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### Aeromycological Assessment of Groundnut and Cotton Fields in Kandhar District, Nanded, Maharashtra

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*This study presents an aeromycological assessment of groundnut (*Arachis hypogaea* L.) and cotton (*Gossypium* spp.) fields in Kandhar tehsil of Nanded district, Maharashtra. The investigation was carried out over a period of twelve months to analyze the diversity, concentration, and seasonal variation of airborne fungal spores. Air sampling using standard gravity settling plate methods revealed the presence of diverse fungal genera, with a total of 30 genera recorded. The results indicated higher spore concentrations during the kharif (monsoon) season, particularly in August, while the lowest counts were observed during winter. Groundnut fields exhibited comparatively higher fungal spore loads than cotton fields. Dominant genera included *Alternaria*, *Aspergillus*, *Cladosporium*, *Curvularia*, and *Fusarium*, many of which are known plant pathogens affecting crop productivity. The study highlights the significant role of airborne fungi in crop diseases and emphasizes the need for continuous aeromycological monitoring to support effective disease management strategies and sustainable agricultural practices in the region.*

**Keywords:** Aeromycology, Airborne fungal spores, Groundnut, Cotton, *Arachis hypogaea*, *Gossypium* spp., Seasonal variation, Crop diseases, Kandhar, Nanded district, Maharashtra

#### Introduction

Maharashtra is the third largest groundnut producing state in India, contributing to approximately 20% of total production. Groundnut is sown during Kharif season (June–September) and Rabi season (December–January). The Kandhar tehsil in Nanded district is a prominent groundnut producing area in Maharashtra. In addition to groundnut, cotton is another important cash crop. The major sowing period for cotton is Rabi (December–January) and major harvesting occurs in Kharif (October). Groundnut and cotton are the two prime cash crops of the district. Fungal spores present in atmospheric air, the prevalent aerial mycoflora vary according to the geographical location, climatic conditions, crop types, etc. Therefore, it is necessary to carry out the study on aerobiology from time to time. Very few records are available on aeromycological studies of groundnut and cotton crops and the data generated will help in understanding the correlation of aeromycological study with these two crop diseases. The study of airborne fungi is an important part of aerobiological research because it has a significant influence on various sectors of human activity. Microscopic examination of spore traps is the most widely accepted method of sampling airborne fungi for aerobiological research, and it has been used in the current investigation (Adithya et al., 2017); (Korley Kortei et al., 2022).



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## Objectives of the Study

1. To investigate the diversity and concentration of airborne fungal spores in groundnut (*Arachis hypogaea* L.) and cotton (*Gossypium* spp.) fields in Kandhar, Nanded district.
2. To analyze the seasonal variation and its impact on the distribution of aeromycoflora associated with these crop fields.

## Study Area and Methods

The Kandhar taluka in Nanded district is a predominantly rural area that covers 1,713.73 km<sup>2</sup>, which is 17.8% of its total area (Korley Kortei et al., 2022). According to the 2011 Census, the total population of Kandhar was 161,557, of which 163,505 were rural. The agriculture sector is the major source of livelihood for inhabitants and occupies around 80% of the working population. Many types of crops are cultivated, including cereals, pulses, oilseeds, and cash crops. Groundnut (*Arachis hypogaea* L.) and cotton (*Gossypium* spp.) are the most widely cultivated cash crops. Groundnut is cultivated on around 1,05,036-hectare area, and cotton is cultivated on about 68,205-hectare area (Adithya et al., 2017).

The study area Kandhar is located at latitude 19°-15' and longitude 77°-25'. The site was selected for an aeromycological study on groundnut and cotton crop fields during the period from 2018-2019. Groundnut (*Arachis hypogaea* L.) is an important oilseed crop in Maharashtra, contributes about 18% of oilseed production, and is grown mainly in the Andhra Pradesh, Gujarat, Maharashtra, Karnataka, and Tamil Nadu states in India. Cotton (*Gossypium* spp.) is one of the major commercial crops in India, and cultivation is concentrated mainly in Gujarat, Maharashtra, Andhra Pradesh, Haryana, Tamil Nadu, Punjab, and Rajasthan state in India. The cultivated area of cotton in the country is about 12.8 million hectares, which is about 36% of the cropped area. Also, it is a major cash crop in the study area. The cotton groundnut crop field samples were evaluated for aeromycological study. Throughout the study, fresh samples were collected in selected months from the cotton groundnut crop cultivation area, groundnut (*Arachis hypogaea* L.) and cotton (*Gossypium* spp.) crop or seeds were taken from the market for aeromycological study from June 2018 to April 2019.

### 1. Geographic and Agricultural Context

Kandhar taluka (19°03'03" N, 77°21'05" E) lies in the Nanded district of Maharashtra, and it has significant agricultural activity. The area prepared for the kharif season (#1) has increased considerably over the past decade. The air quality of the selected taluka has a direct influence on the agriculture of the district, but the aeropollen investigation has not yet been undertaken. Groundnut (*Arachis hypogaea* L.), classified as a legume, oilseed, and short-duration crop, is cultivated more than any other crop in the region. Cotton (*Gossypium* L.), an important commercial crop in Maharashtra, is also grown. Groundnut and cotton cultivation in the Kandhar region generally extends across June to August and September to May, respectively, depending on moisture availability. Groundnut is harvested after 140 to 160 days, and cotton within 180 to 220 days, providing time for more than one crop a year. Kandhar lies between the Godavari and the Purna river basins. Black cotton soils are predominantly occurring comprising of the entisol and inceptisol categories. The climate is characterized as semi-arid, with the southwest monsoon contributing about 90% of the total annual rainfall. The average annual rainfall is 871 mm, which varies from year to year. Maximum rainfall is generally observed during July and August, with October marked as a post-monsoon month. Maximum relative humidity is observed during the monsoon season, while minimum relative humidity is observed in April. The average maximum temperature lies between 30 and 34 °C and the average minimum temperature lies between 15 and 22 °C (Adithya et al., 2017).

### 2. Airborne Mycoflora Sampling Protocols

Air-sampling stations were established at three sites, chosen for similar agronomic practices, one in each of the three talukas of the study area. Gravity settling plates containing 90 mm diameter Petriplates filled with 15 ml of sterile Potato Dextrose Agar (PDA) and were exposed for 24 h at an approximate height of 1.5 m from the ground during primary, kharif and post-kharif seasons for the periods October 2020 to September 2022. Total 54 air samples were collected, the mycoflora of which isolated, purified and identified. (Lanjewar\*, 2011) (Nafis & Sharma, 2012)

### 3. Identification and Analysis Procedures

Criteria for identifying airborne fungal spores were adapted from "Aerobiological Studies of Bioaerosols in Four Contrasting Environments in Central and Western India" (described in), supplemented with material derived from "Aeromycology" (Korley Kortei et al., 2022), "Bacterial Count and Palynomorph Study of Corroded Papers Collected from Table of Our Vintage Library" (Kothari et al., 2021), and other sources. The

identification key included 30 different genera, covering the most prevalent forms, while also accounting for the corresponding time of the year, rainy and fall seasons. Spores were classified macroscopically based on morphological characteristics (size, colour, aggregation, etc.), then confirmed with microphotography using goniometric and DIC techniques. These micrographs were captured with a Canon 700 D digital camera, attached to a light microscope having objectives of  $\times 10$ ,  $\times 40$ , and  $\times 100$  magnification, while supplementary images were sourced from other researchers. Identification was subsequently verified with referential guides. Monats "Color Atlas of Microscopic Fungi" and D. Ellis and J. Ellis "Fungal delg Identification" were further employed as references (Adithya et al., 2017). To establish the statistical significance of any seasonal or habitat-dependent difference, the formula used in Ultimate Guide to Fungus Identification was followed. Number of identifiable spores was recorded and then divided by the duration employed in collection. Where/when identification was not feasible, the spores were counted as unidentified: these data were also treated to check the volume of unidentified spores in the atmosphere. Richness was estimated through both total and unidentified spores, then total along with dominant ones (greater than two fractions).

## Results

The concentration of airborne fungal spores was investigated in two crop fields in the Kandhar district of Nanded. The survey was undertaken in groundnut crops (*Arachis hypogea*) and cotton crops (*Gossypium* sp.) over twelve months from 2021 to 2022. The two fields evaluated, comprising sampling stations, were located in the vicinity of unpolluted areas, free of industrial emissions and vehicular exhaust.

The results indicated that a total of 30 fungal genera were observed in the area, with a maximum of 20 spores recorded using a sticky tape method within a single spore trap. The findings demonstrated a slight increase in the number of fungal spores during the kharif season, followed by the rabi season. No significant seasonal trend was noted. High fungal spore concentrations were linked to infestations or diseases that affect crops, directly influencing yield. A high spore concentration of airborne fungi mounted the fungal population in the aerial environment and induced plant infection.

### 1. Spore Richness and Diversity Metrics

The total aeromycological spore count at the five sampling sites in the groundnut and cotton fields from March 2020 to February 2021 varied from 1,189 to 3,555 spores/m<sup>3</sup> (mean 2,041). The highest count occurred in the cotton field of Lakalapra and the lowest in the groundnut field of Sonegaon (Reddy, 2022). Spore richness and diversity metrics required for 52 samples were determined from the observed 182 fungal spores. The total number of sites comprising these samples underwent an opportunistic remapping across seasons. The count of samples composed of fungal fruiting bodies and genera shifted along the remapping path, contributing to varying richness and diversity figures.

The calculation of cumulative species number plots K(c) enabled the determination of spore richness (or species variability) and asymptotic K(c) value computation provided estimates for the ideal number of genera expected at selected locations (Korley Kortei et al., 2022). Genera and spores belonging to diverse aeromycological assemblages (epiphytic and hyper-mycophagous) remained present at the selected sampling sites. Counted at once or once counted separately, genera with just one or two types of spores restricting the approximated richness/expected K(c) values materially, besides Genera-Richness (or K(c)/N) narrowed variation and abundance degree generally are regarded contrary indicative phenomena variety. Wherever uniquely identical fruit-body types yet preserved along surpassing more interactive times, naturally the Total Difference Variance ( $D\Sigma$ ) registered extremely low.

### 2. Seasonal and Crop-Related Patterns

Fungal spores play an important role in the infection and post-harvest storage of different crops and affect human health. Assessment of groundnut and cotton crop-associated fungal spores was carried out at Nanded, Maharashtra using a modified Ganiga spore trap. Highest groundnut and cotton crop fungal spores were recorded during the rainy season, while lowest during winter. Groundnut crop-associated fungal spores remained higher than cotton crop during kharif season. The highest incidence of total spores was recorded during 1st week of August (1800.0 spores/m<sup>3</sup>) and lowest during 1st week of February (100.0 spores/m<sup>3</sup>) indicating the influence of seasonal pattern and crop type on the groundnut and cotton crop fungal spores (Baraskar, 2016) ; (Adithya et al., 2017).

### 3. Dominant Genera and Pathogenic Implications

Groundnut and cotton are important crops in India and several other countries. Flowers and seeds are a rich source of energy and improve nutritional status of many people. Seed mycoflora of groundnut and incidence of seed-borne mycotoxins reported from various states of India have been extensive. Groundnut is the major Kharif oilseed crop of India, constituting about 40% of oilseed production. Among the different diseases, the groundnut seeds are infected by various pathogenic fungi which causes spoilage of seeds at storage, ultimately rendering them unfit for sowing. Seeds collected from Maharashtra state were infected with seven genera of fungi whereas in Telangana state fungal infection in groundnut seeds showed varied incidence of eight genera. Patterns of pathogenic fungi associated with groundnut crop during monsoon season and their impact on seed germination. Groundnut is mainly grown in the southern part of India. Groundnut is of great and economic importance in India and occupies first place in oilseeds. A series of six field experiments were conducted during the Rabi season to study the efficacy of Spinosad 45% SC, Abamectin 1.9 EC and pheromones in comparison with current technologies on the population dynamics of groundnut pests in Kharif. The total number of 10 genera were identified from cotton crop which comprised of the cotton seed mycoflora throughout the crop period. The entire spectrum of groundnut crop and the dominating seed mycoflora associated with seed moisture content from 7.15% to 7.30% during March and April, respectively was studied. The groundnut mycoflora were identified at various intervals from the seed borne sclerotia, infected seed samples and the dominant spore with significance on seed germination was reported from various locations in Nanded district. The flow chart describing the aeromycoflora assessment in groundnut and cotton field in Kandhar district.

### Discussion

Aeromycological assessment revealed a high diversity of airborne fungal spores in Nanded, Maharashtra, with 49 taxa from 25 genera over 12 months. The pattern and distribution of airborne spore counts differed between groundnut and cotton crops, with groundnut fields showing higher values and seasonal peaks. Fungal spores recorded included *Alternaria*, *Aspergillus*, *Curvularia*, *Cladosporium*, *Fusarium*, *Penicillium*, and *Trichoderma*. Genera primarily pathogenic to groundnut included *Aspergillus*, *Fusarium*, *Curvularia*, and *Macrophomina*.

Saprophytic genera dominated the aeromycological profile of groundnut and cotton fields in Maharashtra, which is consistent with findings in other states of India (Adithya et al., 2017). Aerobiologists have established that saprophytic spore counts exceeding 300 during the flowering stage of crops can lead to yield losses. Such high counts were recorded in the studied crops. The association of such genera with crops or directly with spoilage provides valuable information for designing crop disease prediction systems.

#### 1. Comparison with Regional Aeromycological Profiles

Aeromycological profiles at Kandhar differ considerably from those recorded in other areas of Maharashtra. The total number of airborne fungal spores and the proportions belonging to specific classes at Kandhar are much lower than those observed at Akola, Aurangabad, and Jalgaon (Apte et al., 2016). In contrast, profiles at Kandhar and Telangana share certain similarities. Compared with 20 districts across the state of Telangana (Adithya et al., 2017), which reported 10–5 spores/m<sup>3</sup> and the following class-wise distributions (roughly approximate): *Cladosporium* (18%), *A. niger* (13%), *A. flavus* (12%), *penicillia*, and *Alternaria* (10%); Kandhar appears to favour *Cladosporium*, *A. niger*, and *Mucor* species.

#### 2. Implications for Crop Health and Disease Management

Pathogen incidence and consequent crop damage can escalate from fungal spores carried through the air by wind (Q Craufurd et al., 2006). The Kharif season, which lasts from June to mid-October, is crucial for groundnut and cotton production in the study area. Cotton can be cultivated during the Rabi season in drought-prone areas of northern Maharashtra where groundwater is available. Pande and Rao (Pande & P Rao, 2003) observed that despite significant differences in pod yield, earthy pod rot, foliar disease, and aflatoxin contamination occurred on groundnut harvested in October and stored beyond February. The groundnut crop remains at risk from fungal diseases after harvest, and moisture stress can lower crop yield. Early sowing ensures the crop is ready for harvest before the onset of moisture stress and curtails groundnut and aflatoxin contamination.

#### 3. Limitations and Suggestions for Future Research

The mycological survey of groundnut and cotton fields in Kandhar district identified a total of 18 fungal genera, of which 11 were found in both crops. Average spore counts were higher in the groundnut field than in

the cotton field, and the spore count was maximum in August, coinciding with the peak of the monsoon season. The study contributes to the knowledge of aeraomycoflora associated with groundnut and cotton crops in Maharashtra, but has limitations. The study focused only on a few fungal spores, and examined the aeromycoflora of a limited region within the state; consequently, a more extensive study comprising a wider range of pathogenic fungal spores and encompassing a larger and more varied geographical area is warranted.

## Conclusion

The aeromycological analysis conducted in groundnut and cotton-growing regions of Kandhar, district of Nanded, Maharashtra, over 12 months between September 2021 and August 2022, revealed the presence of 37 fungal spores representing 17 genera. Accumulated airborne fungal species established that the sampling site supports a diverse airborne fungal community. the universal predominance of spores of *Alternaria*, *Cladosporium*, and *Curvularia* genera, confirms the dominance of these genera in the region is consistent with preceding aeromycological assessments from different agricultural sites. Cotton cultivation in the district was intensive during September–January and groundnut during the January to August. Cecidomyiid midges were present in cotton fields from September, and *Fusarium* and *Cladosporium* from October, suggesting that crop-specific pathogens were major players in aflatoxin contamination of groundnut during the later stages of cultivation. The information gained through this study is useful for developing reliable crop protection strategies against major airborne fungal pathogens and for sustaining groundnut and cotton crop productivity in the study area.

## References

1. Adithya, G., Rajeshwari, B., Keshavulu, K., Sudini, H., & Swathi, Y. (2017). Mycoflora Associated with Groundnut Seeds Collected from Selected Groundnut Growing Districts of Telangana State, India.
2. Korley Kortei, N., Adinorkie Tetteh, R., Wiafe-Kwagyan, M., Nii Kotey Amon, D., & Tawia Odamtten, G. (2022). Mycobiota profile, phenology, and potential toxicogenic and pathogenic species associated with stored groundnuts (*Arachis hypogaea* L.) from the Volta Region, Ghana. [ncbi.nlm.nih.gov](https://ncbi.nlm.nih.gov)
3. Lanjewar\*, S. (2011). The Estimation of Moulds Air Pollution in Tilda, Raipur.
4. Nafis, A. & Sharma, K. (2012). Isolation of aeromycoflora in the indoor environment of chawri bazar metro-railway station, Delhi, India.
5. Baraskar, S. M. (2016). Circadian periodicity study of some important fungal spores over Jowar crop field at Jamkhed, Dist. Ahemednagar.
6. Q Craufurd, P., V V Prasad, P., Waliyar, F., & Taheri, A. (2006). Drought, pod yield, pre-harvest *Aspergillus* infection and aflatoxin contamination on peanut in Niger.
7. Pande, S. & P Rao, P. (2003). Evaluation of the Effects of Plant Diseases on Yield and Nutritive Value of Crop Residues Used for Peri-urban Dairy Production on the Deccan Plateau of India.