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AN ALTERNATE TO WASTE PAPER RECYCLING; MUSHROOM CULTIVATION

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ABSTRACT
In this study which P. ostreaus mushroom's cultivation has been studied on waste paper and husk rice additionally investigated effect on yield on early-rising . In the scope of study, waste of paper has been used as main substrate where as waste of husk rice is co-substrate. Results indicated that waste of rice increased important cultivation parameters of P. ostreatus mushroom's such as mycelia development and mushroom yield. Mixtures based on waste of paper and husk rice gave more yield than only waste of paper. The best mycelia development and yield was obtained mixtures of WP+HR (75+25). It can be concluded that mixtures of waste of paper and husk rice can be used suitable for mushroom cultivation instead of only waste of paper.
Keywords: Mushroom , Pleurotus ostreatus. waste of paper, waste of husk rice, yield

ATIK KAĞIT VE PİRİNÇ KAVUZU DESTEKLİ ORTAMLAR ÜZERİNDE KÜLTÜR MANTARI KÜLTİVASYONU

ÖZET
Bu çalışma, pirinç kavuzu ile desteklenmiş atık kağıtlar üzerinde kültür mantarı P. Ostreatus'un verim ve erkencilik özelliklerinin belirlenmesi amaçlarına yönelik olarak hazırlanmıştır. Çalışmada elde edilen sonuçlara göre; WR+HR (75+25) substrat karışımında verim ve erkencilik özellikleri açısından en uygun sonuçlar elde edilmiştir. Çalışmada elde edilen sonuçlara göre atık kağıtların tek substrat olarak kullanılması yerine pirinç kavuzu ile uygun karışım oranlarında birlikte kullanılması kültivasyon özelliklerini olumlu yönde etkilemiştir.
Anahtar Kelimeler: Mantar, p. Ostreatus, atık kağıt ,pirnç kavuzu atığı , verim

1. INTRODUCTION

Most of the edible fungi have strong enzyme system and are capable of utilizing complex organic compounds which occur as agricultural wastes and industrial by-product. These can be used as bedding material for mushroom cultivation [1]. The edible oystre mushroom, Pleurotus sp. is cultivated in many countries in the subtropical and temprate regions [2]. An attractive feature of this group of mushrooms is that they can utilize a large variety of agricultural waste products and transform the lignocellulosic biomass in to food o highly quality, flavor and nutritive value [3,4]. Pleurotus sp. that have been considered for human consumption include P.ostreatus. P. ervngii. P.cornucopiae. P. saior-caiu and P. sapidus [2].
The nutritional requirements and the limits of the physical environment for mycelia growth and fruiting have been investigated for many Pleurotus sp. [5,6]. In addition several practical aspects of cultivation, using serial straw, sawdust and rice husks have been summarized [5,6]. Recent studies have indicated that cotton waste is also a good substrate for the cultivation of Pleurotus sp. [2,7]. On the cultıvation of p.ostreatus cotton waste [2,8]; paddy straw [9]; sawdust and rice bran [10] ; wheat straw [11] ; waste paper [12]; and coffee pulp [13,14] were used by several authors.

Table 1. Include the waste types and mixed ratios compos the prepared composts

Material type	Mixture (% Weight)	Number of Bags
WP	100	4
WP+RH	50+50	4
WP+RH	75+25	4

3. RESULTS AND DISCUSSION

Results of mycelial development period shown on Table 2.

Table 2. Mycelia development period

Bag Number	Material Type	Mixture Ratio	Growth Period (Day)
1	WP	100	24
2	WP	100	25
3	WP	100	23
4	WP	100	25
1	WP+RH	75+25	18
2	WP+RH	75+25	15
3	WP+RH	75+25	17
4	WP+RH	75+25	17
1	WP+RH	50+50	18
2	WP+RH	50+50	18
3	WP+RH	50+50	17
4	WP+RH	50+50	16

WP: Waste paper WP+RH: Waste paper +husk rice

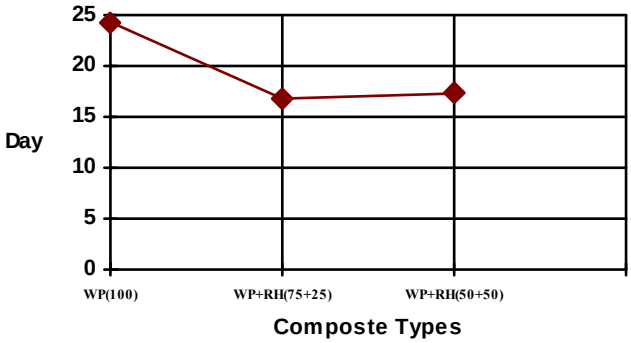

Figure 1. Results of the mycelial development period

The shortest mycelium growing period was obtained from the bags which had WP + RH (75+25) mix ratio. The mycelium growing periods were changing between 15-24 days. According to literature mycelium growing period for another mushroom Pleurotus sorts, is 3 weeks. [1] studied on substrates including after cleaning fiber, after shelling dust, corn-cob and broken pith and strains of oyster mushroom Pleurotus sp. cfr Florida strain 3526, P.ostreatus strain 467 and strain psu. Total mycelial growth was completed between 17-20 days and P.ostreatus (strain 467) had the fastest growth. [15] reported that P.saior-caju cultivation on wheat straw took 32 days for the first harvest. [16], obtained 15 days of spawn run period on the substrates include paddy straw and their mixture (1:1) for the P.ostreatus cultivation. [17], used the cereal straw as a base substrate and four supplements were added to the base substrate ; alfaalfa hay, canola meal, feather meal and brewer's grain. The substrate was packed into clear 46 cm polyethylene tubing and spawn of P.ostreatus was added at a 4 % wet weight basis. Twenty-five kilograms of substrate was placed into each bag and compressed to 48 cm. Spawn-run occured for 20 days was obtained by Rinker. As can be seen from these studies, our results are similar to these workers. There was not any significant difference between WP + RH (75+25) and WP + RH (50+50) mix ratios in terms of mycelium growing period at 95 % confidence limits. The homogenity groups which were obtained from Duncan's test are given below.

Table 3. Homogeneity groups formed statistically for mycelium development period

Material type	Mixture Ratio	Mycelium Growing Period Average HG
WP	100	24,25 b
WP+RH	50+50	16,75 a
WP+RH	75+25	17,25 a

Table 4.Yield properties of florida

ag Number	Material Type	Mixture Ratio	Net Productivity (Fresh M. /Gr)
1	WP	100	275
2	WP	100	240
3	WP	100	280
4	WP	100	255
1	WP+RH	75+25	340
2	WP+RH	75+25	330
3	WP+RH	75+25	328
4	WP+RH	75+25	363
I	WP+RH	75+25	310
2	WP+RH	75+25	280
3	WP+RH	75+25	275
4	WP+RH	75+25	305

WP: Waste paper WP+Rh: Waste paper +husk rice

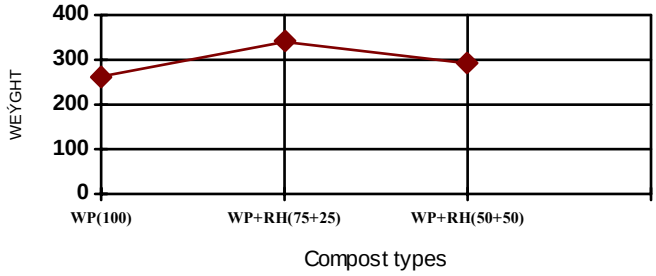

Figure 2. Comparison of yields on compost types

In this experiment;
The highest yield values are obtained from the bags which have WP + RH (75+25) mix ratio. According to the literature, yield values for Pleurotus sorts is 30 % of fresh substrate weight.
When the literature values examined, [18] obtained 39,67 % of yield on WP+WTL(Waste paper*-Waste Tea Leaves: 50+50) for P.florida cultivation. The yield of fruit bodies from the two flushes was 32 % on cocoa shells for cultivation of P. ostreatus by Senyah et all. [19] Kulkami [20] used the six species including Pleurotus spp. and 4 different genotypes of P.ostreatus were used on cotton waste by him. However differences in the rate of mushroom production and biological efficiency were apparent one of the 4 genotypes of P.ostreatus showed significantly higher mushroom yields as 92-107 % of B.E. Barley straw supplemented with brewer's grain (12 and 25 %,dry weight basis) produced 37.1 and 42.6 % more total yield than the check on P.ostreatus cultivation in Rinker's study. Tan [21] cultivated P.ostreatus on cotton waste and noted 100 % yield. Khan [1] achieved the yield values of 45.60 % on after cleaning fiber, 47.76 % on after shelling dust, 78.90 % on com-cob and 81.80 % on broken pith for P.ostreatus cultivation. Sohi and Upadhay [16] reported that the values of BE in two trials for P.ostreatus cultivation as below.

B.E.(%) in Trials

		I	II
P.Ostreatus	paddy straw	45.2	13.3
	Weath straw	18.5	21.7
	Mixture(1:1)	39.3	53.3

Using WP with RH is better than using WP alone . especially the WP+RH (75+25) mix ratio gave us the best

results in the study . The homogenity groups which were obtained from Duncans test are given below on Table 5.

Table 5.Homogeneity groups formed statistically for net produtıvıty values

Material Type	Mixture Ratio	Net ProductıvıtyValues		Yi eld
		Average	HG	(%)
WP	100	262.50	c	43
WP+RH	75+25	340.50	a	57
WP+RH	50+50	292.50	b	48

HG:Homogeneity groups

Best yields of different Pleurotus species on wheat and paddy straws have been stated by many workers [11,22,23,24,25] Among others crushed corn cobs [26], cotton wastes Song et al. [27] and rice husk Wang et al [28], Zadrazil[29] have also been found to be favourable substrate for different Pleurotus species.
Results indicated that our work confirms these results and the values mentioned above are similar to our findings. However, some of them are higher.

4.CONCLUSIONS

In this study has successfully demonstrated the possibility of using waste paper and rice seed coats to cultivate P.ostreatus. The waste paper: rice seed coat ratio of 75 + 25 was found to be superior over the other tested ratios in terms of both the mycelial growth period (15 days) as well as the net productivity (340 gr/kg waste). When compared with other mushroom cultivation procedures, these values were found to be higher than the values published so far.
In this study also demonstrated the fact that the develop approach is very cost - effective. With a very small investment not only waste paper and husk rice - based pollution might be prevented but also the production of mushrooms might help to improve the malnutrition problem that continuous to exist in the world.

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