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ANALYSIS OF AIR SPORA FOUND IN TWO ECOLOGICALLY DIFFERENT LOCATIONS OF SAME CROP ARACHIS HYPOGEA LINN.

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ABSTRACT:
Air contains particles of plants and animal origin which is called air spora. Earlier studies of air spora was done exposing sticky surface but due to its low efficiency has led to the development of suction trap and later on Tilak and Kulkarni discover "Volumetric continuous Tilak Air sampler". Glycerine jelly was used for better visuals. This article elaborates the comparative study of two different locations Newasa and Dhule, it is found that there is difference not only in between humidity, temperature, rain fall and wind velocity but also in air spora. More than 70 type of fungal spores identified during study, which belongs to various groups such as Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina. Fungal members from group Myxomycotina were only found in Newasa, this may happen due to variation in biodiversity to surrounding of crop. In addition to this fungal groups Insect parts, pollen grains, plant trichomes and protozoan cysts were found.

Keywords:- Air spora; Aerobiology; Arachis hypogaea; Groundnut; Fungal spores.

INTRODUCTION :

In India, the study of Aerobiology began in the early 20th century. W. H. Moreland and Mehta were the first to conduct aerobiology research in India. The term 'Air Spora' was coined by P. H. Gregory in an article published in Nature. The inhabitants of airborne particles of plant or animal origin, also known as the 'air spora' (Greek word with similar usage to 'flora' and 'fauna'), consist of spores and pollens of various shapes and sizes, ranging from 100 in diameter for some tree pollen to 3-5 for some of the smallest fungal spores. In addition to pollen, plant and fungal spores, air spores may also contain protists (protozoa), bacteria, viruses, and fragments of diverse biological origins.

Groundnut (Arachis hypogaea Linn.) is one of the principal economic crops of the globe ranking 13th among the food crops and it has been adopted by Indians as a vegetable oil crop during the middle - to - late nineteenth century. In addition, the Arachis hypogaea Linn. crop emits numerous types of biological particles into the surrounding air. The study of such biological particles is essential for taxonomy and for predicting future hazards to crops in the form of diseases. Consequently, it is necessary to compare and analyze the population of airborne particles of plant or animal origin found in groundnut crops in order to comprehend the diversity of airborne particles in two distinct regions.

Before 1969, air spora investigations in India were conducted by exposing adhesive surfaces to the air for several days. It is not possible to establish a close relationship between the captures and meteorological or other data during the period of exposure. The effectiveness of these methods is so low and so dependent on wind speed that it is nearly impossible to

provide a reliable interpretation of the counts made. This has resulted in the creation of a suction-trap with few of the aforementioned disadvantages. Harrington modified a Rotorod sampler discovered by Perkins for spot sampling over a limited time period.

Measured amount of glycerin and distilled water were mixed in a beaker and heated in water bath for 2 to 3 hours. While heating this mixture, gelatin was added slowly by stirring with a glass rod to avoid clumping. After complete dissolution of gelatin, phenol crystals were added as preservative and metabolic inhibitor. After cooling it forms a semi- solid / solid mass of "Glycerin jelly". The jelly can be melted by keeping the flask containing the jelly in a hot water bath whenever required for mounting the slides permanently. The Tilak Air Sampler conversion factor is 14.2, but 14 is used for calculation simplicity and to avoid confusion. For example, if the total number of spores of a particular spore type is 10 for the total capture, the total number of spores per meter cube of air would be 10 x 14 = 140/m3 of air. Using the conversion factor and the assumption that the entrapment efficiency is 75%, one can readily estimate the spore concentration per cubic meter of air. The conversion factor remains constant regardless of location, season, or climate.

For the present Aerobiological research, two ecologically distinct locations were chosen. The 200-kilometer distance between taluka Newasa in district Ahmednagar and taluka Dhule in district Dhule makes them ecologically distinct.

In addition, it has different climatic conditions (Table 1): during the kharif season in Newasa, the average relative humidity is 80.5 percent, the average wind speed is about 6.3 kilometers per hour, and the average temperature is 25.6 degrees Celsius, whereas during the summer season in Newasa, the average relative humidity is 56 percent, the average wind speed is 4.2 kilometers per hour, and the average temperature is 26.7 degrees Celsius.

Similarly, during the kharif season in Dhule, the average relative humidity is 69.5 percent, the average wind speed is 6.2 kilometers per hour, and the average temperature is 32 degrees Celsius, which is much higher than in Newasa, and during the summer in Dhule, the average relative humidity is 53 percent, the average wind speed is 4.5 kilometers per hour, and the average temperature is 40 degrees Celsius, which is also higher than in Newasa.

The study of these two sites was caried out by separate people. The study of first site, is caried out by Bhadane is located at Agriculture College Dhule Tal. Dhule, Dist. Dhule and the study of second site, is caried out by Arsule is located at common agricultural field Tal. Newasa, Dist. Ahmednagar, both sites shows different air spora on same crop Arachis hypogaea Linn.[i].

RESULTS AND DISCUSSION :

In both places we have found lots of fungal members belonging to group Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina. Fungal members from group Myxomycotina were only found in Newasa (**Error! Reference source not found.Error! Reference source not found.**), this may happen due to variation in surrounding crop.

Newasa Taluka shows richer fungal spore biodiversity with 71 types of fungal spores and in Dhule slightly less biodiversity observed with 57 types of fungal spores. In addition to this fungal groups Insect scales, extra hyphal fragments, pollen grains, plant trichomes and protozoan cysts were also found.

The study from both talukas shows presence of *Puccinia* spores. The rust disease of groundnut caused by *Puccinia arachidis* commonly occurs on all groundnut varieties. Chahal D. S. and Chohan J. S. was the first who recorded this disease from Ludhiana (Punjab)[ii]. In a period of

short span, it had spread with an alarming rate throughout the country.

It is found that the group Zygomycotina is more diverse in Newasa with 6 types of spores, while Dhule is having only 3 types of fungal spores in its crop field. Similarly, it is seen that the fungal group Ascomycotina is showing good diversity in Newasa with 23 species, while Dhule's groundnut filed shows diversity of 18 species only. Even though the biodiversity in Dhule is less but number of spore concertation were more as compare to Newasa in respective Kharif and Summer season.

Total number of basidiospores cached in Kharif Season -I of Dhule is 225520 much more than number of total basidiospores cached in Kharif Season -I of Newasa 18886. But in Summer season each site shows drastic decrease in number of spores, Even the same results are obtained in other groups also. The Kharif season provides favourable conditions to almost all organisms which includes fungal spores too, the summer season in Dhule is much drier and unfavourable for spore formation as compared to Newasa hence shows huge decrease in spore concentration. Both places show almost half number of spore concentration in summer than in kharif season.

Newasa and Dhule shows rich diversity in fungal group Deuteromycotina, total 37 and 32 species were found respectively (**Error! Reference source not found.**). Interestingly both talukas during kharif and summer season shows highest spore concentration of Cladosporium Link. It may be the highest point of circadian periodicity of that pathogenic spore. Fungi belonging to the genus Cladosporium are cosmopolitan occurring in various substrate or hosts. Cladosporium spp. are responsible for economic losses in numerous agricultural crops, causing leaf spots, scab, postharvest rots and other disease symptoms[iii].

There are many fungal agents like *Aspergillus* sp., *Fusarium* sp., *Rhizopus* sp., *Rhizoctonia* sp., *Pythium* sp., and *Verticillum* sp. cause disease to groundnut [iv] . Among these pathogens only *Aspergillus* sp., *Fusarium* sp., and *Rhizopus* sp. were recorded during studies at Newasa taluka and similarly only two fungal species *Aspergillus* sp. and *Fusarium* sp. were recorded during studies at Dhule taluka.

Total 37 types of fungal spores are found to be common in both talukas. Which means Newasa and Dhule shares a great diversity of same fungal spores. It is also found that 21 types of fungal spores are new to Newasa as compared to Dhule and 33 types of fungal spores are new to Dhule as compared to Newasa.

It has been observed that Newasa taluka shows richer diversity in fungal spores and Dhule taluka shows greater spore concentration with less fungal spore diversity. As we know that fungi are parasitic as well as saprophytic in nature. Saprophytic fungi are the largest group of macro fungi, responsible for breaking down and recycling dead plant and animal material[v]. The vegetation in Newasa is better as compared to Dhule. So, the fungal biodiversity gets the favourable condition and get flourished to a great extent.

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Table 1 Average relative Humidity, rainfall, Temperature and Wind velocity of Tal. Newasa and Tal. Dhule during Kharif and Summer Season

	Newasa				Dhule			
	Kharif Season		Summer Season		Kharif Season		Summer Season	
	I	II	I	II	I	II	I	II
Relative Humidity (%)	81.8	79.2	55	57	68	71	52	54
Rainfall (mm)	212.7	323.4	0	2.7	110	130	1.5	0
Temperature (°C)	25.8	25.3	28.5	25.3	31	33	41	39
Wind Velocity (km/hr)	5.9	6.7	4.2	4.2	6.1	6.3	4.6	4.4

Table 2 : Season wise comparative total air spora and its contribution percentage to total air spora of two kharif seasons over groundnut fields at Tal. Newasa, Dist. Ahmednagar

Sr. No.	Spore Type	I- Kharif Season		II- Kharif Season		Total Spore Conc. M3 of air	% contribution of total air spora	I- Summer Season		II- Summer Season		Total Spore Conc. M3 of air	% contribution of total air spora
		Spore Conc./M³ of air	% Contribution	Spore Conc./M3 of air	% Contribution			Spore Conc./M3 of air	% Contribution	Spore Conc./M3 of air	% Contribution		
MYXOMYCOTINA													
1	*Physarum* Pers.	1988	0.47	1428	0.38	3416	0.43	728	0.30	1288	0.55	2016	0.42
2	*Stemonitis* Roth.	5502	1.29	3402	0.91	8904	1.11	812	0.34	1414	0.60	2226	0.47
	Total	**7490**	**1.76**	**4830**	**1.29**	**12320**	**1.54**	**1540**	**0.64**	**2702**	**1.14**	**4242**	**0.89**
ZYGOMYCOTINA													
1	*Albugo* Pers. ex. S. F. Gray.	3836	0.90	3556	0.95	7392	0.93	2226	0.93	2772	1.17	4998	1.05
2	*Cunninghamella* Matr.	3878	0.91	3472	0.93	7350	0.92	1092	0.46	1302	0.55	2394	0.50
3	*Mucor* Micheli ex. Fr.	5194	1.22	4956	1.33	10150	1.27	1078	0.45	966	0.41	2044	0.43
4	*Phytophthora* de Bary.	3304	0.78	3458	0.93	6762	0.85	1470	0.61	2604	1.10	4074	0.86
5	*Rhizopus* Ehrenberg.	6258	1.47	5670	1.52	11928	1.49	3738	1.56	2646	1.12	6384	1.34
6	*Selerospora* (Sacc.) Schroet.	5096	1.20	4942	1.32	10038	1.26	0	0	0	0	0	0
	Total	**27566**	**6.48**	**26054**	**6.98**	**53620**	**6.71**	**9604**	**4.01**	**10290**	**4.35**	**19894**	**4.18**
ASCOMYCOTINA													
1	*Amphisphaerella* (Sacc.) Kirsch.	2184	0.51	2002	0.54	4186	0.52	1414	0.59	1806	0.76	3220	0.68
2	*Apiorhynchostoma* Petrak.	518	0.12	602	0.16	1120	0.14	476	0.20	532	0.23	1008	0.21
3	*Ascotricha* Berk	1918	0.45	2044	0.55	3962	0.50	602	0.25	462	0.20	1064	0.22
4	*Bitrimonospora Siwanesan*, Talde & Tilak	1554	0.37	2240	0.60	3794	0.48	0	0.00	0	0.00	0	0.00
5	*Bombardia* Fr.	2660	0.63	826	0.22	3486	0.44	2086	0.87	1148	0.49	3234	0.68
6	*Chaetomium* Kunz. ex. Fr.	3864	0.91	4662	1.25	8526	1.07	3136	1.31	2100	0.89	5236	1.10
7	*Claviceps* Tul.	3822	0.90	4032	1.08	7854	0.98	0	0.00	0	0.00	0	0.00
8	*Cueurbitaria* Gray. Ex Grev.	2590	0.61	2520	0.68	5110	0.64	3136	1.31	1890	0.80	5026	1.06
9	*Didymosphaeria* Fuck.	4186	0.98	4312	1.16	8498	1.06	3500	1.46	3710	1.57	7210	1.52
10	*Hypoxylon* Bull. ex Fr.	3248	0.76	3808	1.02	7056	0.88	2842	1.19	3094	1.31	5936	1.25
11	*Hysterium* Tode. ex Fr.	2856	0.67	3220	0.86	6076	0.76	2632	1.10	2702	1.14	5334	1.12
12	*Leptosphaeria* Ces. & De Not.	4550	1.07	4508	1.21	9058	1.13	1792	0.75	1932	0.82	3724	0.78
13	*Lophiostoma* Ces. & De Not.	3892	0.91	3878	1.04	7770	0.97	1120	0.47	1344	0.57	2464	0.52
14	*Massarina* Sacc.	2870	0.67	3612	0.97	6482	0.81	840	0.35	1106	0.47	1946	0.41

15	*Melanospora* Corda.	0	0.00	0	0.00	0	0.00	3052	1.27	2800	1.18	5852	1.23
16	*Nodulosphaeria* Rabh.	3920	0.92	4270	1.14	8190	1.03	3556	1.48	3962	1.68	7518	1.58
17	*Otthia* Nke.	1988	0.47	784	0.21	2772	0.35	1806	0.75	1092	0.46	2898	0.61
18	*Pleomassaria* Speg.	3164	0.74	3878	1.04	7042	0.88	1134	0.47	1526	0.65	2660	0.56
19	*Pleospora* Rabh.	3038	0.71	3878	1.04	6916	0.87	3066	1.28	3920	1.66	6986	1.47
20	*Pringsheimia* Schultz.	4774	1.12	1778	0.48	6552	0.82	2184	0.91	4298	1.82	6482	1.36
21	*Sordaria* Ces. & De Not.	4942	1.16	4592	1.23	9534	1.19	2422	1.01	4550	1.93	6972	1.47
22	*Trematosphaeria* Fuck.	3066	0.72	2632	0.71	5698	0.71	1036	0.43	1022	0.43	2058	0.43
23	*Valsaria* Ces. & De Not	3682	0.87	3542	0.95	7224	0.90	630	0.26	546	0.23	1176	0.25
	Total	**69286**	**16.28**	**67620**	**18.12**	**136906**	**17.14**	**42462**	**17.72**	**45542**	**19.27**	**88004**	**18.49**
BASIDIOMYCOTINA													
1	Basidiospores	18886	4.44	7098	1.90	25984	3.25	11382	4.75	10836	4.59	22218	4.67
2	Smut spores	30898	7.26	25676	6.88	56574	7.08	12292	5.13	11354	4.80	23646	4.97
3	Uredospores	8918	2.10	8946	2.40	17864	2.24	4088	1.71	4760	2.01	8848	1.86
	Total	**58702**	**13.80**	**41720**	**11.18**	**100422**	**12.57**	**27762**	**11.59**	**26950**	**11.40**	**54712**	**11.50**

Sr. No.	Spore Type	I- Kharif Season		II- Kharif Season		Total Spore Conc. M3 of air	% contribution of total air spora	I- Summer Season		II- Summer Season		Total Spore Conc. M3 of air	% contribution of total air spora
		Spore Conc./M3 of air	% Contribution	Spore Conc./M3 of air	% Contribution			Spore Conc./M3 of air	% Contribution	Spore Conc./M3 of air	% Contribution		
DEUTEROMYCOTINA													
1	*Alternaria* Nees.	23590	5.54	19488	5.22	43078	5.39	11522	4.81	10290	4.35	21812	4.58
2	*Aspergillus* Micheli ex Link.	16282	3.83	15582	4.18	31864	3.99	6384	2.66	5656	2.39	12040	2.53
3	*Beltrania* Penzig.	2870	0.67	4102	1.10	6972	0.87	1834	0.77	2240	0.95	4074	0.86
4	*Bispora* Corda.	3906	0.92	6342	1.70	10248	1.28	5782	2.41	5446	2.30	11228	2.36
5	*Botryodiplodia* Sacc	0	0.00	0	0.00	0	0.00	5138	2.14	5978	2.53	11116	2.34
6	*Cephaliophora* Thaxt.	714	0.17	1428	0.38	2142	0.27	0	0.00	0	0.00	0	0.00
7	*Ceratophorum* Sacc.	2632	0.62	3248	0.87	5880	0.74	1358	0.57	1274	0.54	2632	0.55
8	*Cercospora* Fr.	12894	3.03	13706	3.67	26600	3.33	9254	3.86	6888	2.91	16142	3.39
9	*Chaetomella* Fuc	2996	0.70	3206	0.86	6202	0.78	0	0.00	0	0.00	0	0.00
10	*Chlamydomonas* Bain.	2464	0.58	2450	0.66	4914	0.62	0	0.00	0	0.00	0	0.00
11	*Cladosporium* Link.	64064	15.06	33698	9.03	97762	12.24	18662	7.79	18172	7.69	36834	7.74
12	*Corynespora* Gussow.	2688	0.63	4018	1.08	6706	0.84	2702	1.13	4186	1.77	6888	1.45
13	*Curvularia* Boed.	8722	2.05	7448	2.00	16170	2.02	6090	2.54	4956	2.10	11046	2.32
14	*Dictvoarthrinium* Hughes.	1806	0.42	2114	0.57	3920	0.49	2072	0.86	868	0.37	2940	0.62
15	*Dictyosporium* Corda.	2758	0.65	3570	0.96	6328	0.79	1260	0.53	1344	0.57	2604	0.55
16	*Diplodia* Fr.	3430	0.81	4606	1.23	8036	1.01	3444	1.44	3234	1.37	6678	1.40
17	*Epicoccum* Link.	9072	2.13	7378	1.98	16450	2.06	4494	1.88	3962	1.68	8456	1.78
18	*Exosporium* Link.	2044	0.48	4494	1.20	6538	0.82	3864	1.61	4144	1.75	8008	1.68
19	*Fusariella* Sacc.	5390	1.27	5124	1.37	10514	1.32	0	0.00	0	0.00	0	0.00
20	*Fusarium* Link.	7350	1.73	4158	1.11	11508	1.44	2660	1.11	2590	1.10	5250	1.10
21	*Haplosporella* Speg.	3150	0.74	3206	0.86	6356	0.80	3304	1.38	2982	1.26	6286	1.32
22	*Helminthosporium* Link.	10892	2.56	11018	2.95	21910	2.74	8946	3.73	7504	3.18	16450	3.46
23	*Heterosporium* Klotzsch.	6258	1.47	7126	1.91	13384	1.68	3304	1.38	2912	1.23	6216	1.31
24	*Lacellina* Sacc.	2618	0.62	2324	0.62	4942	0.62	3234	1.35	1638	0.69	4872	1.02
25	*Macrophoma Berl. & Vogl.*	0	0.00	0	0.00	0	0.00	6370	2.66	7042	2.98	13412	2.82
26	*Memnoniella* Hohn.	7252	1.70	6076	1.63	13328	1.67	2940	1.23	3346	1.42	6286	1.32
27	*Nigrospora* Zimm.	10374	2.44	9800	2.63	20174	2.53	5712	2.38	5418	2.29	11130	2.34
28	*Papularia* Fr.	3024	0.71	3262	0.87	6286	0.79	1834	0.77	1456	0.62	3290	0.69
29	*Periconia* Tode.ex Schw.	2296	0.54	2772	0.74	5068	0.63	2072	0.86	2184	0.92	4256	0.89
30	*Pestalotia* De Not.	1330	0.31	2030	0.54	3360	0.42	840	0.35	1260	0.53	2100	0.44
31	*Pithomyces* Berk.	5390	1.27	5880	1.58	11270	1.41	3136	1.31	2198	0.93	5334	1.12
32	*Pyricularia* Sacc.	4284	1.01	4508	1.21	8792	1.10	1694	0.71	868	0.37	2562	0.54

33	*Sirodesmium* De Not.	2590	0.61	2870	0.77	5460	0.68	2450	1.02	2688	1.14	5138	1.08
34	*Sporidesmium* Link.	2184	0.51	2226	0.60	4410	0.55	1008	0.42	1960	0.83	2968	0.62
35	*Tetraploa* Berk. & Br.	4382	1.03	2940	0.79	7322	0.92	3682	1.54	4718	2.00	8400	1.77
36	*Torula* (Pers) Link. this	9114	2.14	7252	1.94	16366	2.05	3682	1.54	3668	1.55	7350	1.54
37	*Trichothecium* Link.	4494	1.06	5362	1.44	9856	1.23	2940	1.23	3710	1.57	6650	1.40
	Total	**255304**	**60.00**	**224812**	**60.24**	**480116**	**60.11**	**143668**	**59.96**	**136780**	**57.88**	**280448**	**58.93**
B. Other morphotypes (Other types)													
1	Hyphal fragments.	2506	0.59	2618	0.70	5124	0.64	4984	2.08	5306	2.25	10290	2.16
2	Insect parts	1750	0.41	2338	0.63	4088	0.51	3612	1.51	3178	1.34	6790	1.43
3	Plant parts	1316	0.31	1008	0.27	2324	0.29	1904	0.79	1722	0.73	3626	0.76
4	Pollen grains	1554	0.37	2198	0.59	3752	0.47	4060	1.69	3836	1.62	7896	1.66
	Total	**7126**	**1.67**	**8162**	**2.19**	**15288**	**1.91**	**14560**	**6.08**	**14042**	**5.94**	**28602**	**6.01**
	Grand Total	**425474**	**100**	**373198**	**100**	**798672**	**100**	**239596**	**100**	**236306**	**100**	**475902**	**100**

Table 3 : Season wise comparative total air spora and its contribution percentage to total air spora of two kharif seasons over groundnut fields at Tal. Dhule, Dist. Dhule

Sr. No.	Spore Type	I- Kharif Season		II- Kharif Season		Total Spore Conc. M3 of air	% contribution of total air spora	I- Summer Season		II- Summer Season		Total Spore Conc. M3 of air	% contribution of total air spora
		Spore Conc./M3 of air	% Contribution	Spore Conc./M3 of air	% Contribution			Spore Conc./M3 of air	% Contribution	Spore Conc./M3 of air	% Contribution		
ZYGOMYCOTINA													
1	Albugo Pers. ex. S. F. Gray.	322	0.01	6468	0.23	6790	0.13	0	0.00	1120	0.07	1120	0.04
2	*Cunninghamella* Matr.	532	0.02	3962	0.14	4494	0.09	378	0.04	938	0.06	1316	0.05
3	*Selerospora* (Sacc.) Schroet.	112	0.00	0	0.00	112	0.00	0	0.00	0	0.00	0	0.00
	Total	**966**	**0.04**	**10430**	**0.38**	**11396**	**0.22**	**378**	**0.04**	**2058**	**0.13**	**2436**	**0.09**
ASCOMYCOTINA													
1	*Apiorhynchostoma* Petrak.	266	0.01	56	0.00	322	0.01	56	0.01	28	0.00	84	0.00
2	*Calospora* Nitschke.	140	0.01	0	0.00	140	0.00	0	0.00	0	0.00	0	0.00
3	*Chaetomium* Kunz. ex. Fr.	1582	0.06	1960	0.07	3542	0.07	686	0.07	504	0.03	1190	0.04
4	*Didymosphaeria* Fuck.	4802	0.19	2898	0.10	7700	0.15	168	0.02	252	0.02	420	0.02
5	*Hypoxylon* Bull. ex Fr.	896	0.04	980	0.04	1876	0.04	56	0.01	42	0.00	98	0.00
6	*Hysterium* Tode. ex Fr.	70	0.00	252	0.01	322	0.01	140	0.01	28	0.00	168	0.01
7	*Leptosphaeria* Ces. & De Not.	4522	0.18	882	0.03	5404	0.10	42	0.00	112	0.01	154	0.01
8	*Lophiostoma* Ces. & De Not.	714	0.03	168	0.01	882	0.02	28	0.00	0	0.00	28	0.00
9	*Melanospora* Corda.	0	0.00	308	0.01	308	0.01	14	0.00	28	0.00	42	0.00
10	*Microsphaerella* Johanson.	448	0.02	0	0.00	448	0.01	0	0.00	0	0.00	0	0.00
11	*Microsphaeria* Griffon & Maublanc.	1652	0.07	238	0.01	1890	0.04	0	0.00	0	0.00	0	0.00
12	*Nodulosphaeria* Rabh.	350	0.01	56	0.00	406	0.01	28	0.00	0	0.00	28	0.00
13	*Parodiella* (Speg) Thesis & Syd.	42	0.00	98	0.00	140	0.00	126	0.01	364	0.02	490	0.02
14	*Passerinella* Berl.	322	0.01	294	0.01	616	0.01	70	0.01	112	0.01	182	0.01
15	*Pleospora* Rabh.	588	0.02	910	0.03	1498	0.03	84	0.01	210	0.01	294	0.01
16	*Pringsheimia* Schultz.	238	0.01	126	0.00	364	0.01	0	0.00	0	0.00	0	0.00
17	*Sordaria* Ces. & de Not.	9184	0.37	4396	0.16	13580	0.26	98	0.01	350	0.02	448	0.02
18	*Sporormia* de. Not.	714	0.03	924	0.03	1638	0.03	14	0.00	756	0.05	770	0.03
	Total	**26530**	**1.08**	**14546**	**0.53**	**41076**	**0.79**	**1610**	**0.15**	**2786**	**0.17**	**4396**	**0.16**
BASIDIOMYCOTINA													
1	Basidiospores	225520	9.15	70448	2.55	295968	5.66	2492	0.24	11788	0.73	14280	0.54

2	*Ganoderma* Karst.	1820	0.07	1554	0.06	3374	0.06	112	0.01	42	0.00	154	0.01
3	*Puccinia* Pers.	1848	0.07	868	0.03	2716	0.05	0	0.00	0	0.00	0	0.00
4	Smut spores	199962	8.11	44926	1.62	244888	4.68	65352	6.25	279384	17.22	344736	12.92
	Total	**429150**	**17.41**	**117796**	**4.26**	**546946**	**10.46**	**67956**	**6.49**	**291214**	**17.95**	**359170**	**13.46**
DEUTEROMYCOTINA													
1	*Alternaria* Nees.	9842	0.40	7672	0.28	17514	0.33	3318	0.32	10318	0.64	13636	0.51
2	*Arthrinium* Corda.	2814	0.11	2884	0.10	5698	0.11	1386	0.13	2212	0.14	3598	0.13
3	*Aspergillus* Micheli ex Link.	44254	1.80	144662	5.23	188916	3.61	691642	66.10	43890	2.71	735532	27.56
4	*Beltrania* Penzig.	0	0.00	56	0.00	56	0.00	70	0.01	28	0.00	98	0.00
5	*Bispora* Corda.	3486	0.14	1232	0.04	4718	0.09	1288	0.12	742	0.05	2030	0.08
6	*Cercospora* Fr.	6622	0.27	3304	0.12	9926	0.19	224	0.02	574	0.04	798	0.03
7	*Cercosporidium* Berk & M. A. Curtis.	336	0.01	98	0.00	434	0.01	28	0.00	0	0.00	28	0.00
8	*Cladosporium* Link.	1811978	73.52	2303924	83.31	4115902	78.70	205226	19.61	1112328	68.57	1317554	49.38
9	*Cordana* Preuss.	0	0.00	56	0.00	56	0.00	350	0.03	490	0.03	840	0.03
10	*Curvularia* Boed.	13216	0.54	8708	0.31	21924	0.42	1778	0.17	2030	0.13	3808	0.14
11	*Deightoniella* Hughes.	0	0.00	644	0.02	644	0.01	0	0.00	112	0.01	112	0.00
12	*Dictvoarthrinium* Hughes.	70	0.00	140	0.01	210	0.00	126	0.01	56	0.00	182	0.01
13	*Diplodia* Fr.	28	0.00	126	0.00	154	0.00	56	0.01	42	0.00	98	0.00
14	*Drechslera* Ho.	11508	0.47	15120	0.55	26628	0.51	1498	0.14	3710	0.23	5208	0.20
15	*Epicoccum* Link.	616	0.02	140	0.01	756	0.01	280	0.03	56	0.00	336	0.01
16	*Fusariella* Sacc.	0	0.00	420	0.02	420	0.01	140	0.01	0	0.00	140	0.01
17	*Fusarium* Link.	70	0.00	392	0.01	462	0.01	14	0.00	224	0.01	238	0.01
18	*Haplosporella* Speg.	1260	0.05	1526	0.06	2786	0.05	126	0.01	168	0.01	294	0.01
19	*Harknessia* Cook.	1680	0.07	1428	0.05	3108	0.06	56	0.01	42	0.00	98	0.00
20	*Heterosporium* Klotzsch.	1456	0.06	3892	0.14	5348	0.10	280	0.03	84	0.01	364	0.01
21	*Lacellina* Sacc.	5474	0.22	6216	0.22	11690	0.22	16716	1.60	6454	0.40	23170	0.87
22	*Memnoniella* Hohn.	4830	0.20	2464	0.09	7294	0.14	1050	0.10	1946	0.12	2996	0.11
23	*Nigrospora* Zimm.	12530	0.51	19110	0.69	31640	0.60	3206	0.31	5810	0.36	9016	0.34
24	*Periconia* Tode.ex Schw.	4774	0.19	3332	0.12	8106	0.15	1834	0.18	1736	0.11	3570	0.13
25	*Periconiella* Sacc.	1078	0.04	2926	0.11	4004	0.08	0	0.00	0	0.00	0	0.00
26	*Pithomyces* Berk.	1582	0.06	1106	0.04	2688	0.05	252	0.02	154	0.01	406	0.02
27	*Pseudotorula* Subram.	532	0.02	784	0.03	1316	0.03	42	0.00	14	0.00	56	0.00
28	*Sclerotium* Todle ex. Fr.	2170	0.09	3976	0.14	6146	0.12	2506	0.24	13398	0.83	15904	0.60
29	*Spegazzinia* Sacc.	84	0.00	14	0.00	98	0.00	70	0.01	42	0.00	112	0.00
30	*Spicaria* Aucl.	0	0.00	3948	0.14	3948	0.08	4284	0.41	308	0.02	4592	0.17
31	*Torula* (Pers) Link. This	1708	0.07	1022	0.04	2730	0.05	322	0.03	798	0.05	1120	0.04
32	*Trichoconis* Clements.	0	0.00	1106	0.04	1106	0.02	56	0.01	434	0.03	490	0.02
	Total	**1943998**	**78.88**	**2542428**	**91.93**	**4486426**	**85.78**	**938224**	**89.67**	**1208200**	**74.48**	**2146424**	**80.44**
Other morphotypes (Other types)													
1	Algal Filaments	420	0.02	56	0.00	476	0.01	112	0.01	14	0.00	126	0.00
2	Fungal Hyphae	20874	0.85	23576	0.85	44450	0.85	13874	1.33	37030	2.28	50904	1.91
3	Insect Scales	8106	0.33	16002	0.58	24108	0.46	6860	0.66	35560	2.19	42420	1.59
4	Plant Trichomes	252	0.01	126	0.00	378	0.01	1050	0.10	0	0.00	1050	0.04
5	Pollen	28910	1.17	32326	1.17	61236	1.17	12558	1.20	31164	1.92	43722	1.64
6	Protozoan Cysts	2660	0.11	6790	0.25	9450	0.18	3570	0.34	14056	0.87	17626	0.66
7	Unidentified Spores	2660	0.11	1414	0.05	4074	0.08	112	0.01	56	0.00	168	0.01
	Total	**63882**	**2.59**	**80290**	**2.90**	**144172**	**2.76**	**38136**	**3.64**	**117880**	**7.27**	**156016**	**5.85**
	Grand Total	**2464526**	**100**	**2765490**	**100**	**5230016**	**100**	**1046304**	**100**	**1622138**	**100**	**2668442**	**100**

Figure 1 Newasa Taluka - aerial view

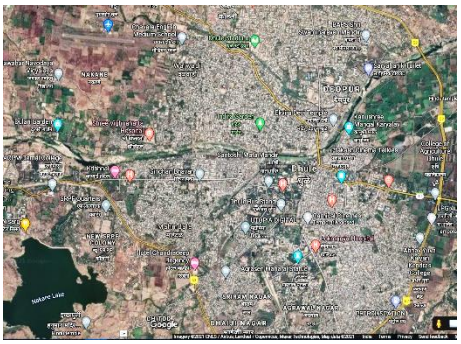
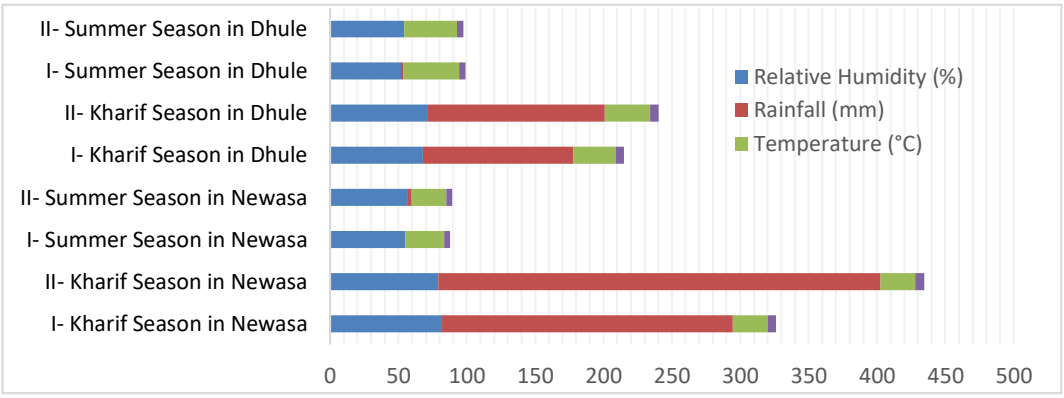


Figure 2 Dhule Taluka - aerial view



Graph 1 Showing Average relative Humidity, rainfall, Temperature and Wind velocity of Tal. Newasa and Tal. Dhule during Kharif and Summer Season

[i] Bhadane, "Aerobiology Studies at Dhulia II Groundnut"; Arsule, "Monitoring of Airborne Bioaerosols Over Groundnut Fields at Newasa Dist Ahmednagar."
[ii] Chahal D. S. and Chohan J. S., "India-Puccinia Rust on Groundnut."
[iii] Rosado et al., "Cladosporium Species Associated with Disease Symptoms on Passiflora Edulis and Other Crops in Brazil, with Descriptions of Two New Species."
[iv] Singh and Oswalt, *Major Diseases of Groundnut*.
[v] Alanazi et al., "Fungi Related with the Red Palm Weevil (Rhynchophorus Ferrugineus) in the Hail Area, Northern Saudi Arabia."