Advances in Bioresearch
Adv. Biores., Special Issue 1 -2025: 84-88

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL: http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.SPL1.8488

Advances in Bioresearch

Remarkable fungal biodiversity on *Arachis hypogea* L. field at Dhule, Maharashtra, India.

Vilas Patil[1], Avinash Ade[2], Pratik Shinde[3*], Sarita Shinde[4]
[1]Dr. B. N. Purandare Arts and Smt. S.G. Gupta Commerce and Science College, Lonavala, Pune - 410403.
[2]Department of Botany, Savitribai Phule Pune University, Ganeshkhind, Pune - 411007.
[3*]Department of Botany, Prof. Ramkrishna More ACS College, Akurdi, Pune - 411044.
[4]Department of Botany, JET's Zulal Bhilajirao Patil College Dhule - 424002
Corresponding Author: Pratik Shinde
Email: shinde.pratik16@gmail.com

ABSTRACT
Groundnut (Arachis hypogea L.) accounts for almost half of India's oil seed area, making it the country's one of most important oil seed crop. Plants of the genus A. hypogea L. are susceptible to suffering from fungal diseases. A purposeful and random sampling was done to record the course of two consecutive kharif seasons in 2022 and 2023, the current aerobiological study was conducted over the A. hypogea L. Var. TAG-24 fields in four talukas of the Dhule district. These talukas are Dhule, Sakri, Shirpur, and Shindkheda. When doing the survey, a volumetric Tilak air sampler is utilized to ascertain the fungal concentration that is present in the crop. It always maintains a height of 0.75 meters and is positioned in the middle of the groundnut field. Over sixty distinct fungal spore species, belonging to five different divisions such as Basidiomycota, Ascomycota, Oomycota, Mucoromycota, and Myxomycota, eleven classes, and more than fifty-five families, were found to be concentrated in a single region under the observation of aerobiological monitoring. Over the course of the kharif seasons, meteorological information was maintained at a current level.
Keywords: *Air spora; Aerobiology; Arachis hypogaea; Groundnut; Fungal Spores, Basidiomycota, Ascomycota.*

Received 24.09.2024 **Revised 30.11.2024** **Accepted 11.12.2024**

How to cite this article:
Vilas Patil, Avinash Ade, Pratik Shinde, Sarita Shinde . Remarkable fungal biodiversity on Arachis hypogea L. field at Dhule, Maharashtra, India. Adv. Biores., Special Issue 1 -2025: 84-88

INTRODUCTION

The present study is all about the qualitative analysis of air spore found in one of the most important oil seed crops *Arachis hypogea* L. this analysis is unique in its own way because, it is found that only one aerobiological survey is carried by Dr. M. T. Bhadane in over 34 years back at Dhule city [1]. Microorganism shows important relationship with crops where they are found on, characteristics of Gram-positive and filamentous bacteria were seen in actinomycetes that were isolated from the rhizospheric areas of *Arachis hypogea* L. and *Gossypium herbaceum* L. The isolates demonstrated the capacity to effectively utilize a wide range of nutritional sources present in the rhizosphere [2]. The research revealed that the predominant species of arbuscular mycorrhizal fungi (AMF) indigenous spores in the rhizosphere of peanuts were *Glomus sp*, *Acaulospora* sp, and *Glomus* sp. The elevation level, population size, and percentage of infection were found to be linked with the type of infection [3]. Uncultivated varieties of the *Arachis* genus exhibited higher resistance to fungal infections compared to farmed peanuts. Some wild accessions exhibited comparable or superior resistance to *A. cardenasii*. [4]. The etiological agent responsible for leaf spot in peanut plants in China is *Cladosporium tenuissimum*. The presence of *C. tenuissimum* infection presents a significant risk to both the quantity and quality of peanut production [5]. Hydrolysis of peanut protein concentrates by fungal crude protease extract affects structural, functional, and in-vitro protein digestibility properties. Hydrolysis with crude extract from *Aspergillus oryzae* showed the highest solubility, water and oil binding capacity, foaming capacity, foam stability, and in-vitro protein digestibility [6]. The experimental treatments NLEFS, DLEFS, DebLEFS, and BBSFS exhibited superior efficacy in managing leaf spot and enhancing pod yield. Based on the data, BBSFS were having the highest overall profit and Benefit-Cost Ratio (Hasan et al., 2016). *Pseudomonas fluorescens* and *Trichoderma viride* can be used to biologically control Fusarium wilt disease in peanuts. The efficacy of Pseudomonas fluorescens in

regulating the growth of *Fusarium oxysporum* was found to be superior, leading to elevated amounts of chlorophyll and carotenoids [7]. *Aspergillus niger, Fusarium solani, Rhizopus stolonifer*, and *Aspergillus flavus* are common pathogenic fungi causing rot in groundnut seeds. Ethanolic *Azadirachta indica* extracts have more inhibitory compounds than aqueous extracts [8]. Arsule and Pande studied fungal airspora over the groundnut fields at Newasa (M.S.) for two consecutive Kharif seasons by employing Tilak volumetric air sampler [1, 2]. Fungal spores are prevalent in *Arachis hypogaea* L. fields and can have an impact on crop yield. Various fungal pathogens, such as *Passalora arachidicola, Aspergillus flavus, A. niger, A. fumigatus, A. nidulans, Fusarium oxysporum, Sclerotium rolfsii, Rhizoctonia bataticola, Curvularia lunata, Alternaria alternata,* and *Rhizopus stolonifer*, have been detected in groundnut fields[9]. These fungal pathogens can cause diseases like early leaf spot and aflatoxin contamination, leading to reduced yield and quality of the crop [10, 11]. However, the prevalence and impact of fungal spores on crop yield can be mitigated through various strategies. For example, the colonization of the endophytic fungus *Phomopsis liquidambaris* has been found to promote nodulation and increase rhizosphere nitrogen availability, resulting in improved overall nitrogen utilization and yield stabilization [12]. Additionally, the use of improved peanut varieties, such as ICGV-SM 90704, has shown lower disease rates, lower levels of aflatoxins, and higher yields compared to locally used varieties.

MATERIAL AND METHODS

For current study air sampling is done using Tilak Air sampler for Plants kharif and summer seasons from the year 2022 and 2023 at Dhule, Sakri, Shirpur and Shindkheda Taluka regions (**Figure 1**). Preparation and scanning of slides is done with the help of PVLG and Motic (Compound Microscope) respectively. Airspora were identified based on spore morphology (the physical characteristics of spores). While spore morphology involves examining the shape, size, colour, and other features of spores produced during asexual or sexual reproduction. For comparison the crop land characters were examine for some values such as pH, Av. Nitrogen, Av. Phosphorus, Av. Potassium (Table-1).

Figure 1 Area of Study: Dhule District, Maharashtra (India)

Table 1 Varieties used for respective seasons with sampling days

Sr No.	Place	Season	Varieties	Total No. of Sampling Days
1	Dhule	*K 1	SB-11	129
2		*K 2	SB-11	126
3		*S 1	TAG-24	119
4		*S 2	TAG-24	123
5	Sakari	*K 1	SB-11	129
6		*K 2	JL-24	126
7		*S 1	TAG-24	123
8		*S 2	TAG-24	119
9	Shindkheda	*K 1	JL-24	125
10		*K 2	JL-24	126
11		*S 1	TAG-24	119
12		*S 2	TAG-24	127
13	Shirpur	*K 1	JL-24	125
14		*K 2	JL-24	126
15		*S 1	TAG-24	119
16		*S 2	TAG-24	128

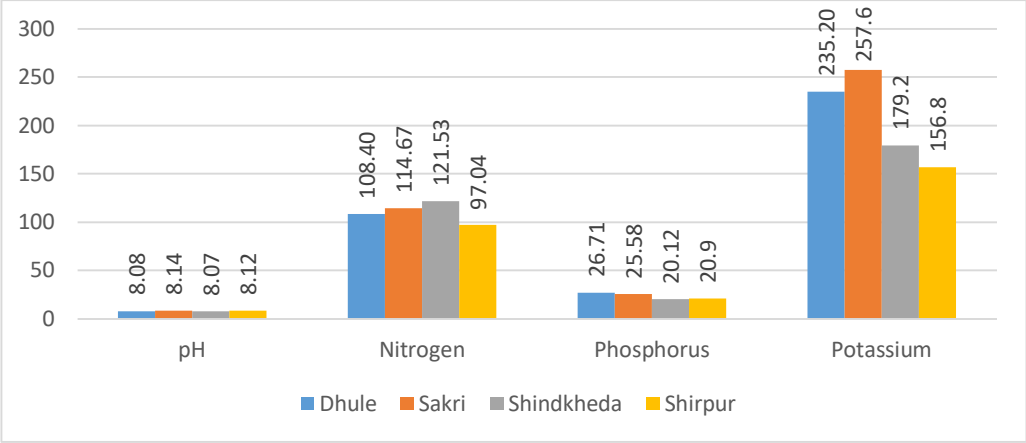

Figure 2 Average pH and NPK Lavels in study area

RESULTS AND DISCUSSION

The presence of fungal spores in *Arachis hypogaea* L. fields can have a negative impact on the quality of the peanuts produced. Fungal diseases, such as groundnut seed rot caused by organisms like *Aspergillus niger, Fusarium solani, Rhizopus stolonifer,* and *Aspergillus flavus,* can lead to rot incidences and reduce the yield of peanuts [13]. These fungi are not only a constraint to peanut production but also pose health hazards for human consumption [14]. Aflatoxin contamination, primarily caused by *Aspergillus flavus*, is a major concern in groundnut cultivation as it affects the quality and safety of the peanuts [15]. To mitigate the impact of fungal diseases, various approaches have been explored, including cultural management, disease-resistant cultivar development, and the use of plant extracts like neem to control fungal growth [3, 5, 12]. Additionally, the use of arbuscular mycorrhizal fungi (AMF) has shown potential in improving yield and yield components in peanuts. Overall, managing fungal spores in peanut fields is crucial for ensuring the quality and safety of the peanuts produced. The study demonstrates a wide range of fungal spores. The divisions encompassed within this taxonomic classification are Deuteromycota, Zygomycota, Ascomycota, Basidomycota, and Myxomycota. The investigation of groundnut cultivation in the talukas like Sakari, Shirpur, and Shindkheda of Dhule District is totally new. Air spora from groundnut field ware studied in 1990 at Dhule taluka of Dhule district. The aerobiological diversity in ground nut fields in areas such as Sakri, Shindkheda, and Shirpur of Dhule district is being examined and reported for the first time. The study revealed that there was a greater variation in the number of spores or fungal hyphae under high humidity circumstances. However, modest differences for presence of spores were noted in all four locations due to variations in climatic parameters. The kharif season months (July-November) had the highest spore count compared to the summer season. Four different types of groundnut seeds, namely Gujrat, Western, Ghungroo, and Local, were obtained from several markets in the state of Madhya Pradesh. The mycoflora present in these seeds was extracted using both the usual blotter paper method and the agar plate method. The seeds in all four kinds demonstrated a higher amount of fungus, accompanied by a greater proportion of incidence. The major fungi identified in the study were *Aspergillus flavus, A. niger, Fusarium oxysporum, Macrophomina phaseolina,* and *Penicillium* sp. A greater quantity of fungus was obtained through the utilization of the agar plate approach in comparison to the conventional blotter paper method. The use of HgCl2 for surface sterilizing decreases the occurrence of *Aspergillus flavus* and *Aspergillus niger* [16].

The prevailing strain of peanut rhizobia in Henan Province, China is *Bradyrhizobium guangdongense*. The occurrence of various strains is correlated with soil pH and the availability of phosphorus [17].

Table 2 Fungal spores were observed in study area.

Sr. No.	Spore Name	MycoBank #
Ascomycota		
1.	*Aspergillus P. Micheli Ex Haller*	7248
2.	*Alternaria Nees*	7106
3.	*Arthrinium Kunze*	7214
4.	*Beltrania Penz.*	7355
5.	*Bispora Corda*	7377
6.	*Botryodiplodia Sacc.*	7420
7.	*Cephaliophora Thaxt.*	7518
8.	*Ceratophorum Sacc.*	7534
9.	*Cercospora Fresen. Ex Fuckel*	7545
10.	*Chaetomella Fuck.*	7575
11.	*Cladosporium Link.*	7681
12.	*Cordana Preuss.*	7777
13.	*Corynespora Güssow.*	92201
14.	*Curvularia Boed.*	7847
15.	*Deightoniella S. Hughes.*	7934
16.	*Dictyoarthrinium Hughes.*	7993
17.	*Dictyosporium Corda.*	8001
18.	*Diplodia Fr.*	8047
19.	*Epicoccum Link.*	8188
20.	*Fusariella Sacc.*	8282
21.	*Fusarium Link.*	8284
22.	*Haplosporella Speg.*	8441
23.	*Harknessia Cook.*	8449
24.	*Helminthosporium Link.*	8495
25.	*Heterosporium Klotzsch.*	8529
26.	*Lacellina Sacc.*	8693
27.	*Memnoniella Höhnel.*	8900
28.	*Nigrospora Zimm.*	9124
29.	*Periconia Tode.Ex Schw.*	9263
30.	*Pestalotia De Not.*	9271
31.	*Pithomyces Berk.*	9412
32.	*Pseudotorula Subram.*	9620
33.	*Pyricularia Sacc.*	9670
34.	*Spegazzinia Sacc.*	9963
35.	*Sporidesmium Link.*	10024
36.	*Tetraploa* Berk. & Br.	10199

Sr. No.	Spore Name	MycoBank #
37.	*Torula (Pers) Link. This*	10248
38.	*Trichothecium Link.*	10303
39.	*Amphisphaerella (Sacc.) Kirsch.*	261
40.	*Ascotricha Berk*	384
41.	*Bitrimonospora Sivanesan, Talde & Tilak*	587
42.	*Chaetomium Kunz. Ex. Fr.*	953
43.	*Claviceps Tul.*	1092
44.	*Cucurbitaria Gray.*	1348
45.	*Didymosphaeria Fuckel.*	1562
46.	*Hypoxylon Bull. Ex Fr.*	2456
47.	*Hysterium Tode. Ex Fr.*	2464
48.	*Lophiostoma Ces. & De Not.*	2933
49.	*Massarina Sacc.*	3016
50.	*Melanospora Corda.*	3085
51.	*Nodulosphaeria Rabh.*	3517
52.	*Otthia Nke.*	3656
53.	*Pleomassaria Speg.*	4214
54.	*Pleospora Rabh.*	4233
55.	*Sordaria Ces. & De Not.*	5061
56.	*Valsaria Ces. & De Not*	5704
Basidiomycota		
57.	Basidiospores	
58.	Ganoderma Karst.	17639
59.	Smut Spores	
Mucoromycota		
60.	*Cunninghamella Matr.*	20150
61.	*Mucor Micheli Ex. Fr.*	20348
Myxomycota		
62.	*Physarum Pers.*	12178
63.	*Stemonitis Roth, Mag.*	1787
Oomycota		
64.	*Albugo Pers. Ex. S. F. Gray.*	20015
65.	*Phytophthora De Bary.*	20418
66.	*Scelerospora (Sacc.) Schroet.*	20514

Effective management strategies for controlling fungal spores in *Arachis hypogaea* L. fields include the use of recommended fungicides [18]. Planting moderately resistant varieties can also reduce the need for fungicide application and associated expenses [19]. Integrated management approaches, which consider all available pest control techniques, are preferred for managing agricultural pests [20]. Biological control, such as the use of native bacterial and fungal bio agents, has shown to be beneficial in reducing the reliance on agricultural chemicals [21]. Additionally, the application of plant extracts, such as neem extracts, has demonstrated inhibitory effects on fungal mycelial growth [4]. Soil application of mineral nutrients, particularly copper and potassium, has also been effective in reducing disease incidence and increasing pod yield. Therefore, a combination of these management strategies, including the use of fungicides, resistant varieties, biological control agents, plant extracts, and soil amendments, can help control fungal spores in *Arachis hypogaea L.* fields.

REFERENCES

1. Arsule, C. S. (2012). *Monitoring of Airborne Bioaerosols Over Groundnut Fields at Newasa Dist Ahmednagar* [Dr. Babasaheb Ambedkar Marathwada University]. http://hdl.handle.net/10603/98865
2. Arsule, C. S., & Pande, B. N. (2010). Incidence of Alternaria spores in the atmosphere over groundnut field at Newasa. *National Journal of Life Science*, *7*(3), 117–119.
3. Bajaya, T., Ghasolia, R., Bajya, M., Shivran, M., & others. (2022). Management of collar rot of groundnut (Arachis hypogaea) by fungicides and mineral nutrients. *Indian Journal of Agricultural Sciences*, *92*(2), 273–277. https://doi.org/10.56093/ijas.v92i2.122251
4. Bhadane, M. T. (1990). *Aerobiology studies at Dhulia II Groundnut* [Dr. Babasaheb Ambedkar Marathwada University]. http://hdl.handle.net/10603/105076
5. Chigoziri, E., & Temitope, O. B. (2020). Assessment of fungi incidence, seed germination and aflatoxin contamination of groundnut *(Arachis hypogaea L.)* from Lagos, Nigeria. *11*(3), 216–223. https://doi.org/10.30574/GSCBPS.2020.11.3.0185
6. Debele, Solomon, Ayalew, & Amare. (2023). Review on the Integrated Management of Cercospora Leaf Spot of Groundnut (Arachis Hypogaea L.) Through Host Resistance And Fungicides. *Journal of Biology, Agriculture and Healthcare*. https://doi.org/10.7176/jbah/13-10-02
7. Geng, Y.-F., Wang, J., Zhang, J., Chen, G., Yu, J., Li, Y., & Ma, L. (2022). First report of Cladosporium tenuissimum causing leaf spot of *Arachis hypogaea* in China. *Plant Disease*. https://doi.org/10.1094/PDIS-11-21-2461-PDN
8. Hasan, M. M., Hossain, I., Kashem, M. A., Mondal, M. M. A., Rafii, M. Y., & Latif, M. A. (2016). Effect of botanicals and biofungicide on controlling tikka disease (Cercospora sp.) of groundnut (Arachis hypogea L.). *Legume Research*, *39*(1), 114–122. https://doi.org/10.18805/LR.V39I1.8874
9. Jogdand, S. K., & Talekar, S. M. (2010). *Fungal population on seeds of Arachis hypogea L.*
10. J.S. Mehta, B. A. J. (2022). Biochemical And Physiological Characterization of Actinomycetes Isolated from Rhizospheric Regions In The Soils of *Arachis Hypogea* L. and *Gossypium Herbaceum* L. Near the Gir Wildlife Sanctuary. *Journal of Pharmaceutical Negative Results*, 267–273. https://doi.org/10.47750/pnr.2022.13.s08.40
11. Kakad, S. A., Parate, R. L., Bramhankar, S. B., Pillai, T., Isokar, S. S., Ss, B., Ravali, T., & Dinkwar, G. T. (2019). Association of seed borne mycoflora of groundnut. *International Journal of Chemical Studies*, *7*(1), 1945–1948. https://www.chemijournal.com/archives/2019/vol7issue1/PartAH/7-1-147-169.pdf
12. Keerthana, S., Srinivas, T., Devi, R., & Vidhya, A. (2022). Integrated management of dry root rot of Arachis hypogaea caused by *Rhizoctonia bataticola*. *Research on Crops*, *23*(2). https://doi.org/10.31830/2348-7542.2022.061
13. Kiri, A. S., Zakari, B. G., & Isa, A. H. M. M. (2023). Postharvest Management of Fungal Rot Agents of Groundnut (Arachis hypogea L.) Using Leaf Extracts of Neem (*Azadirachta indica*). *Asian Plant Research Journal*, *11*(3), 13–21. https://doi.org/10.9734/aprj/2023/v11i3211
14. Kumar, V., Pandey, A. K., & Kumar, R. (2023). Survey and studies on fungal diseases of groundnut (Arachis hypogaea L.) and their management in eastern U.P. *International Journal of Plant Sciences*, *18*(1), 45–50. https://doi.org/10.15740/has/ijps/18.1/45-50
15. Lakshmi, J. S., Kuberan, T., Anburaj, J., Sundaravadivelan, C., Kumar, P., & Dhanaseeli, M. (2011). Effect of plant growth promoting fungal inoculant on the growth of arachis hypogea (L.) and it's role on the induction of systemic resistance against *Rhizoctonia solani*. *Asian Journal of Biological Sciences*, *6*(1), 131–139.
16. Marizal, S., Muzakir, & Syariyah, A. (2017). The Diversity of Arbuscular Mycorrhiza Fungus (AMF) Indigenous in Peanuts (Arachis Hypogea L) Rhizosphere under Different Elevation. *Journal of Tropical Soils*, *21*(2), 109–114. https://doi.org/10.5400/JTS.2016.V21I2.109-114
17. Michelotto, M. D., Barioni, W., Resende, M. D. V. de, Godoy, I. J. de, Leonardecz, E., & Fávero, A. P. (2015). Identification of Fungus Resistant Wild Accessions and Interspecific Hybrids of the Genus Arachis. *PLOS ONE*, *10*(6). https://doi.org/10.1371/JOURNAL.PONE.0128811
18. Njoki, L. M., Okoth, S., Wachira, P., Ouko, A., Mwololo, J. K., Rizzu, M., Oufensou, S., & Amakhobe, T. (2023). Evaluation of Agronomic Characteristics, Disease Incidence, Yield Performance, and Aflatoxin Accumulation among Six Peanut Varieties (*Arachis hypogea* L.) Grown in Kenya. *Toxins*, *15*(2), 111. https://doi.org/10.3390/toxins15020111
19. Rajeswari, P. (2014). Management of Wilt of Arachis hypogea (Groundnut) Caused by *Fusarium oxysporum* with Trichoderma spp. and Pseudomonas fluorescens. *Journal of Biological Control*, *28*(3), 151–159. https://doi.org/10.18311/JBC/2014/14949
20. Santis, M. A. De, Campaniello, D., Tozzi, D., Giuzio, L., Corbo, M. R., Bevilacqua, A., Sinigaglia, M., & Flagella, Z. (2023). Agronomic Response to Irrigation and Biofertilizer of Peanut (*Arachis hypogea* L.) Grown under Mediterranean Environment. *Agronomy*, *13*(6), 1566. https://doi.org/10.3390/agronomy13061566
21. Zhang, J., Peng, S., Li, S., Song, J., Brunel, B., Wang, E. T., James, E. K., Chen, W., & Andrews, M. (2021). Arachis hypogaea L. from Acid Soils of Nanyang (China) Is Frequently Associated with *Bradyrhizobium guangdongense* and Occasionally with *Bradyrhizobium ottawaense* or Three *Bradyrhizobium* Genospecies. *Microbial Ecology*, 1–9. https://doi.org/10.1007/S00248-021-01852-2