Seasons

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***ABSTRACT***
*Studies on two species of Pleurotus (P. ostreatus and P. eryngii) fruiting potentials within the dry and rainy seasons were carried out in the Department of Plant Science and Biotechnology, Rivers State University. Both species (P. ostreatus; P1 and P. eryngii; P2) were grown on hard wood (HW) and soft wood (SW) sawdusts from Mitragyna tree and Xylopia tree at 600g during the dry (D) and rainy (R) seasons. The sawdusts were supplemented with 100g of rice bran and 1g of Rhizophora wood ash. Eight treatments were established based on the interactions of the species to the substrates and seasons viz: P1SWR, P1HWR, P2SWR, P2HWR, P1SWD, P1HWD, P2SWD and P2HWD. Fruiting potential was assessed based on the mean harvest weight and was done for five weeks. P1HWD recorded highest mean weight (33.11g) during the dry season while P1HWR had highest mean weight (33.54g) for week1 harvest. P2 recorded no harvest at the first week. Highest mean weight of 21.72g and 24.61g were observed for P2SWD and P1SWR respectively for the second week of harvest. Week 3 harvest revealed P1SWD and P2SWR with the highest mean weights (14.05g and 23.07g) respectively. Within the fourth week of harvest, P2SWD (5.34g) and P2HWR (17.36g) recorded highest mean weights compared to other treatments. At the fifth week of harvest, highest mean values (10.67g and 17.04g) were seen for P2SWD and P2HWR respectively. Generally, P1 had more fruiting potential than P2 as its treatments fruited in all the weeks of harvest. Soft wood sawdust during the rainy season favoured higher yield than hardwood sawdust during the dry season.*

***Keywords:*** *Fruiting potential, Pleurotus ostreatus, Pleurotus eryngii and seasonal variation*

## INTRODUCTION

Mushrooms are important members of the environment as they do not only service the environment as primary decomposers but also as source of food. The *Pleurotus* genus is a vital member of the Basidomycota taxon and commonly known by its oyster shape. The genus is composed by several species including *ostreatus*, *florida*, *pulmonarius*, *eryngii* and many more. Their utilization cuts across several sectors such as food, agriculture, medicine and industrial as they provide several services not just to man but to animals and the environment (Das *et al*., 2015; Adenipekun and Lawal, 2012; Agbagwa *et al*., 2020a&b).

Tissue culture which hold the continuous cultivation of mushroom stand as a uniting point of mushroom reproduction and cultivation. Products from the mushroom tissue culture are used to

prepare the spawn (Ogden and Prowse, 2004). Different grains have been used for spawn preparation including guinea corn, maize and wheat grain. The grains are first soaked, washed and parboiled before they are put into bottles. The bottled grains are then sterilized at $121^0$C and allowed to cool before the introduction of the active mycelium generated from the tissue culture. The bottles are immediately incubated for days for proper colonization (Iqbal *et al.,* 2016).
Several agro wastes materials such as saw dust, paddy straw, corn cob as well as other botanicals. Other materials like gypsum and lime are also used in the process (Tesfaw *et al.,* 2015). Fully composted substrates are immediately bagged in heat resistant white polyethene bags. PVC pipes are used as lids and cotton wool is also used to plug the PVC pipes. The bagged substrates are sterilized in a pasteurization chamber at $100^0$C. This is done to decontaminate the bags from spoilage organisms (Liasu *et al.,* 2015).
Bags inoculated with spawn are then incubated at 25 to $30^0$C for colonization of the substrate. Incubation chambers are regulated for suitable growth and development of the mycelium. This is achieved with the use of thatch, straw, black nets and availability of numerous ventilation points. This in turn helps to maintain the relative humidity (Liasu *et al.,* 2015). The cropping house is similar to the incubation room in structure with an exception for the specially designed racks or shelves (Sarkar *et al.,* 2007). Cropped bags are watered for few days before they are cut open to enable sprouting. Matured mushrooms are later harvested with a knife after 2 to 3 days after sprouting (Iqbal *et al.,* 2016).
However, there is dearth of information on the yield performance of *Pleurotus ostreatus* and *P. eryngii* grown in Rivers State, Nigeria during the dry and rainy seasons. It is on this premise this research was carried out to assess the yield potential of both mushrooms in Rivers State.

## MATERIALS AND METHODS

### Sample Collection

Soft and hard woods sawdust from *Xylopia aethiopica* and *Mitragyna ciliata* respectively, as well as woods of *Rhizophora racemosa* were obtained from Timber Market Mile II Diobu, Port Harcourt and identified by Dr. F. Chukwundah, the Head of Department of Forestry and Environment, Rivers State University. Bags were attached directly to the saw machine to collect homogenous portions of the selected wood sawdust. The *Rhizophora* wood was burnt for ash collection. Healthy spawns of *Pleurotus ostreatus* and *P. eryngii* as well as rice bran were bought from Dilomat Farms and services limited, Rivers State University. All samples were assembled at Dilomat Farms and services limited, Rivers State University for further studies.

### Cultivation Studies

The various substrate materials were compounded as follow and replicated four times:
Sawdust = 600g, Rice bran = 100g and Wood ash = 1g
A total of eight treatments were established in accordance with the interaction of the season, nature of wood and the *Pleurotus* species as follows: P1SWD, P1HWD, P2SWD, P2HWD, P1SWR, P1HWR, P2SWR and P2HWR.
Where:
P1= *Pleurotus ostreatus*

P2= *Pleurotus eryngii*
SW = Softwood
HW = Hardwood
D= dry season
R= rainy season

The periods adopted for this study were in accordance to season duration documented by SC, (2021) viz: April to October (rainy season) and November to March (dry season). The cultivation methods outlined by Chinda and Chinda (2007) viz: composting, bagging, sterilization, inoculation, incubation, cropping and harvesting were adopted for this research. The methods of Onuoha *et al*. (2009) was used to determine number of fresh weight of fruit bodies with the aid of a weighing balance.

**Statistical Analysis**
Data obtained were subjected to analysis of variance (ANOVA) in a CRD at 5% significance level. Mean separation was by Duncan multiple range test (DMRT) at 5% level of significance.

## RESULTS AND DISCUSION

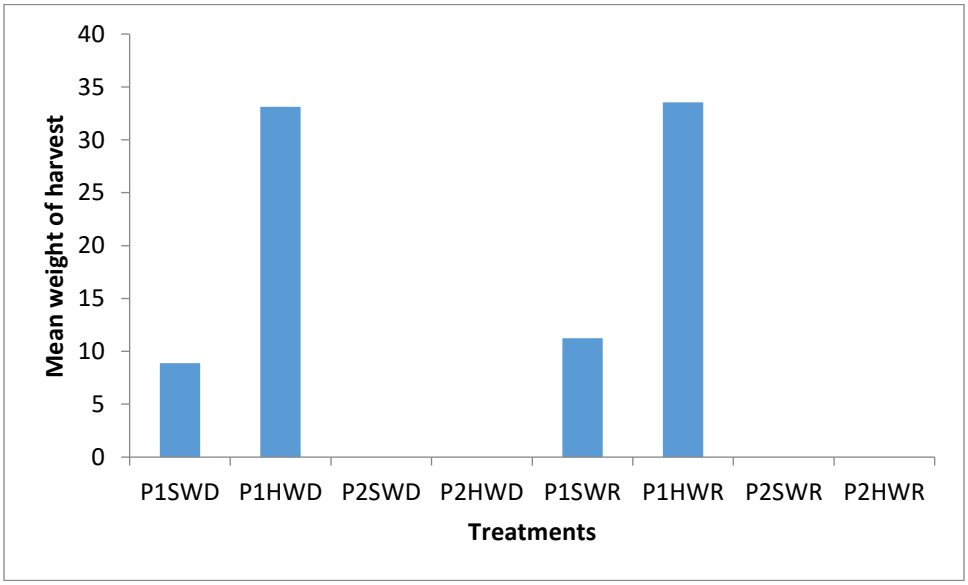


**Figure 1: Effect of season and substrate type on mean weight of week 1 harvest**
P1SWD= *P. ostreatus*+softwood+dry season, P1HWD= *P. ostreatus*+hardwood+dry season, P2SWD= *P. eryngii*+softwood+dry season, P2HWD= *P. eryngii*+softwood+dry season, P1SWR= *P. ostreatus*+softwood+rainy season, P1HWR= *P. ostreatus*+hardwood+rainy season, P2SWR= *P. eryngii*+softwood+rainy season,P2HWR= *P. eryngii*+hardwood+dry season

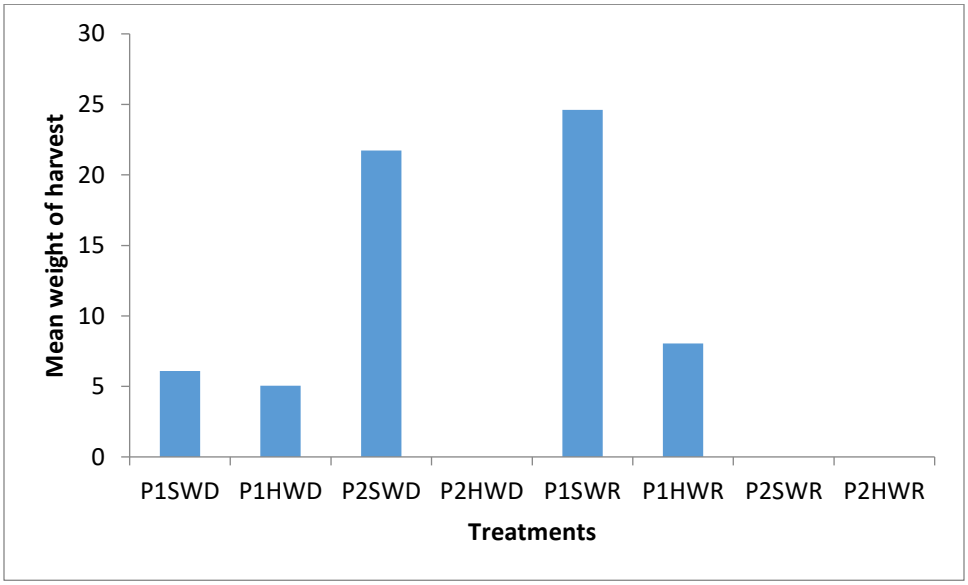


**Figure 2: Effect of season and substrate type on mean weight of week 2 harvest**
P1SWD= *P. ostreatus*+softwood+dry season, P1HWD= *P. ostreatus*+hardwood+dry season, P2SWD= *P. eryngii*+softwood+dry season, P2HWD= *P. eryngii*+softwood+dry season, P1SWR= *P. ostreatus*+softwood+rainy season, P1HWR= *P. ostreatus*+hardwood+rainy season, P2SWR= *P. eryngii*+softwood+rainy season,P2HWR= *P. eryngii*+hardwood+dry season

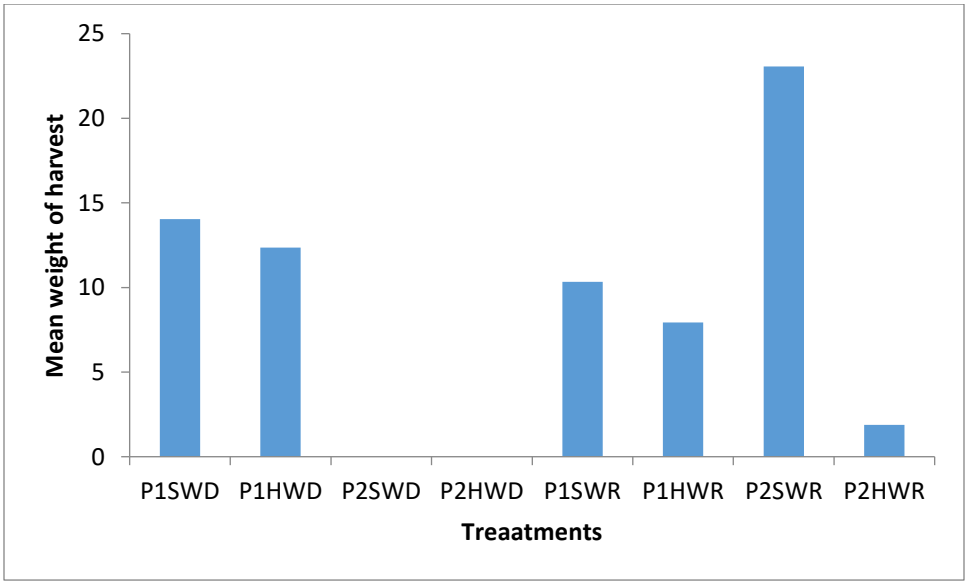


**Figure 3: Effect of season and substrate type on mean weight of week 3 harvest**
P1SWD= *P. ostreatus*+softwood+dry season, P1HWD= *P. ostreatus*+hardwood+dry season, P2SWD= *P. eryngii*+softwood+dry season, P2HWD= *P. eryngii*+softwood+dry season, P1SWR= *P. ostreatus*+softwood+rainy season, P1HWR= *P. ostreatus*+hardwood+rainy season, P2SWR= *P. eryngii*+softwood+rainy season,P2HWR= *P. eryngii*+hardwood+dry season

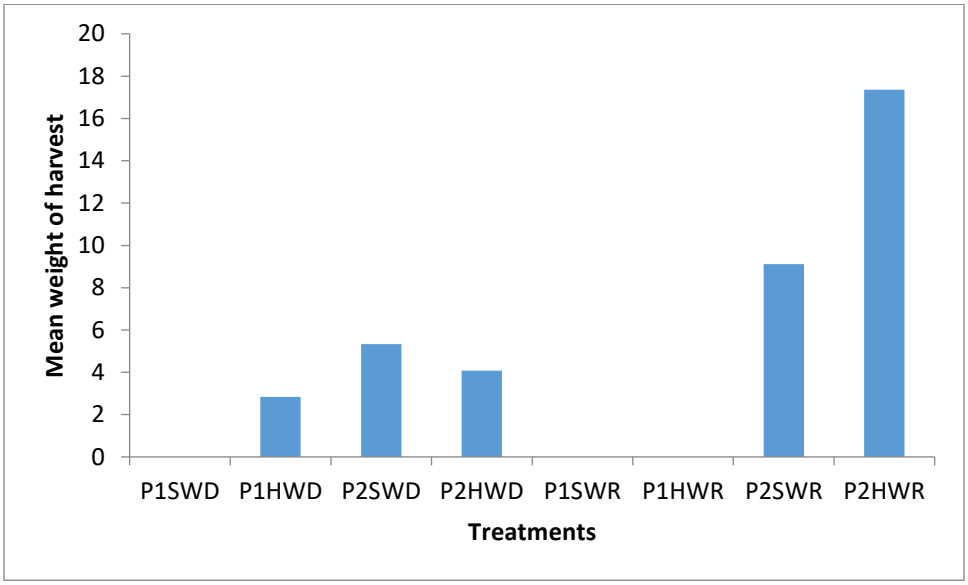


**Figure 4: Effect of season and substrate type on mean weight of week 4 harvest**
P1SWD= *P. ostreatus*+softwood+dry season, P1HWD= *P. ostreatus*+hardwood+dry season, P2SWD= *P. eryngii*+softwood+dry season, P2HWD= *P. eryngii*+softwood+dry season, P1SWR= *P. ostreatus*+softwood+rainy season, P1HWR= *P. ostreatus*+hardwood+rainy season, P2SWR= *P. eryngii*+softwood+rainy season,P2HWR= *P. eryngii*+hardwood+dry season

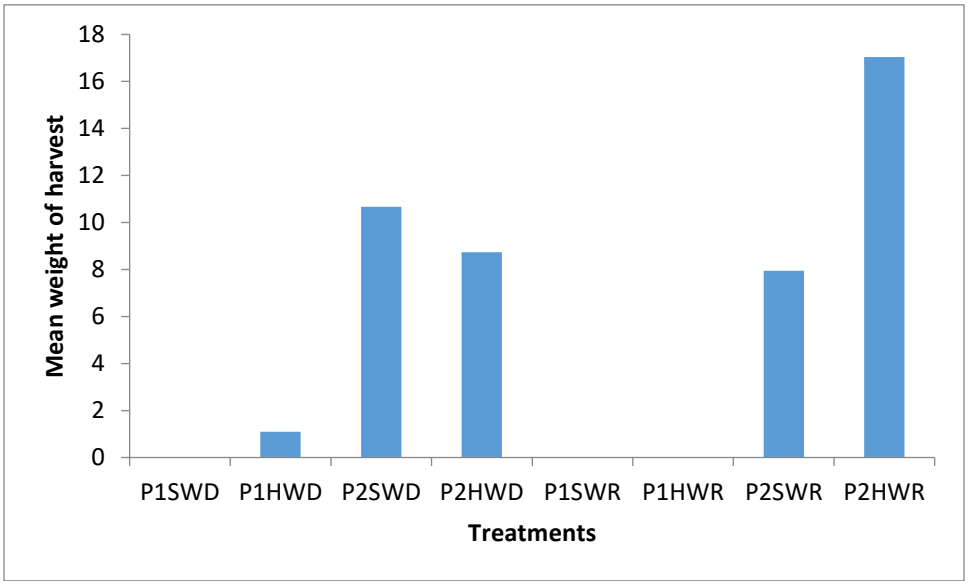


**Figure 5: Effect of season and substrate type on mean weight of week 5 harvest**
P1SWD= *P. ostreatus*+softwood+dry season, P1HWD= *P. ostreatus*+hardwood+dry season, P2SWD= *P. eryngii*+softwood+dry season, P2HWD= *P. eryngii*+softwood+dry season, P1SWR= *P. ostreatus*+softwood+rainy season, P1HWR= *P. ostreatus*+hardwood+rainy season, P2SWR= *P. eryngii*+softwood+rainy season,P2HWR= *P. eryngii*+hardwood+dry season

The result of week 1 harvest presented in Figure 1 showed that only the P1 treatment fruited at the first week. However, rainy season and hardwood favoured more harvest than the dry season and soft wood treatments. P1HWD recorded highest mean weight (33.11g) during the dry season while P1HWR had highest mean weight (33.54g) for the dry season.
The result of week 2 harvest shown in Fig. 2 revealed that dry season favoured more harvest weight. Although P2SWD recorded highest mean weight (21.72g) for the dry season while P1SWR had highest mean weight (24.61g) for rainy season. Generally, dry season and soft wood supported higher mean harvest weight.
The result of week 3 harvest presented in Fig. 3 showed that rainy season supported more harvest weight. However, P1SWD recorded highest value (14.05g) for the dry season. Meanwhile P2SWR had highest mean harvest weight (23.07) for the rainy season. Generally, rainy season and soft wood supported better harvest weight at week 3 harvest
The result of week 4 harvest shown in fig. 4 revealed that dry season favoured more treatment harvest. Although P2SWD had highest mean harvest weight (5.34g) for the dry season while P2HWR recorded highest mean harvest weight (17.36g) for the rainy season. Hardwood supported higher harvest weight than softwood treatments.
The result of week 5 harvest presented in Fig. 5 revealed that dry season favoured more treatment harvest. However, P2SWD recorded highest mean harvest weight (10.67g) for the dry season while P2HWR had highest mean harvest weight (17.04g) for the rainy season. Hardwood supported higher harvest weight than softwood treatments.

The present study has outlined the various weekly weight of harvest for both species of *Pleurotus* during the dry and rainy seasons and shown that the weight varied by species, nature of wood and season on weekly basis. More so, the study has shown that *Pleurotus ostreatus* initiates pin head and fruits faster than *P. eryugii* as fruiting of *P. eryngii* was not recorded during the first week of harvest for both seasons. However, *P. ostreatus* showed a decline in harvest at week 5 compared to *P. eryngii*. Chukwurah *et al.* (2012) reported similar situation for *P. ostreatus* as they also showed that the harvest weight decreased as it progressed to the fifth week of harvest. However, they reported higher harvest weight. This could be as a result of difference in size of the substrate bag as they bagged 9.7kg substrate per bag compared to the 700g bagged in the current study.

Notwithstanding, the result for harvest in the present study were higher than those reported by Itelima, (2011) for *P. ostreatus* grown on sawdust as lower weights were reported for weeks 1, 2, 3 and 4 harvest than their equivalent recorded in the present study. Adebayo *et al.* (2014) reported higher harvest weight for four species of *Pleurotus* during three weeks of harvest. Although, they also revealed that the weight of *P. ostreatus* decreased as the week progressed.

The current study further revealed that the dry season influenced more fruiting of the treatments compared to the rainy season. This is in line with the report of Chitra *et al.* (2018) as they reported similar situation for *P. florida* that fruited more during the dry season months than the rainy season months. Leiva-Lazaro *et al.* (2016) also reported same situation for *Agaricus bisporus* cultivation.

## CONCLUSION

This study has revealed the influence of dry and rainy seasons as well as different substrate composition on the yield performance of *P. ostreatus* and *P. eryngii* for five weeks. Higher yields were supported by dry season and hard wood substrate treatments compared to those treatments cultivated during the rainy season and on soft wood substrate.

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