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Comparative study of yield and growth performance of oyster mushroom on two different substrates (carrot leaves and cotton waste)

Mehwish Ramzan[1*], Haleema Sadia[1], Shakila Kausar[1], Qamar Shahzad[1], Noman Ahmad Khan[2]
[1]Department of Botany, University of Agriculture, Faisalabad, Pakistan.
[2]**Institute of Horticultural Sciences,** University of Agriculture, Faisalabad, Pakistan.
*Corresponding author email: mehwishramzan636@gmail.com

ABSTRACT

Oyster mushroom is an attractive mushroom due to its unique appearance and fragrance. The trial was conducted in medicinal and mushroom lab, Institute of Horticultural Sciences, University of Agriculture, Faisalabad. Carrot leaves substrates used in combination with cotton waste for production of two strain of oyster mushroom *Pleurotus sajor caju (P-3)* and *Pleurotus sapidus (P-6).* By using different types of combinations of carrot leaves and cotton waste viz T0= cotton waste (100%) control, T1= Carrot leaves (100%), T2= Carrot leaves (75%) + Cotton waste (25%), T3= Carrot leaves (50%) + Cotton waste (50%), T4= Carrot leaves (25%) + Cotton waste (75%) and T5 = Carrot leaves (12.5) + Cotton waste (87.5%) as a substrate. The experiment was laid out according to two factors factorial under completely randomized design (CRD).Different parameters such as initiation of spawn running, initiation of mycelium growth, number of days to complete mycelium growth, pinhead formation, number of pinhead, number of days to complete number of flushes (1st, 2nd and 3rd), fresh weight of mushroom, yield per bag, biological efficiency, nitrogen, phosphorus and potassium contents of substrate prior to and after attaining mushroom crop, total soluble solids, acidity, ascorbic acid contents and moisture (%) were studied. Collected data was analyzed statistically by using the analysis of variance technique. LSD test 5% probability was applied to compare the difference among the treatment means. Results indicated that initiation of spawn running, initiation of mycelium growth, number of days to complete mycelium growth, pinhead formation, number of pinhead, number of days to complete number of flushes (1st, 2nd and 3rd), fresh weight of mushroom, yield per bag, biological efficiency, moisture (%), nitrogen contents of substrate after cropping, phosphorus contents of substrate after cropping and potassium contents of substrate after cropping were significantly influenced by treatment (T_2) as compared to control. Additionally, total soluble solids, nitrogen contents of substrate before cropping and potassium contents of substrate before cropping were significantly influenced by treatment (T_1) as compared to other treatments. Furthermore, treatment (T_0) significantly affected acidity (%) and ascorbic contents of mushroom. Moreover, total sugars (%), reducing sugars (%) and non-reducing sugars (%) were significantly affected by treatment (T_4) as compared to other treatments. It is concluded from our research work that cotton waste supplemented with various concentration of carrot leaves give a positive result as compared to control. Overall results showed that maximum parameter was given significant results on cotton waste supplemented with (T_3) 50% carrot leaves for strain (P-3).

Introduction

Mushrooms are source of medicine for humans. Chinese first grow mushrooms for human use. Mushrooms are consumed mostly due to balanced nutritional composition. Mushrooms are used as functional foods. According to Dictionary of the Fungi, almost 97,330 fungi species discovered including fungi mushrooms (Kirk *et al*., 2008). Mushrooms have high quality nutrients, proteins, minerals, vitamins B, C and D, fibers and medicinal properties (Panjikkaran and

Methew, 2013). Different compounds like peptides, lectins, triterpenoids, nucleosides, polysaccharides, lipopolysa, charides, glycoproteins, lipids and their byproducts are present in mushrooms. Many mushrooms are useful in metabolic activators, control intoxication, viral infections and immunomodulation (Wasser, 2002). It contains adequate amount of phosphorous, iron, protein, lipid, riboflavin and thiamine. Its commercial production is easy and least expensive (Pant *et al*., 2006).The group of saprotrophic fungi, oyster mushrooms has its place to the genus *Pleurotus*, phylum Basidiomycota. *Pleurotus* species content high potassium: sodium ratio, which makes mushrooms an ideal food for patients suffering from hyper tension and heart diseases. The cultivation of edible mushroom offers one of the most feasible and economic method for the bioconversion of agro-lignocellulosic wastes (Cohen *et al*., 2002). Oyster mushroom is native to northeastern United States. *Pleurotus* spp*.* are one of most extensively studied white-rot fungi for its exceptional ligninolytic properties. *Pleurotus* mushroom comes under the family Tricholomataceae and commonly called as oyster mushroom, due to its oyster like shape (Li and Shah, 2016). *Pleurotus* spp. are popular and widely cultivated throughout the world mostly in Asia, America and Europe because of their simple, low cost production technology and high biological efficiency. In basidiomycete fungi, extracellular laccases are constitutively produced in small amounts and the lignocellulolytic enzymes are affected by many typical fermentation factors, such as medium composition, pH, temperature, aeration rate, etc (Velioglu and Urek, 2015). Oyster mushroom comprises about 40 species. Oyster mushrooms have flexible nature, grow at temperature 20 to 30°C and at humidity of 55–70%, on different substrates. Oyster mushroom is good source of non-starchy carbohydrates, dietary fibers, proteins and vitamins. Oyster mushroom has 19-35% protein and 4.0% fat contents, which are good for our diet. Oyster mushroom contains many essential minerals and trace elements (Rehman *et al*., 2008).Oyster mushroom has great values for diabetes and cancer. Oyster mushrooms contain high protein content ranging between 1.6 to 2.5% and mineral salts required for the human body. They also rich in Vitamin C, B complex and niacin contents approximately ten times higher than any other vegetables (Randive, 2012). The compost in which mushrooms can grow is called substrate. Substrate is organic based material and important component for mushroom cultivation. Substrate is chemical, functional and sensorial characteristic for mushroom growth (Oyetayo and Ariyo, 2013). For commercial production of the fruiting bodies, mainly straw from wheat (Western countries) and rice (Asia) is used as cheap basic substrate, but saw dust and wood chips and other agricultural wastes may also be used. To facilitate growth on such lignocellulosic substrates, white rot-fungi secrete different types of oxidative enzymes for lignin degradation (Chang, 2005). A substrate plays an important role in determining yield of mushroom, it is necessary to evaluate different substrates for mushroom yield and also to find the best suitable substrate for its cultivation. The natural substrates of the mushrooms include logs of woods, decomposed agro- and animal wastes, and soil where nutrients are available through external digestion and absorption by the mycelium (Okwulehie and Ogoke 2013). Agro-industrial waste is produced in huge amounts, and it becomes an interesting substrate, due its commercial exploitation as well as associated environmental problems (Silva *et al*., 2012). The substrate has a direct influence on mineral composition, because the hyphae of fungi are in contact with the compound and it withdraws its essential elements. Variations will be occurring in protein and other nutrient contents in mushroom fruiting bodies when grown on different agro wastes (Michael *et al*., 2011). Wheat bran supplements are effective in improving mushroom productivity and also the inclusion of maize additive shows an increase in both the nutritional value and productivity of mushrooms (Oei, 2005). Genus *Pleurotus* is fast growing fungus. Mostly in China, mushrooms are cultivated outdoor and U.S. cultivated indoor. Different agricultural wastes are used for Pleurotus mushrooms growth. For mushroom cultivation, cotton waste is commercially used worldwide. Many substances in Pleurotus spp*.* are used as a substrate like elephant grass, cotton waste, sawdust, rice stubble, wheat straw (banana tree, pea, peanut) (Carvalho *et al*., 2010). Many lignocelluloses wastes such as sugarcane bagasse and cardboard are used for Pleurotus cultivation. From apiaceae family carrot is an important crop. First time as a medicine, carrots were used. Carrots contain anthocyanins and carotenoids (Silva, 2014). There are different nutrients in carrot leaves, which are rare in nature such as omega-6fatty acids and omega-3. Carrot leaves have mineral contents, antioxidant activities, fatty acid composition and chlorophyll contents (Almeida, 2009). As compared to roots high amount of essential oils are present in carrot leaves. Major components which are present in carrot leaves are β-caryophyllene, β-myrcene, (E)-β-farnesene, α-asarone, limonene, methyl isoeugenol and sabinene. Carrot leaves are wealthy in β-carotene and vitamin C nutrients, many minerals such as P, Na, Ca, K, Mn, Mg, Fe, Zn and fibers (Habegger and Schnitzler, 2000).Mushrooms can grow on different agricultural wastes. Cotton waste is effective for commercial scale production of oyster mushroom. It is most popular agro-waste and

potential material for best mushroom production it is available in abundance in Pakistan cotton is cultivated in abundance that is why it is easily available. On cotton waste, substrate mushrooms can grow finest. Cotton waste substrate for pasteurization methods improve yield of oyster mushroom (Ali *et al*., 2007). Therefore, objective of this study is to check the ability of cotton waste augmented with carrot leaves on growth and production of oyster mushroom.

MATERIALS AND METHODS

The research work was done at Medicinal Mushroom Lab, Institute of Horticultural Sciences, University of Agricultural, Faisalabad, on cotton waste enhanced with carrot leaves and carrot leaves alone during 2016-2018 for assessment of two strains *Pleurotus sajor- caju (P-3)* and *Pleurotus sapidus (P-6).*

Design of Experiment and Layout Strategy

The experiment was laid out in factorial CRD with five replications. The experiment was comprised of following treatment: **T0**= Cotton waste (100%) Control, **T1**= Carrot leaves (100%), **T2=** Carrot leaves (75%) + Cotton waste (25%), **T3**= Carrot leaves (50%) + Cotton waste (50%), **T4**= Carrot leaves (25%) +Cotton waste (75%), **T5**= Carrot leaves (12.5) +Cotton waste (87.5%)

Preparation and bag filling of Substrate

First took sun dried carrot leaves then soaked them in hot water. cotton waste was also prepared. First soaked in water then mixed 4% lime to keep the PH. Then substrate is cover with polythene sheet and allow it fermentation for 48 hours. After 2 days to remove the excessive moisture substrate is spread on the floor, after that cotton waste is mixed with carrot leaves in different combination then filled the substrate in 6×10 inch bags and tight with rubber band lossely.

Pasteurization and spawning of bags

To treat the bags against different fungus pasteurization was done. For this purpose, bags were kept in hot water drum for 2 hours. After that bags were kept at room temperature over night for cooling. After that spawning was done 1% with weight per bag

Humidity and Temperature control

The growth room temperature during spawn running was controlled between 18-22 ^{o}C. The humidity was kept up between 75 to 80 percent.

Cropping

When mycelium growth is completed 16 to 19 ^{o}C temperature was kept for fruit body development. For fruit body development 80 to 90 percent humidity was kept. For moisture and humidity requirement water was flooded on the floor several times a day.

STUDIED PARAMETER

Time taken for start spawn run (In days)

For mycelia growth and start spawn running number of days were noted.

Time taken for complete mycelia growth (in days)

For complete compost mycelia growth time (in days) was calculated.

Days for initiation of pinheads

For initiation of pinhead's days was calculated.

Pinhead numbers

Per bag number of pinhead was noted.

Days for completion of flushes

From spawning to completion of flush number of days were recorded.

Number of flushes

Per bag number of flushes was noted.

From each bag calculation of yield (grams)

Until end for cropping period the yield of every bag was recorded.

Substrate pH

Using digital pH meter, the pH was determined. 20 mili liter solution of substrate was taken in a beaker and pH was calculated (Hi 98117, Hana apparatuses, Mauritiaus).

TSS (o Brix)

For the determination of TSS (°Brix) the digital refractometer (Atago japan, Rx 500.) was used. On the prism of refractometer, the mushroom juice drop was placed; the lid was clos
ed and at room temperature range 25-28°C the TSS (°Brix) was recorded directly from the digital scale of refractometer.

Moisture percentage

To calculate the moisture percentage first we take the weight of fresh then take the weight after drying the sample and applied the formula to the readings. Moisture percentage was calculated by following:

Moisture percentage = initial – dried/initial × 100Nutrient elements determination

Determination of nitrogen (N)

After the prepared digest, the sample for nitrogen analysis was prepared. For the preparation of sample, 10 ml was taken from the prepared volume and added into flask of fifty milliliter. Into that flask 10 ml NaOH of purity 40 percent was added and connected it with distillation flask in Kjeldhal apparatus. The process for the distillation was then started. Two percent boric acid solution was collected followed by mixing of indicator and titrated it against sulfuric acid having normality of 0.01. The volume of acid used in titration was then recorded.

Given formula was used for N calculation:

N (%) =100 × (A-B×C×o.oo14)/D

A = used N/10 H_2SO_4 quantity, **B** = blank reading

C = after digestion volume made (250 mili liter), **D** = used sample digested volume

100 = for percentage, **0.0014** = factor (which is equal to g for N/H_2SO_4)

Spectro photometer analysis

When the digestion was done the phosphorus contents was calculated by spectro photometer the reading was taken on digital screen

Flame photometric analysis

When the digestion was done the phosphorus contents was calculated by flame photometer. Six standards were used in flame photometric analysis. Standard curve was drawn with the help of reading of these standards.

Acidity (%)

To calculate the TA first we took 10 g mushroom pulp from the sample then apply some water to make homogeneous mixture and made 100 ml volume which was titrated by following the titration method of hortwit(196O). The results were expressed in percentage of citric acid.

Acidity (%) = $\frac{\text{N/10 NaOH used} \times 0.0064}{\text{volume or wt of sample used}} \times 100$

Ascorbic acid (mg / 100ml juice) = $\frac{1 \times R1 \times V \times 100}{R \times W \times V1}$

R1denotes dye in ml which is used to titrate standard solution

R indicates the titration volume of dye for VI

V represents the aliquot volume made by oxalic acid 4 percent

V1is volume of mushroom juice for titration

W is the volume of mushroom juice

Biological efficiency:

To calculate the biological efficiency this formula is used.

Biological efficiency % = (Weight of fresh mushroom fruiting bodies/Weight of dry substrate) x 100.

Statistical Analysis

By applying the fisher ANOVA technique, the data was analyzed (steel *et al*.,1997) and by using LSD test means of treatment was compared at 5% probability level.

RESULTS AND DISCUSSION

Nitrogen content (%) of substrate before cropping

The carrot leaves treatment is pointedly influence nitrogen contents before cropping indicated in ANOVA. Accomplishment of nitrogen contents pointedly influenced by carrot leaves treatment before cropping (Table 1(A)). Carrot leaves altogether influenced nitrogen substance of substrate before elimination in different treatments of carrot leaves. Maximum nitrogen contents (0.900%) were recorded in (T3) and least (0.43%) from (T4) (Table 1(B)).

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Oyster mushroom depend on nitrogen, carbon (cellulose, monosaccharaides, polysaccharides, natural acids, amino acids, hemicellulose and lignin) and inorganic supplements for its nourishment which is used during forth running and fruiting body development. Mushrooms take the carbon as an essential component of cells (Mudakir, 2010).

Carrot leaves adjust physiological and biochemical procedures, for example, water use, mineral take-up, photosynthesis, amino corrosive digestion, protein union, glycolysis, ATP combination and mitochondrial breath among others (Weir *et al*., 2004).

Our results show similarity with findings of (Panjabrao *et al.,* 2007), who reported that growing media, environmental conditions and supplementation of substrate with growth enhancing chemicals improve the growth period and quality of mushrooms. (Ferro *et al.,* 2015).

Table .1(A): Analysis of variance for the influence of treatments on nitrogen content (%) of substrate before cropping.

Source	DF	SS	MS	F	P
Treatment	5	0.39	0.079	7.94	0.00
Error	12	0.00	0.00		
Total	17	0.39			

Table 1(B): Effect of treatments on nitrogen content (%) of substrate before cropping.

Treatment	Mean	STD
T0 CW (100%)	0.53±0	0
T1 CL (100%)	0.67±0	0
T2 CL (75%)+CW (25%)	0.73±0	0
T3 CL (50%)+CW(50%)	0.23±0	0
T4 CL (25%)+CW (75%)	0.43±0	0
T5 CL (12.5%)+CW(87.5%)	0.67±0	0
Mean		

(T_0, CW= Cotton waste (100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Phosphorus content (%) of substrate before cropping

The carrot leaves treatment is pointedly influence phosphorus contents before cropping indicated in ANOVA. Accomplishment of phosphorus contents pointedly influenced by carrot leaves treatment before cropping (Table 2(A)). Carrot leaves at various addiction did not influence the phosphorus contents of the developing media.Phosphorus is major mineral element which are used for building cell components and enhancing metabolic activities. Phosphorus is not only beneficial to mycelia growth, but also to the formation of fruiting bodies (Chen, 2004).

Table 2(A): Analysis of variance for the influence of treatments on phosphorus content (%) of substrate before cropping.

Source	DF	SS	MS	F	P
Treatment	5	3.84	0.76	7.68	0.00
Error	12	0.00	0.00		
Total	17	3. 84			

Table 4.2(B): Effect of treatments on phosphorus content (%) of substrate before cropping.

Treatment	Mean	STD
T0 CW (100%)	1.08±0	0
T1 CL (100%)	1.27±0	0
T2 CL (75%)+CW (25%)	0.83±0	0
T3 CL (50%)+CW (50%)	4.24±0	0
T4 CL (25%)+CW (75%)	1.33±0	0
T5 CL (12.5%)+CW(87.5%)	0.67±0	0
Mean		

(T_0, CW= Cotton waste (100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste (75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Potassium content (%) of substrate before cropping

The carrot leaves treatment is pointedly influence potassium contents before cropping indicated in ANOVA. Accomplishment of potassium contents pointedly influenced by carrot leaves treatment before cropping (Table 3). Carrot leaves treatments at different concentration do not effect the potassium content of the growing media. Potassium is a mineral supplement for tissues development. Potassium has been distributed numerous physiological capabilities for plant development. Potassium is required for the initiation of specific catalysts (Lindhauer, 1989).

Table 3 (A): Analysis of variance for the influence of treatments on potassium content (%) of substrate before cropping.

Source	DF	SS	MS	F	P
Treatment	5	0.39	0.07	7.94	0.00
Error	12	0.09	0.08		
Total	17	0.39			

Table 3(B): Effect of treatments on potassium content (%) of substrate before cropping.

Treatment	Mean	STD
T0 CW (100%)	0.53±0	0
T1 CL (100%)	0.67±0	0
T2 CL (75%)+CW (25%)	0.73±0	0
T3 CL (50%)+CW (50%)	0.49±0	0
T4 CL (25%)+CW (75%)	0.43±0	0
T5 CL(12.5%)+CW(87.5%)	0.67±0	0
Mean		

(T_0, CW= Cotton waste (100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

p.H of media

The carrot leaves treatment is pointedly influence pH indicated in ANOVA. Accomplishment of pH pointedly influenced by carrot leaves treatment (Table 4). Carrot leaves fundamentally influenced pH substance of substrate before cropping in different treatments of Carrot leaves.

The pH range is necessary for the development and enzymatic generation of oyster mushroom (OMahony *et al*., 2002). The pH of the medium changes the charge of the catalyst which additionally helps in the biodegradation and familiar for metabolite items (Lucas *et al*., 2008; Lu *et al*., 2009).

Table 4(A): Analysis of variance for the influence of treatments on pH of substrate.

Source	DF	SS	MS	F	P
Treatment	5	0.99	0.19	113.62	0.00
Error	12	0.02	0.05		
Total	17	1.01			

Table 4(B): Effect of treatments and their Interaction on pH of substrate.

Treatment	Mean	STD
T0 CW (100%)	6.96±0	0
T1 CL (100%)	7.5±0	0
T2 CL (75%)+CW (25%)	7.59±0	0
T3 CL (50%)+CW (50%)	10.13±0	0
T4 CL (25%)+CW (75%)	7.24±0	0
T5 CL (12.5%)+CW(87.5%)	7.01±0	0
Mean		

(T_0, CW= Cotton waste (100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Time taken for initiation of spawn running (in days)

The carrot leaves treatment and varieties are no pointedly influence the spawn run initiation indicated in ANOVA. Spawn run initiation not influenced by carrot leaves treatment. On accomplishment of spawn run initiation varieties are not influenced pointedly. On the other hand, the carrot leaves and variety interaction are not influenced pointedly in spawn run initiation (Table 5).

Table 5(A): Analysis of variance for the influence of treatments and varieties on Initiation of Spawn run.

Source	DF	SS	MS	F	P
Treatment	5	0.18	0.03	0.11	0.03
Varity	1	7.35	7.35	21.25	0.00
Treatment*Varity	5	0.60	0.12	0.35	0.88
Error	48	16.60	0.34		
Total	59	24.73			

Table: 5(B) Effect of treatments, varieties and their interactions on spawn running of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	2	2	2±0	0
T1 CL (100%)	2	2	2±0	0
T2 CL (75%)+CW (25%)	2	2	2±0	0
T3 CL (50%)+CW (50%)	2	2	2±0	0
T4 CL (25%)+CW (75%)	2	2	2±0	0
T5CL(12.5%)+CW(87.5%)	2	2	2±0	0
Mean	2	2		

(T_0, CW= Cotton waste (100%) control, T_1, CL= Carrot leaves (100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Time taken for 25 percent mycelium growth completion (in days)

The examination of difference demonstrated that carrot leaves and verities essentially impact time taken for fruition of 25% mycelium development (Table 6). Among various medications of carrot leaves least days (43.40 days) were taken by treatment (T4. (Table .6). Assortments were additionally huge impact on finishing of 25% mycelium development. Among various assortments least days were recorded as (43.40 days) in assortment (V2) and most extreme were recorded as (55.60 days) in assortment (V1) (Table 4.6). Be that as it may, association of carrot leaves medicines and assortments were fundamentally impacted culmination of 25% mycelium development. Oyster mushroom mycelium growth depends upon different aseptic environmental factor such as pH, temperature, light, air and humidity (Chang and Miles, 2004). The optimum temperature was 19-23 ℃, humidity were kept 75-85% and pH of substrate was range from 7.09 to 7.83. The mycelium run rate was higher in strain P3 as compare to P6. Carrot leaves change physiological and biochemical procedures, for example, water use, mineral take-up, photosynthesis, amino corrosive digestion, protein blend, glycolysis, mitochondrial breath and ATP combination (Weir *et al*., 2004), which thus helps in early finish of mycelium development when compared with natural. Our results show resemblance with findings of (Xiu *et al.,* 2010; Khandakar *et al.,* 2008). (Singh *et al.*, 2013) concluded that application of carrot leaves helpful in growth of crops. Foliar application of 6mM and 10mM carrot leaves a promising concentration for getting early completion of mycelium growth in oyster mushroom.

Table 6(A): Analysis of variance for the influence of treatments and varieties on 25% mycelium growth of oyster mushroom

Source	DF	SS	MS	F	P
Treatment	5	717.28	143.45	1.42	0.23
Varity	1	6.02	6.01	0.06	0.80

Treatment*Varity	5	272.48	54.49	0.54	0.74
Error	48	484.20	100.94		
Total	59	584.98			

Table 6(B): Effect of treatments, varieties and their Interaction on 25% mycelium growth of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	55.61a	47.42a	51.51ab±2.36	4.1
T1 CL (100%)	52.22a	53.24a	52.73a±0.28	0.5
T2 CL (75%)+CW (25%)	51.81a	54.85a	53.32a±0.86	1.5
T3 CL (50%)+CW (50%)	50.43a	54.22a	52.25ab±1.03	1.8
T4 CL (25%)+CW (75%)	43.65a	43.44a	43.53ab±0.05	0.1
T5 CL (12.5%)+CW(87.5%)	45.66a	50.23a	47.93b±1.32	2.3
Mean	51.11	51.72		

(T_0, CW= Cotton waste (100%) control, T_1, CL= Carrot leaves (100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Time in days for pinhead initiation

The carrot leaves treatment and varieties are pointedly influence the time in days for pin head initiation indicated in ANOVA. Initiation of pin head influenced by carrot leaves treatment. (in days) (Table 7). Carrot leaves influenced on initiation of pinhead's arrangement. Assortments were non-essentially influence initiation of pinhead's arrangement. In any case, collaboration of carrot leaves medications and assortments were essentially impacted on initiation of pinhead's arrangement. The initiation of pinhead depends upon type of substrate, temperature (10-24 ^{0}C), strain, relative humidity (80-90%), light, Co_2 (800-1000 ppm) and chemical matters (Amin *et al*., 2007; Kong *et al.,* 2004). Proper management of the aeration in the growth room should be maintained that fresh air entertains the pinhead because improper airflow attribute distortion of pinheads (Chang and Miles, 2004). Our results show resemblance with findings of (Kirbag and Akyuz, 2008; Kashangura, 2008) who got timely pinheads from oyster mushroom as compared to control.

Table 7(A): Analysis of variance for the influence of treatments and varieties on Pinheads initiation of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	45.02	9.00	13.85	0.00
Varity	1	0.00	0.00	0.01	0.93
Treatment*Varity	5	0.02	0.00	0.01	1.00
Error	48	31.20	0.65		
Total	59	76.24			

Table 4.7(B): Effect of treatments, varieties and their Interaction on pinheads initiation of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	1.43e	1.52de	1.45e±0.02	0.05
T1 CL (100%)	2.33cde	2.26cde	2.74ce±0.03	0.4
T2 CL (75%)+CW (25%)	2.53bcd	2.54bcd	2.53cd±0.43	0.80
T3 CL (50%)+CW (50%)	3.35ab	3.89abc	3.35be±0.29	0.28
T4 CL (25%)+CW (75%)	3.52a	3.53a	3.51ab±0.10	1.25
T5 CL (12.5%)+CW(87.5%)	2.73b	4.58	4.59e±0.40	0.29
Mean	2.75	2.75		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

No. of pinheads/bag

The carrot leaves treatment and varieties are pointedly influence the no of pin head per bag indicated in ANOVA. Total no of pin head influenced by carrot leaves treatment. Maximum no of pin head per bag (44.15) were taken by (T_3) as followed by treatment (T_1) (39.65) treatment and least no of pin head per bag (26.15) were taken by treatment T_0 from all the treatments of carrot leaves. On accomplishment of pin head initiation varieties are influenced pointedly. Maximum no of pin head per bag (34.2) were recorded by V2. On the other hand, the carrot leaves and variety interaction are influenced pointedly in pin head initiation Maximum no of pin head per bag (57.4) were taken by (T_3) in V2 variety as related to others.

Table 8(A): Analysis of variance for the influence of treatments and varieties on Pinheads bags initiation of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	7112.01	1422.40	10.62	0.00
Varity	1	1943.71	1943.70	14.51	0.00
Treatment*Varity	5	723.80	144.76	1.08	0.38
Error	48	6431.71	133.99		
Total	59	16211.21			

Table 8(B): Effect of treatments, varieties and their Interaction on number of pinheads bags of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	8.53f	19.82def	14.15cd±3.26	5.65
T1 CL (100%)	35.25bc	44.16bcd	39.65ab±2.56	4.45
T2 CL (75%)+CW (25%)	25.62cde	34.86a	29.82bc±2.42	4.22
T3 CL (50%)+CW (50%)	30.91bcd	57.42bcd	44.15a±7.64	13.25
T4 CL (25%)+CW (75%)	22.72cdef	29.62def	26.15de±1.99	3.45
T5 CL (12.5%)+CW(87.5%)	14.11ef	20.30a	17.15e±1.81	3.15
Mean	24.15b	31.84c		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

No. of flushes/bag

The carrot leaves treatment and varieties are pointedly influence the no of flushes per bag indicated in ANOVA. No of flushes per bag influenced by carrot leaves treatment. Most no of flushes (6.6) were taken by (T_4) as followed by treatment (T_3) (5) treatment and least no of flushes (3.7) were taken by treatment T_0. On accomplishment of no of flushes per bag varieties are not influenced pointedly. Most no of flushes per bag (6) were taken T_4 in V1 variety as related to others.

Table 9 (A): Analysis of variance for the influence of treatments and varieties on number of flushes per bag of oyster mushroom.

Source	DF	SS	MS
Treatment	5	35.23	7.04
Varity	1	0.68	0.68
Treatment*Varity	5	1.56	0.31
Error	48	22.16	0.36
Total	59	59.65	

Table 9(B): Effect of treatments, varieties and their Interaction of number of flushes per bag of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	2.83	2.33	2.58d±0.14	0.25

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T1 CL (100%)	2.66	2.66	2.66d±0.3	0.21
T2 CL (75%)+CW (25%)	3.16	2.83	3.16cd±0.09	0.16
T3 CL (50%)+CW (50%)	3.5	3	3.21a±0.096	0.25
T4 CL (25%)+CW (75%)	3.66	4	3.83b±0.09	0.16
T5 CL (12.5%)+CW(87.5%)	4.66	4.5	4.58c±0.04	0.08
Mean	3.33	2.91		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

No of days taken for 1st flush

The carrot leaves treatment and varieties are pointedly influence the days for first flush indicated in ANOVA. Accomplishment of the days for first flush pointedly influenced by carrot leaves treatment On accomplishment of the days for first flush varieties are not influenced pointedly. Among various treatments of carrot leaves least days (58.50 days) were taken by treatment (T4), as taken after by treatment (T0) (61.50) days.

Table 10(A): Analysis of variance for the influence of treatments and varieties on number of days for completion of 1st flush of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	143.33	28.66	1.55	0.19
Varity	1	91.27	91.26	4.94	0.03
Treatment*Varity	5	434.33	86.86	4.70	0.00
Error	48	886.80	18.47		
Total	59	1555.73			

Table 10(B): Effect of treatments, varieties and their Interaction on number of days for completion of 1st flush of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	65.63a	57.43bc	61.53ab±2.36	4.13
T1 CL (100%)	62.21ab	63.24a	62.79a±0.28	0.57
T2 CL (75%)+CW (25%)	61.82ab	75.51da	68.65a±3.95	6.85
T3 CL (50%)+CW (50%)	60.41ab	64.32c	62.24ab±1.03	1.86
T4 CL (25%)+CW (75%)	63.67a	53.43ab	58.54b±2.94	5.12
T5 CL (12.5%)+CW(87.5%)	64.23a	60.27b	62.28a±1.15	2.11
Mean	62.92a	61.75a		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%)

No of days taken for 2nd flush

The carrot leaves treatment and varieties are pointedly influence the days for second flush indicated in ANOVA. Accomplishment of the days for second flush pointedly influenced by carrot leaves treatment. least days (61.50 days) were taken by treatment (T4), and maximum days (66.30 days) were recorded in (T2). On accomplishment of the days for second flush varieties are not influenced pointedly. On the other hand, the carrot leaves and variety interaction are influenced pointedly in the days for second flush.

Table 11(A): Analysis of variance for the influence of treatments and varieties on number of days for completion of 2nd flush of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	143.33	28.66	1.55	0.19

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Varity	1	91.27	91.26	4.94	0.03
Treatment*Varity	5	434.33	86.86	4.70	0.06
Error	48	886.80	18.47		
Total	59	1555.73			

Table 11(B): Effect of treatments, varieties and their Interaction on number of days for completion of 2nd flush of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	68.61a	60.42bc	64.52ab±2.36	4.11
T1 CL (100%)	65.22a	66.23a	65.73a±0.28	0.50
T2 CL (75%)+CW (25%)	64.84a	67.85a	66.36a±0.86	1.51
T3 CL (50%)+CW (50%)	63.44ab	67.47a	65.23ab±1.03	1.87
T4 CL (25%)+CW (75%)	66.65ab	56.40ca	61.56b±2.94	5.15
T5 CL (12.5%)+CW(87.5%)	67.21ab	63.23ab	65.28ab±1.15	2.89
Mean	65.93a	64.75c		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

No of days taken for 3rd flush

The carrot leaves treatment and varieties are pointedly influence the days for third flush indicated in ANOVA. Accomplishment of the days for third flush pointedly influenced by carrot leaves treatment. Carrot leaves essentially influenced number of days for finishing of third flush. Among various treatments of carrot leaves, least days (65.30 days) were taken by treatment (T4), and maximum days (70.20 days) were recorded in (T2).

Table 12(A): Analysis of variance for the influence of treatments and varieties on number of days for completion of 3rd flush of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	153.48	30.69	1.66	0.16
Varity	1	98.82	98.81	5.35	0.02
Treatment*Varity	5	444.68	88.93	4.82	444.68
Error	48	886.00	18.45		
Total	59	1582.98			

Table 12(B): Effect of treatments, varieties and their Interaction on number of days for completion of 3rd flush of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	72.61a	64.45bc	68.52ab±2.36	4.11
T1 CL (100%)	69.23ab	70.28a	69.78a±0.28	0.55
T2 CL (75%)+CW (25%)	68.84ab	71.68a	70.28a±0.80	1.48
T3 CL (50%)+CW (50%)	67.47ab	71.43a	63.43a±1.03	1.85
T4 CL (25%)+CW (75%)	70.61a	60.46bc	65.30a±3.05	5.32
T5 CL (12.5%)+CW(87.5%)	71.25a	67.23b	69.24bc±1.15	2.43
Mean	69.96a	68.73a		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Fresh weight of mushroom (g)

The investigation about fresh weight of mushrooms demonstrated that carrot leaves and assortments fundamentally impact fresh weight of mushroom (g) (Table 13). Among various treatments of carrot leaves maximum weight of mushrooms was (200 gram) (Table 13). Least (95 g) was recorded in assortment (V1).Foliar application of carrot leaves to growing media activates continuous change in growth parameters in term of flushes, yield and fresh weight of oyster

mushrooms. Mostly morphological parameters are stimulated by carrot leaves enriched cotton waste as a growing media. Our results show resemblance with finding of (Balbaa and talaat 2007) who applied polyphenol to rosemary plant and get significant result in term of fresh weight and dry weight. Similar results were also reported by (El-Aziz *et al*., 2007).

Table 13(A): Analysis of variance for the influence of treatments and varieties on fresh weight (g) per bag of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	2663.46	532.69	4.51	2663.46
Varity	1	79.79	79.78	0.68	79.79
Treatment*Varity	5	755.92	151.18	1.28	0.28
Error	48	5670.95	118.14		
Total	59	9170.12			

Table 13(B): Effect of treatments, varieties and their Interaction on fresh weight (g) per bag of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	0.34d	1.79	0.89cd±0.51	0.89
T1 CL (100%)	8.67bcd	16.44	12.56ab±2.24	3.88
T2 CL (75%)+CW (25%)	23.47a	13.04	18.25abcd±3.00	5.21
T3 CL (50%)+CW (50%)	14.77abc	26.68	20.72a±3.43	5.95
T4 CL (25%)+CW (75%)	15.25abc	13.79	14.52abcd±0.42	0.73
T5 CL (12.5%)+CW(87.5%)	17.33ab	21.59	19.46a±1.23	2.13
Mean	15.01a	15.11		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Yield/bag (g)

The investigation of about yield of mushroom per bag demonstrated that carrot leaves and assortments significantly influence yield per bag (table 14(A)). Among various treatments of carrot leaves maximum yield per bag (275.60 g) picked up from treatment (T1 has taken after by treatment (T4) (70.5 g) and least yield per bag (98.87 g) were seen in (T0) (table 14(B)). Yield was significantly increased by carrot leaves in every treatment as compare to control. Maximum yield was obtained from T4.

Table 14(A): Analysis of variance for the influence of treatments and varieties on yield per bag (g) of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	319.57	63.91	0.81	0.54
Varity	1	47.95	47.94	0.61	0.43
Treatment*Varity	5	355.91	71.18	0.90	0.48
Error	48	3775.84	78.66		
Total	59	4499.26			

Table 14(B): Effect of treatments, varieties and their Interaction on yield per bag (g) of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	80.14bc	99.8abc	89.97±5.67	9.83
T1 CL (100%)	89.24abc	150.85a	120.04±17.78	30.805
T2 CL (75%)+CW (25%)	33.51abc	240.2abc	285.35±26.06	45.15
T3 CL (50%)+CW (50%)	165.62ab	162.6abc	125.06±0.86	1.5
T4 CL (25%)+CW (75%)	80.11abc	100.62abc	90.36±5.92	10.26
T5 CL (25%)+CW (75%)	91.52a	129.3abc	110.4±10.91	18.9
Mean	90.37ab	140.07a		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Total solvable solids (^{0}Brix)

The carrot leaves treatment and varieties are pointedly influence the TSS indicated in ANOVA. Accomplishment of TSS pointedly influenced by carrot leaves treatment. (Table 15(A). Carrot leaves considerably influenced on TSS. Among various treatments of carrot leaves, maximum (TSS) (5.38 0Brix) were seen in treatment (T2), and least (4.23 ^{o}Brix) were recorded in (T4) (Table 4.15(B).The total soluble solids are increased in oyster mushroom by carrot leaves. The reason behind increasing the total soluble solid is correlated to respiration. When respiration is stopped after harvesting of fruits, degradation of polysaccharides does not occur thus maintaining the amount of carbohydrates, protein, pectin and glycosides (Medeiros *et al*., 2012).

Table 15(A): Analysis of variance for the influence of treatments and varieties on overall soluble solids (TSS) of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	6.44	1.28	3.78	0.01
Varity	1	0.56	0.56	1.65	0.21
Treatment*Varity	5	10.77	2.15	6.33	0.00
Error	24	8.18	0.34		
Total	35	25.96			

Table 15(B): Effect of treatments, varieties and their Interaction on overall soluble solids (TSS) of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	5.43abc	5.35bcd	5.36a±0.03	0.06
T1 CL (100%)	5.74ab	4.52cde	5.11ab±0.34	0.6
T2 CL (75%)+CW (25%)	4.46cde	6.34a	5.38b±0.52	0.91
T3 CL (50%)+CW (50%)	4.03e	5.03bcd	4.53bc±0.28	0.5
T4 CL (25%)+CW (75%)	4.73cde	3.76a	4.23c±0.26	0.46
T5 CL (12.5%)+CW(87.5%)	4.36de	5.33bcd	4.83abc±0.26	0.46
Mean	4.58a	5.16a		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Moisture (%)

The investigation about moisture demonstrated that carrot leaves and assortments impact moisture (%). Carrot leaves treatments considerably influenced moisture rate. Varieties were also influenced rate of moisture. Maximum moisture was seen from (90.27%) from (V1) and minimum moisture (%) were observed (70.10) from (T2) from (V2) as contrast and other.The water holding limit is said as moisture content. Mushrooms contain high measure of moisture rate contingent upon the strains and different parameters identified with development, collect, culinary and capacity conditions (Guillamon *et al*., 2010). Carrot leaves treatments essentially impact moisture contents of fruiting body.

Table 16(A): Analysis of variance for the influence of treatments and varieties on moisture percentage of oyster mushroom.

Source	DF	SS	MS
Treatment	5	172.40	34.48
Varity	1	6.24	6.24
Treatment*Varity	5	19.98	3.99
Error	60	1.29	0.02
Total	71	199.92	

Table 16(B): Effect of treatments, varieties and their Interaction on moisture percentage of oyster mushroom.

Treatment	V1	V2	Mean	STD

T0 CW (100%)	90.4f	92.38b	91.39e±0.57	0.99
T1 CL (100%)	91.38d	91.65c	91.51b±0.07	0.13
T2 CL (75%)+CW (25%)	92.51b	93.13a	92.80a±0.16	0.29
T3 CL (50%)+CW (50%)	88.66i	87.25j	87.95f±0.40	0.70
T4 CL (25%)+CW (75%)	89.41h	90.22g	89.80e±0.22	0.39
T5 CL (12.5%)+CW(87.5%)	89.28h	90.61e	89.95d±0.38	0.66
Mean	89.90b	91.13a		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Nitrogen content (%) of media after cropping

The carrot leaves treatment is pointedly influence nitrogen contents after cropping indicated in ANOVA. Accomplishment of nitrogen contents pointedly influenced by carrot leaves treatment after cropping. Maximum nitrogen (%) was (0.42%) from (T0) has taken after (T1) (0.41). Among various treatments of carrot leaves, least nitrogen (0.12%) were recorded from treatment (T2), as taken after treatment (T3) (0.19%) (Table 17(B).

In oyster mushroom typical pattern was seen for the venality proteins (cellulase, laccases, Mn-oxidizing peroxidases, and aryl-liquor oxidase) and their action in the late phase of mycelia culture.

Table 17(A): Analysis of variance for the influence of treatments on nitrogen content (%) of substrate after cropping.

Source	DF	SS	MS	F	P
Treatment	5	0.21	0.04	0.00	0.21
Error	12	0.00	0.00		
Total	17	0.22			

Table 17(B): Effect of treatments and their Interaction on nitrogen content (%) of substrate after cropping.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	0.42a	0.02c	0.22±0.11	0.19
T1 CL (100%)	0.41a	0.00c	0.20±0.11	0.20
T2 CL (75%)+CW (25%)	0.12e	0.34a	0.23±0.06	0.11
T3 CL (50%)+CW (50%)	0.19d	0.31ab	0.25±0.03	0.06
T4 CL (25%)+CW (75%)	0.23c	0.31ab	0.27±0.02	0.04
T5 CL (12.5%)+CW(87.5%)	0.27b	0.25b	0.26±0.00	0.05
Mean	0.25b	0.28a		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%)

Phosphorus content (%) of substrate after cropping

The carrot leaves treatment is pointedly influence phosphors contents after cropping indicated in ANOVA. Accomplishment of phosphors contents pointedly influenced by carrot leaves treatment after cropping. Among different treatments of carrot leaves, greatest rate (3.1%) of phosphorus substance of substrate was seen from treatment (T5), as taken after by treatment (T1) (2.67%) and minimum (1.70%) were recorded in (T0) (Table 18(B). All parasites secrete corrosive phosphatase (compound aides in phosphorus digestion) however every growth had diverse levels of phosphatase movement, while all organisms could realize soil phosphorus usage because of their steady phosphatase action (Wang *et al*., 2014).

Table 18(A): Analysis of variance for the influence of treatments on phosphorus content (%) of substrate after cropping.

Source	DF	SS	MS	F	P
Treatment	5	4.45	0.89	8.90	0.00
Error	12	0.00	0.00		
Total	17	4.45			

Table 18(B): Effect of treatments and their Interaction on phosphorus content (%) of substrate after cropping.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	1.7f	1.03e	1.36±0.19	0.33
T1 CL (100%)	2.67b	1.09b	1.88±0.45	0.78
T2 CL (75%)+CW (25%)	1.8e	1.18c	1.49±0.17	0.30
T3 CL (50%)+CW (50%)	2.57c	1.58d	2.07±0.28	0.49
T4 CL (25%)+CW (75%)	2.13e	1.15e	1.64±0.28	0.48
T5 CL (12.5%)+CW(87.5%)	3.1b	1.13c	2.11±0.56	0.98
Mean	2.35e	1.14b		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%)

Potassium content (%) of substrate after cropping

The carrot leaves treatment is pointedly influence potassium contents after cropping indicated in ANOVA. Accomplishment of potassium contents pointedly influenced by carrot leaves treatment after cropping Among different treatments of carrot leaves, (0.69%) were taken by (T_5) as followed by treatment (T_4) (0.56%) and least no of K contents (0.40%) were taken by treatment T_1 from all the treatments of carrot leaves.Carrot leaves under potassium insufficiency demonstrated that flavonoid content expanded with carrot leaves. Flavonoids have been said to diminish weakness and apply a cortisone-like impact on tissues (Gonzalez-Nunez *et al*., 2001).

Table 19(A): Analysis of variance for the influence of treatments on potassium content (%) of substrate after cropping.

Source	DF	SS	MS	F	P
Treatment	5	0.35	0.07	0.00	0.35
Error	12	0.00	0.00		
Total	17	0.35			

Table 19(B): Effect of treatments and their Interaction on Potassium content (%) of substrate after cropping.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	0.51b	0.29c	0.39±0.05	0.10
T1 CL (100%)	0.63a	0.38a	0.49±0.06	0.10
T2 CL (75%)+CW (25%)	0.22e	0.26d	0.23±0.01	0.03
T3 CL (50%)+CW (50%)	0.274d	0.15fg	0.21±0.03	0.05
T4 CL (25%)+CW (75%)	0.32c	0.14g	0.22±0.04	0.07
T5 CL (12.5%)+CW(87.5%)	0.37c	0.20ef	0.25±0.02	0.04
Mean	0.35a	0.23c		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%)

Total Soluble Sugar (%)

The examination about total soluble sugar demonstrated that carrot leaves and assortments generously influenced sugar (%) (Table 20). Carrot leaves medications clearly influenced on soluble sugar (%). Among different treatments of carrot leaves, maximum (5.38%) sugars seen from treatment (T2), as taken after by treatment (T0) (5.36%) and least (4.23%) were recorded in (T4).

Table 20(A): Analysis of variance for the influence of treatments and varieties on total soluble sugars of oyster mushroom.

Source	DF	SS	MS	F	P

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Treatment	5	6.44	1.28	3.78	6.44
Varity	1	0.56	0.56	1.65	0.56
Treatment*Varity	5	10.77	2.15	6.33	10.77
Error	24	8.18	0.34		
Total	35	25.96			

Table 20(B): Effect of treatments, varieties and their Interaction on total soluble sugars content of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	5.43abc	5.36bcd	5.36a±0.03	0.06
T1 CL (100%)	5.73ab	4.53cde	5.1ab±0.34	0.6
T2 CL (75%)+CW (25%)	4.46cde	6.35a	5.38a±0.52	0.91
T3 CL (50%)+CW (50%)	4.03e	5.03bcd	4.53bc±0.28	0.5
T4 CL (25%)+CW (75%)	4.73cde	3.76e	4.23c±0.26	0.46
T5 CL (12.5%)+CW(87.5%)	4.36a	5.35bcd	4.83abc±0.26	0.46
Mean	4.58a	5.16e		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Reducing sugars (%)

The examination of reducing sugars demonstrated that carrot leaves treatments had great effect on reducing sugars (%) (Table 21(A). Carrot leaves treatments basically impacted on sugars (%). Among different meds of carrot leaves, minimum (0.79%) were recorded from treatment (T0), as taken after by treatment (T2) (0.84%) and maximum (1.34%) were recorded in (T4) (Table 21(B).It has been demonstrated that sugars, (for example, glucose and sucrose) can extinguish receptive oxygen species, in this way adding to push resistance (Couee *et al*., 2006; Bolouri-Moghaddam *et al*., 2010). In addition, (Li *et al*., 2006) revealed that glucose changes the statement of 6.6% of all qualities in Arabidopsis thaliana, proposing changes in sugars in tissues may cause changes in exercises of numerous chemicals. Thus, glucose incites the exercises of Manganese SOD and a sort of copper/zinc SOD in plants (Slesak *et al*., 2006), while it upgrades the ascorbate level (Wei *et al*., 2011).Plant phenolic compounds are widely studied regulators which stimulate plant function and promote sugar contents of crops especially vegetables and fruits (Hegab *et al.,* 2008). From present study an inference of high reducing sugar contents has been drawn. The result concluded that carrot leaves are reducing sugar promoter in oyster mushrooms.

Table 21(A): Analysis of variance for the influence of treatments and varieties on Reducing Sugar of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	1.31	0.26	3.40	1.31
Varity	1	5.10	5.10	66.07	0.00
Treatment*Varity	5	2.86	0.57	7.41	2.86
Error	24	1.85	0.07		
Total	35	11.12			

Table 21(B): Effect of treatments, varieties and their Interaction on Reducing Sugar of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	0.78def	0.84def	0.79b±0.00	0.01
T1 CL (100%)	1.40bc	20.63ef	1.40ab±0	0.32
T2 CL (75%)+CW (25%)	0.97cde	0.66ef	0.82b±0.08	0.15
T3 CL (50%)+CW (50%)	1.19bcd	0.54f	0.84b±0.20	0.34
T4 CL (25%)+CW (75%)	2.23a	0.45f	1.34a±0.51	0.89
T5 CL (12.5%)+CW(87.5%)	1.55b	0.58ef	1.07ab±0.28	0.48
Mean	1.30a	0.58b		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Non-reducing sugars (%)

The investigation of non-reducing sugar demonstrated that carrot leaves treatments fundamentally impact non reducing sugars (%) (Table 22(A). Carrot leaves treatments fundamentally influenced non reducing sugars (%). Among various treatments of carrot leaves, minimum non reducing sugar (3.50%) were recorded from treatment (T0), as taken after by treatment (T5) (3.89%) and maximum (5.12%) were recorded in (T4) (Table 22(B).

Table 22(A): Analysis of variance for the influence of treatments and varieties on Non Reducing Sugar content (%) of oyster mushroom.

Source	DF	SS	MS	F	P
Treatment	5	9.87	1.97	43.79	0.00
Varity	1	2.13	2.13	47.40	0.00
Treatment*Varity	5	11.15	2.23	49.48	0.00
Error	24	1.08	0.04		
Total	35	24.23			

Table 22(B): Effect of treatments, varieties and their Interaction on Non Reducing Sugar content (%) of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	3.61e	3.42e	3.50e±0.06	0.10
T1 CL (100%)	2.85f	5.51a	4.17c±0.76	1.32
T2 CL (75%)+CW (25%)	5.14b	4.24d	4.69b±0.25	0.44
T3 CL (50%)+CW (50%)	4.36c	4.44d	4.38c±0.01	0.02
T4 CL (25%)+CW (75%)	4.89d	5.35ab	5.12a±0.13	0.23
T5 CL (12.5%)+CW(87.5%)	3.45c	4.33d	3.89d±0.25	0.44
Mean	3.98eb	4.36a		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%)

Acidity (%)

The investigation about acidity demonstrated that carrot leaves and assortments fundamentally impact on acidity (%) (Table 23(A). Carrot leaves significantly influenced acidity rate. Among different treatments of carrot leaves, maximum rate (0.28%) was seen from treatment (T4) and least (0.16%) were recorded in (T3) (Table 23(B). Minimum (%) of acridity were seen as (0.20%) in assortment (V1) and most extreme (0.25%) from (V2). Maximum acidity was seen from (0.39%) from (T5) (V2) as appeared in (Table 23(B).Carrot leaves brings conformational changes in total acidity of oyster mushroom fruits. The variation in total acidity is due to presence of organic acids present in the oyster fruits. Our results show resemblance with findings of (Xing *et al.*, 2013), they applied cinnamon fumigation to cinnamon oil. Hence from findings it is concluded that carrot leaves can retain the required acidity of oyster mushroom.

Table 23(A): Analysis of variance for the influence of treatments and varieties on acidity content (%) of oyster mushroom.

Source	DF	SS	MS
Treatment	5	0.19	0.03
Varity	1	0.05	0.05
Treatment*Varity	5	0.13	0.02
Error	60	0.02	0.00
Total	71	0.40	

Treatment	V1	V2	Mean	STD
T0 CW (100%)	0.27b	0.27b	0.27a±0.2	0.32
T1 CL (100%)	0.14e	0.24c	0.19b±0.02	0.05
T2 CL (75%)+CW (25%)	0.17e	0.17b	0.17c±03	0.25
T3 CL (50%)+CW (50%)	0.17d	0.16de	0.16c±0.10	0.03
T4 CL (25%)+CW (75%)	0.28d	0.29b	0.28a±0.30	0.01
T5 CL (12.5%)+CW(87.5%)	0.15be	0.39a	0.27a±0.06	0.11
Mean	0.17d	0.26a		

Table 23(B): Effect of treatments, varieties and their Interaction on Acidity content (%) of oyster mushroom.

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= leaves(12.5) + CW= Cotton waste (87.5%).

Ascorbic acid content (%)

The investigation about ascorbic acid demonstrated that carrot leaves and assortments effect on ascorbic acid substance (Table 24(A). Carrot leaves considerably influenced ascorbic acid substance. Among various treatments of carrot leaves, maximum (14.80 %) of ascorbic acid was recorded. Greatest ascorbic acid was seen as (13.36 %) from (V1) and least (11.78 %) from (V2), and least were recorded as (5.7 %) from (T0) (V2) (Table 24(B).Ascorbic acid is a water-soluble micronutrient needed for many biological functions. The constancy of ascorbic acid is usually affected by certain factors, such as temperature, availability of surrounding oxygen, humidity, light and the activities of ascorbate oxidase and polyphenol oxidase enzymes during storage (Sharma, 2011).

Table 24(A): Analysis of variance for the influence of treatments and varieties on ascorbic acid content (%) of oyster mushroom.

Source	DF	SS	MS
Treatment	5	632.86	126.56
Varity	1	44.80	44.80
Treatment*Varity	5	249.59	49.91
Error	60	39.20	0.65
Total	71	966.42	

Table 24(B): Effect of treatments, varieties and their Interaction on ascorbic acid content (%) of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	6.81e	5.74f	6.25d±0.31	0.55
T1 CL (100%)	14.34c	14.92b	14.45a±0.25	0.45
T2 CL (75%)+CW (25%)	15.32	13.23d	14.15ab±0.66	1.15
T3 CL (50%)+CW (50%)	15.23b	14.69bc	14.81a±0.11	0.26
T4 CL (25%)+CW (75%)	16.75a	7.53e	12.12b±2.65	4.63
T5 CL (12.5%)+CW(87.5%)	12.47d	15.45b	13.73abc±0.75	1.32
Mean	14.58a	13.84b		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste (75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

Biological efficiency (%)

The carrot leaves treatment and varieties are pointedly influence the biological efficiency indicated in ANOVA. Accomplishment of biological efficiency pointedly influenced by carrot leaves treatment. Biological efficiency maximum (25.79%) was taken by (T_4) as followed by treatment (T_1) (23.25%) treatment and least biological efficiency of mushroom

(17.704%) were taken by treatment T_0 from all the treatments of carrot leaves. On accomplishment of biological efficiency of mushroom varieties are influenced pointedly. Biological efficiency maximum (24.16%) was taken by V2.

Table 25(A): Analysis of variance for the influence of treatments and variety on biological efficiency of oyster mushroom.

Source	DF	SS	MS
Treatment	5	2103.24	420.64
Varity	1	95.83	95.79
Treatment*Varity	5	6.79	1.35
Error	60	22.96	0.38
Total	71	2228.79	

Table 25(B): Effect of treatments, varieties and their Interaction on Biological Efficiency of oyster mushroom.

Treatment	V1	V2	Mean	STD
T0 CW (100%)	69.11h	71.25g	70.18f±0.61	1.06
T1 CL (100%)	71.45g	73.26f	72.35e±0.52	0.90
T2 CL (75%)+CW (25%)	76.76e	79.18d	77.97d±0.69	1.20
T3 CL (50%)+CW (50%)	78.54d	80.86c	79.70c±0.66	1.15
T4 CL (25%)+CW (75%)	81.09c	84.63b	82.86b±1.02	1.76
T5 CL (12.5%)+CW(87.5%)	84.65b	86.28a	85.47a±0.46	0.81
Mean	77.65b	80.02a		

(T_0, CW= Cotton waste(100%) control, T_1, CL= Carrot leaves(100%), T_2, CL= Carrot leaves(75%)+CW= Cotton waste, (25%), T_3, CL= Carrot leaves (50%) + CW= Cotton waste(50%), T_4, CL= Carrot leaves (25%) + CW= Cotton waste(75%), T_5, CL= Carrot leaves(12.5) + CW= Cotton waste (87.5%).

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