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## STUDIES ON COMPOSITION AND COMPONENTS OF AIRSPORA BELONGING TO ASCOMYCETES OVER COTTON FIELD DURING TWO CONSECUTIVE KHARIF SEASONS

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### Abstract:

*During the present studies composition and components of the airspora belonging to the Ascomycetes over the cotton field was studied. For this slides of spore catches were prepared, mounted and spore scanning was carried out regularly. Seventeen types of fungal spores belonging to the Ascomycetes were trapped on the cellophane tape fixed on the drum of the sampler. Apart from these various dust particles were also seen in abundance.*

### KEY WORDS:

Composition , Airspora , Cotton Field , Ascomycetes , Aerobiology , Interdisciplinary Science .

### INTRODUCTION

Aerobiology is an interdisciplinary science which deals with the study of biological components like pollen grains, fragments of fungal spores, hyphal fragments bacteria, viruses, algae, lichens, plant seeds and other propagules, protozoa, minute insects and insect parts etc. in the atmosphere. Abiotic particulates and gases affecting living organisms have been recently included in the concept of aerobiology. The aerobiological studies are mainly concerned with the interrelationships between the biological components in the atmosphere, sources of biological components, their release in the atmosphere, their deposition and impact on health of plants and animals including human beings. Airborne infections and the resulting diseases threaten the lives and productivity of plants. Airborne diseases still pose a challenge to mankind.

It is evident from the literature that investigations on outdoor (extramural) atmosphere for the detection of microorganisms have got manifold significance and utility. The aero allergenic pollen grains, fungal spores and other biologically significant particles detected from the atmosphere have their impact on human health. The detection and trapping of the significant plant pathogenic airborne fungi over crop fields are ultimately helpful in formulating a better and efficient forecasting system.

It is also clear from the literature that many workers have focused attention towards the relationship between airborne fungi and phytopathological problems. In India several workers like Cunningham (1873), Mehta (1952), Padmanabhan (1953), Ramlingam (1966), Sreeramalu (1970), and Tilak (1970) carried out the systematic and classic aerobiological work on rust spores with reference to wheat, jowar bajra, rice, sugarcane, cotton, banana, citrus and vegetables at various research centers.

In Maharashtra particularly in the Marathwada region aerobiological work with reference to many crop plants was extensively carried out by various workers like Tilak (1970), Nagpurme (1973), Bhalke (1979), Chakre (1979), Balkhanale (1980), Babu (1983) Meshram (1990), Naik (1995), Pawar (1997),

Kadam (2002), Bembrekar (2005), Dhaware (2007) and Patil (2008) at various centres. However detail studies on air spora over Cotton field in respect to seasonal conditions are meager. Considering these facts studies on air spora belonging to the Ascomycetes over Cotton field is carried out.

#### MATERIALS AND METHODS:

Composition of airspora belonging to Ascomycetes over the field of Cotton during two consecutive kharif seasons:

In order to study composition and components of the air spora belonging to the Phycomycetes over cotton field, slides of spore catches were prepared, mounted and spore scanning was carried out regularly. Before the scanning, the slides were marked with a ball-point pen in to six equal parts, each part indicating the spore catch of two hours of sampling period. Area of 9600sq. micron of the total area of the trace obtained was scanned under 10X x 45X eye piece objective combination of binocular research microscope. The identification of fungal spore types was made on the basis of morphological characters, visual identification by comparison with reference slides.

#### RESULTS AND DISCUSSION:

Analysis of spore catches from the results presented in table-1 revealed that seventeen types of fungal spores belonging to the Ascomycetes were trapped on the cellophane tape fixed on the drum of the sampler. Apart from these various dust particles were also seen in abundance.

Enumeration of the identified spores of fungi belonging to Ascomycetes over the cotton field during the two consecutive kharif seasons:

##### 5. *Bitrimonospora* Shrin.

Spores are one celled, spherical, dark brown to black, with a very thick outer wall, shining, 34-42m, occurred on dead hypocotyl region of *Achyranthus aspera* Linn.

The occurrence of these spores was regular throughout the period of investigation and it was abundant. During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 156/m<sup>3</sup> and 1456/ m<sup>3</sup> of air respectively. They contributed 0.09% and 0.90% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.49% to the total airspora over the cotton field.

Sivanesan, Talde and Tilak (1974) erected and described this genus showing 0.02% contribution to air as Nocturnal wet spora type peak at 11.11 hours.

##### 6. *Chaetomium* Kunz.ex.Fr.

Spores are dark, unicellular, tapering at both the ends, elliptic, sometimes circular to triangular, 10-12 x 9-10 m in size.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 1344/m<sup>3</sup> and 1708/m<sup>3</sup> of air respectively. They contributed 0.82% and 1.06% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.94% to the total airspora over the field of cotton

There are several reports of incidence of *Chaetomium* recorded from air. Pady (1951) collected *Chaetomium reflectus* over Arctic area of Canada. Harvey, Hodgkiss and Lewis (1969) isolated these spores at Cardiff from airspora samples. They observed positive effect of wet and moist air on spore liberation. They found that direct impact of rain drops was more effective in the release of spores.

Mishra and Kamal (1971) reported *Chaetomium* glooms during winter only. Gaikwad (1974) reported 0.04% spores from Ahmedpur. Mane (1978) reported 0.15% spores from Vaijapur. Patil (1985) reported 0.40% of spores to the total airspora. Jogdand (1987) and Kavishwar (1990) reported the spores over jowar fields at Aurangabad and Dhulia respectively.

Other reports are of Babu (1983), Patil (1983), Bhasale (1983), Shanta (1983), Saibaba (1983), Wankhade (1983) and Quazi (1985) over different crop fields at Aurangabad. To trace the source, the fungus was collected on decaying dead branches of different plants around the crop fields during different seasons.

### 7. *Cucurbitaria* Gray ex Grev.

Spores oblong, fusiform, yellowish brown, 24 – 36 x 9-16 m, with transverse septa and one to many longitudinal septae in most of the segments, markedly constricted at the middle septum. The spores were encountered rarely during the periods of investigations.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 308/m<sup>3</sup> and 182/m<sup>3</sup> of air respectively. They contributed 0.18% and 0.11% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.14% to the total airspora over the cotton field.

Tilak (1989) collected these spores on dead stems of various plants; Patil (1983) reported 0.02 % contribution while Jogdand (1987) reported 0.004%. Lakhe (1980), Meshram (1990) also reported these spores.

### 8. *Didymosphaeria* Fuck.

Spores two celled with single transverse septum, brown, elliptic or cylindrical, slightly constricted at the septum, 9.4 – 17 x 6.7-8.2 m. The spores were trapped throughout the period of investigations.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 16524/m<sup>3</sup> and 112/m<sup>3</sup> of air respectively. They contributed 1.01% and 0.06% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.53% to the total airspora over the cotton field.

There was correlation between occurrence of these spores, rainfall and humid conditions. Even scanty rainfall also cause spore liberation which subsequently increased the spore concentration in the airspora. Incidence of this spore type in the air was recorded by few workers. Meredith (1962) at Jamaica, other reports are of Kulkarni (1971) who recorded 0.34% over sugarcane fields, Bhalke (1981) reported 1.86% over sorghum fields. Ramchander Rao (1987) reported 0.67% over sunflower fields at Aurangabad. Patil (1992) recorded 1.86% mean contribution over jowar field at Jalgaon. Kadam (2002) recorded 1.06% spore contribution to the total airspora over sugarcane field at Shankarnagar. During the present investigation the fungus was collected on dried twigs from neighboring fields and the source of *Didymosphaeria* may be neighboring fields where it grows as a saprophytes.

### 9. *Hypoxyton* Bull. Ex. Fr.

Spores elliptic, fusiform to bean shaped, dark brown in colour, one celled with distinct colourless furrow on one longitudinal side, 10. 2-16 .2 x 6.2-7 m.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 2524/m<sup>3</sup> and 378/ m<sup>3</sup> of air respectively. They contributed 0.15% and 0.23% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.19% to the total airspora over the cotton field.

Spore discharge mechanism of *Hypoxyton* was studied by Ingold and Marshall (1963) and reported that in *Pyrenomyces* light had the adverse effect and mainly inhibit the spore discharge. Incidence of spores in air was found to be favored by high humid conditions. It was clearly pointed out that the spore catch was high during night hours. Thus it belongs to “night spora” group.

Mane (1978) reported 0.72% spores to the total airspora at Vaijapur and recorded high concentration during night and pointed out its “night spora” pattern. Bhalke (1981), Babu (1983) reported 1.72% and 0.45% over jowar and banana fields at Aurangabad. Jogdand (1987) recorded 0.04% to the total airspora.

### 10. *Hysterium* Tode Ex Fr.

Spores three septate, elliptic, cylindrical, uniformly brown slightly constricted at septa, 15-29 x 6-8 m in size.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 1442/m<sup>3</sup> and 952/ m<sup>3</sup> of air respectively. They contributed 0.88% and 0.59% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded

0.73% to the total airspora over the cotton field.

Tilak and Srinivasulu (1967) reported *Hysterium* spores from the airspora of Aurangabad for the first time. Ahuja (1991) recorded 0.4% to the total airspora over jowar fields at Aurangabad.

#### 11. *Leptosphaeria* Ces & de Not.

Spores lightly coloured, two to multiseptate, fusiform, one middle swollen cell and 12.2-14.4 x 4.1-4.9  $\mu$ m in size. The spore catch was maximum during the rainy season. Prolonged dry conditions typically showed the absence of these spores in the air.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 1428/ $\text{m}^3$  and 1448/ $\text{m}^3$  of air respectively. They contributed 0.87% and 0.92% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.89% to the total airspora over the cotton field.

Rees (1964) recorded 1.6% spores to the total airspora at Brisbane and stated that the spore is largely moisture regulated and nocturnal type. Hamilton (1959), Lacey (1962), Sreeramulu and Ramalingam (1966), Tilak and Srinivasulu (1987), Davica (1969), Agarwal and Shivpuri (1974) reported these spores and also reported peak during forenoon at 10.00 hours and pointed out their concentration declining during early morning and afternoon hours, and belongs to the "wet spora" group.

#### 12. *Lophiostoma* Ces. & de Not.

Conidia fusiform, olive brown, 5-7 septate, slightly constricted at the septum, 18-22 x 6-7  $\mu$ m in size.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 1400/ $\text{m}^3$  and 1456/ $\text{m}^3$  of air respectively. They contributed 0.85% and 0.90% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.87% to the total airspora over the cotton field.

Kulkarni (1971) reported these spores from Aurangabad airspora over vegetable fields. Mane (1978) recorded 0.12% over bajra field at Vaijapur. Meshram (1990) reported 0.26% to the total airspora over the green gram fields at Udgir, Nagpurne (1993) reported 0.01% and 0.09% to the total air spora during first and second seasons respectively over vegetable fields.

#### 13. *Massarina* Sacc.

Conidia one celled, dark, ovoid to pointed, truncate at base, basal scar with prominent longitudinal germ slit.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 20160/ $\text{m}^3$  and 2296/ $\text{m}^3$  of air respectively. They contributed 1.23% and 1.43% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 1.33% to the total airspora over the cotton field.

Patil (1985), Bhagwan (1983) reported these spores from Nanded and Aurangabad respectively.

#### 14. *Melanospora* Cord.

Spores one celled, oval, discoid, often in equilateral, with prominent germ pores at both ends, brown to blackish green 13-22 x 7-14  $\mu$ m in size.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 1652/ $\text{m}^3$  and 3598/ $\text{m}^3$  of air respectively. They contributed 1.01% and 2.24% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 1.62% to the total airspora over the cotton field.

Pande (1976) reported 0.2% of these spores to the total airspora over orange fields at Nanded.

#### 15. *Passereniella* Berl.

Spores elliptic, fusiform, 3 septate with brown central cells and hyaline terminal ones slightly

constricted at septum, 28-30 x 9-10 m in size.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 1540/m<sup>3</sup> and 2016/ m<sup>3</sup> of air respectively. They contributed 1.94% and 1.25% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 1.09% to the total airspora over the cotton field.

Kulkarni (1971), for the first time reported 0.004% spores from Aurangabad airspora. Mane (1978) included this spore type under "night spora" group. Their maximum concentration occurred from 19.00 hrs reaching highest peak at about 21.00 hrs.

#### 16. Pleospora Rabb.

Spores oblong - fusiform or ovoid, yellowish-brown or golden brown, with several cross septa and 1 or usually 2 longitudinal septa, septa in most or all of the segments; upper half usually wider than the lower half, always constricted at the middle septum and often slightly at the other septa, 30-38 x 13-16 m in size.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 224/m<sup>3</sup> and 322/ m<sup>3</sup> of air respectively. They contributed 0.13% and 0.20% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.16% to the total airspora over the cotton field.

Dye and Vernon (1952) from New Zealand Richards (1956) from England, Kramer and Pady (1960) from Kansas reported the incidence of these spores in air. The occurrence of these spores in air was favoured by high humid conditions. Bhalke (1981) reported 0.23% spores over jowar fields at Aurangabad. Patil and Kulkarni (1981) reported these spores in hospital ward at Kolhapur; Bhasale (1983) reported 0.09% of these spores from the air of vegetable fields at Aurangabad, Jogdand (1987) reported 0.23% contribution to the total airspora at Aurangabad. Other reports are of Tilak and Kulkarni (1979) from Aurangabad, Babu (1983), from Aurangabad and Wankhede (1983) over jowar fields from Aurangabad.

The present investigations are in confirmation with the earlier reports. It appears from the above results that these spores occur in wet period which confirms with the results of Kramer and Pady (1960) and Sreeramulu and Sheshavataram (1962).

#### 17. Pringsheimia Schulz.

Spores 3-5 septate, septa horizontal but in mature spores a vertical septum is found in each cell, hyaline, elliptic, 27-36 x 11.2-17.4 m in size.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 2254/m<sup>3</sup> and 2646/ m<sup>3</sup> of air respectively. They contributed 1.38% and 1.63% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 1.50% to the total airspora over the cotton field.

In India Tilak and Srinivasulu (1967) for the first time reported it, in the airspora of Aurangabad with 0.42% concentration. Babu (1983) noted 0.08% spores in the airspora of hospital ward at Aurangabad. Mane (1978) reported 0.53% spores over bajra field at Vaijapur. Patil (1985) reported its percentage contribution 0.94% to the total airspora over jowar fields at Aurangabad. The spores were also reported by Patil (1983) Jogdand (1987) Reddy (1988).

Meshram (1990) reported 0.3% spores over green gram field during kharif season at Udgir; Nagpurne (1993) recorded 0.73% and 0.03% spores during first kharif and second kharif season respectively over jowar fields at Kandhar. Mali (1998) reported 1.50%, 8.30% and 12.05% to the total airspora during second summer and two kharif seasons respectively. Jagannath (2001) recorded 0.33% and 0.23% to the total airspora during the first and second kharif crop season over cotton field at Ahmedpur.

#### 18. Sordaria Ces.

Spores sub globose to elliptical, aseptate, almost black and opaque at maturity, with a germ pore at the lower end and a distinct short pointed beak at one end. The spores measure 19.2 to 23 x 15.2 m and 34.4 to 38.2 x 20.2 to 23 m in size.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 1540/m<sup>3</sup> and

1624/ m<sup>3</sup> of air respectively. They contributed 0.94% and 1.01% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.97% to the total airspora over the cotton field.

#### 19. *Sporormia de Not.*

Spores dark brown, uniseriate with three transverse septa, having a tendency to break at the septum level, four celled, surrounded by a hyaline gelatinous sheath, 26.4-34 x 6-7.2 m in size. The incidence of the spores was not regular in first and second seasons.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 1540/m<sup>3</sup> and 1624/ m<sup>3</sup> of air respectively. They contributed 0.94% and 1.01% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.97% to the total airspora over the cotton field.

Babu (1983) pointed out its peak at 10.00 hours. Several workers reported the incidence of spores in the air. Pady (1957), Kramer and Pade (1960) from Kansas, Tilak and Bhalke (1979), Patil (1983), Bhasale (1983), Shanta (1983) and Wankhade (1983) from Aurangabad over different crop fields. The diurnal periodicity studies showed that spores of *Sporormia* are of "day Spora" with maximum concentration from 10.00 hours to 16.00 hours and reaching a peak at about 12.00 hours. Reddy (1974) reported it during day time between 8.00 hrs and 18.00 hrs with higher concentration in the period between 10.00 and 12.00 hours.

#### 20. *Trematosphaeria Fuck.*

Spores fusiform, pale brown, 3-septate, markedly constricted at the middle septum, 20-27 x 5-7 m, saprophytic on dead branches. These spores occurred in low concentration. They were irregular throughout the investigation period.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 98/m<sup>3</sup> and 140/ m<sup>3</sup> of air respectively. They contributed 0.06% and 0.08% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 0.07% to the total airspora over the cotton field.

#### 21. *Xylaria Hill.ex Grev.*

Spores one celled, fusiform or bean shaped, dark brown to black, with germ slit more or less throughout the length of spores, 14-20 x 6-9 m. The spores occurred on dead stems and leaves of various plants.

During the present studies the spore concentration in the first test kharif season from 21-06-2009 to 30-11-2009 and second test kharif season from 21-06-2010 to 30-11-2010 was recorded 3276/m<sup>3</sup> and 4746/ m<sup>3</sup> of air respectively. They contributed 2.00% and 2.95% to the total airspora in the first and second kharif seasons respectively. The average percentage contribution for both the test seasons was recorded 2.47% to the total airspora over the cotton field.

Shastri (1981) reported 0.05% concentration in of these spores at Aurangabad. Jayswal (1993) while working on sunflower at Dhulia also reported these spores. Pole (1995) reported these spores from Udgir airspora.

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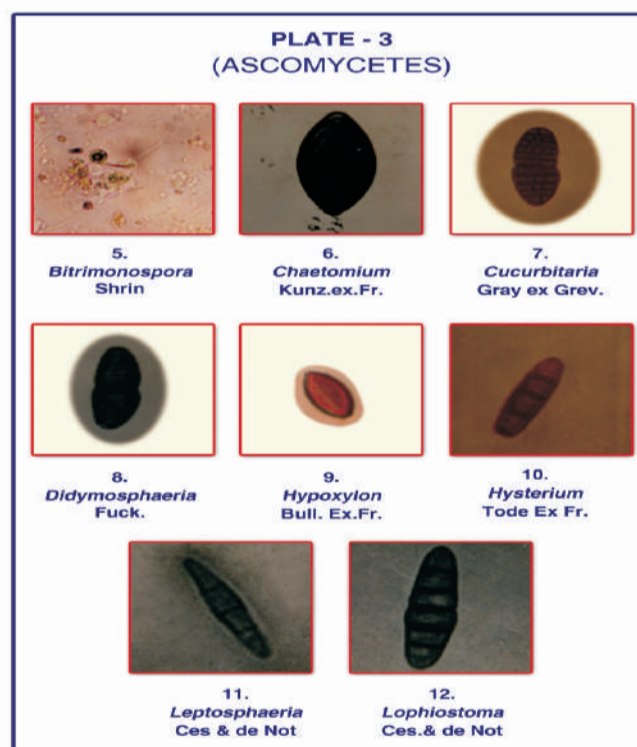


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**Table-1: Composition of airspora belonging to Ascomycetes over the cotton field during two consecutive kharif seasons.**

Sr. No.	Spore type
5	<i>Bitrimonospora</i> Shrin.
6	<i>Chaetomium</i> Kunz.ex.Fr.
7	<i>Cucurbitaria</i> Gray ex Grev.
8	<i>Didymosphaeria</i> Fuck.
9	<i>Hypoxyton</i> Bull. Ex.Fr.
10	<i>Hysterium</i> Tode Ex Fr.
11	<i>Leptosphaeria</i> Ces& de Not
12	<i>Lophiostoma</i> Ces.& de Not
13	<i>Massarina</i> Sacc.
14	<i>Melanospora</i> Cord.
15	<i>Passereniella</i> Berl.
16	<i>Pleospora</i> Rabb.
17	<i>Pringsheimia</i> Schulz.
18	<i>Sordaria</i> Ces.
19	<i>Sporormia</i> de Not.
20	<i>Trematosphaeria</i> Fuck.
21	<i>Xylaria</i> Hill.ex Grev.

**PLATES:**



**PLATE - 4  
(ASCOMYCETES)**



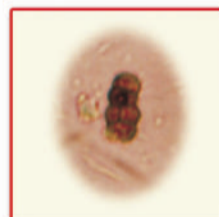
13.  
*Massarina*  
Sacc.



14.  
*Melanospora*  
Cord.



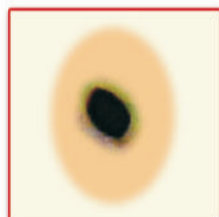
15.  
*Passereniella*  
Berl.



16.  
*Pleospora*  
Rabb.



17.  
*Pringsheimia*  
Schulz.



18.  
*Sordaria*  
Ces.



19.  
*Sporormia*  
de Not.



20.  
*Trematosphaeria*  
Fuck.



21.  
*Xylaria*  
Hill.ex Grev.

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