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Assessment of Fungal Air Spora at Asaba Area in Delta State, Nigeria

Bosah, Bernadette Obiageli

Senior Lecturer, Department of Agronomy, Delta State University,
Asaba Campus, Asaba, Nigeria

Abstract:

*The fungal air spora in Asaba area was investigated. The spore load was assessed during the raining and dry season of 2012. The air spora was assessed in three locations namely: Ogbeogonogo market area, Cable point market area and West end area. The agar plate method was used. The result showed that there were seasonal variations in the air spora of the three locations. This influenced the types of fungi isolated and also the frequency of isolation. Many fungal colonies were isolated and identified they include, *Penicillium* spp., *Sclerotium* spp., *Aspergillus* spp., *Fusarium* spp., *Aspergillus* spp., *Cladosporium* and yeasts. The air is the most common medium of dispersal of pollen grain, fungal spores and hyphal fragments. Percentage frequency of isolation was determined for each of the fungus. The spore load was highest during the raining season.*

Keywords: Fungal air spora, spore, fungi, Isolation

1. Introduction

Fungal spores are found everywhere and they form a normal component of the earth's atmosphere. Most causes allergic reaction to humans and some are pathogenic to agricultural crops. It is known that species like *Aspergillus*, causes several conditions such as Aspergilosis, allergic branch pulmonary aspergillosis Newmark, (1970). Investigations of fungal air spora are usually made by one or both of two sampling methods. The exposure of culture plates gives information upon the numbers and nature of spores of those moulds which are vital and can be cultivated and the exposure of sticky tapes or slides enables counts to be made of the entire spore load.

Fungal spores are present in the air and can cause allergies to man and as well as domestic animals. Many fungi spores are pathogenic to agricultural crops both in the field and in storage. The fungi spores and chemical pollutants are likely to interact with each other and affect human health (Newmark, 1970). Air is the most common medium for the dispersal of pollen grains, fungal spores and hyphal fragments. Like pollen grains, air borne fungal propagules may cause human allergies. Investigations of fungal airspora are usually made by one or both of two sampling methods: the exposure of culture plates gives information upon the numbers and nature of spores of these moulds which are vital and can be cultivated and the exposure of sticky tapes or slides enables counts to be made of the entire spore, but gives an incomplete picture of the types comprising it. There is scarce information on the prevailing fungi species in Asaba, Delta State hence, the objective of this work was assessing the prevailing fungi airspora in different location within Asaba area of Delta State.

2. Materials and Methods

Two media namely, Potato dextrose agar (PDA) and malt agar (MA), were used for collecting samples. Preliminary studies indicated the need to suppress bacterial growth, consequently, 20 U of Chloroamphenicol were added to each of the media. Various precautions were taken to minimize contamination either from the equipment or the operators. A petri dish containing formaldehyde solution (30 to 35%, wt/vol) was left in the sampling chamber of the slit sampler overnight before sampling. The sampler parts and slit were swabbed with ethanol before any sampling sequence. The movements and activities at the sampling sites were reduced to a minimum before and during sampling processes. These precautions reduced the possibility of contamination.

During the year there were two distinct seasons, wet and dry. The wet season was from April to October and the dry season was between November and March. The mean annual rainfall was 226.4mm and the temperature varied between 19.9°C and 36.9°C. The concentrations of airborne fungal spores generally differ from location to location and even fluctuate with time in a given location. Three areas were used and the same hours of the day (11:00am to 12:00 noon) for each of the three locations. The study was conducted over a period of 12 months (January to December, 2012) as presented. Three replicate plates of each of the two media were exposed at each incubation temperature (26°C and 37°C) at each of the location once a week.

The exposed plates were incubated initially for 3 days at 26°C and 37°C. The colonies were counted and the plates were left for further incubation, with daily colony counts made for up to 7 days. The fungal colonies on each plate were counted and examined for morphological characteristics and the mean number of colonies on each medium for each incubation temperature at each site was recorded. Standard 90mm disposable Petri dishes containing 27ml of medium

were exposed for 20 seconds. Antibiotic (Chloroamphenicol) was incorporated into the agar to prevent bacterial growth. 10 plates of potato dextrose agar were exposed at 8.00am, 12 noon and 5pm on the second and fourth Thursdays of every month. After exposure, the plates were incubated at 24°C for 3 days, after which time, fungal colonies were identified and counted. The identification was done using method according to (Barnett, and Hunter, 1998). Most of the fungal colonies were identified to the genus only. However, some were identified to the species level.

3. Results

Table 1, showed that in Ogbeogonogo market, there were variations in the isolation frequency. More fungi were isolated during the raining season than in dry season; also, different species were isolated in the raining season. *Sclerotium rolfsii* recorded the highest isolated frequency of 22.02 followed by *Fusarium oxysporum* during the raining season, while *Curvularia lunata* recorded the least. However, isolated frequency lower than that of the raining reason was observed in all, during the dry season.

Fungi	Total No of Times Isolated	Isolated Frequency (%)
<i>Fusarium oxysporum</i>	87	19.55
<i>Sclerotium rolfsii</i>	98	22.02
<i>Aspergillus niger</i>	30	6.74
<i>Cladosporium vignae</i>	15	3.37
<i>Alternaria tenius</i>	8	1.87
<i>Curvularia lunata</i>	6	1.35
<i>Collectotrichum spp</i>	80	17.98
<i>Penicillium spp</i>	22	4.94
<i>Chlamydozporae spp</i>	19	4.27
<i>Botrodiploidiat heobromae</i>	40	9.01
<i>Phytophthora vigne</i>	40	8.99
Total	445	100

*Table 1: Comparison of Fungi Species Isolated at Ogbeogonogo Market Areas of Asaba during 2012 Planting Season
Ogbeogonogo Market (Rainy Season)*

Fungi	Total no of Times Isolated	Isolated Frequency (%)
<i>Fusarium oxysporum</i>	92	14.67
<i>Sclerotium rolfsii</i>	99	15.79
<i>Aspergillus niger</i>	42	6.67
<i>Alternaria tenius</i>	18	2.87
<i>Cladosporium vignae</i>	28	4.47
<i>Curvularia lunata</i>	13	2.07
<i>Collectotrichum spp</i>	68	10.84
<i>Penicillium notatum</i>	17	2.71
<i>Chlamydozporae spp</i>	10	1.59
<i>Botrodiploidiat theobromae</i>	61	9.73
<i>Phytophthora vigne</i>	55	8.77
<i>Scopulariopsis spp.</i>	12	1.91
<i>Botrytis spp.</i>	33	5.26
<i>Chaetomium spp.</i>	18	2.87
<i>Pyricularia spp.</i>	19	3.03
<i>Pleospora spp.</i>	36	5.74
<i>Microsphaomina spp.</i>	6	0.96
Total	627	100

Table 2: Ogbeogonogo Market (Dry Season)

Result as presented in table 3 shows that at Cable Point Market of Asaba, the isolated frequency of each fungus was higher during the raining season than in the dry season. However, higher number of fungi was observed in the dry season (751) than the raining season (356).

Fungi	Total no of Times Isolated	Isolated Frequency (%)
Sclerotium rolfsii	96	26.9
Fusarium oxysporum	90	25.3
Curvularia lunata	6	1.7
Alternaria tenius	4	1.1
Penicillium notatum	30	8.4
Cercospora cruenta	28	7.8
Microphomina phaseoline	17	4.8
Rhizoctonia solani	14	3.9
Phyllachora spp	23	6.5
Albugo spp	10	2.8
Aspergillus niger	38	10.7
Total	356	100

Table 3: Comparison of Fungi Species Isolated at Cable Point Market of Asaba during 2012 Planting Season. Cable Point Market (Rainy Season)

Fungi	Total no of Times Isolated	Isolated Frequency (%)
Corynespora spp	8	1.06
Cephalophora spp	4	0.53
Pleospora spp	13	1.73
Fusarium oxysporum	98	13.05
Chaetomium spp	20	2.66
Aspergillus niger	79	10.52
Pyricularia spp	16	2.13
Beltraniella spp	10	1.33
Penicillium notatum	30	3.99
Pythiumaphan idermatum	15	1.99
Colletotrichum lindemuthianum	108	14.38
Cladosporium vignae	23	3.06
Sclerotium rolfsii	97	12.92
Curvularia lunata	39	5.19
Rhizoctonia solani	48	6.39
Cercospora cruenta	42	5.60
Alternario tenius	24	3.19
Botrodiploia theobomae	26	3.46
Phytophthora vigne	20	2.66
Microcropphomia phaseoline	21	4.12
Total	751	100

Table 4: Cable Point (Dry Season)

Table 5, showed that in West End area of Asaba, there were variations in the isolation frequency. More fungi were isolated during the raining season than in dry season, also, different species were isolated in the raining season. Colletotrichum lindemuthianum and Fusarium oxysporum recorded the highest isolated frequency of 19, followed by Sclerotium rolfsii with isolated frequency of 18, during the raining season, while Curvularia lunata recorded the least. However, isolated frequency lower than that of the raining reason was observed in all, during the dry season.

Fungi	Total No of Times Isolated	Isolated Frequency (%)
Penicillium notatum	22	4.4
Pythium aphanidermatum	13	2.6
Aspergillus niger	53	10.7
Colletotrichum lindemuthianum	98	19.8
Fusarium oxysporum	95	19.2
Cladosproum vignae	10	2.0
Sclerotium rolfsii	90	18.2
Curvularia lunata	6	1.2
Rhizoctona solani	42	8.5
Cercospora tenius	13	2.6
Alternaria tenius	5	1.0
Botrodiplodia theobromae	15	3.0
Phytophthora vigne	15	3.0
Microphomia phaseoline	18	3.6
TOTAL	495	100

Table 5: Comparison of Fungi Species Isolated at West End Area of Asaba during 2012 Planting Season West End (Rainy Season)

Fungi	Total no of Times Isolated	Isolated Frequency (%)
Sclerotium rolfsii	90	17.51
Fusarium oxysporum	96	18.68
Curvularia lunata	20	3.89
Alternaria tenius	18	3.50
Penicillium notatum	36	7.00
Cercospora cruenta	22	4.28
Microphomina phaseoline	24	4.67
Rhizoctonia solani	18	3.50
Phyllachora spp.	22	4.28
Albugo spp.	25	4.86
Aspergillus niger	60	11.67
Pyricularia spp.	17	3.31
Cephalophora spp.	12	2.33
Beltraniella spp.	31	6.03
Pleospora spp.	23	4.47
Total	514	100

Table 6: West end (Dry Season)

Table 6, showed the ranges of temperature and humidity during the study period. A very high humidity was recorded during the raining season and a low humidity in the dry season.

	Temp 0°C		Humidity (%)	Rainfall mm
	Max	Min		
2012				
Jan	34.8	19.9	64	0.1
Feb	34.8	24.0	80	20.3
Mar	36.9	25.1	75	20.6
April	34.6	24.3	79	169.5
May	33.7	23.5	82	465.4
June	32.0	23.5	86	269.0
July	30.9	23.2	87	503.2
Aug	30.1	23.1	89	498.5
Sept	31.5	23.4	86	557.1
Oct	32.4	22.8	83	213.4
Nov	35.0	23.4	78	Nil
Dec	35.1	19.9	65	Nil

Table 7: The Meteorological Data of the Study Area as Obtained from Asaba Meteorological Office, Asaba, Delta State

4. Discussion

The results in tables 1,2, and 3 show that there were variations in the frequencies of fungi during the rainy and dry seasons at Ogbegonogo market, cable point market and west end areas of Asaba. The result showed that the spore load was highest in the rainy season. The reason can be ascribed to the variation in the humidity of the study area, which was very high during the raining season and thus favours the growth and dispersal of fungi spores, as compares to a low humidity that was observed in the dry season. As the temperature increases during the dry season, air currents carry spores upward and the spores become more difficult to catch. This observation was supported by the findings of Ogunlana, (1975) who reported that spores' population at the atmosphere was high at the beginning of dry season (October). However, there was gradual decrease in December after which an upward trend was observed.

The most prevalent fungi in the three locations during dry season were *Fusarium oxysporum*, *Collectotrichum* spp, *Aspergillus Niger*, *Sclerotium rolfsii*, *Phytophthora* vignae and *Botryodiplodia theobromae*, while during the rainy season, the most prevalent were *Fusarium oxysporum*, *Sclerotium rolfsii*, and *Collectotrichum* spp. *Cladosporium* spp was recorded in almost all the months of the year with its seasonal maxima in February. The category *Aspergillus niger* were significant over a major part of the year but more so during November-December, this was confirmed by the work of (Janaki, and Subba, 1981). The prevalence of *Curvularia* and *Alternaria* were also observed during the course of this study, the former was more numerous during August-December while the latter showed no such demarcation. This agrees with the findings of Tan, et al. (1992) who reported that the conidia of *Curvularia* and *Alternaria* were perennial in their occurrence. *Curvularia* and *Alternaria* spp has earlier been reported to occur in Nigeria by Ogunlana, (1975). *Curvularia* spp mostly occurs as a facultative or secondary parasite on monocotyledons such as, grasses, sorghum, maize, millet and sugar cane and it is also human allergen Hsiao-Ma, (1996). Upsher, and Griffith (1973) observed warmer conditions favour this fungus and cannot grow well during periods of low minimum temperature. While, *Fusarium oxysporum* was found to occur at a fairly even level in the three locations, throughout the period of assessment.

5. References

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