

Geographical Locations, Morphological Characterization and Growth Performance of Wild Edible Oyster Mushrooms Collected from Forest Regions of Maharashtra

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ABSTRACT

The present research studies were carried out with an objective to undertake the survey and collect wild edible oyster mushrooms in order to isolate and culture them and to study their growth and yield performance on wheat straw substrate. Various strains of *Pleurotus* spp. were collected from Sahyadri and Satpuda valleys of Maharashtra state which included Pune, Ahmednagar and Nashik districts. Twenty six samples were collected from different habitat like tree trunk, leaf litter, humus, compost and wooden stumps during monsoon. The morphological characters of wild oyster mushroom viz., cap colour, cap shape, cap diameter, stipe attachment, stipe length and gill attachment were recorded. Light pink colour of cap were commonly observed. The cap diameter varied from 4.25 to 5.98 cm. Stipe attachment was lateral and commonly observed for all strains. The stipe length varied from 0.61 to 1.23 cm. Various forms of gill attachment viz. shortly decurrent, decurrent, adnexed and adnate were observed for different strains. Selected wild oyster mushrooms were isolated and their growth performance on Potato Dextrose Agar (PDA) media was studied. Isolate Pune *Pleurotus*-4 (PNP-4) showed significantly maximum growth than remaining isolates and the standard control *P. sajor caju*. The spawn of selected isolates was prepared on wheat grains and the time required for spawn production varied from 14 to 19.75 days. The strain PNP-10 required minimum time for spawn production (14 days).

Key words *Geographical location, Morphological characters, growth performance, Pleurotus spp.*

Mushroom is a general term used mainly for the fruiting body of macrofungi (Ascomycota and Basidiomycota) and represents only a short reproductive stage in their life cycle (Das, 2010). Mushroom can be epigeous or hypogeous, large enough to be seen with the naked eyes and can be picked by hands (Chang, 1992).

Mushrooms are popular for their delicacy and flavor and can be regarded as vegetable meat. Mushrooms have achieved significant importance due to their nutritive and medicinal values and also as income generating venture in most of the countries. Mushroom is an attractive protein source for the developing countries where people rely heavily on cereal diet (Sohi, 1988). In recent times, increasing importance is given for the cultivation of protein rich mushrooms as they hold greater promise in satisfying the protein requirement of mankind.

Mushrooms have a long association with human kind and provide profound biological and economical impact.

From ancient times, wild mushrooms have been consumed by man with delicacy probably, for their taste and pleasing flavor (Das, 2010). They have rich nutritional value with high content of proteins, vitamins, minerals, fibers, trace elements and low number of calories and cholesterol (Agrahar and Subbulakshmi, 2005; Wani *et al.* 2010).

MATERIAL AND METHODS

Survey and collection of wild edible oyster mushrooms

The present investigation was carried out on *Pleurotus* spp. collected during survey for their growth and yield performance on wheat straw. Samples of *Pleurotus* spp. were collected from Sahyadri and Satpuda valleys of Maharashtra state which included Pune, Ahmednagar, Nashik and Jalgaon districts. The samples were collected from dense forest regions of the Maharashtra during monsoon.

Geographical locations of wild edible mushrooms:

Twenty six samples of oyster (*Pleurotus* spp.) mushrooms were collected from the forest regions and their locations are presented in Table 1. Most of the samples were found in dense forest area and at high latitudes and among the samples the variability in habitat were observed. The samples were seen on the tree trunk, wooden stumps, leaf litter, humus, grassland and compost. At the time of collection of samples, information regarding edibility was collected from local people. Further the mushrooms were isolated in the laboratory and simultaneously tested the edibility of these mushrooms by feeding to the rats and also confirmed by using reference books viz., The mushrooms, edible and otherwise, its habitat and its time of growth (M. E. Hard) and Introduction to mushroom science (T. N. Kaul). The isolates from the samples which showed profuse growth on media and found edible were selected for further study. Out of twenty six samples, fifteen cultures were obtained and best nine cultures were included for evaluation study and these are PN-14-25, PN-14-38, PN-14-40, PN-14-41, PN-14-42, PN-14-47, PN-14-48, PN-14-49 and PN-14-50.

Habitat:

The natural habitat of collected samples PN-14-25, PN-14-41 was on leaf litter and tree trunk, PN-14-42, PN-14-47, PN-14-48 and PN-14-49 were on tree trunk, sample PN-14-38 and PN-14-40 were on wooden stump and PN-14-50 was on leaf litter.

Morphological characters of selected wild edible oyster mushrooms

The morphological characters of wild edible oyster mushroom viz., cap colour, cap shape, cap diameter, stipe attachment, stipe length and gill attachment were recorded

Table 1. Geographical location of selected wild edible oyster mushrooms collected during survey.

| Sr. No. | Sample Code No. | Location | GPS data | Habitat |
|---------|-----------------|---------------------------------------|---|-------------------------------|
| 1 | PN-14-07 | Agriculture College, Pune Dist-Pune | La-18 ⁰ 32'01.86"N Lo-73 ⁰ 50'39.73 "E | On tree trunk |
| 2 | PN-14-09 | Pune University, Dist – Pune | La-18 ⁰ 33'09.45"N Lo-73 ⁰ 49'37.13"E | Humus |
| 3 | PN-14-16 | Agriculture College, Pune Dist – Pune | La-18 ⁰ 32'08.12"N Lo-73 ⁰ 50'53.64 "E | Leaf litter |
| 4 | PN-14-18 | Agriculture College, Pune Dist - Pune | La-18 ⁰ 32'07.87"N Lo-73 ⁰ 50'54.88 "E | On tree trunk |
| 5 | PN-14-19 | Agriculture College, Pune Dist – Pune | La-18 ⁰ 32'07.94"N Lo-73 ⁰ 50'54.64 "E | Leaf litter |
| 6 | PN-14-20 | Agriculture College, Pune Dist – Pune | La-18 ⁰ 32'07.94"N Lo-73 ⁰ 50'54.28 "E | On tree trunk |
| 7 | PN-14-24 | Agriculture College, Pune Dist – Pune | La-18 ⁰ 32'08.09"N Lo-73 ⁰ 50'29.04 "E | Wooden stumps |
| 8 | PN-14-25 | Agriculture College, Pune Dist – Pune | La-18 ⁰ 32'08.03"N Lo-73 ⁰ 50'30.08 "E | On tree trunk and leaf litter |
| 9 | PN-14-26 | Peth Avsari ghat, Pune Dist – Pune | La-18 ⁰ 55'40.13"N Lo-73 ⁰ 55'16.01"E | Wooden stumps |
| 10 | PN-14-27 | Peth Avsari ghat, Pune Dist – Pune | La-18 ⁰ 57'48.22"N Lo-73 ⁰ 56'16.97"E | Compost |
| 11 | PN-14-28 | Peth Avsari ghat, Pune Dist – Pune | La-18 ⁰ 57'07.28"N Lo-73 ⁰ 56'28.30"E | Humus |
| 12 | PN-14-29 | Peth Avsari ghat, Pune Dist – Pune | La-18 ⁰ 58'03.36"N Lo-73 ⁰ 56'26.30"E | Humus |
| 13 | PN-14-33 | Peth Avsari ghat, Pune Dist – Pune | La-18 ⁰ 57'57.32"N Lo-73 ⁰ 56'27.45"E | Compost |
| 14 | PN-14-35 | Peth Avsari ghat, Pune Dist – Pune | La-18 ⁰ 57'55.59"N Lo-73 ⁰ 56'21.10"E | Wooden stumps |
| 15 | PN-14-38 | Peth Avsari ghat, Pune Dist – Pune | La-18 ⁰ 60'18.30"N Lo-73 ⁰ 56'21.02"E | Wooden stumps |
| 16 | PN-14-40 | Peth Avsari ghat, Pune Dist – Pune | La-18 ⁰ 59'21.02"N Lo-73 ⁰ 57'48.60"E | Wooden stumps |
| 17 | PN-14-41 | Igatpuri, Dist - Nashik | La-19 ⁰ 47'27.19"N Lo-73 ⁰ 33'30.1"E | On tree trunk and leaf litter |
| 18 | PN-14-42 | Igatpuri, Dist - Nashik | La-19 ⁰ 41'20.18"N Lo-73 ⁰ 30'21.30"E | On tree trunk |
| 19 | PN-14-43 | Igatpuri, Dist - Nashik | La-19 ⁰ 41'34.67"N Lo-73 ⁰ 33'28.43"E | Humus |
| 20 | PN-14-44 | Igatpuri, Dist - Nashik | La-19 ⁰ 41'69.04"N Lo-73 ⁰ 31'70.20"E | Humus |
| 21 | PN-14-46 | Vaitarana, Dist-Nashik | La-19 ⁰ 41'38.40"N Lo-73 ⁰ 31'18.10"E | Wooden stumps |
| 22 | PN-14-47 | Vaitarana, Dist- Nashik | La-19 ⁰ 40'45.69"N Lo-73 ⁰ 32'38.42"E | On tree trunk |

| Sr. No. | Sample Code No. | Location | GPS data | Habitat |
|---------|-----------------|---------------------------------------|--------------------------------------|---------------|
| 23 | PN-14-48 | Vaitarana, Dist - Nashik | La-19°40'48.30"N Lo-73°32'24.76"E | On tree trunk |
| 24 | PN-14-49 | Vaitarana, Dist - Nashik | La-19°40'45.96"N Lo-73°32'32.63"E | On tree trunk |
| 25 | PN-14-50 | Kanashi, Dist - Nashik | La-20°31'27.67"N Lo-73°54'41.63"E | Leaf litter |
| 26 | PN-14-61 | Agriculture College, Pune Dist - Pune | La-18°32'07.12"N Lo-73°50'48.70"E | On tree trunk |

and presented in Table:2.

Cap colour and cap shape

Different strains were collected from different locations showed variation in colours of cap. The colours *viz.*, white, dark pink and light pink were commonly observed. The strains PN-14-25 and PN-14-42 were white, PN-14-38 and PN-14-47 were creamy white, PN-14-40 was pinkish, PN-14-41 was pink, PNP-14-48 and PN-14-49 was light pink and PN-14-50 was dark pink in colour. There was variation in the cap shape also. The various shapes *viz.*, slightly circular, depressed, flat and oyster like were observed. The cap shape of strain PN-14-25 was slightly circular, PN-14-38, PN-14-42 and PN-14-48 were depressed, PN-14-40 and PN-14-50 were flat, PN-14-41 and PN-14-46 were oyster like.

Cap diameter:

The data for cap diameter of collected wild edible oyster mushroom was recorded. The maximum cap diameter was observed in sample PN-14-48 (5.98 cm), followed by PN-14-50 (5.96 cm), PN-14-49 (5.94 cm), PN-14-38 (5.92 cm), PN-14-41 (5.84 cm), PN-14-25 (5.81 cm), PN-14-42 (5.63 cm) and PN-14-47 (4.33 cm) where as it was minimum (4.25 cm) in PN-14-40.

Stipe attachment

Stipe attachment of wild edible oyster mushroom was lateral for all the collected strains. There was no variation observed for this character.

Stipe length

The morphological character *i.e.* stipe length was noted for all the collected strains of wild edible oyster mushrooms. The maximum stipe length was recorded in PN-14-47 (1.23 cm), followed by PN-14-48 (1.17 cm), PN-14-50 (1.14 cm), PN-14-49 (0.96 cm), PN-14-42 (0.92 cm), PN-14-41 (0.91 cm), PN-14-25 (0.85 cm) and PN-14-38 (0.74 cm), where as minimum stipe length (0.61 cm) was recorded in PN-14-40.

The remaining samples were either found non edible or no growth on culture medium and hence not included in present study and their morphological characters were not included in results.

Gill attachment

Strains of wild edible oyster mushrooms collected

during survey showed variation in their gill attachment. There were various forms of gill attachment *viz.*, shortly decurrent, decurrent, adnexed and adnate. The strains PN-14-25, PN-14-38 and PN-14-40 had shortly decurrent type of attachment, while PN-14-41 and PN-14-42 had decurrent type, strains PN-14-47 and PN-14-50 had adnate type, strain PN-14-48 had slightly decurrent and strain PN-14-49 had adnexed type of gill attachment.

Growth performance of different wild edible oyster mushroom isolates on Potato Dextrose Agar medium

Selected wild edible oyster mushrooms were isolated and their growth performance on Potato Dextrose Agar medium was recorded after 3, 5 and 7 days and presented in Table 3. Isolates PNP-4, PNP-9 and PNP-10 showed significantly maximum growth, followed by PNP-7 and PNP-8, whereas isolate PNP-2 recorded minimum growth performance.

Colony diameter

Selected wild edible oyster mushrooms were isolated and grown on Potato Dextrose Agar medium. The observations for their colony diameter were recorded on 7th day and are presented in Table:3. The isolates PNP-4 showed significantly maximum colony diameter (73.3 mm), followed by PNP-10 (72.4 mm), PNP-9 (71.5 mm), PNP-8 (53.9 mm), PNP-7 (53.0 mm), PNP-6 (50.5 mm), PNP-3 (49.3 mm), PNP-5 (35.4 mm), PNP-1 (34.3 mm) while the minimum colony diameter (32.7 mm) was recorded in PNP-2.

In present study an attempt had been made to survey, collect and isolate the wild edible oyster mushrooms and evaluated the different isolates for its growth and yield performance on wheat straw substrate.

Survey and collection of wild edible oyster mushrooms

During present investigation survey of Sahyadri and Satpuda regions including Pune, Ahmednagar, Nashik and Jalgaon districts were carried out and samples of wild oyster mushrooms were collected. Further morphological characters of wild mushrooms *viz.* their habitat, GPS data, cap colour, cap diameter, cap shape, stipe attachment, stipe length, gill attachment were recorded and information regarding edibility of samples were collected from local people. Isolation and culturing of strains were carried out in laboratory in controlled condition on Potato Dextrose Agar media. Further these mushrooms were feeded to the

Table 2. Morphological characters of selected wild edible oystermushrooms.

| Sr. No. | Sample No. | Cap colour | Cap diameter (cm) | Cap shape | Stipe attachment | Stipe length (cm) | Gill attachment |
|---------|------------|--------------|-------------------|-------------------|------------------|-------------------|--------------------|
| 1 | PN-14-07 | Yellow | 4.51 | Funnel | Lateral | 0.77 | Adnate |
| 2 | PN-14-09 | White | 4.89 | Ovoid | Lateral | 0.93 | Adnate |
| 3 | PN-14-16 | White | 4.15 | Oyster | Lateral | 1.05 | Adnascad |
| 4 | PN-14-18 | Creamy | 5.16 | Oyster | Lateral | 1.68 | Adnascad |
| 5 | PN-14-19 | Creamy white | 5.89 | Oyster | Lateral | 1.11 | Adnascad |
| 6 | PN-14-20 | Pinkish | 4.33 | Oyster | Lateral | 1.98 | Adnascad |
| 7 | PN-14-24 | Light pink | 4.74 | Oyster | Lateral | 0.73 | Free |
| 8 | PN-14-25 | White | 5.81 | Slightly circular | Lateral | 0.85 | Shortly decurrent |
| 9 | PN-14-26 | White | 4.46 | Oyster | Lateral | 1.16 | Adnascad |
| 10 | PN-14-27 | Creamy | 4.47 | Oyster | Lateral | 1.74 | Adnascad |
| 11 | PN-14-28 | White | 5.64 | Oyster | Lateral | 1.18 | Adnascad |
| 12 | PN-14-29 | White | 4.58 | Oyster | Lateral | 1.69 | Adnascad |
| 13 | PN-14-33 | White | 5.68 | Oyster | Lateral | 0.94 | Adnascad |
| 14 | PN-14-35 | White | 5.14 | Oyster | Lateral | 0.67 | Adnascad |
| 15 | PN-14-38 | Creamy white | 5.92 | Depressed | Lateral | 0.74 | Shortly decurrent |
| 16 | PN-14-40 | Pinkish | 4.25 | Flat | Lateral | 0.61 | Shortly decurrent |
| 17 | PN-14-41 | Pink | 5.84 | Oyster like | Lateral | 0.91 | Decurrent |
| 18 | PN-14-42 | White | 5.63 | Depressed | Lateral | 0.92 | Decurrent |
| 19 | PN-14-43 | White | 5.44 | Oyster | Lateral | 0.91 | Shortly decurrent |
| 20 | PN-14-44 | White | 5.64 | Oyster | Lateral | 0.71 | Adnate |
| 21 | PN-14-46 | Creamy white | 4.97 | Oyster | Lateral | 0.98 | Shortly decurrent |
| 22 | PN-14-47 | Creamy white | 4.33 | Oyster like | Lateral | 1.23 | Adnate |
| 23 | PN-14-48 | Light pink | 5.98 | Depressed | Lateral | 1.17 | Slightly decurrent |
| 24 | PN-14-49 | Light pink | 5.94 | Oyster like | Lateral | 0.96 | Adnexed |
| 25 | PN-14-50 | Dark pink | 5.96 | Flat | Lateral | 1.14 | Adnate |
| 26 | PN-14-61 | Dark pink | 5.86 | Oyster | Lateral | 1.19 | Shortly decurrent |

Table 3. Growth performance of different wild edible oyster mushroom isolates on Potato Dextrose Agar medium.

| Sr. No. | Sample No. | Growth performance | | | Colony diameter at 7 th day* |
|---------|--------------------------|--------------------|--------------|--------------|--|
| | | After 3 days | After 5 days | After 7 days | |
| 1 | PN-14-07 | No growth | No growth | No growth | - |
| 2 | PN-14-09 | No growth | No growth | No growth | - |
| 3 | PN-14-16 | - | - | + | 17.7 |
| 4 | PN-14-18 | No growth | No growth | No growth | - |
| 5 | PN-14-19 | - | - | + | 14.6 |
| 6 | PN-14-20 | - | - | + | 28.3 |
| 7 | PN-14-24 | No growth | No growth | No growth | - |
| 8 | PN-14-25 | - | - | + | 34.3 |
| 9 | PN-14-26 | No growth | No growth | No growth | - |
| 10 | PN-14-27 | No growth | No growth | No growth | - |
| 11 | PN-14-28 | No growth | No growth | No growth | - |
| 12 | PN-14-29 | No growth | No growth | No growth | - |
| 13 | PN-14-33 | - | - | + | 27.1 |
| 14 | PN-14-35 | No growth | No growth | No growth | - |
| 15 | PN-14-38 | - | - | + | 32.7 |
| 16 | PN-14-40 | - | + | ++ | 49.3 |
| 17 | PN-14-41 | + | ++ | +++ | 73.3 |
| 18 | PN-14-42 | - | - | + | 35.4 |
| 19 | PN-14-43 | No growth | No growth | No growth | - |
| 20 | PN-14-44 | No growth | No growth | No growth | - |
| 21 | PN-14-46 | - | - | + | 30.8 |
| 22 | PN-14-47 | - | + | ++ | 50.5 |
| 23 | PN-14-48 | + | + | ++ | 53.0 |
| 24 | PN-14-49 | + | + | ++ | 53.9 |
| 25 | PN-14-50 | + | ++ | +++ | 71.5 |
| 26 | PN-14-61 | - | - | + | 31.9 |
| | Control | | | | |
| 27 | (<i>P. sajor-caju</i>) | + | ++ | +++ | 72.4 |
| | S.E. | | | | 4.6 |
| | C.D. (0.05) | | | | 13.6 |

*Mean of four replications

Note: - Poor growth; + Good growth; ++ Medium growth; +++ Very good growth

rats for continuous ten days. Those strains found edible and showed profuse growth on culture media were selected for further study.

Melghat forest in central India was surveyed for occurrence of wild edible fungi and their prevalent favourable ecological factor in the month of June to February and 153 species of mushrooms were recorded by Ram *et al.* (2010).

Growth observations of selected wild edible oyster mushrooms on culture media

Selected wild mushrooms were isolated and their growth performance on Potato Dextrose Agar media was recorded after 3, 5 and 7 days. Isolates PNP-4, PNP-9 and PNP-10 showed significantly maximum growth followed by PNP-7 and PNP-8. Isolate PNP-2 recorded least growth on culture media.

Observations regarding colony diameter for all isolates were observed after 7 days. The colony diameter varied between 32.7 mm to 73.3 mm. The maximum colony diameter was recorded for isolate PNP-4, followed by PNP-10, PNP-9, PNP-8, PNP-7, PNP-6, PNP-3, PNP-5 and PNP-1. The minimum colony diameter was recorded for PNP-2. Similar observations for growth performance of wild oyster isolates on PDA culture media were noticed by Mshandete and Kivaisi (2013), Asmamaw Tesfaw *et al.* (2015) and Bilal Sofi *et al.* (2014). They reported 45 to 81.7 mm colony diameter on Potato Dextrose Agar medium.

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