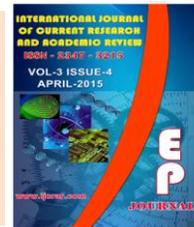




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Circadian periodicity studies in the incidence of airborne spores of *Leptosphaeria* and *Didymosphaeria*

Vaishali A. Thakur^{1*} and Paramjit Kaur Jite²

¹Department of Botany, Fergusson College, Pune-411004, Savitribai Phule,
Pune University, India

²Department of Botany, Savitribai Phule Pune University, Pune-411007 India

*Corresponding author

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A B S T R A C T

Circadian periodicity studies in the incidence of airborne spores of *Leptosphaeria* (Ces and de Not) and *Didymosphaeria* (Fuck.) are described from data obtained by sampling air with volumetric "Tilak air sampler" for one Kharif season (rainy) from 18th June 2012 to 10th September 2012. The sampling was carried out over *Phaseolus vulgaris* L. crop field at Ganeshkhind Pune. The periodicity of *Leptosphaeria* and *Didymosphaeria* are mentioned with respect to the related weather parameters and it confirmed to the night pattern. Maximum incidence of these spores was observed in the month of August and September respectively. The peak mean concentration for both types occurred at 4.00 hrs and belongs to night spora group.

Introduction

Ascospores show their peak periods in rainy season are typical members of night, their spore production and discharge being correlated with low temperature and high humidity (Pady *et al.*, 1962). There is a close relationship between the rainfall and release of ascospores. Gregory (1967) has clearly confirmed that interpretations of the circadian periodicity studies are not always clear. A circadian rhythm is reflected in some spore types for liberation mechanism and other reflects a daily change in meteorological factors.

The release of spore and their incidence in air are almost controlled by meteorological conditions, so that circadian periodicity patterns may differ from place to place. Previously, workers like Sreeramulu and Sehavataram (1962), Subbareddy (1974), Subbareddy and Janakibai (1977), Tilak *et al.* (1983) have studied circadian periodicity of some fungal spores from air. Recently Trejo *et al.* (2011) studied airborne ascospores in Merida (SW Spain) and the effect of rain and other meteorological parameters on their concentrations.

Abu-Dieyeh and Barham (2014) studied concentration and dynamics of fungal spore populations in the air of Zarqa, Jordan. So in order to understand the circadian periodicity in the incidence of airborne ascospores of *Leptosphaeria* (Ces and de Not) and *Didymosphaeria* (Fuck.) in Pune region, the present investigation was undertaken.

Materials and Methods

The incidence of these spores in the atmosphere were observed while studying aerospora over *Phaseolus vulgaris* L. crop field at farms of Mahatma Phule Krishi Vidyapeeth Zonal Agricultural Research Station (Western Maharashtra, Plain Zone) located at Ganeshkhind Pune – 7, India. Pune lies between 18° 28'25'' north latitude, 73° 47'52'' East longitude and 560 meters altitude exhibiting tropical wet and dry atmosphere. The air sampling was carried out by using volumetric continuous Tilak air sampler (Tilak and Kulkarni, 1970) for one Kharif season (rainy) from 18th June 2012 to 10th September 2012.

The day today meteorological record of temperature, relative humidity and rainfall was obtained from India Meteorological Department, Shivaginagar, Pune (M.S.), nearest place from the crop field. Slide preparation, scanning and detailed calculations were obtained by using same method described earlier (Tilak and Srinivasulu, 1967). Identification was done by using authentic literature, reference slides, photographs etc.

Result and Discussion

The mean circadian periodicity curve for *Leptosphaeria* and *Didymosphaeria* was presented as percentage derived from the bihourly catches for 24 hour periods for each spore type from the data on the spores

present in the air (Figure 1 and 2). *Leptosphaeria* and *Didymosphaeria* was significant contributor to aerospora, present throughout the rainy season.

Highest spore load of *Leptosphaeria* spore has been recorded in the month of August (21252/m³ of air) whereas the highest daily count has been recorded on 1st September 2012 (1694 spores/m³ of air) during Kharif 2012. Circadian periodicity studies indicated that during day time spore concentration was low, occurred maximum in number during night time, so it is a 'Nocturnal type' belongs to 'Night spora' group. The number of this spore type increases steadily after 20.00 hrs, the highest peak was observed during early morning at 4.00 hrs and showed that concentration declined during morning and afternoon hours.

The incidences of ascospores of *Leptosphaeria* were recorded maximum in the atmosphere in the month of August 2012. During this month there was record of total rainfall 204.6 mm, the average relative humidity 80.4%, and temperature 26.3°C. This clearly indicated that during these days the weather conditions were favorable for the discharge of spores and increased the concentrations of spores in the atmosphere in high humid conditions, whereas on the dry days the spores were less in the air. Therefore the spore type belongs to "Wet spora" group, which means that their release from pseudothecia is triggered by rainfall (Grinn- Gofron and Mika, 2008, Dawidziuk *et al.*, 2012).

Gregory (1952) reported that *Leptosphaeria* spores need better condition for liberation. Their concentration increased with increase in humidity. Significant correlation between rainfall and some ascospore types including *Leptosphaeria* was also recorded by Trejo *et al.* in 2011 at Merida (SW Spain).

Figure.1 Circadian periodicity curve of average percentage contribution of *Leptosphaeria*

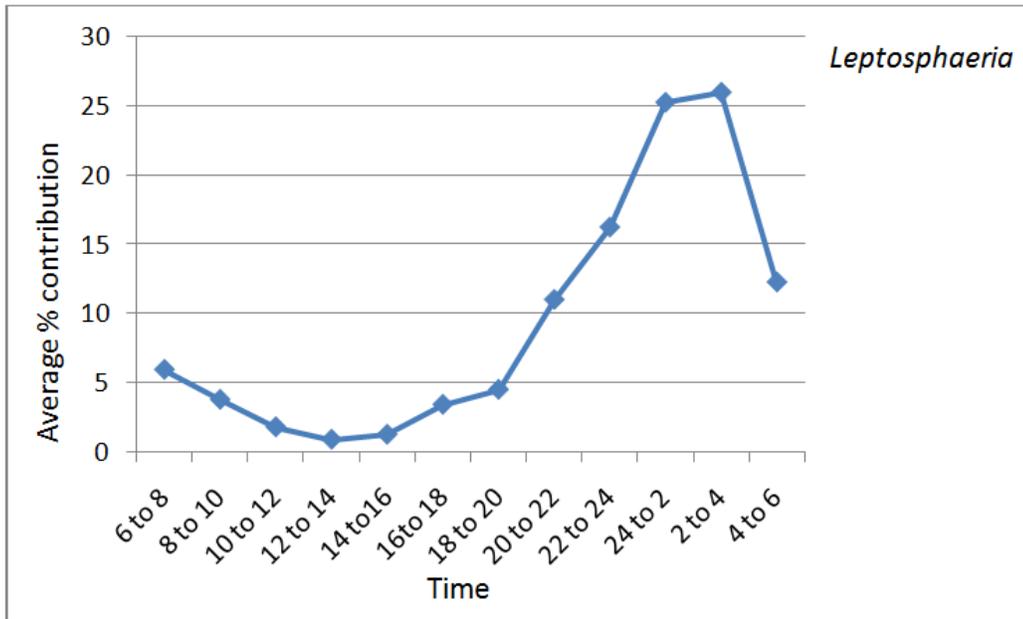


Figure.2 Circadian periodicity curve of average percentage contribution of *Didymosphaeria*

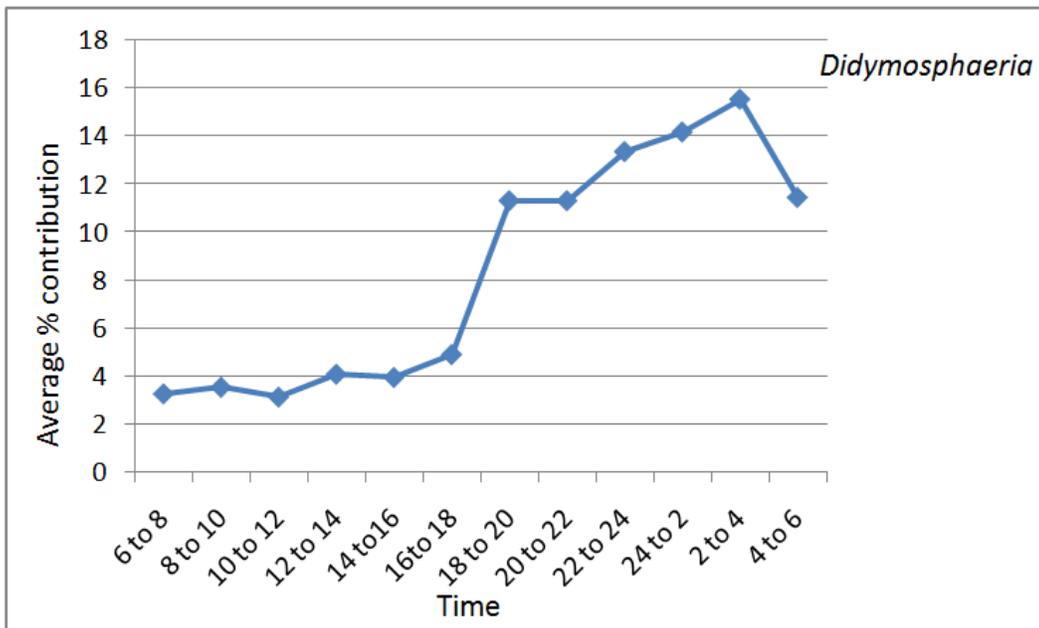
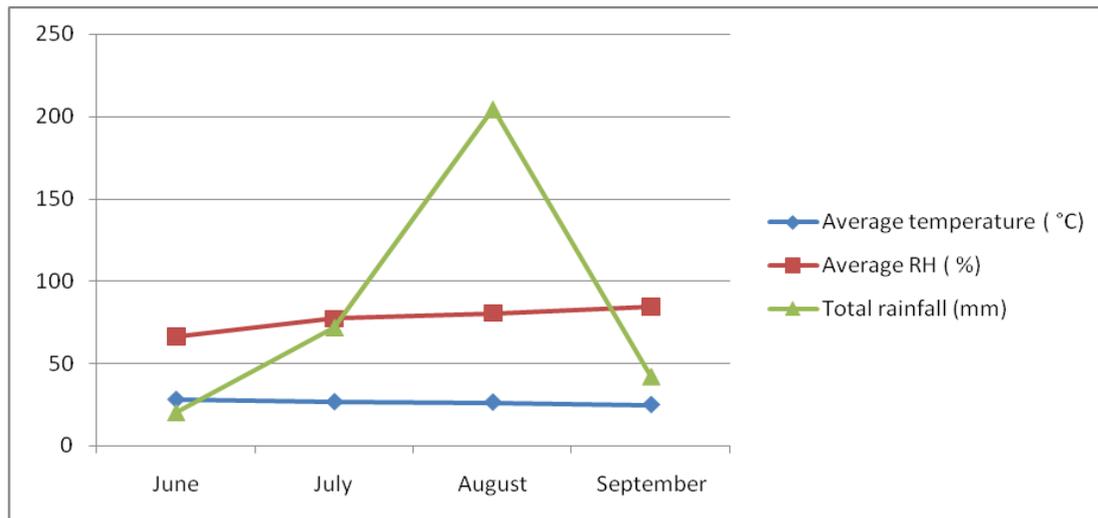


Figure.3 Weather parameters for Kharif season 2012 over *Phaseolus vulgaris* L. crop field at Ganeshkhind, Pune



Highest spore load of *Didymosphaeria* spore has been recorded in the month of September (7448/m³ of air) whereas the highest daily count has been recorded on 9th August 2012 (1316 spores/m³ of air) during Kharif 2012. Circadian periodicity studies showed that the maximum number of spores were present during night time so it belongs to ‘Night spora’ group. The number of this spore type increases gradually after 22.00 hrs, the highest peak was observed during early morning at 4.00 hrs and showed that concentration declined gradually.

The incidence of ascospores of *Didymosphaeria* was recorded maximum in the atmosphere in the month of September 2012 in relevance to total rainfall 42.4 mm, the average relative humidity 84.5%, and average temperature 24.8°C. Thus occurrence of this spore type could be correlated with the prevailing weather parameters like rainfall and humid conditions at optimum temperature. This indicates that even less rain also helped in increasing the spore liberation which subsequently increased the spore load in the airspora.

Thus *Leptosphaeria* and *Didymosphaeria* show nocturnal peaks in rainy season. Its night peak is similar with that of many ascospore types. Similar findings have been recorded by Sreeramulu and Ramlingam (1964), Ingold (1965), Tilak and Srinivasulu (1971), Tilak and Babu (1983) for the incidence of certain ascospores in the air. The timing of peak concentration of both types varied slightly at Aurangabad, Tilak and Babu (1983) recorded peak hour of *Leptosphaeria* at 6.00 hrs and *Didymosphaeria* at 8.00 hrs but both types occurred maximum in number during night time.

Conclusions

Presence of airborne ascospores of *Leptosphaeria* and *Didymosphaeria* in the atmosphere is greatly affected by weather, especially rain and high relative humidity seems to increase the spore concentration. These types belong to ‘wet spora’ group, besides their nocturnal pattern and the peak mean concentration for both types occurred at 4.00 hrs.

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