

Assessment of fungal air spora at Asaba area in Delta State, Nigeria

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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: Ogbegonogo 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 and they include, *Penicillium* spp., *Sclerotium* spp., *Aspergillus* spp., *Fusarium* 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.

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Key words: 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 [1]. 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 [1]. 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 assess 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 [2]. 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 oxysporium* 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.

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>	87	19.55
<i>Sclerotium rolfsii</i>	98	22.02
<i>Aspergillus niger</i>	30	6.74
<i>Cladosperium vignae</i>	15	3.37
<i>Alternaria tenius</i>	8	1.87
<i>Curvularia lunata</i>	6	1.35
<i>Collectrotrichum spp</i>	80	17.98
<i>Penicillium spp</i>	22	4.94
<i>Chlamydozspores spp</i>	19	4.27
<i>Botrodiploidiat heobromae</i>	40	9.01
<i>Phytophthora vigne</i>	40	8.99
TOTAL	445	100

Ogbeogonogo market (Dry 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>Cladosperium vignae</i>	28	4.47
<i>Curvularia lunata</i>	13	2.07
<i>Collectrotrichum spp</i>	68	10.84
<i>Penicillium notatum</i>	17	2.71
<i>Chlamydozspores 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>Microsphomina spp.</i>	6	0.96
TOTAL	627	100

Result as presented in table 2 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).

Table 2: 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 (%)
<i>Sclerotium rolfii</i>	96	26.9
<i>Fusarium oxysporum</i>	90	25.3
<i>Curvularia lunata</i>	6	1.7
<i>Alternaria tenuis</i>	4	1.1
<i>Penicillium notatum</i>	30	8.4
<i>Cercospora cruenta</i>	28	7.8
<i>Microphomina phaseoline</i>	17	4.8
<i>Rhizoctonia solani</i>	14	3.9
<i>Phyllachora spp</i>	23	6.5
<i>Albugo spp</i>	10	2.8
<i>Aspergillus niger</i>	38	10.7
TOTAL	356	100

Cable Point (Dry Season)

Fungi	Total no of times isolated	Isolated frequency (%)
<i>Corynespora spp</i>	8	1.06
<i>Cephalophora spp</i>	4	0.53
<i>Pleospora spp</i>	13	1.73
<i>Fusarium oxysporum</i>	98	13.05
<i>Chaetomium spp</i>	20	2.66
<i>Aspergillus niger</i>	79	10.52
<i>Pyricularia spp</i>	16	2.13
<i>Beltraniella spp</i>	10	1.33
<i>Penicillium notatum</i>	30	3.99
<i>Pythiumaphan idermatum</i>	15	1.99
<i>Colletrotrichum lindemuthianum</i>	108	14.38
<i>Cladosporium vigenae</i>	23	3.06
<i>Sclerotium rolfii</i>	97	12.92
<i>Curvularia lunata</i>	39	5.19
<i>Rhizoctonia solani</i>	48	6.39
<i>Cercospora cruenta</i>	42	5.60
<i>Alternaria tenuis</i>	24	3.19
<i>Botryodiplodia theobomae</i>	26	3.46
<i>Phytophthora vigne</i>	20	2.66
<i>Microcrophomia phaseoline</i>	21	4.12
TOTAL	751	100

Table 3, 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. *Colletrotrichum lindemuthianum* and *Fusarium oxysporum* recorded the highest isolated

frequency of 19, followed by *Sclerotium rolfii* 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.

Table 3: 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 (%)
<i>Penicillium notatum</i>	22	4.4
<i>Pythium aphanidermatum</i>	13	2.6
<i>Aspergillus niger</i>	53	10.7
<i>Colletotrichum lindemuthianum</i>	98	19.8
<i>Fusarium oxysporum</i>	95	19.2
<i>Cladosproum vignae</i>	10	2.0
<i>Sclerotium rolfsii</i>	90	18.2
<i>Curvularia lunata</i>	6	1.2
<i>Rhizoctona solani</i>	42	8.5
<i>Cercospora tenius</i>	13	2.6
<i>Alternaira tenius</i>	5	1.0
<i>Botrodiploia theobromae</i>	15	3.0
<i>Phytophthora vigne</i>	15	3.0
<i>Microphomia phaseoline</i>	18	3.6
TOTAL	495	100

West end (Dry Season)

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

Table 4, 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.

Table 4: The Meteorological data of the study area as obtained from Asaba Meteorological Office, Asaba, Delta State.

2012	Temp 0°C		Humidity (%)	Rainfall mm
	Max	Min		
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

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 Ogbeogonogo 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 carries spores upward and the spores become more difficult to catch. This observation was supported by the findings of [3] 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 vigne* and *Botrodiplochia 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 [4]. The prevalence of *Curvularia* and *Altenaria* were also observed during the cause of this study, the former was more numerous during August-December while the latter showed no such demarcation. This agrees with the findings of [5]

who reported that the conidia of *Curvularia* and *Altenaria* were perennial in their occurrence. *Curvularia* and *Altenaria spp* has earlier been reported to occur in Nigeria by [3]. *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 [6] (Hsiao-man, 1996). [7] observed warmer conditions favourt this fungu and cannot grow well during periods of low minimum temperature. While, *Fusarium oxysporium* was found to occur at a fairly even level in the three locations, throughout the period of assessment.

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