Documentation and statistical approach towards foliar fungi found in Western Ghats (Desh region of Maharashtra), India

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Abstract
This paper focuses on the systematics and statistical analyses of foliar fungi found in the protected forest areas of Western Ghats mounting in Desh region of Maharashtra, consisting of five districts viz., Ahmednagar, Pune, Satara, Sangli, and Kolhapur. During this study, 144 taxa of foliar fungi were taxonomically characterised from 192 fungal isolates obtained from 170 collections. With 12 species, Meliola was the dominant genus in terms of having the highest number of species. Among species, Corynespora cassicola was the dominant species in terms of having been isolated from the maximum number of collections (11). Besides taxonomic studies, the diversity of foliar fungi was also analyzed using statistical approaches aiming to analyze the difference in biodiversity across the districts, for which parametric and non-parametric approaches were adopted. Parametric ordinary least squares models were developed with species count as the regressand. There was statistically significant (p-value < 0.05 for F-test) difference in mean species count across the districts. Non-parametric Kruskal Wallis Test yielded similar results (p-value < 0.05) for the median species count. Jaccard Similarity Index was computed to analyze the similarity in species composition between any two districts, which was maximum (3.39%) between Satara and Kolhapur districts. No species was common in all districts; only one species (0.69% of total) was common in the maximum three districts, viz., Pune, Satara and Kolhapur. Desh region also showed high values of diversity indices viz., Gini-Simpson's (0.9918), Shannon’s (4.7425), and normalized Shannon’s (0.9543). The study thus provides the latest information on the foliar fungi occurring in the Desh region. Further, based on the statistical analyses, it can be concluded that Desh region exhibits rich diversity of foliar fungi.

Keywords – Foliicolous fungi – Maharashtra – Mycobiotan – Statistical analysis

Introduction
The Western Ghats is a mega biodiversity region with varied flora and fauna. It has a wide range of vegetation and topographical characteristics. Biogeographically, the hill chains of the Western Ghats form the Malabar province of the Oriental realm, about 1600 km in length, running parallel to India’s west coast, and located between 8° N to 21° N latitudes and 73° E to 77° E longitudes. The hills of Western Ghats rise from relatively thin strip of west coast, rise up to 2800 m before blending into Deccan plateau in east at altitude of 500–600 m. The mean width of these hill ranges is about 100 km (Ramachandra & Suja 2006). The forests of Western Ghats contain some of the best samples of non-equatorial tropical evergreen forests (UNESCO 2012).
IUCN characterized Western Ghats as a region having exceptionally high level of biodiversity and endemism, with conservation outlook assessed as “significant concern” (IUCN 2020), implying an urgent need for the conservation. From north to south, the Western Ghats covers six states viz., Gujarat, Maharashtra, Goa, Karnataka, Kerala, and Tamil Nadu. Maharashtra has five major regions (from west to east) viz., Konkan, Khandesh, Desh, Vidarbha, and Marathwada. The Desh region consists of Ahmednagar, Pune, Satara, Sangli, Kolhapur, and Solapur districts, located from north to south. Desh region has protected areas such as Bhimashankar Wildlife Sanctuary (WLS), Chandoli National Park (NP), Dajipur WLS, Radhanagari WLS, Koyna WLS, as well as forests viz., Lonavala, Khandala, Harishchandragad, Mahabaleshwar, Malshej Ghat, and Pasarni Ghat that belong to Western Ghats of Maharashtra. The forests of Desh region are home to many species of plants infested by foliar fungi. Therefore, a study was carried out to estimate the diversity, distribution and taxonomy of foliar fungi growing on plants in the Western Ghats, which include many important taxa such as Ficus, Lagerstroemia, Memecylon, Syzygium and Bambusa species, valued for their wood, edible fruits, and other ethnobotanical uses (Begum et al. 2016). Over the years, systematic investigations were carried out on foliar fungi, which resulted in the identification of several species. For instance, Dubey & Pandey (2017) reported 336 foliicolous fungi in Maharashtra state, along with associated symptoms. Dubey & Pandey (2019) conducted a study in the Konkan region of Maharashtra and provided enumeration of 191 foliicolous fungal species and their respective hosts and a diversity study based on statistical analysis. The present study focuses on the systematics of foliar fungi of the Desh region of Maharashtra state and provides associated host and locational data. We also carried out statistical analyses of the obtained fungal diversity data to gain a deeper understanding of the underlying biodiversity patterns.

Materials & Methods

Foliicolous samples were collected from 24 locations in five districts in Desh region (Fig. 1) viz., Ahmednagar (3), Pune (6), Satara (6), Sangli (3) and Kolhapur (6). The collection sites included protected areas and forests of Harishchandragad (Ahmednagar District); Bhimashankar Wildlife Sanctuary, Lonavala, Khandala, Malshej Ghat and urban forests of Pune (Pune District); Chandoli National Park spanning over the districts of Sangli, Satara and Kolhapur; Dajipur Wildlife Sanctuary, Radhanagari Wildlife Sanctuary (Kolhapur District); Koyna Wildlife Sanctuary, Mahabaleshwar, Pasarni Ghat (Satara District). The care was taken to survey all the major forest areas of each district to ensure fair representation of the region. The sample collection was carried out for three years, from 2012 to 2015. Fig. 1 shows the map of collection sites. Using GPS data collected during field surveys, the map is made with QGIS 2.8 Wien (2014). On the map, the Western Ghats are shaded in green. Fig. 2 provides overview of the study area.

Fig. 1 – Map showing the Collection sites (24) in different districts (labeled) of Desh region in
Maharashtra and location of Maharashtra state in India (in inset).

Fig. 2 – Overview of the study area. A Harishchandragarh. B Lonavala. C Bhimashankar. D Malshej Ghat. E Junnar. F Mahabaleshwar. G Chandoli National Park. H Koyna WLS. I–J Radhanagri WLS. (WLS = Wildlife Sanctuary).
The samples of leaves were placed in paper and Aluminum foil bags, taken to the laboratory, and processed according to Castañeda-Ruiz (2005). Mounts were prepared in PVL (polyvinyl alcohol, lactic acid, and phenol), and measurements were made at different magnifications. Photomicrographs were obtained from Nikon eclipse 50i Microscope connected with Nikon DS-Fi 1 camera. Scanning Electron microscopic images were captured by using Zeiss Scanning Electron Microscope Model, EVO 18–12–97. Identification and description of fungi were made using books, monographs and reviews published in standard journals and books. Ainsworth et al. (1973) and von Arx (1981) provided keys to several fungal groups. Pycnidia or acervuli forming fungi were identified from Nag Raj (1993), Sutton (1980). For Hypomycetes, Ellis (1971, 1976), Subramanian (1971), Ellis & Ellis (1985) and Seifert et al. (2011) were referred. Literature from Cummins & Hirsukta (1983) for rust and smut species, Hosagoudar (1996, 2008, 2012, 2013) and Hosagoudar & Robin (2011) for black mildew fungi, and Sivanesan (1983) for Bitunicate ascomycetes were used during the identification. In Table 1, all the fungal taxa are enumerated along with associated host and location data.

Statistical Method

A posteriori statistical analysis has been carried out to examine how rich is the diversity of foliar fungi in Desh region. We approach the analysis of the fungal diversity in three ways. First, we examine differences in mean and median species count across the districts. Second, we analyse similarity in species composition between all possible pair of districts and calculate percentage of species common to all districts. Third, we combine information on number of species and the number of isolates to calculate a measure of fungal diversity for the whole region. The first two are consistent with the approach adopted in Dubey & Pandey (2019) and the last one is consistent with the approach followed in Naseem & Kayang (2021). Choice of modelling strategy has been kept as simple as possible so that results are easy to interpret and have appeal to a much wider range of audience. This comes especially handy in designing conservation strategies.

The details of the aforementioned three approaches are as follows:

First, for analysing the difference in diversity of foliicolous fungi across the five districts, additive dummy variable, Classical Normal Linear Regression Model (CNLRM), estimated by Ordinary Least Squares (OLS), of following functional form was developed:

\[ \text{SpsCount} = \beta_0 + \beta_1 DA + \beta_2 DP + \beta_3 DSat + \beta_4 DK \quad \ldots \ldots \ldots \quad (1) \]

Where DA is Ahmednagar district dummy, DP is Pune district dummy, DSat is Satara district dummy and DK is Kolhapur district dummy. Mean SpsCount for Sangli district is represented by the intercept term \( \beta_0 \), chosen as the benchmark category for the comparison purpose due to its lowest mean. Care has been taken that even though a species may be found at several locations; a species is counted just once at any given location. Here species count is used as regressand, being the simplest measure of biodiversity. District dummies are used as regressors since biodiversity in any given district is outcome of entire array of biotic and abiotic factors, allowing district dummies to be used as proxy for the same.

In OLS model, F-test is used to test the null hypothesis that all the slope coefficients estimated concurrently equal zero, i.e., no difference in the mean species count across the districts. Thus, within the regression framework, rejecting the null hypothesis would imply a statistically significant difference in the mean species count, thus foliar fungal biodiversity, across the districts. Regression diagnostics were conducted to make sure that OLS assumptions are complied with to avoid erroneous conclusions (Greene 2011, Gujarati 2014). OLS model was tested for residual normality and homoskedasticity. The null hypothesis of no heteroskedasticity of residuals was tested using the Breusch-Pagan test and White’s test. The null hypothesis of normality of residuals
was tested using Chi-square test. When not distributed normally, residuals make f, z, t- and Chi-square- tests suspect as all of them are founded upon the assumption of residual normality. Absence of homoskedasticity can cause overestimated statistical significance of estimated coefficients, and as t-test is theoretically related to F-test, heteroskedasticity can theoretically affect F-test too. Details of models and associated regression diagnostics have been discussed in Greene (2011) and Gujarati (2014). In nature, often fungal species distribution does not follow normal distribution – some areas contribute disproportionately high number of species, whereas there are areas that have fewer species. In such situation, it is necessary to have measures unaffected by outliers, such as median; and non-parametric tests, which make no assumptions about underlying distribution. Kruskal Wallis Test (Spiegel et al. 2012) is one such non-parametric test, which tests the null hypothesis of no difference in median species count across the districts.

Second, to analyse similarity in species composition between any two districts (X&Y), Jaccard Similarity Index (JSI) was calculated. JSI (Gotelli & Ellison 2004) is given by formula:

\[ \text{JSI (between X &Y)} = \frac{n(X \cap Y)}{n(X \cup Y)} = \frac{n(X \cap Y)}{n(X) + n(Y) - n(X \cap Y)} \quad \ldots \ldots (2) \]

Third, we calculate diversity indices for the Desh Region. The two indices calculated were Simpson’s index and Shannon’s index (Peet 1974). These diversity indices are used to measure diversity of fungi by combining data on number of isolates and number of distinct species. Further simplified forms of the two were computed for more intuitive and easier interpretations.

Simpson’s index measures the probability of two randomly selected isolates belonging to the same species. It takes values from 0 to 1. It is given by the formula:

\[ D = \frac{\sum_{i=1}^{S} n_i(n_i-1)}{N(N-1)} \quad \ldots \ldots (3) \]

Where, \( n_i \) = number of isolates of \( i^{th} \) species, \( N = \) total number of isolates of all species, \( S = \) number of distinct species.

Thus, the lower the index value, the lower the probability of two isolates belonging to the same species, thus higher the diversity and vice-versa. However, such interpretation tends to be counter-intuitive. Hence, its complement (1-D), known as Gini-Simpson’s index (Jost 2006), which follows naturally from the axioms of probability, has been used which is easy and intuitive in terms of interpretability as higher values correspond to higher diversity.

The Shannon’s index quantifies the uncertainty (or entropy) associated with correctly predicting species to which next isolate belongs to. Therefore, higher the value, the more the uncertainty, thereby higher the diversity. It is calculated as follows:

\[ H = \sum_{i=1}^{S} p_i \ln(1/p_i) \quad \ldots \ldots (4) \]

Where \( p_i = n_i/N \), \( n_i = \) number of isolates of \( i^{th} \) species, \( N = \) total number of isolates of all species, \( S = \) number of distinct species, and \( \ln = \) natural logarithm.

Unlike Simpson’s Index, Shannon’s index is not bound by zero and one. This makes latter harder to interpret than former. However, this minor shortcoming can be overcome by normalizing. General formula for normalizing a given X is,
\[ X_{\text{normalized}} = \frac{X - X_{\text{min}}}{X_{\text{max}} - X_{\text{min}}} \ldots (5) \]

The Shannon’s index takes minimum value when all isolates belong to one single species, making \( p_i = 1 \), resulting in \( \ln \left( \frac{1}{p_i} \right) = 0 \), therefore \( H_{\text{min}} = 0 \); whereas the maximum is achieved when probability of observing all species is equal, i.e. \( p_i = 1/S \), which results in \( \sum_{i=1}^{S} p_i = 1 \) and \( \ln \left( \frac{1}{p_i} \right) = \ln(S) \), therefore \( H_{\text{max}} = \ln(S) \). Thus, we get normalized Shannon’s index \( (H_{\text{normalized}}) \) as follows:

\[ H_{\text{normalized}} = \frac{H}{\ln(S)} \ldots (6) \]

The above normalization has twofold advantages as well as interpretations. First is mathematical and more mechanical, in the sense that, being bound between 0 and 1, Normalized Shannon’s index becomes much easier to interpret. This is the approach suggested by Ramezani (2012). Second, normalized Shannon’s index also has ecological, and somewhat different interpretation, as suggested by Pielou (1995), where it is interpreted as measure of species evenness, better known as Pelou’s Evenness Index \( (J') \), with higher values corresponding to more equitable distribution, and \( J' = 1 \) representing perfectly equitable distribution where all species are equally abundant.

Gretl (Cottrell & Lucchetti 2021) was used for regression, Python’s SciPy library was used for Kruskal-Wallis Test, and MS-Excel were used for other analyses.

**Results**

In the present study, all the major forest areas in Western Ghats of each district of Desh region were surveyed for the collection of foliicolous samples. This resulted in isolation of 144 species of foliar fungi from 192 fungal isolates obtained from 170 foliicolous samples, as enumerated in Table 1, which included five new species. The supplementary table provides district and location-wise enumeration of foliar fungi. Top five genera in terms of having maximum number of species, as shown in Fig. 3, are: *Meliola* (12), *Asterina* (6), *Zygosporium* (6), *Cladosporium* (4) and *Colletotrichum* (4). Some fungi and their host plants are shown in Fig. 5.

![Fig. 3 – Top five genera having highest number of species.](image-url)
Top five taxa, in terms of having been isolated from maximum number of collections, as shown in Fig. 4, are *Corynespora cassicola* (11), *Ardhachandra cristaspora* (10), *Domigoella asternarum* (6), *Trichotheceum roseum* (5), *Pseudocercospora griseola* (4).

![Fig. 4](image-url)

**Fig. 4** – Top five species, in terms of having been isolated from maximum number of collections.

The survey also resulted in the discovery of 5 new species viz., *Tharoopama livistonae* on the leaf sheaths of *Phoenix sylvestris* (Dubey & Moonambeth 2013), *Vermiculariopsiella papaya* on the leaves of *Carica papaya* (Dubey & Moonambeth 2014), *Zygosporium cocos* on the leaf sheaths of *Cocos nucifera* (Dubey 2014), *Stigmina koyanensis* on the leaves of *Ficus* (Dubey & Sengupta 2016) and *Periconia chandoliensis* on the leaves of *Saccharum officinarum* (Dubey 2017).

OLS models (Table 2) showed statistically significant (p-value < 0.05 for F-test) difference in mean SpsCount across the districts. Pune district dummy showed a highly statistically significant coefficient (p-value < 0.01). However, when regression diagnostics were carried out, Model 1 showed heteroskedasticity (p-value < 0.01 for Breusch-Pagan Test, p-value < 0.10 for White’s Test) for both the tests. Also, in Model 1 residuals were not normally distributed (p-value < 0.05 for Chi-square test). Model 2 was developed to overcome these limitations, having natural log of SpeciesCount as regressand. This yielded identical results, with normally distributed residuals (p-value > 0.10) and no evidence of heteroskedasticity (p-value > 0.10) for both tests, lower AIC, with only major difference being in statistically significant coefficient for Satara district dummy (p-value < 0.10). However, the overall conclusion remained the same for both the models viz., F-test and t-test (for Pune district dummy) were statistically significant. Hence, Model 1 has been retained due to its simplest functional form and ease of interpretability. Kruskal-Wallis test (Table 3) yielded statistically significant (p-value < 0.05) difference in median SpsCount across the districts.

For studying similarity in species composition between any two districts, Jaccard Similarity Index (JSI) was calculated (Table 4). Maximum JSI was 3.39%, between Satara and Kolhapur districts. None of the species was common in all the districts. Only 1 species (0.69% of total) viz., *Domigoella asternarum* was common in maximum of 3 districts viz., Pune, Satara & Kolhapur. Desh region showed very high values for diversity indices (Table 5) viz., Gini-Simpson’s index (*I\(D\) = 0.9918), Shannon’s index (*H* = 4.7425), as well as Normalised Shannon’s index or Pielou’s Evenness Index (*H_{normalised} = J’ = 0.9543).*
Fig. 5 – Foliicolous fungi with Host Plants found in Desh Region, Maharashtra. A–B Ardhachandra cristaspore on Ipomea pes-caprae. C–D Beltrania mangiferae on Mangifera indica. E–F Botryosporium longibrachiatum on Dracaena fragrans. G–H Botryosporium madrasense on Dracaena sp. I–J Catenuaria cubensis on Cocos nucifera. K–L Cercospora api on Impatiens balsamina. M–N Cladosporium cladosporioides on Fragaria × ananassa. O–P Dendryphion comosum on Agave americana. Q–R Dictyosporium elegans on Roystone aregia. S–T Gonatophragmium mayteni on Maytenus sp. U–V Helicomyces hyderabadensis on Roystone aregia. W–X Isthmospora spinosa on Lagerstroemia sp. Y–Z Puccinia oxalidis on Oxalis sp. Scale bars: E, G, O = 100 µm, M = 60 µm, A, C, I, K, Q, U, W, Y = 50 µm, S = 20 µm.
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|---------|-------------------|-------------------------------------------------------------|-----------|---------------------------|-----------------|-------------------|----------|-----------|-------------|
| 1       | Acremonia uniseptata Huseyn, Selçuk & Akgul 2015 | Anamorphic Pezizomycotina | *Memecylon umbellatum* Burn.f | 201652 | Radhanagari WLS, Location 1, Kolhapur Dist. | 10.02.2015 | 16.392473 | 73.947669 | 712 |
| 2       | Aithaloderma viride L.R. Fraser 1935 | Trichomeriaceae | *Olea dioica* Roxb. | 201716 | Chandoli NP, location 1, Satara Dist. | 11.02.2015 | 17.320175 | 73.720187 | 867 |
|         |                   | | *Olea dioica* Roxb. | 201729 | Chandoli NP, location 1, Kolhapur Dist. | 11.02.2015 | 17.049546 | 73.850917 | 826 |
|         |                   | | *Olea dioica* Roxb. | 201738 | Chandoli NP, location 2, Kolhapur Dist. | 11.02.2015 | 17.069828 | 73.819449 | 928 |
| 3       | Alternaria brassicicola (Schwein.) Wiltshire 1947 | Pleosporaceae | *Brassica oleracea var. botrytis* L. (Cauliflower) | 200294 | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325 |
| 4       | Alternaria dianthicola Neerg. 1945 | Pleosporaceae | *Glochidion* sp. | 199661 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966 |
| 5       | Alternaria tenuissima (Nees) Wiltshire 1933 | Pleosporaceae | *Cycas* sp. | 196313 | Junnar, Pune Dist. | 22.09.2013 | 19.192865 | 73.859068 | 808 |
| 6       | Amazonia syzygii Hosag. 1989 | Meliolaceae | *Syzygium cumini* (L.) Skeels | 201751 | Koyna WLS, Location 1, Satara Dist. | 13.02.2015 | 17.652007 | 73.744603 | 770 |
| 7       | Ampelomyces quisqualis Ces. 1852 | Phaeosphaeriaceae | *Pavetta indica* L. | 200300 | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325 |
| 8       | Ampullifera foliicola Deighton 1960 | Anamorphic Pezizomycotina | *Maytenus rothiana* (Walp.) Ramamoorthy | 199650 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966 |
|         |                   | | *Maytenus rothiana* (Walp.) Ramamoorthy | 199657 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966 |
| 9       | Ardhachandra cristaspora (Matsush.) Subram. & Sudha 1978 | Herpotrichiellaceae | *Syzygium cumini* (L.) Skeels | 196269 | Harishchandragad, location 1, Ahmednagar Dist. | 21.09.2013 | 19.425062 | 73.782742 | 883 |
|         |                   | | *Lagerstroemia macrocarpa* Kurz. | 196270 | Harishchandragad, location 2, Ahmednagar Dist. | 21.09.2013 | 19.409974 | 73.756826 | 858 |
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|--------|--------------------|---------------------------------------------------------------|------------|--------------------------|------------------|-------------------|----------|-----------|-------------|
| 8      | Glochidion sp.     | 196272 Harishchandragad, location 2, Ahmednagar Dist.         |            | 21.09.2013               | 19.409974        | 73.756826         | 858      |           |             |
| 9      | Glochidion sp.     | 196275 Harishchandragad, location 2, Ahmednagar Dist.         |            | 21.09.2013               | 19.409974        | 73.756826         | 858      |           |             |
| 10     | Leea indica L.     | 196276 Harishchandragad, location 2, Ahmednagar              |            | 21.09.2013               | 19.409974        | 73.756826         | 858      |           |             |
| 11     | Syzygium sp.       | 196277 Harishchandragad, location 3, Ahmednagar Dist.         |            | 21.09.2013               | 19.450936        | 73.738009         | 873      |           |             |
| 12     | Leea indica L.     | 196281 Harishchandragad, location 3, Ahmednagar Dist.         |            | 21.09.2013               | 19.450936        | 73.738009         | 873      |           |             |
| 13     | Ipomoea pes-caprae (L.) R. Br. | 196306 Malshej Ghat, Pune Dist. |            | 22.09.2013               | 19.316708        | 73.821817         | 743      |           |             |
| 14     | Syzygium cumini (L.) Skeels | 199568 Lonavala, Pune Dist. |            | 26.09.2011               | 18.719936        | 73.392333         | 701      |           |             |
| 15     | Leea indica L.     | 199654 Bhimashankar WLS, Pune Dist.                           |            | 19.069382                | 73.629239        | 966                |          |           |             |
| 10     | Asperisporium pongamiae (H.Syd.) Deighton 1976 | Mycosphaerellaceae | Pongamia pinnata (L.) Pierre | 200346 Pasarni Ghat, Satara Dist. | 16.10.2014          | 73.856621         | 869      |           |             |
| 11     | Asteridiella malloticola (Yaman) Hansf. 1957 | Meliolaceae | Mallotus Philippensis (Lam.) Muell Arg. | 201772 Koyna WLS, Location 2, Satara Dist. | 13.02.2015          | 73.708464         | 691      |           |             |
| 12     | Asterina henianii R.C. Verma, M.S. Tripathi & R.K. Chaudhary 1999 | Asterinaceae | Syzygium sp. | 201620 Dajipur WLS, Location 1, Kolhapur Dist. | 09.02.2015          | 73.885414         | 766      |           |             |
| 13     | Asterina hydrocotyles Hosag. & C.K. Biju 2005 | Asterinaceae | Lawsonia inermis L. | 196234 Junnar, Pune Dist. | 21.09.2013          | 73.859068         | 808      |           |             |
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude   | Longitude  | Altitude (m) |
|---------|-------------------|---------------------------------------------------------------|------------|--------------------------|-----------------|-------------------|------------|------------|--------------|
| 14      | Asterina morellae Hosag., Biju & Abraham 2001 | Asterinaceae | Garcinia sp. | 201773 | Koyna WLS, Location 2, Satara Dist. | 13.02.2015 | 17.670708 | 73.708464 | 691          |
| 15      | Asterina wrightiae Syd. 1931 | Asterinaceae | Lagerstroemia sp. | 199560 | Khandala, Pune Dist. | 26.09.2011 | 18.787171 | 73.392989 | 568          |
| 16      | Asterostomella state of Asterina jasmini Hansf. 1948 | Asterinaceae | Jasminum sp. | 201688 | Chandoli NP, location 1, Sangli Dist. | 11.02.2015 | 17.153253 | 73.893663 | 947          |
| 17      | Asterostomella state of Asterina jasminicola W. Yamam. 1918 | Asterinaceae | Jasminum sp. | 201708 | Chandoli NP, location 3, Sangli Dist | 11.02.2015 | 17.157016 | 73.878882 | 909          |
| 18      | Asterostomula pavettae V.B. Hosagoudar & A. Sabeena 2012 | Anamorphic Pezizomycotina | Pavetta sp. | 201776 | Koyna WLS, Location 2, Satara Dist. | 13.02.2015 | 17.670708 | 73.708464 | 691          |
| 19      | Balladyna pavattae Boedijin 1961 | Parodiopsidaceae | Pavetta crassicaulis | 200326 | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325         |
| 20      | Balladyna ugandensis Syd. & P. Syd. 1939 | Parodiopsidaceae | Pavetta sp. | 199628 | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966          |
| 21      | Balladyna velatina (Berk. & M.A. Curtis) Höhn 1910 | Parodiopsidaceae | Pavetta indica L. | 196268 | Harishchandragad, location 1, Ahmednagar Dist. | 21.09.2013 | 19.425062 | 73.782742 | 883          |
|         |                   |                                                               | Pavetta indica L. | 201769 | Koyna WLS, Location 2, Satara Dist. | 13.02.2015 | 17.670708 | 73.708464 | 691          |
| 22      | Beltrania mangiferae Munjal & J.N. Kapoor 1963 | Anamorphic Pezizomycotina | Mangifera indica L. | 196504 | Koyna WLS, Location 1, Satara Dist. | 17.11.2013 | 17.652007 | 73.744603 | 770          |
| 23      | Beltrania guerna Harkn. 1884 | Anamorphic Pezizomycotina | Eucalyptus sp. | 194127 | Pune City, Pune Dist. | 30.10.2014 | 18.536166 | 73.88506 | 554          |
| 24      | Beltrania rhombica Penz. 1882 | Anamorphic Pezizomycotina | Mangifera indica L. | 196504 | Koyna WLS, Location 1, Satara Dist. | 17.11.2013 | 17.652007 | 73.744603 | 770          |
| 25      | Beltraniella spiralis Piroz. & S.D. Patil 1966 | Hyponectriaceae | Mangifera indica L. | 201781 | Radhanagari WLS, Location 2, Kolhapur Dist. | 10.02.2015 | 16.374583 | 73.923508 | 806          |
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|---------|------------------|-------------------------------------------------|----------|-------------------------|-----------------|------------------|---------|-----------|-------------|
| 26      | Botryosporium longibrachiatum (Oudem.) Maire 1903 | Anamorphic Pezizomycotina | unidentified leaf | Pune City, Pune Dist. | 29.07.2015 | 18.536166 | 73.88506 | 554       |
| 27      | Botryosporium madrasense Raghukumar 1970 | Anamorphic Pezizomycotina | Dracena fragrans (L.) Ker Gawl. | Pune City, Pune Dist. | 29.07.2013 | 18.536166 | 73.88506 | 554       |
| 28      | Calonectria morganii Crous, Alfenas & M.J. Wingf. 1993 | Nectriaceae | Azadirachta indica A. Juss. | Pune City, Pune Dist. | 21.08.2013 | 18.536166 | 73.88506 | 554       |
| 29      | Capnodium coaratum Chomnunti & K.D. Hyde 2011 | Capnodiaceae | Syzygium sp. | Harishchandragad, location 1, Ahmednagar Dist. | 21.09.2013 | 19.425062 | 73.782742 | 883       |
| 30      | Capnodium sp. 3 | Capnodiaceae | Unidentified plant sp. | Chandoli NP, location 1, Satara Dist. | 11.02.2015 | 17.320175 | 73.720187 | 867       |
| 31      | Catenularia cubensis Hol.-Jech. 1982 | Chaetosphaeriaceae | Cocos nucifera L. | Pune City, Pune Dist. | 17.08.2013 | 18.536166 | 73.88506 | 554       |
| 32      | Cercospora apii Fresen 1863 | Mycosphaerellaceae | Impatiens balsamina L. | Khandala, Pune Dist. | 26.09.2011 | 18.787171 | 73.392989 | 568       |
|         |                  | Mycosphaerellaceae | Paracaryopsis sp. | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966       |
|         |                  | Mycosphaerellaceae | Pogostemon sp. | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966       |
| 33      | Chaetospermum camelliae Agnithoth. 1962 | Mycosphaerellaceae | Phoenix sylvestris (L.) Roxb. | Pune City, Pune Dist. | 08.05.2013 | 18.536166 | 73.88506 | 554       |
| 34      | Chalara sp. | Anamorphic Pezizomycotina | Dracena fragrans (L.) Ker Gawl. | Pune City, Pune Dist. | 06.03.2013 | 18.536166 | 73.88506 | 554       |
| 35      | Ciliochorella mangiferae Syd. 1935 | Anamorphic Pezizomycotina | Mangifera indica L. | Pune City, Pune Dist. | 09.12.2012 | 18.536166 | 73.88506 | 554       |
| 36      | Cladosporium aecidiicola Thüm 1876 | Cladosporiaceae | Pavetta indica L. | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325      |
|         |                  | Cladosporiaceae | Smilax zeylanica L. | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325      |
| 37      | Cladosporium cladosporoides (Fresen.) G.A. de Vries 1952 | Cladosporiaceae | Fragaria × ananassa Duchesne ex Rozier | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325      |
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. | BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|---------|---------------------|---------------------------------------------------------------|------------|----------------|----------|----------------|--------------------|-----------|-----------|-------------|
| 38      | *Cladosporium colocasiae* Sawada 1916 | Cladosporiaceae | *Caryota urens* L. | 194292 | Pune City, Pune Dist. | 18.10.2013 | 18.536166 | 73.88506 | 554 |
| 39      | *Cladosporium oxysporum* Berk. & Curt. 1868 | Cladosporiaceae | *Erythrina corallodendron* L. | 200276 | Radhanagari WLS, Location 1, Kolhapur Dist. | 23.01.2012 | 16.392473 | 73.947669 | 712 |
|         |                     |                   | *Colocasia esculenta* Schott. | 201192 | Malshej Ghat, Pune Dist. | 20.10.2012 | 19.316708 | 73.821817 | 743 |
| 40      | *Colletotrichum capsici* (Syd. & P. Syd.) E.J. Butler & Bisby 1931 | Glomerellaceae | *Agave americana* L. | 199685 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966 |
| 41      | *Colletotrichum dematium* (Pers.) Grove 1918 | Glomerellaceae | *Thespesia populnea* (L.) Sol. ex Corrêa | 199539 | Khandala, Pune Dist. | 26.09.2011 | 18.787171 | 73.392989 | 568 |
| 42      | *Colletotrichum gloeosporioides* (Penz.) Penz. and Sace 1884 | Glomerellaceae | *Smilax* sp. | 199541 | Khandala, Pune Dist. | 26.09.2011 | 18.787171 | 73.392989 | 568 |
|         |                     |                   | *Glochidion* sp. | 199621 | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966 |
| 43      | *Colletotrichum lindemuthianum* (Sacc. & Magnus) Briosi & Cavara 1889 | Glomerellaceae | Unidentified | 199521 | Khandala, Pune Dist. | 25.09.2011 | 18.787171 | 73.392989 | 568 |
|         |                     |                   | *Pavetta indica* L. | 199665 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966 |
| 44      | *Coniella granati* (Sacc.) Petr. & Syd. 1927 | Schizoparmaceae | *Ampelocissus* sp. | 201174 | Malshej Ghat, Pune Dist. | 20.10.2012 | 19.316708 | 73.821817 | 743 |
| 45      | *Coniothyrium eucalypticola* B. Sutton. 1971 | Coniothyriaceae | *Capparis grandis* L.f. | 196222 | Junnar, Pune Dist. | 20.09.2013 | 19.192865 | 73.859068 | 808 |
| 46      | *Corynespora cassicola* (Berk & Curt.) Wei 1950 | Corynesporascaceae | *Meyna laxiflora* Robyns | 196254 | Junnar, Pune Dist. | 21.09.2013 | 19.192865 | 73.859068 | 808 |
|         |                     |                   | *Leucas* sp. | 196259 | Harisshchandragad, location 1, Ahmednagar | 21.09.2013 | 19.425062 | 73.782742 | 883 |
|         |                     |                   | *Jasminum malabaricum* Wight | 199516 | Khandala, Pune Dist. | 25.09.2011 | 18.787171 | 73.392989 | 568 |
|         |                     |                   | *Canthium* sp. | 199544 | Khandala, Pune Dist. | 26.09.2011 | 18.787171 | 73.392989 | 568 |
### Table 1 Continued.

| Sr. No. | Name of the fungus       | Position in classification as per Index Fungorum database 2021 | Host plant                        | Collection No. - BSI (WC) | Collection sites                          | Date of collection | Latitude         | Longitude        | Altitude (m) |
|---------|--------------------------|---------------------------------------------------------------|-----------------------------------|----------------------------|--------------------------------------------|--------------------|-----------------|----------------|--------------|
| 47      | Craspedodidymum sp.      | Chaetosphaeriaceae                                             | Bridelia sp.                      | 201750                     | Koyna WLS, Location 1, Satara Dist.        | 13.02.2015         | 17.652007       | 73.744603       | 770          |
| 48      | Cryptomyces sp.          | Cryptomycetaceae                                               | Casearia sp.                      | 201762                     | Koyna WLS, Location 2, Satara Dist.        | 13.02.2015         | 17.670708       | 73.708464       | 691          |
| 49      | Cryptophiale sp.         | Anamorphic Pezizomycotina                                      | Litsea sp.                        | 201655                     | Radhanagari WLS, Location 2, Kolhapur Dist. | 10.02.2015         | 16.374583       | 73.923508       | 806          |
| 50      | Cucurbidothis pityophila (Schmidt and Kunze) Petr. 1921 | Cucurbitariaceae                                               | Dracena fragrans (L.) Ker Gawl.   | 131939                     | Pune City, Pune Dist.                      | 10.07.2012         | 18.536166       | 73.88506        | 554          |
| 51      | Dendryphion comosum Wallr. 1833 | Pleosporaceae                                                  | Agave americana L.                | 199685                     | Bhimashankar WLS, Pune Dist.               | 29.09.2011         | 19.069382       | 73.629239       | 966          |
| 52      | Dictyosporium elegans Corda 1836 | Anamorphic Pezizomycotina                                      | Roystonea regia (Kunth) O.F.Cook   | 194289                     | Pune City, Pune Dist.                      | 30.10.2013         | 18.536166       | 73.88506        | 554          |
| 53      | Didymella fabae Jellis & Punith. 1991 | Didymellaceae                                           | Commelina sp.                      | 196217                     | Junnar, Pune Dist.                         | 20.09.2013         | 19.192865       | 73.859068       | 808          |
| 54      | Diplococcium spicatum Grove 1885 | Helminthosphaeriaceae                                         | Dalbergia sissoo DC.              | 201697                     | Chandoli NP, location 2, Sangli Dist       | 11.02.2015         | 17.153694       | 73.867088       | 708          |
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|---------|-------------------|-------------------------------------------------------------|------------|--------------------------|-----------------|-------------------|----------|-----------|-------------|
| 55      | Domigoella asternarum Petr. & Shiff 1932 | Anamorphic Pezizomycotina | Syzygium cumini (L.) Skeels | 196505 | Koyna WLS, Location 1, Satara Dist. | 17.11.2013 | 17.652007 | 73.744603 | 770 |
|         |                   | Dimocarpus longan | Koyna WLS, Location 1, Satara Dist. | 17.11.2013 | 73.744603 | 770 |
|         |                   | Piper sp. | Koyna WLS, Location 1, Satara Dist. | 17.11.2013 | 73.744603 | 770 |
|         |                   | Memecylon talbotianum | Koyna WLS, Location 1, Satara Dist. | 23.01.2012 | 73.947669 | 712 |
|         |                   | Memecylon umbellatum | Koyna WLS, Location 1, Satara Dist. | 09.02.2015 | 73.867134 | 616 |
|         |                   | Dimocarpus longan | Koyna WLS, Location 1, Satara Dist. | 13.02.2015 | 73.708464 | 691 |
| 56      | Drechslera papendorfii (Aa) M.B. Ellis 1971 | Pleosporaceae | Poaceae | 199623 | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966 |
| 57      | Drechslera rostrata M.J. Richardson & E.M. Fraser 1968 | Pleosporaceae | Roystonea regia (Kunth) O.F.Cook | 194252 | Pune City, Pune Dist. | 27.07.2013 | 18.536166 | 73.88506 | 554 |
| 58      | Erysiphe prasadii (M.K. Bhatn. & K.L. Kothari) U. Braun & S. Takam. 2000 | Erysipheae | Pavetta sp. | 200369 | Pasarni Ghat, Satara Dist. | 25.01.2012 | 73.856621 | 869 |
| 59      | Erysiphe tectonae (E.S. Salmon) U. Braun & S. Takam 2000 | Erysipheae | Tectona grandis L.f. | 200370 | Pasarni Ghat, Satara Dist. | 25.01.2012 | 73.856621 | 869 |
|         |                   | Tectona grandis L.f. | Chandoli NP, location 1, Sangli Dist | 12.02.2015 | 73.893663 | 947 |
| 60      | Fusariella indica R.Y. Roy & B. Rai 1968 | Anamorphic Pezizomycotina | Cocos nucifera L. | 194108 | Pune City, Pune Dist. | 17.08.2013 | 18.536166 | 73.88506 | 554 |
| 61      | Gibberella pulicaris (Kunze) Sacc. 1878 | Nectriaceae | Colocasia esculenta Schott. | 201192 | Malshej Ghat, Pune Dist. | 20.10.2012 | 19.316708 | 73.821817 | 743 |
| Sr. No. | Name of the fungus                          | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. – BSI (WC) | Collection sites | Date of collection | Latitude  | Longitude | Altitude (m) |
|--------|-------------------------------------------|-------------------------------------------------------------|------------|----------------------------|------------------|-------------------|-----------|-----------|--------------|
| 62     | Gonatophragmium mayteni                   | Acropermataceae                                             | Maytenus rothiana Lobb. -Callen | 199646         | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382  | 73.629239  | 966          |
| 63     | Gyrothrix circinata                        | Anamorphic Pezizomycotina                                   | Actinodaphne angustifolia Nees. | 196520         | Koyna WLS, Location 1, Satara Dist. | 17.11.2013 | 17.652007  | 73.744603  | 770          |
| 64     | Harpgraphium fasiculatum                   | Anamorphic Pezizomycotina                                   | Dracena fragrans (L.) Ker Gawlw. | 194102         | Pune City, Pune Dist. | 08.11.12   | 18.536166  | 73.88506   | 554          |
| 65     | Harpgraphium sp.                           | Anamorphic Pezizomycotina                                   | Dracena fragrans (L.) Ker Gawlw. | 194044         | Pune City, Pune Dist. | 26.01.2013 | 18.536166  | 73.88506   | 554          |
| 66     | Helicomyces hyderabadensis                 | Tubeufiaceae                                                | Roystonea regia (Kunth) O.F.Cook | 194113         | Pune City, Pune Dist. | 29.07.2013 | 18.536166  | 73.88506   | 554          |
| 67     | Hemibetrania nectandrae                    | Anamorphic Pezizomycotina                                   | Litsea stocksii (Meisner) J.Hk. | 199659         | Lonavala, Pune Dist. | 29.09.2011 | 19.069382  | 73.629239  | 966          |
| 68     | Hermatomyces tucumanensis                  | Anamorphic Pezizomycotina                                   | Roystonea regia (Kunth) O.F.Cook | 194111         | Pune City, Pune Dist. | 17.08.2013 | 18.536166  | 73.88506   | 554          |
| 69     | Heteropatella lacera Fockel                | Helotiaceae                                                 | Unidentified | 196499         | Pune City, Pune Dist. | 30.10.2014 | 18.536166  | 73.88506   | 554          |
| 70     | Humicola fuscoatra Traen                    | Chaetomiaceae                                               | Syzygium cumini (L.) Steels | 201751         | Koyna WLS, Location 1, Satara Dist. | 13.02.2015 | 17.652007  | 73.744603  | 770          |
| 71     | Idriella lunata P.E. Nelson & S. Wilh      | Helotiaceae                                                 | Allophylus cobbe (L.) Raensch. | 196511         | Koyna WLS, Location 1, Satara Dist. | 17.11.2013 | 17.652007  | 73.744603  | 770          |
| 72     | Isthmospora spinosa F. Stevens 1918        | Microthryiaceae                                             | Unidentified | 196512         | Koyna WLS, Location 1, Satara Dist. | 15.11.2013 | 17.652007  | 73.744603  | 770          |
|        |                                           |                                                             | Lagerstromia sp. | 200371         | Pasarni Ghat, Satara Dist. | 25.01.2012 | 17.935744  | 73.856621  | 869          |
| 73     | Khukia oryzae H.J. Huds. 1963              | Trichosphaeriales                                           | Barleria sp. | 199648         | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382  | 73.629239  | 966          |
|        |                                           |                                                             | Pavetta indica L. | 199665         | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382  | 73.629239  | 966          |
| 74     | Kirschsteiniothelia atra                   | Dothideomycetes                                             | Albizia saman (Jacq.) Merr. | 194104         | Pune City, Pune Dist. | 26.03.2012 | 18.536166  | 73.88506   | 554          |
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|---------|-------------------|---------------------------------------------------------------|------------|--------------------------|-----------------|-------------------|----------|-----------|--------------|
| 75      | *Lichenocionium boreale* (P. Karst.) Petr. & Syd 1927 | Lichenoconiaceae | *Terminalia chebula* Retz. | 199609 | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966          |
| 76      | *Melanocarpus* sp. | Melanosporales | *Achyranthes aspera* L. | 199637 | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966          |
| 77      | *Meliola agrostistachydis* Hosag & Rajkumar 2005 | Meliolaceae | *Agrastistachys* sp. | 201745 | Koyna WLS, Location 1, Satara Dist. | 13.02.2015 | 17.652007 | 73.744603 | 770          |
| 78      | *Meliola diospyri* H.S. Yates 1911 | Meliolaceae | *Diospyros* sp. | 201629 | Dajipur WLS, Location 1, Kolhapur Dist. | 09.02.2015 | 16.337726 | 73.885414 | 766          |
| 79      | *Meliola eugeniae-stocksii* Hosag. 1996 | Meliolaceae | *Ficus* sp. | 201782 | Radhanagari WLS, Location 2, Kolhapur Dist. | 10.02.2015 | 16.374583 | 73.923508 | 806          |
| 80      | *Meliola flemingicola* Hosag., P.A. Jose & H. Biju 2005 | Meliolaceae | *Lagerstromia* sp. | 200371 | Pasarni Ghat, Satara Dist. | 25.01.2012 | 17.937544 | 73.856621 | 869          |
| 81      | *Meliola garhwalensis* S.L. Srivast. & Topal 1981 | Meliolaceae | *Jasminum malabaricum* Wight | 200335 | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.67523 | 1325         |
| 82      | *Meliola holigarnae* F. Stevens 1928 | Meliolaceae | *Holigarna* sp. | 201754 | Koyna WLS, Location 1, Satara Dist. | 13.02.2015 | 17.652007 | 73.744603 | 770          |
| 83      | *Meliola ixorae* H.S. Yates 1917 | Meliolaceae | *Ixora* sp. | 201662 | Radhanagari WLS, Location 2, Kolhapur Dist. | 10.02.2015 | 16.374583 | 73.923508 | 806          |
| 84      | *Meliola ixorae-coccineae* Hosag. & C.M. Pillai 1994 | Meliolaceae | *Ixora* sp. | 201626 | Dajipur WLS, Location 1, Kolhapur Dist. | 09.02.2015 | 16.337726 | 73.885414 | 766          |
| 85      | *Meliola memecylti* Syd. & P. Syd. 1917 | Meliolaceae | *Memecylon umbellatum* Burm.f | 201646 | Dajipur WLS, Location 1, Kolhapur Dist. | 09.02.2015 | 16.365326 | 73.867134 | 616          |
| 86      | *Meliola memecylvicola* Hansf. 1957 | Meliolaceae | *Memecylon talbotianum* Brandis | 200277 | Radhanagari WLS, Location 1, Kolhapur Dist. | 23.01.2012 | 16.392473 | 73.947669 | 712          |
| 87      | *Meliola nothopegiae* Hansf. 1957 | Meliolaceae | *Notohepgia* sp. | 201606 | Dajipur WLS, Location 1, Kolhapur Dist. | 09.02.2015 | 16.337726 | 73.885414 | 766          |
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|--------|------------------|-------------------------------------------------------------|------------|--------------------------|-----------------|------------------|----------|-----------|-------------|
| 88     | Meliola sp.      | Meliolaceae                                                  | Casearia sp. | 201744                   | Koyna WLS, Location 1, Satara Dist. | 13.02.2015 | 17.652007 | 73.744603 | 770         |
| 89     | Meliolina mollis (Berk. & Broome) Höhn 1919 | Meliolaceae                                                  | Memecylon umbellatum Burm.f. | 200289 | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325        |
|        |                  |                                                             | Persicaria auriculata (Makino) Masam. | 200314 | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325        |
|        |                  |                                                             | Memecylon umbellatum Burm.f. | 200329 | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325        |
| 90     | Monilochaetes laeensis (Matsush.) Réblová, W. Gams & Seifert 2011 | | Dracena fragrans (L.) Ker Gawl. | 194167 | Pune City, Pune Dist. | 06.03.2013 | 18.536166 | 73.88506 | 554         |
| 91     | Monodictys patradianis (Wallr.) S. Hughes 1958 | Dothideomycetes                                              | Dioscorea sp. | 196231 | Junnar, Pune Dist. | 21.09.2013 | 19.192865 | 73.859068 | 808         |
| 92     | Monostichella indica B. Sutton 1980 | Helotiales                                                   | Holarrhena pubescens (Buch. - Ham.) Wall. ex DC. | 199520 | Khandala, Pune Dist. | 25.09.2011 | 18.787171 | 73.392989 | 568         |
| 93     | Monostichella salicis (Westend.) Arx 1957 | Helotiales                                                   | Trichodesma sp. | 199639 | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966         |
| 94     | Nigrospora sacchari (Speg.) E.W. Mason 1927 | Trichosphaeriales                                            | Dalbergia sissoo DC. | 201697 | Chandeloi NP, location 2, Sangli Dist | 11.02.2015 | 17.153694 | 73.867088 | 708         |
| 95     | Oidiopsis haplophylli (Magnus) Rulamort 1986 | Erysiphaceae                                                 | Euphorbia sp. | 201181 | Malshej Ghat, Pune Dist. | 20.10.2012 | 19.316708 | 73.821817 | 743         |
| 96     | Oidium azadirachtae Narayanasamy & Ramkrishnan 1969 | Erysiphaceae                                                 | Azadirachta indica A. Juss. | 194107 | Pune City, Pune Dist. | 21.08.2013 | 18.536166 | 73.88506 | 554         |
| 97     | Oidium caricae F. Noack 1898 | Erysiphaceae                                                 | Carica papaya L. | 194215 | Pune City, Pune Dist. | 05.05.2012 | 18.536166 | 73.88506 | 554         |
| 98     | Parapericoniella asterinae (Deighton) U. Braun, Heuchert & K. Schub. 2005 | Cladosporiaceae                                              | Memecylon talbotianum Brandis | 200277 | Radhanagari WLS, Kolhapur Dist. | 23.01.2012 | 16.392473 | 73.947669 | 712         |
| 99     | Paraphoma fimeti (Brunaud) Gruyter, Aveskamp & Verkley 2010 | Pleosporales                                                 | Rungia sp. | 199675 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966         |
Table 1 Continued.

| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|---------|--------------------|----------------------------------------------------------------|------------|--------------------------|-----------------|-------------------|----------|-----------|-------------|
| 100     | Passalora leaeae (Chidd.) U. Braun & Crous 2003 | Mycosphaerellaceae | Leea indica L. | 199654 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966         |
| 101     | Periconia chandoliensis Rashini Dubey 2017 | Pleosporales | Saccharum officinarum L. | 201720 | Chandoli NP, location 2, Satara Dist | 11.02.2015 | 17.316467 | 73.686653 | 910         |
| 102     | Pestalotiopsis guelpinii Desm.1949 | Amphisphaeriaceae | Leea indica (Burm. f.) Merr | 201767 | Koyna WLS, Location 2, Satara Dist | 13.02.2015 | 17.670708 | 73.708464 | 691         |
| 103     | Pestalotiopsis inflexa Maharachch. & K.D. Hyde 2012 | Amphisphaeriaceae | Ixora brachiata L. | 196240 | Junnar, Pune Dist. | 21.09.2013 | 19.192865 | 73.859068 | 808         |
| 104     | Pestalotiopsis palustris Nag Raj 1993 | Amphisphaeriaceae | Canthium dichocorum (Gaertn.) Merr. | 199538 | Khandala, Pune Dist. | 26.09.2011 | 18.787171 | 73.392989 | 568         |
| 105     | Phaeotrichoconis sp. | Anamorphic Pezizomycotina | Roystonea regia (Kunth) O.F.Cook | 194208 | Pune City, Pune Dist. | 30.10.2012 | 18.536166 | 73.885068 | 554         |
| 106     | Phoma herbarum Cooke 1852 | Didymellaceae | Bambusa bambos (L.) Voss | 196287 | Malshej Ghat, Pune Dist. | 22.09.2013 | 19.316708 | 73.821817 | 743         |
| 107     | Phyllachora sp. | Phyllachoraceae | Memecylon umbellatum Burn f. | 196311 | Malshej Ghat, Pune Dist. | 22.09.2013 | 19.316708 | 73.821817 | 743         |
| 108     | Physopella hiratsukae (Syd.) Cummins & Ramachar 1959 | Phakopsoraceae | Bambusa bambos (L.) Voss | 201183 | Malshej Ghat, Pune Dist. | 20.10.2012 | 19.316708 | 73.821817 | 743         |
| 109     | Pileolaria sp. | Pileolariaceae | Jasminum sp. | 200306 | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325        |
| 110     | Pithomyces bulbilis Satya. 1975 | Pleosporaceae | Jasminum malabaricum Wight | 196498 | Harishchandragad, location 3, Ahmednagar | 22.09.2013 | 19.450936 | 73.738009 | 873         |
| 111     | Pithomyces chartarum (Berk. & Curt.) M.B. Ellis 1960 | Pleosporaceae | Solanum sp. | 200292 | Mahabaleshwar, Satara Dist. | 24.01.2012 | 17.952602 | 73.675723 | 1325        |
| 112     | Pseudocercospora griseola (Sacc.) Crous & Braun 2006 | Mycosphaerellaceae | Glochidion sp. | 199656 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966         |
|         |                    |                        | Glochidion sp. | 199667 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966         |
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|---------|---------------------|---------------------------------------------------------------|------------|--------------------------|-----------------|-----------------|----------|-----------|--------------|
|        | Glochidion sp.      |                                                               |            | 200312                   | Mahabaleshwar,  | 24.01.2012      | 17.952602| 73.675723| 1325         |
|        | Glochidion ellipticum | Wight                                                         |            | 201764                   | Koyna WLS,      | 13.02.2015      | 17.670708| 73.708464| 691          |
| 113    | *Pseudocercospora viticicola* (J.M. Yen & Lim) J.M. Yen 1980 | Mycosphaerellaceae                                            |            |                          | Mahabaleshwar,  |                |          |            |              |
|        |                     |                                                               |            |                          | Satara Dist.    | 20.01.2012      | 18.787171| 73.821817| 743          |
| 114    | *Pseudoseptoria stomaticola* (Bäumler) B. Sutton 1980 | Saccoteciaceae                                                |            | 201188                   | Malshej Ghat,    | 20.10.2012      | 19.316708| 73.675723| 691          |
| 115    | *Puccinia imposita* Arth. 1919 | Pucciniaceae                                                  |            | 199550                   | Khandala, Pune   | 26.09.2011      | 17.952602| 73.675723| 1325         |
| 116    | *Puccinia longinqua* Cummins 1951 | Pucciniaceae                                                  |            | 200315                   | Mahabaleshwar,   | 24.01.2012      | 17.952602| 73.675723| 1325         |
| 117    | *Puccinia oxalidis* Dietel & Ellis 1895 | Pucciniaceae                                                  |            | 200295                   | Mahabaleshwar,   | 24.01.2012      | 17.952602| 73.675723| 1325         |
| 118    | *Ramularia vitis* Sydow 1988 | Mycosphaerellaceae                                            |            | 201771                   | Koyna WLS,      | 13.02.2015      | 17.670708| 73.708464| 691          |
| 119    | *Sarcinella cryptostegiae* N. Srivastava, S. Chandra & C. Gupta 1990 | Englerulaceae                                                |            | 201193                   | Malshej Ghat,    | 20.10.2012      | 19.316708| 73.675723| 1325         |
| 120    | *Sarcinella* sp.   | Englerulaceae                                                 |            | 201723                   | Chandoli NP,     | 12.02.2015      | 17.316047| 73.686653| 910          |
| 121    | *Scolecostigmina fici-elasticae* (J.N. Kapoor) U. Braun 1999 | Mycosphaerellaceae                                            |            | 200373                   | Pasarni Ghat,    | 25.01.2012      | 17.937544| 73.856621| 869          |
| 122    | *Sordaria fimicola* (Rob.) Ces. & de Not 1863 | Sordariaceae                                                  |            | 194115                   | Pune City, Pune  | 29.07.2013      | 18.536166| 73.88506| 554          |
| 123    | *Spiropes guareicola* (F. Stevens) Cif. 1955 | Anamorphic Pezizomycotina                                     |            | 201656                   | Radhanagari WLS, | 10.02.2015      | 16.374583| 73.923508| 806          |
| 124    | *Stemphylium solani* G.F. Weber 1930 | Pleosporales                                                  |            | 200292                   | Mahabaleshwar,   | 24.01.2012      | 17.952602| 73.675723| 1325         |
| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|---------|-------------------|---------------------------------------------------------------|-------------|--------------------------|-----------------|------------------|-----------|-----------|-------------|
| 125     | *Stemphylium vesicarium* (Wallr.) E.G. Simmons 1969 | Pleosporales | Asteraceae | 196207 | Junnar, Pune Dist. | 20.09.2013 | 19.192865 | 73.859068 | 808         |
| 126     | *Stenella plectroniae* Ponna 1968 | Mycosphaerellaceae | *Meyna laxiflora* Robyns | 196254 | Harishchandragad, location 1, Ahmednagar | 21.09.2013 | 19.425062 | 73.782742 | 883         |
| 127     | *Stigminakoyanensis* Rashmi Dubey & Sengupta 2016 | Mycosphaerellaceae | *Ficus sp.* | 201782 (Acc. No.-134149) | Radhanagari WLS, Location 2, Kolhapur Dist. | 10.02.2015 | 16.374583 | 73.923508 | 806         |
| 128     | *Tetraploa aristata* Berk. & Broome 1850 | Tetraplosphaeriaceae | *Roystonea regia* (Kunth) O.F.Cook | 194114 | Pune City, Pune Dist. | 29.07.2013 | 18.536166 | 73.88506  | 554         |
| 129     | *Tharoopama livistonae* Rashmi Dubey & Moonambeth 2013 | Anamorphic Pezizomycotina | *Phoenix sylvestris* (L.) Roxb. | 194243 (Acc. No.-132410) | Pune City, Pune Dist. | 17.06.2013 | 18.536166 | 73.88506  | 554         |
| 130     | *Torula herbarum* (Pers.) Link 1809 | Capnodiales | *Agave americana* L. | 196202 | Pune City, Pune Dist. | 20.09.2013 | 18.536166 | 73.88506  | 554         |
| 131     | *Tretospora thetei* Hosag., Abraham, Ahmad & Sarbhoy 1999 | Parodiopsidaceae | *Catunaregam spinosa* (Thunb.) Tirveng. | 201694 | Chandoli NP, location 1, Sangli Dist | 11.02.2015 | 17.153253 | 73.893663 | 947         |
| 132     | *Trichotheicum roseum* (Pers.) Link 1809 | Hypocreales | *Ficus benghalensis* L. | 196205 | Junnar, Pune Dist. | 20.09.2013 | 19.192865 | 73.859068 | 808         |
|         |                   |                  | *Dalbergia sp.* | 196208 | Junnar, Pune Dist. | 20.09.2013 | 19.192865 | 73.859068 | 808         |
|         |                   |                  | *Cucumis sp.* | 196213 | Junnar, Pune Dist. | 20.09.2013 | 19.192865 | 73.859068 | 808         |
|         |                   |                  | *Phyllanthus sp.* | 199615 | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966         |
|         |                   |                  | Leguminosae | 199634 | Bhimashankar WLS, Pune Dist. | 28.09.2011 | 19.069382 | 73.629239 | 966         |
| 133     | *Tripospermum myrti* (Lind) S. Hughes 1951 | Capnodiales | *Erythrina coralloidron* L. | 200276 | Radhanagari WLS, Location 1, Kolhapur Dist. | 23.01.2012 | 16.392473 | 73.947669 | 712         |
| 134     | *Tryblidiopycnis pinastri* Höhn 1918 | Rhytismataceae | *Ficus religiosa* L. | 196521 | Pune City, Pune Dist. | 20.11.2013 | 18.536166 | 73.88506  | 554         |
| 135     | *Ulocladium botrytis* Preuss 1851 | Pleosporaceae | *Canthium sp.* | 199544 | Khandala, Pune Dist. | 26.09.2011 | 18.787171 | 73.392989 | 568         |
| 136     | *Uredo sp.* | Pucciniales | *Flacourtia sp.* | 201733 | Chandoli NP, location 2, Kolhapur Dist. | 12.02.2015 | 17.069828 | 73.819449 | 928         |
### Table 1 Continued.

| Sr. No. | Name of the fungus | Position in classification as per Index Fungorum database 2021 | Host plant | Collection No. - BSI (WC) | Collection sites | Date of collection | Latitude | Longitude | Altitude (m) |
|---------|---------------------|---------------------------------------------------------------|------------|--------------------------|------------------|-------------------|----------|-----------|-------------|
| 137     | *Uromyces nassellae* Cummins 1956 | Pucciniaceae | Jasminum sp. | 201708 | Chandoli NP, location 3, Sangli Dist | 11.02.2015 | 17.157016 | 73.878882 | 909 |
| 138     | *Vermiculariopsis papayae* Rashmi Dubey & Moonambeth 2014 | Helminthosphaeriaceae | Carica papaya L. | 133479 | Pune City, Pune Dist. | 10.09.2012 | 18.536166 | 73.88506 | 554 |
| 139     | *Zygosporium cocos* Rashmi Dubey 2014 | Anamorphic Pezizomycotina | Cocos nucifera L. | 131938 | Pune City, Pune Dist. | 01.05.2012 | 18.536166 | 73.88506 | 554 |
| 140     | *Zygosporium gibbum* (Sacc., M. Rousseau & E. Bommer) S. Hughes 1958 | Anamorphic Pezizomycotina | Syzygium sp. | 196244 | Junnar, Pune Dist. | 21.09.2013 | 19.192865 | 73.859068 | 808 |
| 141     | *Zygosporium majus* Piroz. 1972 | Anamorphic Pezizomycotina | Strobilanthes callosa Nees | 199570 | Lonavala, Pune Dist. | 26.09.2011 | 18.719936 | 73.392333 | 701 |
| 142     | *Zygosporium masonii* S. Hughes 1951 | Anamorphic Pezizomycotina | Roystonea regia (Kunth) O.F.Cook | 194117 | Pune City, Pune Dist. | 27.08.2013 | 18.536166 | 73.88506 | 554 |
| 143     | *Zygosporium minus* S. Hughes 1951 | Anamorphic Pezizomycotina | Strobilanthes callosus Nees | 199649 | Bhimashankar WLS, Pune Dist. | 29.09.2011 | 19.069382 | 73.629239 | 966 |
| 144     | *Zygosporium oscheoides* Mont. 1842 | Anamorphic Pezizomycotina | Cycas sp. | 196313 | Junnar, Pune Dist. | 22.09.2013 | 19.192865 | 73.859068 | 808 |

### Table 2 OLS regressions.

| Regressand | Model 1 | Model 2 |
|------------|---------|---------|
|            | SpsCount | ln_SpsCount |
| Const      | 2.3333  | 0.828302* |
|            | (3.33246) | (0.420737) |
| DA         | 0.33333 | -0.0607739 |
|            | (4.7128) | (0.595012) |
| DP         | 12.5*** | 1.67331*** |
|            | (4.08141) | (0.515295) |
| DS         | 5.16667 | 0.92678* |
|            | (4.08141) | (0.515295) |
Table 2 Continued.

| Regressand | Model 1          | Model 2          |
|------------|------------------|------------------|
|            | SpsCount         | ln_SpsCount      |
| DK         | 1.33333 (4.08141) | 0.298627 (0.515295) |
| Number of observations | 24              | 24              |
| R-squared  | 0.468346         | 0.501690         |
| Adjusted R-squared | 0.356419       | 0.396783         |
| F (4, 19)  | 4.184390         | 4.782220         |
| p-value (F-test) | 0.013484**   | 0.007711***      |
| Sum squared resid | 633.0000      | 10.09011         |
| S.E. of regression | 5.771983       | 0.728738         |
| Log-likelihood | −73.32352       | −23.65655        |
| Akaike Information Criterion (AIC) | 156.6470      | 57.31309         |
| Chi-square test for normality of residual (with null hypothesis of normality) p-value | 0.012666** | 0.303549         |
| White’s test for heteroskedasticity (with Null hypothesis of no heteroskedasticity) p-value | 0.0854502* | 0.439527         |
| Breusch-Pagan’s test for heteroskedasticity (with Null hypothesis of no heteroskedasticity) p-value | 0.00140562*** | 0.742585         |

Standard errors in parentheses.
*p<0.1, ** p< 0.05, ***p<0.01

Table 3 Kruskal-Wallis Test

| Calculated Test Statistic | p-value |
|---------------------------|---------|
| 10.9146                   | 0.0275**|

Table 4 Jaccard Similarity Index (JSI).

|           | Pune Dist. | Sangli Dist. | Kolhapur Dist. | Satara Dist. | Ahmednagar Dist. |
|-----------|------------|--------------|----------------|--------------|------------------|
| Pune Dist.| 1          |              |                |              |                  |
| Sangli Dist.| 0         | 1            |                |              |                  |
Table 4 Continued.

|                | Pune Dist. | Sangli Dist. | Kolhapur Dist. | Satara Dist. | Ahmednagar Dist. |
|----------------|------------|--------------|----------------|--------------|------------------|
| Kolhapur Dist. | 0.0208     | 0            | 1              |              |                  |
| Satara Dist.   | 0.0168     | 0.0208       | 0.0339         | 1            |                  |
| Ahmednagar Dist.| 0.0241     | 0            | 0              | 0.0213       | 1                |

Table 5 Diversity Indices for Desh Region

| Diversity Index                        | Calculated Value |
|----------------------------------------|------------------|
| Simpson’s Index (D)                    | 0.0082           |
| Gini-Simpson’s Index (1-D)             | 0.9918           |
| Shannon’s Index (H)                    | 4.7425           |
| Normalised Shannon’s Index (H_{normalized}) or Fielou’s Evenness Index (J’) | 0.9543 |

Discussion

Present study resulted in isolation of 144 species of foliar fungi from 192 fungal isolates obtained from 170 foliicolous samples, including five new species. *Meliola*, represented by 12 species, was genus with highest number of species, whereas *Corynespora cassicola* with 11 isolates, represented commonest species isolated from maximum number of collections. In order to analyze the difference in biodiversity across the districts OLS model was developed with Species Count (SpsCount) as the regressand and district dummies as regressors, with Sangli being benchmark category, represented by intercept term. Regression diagnostics of Model 1 necessitated the need for alternative functional form. For this, original OLS model was modified with natural logarithm of regressand of Model 1 as new regressand, following suggestions mentioned in Greene (2011) and Gujarati (2014). This resulted in Model 2, with regressors remaining same as in Model 1. Model 1 and 2 both yielded overall similar results. This implies that within the parametric framework, non-normality of residuals and heteroskedasticity in Model 1, were not strong enough to alter the overall results. As discussed in Greene (2011) and Gujarati (2014), heteroskedasticity is often result of locational heterogeneity, which is to be expected given biodiversity of Western Ghats. Though Model 2 shows p-value < 0.01 for F-test, additional statistically significant Satara district dummy (p-value < 0.10) and smaller AIC, Model 1 has been retained as it is simplest in terms of functional form and ease of interpretability. As previously discussed, non-parametric approach becomes indispensable due to non-normality of species distribution data. Non-parametric Kruskal-Wallis test yielded statistically significant (p-value < 0.05) difference in median SpsCount, thus biodiversity, across the districts. Thus, it can be concluded that there is a statistically significant difference in mean (based on OLS) and median SpeciesCount (based on Kruskal-Wallis test) across the districts of Desh region. Maximum JSI (3.39%) was observed between Satara and Kolhapur districts, with only one species is common in all the districts (0.69% of the total).
Thus, even though individual estimated coefficients for district dummies other than Pune, were statistically insignificant (p-value > 0.10), districts showed highly dissimilar species composition. Further, Desh region showed very high values for both diversity indices viz., Gini-Simpson’s index ($I-D = 0.9918$), Shannon’s index ($H = 4.7425$), as well as Normalised Shannon’s index ($H_{\text{normalised}} = 0.9543$). Normalised Shannon’s Index ($H_{\text{normalised}}$) was comparable with Gini-Simpson’s index ($I-D$). As mentioned earlier, this is also defined as Pielou’s Evenness Index ($J'$), shows more equitable species distribution with its high value. Insights gained from different statistical analyses are synthesized in the following way. Firstly, the results from the regression, Kruskal-Wallis test and JSI need to be considered together, as it is always possible to have no statistically significant difference in mean or median species count across the districts. Yet, the districts may be greatly dissimilar in terms of species composition (low pairwise JSI values and very few species common to all districts). Here too, though only Pune coefficient in OLS model is statistically significant, pairwise JSI values between districts (as well as number of common species as a percentage of total) are very low. This becomes especially important when making comparisons at the level of districts. Finally, diversity indices also need to be looked at since they take into account both information viz., number of isolates and number of species. Hence, considering the results from OLS, Kruskal Wallis Test, JSI, and diversity indices, it can be concluded that the Desh region exhibits rich biodiversity of foliicolous micro-fungi.

The statistical results of the study thus, provide much deeper insight and nuanced understanding of the biodiversity of foliar fungi of the region at district level in more objective and quantitative terms. The location-wise enumeration and simplicity of modelling strategy enhances our understanding of diversity of foliar fungi of the region, and provides valuable insights in designing effective conservation strategies to the authorities and other stakeholders. However, the statistical analysis carried out in this study is a posteriori in nature, based on the data obtained from the study. Therefore, the statistical results cannot be generalized as diverse ecological features and sheer number of fungi (many yet to be discovered) can yield different results. Further, it needs to be emphasized that more detailed study focussing on a district or an individual protected area, is needed to uncover the actual diversity of foliicolous fungi of Western Ghats of the Desh region.

Hence, there is an urgent need for the conservation and further exploration of these fungal species before they become extinct due to climate change and unfavourable land use patterns (Pradhan & Acharya 2012)

**Conflict of Interest**

There was no conflict of interest on the findings of this study.

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**Supplementary Table** District and location-wise enumeration of foliar fungi.

| District        | Location    | Species                                                                 |
|-----------------|-------------|--------------------------------------------------------------------------|
| Pune Dist.      | Junnar (11) | Alternaria tenuissima, Asteria hydrocotyles, Coniothyrium eucalypticola, Corynespora cassicola, Didymella fabae, Monodictys putradinis, Pestalotiopsis inflexa, Stemphylium vesicarium, Trichothecium roseum, Zygosporium gibbum, Zygosporium oscheoides. |
| Khandala (10)   | Asteria wrightiae, Cercospora apii, Colletotrichum dematium, Colletotrichum gleosporioides, Colletotrichum lindemuthianum, Pestalotiopsis palustris, Puccinia imposita, Ulocladium botrytis, Corynespora cassicola, Monostichella indica |
| Lonavala (4)    | Ardhachandra cristaspora, Hemibeltrania nectandrae, Pestalotiopsis palustris, Zygosporium majus |
| Malshej Ghat (11) | Ardhachandra cristaspora, Cladosporium oxysorum, Coniella granati, Corynespora cassicola, Gibberella pulicaris, Oidiopsis haplophylli, Phoma herbarum, Phyllachora sp., Physopella hiratsukae, Pseudoseptoria stomaticola, Sarcinella cryptostegiae, |
| Pune (31)       | Beltrania querna, Botryosporium longibrachiatum, Botryosporium madrasense, Calonectria morganii, Catenularia cubensis, Chaetospermum camelliae, Chalara sp., Ciliochorella mangiferae, Cladosporium coloscaiae, Cucurbitothis pityophila, Dictysporium elegans, Drechslera rostrata, Fusariella indica, Harpographium fasiculatum, Harpographium sp., Helicomyces hyderabadensis, Hermatomyces tucumanensis, Heteropatella lacerca, Kirschsteinitiothelia atro, Moniliahaetes laeensis, Oidium azadirachtu, Oidium caricae, Phaeotrichoconis sp., Sordaria fimicola, Tetraploa aristata, Tharoopama livistonaes, Torula herbarum, Tryblidiopycnis pinastri, Vermiculariopsis papayae, Zygosporium cocos, Zygosporium masonii |
| Bhimashankar WLS (22) | Alternaria dianthicola, Ampullifera foliicola, Ardhachandra cristaspora, Balladyna ugandensis, Cercospora apii, Colletotrichum capsici, Colletotrichum gleosporioides, Colletotrichum lindemuthianum, Corynespora cassicola, Dendryphon comosum, |
## Supplementary Table

| District       | Location                  | Species                                                                 |
|----------------|---------------------------|-------------------------------------------------------------------------|
|                 |                           | **District**                                                           | **Location**                                               | **Species**                                                                 |
|                |                           | **Location**                                                           | **Species**                                                                 |
| Sangli Dist    | Chandoli NP, location 1 (3) | Domigoella asternarum, Drechslera papendorfii, Gonatophragmium mayteni, | Chandoli NP, location 1 (3)                                    | Asterostomella state of Asterina jasmini, Erysiphe tectonae, Tretospora |
|                |                           | Khuschia oryzae, Lichenocoonium boreale, Melanocarpus sp., Monostichella |                           | thetei                                                                               |
|                |                           | salicis, Paraphoma filmeti, Passalora leaeae, Pseudocercospora griseola, | Chandoli NP, location 2 (2)                                    | Diplococcium spicatum, Nigrospora sacchari                                    |
|                |                           | Trichothecium roseum, Zygosporium minus.                               | Chandoli NP, location 3 (2)                                    | Asterostomella state of Asterina jasminicola, Uromyces nassellae               |
| Satara Dist    | Chandoli NP, location 1 (2) | Aithaloderma viride, Capnodium sp. 3.                                  | Chandoli NP, location 2 (2)                                    | Periconia chandoliensis, Sarcinella sp.                                      |
|                | Chandoli NP, location 1 (2) | Amazonia sylvyii, Beltrania mangiferae, Beltrania rhombica, Craspedo     | Chandoli NP, location 2 (2)                                    | Asteridiella malloticola, Asterina morellae, Asterostomula pavettae, Balladyna |
|                |                           | didymum sp., Domigoella asternarum, Gyrothrix cincinata, Humicola       |                           | velutina, Cryptomyces sp., Domigoella asternarum, Pestaliospis guepinii,     |
|                |                           | fuscoatra, Idrriella lunata, Isthmospora spinosa, Meliola agriosttachydis, |                           | Pseudocercospora griseola, Pseudocercospora viticicola, Ramularia vitis       |
|                |                           | Meliola holigarnae, Meliola sp.                                        |                           | Mahabaleshwar (13)                                                            |
|                |                           | Bacteriella malloticola, Asterina morellae, Asterostomula pavettae,     | Koyna WLS, Location 1, Satara Dist. (12)                       | Alternaria brassicicola, Ampelomycys quisqualis, Balladya pavattae,        |
|                |                           | Balladyna velutina, Cryptomyces sp., Domigoella asternarum, Pestaliosp    |                           | Cladosporium aeacidicola, Cladosporium cladosporioideis, Meliola garhwalensis, |
|                |                           | ispis guepinii, Pseudocercospora griseola, Pseudocercospora viticicola, | Koyna WLS, Location 2, Satara Dist. (10)                       | Meliola moliis, Pileolaria sp., Pithomyces chartarum, Pseudocercospora       |
|                |                           | Ramularia vitis                                                        |                           | griseola, Puccinia longinqua, Puccinia oxalidis, Stempylium solani           |
|                |                           | Mahabaleshwar (13)                                                     |                           | Pasarni Ghat (6)                                                             |
| Kolhapur Dist  | Chandoli NP, location 1, Kolhapur Dist. (1) | Aithaloderma viride                                                     | Chandoli NP, location 1 (2)                                    | Asperisporium pongamiae, Erysiphe prasadii, Erysiphe tectonae, Isthmospora   |
|                |                           | Aithaloderma viride, Uredo sp.                                          | Chandoli NP, location 2, Kolhapur Dist. (2)                    | spinosa, Meliola flemingicola, Scloecostigmixa fici-                           |
|                |                           | Asterina henianii, Meliola diospyri, Meliola ixorae-coccineae, Meliola   | Dajipur WLS, Location 1, Kolhapur Dist. (4)                    | elasticae                                                             |
|                |                           | nothopegiae                                                             | Dajipur WLS, Location 2, Kolhapur Dist. (3)                    | Asterina henianii, Domigoella asternarum, Meliola memecyli                  |
|                |                           | Asterina henianii, Domigoella asternarum, Meliola memecyli              | Radhanagari WLS, Location 1, Kolhapur Dist. (6)                | Acremoniula uniseptata, Cladosporium oxysporum, Domigoella                   |
|                |                           | Asterina henianii, Domigoella asternarum, Meliola memecylicola, Paraperi   | Radhanagari WLS, Location 2, Kolhapur Dist. (6)                | asterinae, Tripospermum myrti                                                 |
|                |                           | conidium memeciligica, Arthuriella spiralis, Cryptophiale sp., Meliola  |                           | Beltraniliea spiralis, Cryptophiale sp., Meliola eugeniae-stocksii, Meliola  |
|                |                           | ixorae, Spirotes guareicola, Stigmina koyanensis                         |                           | ixorae, Spirotes guareicola, Stigmina koyanensis                             |
| Ahmednagar     | Harishchandragad, location 1 (5) | Ardhaechandra cristaspore, Balladyna velutina, Capnodium coartatum,     | Harishchandragad, location 2 (1)                               | Ardhaechandra cristaspore                                                     |
| Dist.          |                           | Corynespora cassicola, Stenella electroniae                              | Harishchandragad, location 3 (2)                               | Ardhaechandra cristaspore                                                    |
|                |                           |                                                                          |                                                                          | Pithomyces bulbilis                                                          |