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# Biochemical parameters and shelf life of oyster mushroom affected by pre-treatment and packaging material

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## ABSTRACT

After harvest and grading, fresh oyster mushroom (*Pleurotus ostreatus* var. Florida) was subjected to pre-treatment of aqueous solution of 0.050% potassium meta-bisulphite (KMS) for 5 minutes along with control (no dip). The treated air dried samples were subjected to packing 400 g each in polyethylene (150 gauge), jute bag, bubble wrap, non-absorbent cotton bag, corrugated fibre board (CFB), brown paper bag, cotton cloth bag, newspaper bag, punnet along with controls (water dip and no dip/no packing) at ambient (25 ±2°C) and low temperature (4-6±1°C). The physiological loss in weight (% PLW) in all the treatments was recorded during storage (3 days at ambient and 12 days at low temperature) which was found to increase significantly with the advancement of storage period at both the conditions. However, it was found maximum in control (no packing) followed by CFB, newspaper, brown paper and jute bag whereas minimum in polyethylene, punnet and bubble wrap at ambient and low temperature. Shelf-life and quality of oyster mushroom was found good for 2-3 days at ambient and 10-12 days at low temperature in 0.05% KMS compared to control (no dip/no packing). The protein, total sugars and phenols were found to reduce whereas polyphenol oxidase (PPO) activity increased significantly at both storage conditions. The study revealed that postharvest shelf-life of oyster mushroom (*Pleurotus ostreatus* var. Florida) can be extended upto 12 days with better quality by pre-treatment with 0.050% KMS followed by packing 400 g in polyethylene, punnet and bubble wrap under low temperature (4-6±1°C).

**Keywords:** Oyster mushroom, *Pleurotus ostreatus* var. Florida, packaging material, storage conditions

Nearly 60 mushrooms are being cultivated in more than 100 countries around the world. Among different mushrooms, oyster (*Pleurotus* sp.) belonging to class basidiomycota and family pleurotaceae, is one of the important and 2$^{nd}$ largest mushroom (21%) as far as total world mushroom production is concerned (Bijla and Sharma, 2023). Out of the total oyster production, more than 87% is being produced by China (Barh *et al*., 2019). Apart from other mushrooms, oyster is rich in various nutritional compounds including protein (11.95-35.50%), carbohydrate (34.00-63.03%), fat (1.06-7.50%), crude fibre (6.20-28.29%) and potassium (15.30-2709 mg/kg) per 100 gm dried mushroom along with vitamins, essential amino acids particularly lysine and leucine along with various other minerals (Raman *et al*., 2021) as well as Vitamin C and B complex which are required for a sound health (Randive, 2012). Oyster mushroom has been found as an alternative source of fish, meat and vegetables because of presence of very high mineral contents (Kakon *et al*., 2012 and Ahmed *et al*., 2016). The demand of oyster mushroom is comparatively low compared to button (*Agarius bisporus*) and shiitake (*Lentinula edodes*) in the global market due to open

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sporophores having shorter shelf-life. The consumers have been found to attract towards the appealing taste, flavour, nutritional composition as well as medicinal properties of oyster mushroom (Aditya *et al*., 2024). Although, oyster mushroom is a complete pack comprising various vital nutrients however, the physiological process, shrivelling of fruit bodies, liquefaction as well as changes in texture and flavour shortens the shelf life (Barden *et al*., 1990). Presence of high tyrosinase along with phenolic compounds is responsible for enzymatic browning (Brennan *et al*., 2000) because of which there is drastic reduction in the market value of the produce (Mohapatra *et al*., 2010). The fruit bodies are prone to very high respiration rate after harvest which further increases if the storage temperature is more. A number of packaging materials have been tried by various workers resulting in increase in the shelf life retaining colour, texture, flavour, nutritional value as well as microbial load (Ambatkar and Kumar, 2015). Oyster mushroom after chemical treatment followed by storage through MAP having 1.5% $O_2$ and 20% $CO_2$ resulted in maintaining the quality and shelf life (Xiao *et al*., 2011). Jafri *et al*. (2013) revealed that oyster mushroom treated with different chemicals followed by MAP having 10% $O_2$ and 5% $CO_2$ retained the quality for 25 days at 4°C. The present studies were undertaken to see the effect of aqueous treatment of KMS (0.050%) on PLW and biochemical parameters of fresh oyster mushroom stored at ambient and low temperature after packing in different packaging materials.

## MATERIALS AND METHODS

### Raw materials

To undertake the study during 2020-21, oyster mushroom (*Pleurotus ostreatus* var. Florida) was procured from the farm section of ICAR-Directorate of Mushroom Research, Solan (H.P.). The mushrooms were sorted and graded followed by treatment with 0.050% aqueous solution of potassium meta-bisulphite (KMS) for 5 minutes along with controls (water dip and no dip/no packing). Out of different concentrations (0.010, 0.150, 020, 0.025, 0.030, 0.035, 0.040, 0.045, 0.050, 0.055, 0.060%), the best one (0.050%) was selected by conducting initial trials. After surface air drying under the fan, the treated samples were packed in polyethylene (PE 150 gauge), jute bag, bubble wrap bag, non-absorbent cotton bag, corrugated fibre board box (CFB), brown paper bag, cotton cloth bag, newspaper bag, punnet along with controls (water dip and no dip/no packing) having 400 g capacity each and stored at ambient (25±2°C) and low temperature (4-6±1°C). The packages of polyethylene, bubble wrap and punnet were having 0.01% vents whereas others other package materials were kept intact.

### Physiological loss in weight

The packed samples were stored both at ambient (25±2°C and 58-64% RH) and low (4-6±1°C and 82-84% RH) temperature for recording physiological loss in weight (PLW) and other bio-chemical parameters. During storage the physiological loss in weight (% PLW) in all 10 treatments at ambient and low temperature storage was recorded at regular intervals by taking the initial weight and the final weight and it was calculated as per the following formula:

$$\% \text{ PLW} = \frac{\text{Initial weight - Final weight}}{\text{Initial weight of the sample}} \times 100$$

### Protein and sugar content

Protein content in different samples of mushroom under various treatments during storage was estimated by using Kelplus Elite Ex Micro Kjeldahl method given by Fujihara *et al*. (1995) with a conversion factor of 4.38. The total sugar (reducing and non-reducing) contents in the treatments were estimated by anthrone method as described by Turfan *et al*. (2018).

**Total phenols**

For determining total phenols in all the treatments, Folin-Ciocalteu (FC) reagent method given by Singleton and Rossi (1965) with some modifications was used. One gram of sample was extracted overnight with 10 ml of 50% aqueous methanol. This mixture was centrifuged at 10,000 rpm for 15 min. and 0.5 ml of the supernatant was taken in a test tube containing 5 ml FC reagent (10% aqueous solution) and 4 ml aqueous sodium carbonate. The absorbance was recorded at 665 nm using a spectrophotometer (Perkin Elmer UV/VIS spectrophotometer Lambda 25, Germany) after keeping the tubes for 15 min in dark. The results on total phenols were expressed as mg GAE (Gallic acid equivalent)/g sample.

**Polyphenol oxidase (PPO)**

The method given by Kaul and Farooq (1994) was used for the estimation of polyphenol oxidase activity (PPO) in all the treatments of oyster mushroom stored at ambient and low temperature. Five g mushroom was homogenized in 10 ml of cold 0.2 M tris – HCl buffer (pH = 7.5) containing 0.1 M each of cystein and EDTA. The homogenate was centrifuged at 15000 rpm for 20 minutes at 4ºC in a refrigerated centrifuge and the supernatant was used for enzyme assay. A volume of 0.5 ml of enzyme extract was incubated with 4 ml of 0.05 M catechol in 0.03 M phosphate buffer (pH 6) for 20 minutes at 30ºC. The reaction was terminated by adding 1.0 ml of chilled 10 per cent TCA and the optical density was recorded at 430 nm against the reagent blank. The total enzyme activity was measured in units/g fresh wt/h. One unit of enzyme represents increase in O.D. by 1.0 under the standard conditions.

**Shelf life quality**

The postharvest shelf life and storage quality of all the treatments of oyster mushroom at ambient and low temperature conditions was assessed by a panel of 10 judges through visual inspection after 3 and 12 days storage respectively

**Statistical analysis**

The experiment comprising 10 treatments both at ambient and low temperature conducted in completely randomized block design (CRBD) was replicated thrice. The experimental data were subjected to analysis of variance and the least significant difference was determined at the level of $P<0.05$ as per the method of Panse and Sukhatme (2000).

## RESULTS AND DISCUSSION

**Physiological loss in weight (%PLW) in oyster mushroom**

The physiological loss in weight (%PLW) was recorded in all the treatments at various intervals after treating the fruit bodies of oyster mushroom with 0.05% KMS followed by surface air drying, packing (400g) in different packages and storage at ambient and low temperature. The results revealed a significant increase in PLW irrespective of the package and storage conditions however, the increase was recorded highest in controls (water dip and no dip/no pack) and lowest in punnet followed by bubble wrap and PE at both the storage conditions (Fig.1 and 2.). The fruit bodies dipped in water were found to spoil fast because of higher water content making sporophores fragile. The minimum PLW in punnet, bubble wrap and PE may be attributed to the barrier because of plastic polymer which created hindrance for exchange of gases thereby retained the moisture compared to other packages. Further, under low temperature due to controlled respiration, PLW was recorded minimum in all the treatments compared to ambient conditions. Similar to the present studies a significant loss in total weight of oyster mushroom packed in different packing materials after treating in

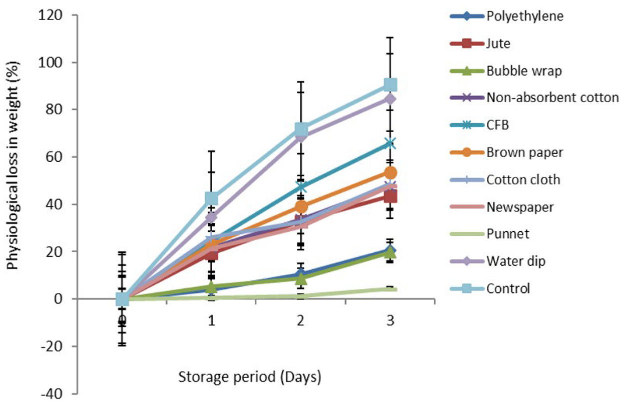


**Fig. 1.** Physiological loss in weight (%PLW) in oyster mushroom (400g) *P. ostreatus* var. Florida in different packages stored at ambient (25±2°C) conditions after 0.050% KMS dip treatment

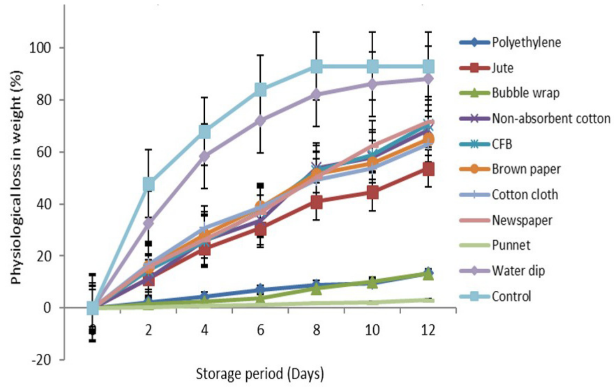


**Fig. 2.** Physiological loss in weight (%PLW) in oyster mushroom (400g) P. ostreatus var. Florida in different packages stored at low (4-6±1°C) temperature conditions after 0.050% KMS dip treatment

$H_2O_2$ was also recorded after storage for 7 days (Das *et al.*, 2010). A minimum PLW was recorded in oyster mushroom packed in PVC at 8-10° C and stored for 16 days (Ambatkar and Kumar, 2015). Further, the oxygen transmission rate (OTR) and water vapour transmission rate (WVTR) in PE and PP was low which helped to maintain higher moisture as reported by Gantner *et al.* (2016).

Further, the PLW in KMS treated oyster fruit bodies in all the treatments at ambient and low temperature was significantly lesser than the control (no dip/no packing) including water treatment. This could be attributed due to the antimicrobial action of KMS on micro-flora present on the fruit bodies responsible for spoilage resulting in better shelf life. The results revealed that the moisture loss was significantly low at refrigerated temperature than ambient conditions (Fig 1and 2). Apart from controlling the microbial spoilage as well as enzymatic browning, the KMS treatment might have blocked the cuticle in the oyster mushroom fruit bodies thereby restricting the loss of the moisture during storage. The results revealed that the PLW was significantly higher during initial storage period because of more surface water which decreased later. This could be due to the reduction in pore size of oyster mushroom fruit bodies allowing lesser moisture loss in all the treatments at later stages of storage. Singh *et al.* (2016) has reported minimum weight and moisture loss in button mushroom because of better retention of cellular organization and reduced enzyme activities after treating with 0.5% KMS+0.5% NaCl+0.5% $CaCl_2$ and packing in PP bags. Reduced rate of respiration and transpiration was found in button mushroom in PP bags treated with citric acid and $H_2O_2$ resulting in a significant reduction in weight loss during low temperature storage (Gupta and Bhat, 2016).

**Biochemical parameters of oyster mushroom**

A significant difference was recorded in biochemical parameters viz., protein, total sugars, phenols and polyphenol oxidase (PPO) in all the treatments at both the storage conditions. The protein content was found to decrease significantly in all the treatments at both ambient and low temperature but faster at ambient conditions. The highest mean reduction in protein content was recorded in control (no dip/no packing) at ambient (3 days) and low temperature (12 days). The sporophores treated with water were found to have higher reduction because of no restriction in the physiological process. The lowest decrease in protein content was recorded at low temperature in PE, punnet and bubble wrap because of accumulation of more $CO_2$ in pack (Table 1). The higher loss of protein in non-plastic material recorded during storage may be attributed to more gaseous exchange. During storage respiration rate might have led to breakdown of proteins due to more protease enzyme activity which has also been reported by Rai and Saxena (1989). Singh *et al*. (2016) has also reported minimum changes in biochemical properties in button mushroom during storage in PP bags as compared to paper punnet with shrink wrapping (PPSW).

In all the treatments of oyster mushroom, the total sugar contents were found to decrease significantly with highest reduction in control (water treated and no dip/no pack) followed by CFB, newspaper and brown paper in both the storage conditions (Table 2). Apart from the maximum decrease in total sugars in control, minimum reduction was recorded n PE, punnet and bubble wrap. This could have been attributed due to the restricted respiration rate in the packing material with accumulation of $CO_2$ at both the conditions and low temperature further has contributed to retain the sugars during storage. A report on the loss of total sugars during storage due to utilization of the most abundant non-reducing disaccharide trehalose in button mushroom has also been reported by Rai and Saxena (1989). Because of higher metabolism along with respiration rate in mushroom compared to fruits and vegetables (Mahajan *et al*. 2008) even at low temperature and utilization of available carbohydrates coupled with Maillard reaction resulted into significant reduction in the total sugars in different mushrooms (Verma *et al*., 2019).

Both at ambient and low temperature storage, a significant reduction in phenol contents was recorded in all the oyster mushroom treatments with a faster rate in former than later. The lowest reduction in phenol content was recorded in PE followed by punnet and bubble wrap whereas highest in controls (water dip and no dip/no pack) followed by CFB, newspaper and brown paper at both the storage conditions (Table 3). The KMS treated oyster mushrooms could have retained more phenols because of reduced PPO activity due to less oxidation and browning. Similar to the present studies, Rai and Saxena (1989) have also reported reduction in the phenol contents in button mushroom during storage because of its oxidation by polyphenol oxidase (PPO) enzyme. Further, in button mushroom stored at ambient and refrigerated conditions, the total phenol contents, total sugars and mannitol contents were also found to decrease significantly due to natural senescence and higher respiration rate as reported by Gupta *et al*. (2015).

The enzymatic discolouration in different crops including mushrooms during storage is largely mediated by copper oxygenases enzyme called polyphenol oxidases (PPOs: laccases and tyrosinases) and peroxidases. The polyphenol oxidase (PPO) activity in all the treatments of oyster mushroom was recorded which was found to increase significantly during storage with a faster rate at ambient than low temperature (Table 4). The PPO activity increased with storage period and found to be the highest in water treated control including water dip and no dip/no packing followed by CFB, newspaper and brown paper whereas it was recorded lowest in PE, punnet and bubble wrap at both the storage conditions. As there was restricted gaseous exchange in PE, punnet and bubble wrap, the PPO activity remained under control. The oxidation of phenolic compounds to browning pigments melanin because of higher respiration rates is responsible for increased PPO activity during storage of button mushroom (Rai and Saxena 1989). The highest PPO activity during storage in button mushroom was recorded in PVC at ambient conditions compared to PP, HIPS and PVC punnet (Mittal *et al*. 2014).

**Table 1.** Effect of 0.050% KMS treatment and packages on the protein content (mg/g dry wt.) in oyster (*Pleurotus ostreatus* var. Florida) at ambient (25±2°C) and low (4-6±1°C) temperature storage

| Packaging material | Storage (Days) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ambient | | | | | Low | | | |
| | 0 | 1 | 2 | 3 | Mean | 4 | 8 | 12 | Mean |
| 1. Polyethylene | 280.2 | 275.2 | 269.4 | 261.2 | 271.50 | 275.4 | 270.6 | 264.4 | 272.65 |
| 2. Jute | 280.2 | 271.4 | 260.8 | 254.6 | 266.75 | 271.5 | 261.0 | 254.2 | 266.73 |
| 3. Bubble wrap | 280.2 | 273.0 | 265.2 | 258.8 | 269.30 | 275.2 | 265.0 | 259.4 | 269.95 |
| 4. Non-absorbent cotton | 280.2 | 272.4 | 263.2 | 257.8 | 268.40 | 273.0 | 263.6 | 257.8 | 268.65 |
| 5. CFB | 280.2 | 267.6 | 255.2 | 249.2 | 263.05 | 268.6 | 257.8 | 250.8 | 264.35 |
| 6. Brown paper | 280.2 | 270.2 | 259.4 | 253.6 | 265.85 | 270.2 | 260.4 | 254.0 | 266.20 |
| 7. Cotton cloth | 280.2 | 272.0 | 262.0 | 255.2 | 267.35 | 272.4 | 262.0 | 255.4 | 267.50 |
| 8. Newspaper | 280.2 | 268.2 | 257.0 | 251.4 | 264.20 | 269.0 | 259.4 | 253.0 | 265.40 |
| 9. Punnet | 280.2 | 274.0 | 267.8 | 259.6 | 270.40 | 277.2 | 268.4 | 262.6 | 272.10 |
| 10. Water treated | 280.2 | 266.1 | 254.8 | 248.7 | 262.45 | 267.6 | 257.2 | 249.3 | 263.58 |
| 11.Control (no dip/no packing | 280.2 | 265.7 | 253.4 | 248.0 | 261.83 | 266.5 | 255.4 | 248.8 | 262.73 |
| Mean | 280.2 | 270.52 | 260.74 | 254.37 | - | 271.50 | 261.89 | 255.42 | - |
| CD (0.05%) | 0.0 | 0.56 | 0.50 | 0.48 | - | 0.56 | 0.51 | 0.49 | - |

**Table 2.** Changes in total sugar contents (mg/g dry wt.) in oyster (*Pleurotus ostreatus* var. Florida) after 0.050% KMS treatment and packing in different material (25±2°C) at ambient and low (4-6±1°C) temperature storage

| Packaging material | Storage (Days) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ambient | | | | | Low | | | |
| | 0 | 1 | 2 | 3 | Mean | 4 | 8 | 12 | Mean |
| 1. Polyethylene | 85.0 | 84.8 | 83.4 | 83.0 | 84.05 | 84.8 | 84.6 | 83.8 | 84.55 |
| 2. Jute | 85.0 | 83.4 | 82.2 | 81.8 | 83.10 | 83.6 | 82.4 | 79.6 | 82.65 |
| 3. Bubble wrap | 85.0 | 84.4 | 83.0 | 82.6 | 83.75 | 84.6 | 83.8 | 82.0 | 83.85 |
| 4. Non-absorbent cotton | 85.0 | 84.2 | 82.8 | 82.2 | 83.55 | 84.0 | 83.2 | 81.4 | 83.40 |
| 5. CFB | 85.0 | 81.8 | 80.0 | 78.6 | 81.35 | 82.0 | 80.6 | 77.6 | 81.30 |
| 6. Brown paper | 85.0 | 83.2 | 81.4 | 81.0 | 82.65 | 83.4 | 82.0 | 79.0 | 82.35 |
| 7. Cotton cloth | 85.0 | 83.8 | 82.6 | 82.0 | 83.35 | 83.8 | 82.8 | 80.2 | 82.95 |
| 8. Newspaper | 85.0 | 82.6 | 80.4 | 79.8 | 81.95 | 83.0 | 82.0 | 78.8 | 82.20 |
| 9. Punnet | 85.0 | 84.6 | 83.2 | 82.8 | 83.90 | 84.8 | 84.0 | 83.6 | 84.35 |
| 10. Water treated | 85.0 | 81.3 | 79.8 | 77.9 | 81.00 | 81.4 | 79.3 | 76.6 | 80.58 |
| 11. Control (no dip/no packing | 85.0 | 80.6 | 77.8 | 76.0 | 79.85 | 79.6 | 77.0 | 73.6 | 78.80 |
| Mean | 85.00 | 83.15 | 81.50 | 80.70 | - | 83.18 | 81.97 | 79.65 | - |
| CD (0.05%) | 0.0 | 0.24 | 0.18 | 0.16 | - | 0.24 | 0.23 | 0.20 | - |

**Table 3.** Changes in phenol contents (mg/g dry wt.) in oyster (*Pleurotus ostreatus* var. Florida) after 0.050% KMS treatment and packing in different material at ambient (25±2°C) and low (4-6±1°C) temperature storage

| Packaging material | Storage (Days) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ambient | | | | | Low | | | |
| | 0 | 1 | 2 | 3 | Mean | 4 | 8 | 12 | Mean |
| 1. Polyethylene | 6.50 | 6.20 | 5.90 | 5.72 | 6.08 | 6.20 | 6.02 | 5.86 | 6.14 |
| 2. Jute | 6.50 | 5.94 | 5.34 | 5.06 | 5.71 | 5.88 | 5.64 | 5.48 | 5.88 |
| 3. Bubble wrap | 6.50 | 6.08 | 5.76 | 5.48 | 5.95 | 6.10 | 5.88 | 5.75 | 6.06 |
| 4. Non-absorbent cotton | 6.50 | 6.00 | 5.54 | 5.20 | 5.81 | 6.02 | 5.80 | 5.68 | 6.00 |
| 5. CFB | 6.50 | 5.84 | 5.12 | 4.72 | 5.55 | 5.72 | 5.22 | 5.04 | 5.62 |
| 6. Brown paper | 6.50 | 5.90 | 5.28 | 4.86 | 5.64 | 5.82 | 5.58 | 5.36 | 5.82 |
| 7. Cotton cloth | 6.50 | 5.98 | 5.42 | 5.12 | 5.76 | 5.94 | 5.74 | 5.60 | 5.95 |
| 8. Newspaper | 6.50 | 5.88 | 5.16 | 4.80 | 5.86 | 5.78 | 5.34 | 5.16 | 5.70 |
| 9. Punnet | 6.50 | 6.18 | 5.86 | 5.64 | 6.05 | 6.18 | 5.98 | 5.82 | 6.12 |
| 10. Water treated | 6.50 | 5.82 | 5.04 | 4.70 | 5.52 | 5.70 | 5.20 | 5.00 | 5.60 |
| 11. Control (no dip/no packing | 6.50 | 5.80 | 5.00 | 4.64 | 5.49 | 5.68 | 5.14 | 4.92 | 5.56 |
| Mean | 6.50 | 5.96 | 5.40 | 5.08 | - | 5.91 | 5.59 | 5.42 | - |
| CD (0.05%) | 0.0 | 0.09 | 0.07 | 0.05 | - | 0.08 | 0.07 | 0.06 | - |

**Table 4.** Changes in polyphenol oxidase activity (μg/g dry wt.) in oyster (*Pleurotus ostreatus* var. Florida) after 0.050% KMS treatment and packaging in different material at ambient (25±2°C) and low (4-6±1°C) temperature storage

| Packaging material | Storage (Days) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ambient | | | | | Low | | | |
| | 0 | 1 | 2 | 3 | Mean | 4 | 8 | 12 | Mean |
| 1. Polyethylene | 4.98 | 5.04 | 5.18 | 5.28 | 5.12 | 5.12 | 5.26 | 5.42 | 5.20 |
| 2. Jute | 4.98 | 5.40 | 5.59 | 5.85 | 5.46 | 5.52 | 5.82 | 6.02 | 5.86 |
| 3. Bubble wrap | 4.98 | 5.15 | 5.28 | 5.42 | 5.21 | 5.20 | 5.46 | 5.64 | 5.32 |
| 4. Non-absorbent cotton | 4.98 | 5.20 | 5.36 | 5.56 | 5.28 | 5.28 | 5.52 | 5.70 | 5.37 |
| 5. CFB | 4.98 | 5.65 | 5.98 | 6.58 | 5.80 | 6.00 | 6.36 | 6.64 | 6.00 |
| 6. Brown paper | 4.98 | 5.48 | 5.74 | 6.10 | 5.76 | 5.84 | 6.12 | 6.36 | 5.83 |
| 7. Cotton cloth | 4.98 | 5.28 | 5.47 | 5.68 | 5.35 | 5.39 | 5.70 | 5.86 | 5.48 |
| 8. Newspaper | 4.98 | 5.58 | 5.92 | 6.28 | 5.69 | 5.92 | 6.26 | 6.48 | 5.91 |
| 9. Punnet | 4.98 | 5.08 | 5.22 | 5.34 | 5.16 | 5.15 | 5.34 | 5.50 | 5.24 |
| 10. Water treated | 4.98 | 5.60 | 6.00 | 6.60 | 5.79 | 6.02 | 6.40 | 6.70 | 6.03 |
| 11. Control (no dip/no packing | 4.98 | 5.58 | 6.10 | 6.67 | 5.83 | 6.04 | 6.44 | 6.76 | 6.06 |
| Mean | 4.98 | 5.36 | 5.62 | 5.94 | - | 5.58 | 5.88 | 6.09 | - |
| CD (0.05%) | 0.0 | 0.08 | 0.07 | 0.06 | - | 0.08 | 0.06 | 0.05 | - |

**Table 5.** Quality of oyster mushroom after treating with 0.050% KMS followed by packing in different packages and stored at ambient (25±2°C) and low (4-6±1°C) temperature

| Packaging material | Oyster mushroom | |
|---|---|---|
| | **Ambient temperature (3 days)** | **Low temperature (12 days)** |
| 1. Polyethylene | Fresh and slimy | Watery but good |
| 2. Jute | Partially dried and slimy | Slightly dried and not good |
| 3. Bubble wrap | Watery and slimy | Watery but good |
| 4. Non-absorbent cotton | Died and slimy | Dried and not good |
| 5. CFB | Dried and not good | Partially dried and not good |
| 6. Brown paper | Dried and not good | Partially dried and not good |
| 7. Cotton cloth | Dried and not good | Partially dried and not good |
| 8. Newspaper | Dried and not good | Partially dried and not good |
| 9. Punnet | Fresh and good | Fresh and marketable |
| 10. Water treated | Watery and slimy | Soggy and slimy |
| 11.Control | Dried and not good | Dried and not good |

The shelf life quality of all the treatments of oyster mushroom after storage of 3 and 12 days at ambient and low temperature was assessed which has been shown in table 5. The quality was found better under low temperature compared to ambient conditions because of restricted respiration rate resulting in retention of biochemical parameters for longer duration.

## CONCLUSION

In the present study, increase in PLW (%) was recorded in all the oyster mushroom treatments treated with 0.050% KMS followed by packing (400g) in polyethylene, jute bag, bubble wrap, non-absorbent cotton bag, corrugated fibre board (CFB), brown paper bag, cotton cloth bag, newspaper bag, punnet along with controls (water treated and no dip/no packing). Ambient temperature showed higher increase in PLW compared to low temperature in all the treatments during storage for 3 and 12 days respectively. There was a significant reduction in protein content, total sugars and phenols whereas the PPO activity was found to increase all treatments at both the storage conditions. The shelf life of oyster mushroom recorded 3 days at ambient and 12 days at low temperature having good quality in PE, punnet and bubble wrap compared to other packing material.

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