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Atmospheric Pollen and Mold Spores in Bangkok : A 15 Year Survey

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SUMMARY **A 15-year survey of atmospheric pollen and mold spores was carried out in Bangkok, Thailand, from January 1973 to December 1987 by Durham's standard gravity slide sampler. The pollen and mold spore counts were presented. The peak of the pollen and mold spores occurred during the time of the year with lower average temperature, relative humidity and rain-fall. For pollen, this was from November to January and for mold spores from December to February. Mold spores of the Class Fungi Imperfecti were predominant and most likely the major fungi in mold.allergy. Grass was the principal air-borne pollen.**

Atmospheric pollen and mold spores are among the most important causes of inhalant allergy. [1,2] The responsible pollen are, for the most part, wind pollinated. [1] Many types of terrestrial fungi implicated in allergy are widely recognized, [2] and those that produce allergic spores are, in general distinct from agents of the deep human mycoses. [2]

Precise knowledge of pollen and mold spores is an indispensable aid for the allergist in the diagnosis and treatment of inhalant allergy. Through the study of the local flowering plants, pollen, and mold spores aerobiology, the practitioner can increase materially his own diagnostic acumen. In addition, by correlating careful clinical observations, it can provide information to fill the gaps in our basic knowledge of inhalant allergy. The seasonal pattern of symptoms that pollen and mold sensitive patients present closely reflect their annual exposure to specific offending allergens. The dates at which symptoms appear and abate each year must be defined whenever the allergic patients are evaluated. However, day to day variations in the prevalence of atmospheric pollen and mold spores often occur. Allergists must be familiar with the seasonal occurrence of tree, grass, weed pollen and mold spores, especially in his own locality.

Incidence of atmospheric pollen and mold spores has been reported in many countries. [3] There have been few reports of the shorter-term surveys [4-8] and one long term survey [9] in Bangkok. Since regular air sampling and identification of particles in the long term are important, this paper reports the airborn pollen and mold spores survey for 15 years found in the atmosphere of Bangkok Metropolis, Thailand.

MATERIALS AND METHODS

This study was carried out from January 1973 to December 1987 at the Ramathibodi Hospital, Bangkok, Thailand, by the standard gravity slide sampler (Durham). [10] The sampler was placed and fixed to an unobstructed roof 4 meters above the ground, and free from interference by trees or buildings. One by three inch microscope glass slides were prepared for exposure by spreading on them a thin film of glycerine jelly and were changed daily about 8 a.m. on week days and only once during the week-end. The slides were stained with Calberla's solution and examined microscopically for pollen and mold spores identification and counting. The pollen and mold

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spores were identified using standard keys.[1,2,11,12] Particle counts were expressed as the number of particles of each type observed on one square centimeter of slide area.

RESULTS

The daily counts converted to monthly mean values per year of the 15 year counts of mold spores and pollen are shown in Table 1, and the frequency curves of the total mold and pollen counts in Fig. 1. The seven genera of mold with high counts and the important aeroallergens are shown in Fig. 2. Individual pollen counts are shown in Fig. 3. The mold spore and pollen calendar are shown in Fig. 4 and 5 respectively.

DISCUSSION

Bangkok, Thailand is situated at the latitude of 13° 44′ N and the longitude of 100° 34′ E. It has the climatic characterization of a tropical area with warm temperature, high humidity and high rain fall. The means of climatological data per year for the period of 30 years (1956-1985)[13] are shown in Table 2 and the graphic data in Fig. 6. Such a climate is favorable for the growth of plants and molds.

From this survey, most of the pollen and mold spores were present consistently throughout the year with some seasonal variations.

Much higher atmospheric concentration of the mold spores over the pollen was observed throughout the year. The peak of the pollen occurred during November through January with slightly higher counts than the rest of the year from February to April and October. The peak of the mold spores was observed in December through February and slightly lower counts in November, April and May. The peak of both mold spores and pollen occurred during the time of the year with the average lower temperature, relative humidity and rainfall. (Fig. 1, and 6)

Grass, with the highest pollen count, constituted the principal airborne pollen throughout the year. It had a peak from November to January (Fig. 3), and this confirmed

Table 1. Pollen and mold spore counts per year (mean, 15 year period, 1973–1987)

	Number of Pollen and mold spores per cm^2												
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternaria	11	.5	6	9	13	8	9	8	8	8	12	9	106
Ascospore	26	25	24	25	32	28	33	35	46	42	31	17	364
Basidiospore	8	12	15	20	9	7	7	10	13	11	5	8	125
Botrytis	5	8	7	12	19	15	16	17	21	16	11	5	152
Cladosporium	568	407	218	322	243	108	124	100	104	105	217	345	2861
Curvularia	39	19	15	18	20	19	18	23	16	30	50	47	314
Drechslera	4	3	2	6	7	3	5	3	2	5	4	3	47
Fusarium	18	21	11	12	21	12	23	15	15	17	16	10	191
Helminthosporium	39	15	15	13	11	11	12	10	13	11	17	16	183
Leptospaeria	4	4	3	3	6	6	5	6	6	7	5	3	58
Myxomycetes	34	17	19	17	28	15	21	16	14	20	26	35	262
Nigrospora	8	7	7	7	7	8	7	7	10	7	11	13	99
Pithomyces	3	4	1	2	2	1	3	2	4	4	5	5	36
Rosellinia	1	1	1	2	3	3	2	4	4	6	4	1	32
Rust	6	8	12	11	14	13	12	14	13	14	13	7	137
Smut	16	8	5	5	7	3	4	4	6	7	10	8	83
Sporidesmium	10	7	5	9	13	11	15	16	22	16	11	6	141
Stemphylium	4	3	4	2	3	3	3	3	4	4	4	5	42
Tetraploa	3	2	2	1	2	1	2	2	2	2	4	4	27
Torula	4	2	1	2	2	2	2	3	4	3	4	4	33
Triphragmium	2	3	2	4	4	5	5	5	6	7	3	3	49
Ulocladium	1	–	–	1	1	–	1	1	2	1	2	1	11
Unidentified molds	5	4	6	4	5	6	6	7	7	8	5	5	68
Total mold spores	819	585	381	507	472	288	335	311	342	351	470	560	5421
Acacia	1	2	2	1	–	–	1	–	1	–	1	1	10
Grass	149	79	83	57	35	40	36	32	42	72	129	122	876
Ixora	2	3	4	3	2	3	1	2	3	5	6	5	39
Weed (Chenopod–Amaranth)	9	4	6	6	6	3	4	8	7	7	10	12	82
Unidentified pollens	11	6	11	11	5	4	4	5	3	7	8	8	83
Total pollens	172	94	106	78	48	50	46	47	56	91	154	148	1090
Insect scale	55	33	57	14	28	77	31	34	50	81	31	30	521

Table 2. The climatic characterization of the City of Bangkok, Thailand (Mean of the past 30 years, 1956–1985)

Bangkok Metropolis	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Mean rainfall, (mm)	9.3	29.1	26.2	66.4	189.9	156.1	158.7	204.6	339.4	239.3	48.3	9.7	1477 (Total)
Mean relative humidity, (%)	72.1	75.7	76.0	76.0	78.4	78.5	79.3	80.2	82.8	82.2	77.5	72.5	77.6
Mean temperature, (°c)	25.6	27.2	28.6	29.6	29.3	28.7	28.1	27.9	27.6	27.5	26.7	25.5	27.7
Mean wind speed, (knot)	2.6	4.1	5.0	4.6	3.8	3.8	3.5	3.6	2.7	2.3	2.3	2.4	–

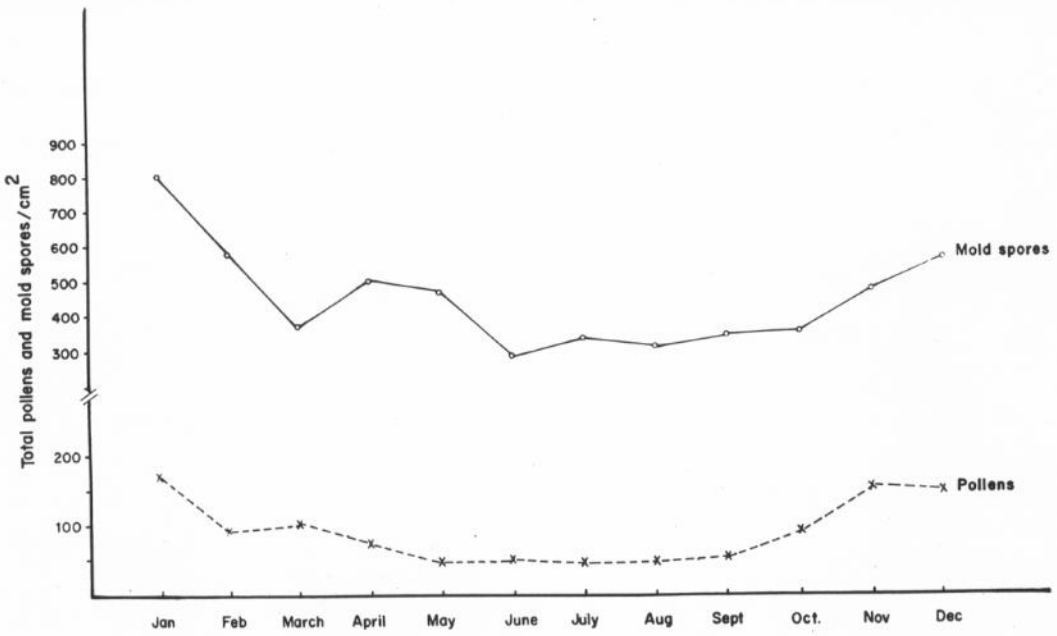

Fig. 1 Monthly counts of the total of pollens and mold spores in Bangkok (mean, 15 years).

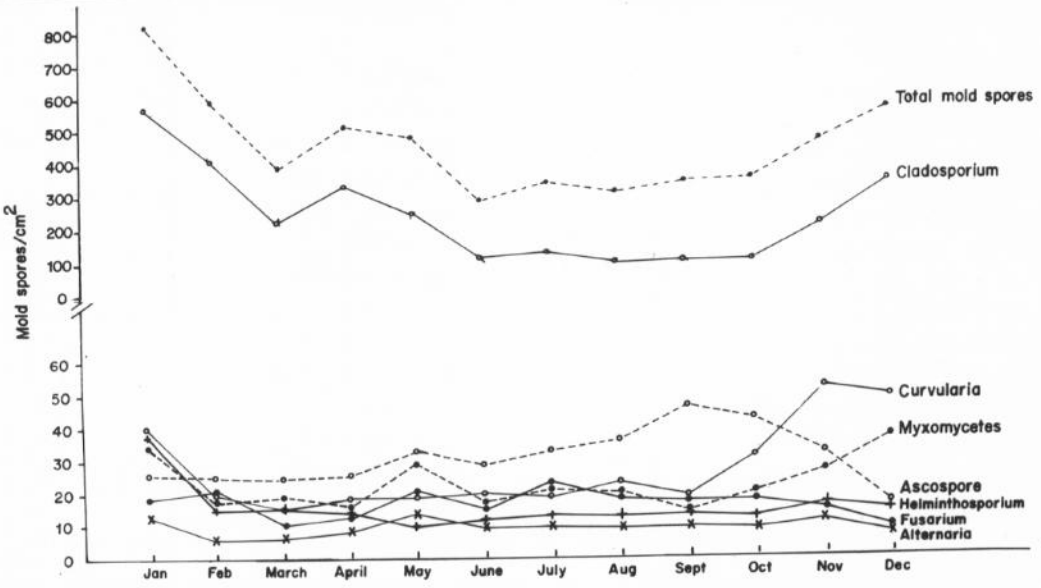

Fig. 2 Monthly individual mold spores with high count and total mold spores in Bangkok (mean, 15 years).

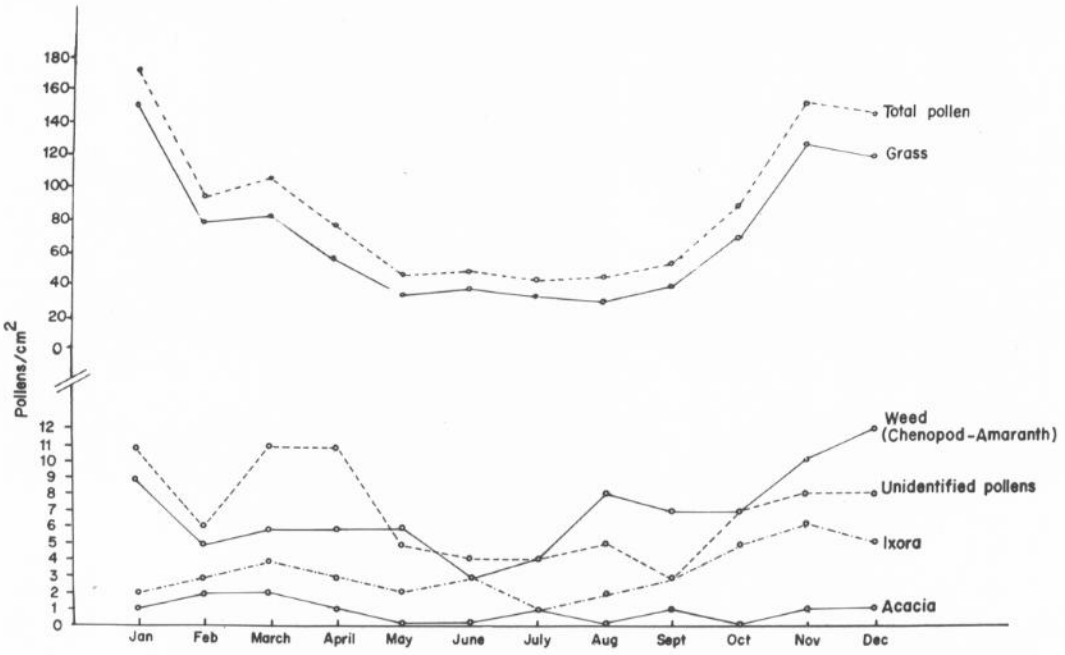

Fig. 3 Monthly individual and total pollen counts in Bangkok (mean, 15 years).

the previous studies.[4-7] The all year round pollination was different from the temperate attitude in which it was shed, only in late spring and early summer.[3] Since grass pollen is capable of inducing inhalant allergy, it should be considered one of the most important sources of allergenic pollen in this region. Three additional types of pollen were detected in low counts. They were Chenopodiaceae/Amaranthaceae, Ixora and Acacia. Chenopodiaceae/Amaranthaceae was found all year round and was second in concentration to the grass. Continuous sampling over the 15 year period of this survey demonstrated no definite peak of pollination as in the previous studies.[4,5,7,9] Very slight increase of this pollen count during November to December in concurrence with the peak of grass pollination was observed but was not as high as in our previous study.[6]

Ixora and Acacia pollen were seen in lower counts. Their significance as pollen offenders should be evaluated.

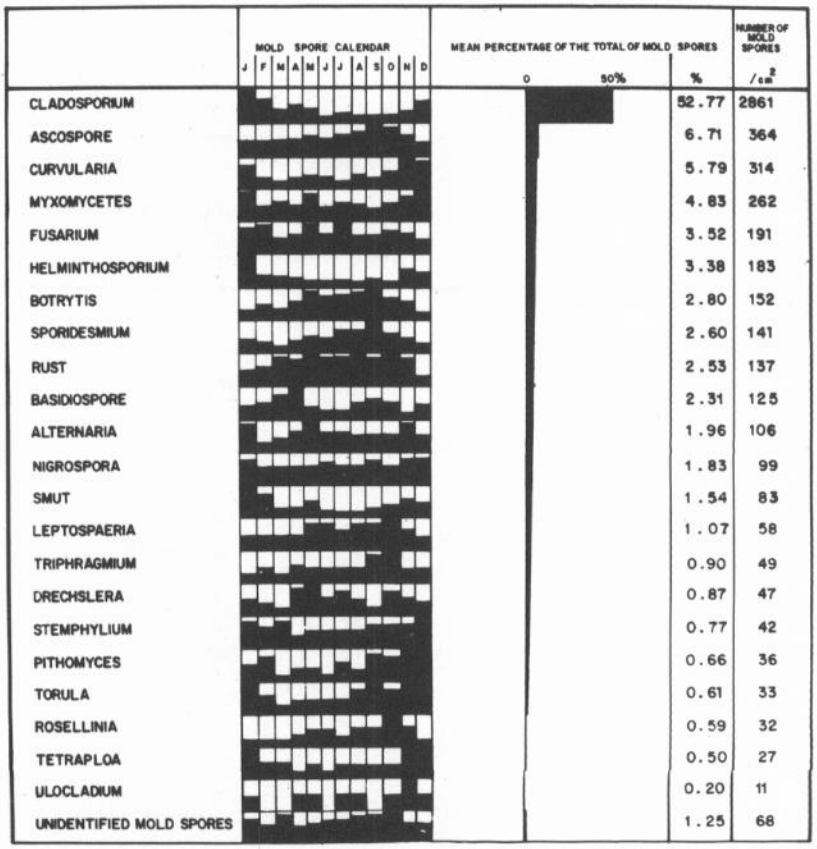

Fig. 4 Spore Calendar of Bangkok (mean, 15 years).

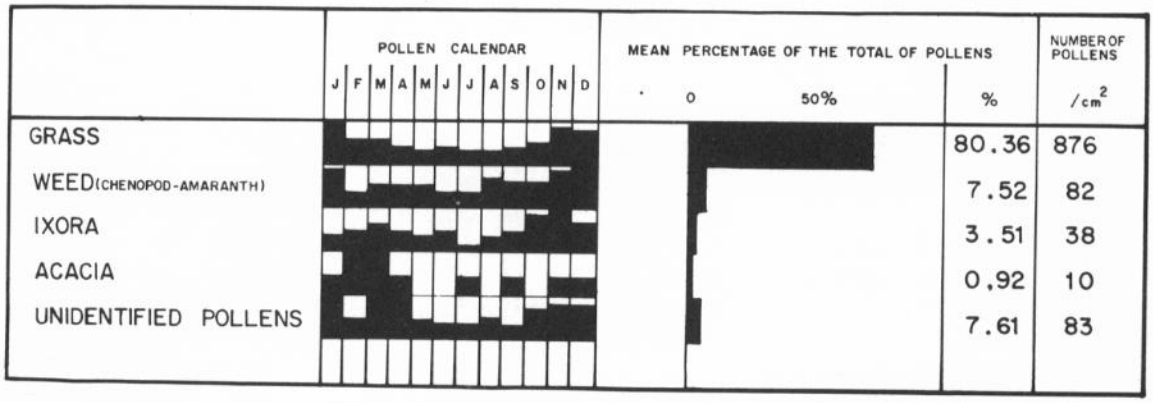

Fig. 5 Pollen Calendar of Bangkok (mean, 15 years).

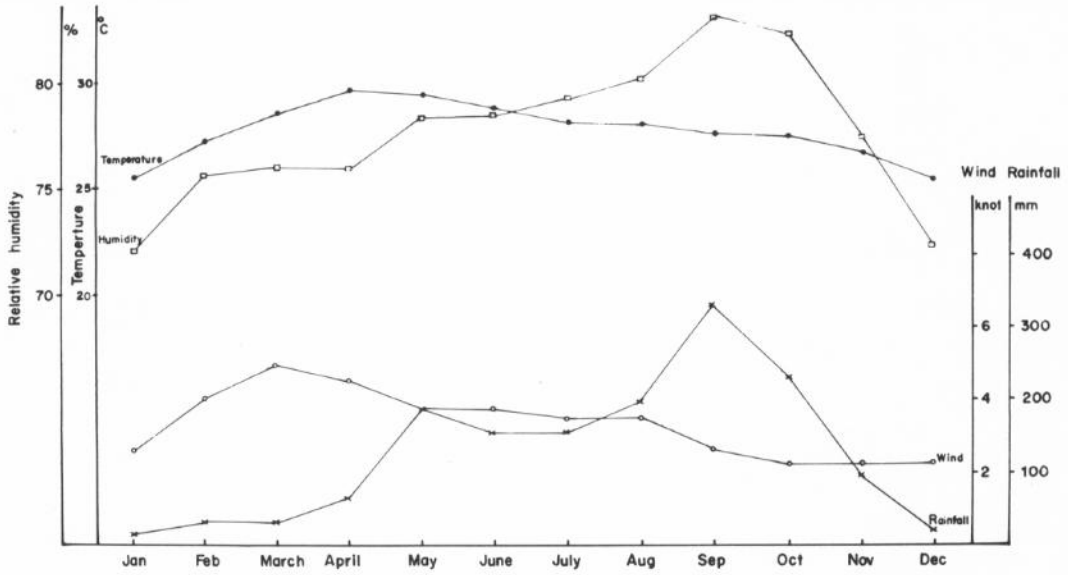

Fig. 6 The graphical data of the climate of Bangkok (mean, 30 years).

Many different kinds of mold spores were found in the atmosphere during the entire year. The 12 categories of the highest prevalence in decreasing order were : Cladosporium, Ascospores, Curvularia, Myxomycetes, Fusarium, Helminthosporium, Botrytis, Sporidesmium, Rust, Basidiospores, Alternaria and Smut. Of the mold spores reported allergenic, Cladosporium was found in abundance (52.77%) and to be the highest mold spore count as reported in the previous studies[6-8] in Thailand and in other parts of the world.[3] The other allergenic mold spores with the highest prevalence, in decreasing order, were : Curvularia, Fusarium, Helminthosporium, Rust, Alternaria and Smut. Most of them belonged to the Class Fungi Imperfecti.

Ascospores and Myxomycetes, the second and fourth most prevalent fungi need further studies to establish their significance in allergy. Lower counts of the rest of the fungus spores were found throughout the year. Unidentified pollen and mold spores and insect scale were seen in this survey. These might contribute also to the inhalant allergy in this area and also require further attention and study.

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