AEROMYCOLOGY OF COOCH BEHAR DISTRICT

Results:

Chief components of the Aeromycoflora -

During two year sampling periods 88 fungal spore types were identified. These included one Phycomycetes, eight Ascomycetes, eight Basidiomycetes, and 71 Deuteromycetes. Spores which could not be identified were placed under 'indeterminate type'. The identified spores are listed in Table 20, along with data on monthly catches and their percentage contribution to the total aeromycoflora.

Morphology and Phenology of fungal spores -

Identifying character and phenology of all identified spore types are described below:

Phycomycetes:

1. Choanephora Currey (Plate 14, Fig. 6 & 7)

   Spores solitary, unicellular, brown to purplish; ± 6.8 x 15.8 um.; ellipsoidal, thin walled with characteristic striations on wall.

   The spore type was distributed from October to December and July to September, with sporadic occurrence. Total contribution to the aeromycoflora was 91 (0.55%) and 66 (0.31%) spores in 1985 86 and 1986 87 respectively (Fig. 28).

Ascomycetes:

1. Chaetomium Kunze Schmidt

   Spores in mass, pale brown; ± 8.0 x 4.8 um; elliptical thin walled.

   They were encountered in October and November with higher frequency in the former month. They contributed 0.25%, with a total of 43 spores in 1985 86 and 0.17% with a total of 37 spores in 1986 87.
2. **Dothidea** E. & E. (Plate 14, Fig. 3)

Spores solitary, hyaline to dark brown; ± 10.2 x 6.4 μm.; broadly elliptical, thin walled and with one transverse septum.

This spore type occurred sporadically during the entire investigation period. Total spore count was 25 (0.14%) and 33 (0.15%) spores in 1985-86 and 1986-87 respectively.

3. **Gyrostomum** (Arch) Fr. (Plate 14, Fig. 2)

Spores solitary, dark brown; ± 8.0 x 3.6 μm.; elliptical, thick walled.

Their contribution to the total aeromycoflora was 0.12%, recording a total of 21 spores in the first year, and 0.04%, with a total 11 spores in the second year. Occurrence was inconsistent in both the years.

4. **Parodiella** (Speg.) Theiss & Syd. (Plate 14, Fig. 8)

Spores solitary two celled, mid brown; ± 45.5 x 24.5 μm.; elliptic, thick walled, 1 septate, distinctly striated, striations convergent towards end.

This spore type was distributed from February to April, with a total count of 15 (0.08%) and 11 (0.04%) in 1985-86 and 1986-87 respectively.

5. **Pleospora** Pers.ex Fr.) Rabenh. (Plate 14, Fig. 4)

Spores solitary, yellow to brown; ± 32.4 x 14.8 μm.; broadly elliptic, with many transverse and one longitudinal septa.

This spore type was distributed from October to December and September, occurrence was sporadic with percentage of 0.15 and 0.06 in the two years respectively.
and include those types which could not be identified. This group was recorded throughout the survey period, except in August. Total count in 1985-86 was 210 (1.24%) and 208 (1.00%) spores in 1986-87.

7. _Annellophora_ Hughes emend. M.B. Ellis (Plate 16, Fig. 1-2)

Conidia solitary, brown; $48.0 \times 8.0$ $\mu$m., $2.0 \mu$m wide at the truncate base; obclavate, smooth.

Spores were distributed from October to December and again from May to September, frequency was sporadic and maximum concentration was recorded in October. Total spore count was 113 (0.67%) in 1985-86, and 154 (0.74%) in 1986-87 (Fig. 28).

8. _Annellophora dendrographi_ M.B. Ellis (Plate 16, Fig. 13)

Conidia solitary brown; $44.0 \times 8.0 \mu$m.; obclavate, transversely septate, smooth.

The spores recorded a percentage contribution of 0.51 in 1985-86 and 0.66 in 1986-87. Total count was 86 and 138 spores, with maximum values in October.

9. _Arthrobotryum_ Ces. (Plate 16, Fig. 14)

Conidia obtained solitary, pale brown; $17.5 \times 4.9 \mu$m.; clavate, truncate at the base, 2-3 transverse septa, smooth.

The spores distributed in April and May with a total count of 22 (0.13%) in 1985-86, and 25 (0.12%) in 1986-87.
6. **Podospora de Not.** (Plate 14, Fig. 5)

   Spores in mass, pale brown; \(+ 14.4 \times 4.0 \, \mu m\); individual spores ellipsoidal, thick walled, smooth.

   This spore type had an extended distribution period, and was recorded in October, December to March and May to September. Total count was 43 with a percentage contribution of 0.25 in 1985-86, while 76 and 0.36 in 1986-87 (Fig. 28).

7. **Rosellinia Ces. & de Not.**

   Spores solitary, dark brown; \(+ 22.8 \times 8.2 \, \mu m\); elliptical, with longitudinal furrow.

   This spore type recorded a total count of 31 spores (0.18%) in 1985-86, and 25 spores (0.11%) in 1986-87.

8. **Trichospora E. & E.**

   Spores solitary, pale to mid brown; \(+ 38.5 \times 14.0 \, \mu m\); broadly elliptic, with several transverse and oblique septa, thick walled.

   Spore type distributed from May to July with percentage contribution of 0.28 and 0.14 in 1985-86 and 1986-87 respectively. Maximum contribution was recorded in July.

**Basidiomycetes :**

1. **Elaphomyces Fr.** (Plate 14, Fig. 13)

   Spores solitary, dark brown; \(+ 28.0 \, \mu m\). diameter; spherical, spore wall thick with irregular wart like processes.

   In 1985-86, this basidiospore was recorded in November and December, with a total contribution of 0.05%, while in 1986-87 it was distributed from October to December, contributing 0.10% to the total aeromycoflora. Total count was 10 and 22 spores in the two years respectively.
2. **Ganoderma** Karst.

Spores solitary or in mass, brown; +6.5 x 4.5 μm.; ellipsoid ovate, truncate at the distal part; surface foveate.

This spore type showed a consistent occurrence in August and September, with maximum values in the latter month. Total count was 245 (1.45%) in 1985-86 and 311 (1.49%) in 1986-87.

3. **Inocybe** Maire & Konrad (Plate 14, Fig. 11)

Spore brown; + 5.6 x 7.4 μm.; ellipsoid nodulose with rounded conical bosses, wall thick and smooth.

Maximum concentration of this spore type was recorded in May. A total of 57 (0.33%) and 43 (0.20%) spores were noted in 1985-86 and 1986-87 respectively.

4. **Podaxis** Fl.

Spores solitary, hyaline; + 10.2 x 3.4 μm.; thin walled and smooth.

This spore type was recorded in August only, with percentage contribution of 0.05 in 1985-86 and 0.03 in 1986-87.

5. **Puciniopsis** Speg.

Spores solitary, dark brown; + 12.6 x 26.4 μm.; ovoid, thick walled.

Spore type recorded in September (1985-86) only, contributing 0.01% to the total aeromycoflora.

6. **Rust Spores** (Plate 14, Fig. 1, 14-18)

This group include the uredospores and teleutospores of different rust fungi. They were distributed throughout the year with maximum concentration during January to March. Frequency was sporadic from October to November and June to September. Total count was 1181 (7.01%) in 1985-86 and 1570 (7.57%) in 1986-87.
7. **Tilletia (DC) Tul.** (Plate 14, Fig. 9)

Spores solitary or in clump, pale yellow; $\pm 22.0 \, \mu m$ in diameter; sub globose to circular; reticulate with uniform meshes.

This spore type was recorded in December to January, and April to June in 1985-86, and December to February, May to June in 1986-87. Maximum values in the first year was noted in January (154 spores), and in May (195 spores), 1986-87. The total spore count was 259 (1.53%) and 353 (1.70%) respectively (Fig. 28).

8. **Urocystis E. & E.** (Plate 14, Fig. 12)

Spores solitary or in clump, light brown; $\pm 33.0 \, \mu m$ in diameter, sub-globose.

This spore type was recorded from October to January, with maximum concentration in December, 1985-86 and in November, 1986-87. Total count was 39 (0.23%) in the first year and 47 (0.22%) spores in the second year.

**Deuteromycetes:**

1. **Alternaria alternata** (Fr.) Keisster (Plate 15, Fig. 3)

Conidia solitary or in acropetal chains, light brown; $\pm 36.4 \times 4.8 \, \mu m$.; obclavate, transversely septate and frequently with oblique septa, smooth.

The conidia were distributed throughout the investigation period with the exception of January and August. Maximum concentration was recorded from February to June. The total contribution was 3.67% in 1985-86 and 5.26% in 1986-87, with total count of 619 and 1092 spores respectively.
2. *Alternaria brassicae* (Berk.) Sacc. (Plate 15, Fig. 6)

Conidia solitary, pale greyish olive; $\pm 189.0 \times 20.0\ \mu m.;$ beak one third of the conidium, $\pm 4.8\ \mu m.$ thick; obclavate, slightly curved, number of transverse septa $\pm 14,$ smooth.

Maximum values of this spore type was recorded in February and March, occurrence sporadic in other months. Total count was 207 (1.22%) in 1985-86 and 266 (1.28%) in 1986-87.

3. *Alternaria crassa* (Sacc.) Rand. (Plate 15, Fig. 7)

Conidia solitary, straw coloured; $\pm 110.2 \times 14.0\ \mu m.,$ beak $\pm 59.5 \times 2.7\ \mu m.$ fusiform, beak greater than conidial length, 4 transverse septa and 1-2 longitudinal septa, constricted at septa, smooth.

This spore type was recorded almost throughout the year, with highest and consistent occurrence during September to November. Total percentage contribution was 5.27 in 1985-86 and 5.32 in 1986-87, with a total count of 888 and 1105 spores respectively.

4. *Alternaria longissima* Deighton & Mac Gravie (Plate 15, Fig. 2)

Conidia solitary, pale straw coloured; $\pm 402.5 \times 3.5\ \mu m.,$ thick in the broadest part; basal subcylindric portion of few cells and a very long septate beak, $\pm 14$ transverse septa, smooth.

The total distribution of the spores extended from November to March, with peak incidence in January. Its total contribution was 0.18% in 1985-86, and 0.34% in 1986-87 to the total aeromycoflora.

5. *Alternaria tenuissima* (Kunze ex Pers.) Wiltshire (Plate 15, Fig. 4)

Conidia solitary or in chains; $\pm 24.0 \times 8.2\ \mu m.$ thick in the broadest part; obclavate, beak swollen, 4-6 transverse septa and several oblique septa.
10. *Aspergillus* Link

Conidia solitary or in basipetal chain, variously coloured; $\pm$ 4.0 x 2.8 $\mu$m.; subspherical or oval, smooth or ornamented.

The spore season of this type began from May and continued until September, with a maximum concentration in August and September. Percentage contribution to the total airmycoflora was 4.57 in 1985-86, and 2.91 in 1986-87 with a total count of 770 and 605 respectively.

11. *Camarosporium* Schutz (Plate 16, Fig. 5)

Conidia solitary, golden brown; $\pm$ 20.8 x 10.0 $\mu$m.; oval with rounded ends, muriform, with several transverse and few oblique septa, smooth.

The spores were found to be distributed from December to July, and recorded maximum frequency in February and March. In 1985-86 a total of 175 (1.03%), and 210 (1.01%) spores in 1986-87 was recorded from the airmospora (Fig. 29).

12. *Camposporium* Harkness (Plate 16, Fig. 12)

Conidia solitary, pale brown and unequally coloured, end cells subhyaline; $\pm$ 88.0 x 4.8 $\mu$m.; cylindrical, rounded at apex, with truncate base, multiseptate; smooth.

Recorded sporadically and in very low concentration in November, December and January, with a total contribution of 0.05% in 1985-86, and 0.10% in 1986-87.

13. *Camptomeris albizae* (Petch) Mason (Plate 16, Fig. 3)

Conidia solitary, pale brown; $\pm$ 45.5 x 14.0 $\mu$m.; obclavate, rounded at ends, 0-3 septate, verruculose.

The spore season of this species ranged from October to December, and September, with a total count of 38 (0.22%) and 43 (0.20) spores in 1985-86 and 1986-87 respectively (Fig. 28).

Conidia solitary branched, consists of two curved arms, pale brown; \( \pm 32.0 \times 4.0\ \mu\text{m}. \); several septate, smooth.

Spore type recorded in October to November, with maximum values in the former month. It contributed a total of 0.16\% in 1985-86, and 0.16\% in 1986-87. Occurrence was discontinuous.

15. *Cercospora* Fresenius (Plate 16, Fig. 17)

Conidia solitary, sub hyaline; \( \pm 29.7 \times 3.5\ \mu\text{m}. \); obclavate to cylindric, straight or slightly curved, truncate base, 0-3 septate, smooth.

The main spore season was recorded from October to December, and May to September. September and October recorded highest values. It contributed a total of 1.49\% in 1985-86, and 1.13\% in 1986-87. The total count was 251 and 236 respectively (Fig. 28).

16. *Cercosporidium* Earle (Plate 16, Fig. 4)

Conidia solitary, pale brown; \( \pm 59.5 \times 14.0\ \mu\text{m}. \); clavate with thickened hilum, 1-3 septate, verrucose.

Occurrence of this spore type was sporadic, with a total count of ten (0.05\%) and 18 (0.08\%) in 1985-86 and 1986-87 respectively.

17. *Cladosporium cladosporioides* (Fresen.) de Vries (Plate 16, Fig. 10

Conidia in long chains, pale brown; \( \pm 3.2 \times 2.0\ \mu\text{m}. \); limoniform, 0 septate, smooth.

The spores were recorded throughout the year, with varying numbers in different months. In 1985-86 a total of 1802 spores with a contribution of 10.70\% was noted, and maximum concentration was in September (380 spores). Total contribution in 1986-87 was 9.23\% with a count of 1915 spores, recording maximum values in September (410 spores).
18. *Cladosporium variable* (Cooke) de Varies (Plate 16, Fig. 15)

Conidia in short chains, pale brown; $+$ 17.0 x 7.0 $\mu$m.; sub globose, 0-septate, verrucose.

The main spore season lasted from November to March, with higher concentration in February. Total percentage contribution was 1.33 in 1985-86 with a total count 225 spores, and 1.63 in 1986-87 with a total count of 339 spores.

19. *Clasterosporium* Schweinitz (Plate 16, Fig. 6)

Conidia solitary, pale brown; $+$ 60.0 x 40.0 $\mu$m. thick at the broadest part; cylindrical, straight, $+$ 8 transverse septa; smooth.

Spores recorded in 1986-87 only, with a total count of nine (0.05%).

20. *Cordana* Fruss

Conidia obtained solitary, dark brown; $+$ 12.0 x 8.0 $\mu$m.; broadly ellipsoidal, dark band at the septum, smooth.

This spore type was recorded sporadically in various months with a record of high concentration in February. It contributed a total of 43 (0.25%) spores in 1985-86, and 50 spores (0.24%) in 1986-87 (Fig. 28).

21. *Corynespora* Gussow (Plate 16, Fig. 7)

Conidia solitary, straw coloured; $+$ 98.0 x 14.0 $\mu$m. thick at the broadest part; obclavate, septate or pseudoseptate, truncate base, smooth.

Maximum concentration of this spore type was recorded in September. It contributed a total of 121 spores (0.71%) and 87 spores (0.41%) in 1985-86 and 1986-87 respectively (Fig. 29).
22. *Curvularia* Boed (Plate 16, Fig. 8, 9, 11 & 16)

Conidia solitary, pale brown, end cells hyaline; + 24.0 to 36.0 x 8.0 to 12.0 μm.; clavate or broadly fusiform, curved, 3 or more septate, smooth.

Conidia of this fungi were encountered throughout the investigation period, with highest frequency in March (85 86) and December (86-87). A total of 874 (5.19%) and 1255 (6.05%) spores were recorded in 1985-86 and 1986-87.

23. *Deightoniella* Hughes (Plate 17, Fig. 5)

Conidia solitary, golden brown; + 44.0 x 16.0 μm.; doliiform, + 3 transverse septa, smooth.

This spore type was recorded in highest number in November, contributing a total of 35 (0.20%) and 47 (0.22%) spores in 1985-86 and 1986-87 respectively.

24. *Dendryphiella* Bubak & Ranojevic (Plate 17, Fig. 4)

Conidia in chains, pale brown; + 24.5 x 6.3 μm.; cylindrical, 3 septate, darker at hilum, faintly verruculose.

Recorded sporadically from November to January, contributing 0.14% in 1985-86 and 0.05% in 1986-87.

25. *Dendryphiopsis* Hughes (Plate 17, Fig. 3)

Conidia solitary, dark brown; + 49.0 x 17.5 μm; cylindrical, rounded ends, transversely septate, thick walled, smooth.

This spore type contributed only 0.01% with a total 3 spores only in 1985 86.

26. *Diplococcium* Grove (Plate 17, Fig. 7)

Conidia in chain, pale brown; + 8.0 x 3.6 μm.; oblong, rounded at ends, 1 septate, constricted at septum, smooth.

This spore type was distributed in November and December, recording a total count of 23 spores (0.13%) in 1985-86 and 26 spores (0.12%) in 1986-87.
27. **Drechslera euphorbieae** (Hansford) M.B. Ellis Comb.nov. (Plate 17, Fig. 14)

Conidia solitary, golden brown; \( + 120.0 \times 12.0 \mu m \); narrow ellipsoidal, tapering towards rounded ends, \( + 10 \) pseudoseptate, hilum \( + 2.4 \mu m \) wide, smooth.

The spores were restricted to February and March, with consistent occurrence. Maximum values noted in March. Total contribution was 0.67% (113 spores) in 1985-86, and 0.57% (120 spores) in 1986-87.

28. **Drechslera halodes** (Drechsler) Subram. & Jain (Plate 19, Fig. 5)

Conidia solitary, very pale brown; \( + 36.0 \times 10.0 \mu m \) thick at the broadest part; cylindrical, end cells hyaline, \( + 8 \) pseudoseptate, hilum protruberant, smooth.

These conidia were recorded from October to June, maximum values recorded in December. Percentage contribution was 0.49 in 1985-86 and 0.42 in 1986-87 to the total aeromycoflora.

29. **Drechslera heterostrophus** (Drechsler) Drechsler (Plate 19, Fig. 14)

Conidia solitary, pale brown; \( + 120.0 \times 16.0 \mu m \) thick at the broadest part; fusiform, distinctly curved, \( + 11 \) pseudoseptate, hilum \( + 3.6 \mu m \) wide, smooth.

Reported irregularly from October to December and again in September. Total count in 1985-86 was 63 (0.37%) and 62 (0.29%) spores in 1986-87. Highest number recorded in November.

30. **Drechslera nodulosus** Luttrell (Plate 19, Fig. 16)

Conidia solitary. pale brown; \( + 49.0 \times 14.0 \mu m \) thick in the broadest part; obclavate, \( + 6 \) pseudoseptate, hilum \( + 3.6 \mu m \) wide, with a hyaline zone above it and then a dark zone, smooth.
31. *Drechslera tritici-repentis* (Died.) Drechsler (Plate 19, Fig. 18)

Conidia solitary, sub hyaline brown; $\pm 129.5 \times 14.0$ μm. thick at the broadest part; cylindrical, straight, rounded apex, basal part distinctly conical, $\pm 5$ pseudoseptate, smooth.

This spore type contributed a total of 160 spores (0.95%) in 1985-86, and 210 spores (1.01%) in 1986-87. Occurrence was maximum in October (Fig. 29).

32. *Drechslera* Ito (Plate 19, Fig. 2-4, 6-13, 15 & 17)

It is a heterogenous group, and include those conidia which could not be identified to specific level. They were recorded throughout the year in different concentration, maximum values were noted in October and November. Frequency of occurrence was consistent during most of the month. They recorded a total of 867 spores (5.14%) in 1985-86, and 1999 spores (9.64%) in 1986-87.

33. *Dwayabeeja* Subramanian (Plate 17, Fig. 6 & 9)

Short conidia obtained solitary, dark brown; $\pm 60.0 \times 12.0$ μm.; broadly fusiform, slightly curved, 2-12 septate, constricted at septa, echinulate.

In both the years this type was recorded in October and August to September. Occurrence was sporadic. Total contribution was 0.27% in 1985-86 and 0.21% in 1986-87.

34. *c.f. Endophragmia* Duvernoy & Maire (Plate 17, Fig. 2)

Conidia solitary, dark brown; $\pm 24.9 \times 16.0$ μm.; obovoid, 3-septate, with dark band at septum, smooth.

Recorded only in November (1985-86) and January (1986-87) in very low frequency. Total concentration was 0.07% in the first year, and 0.03% in the second year.
35. *c.f. Endophragmiopsis* M.B. Ellis (Plate 17, Fig. 8)

Conidia solitary, pale brown; + 28.0 x 16.0 μm.; ellipsoidal, transversely septate, intermediate cells dark and end cells hyaline, smooth.

This spore type was recorded in November (1985-86) and November to December (1986-87). It recorded a total of 12 spores (0.07%) in the first year and 22 spores (0.10%) in the second year.

36. *Epicoccum* Link ex Schlecht (Plate 17, Fig. 11-12)

Conidia solitary, dark brown; + 18.2 μm in diameter; sub spherical, muriform, wall thick, verrucose.

In 1985-86 this spore was noted first in October, then November, January to March and the last month recorded highest number. It first appeared in November 1986-87 and then January to May with maximum values in March. Total contribution was 1.85% (312 spores) in the first year, and 3.83% (796 spores) in the second year.

37. *Fulvia* Ciferri (Plate 17, Fig. 17)

Conidia catenate, pale brown; + 24.5 x 12.2 μm.; ellipsoidal, 1-septate, hilum slightly protuberant, smooth.

Recorded once in May (1985-86), and again in March (1986-87). Total count was four (0.02%) spores, and six (0.02%) spores in the two years survey period respectively.

38. *Fusariella* Saccardo (Plate 17, Fig. 16)

Conidia obtained solitary and in chain, pale brown; + 16.8 x 3.5 μm.; fusiform, pointed at apex and truncate base, 1-septate, smooth.

These conidia were distributed from October to April, with consistent frequency in first three months. Maximum number recorded in December (1985-86), and October (1986-87). The contribution was 3.97% with a total 669 spores in the first year, and 3.30% with a total of 686 spores in the second year.
39. **Fusarium** Link

Macroconidia solitary, hyaline; $+ 36.0 \times 4.0 \, \mu m.$; sickle shaped, ends pointed, several celled, smooth.

In both the years they were recorded from July to September, with sporadic occurrence. Total count was 15 spores (0.08%) in 1985-86 and 34 spores (0.11%) in 1986-87.

40. **Fusicladium** Bonorden (Plate 17, Fig. 13)

Conidia obtained solitary, pale brown; $+ 28.0 \times 8.0 \, \mu m.$; broadly fusiform, pointed at apex and truncate base, 0-septate, verruculose.

These spore types were recorded from October to November (1985-86) and October to December (1986-87), in different concentrations. Percentage contribution and total count was 0.19 and 33 spores in the first year, and 0.27 and 56 spores in the second year.

41. **Gliomastix** Gueguen

Conidia obtained solitary, brown; ellipsoidal, 0-septate, verrucose.

In both the years these were recorded in August and September. Contribution to the total aeromycoflora was 0.07% in 1985-86, and 0.06% in 1986-87.

42. **Grallomyces** F.L. Stevens (Plate 17, Fig. 10)

Conidia solitary, brown; $+ 70.0 \times 7.7 \, \mu m.$; cylindrical, gently curved, stalked attachment organ at the end, multiseptate, finely verruculose.

These were recorded in low frequency in October and September (1985-86), and only in October (1986-87). Total count was ten (0.06%) and four (0.01%) spores in the first and second year respectively.
43. Helminthosporium Link ex Fries (Plate 17, Fig. 1 & 15)

Conidia solitary, pale brown; $\pm$ 32.0 x 3.6 $\mu$m.; cylindrical or elliptical, pseudoseptate, with basal scar, smooth.

These conidia were recorded almost throughout the year, in varying concentration. Maximum values were noted in June. Total contribution was 4.60% in 1985-86, and 1.96% in 1986-87, with a total count of 776 and 407 spores respectively.

44. Hirudinaria Cesati

Conidia solitary, dark brown; $\pm$ 128.0 x 7.2 $\mu$m.; cylindrical, forked, v shaped, arms curved, multiseptate, faintly verrucose.

Total count five (0.02%) in 1985-86, and eight (0.03%) in 1986-87. In both the years it was recorded in May.

45. Hormiscium Kunze ex Fries (Plate 17, Fig. 21)

Conidia are buds attached in chains, dark brown; $\pm$ 7.0 $\mu$m diameter; sub spherical, smooth.

This type contributed a total of 0.06% and 0.05% in 1985-86 and 1986-87 respectively. Occurrence was totally sporadic.

46. Humicola Traaen (Plate 17, Fig. 18)

Conidia globose, unicellular, brown with an exospore which is yellowish brown; $\pm$ 14.6 $\mu$m. in diameter; diaphanous and showing double contour.

This type was recorded only once in December, 1985-86, with a total count of four and contributing 0.02% to the total aeropalynoflora.
47. *Leptosphaeria salvini* Cattaneo (Plate 17, Fig. 19 & 20)

Conidia solitary, unequally coloured; ± 59.5 x 14.0 μm.; falcate, cell at each end hyaline and intermediate cell pale brown, 3-septate, smooth.

These spores were recorded from October to February, with sporadic frequency. The total contribution to the aeromycoflora was 0.26% (45 spores) in 1985-86, and 0.11% (24 spores) in 1986-87 (Fig. 28).

48. *c.f. Mammaria* Cesati (Plate 17, Fig. 22)

Conidia solitary, golden brown; ± 18.0 x 6.0 μm.; ellipsoidal, truncate base, 0-septate, smooth.

Reported in August and September, with a total count of 21 spores (0.12%) in 1985-86, and 28 spores (0.13%) in 1986-87.

49. *Monodictys* Hughes (Plate 18, Fig. 5)

Conidia solitary, or in mass, pale brown; ± 24.5 x 17.5 μm.; sub spherical or ellipsoidal, muriform, smooth.

Percentage contribution was 0.08 and 0.15 in 1985-86 and 1986-87 respectively. In both the years reported in August and September with a total count of 15 and 33 spores.

50. *Mycoenterolobium* Goos. (Plate 18, Fig. 1)

Conidia solitary, dark brown; ± 52.5 μm. diameter; spheroidal, flattened in one plane, muriform with rows of cells radiating fanwise from the hilum, smooth.

This type was recorded once in September and November 1986-87, with a percentage contribution of 0.03 to the total aeromycoflora.
51. *Myrothecium* Tode ex Fries

Conidia aggregated, grey; + 7.3 x 3.5 µm.; broadly elliptic, truncate base, 0-septate, smooth.

This spore type was recorded with good frequency from November to January, with higher incidence in December. Total contribution was 3.22% (543 spores) in 1985-86, and 1.02% (212 spores) in 1986-87 (Fig. 29).

52. *Nigrospora* Zimm.

Conidia solitary, shining black; + 12.0 µm. in diameter; broadly elliptic, 0-septate, smooth.

The conidia were recorded throughout the investigation period with highest number in August. Its percentage contribution was 1.25 (212 spores) in 1985-86, and 1.11 (232 spores) in 1986-87 (Fig. 29).

53. *Paecilomyces* Bain (Plate 18, Fig. 3)

Conidia in chain, one celled, pale brown; + 9.6 x 4.0 µm.; broadly elliptic, smooth.

Recorded sporadically in October and March, with total count of 15 (0.08%) in 1985-86 and ten (0.03%) spores in 1986-87.

54. *Periconia byssoides* Pers. ex Merat. (Plate 18, Fig. 9)

Conidia in clump, dark brown; + 15.0 µm. in diameter; spherical, verrucose.

In 1985-86 this type was recorded from October to June, with maximum concentration in December. Occurrence in 1986-87 was from December to July, with a peak in January. Total contribution was 3.49% (589 spores) in 1985-86 and 1.72% (357 spores) in 1986-87.
55. *Periconia echljochloae* (Batista) M.B. Ellis Comb nov. (Plate 18, Fig. 16)

Conidia solitary, golden brown; + 16.8 x 9.8 μm.; ellipsoidal, verruculose.

These were recorded sporadically from December to April in 1985-86, and November to March 1986-87. Total count was 44 spores (0.26%) and 41 spores (0.19%) in 1985-86 and 1986-87 respectively.

56. *c.f. Periconiella* Saccardo (Plate 18, Fig. 2)

Conidia obtained solitary, pale brown; + 24.0 x 3.6 μm.; ellipsoidal, rounded at the apex and truncate at base, finely verruculose.

Maximum frequency was noted in September, with a total contribution of 0.37% (63 spores) in 1985-86, and 0.27% (58 spores) in 1986-87.

57. *Phaeotrichoconis* Subramanian (Plate 18, Fig. 14)

Conidia solitary, golden brown; + 71.5 x 21.5 μm. thick in the broadest part; cbclavate, thick walled, beak + 60.0 x 1.6 μm., narrow and hyaline, brown scar at base, scar + 4.0 μm. wide, 6-septate, smooth.

This spore type was recorded throughout the year in varying concentration, with a peak in October. Total count was 514 (3.05%) and 398 (1.91%) spores in 1985-86 and 1986-87 respectively.


Conidia solitary, dark brown; + 23.8 x 16.8 μm.; broadly ellipsoidal, + 3-septate, middle cell usually divided by longitudinal septa, echinulate or verruculose.

This type was recorded in all months of 1985-86, except November, March and April with a highest frequency in October. In 1986-87 it was absent only in November and August, with a peak concentration in October. Total contribution of 271 spores (1.60%) in 1985-86 and 697 spores (3.36%) in 1986-87 was noted.
59. **Pseudocercospora** Spegazzini (Plate 18, Fig. 8)

Conidia solitary, pale brown; $\pm$ 33.5 x 6.3 $\mu$m. thick at the broadest part, obclavate, conicotruncate at the base, numerous transverse septa, smooth.

Maximum values of this type were recorded in October, occurrence was sporadic. Total count was 111 spores (0.65%) in 1985-86, and 101 spores (0.50%) in 1986-87 (Fig. 29).

60. **Sarcinella** Saccardo (Plate 18, Fig. 12)

Conidia solitary, dark brown; $\pm$ 28.0 x 16.0 $\mu$m.; irregularly sarciniform, septa muriform, cruciately arranged, deeply constricted, smooth.

This type contributed a total of 0.16% and 0.14% in 1985-86 and 1986-87 respectively. Occurrence was sporadic in both the years and recorded in August and September.

61. **Sclerographium** Berkely (Plate 18, Fig. 6)

Conidia solitary, dark brown; $\pm$ 36.0 x 10.0 $\mu$m.; cylindrical, rounded at ends, several transverse septa and few longitudinal septa, echinulate.

In both the years this type was recorded in July with a total of five spores (0.02%) in 1985-86, and four spores (0.01%) in 1986-87.

62. *c.f. Scolecobasidium* Abbot (Plate 18, Fig. 4)

Conidia solitary, pale brown; $\pm$ 14.3 x 7.3 $\mu$m.; cylindrical, rounded at ends, 1-septate, echinulate.

This type contributed 0.09% in 1985-86 and 0.11% in 1986-87 to the total aeromycoflora, recording a total of 16 and 23 spores respectively. In the first year it was noted from May to July, and in the second year from April to July.
63. *Sporidesmium* Link ex Fries (Plate 18, Fig. 13, 15, 17-18)

Conidia flexuous, dark reddish brown; + 168.0 x 20.0 μm. thick in the broadest part; obclavate, greatly elongated, rounded apex, conicotruncate base, + pseudoseptate, smooth.

In 1985-86 this occurred from March to May and in 1986-87 from May to July. Frequency of occurrence was sporadic. A total count of 19 spores (0.11%) and 26 spores (0.12%) was recorded in the first and second year respectively.

64. *Scopulariopsis* Bainier

Conidia in chains, unicellular, light brown; + 7.0 x 5.0 μm.; globose, thickened rim around the truncate base, spinulose.

This type recorded a maximum concentration in February, with a total percentage contribution of 0.16 and 0.10 in 1985-86 and 1986-87.

65. *Stemphylium* Wallroth (Plate 18, Fig. 10)

Conidia solitary, pale brown; + 21.0 x 11.9 μm.; broadly ellipsoidal, rounded ends, + 3 septate and 1-2 longitudinal septa, echinulate.

This type was recorded in less amount in 1985-86, in comparison to the total of 1986-87. Maximum values were noted in May (1985-86) and March (1986-87). The total count was 187 (1.11%) and 243 (1.17%) spores in the first and second year respectively (Fig. 29).

66. *Stemphyliomma* Saccardo & Traverso

Conidia solitary, dark brown; + 25.0 x 12.0 μm.; club shaped, end cells hyaline, + 3 septate, verruculose.

Recorded in low concentration with a total contribution of 0.02% and 0.03% in 1985-86 and 1986-87 respectively. In both the years it was recorded in September.
127. Tetracoccosporium Szabo

Conidia solitary, mid brown; + 14.0 x 11.0 μm.; sub spherical, divided cruciately by septa at right angles to one another, minutely echinulate.

This type was recorded from December to March without any consistency. The total contribution was 0.23% in 1985-86 and 0.20% in 1986-87 (Fig. 28).

68. Tetraploa Berkeley & Broome (Plate 20, Fig. 1, 3-4)

Conidia solitary, brown; + 42.0 x 31.5 μm. thick at the base; with septate appendages, conidium of four cells to each column, furrows between column of cells, muriform, septate appendages + 24.5 μm. long, verrucose.

Tetraploa spores were recorded throughout the year with peak catches in October. The total count was 542 (3.21%) and 838 (4.04%) spores in 1985-86 and 1986-87 respectively.

69. Trichoglossum Boudier (Plate 20, Fig. 6)

Conidia solitary, pale brown; + 73.5 x 6.3 μm.; cylindrical, straight or slightly curved, truncate base, multisepate, smooth.

This type contributed a total of 0.59% and 0.48% in 1985-86 and 1986-87 respectively. Maximum values were recorded in May (1985-86) and September (1986-87).

70. Triposporium Corda

Conidia solitary, mid brown; + 32.0 x 8.0 μm. thick at base; clavate, stalk cell and three conical septate arms joined by their bases, smooth.

This type was recorded in low concentration, with total contribution of 0.04% in 1985-86 and 0.07% in 1986-87.
71. **Torula** (Pers.) Link ex Fr. (Plate 20, Fig. 2, 5 & 10)

Conidia solitary or in chains, brown; ± 13.3 x 4.8 μm.; cylindrical, rounded cells, ± 1-3 septate, constricted at septum, finely echinulate.

Maximum concentration was recorded in October and December, with a total count of 538 (3.19%) in 1985-86, and 899 (4.33%) in 1986-87.

'Indeterminate types' (Plate 20, Fig. 7-9)

The number of 'indeterminate types' recorded in 1985-86 were 611, contributing 3.62% to the total aeromycoflora. In 1986-87, 750 spores were recorded which contributed 3.61%, slightly less than the first year. Maximum values were recorded in October.
Figs.

1. Rust spore x 820
2. Gyrostomum x 220
3. Dothidea x 300
4. Pleospora x 1120
5. Podospora x 400
6 & 7. Choanephora x 550
8. Parodiella x 900
9. Tilletia x 400
10. Podaxis x 850
11. Inocybe x 620
12. Urocystis x 550
13. Elaphomyces x 1400
14. Rust spore x 1150
15 & 18. Rust spore x 1350
16. Rust spore x 1050
17. Rust spore x 850
PLATE - 15

Figs. 1, 9 & 10. *Alternaria* x 900

2. *Alternaria longissima* x 450

3. *A. alternata* x 1450

4. *A. tenuissima* x 500

5 & 8. *Alternaria* x 1020

6. *A. brassicae* x 2400

7. *A. crassa* x 1230

11 & 14. *Alternaria* x 850

12. *Alternaria* x 2500

13, 15 & 16. *Alternaria* x 1100
PLATE - 16

Figs. 1 & 2. *Annellophora* x 1040

3. *Camptomeris albiziae* x 1260
4. *Cercosporidium* x 1500
5. *Camarosporium* x 530
6. *Clasterosporium* x 870
7. *Corynespora* x 1800
8. *Curvularia gemiculata* x 820
9. *Curvularia* x 920
10. *Cladosporium cladosporioides* x 320
11. *Curvularia* x 1050
12. *Camposporium* x 1600
13. *Annellophora dendrographii* x 540
14. *Arthrobotryum* x 875
15. *Cladosporium variabile* x 890
16. *Curvularia* x 950
17. *Cercospora* x 870
PLATE - 17

Figs.

1. Helminthosporium x 3500
2. Endophragmia x 550
3. Dendryphiopsis x 1060
4. Dendryphiella x 800
5. Deightoniella x 1400
6 & 9. Dwayabeeja x 1300
7. Diplococcum x 1200
8. Endophragmiopsis x 840
10. Grallomyces x 1900
11 & 12. Epicoccum x 910
13. Fusicladium x 1270
14. Drechalera euphorbiae x 1370
15. Helminthosporium x 810
16. Fusarilla x 1500
17. Fulvia x 1100
18. Humicola x 750
19. Leptosphaeria salvinii x 1050
20. Leptosphaeria x 1140
21. Hormiscium x 980
22. Mammaria x 920
PLATE. - 18

Figs.
1. Mycoenterolobium x 1450
2. Periconiella x 1500
3. Paecilomyces x 250
4. Scolecobasidium x 840
5. Monodictys x 640
6. Sclerographium x 1120
7. Periconia x 850
8. Pseudocercospora x 650
9. Periconia byssoides x 780
10. Stemphylium x 460
11. Periconia x 820
12. Sarcinella x 1000
13, 15 & 18. Sporidesmium x 2000
14. Phaeotrichoconis x 600
16. Periconia echinochloae x 850
17. Sporidesmium x 1380
PLATE - 19

Figs. 1-3. *Drechslera* x 800
4. *Drechslera* x 900
5. *D. halodes* x 950
6. *Drechslera* x 750
7-9. *Drechslera* x 850
10. *Drechslera* x 900
11-12. *Drechslera* x 850
13. *Drechslera* x 900
14. *D. heterostrophus* x 1140
15. *Drechslera* x 750
16. *D. nodulosus* x 790
17. *Drechslera* x 750
18. *D. tritici-repentis* x 1260
PLATE - 20

Figs. 1 & 3. *Tetraploa* x 700
2. *Torula* x 1280
4. *Tetraploa* x 490
5. *Torula* x 1700
6. *Trichoglossum* x 1050
7. Indeterminate type x 900
8. Indeterminate type x 550
9. Indeterminate type x 600
10. *Torula* x 870
**Seasonal Variation**

The weather record of Cooch Behar district is dominated by dry and wet periods. September and February in 1985-86 were found to have the highest and lowest values for rainfall respectively, and it was July and December in 1986-87. There was no rainfall from November to February in 1985-86, and January to February in 1986-87. The mean values for the maximum temperature was obtained in June (1985-86) and May (1986-87), whereas the minimum in January for both the cycles. The mean relative humidity was maximum in September (1985-86) and August (1986-87), and the minimum was in March and April respectively (Table 13).

The highest monthly fungal spore counts in 1985-86 were obtained in October, December, January, March and September, while in 1986-87 they were in October, November, February, March and May (Table 13). Out of the four classes of fungi Phycomycetes recorded the frequency peaks in October (1985-85) and August (1986-87), Ascomycetes in October, May to July (1985-86) and October, May to August (1986-87). The Basidiomycetes had the maximum values in December to May and August to September in both the cycles. The Deuteromycetes recorded highest counts in October, December and March (1985-86), and October, November, February to March (1986-87). The 'indeterminate' spore types attained maximum total counts in October and November of 1985-87 (Table 21).

The total counts of each month for 1985-86 and 1986-87 were plotted in relation to the five seasons (Table 14). The winter season recorded the highest values (36.89% and 37.16% respectively) and this was preceded by low counts during rainy months (18.22% and 12.62% respectively). Out of the winter months December recorded relatively higher catches compared with the other remaining months of the same season. During the monsoon months September attained the peak, where spores from Ascomycetes, Basidiomycetes and Deuteromycetes showed higher percentage contribution.
Each constituent spore type of the total aeromycoflora had a peak. Accordingly the dominant spore types could be organised into different groups in relation to their respective high values and the corresponding season, as shown below:

<table>
<thead>
<tr>
<th>Group/Season (Season)</th>
<th>Dominant Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I (Autumn)</td>
<td>Alternaria crassa, Phaeotrichoconis, Pithomyces, Pseudocercospora, Tetraploa, Torula, Elaphomyces, Rust spore, Chaetomium, Choanephora.</td>
</tr>
<tr>
<td>Group II (Winter)</td>
<td>Alternaria brassicae, A. longissima, Cladosporium cladosporioides, C. variable, Curvularia, Diplococcum, Drechslera, Fusariella, Leptosphaeria, Myrothecium, Periconia, Tetraploa, Torula, Rust spore, Urocystis, Tilletia.</td>
</tr>
<tr>
<td>Group III (Spring)</td>
<td>Alternaria alternata, A. tenuissima, Camroporium, Cladosporium cladosporioides, Epicoccum, Drechslera tritici repentis, Stemphylium, Tetraploa. Rust spores.</td>
</tr>
<tr>
<td>Group IV (Summer)</td>
<td>Alternaria alternata, Cercospora, Curvularia, Drechslera nodulosus, Helminthosporium, Stemphylium, Trichoglossum, Ganoderma, Tilletia, Teichospora.</td>
</tr>
</tbody>
</table>
Group V (Rainy season) - Alternaria crassa, 'aspergilli', Cladosporium cladosporioides, Fusarium, Helminthosporium, Nigrospora, Ganoderma, Rosellinia.

The five groups above display the seasonal variations of the dominant spore types. Some of the types were represented in two or more seasons, e.g. Alternaria, Cladosporium, Tetraploa, Curvularia, etc., thereby, establishing their wide distribution pattern independent of seasonal effect.

Yearly Variation of Aeromycoflora:

A comparative approach to the two successive cycles of aeromycoflora with regard to the constituents, total composition, frequency of incidence and percentage contribution, showed differences to a restricted extent which are outlined below:

The constituents of the aeromycoflora were more or less similar in both the cycles (Table 20), except for three specific spore types. In 1985-86 Dendryphiopsis was recorded in addition to other spore types, while 1986-87 it was Clesterosporium and Mycoenterolobium unlike the first cycle.

Total Aeromycoflora -

The total fungal spores recorded in different months of sampling period, along with their percentage contribution to the total aeromycoflora are given in Table 22. Maximum frequency was noted in October, 1985 with 13.44% of the total during 1985-86. The maximum values during 1986-87 were also recorded in October, with 14.42% of the total in that cycle. Thus an increase of 0.98% was recorded in 1986-87.
### TABLE - 22
Correlation of total monthly count and percentage contribution to the yearly aeromycoflora

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No./10 cm²</td>
<td>% Contribution</td>
</tr>
<tr>
<td>October</td>
<td>2262</td>
<td>13.44</td>
</tr>
<tr>
<td>November</td>
<td>1465</td>
<td>8.70</td>
</tr>
<tr>
<td>December</td>
<td>1738</td>
<td>10.32</td>
</tr>
<tr>
<td>January</td>
<td>1684</td>
<td>10.0</td>
</tr>
<tr>
<td>February</td>
<td>1328</td>
<td>7.89</td>
</tr>
<tr>
<td>March</td>
<td>1633</td>
<td>9.69</td>
</tr>
<tr>
<td>April</td>
<td>1197</td>
<td>7.11</td>
</tr>
<tr>
<td>May</td>
<td>1472</td>
<td>8.75</td>
</tr>
<tr>
<td>June</td>
<td>994</td>
<td>5.90</td>
</tr>
<tr>
<td>July</td>
<td>527</td>
<td>3.14</td>
</tr>
<tr>
<td>August</td>
<td>876</td>
<td>5.20</td>
</tr>
<tr>
<td>September</td>
<td>1664</td>
<td>9.89</td>
</tr>
<tr>
<td>Total</td>
<td>16840</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Frequency of Incidence -

A comparative analysis of the frequency of incidence of some of the dominant spore types (Fig. 31) during in two years survey period demonstrated differences in certain cases. In case of Alternaria, Drechslera and Epicoccum the differences were more striking, while it was moderate for Rust spores, Curvularia, Torula, Tetraploa etc. in 1986-87. Helminthosporium was the only type with a relatively high incidence in 1985-86. The differences were not so remarkable for the remaining types. Further a look into the calendar (Fig. 22 & 23) of dominant spore types reveal the relative dominances in each during both the cycles.

Peak Month of Incidence -

The peak month of incidence of the major spore types and their monthly total number per 10 cm² of the trap surface in the corresponding month of both the cycles are given in Table 23. The cumulative data signifies that the peak month of incidence was not similar in 1985-86 and 1986-87 for at least some of the spore types. Further, the total number recorded for each individual type showed less differences in both the cycles. The peaks for Cercospora, Curvularia, Drechslera nodulosus, Dwayabeesa, Fusariella, Leptosphaeria salvinii, Tilletia, Periconia byssoides, Stemphylium were recorded in different months in both the cycles. The monthly total number per 10 cm² of the trap surface for Myrothecium, Periconia and Phaeotrichocconis were higher in 1985-86, whereas Alternaria alternata, A. crassa, Epicoccum, Pithomyces and Rust spores were comparatively higher in 1986-87.

Maximum Daily Occurrence -

The maximum daily occurrence for all the spore types varied from year to year as shown in Table 24, e.g. the highest value of Curvularia, Drechslera nodulosus, Fusariella and Pithomyces were recorded in different months, distantly variable from each other. On the
Peak monthly incidence of the major fungal spore types and their total catch in the respective peak months during the period 1985-1986 and 1986-1987

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak Month</td>
<td>No./10 cm²</td>
</tr>
<tr>
<td><strong>Alternaria alternata</strong></td>
<td>May</td>
<td>200</td>
</tr>
<tr>
<td><strong>A. crassa</strong></td>
<td>October</td>
<td>332</td>
</tr>
<tr>
<td><strong>Annellophora</strong></td>
<td>October</td>
<td>60</td>
</tr>
<tr>
<td><strong>Camarosporium</strong></td>
<td>March</td>
<td>88</td>
</tr>
<tr>
<td><strong>Cercospora</strong></td>
<td>September</td>
<td>53</td>
</tr>
<tr>
<td><strong>Cladosporium cladosporioides</strong></td>
<td>September</td>
<td>380</td>
</tr>
<tr>
<td><strong>Curvularia</strong></td>
<td>March</td>
<td>166</td>
</tr>
<tr>
<td><strong>Drechslera triticirepentina</strong></td>
<td>March</td>
<td>98</td>
</tr>
<tr>
<td><strong>D. nodulosus</strong></td>
<td>June</td>
<td>57</td>
</tr>
<tr>
<td><strong>Dwayabeeja</strong></td>
<td>October</td>
<td>19</td>
</tr>
<tr>
<td><strong>Epicoccum</strong></td>
<td>March</td>
<td>128</td>
</tr>
<tr>
<td><strong>Fusariella</strong></td>
<td>December</td>
<td>258</td>
</tr>
<tr>
<td><strong>Helminthosporium</strong></td>
<td>June</td>
<td>170</td>
</tr>
<tr>
<td><strong>Leptosphaeria salvinii</strong></td>
<td>January</td>
<td>9</td>
</tr>
<tr>
<td>Fungus</td>
<td>Month</td>
<td>Count</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>Myrothecium</td>
<td>December</td>
<td>212</td>
</tr>
<tr>
<td>Nigrospora</td>
<td>August</td>
<td>48</td>
</tr>
<tr>
<td>Periconia byssoides</td>
<td>December</td>
<td>172</td>
</tr>
<tr>
<td>Pheotrichoconis</td>
<td>October</td>
<td>127</td>
</tr>
<tr>
<td>Pithomyces</td>
<td>October</td>
<td>110</td>
</tr>
<tr>
<td>Pseudocercospora</td>
<td>October</td>
<td>32</td>
</tr>
<tr>
<td>Stemphylium</td>
<td>May</td>
<td>128</td>
</tr>
<tr>
<td>Tetraploa</td>
<td>October</td>
<td>107</td>
</tr>
<tr>
<td>Tilletia</td>
<td>January</td>
<td>154</td>
</tr>
<tr>
<td>Torula</td>
<td>October</td>
<td>163</td>
</tr>
<tr>
<td>Rust Spore</td>
<td>February</td>
<td>304</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Date</td>
<td>No./10 cm²</td>
</tr>
<tr>
<td>Alternaria crassa</td>
<td>3.10.85</td>
<td>50</td>
</tr>
<tr>
<td>Cercospora</td>
<td>14.9.86</td>
<td>36</td>
</tr>
<tr>
<td>Cladosporium</td>
<td>16.9.86</td>
<td>148</td>
</tr>
<tr>
<td>Curvularia</td>
<td>19.12.85</td>
<td>47</td>
</tr>
<tr>
<td>Drechslera nodulosus</td>
<td>8.6.86</td>
<td>36</td>
</tr>
<tr>
<td>Epicoccum</td>
<td>18.3.86</td>
<td>59</td>
</tr>
<tr>
<td>Fusariella</td>
<td>22.12.85</td>
<td>27</td>
</tr>
<tr>
<td>Helminthosporium</td>
<td>7.6.86</td>
<td>33</td>
</tr>
<tr>
<td>Myrothecium</td>
<td>24.12.86</td>
<td>66</td>
</tr>
<tr>
<td>Periconia</td>
<td>13.12.85</td>
<td>28</td>
</tr>
<tr>
<td>Phaeotrichocornis</td>
<td>25.10.85</td>
<td>22</td>
</tr>
<tr>
<td>Pithomyces</td>
<td>12.10.85</td>
<td>29</td>
</tr>
<tr>
<td>Species</td>
<td>Date</td>
<td>Number</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>Tetraploa</td>
<td>3.11.85</td>
<td>19</td>
</tr>
<tr>
<td>Tilletia</td>
<td>8.1.86</td>
<td>86</td>
</tr>
<tr>
<td>Torula</td>
<td>7.10.85</td>
<td>21</td>
</tr>
<tr>
<td>Rust spore</td>
<td>17.2.86</td>
<td>28</td>
</tr>
</tbody>
</table>
other hand the spores of *Alternaria crassa*, *Cladosporium*, *Helminthosporium*, *Myrothecium* and Rust spores recorded highest daily concentrations in the same month of both the cycles. Similarly, differences in their number per $10\ cm^2$ of trap surface on the respective days with daily peak and their percentage contributions to days total aeromycoflora were also recorded. Such differences were peripheral in the case of *Cercospora*, *Curvularia*, *Drechslera nodulosus*, *Helminthosporium*, *Phaeotrichoconis*, *Pithomyces*, *Tetraploa*, *Torula* and Rust spores, whereas significant in *Alternaria crassa*, *Epicoccum* and *Tilletia*.

**Percentage contribution of different groups and individual major spore types**

The total count and percentage contribution of the five classes of fungi and the 'indeterminate' spore types to the total aeromycoflora were different in both the cycles (Table 21 & 25). The contribution of Basidimycetes was slightly lower in 1985-86, whereas the contribution of Phycomycetes and Deuteromycetes was relatively lower in 1986-87.

The percentage contribution of some major fungal spore types to the total aeromycoflora for both the cycles have been given in Table 26. It indicates that with the exception of four spore types, namely, *Pseudocercospora*, *Corynespora*, and *Tetracoccosprium*, the order of dominance of the other components were not the same in both the cycles and *Cladosporium*, which was the most dominant spore type in 1985-86, occupied third position in 1986-87, during which *Alternaria* was more dominant. In 1985-86, *Alternaria* was second in order of dominance. *Drechslera* showed higher percentage contribution in 1986-87 and was second in position. Rust spores and *Curvularia* were the fourth and fifth dominant types in both the cycles with slightly higher concentration in 1986-87. The contributions of *Helminthosporium*, 'aspergilli', *Fusariella*, *Periconia*, *Phaeotrichoconis* and *Cercospora* carries much higher value in 1985-86, though the last four types were similar in order of dominance in both the cycles.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Phycomycetes</td>
<td>0.55</td>
<td>0.31</td>
</tr>
<tr>
<td>Ascomycetes</td>
<td>1.54</td>
<td>1.19</td>
</tr>
<tr>
<td>Basidiomycetes</td>
<td>10.73</td>
<td>11.37</td>
</tr>
<tr>
<td>Deuteromycetes</td>
<td>83.56</td>
<td>83.51</td>
</tr>
<tr>
<td>Indeterminate Types</td>
<td>3.62</td>
<td>3.62</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>
Percentage contribution of major fungal spore types to the total aero- 
mycoflora of Cooch Behar district for the period 

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cladosporium</td>
<td>12.03</td>
<td>Alternaria</td>
<td>13.47</td>
</tr>
<tr>
<td>2</td>
<td>Alternaria</td>
<td>11.89</td>
<td>Drechslera</td>
<td>13.26</td>
</tr>
<tr>
<td>3</td>
<td>Drechslera</td>
<td>9.16</td>
<td>Cladosporium</td>
<td>10.86</td>
</tr>
<tr>
<td>4</td>
<td>Rust spore</td>
<td>6.86</td>
<td>Rust spore</td>
<td>7.41</td>
</tr>
<tr>
<td>5</td>
<td>Curvularia</td>
<td>5.19</td>
<td>Curvularia</td>
<td>6.05</td>
</tr>
<tr>
<td>6</td>
<td>Helminthosporium</td>
<td>4.60</td>
<td>Torula</td>
<td>4.33</td>
</tr>
<tr>
<td>7</td>
<td>'aspergilli'</td>
<td>4.57</td>
<td>Tetraploa</td>
<td>4.04</td>
</tr>
<tr>
<td>8</td>
<td>Fusariella</td>
<td>3.97</td>
<td>Epicoccum</td>
<td>3.83</td>
</tr>
<tr>
<td>9</td>
<td>Periconia</td>
<td>3.75</td>
<td>Pithomyces</td>
<td>3.36</td>
</tr>
<tr>
<td>10</td>
<td>Myrothecium</td>
<td>3.22</td>
<td>Fusariella</td>
<td>3.30</td>
</tr>
<tr>
<td>11</td>
<td>Tetraploa</td>
<td>3.21</td>
<td>'aspergilli'</td>
<td>2.91</td>
</tr>
<tr>
<td>12</td>
<td>Torula</td>
<td>3.19</td>
<td>Helminthosporium</td>
<td>1.96</td>
</tr>
<tr>
<td>13</td>
<td>Phaeotrichoconis</td>
<td>3.05</td>
<td>Periconia</td>
<td>1.92</td>
</tr>
<tr>
<td>14</td>
<td>Epicoccum</td>
<td>1.85</td>
<td>Phaeotrichoconis</td>
<td>1.91</td>
</tr>
<tr>
<td>15</td>
<td>Pithomyces</td>
<td>1.60</td>
<td>Tilletia</td>
<td>1.70</td>
</tr>
<tr>
<td>16</td>
<td>Tilletia</td>
<td>1.53</td>
<td>Ganoderma</td>
<td>1.49</td>
</tr>
<tr>
<td>17</td>
<td>Cercospora</td>
<td>1.47</td>
<td>Annellophora</td>
<td>1.40</td>
</tr>
<tr>
<td></td>
<td>Species</td>
<td>Value 1</td>
<td>Species</td>
<td>Value 2</td>
</tr>
<tr>
<td>---</td>
<td>-----------------</td>
<td>---------</td>
<td>--------------</td>
<td>---------</td>
</tr>
<tr>
<td>18.</td>
<td>Ganoderma</td>
<td>1.45</td>
<td>Stemphylium</td>
<td>1.17</td>
</tr>
<tr>
<td>20.</td>
<td>Anellophora</td>
<td>1.18</td>
<td>Nigrospora</td>
<td>1.11</td>
</tr>
<tr>
<td>21.</td>
<td>Stemphylium</td>
<td>1.11</td>
<td>Myrothecium</td>
<td>1.02</td>
</tr>
<tr>
<td>22.</td>
<td>Camarosporium</td>
<td>1.03</td>
<td>Camarosporium</td>
<td>1.01</td>
</tr>
<tr>
<td>23.</td>
<td>Pseudocercospora</td>
<td>0.71</td>
<td>Pseudocercospora</td>
<td>0.50</td>
</tr>
<tr>
<td>24.</td>
<td>Corynespora</td>
<td>0.65</td>
<td>Corynospora</td>
<td>0.41</td>
</tr>
<tr>
<td>25.</td>
<td>Choanephora</td>
<td>0.55</td>
<td>Choanephora</td>
<td>0.31</td>
</tr>
<tr>
<td>26.</td>
<td>Tetracoccosporiunm</td>
<td>0.23</td>
<td>Tetracoccosporiunm</td>
<td>0.20</td>
</tr>
</tbody>
</table>
Effect of meteorological factors on the incidence and dispersal of fungal spores:

Effect on Monthly total Aeromycoflora -

The monthly records of the total aeromycoflora (1985-86 and 1986-87), were correlated with meteorological factors, such as maximum and minimum temperatures, relative humidity, and total rainfall, recorded during the respective months of the year (Fig. 9).

The monthly total rainfall in 1985-86 showed that there were two wet periods, the first one in October and the second from March to September, with intermittent dry spell from November to February. In first wet period there was a total rainfall of 152.5 mm. The second wet period recorded a total of 2831.6 mm. of precipitation, of which a greater portion was recorded in September (793.6 mm.), followed by August (667.8 mm.), June (611.6 mm.) and finally with July 517.0 mm. (Table 1). The concentration of the aeromycoflora was not affected by the initial rain during the first wet spell, rather it appears to have contributed in building up the concentration in the airspora, as is apparent from the data. The dry spell showed higher values with fluctuating concentration and maximum diversity of spore types. The beginning of the second wet spell in March was again marked by higher counts, and this continued until June. July and August received maximum rains under the influence of the north east monsoon, and this prolonged wet spell gradually decreased the concentration of spore types until the September, after which there was a gradual increase in concentration as is evident from the data (Table 1). Though September received highest amount of rainfall, it was not continuous and was interrupted by dry days. The previous prolonged wet spell in July to August followed by intermittent dry days in September aided in the growth and sporulation of several fungi, and this must have contributed to greater concentration in the subsequent months.
The total rainfall was low (728.7 mm.) during 1986-87. The first wet spell was from October to December with intermittent dry spell from January to February, and the second wet spell was from March to September with a maximum rainfall (122.2 mm.) in August (Table 14). On average was intermittent during the wet periods without any long and prolonged spell. Such a condition favoured the overall growth, development and dispersal of the conidial fungi. Further in 1986-87 the concentrations of spore types were relatively higher by 10.38%, when compared with the data of 1985-86.

Effect of few short periods of rainfall on day to day concentration —

From the two years sampling period, few short days characterised by continuous dry, followed by wet and again dry; intermittent rainfall; and continuous heavy rainfall, were selected and correlated with day to day variation in concentration of three dominant spore types of Alternaria, Drechslera and Curvularia. In addition to rainfall other meteorological factors were also taken into consideration (Fig. 10 & 11).

Thirteenth to 21st October, 1985, and 1st to 10th November 1986: These periods were characterised by previously dry, then wet and again dry conditions. The temperature on an average was 25.3°C in 1985 and 24.8°C in 1986, and the relative humidity was high. The concentrations of spores were affected by the showers in between the dry days. It recorded low catches of Alternaria (1985) and nil values for the other spore types. The concentration of Drechslera increased significantly the next day after a smart shower (18.0 mm.) on 6th November, 1986.

Second to 16th April, 1986 and 1st to 21st July 1987: These periods recorded intermittent rainfall, and the wet periods alternated with dry periods. The rainfall was moderate and the average temperatures were 24.3°C (1986) and 28.0°C (1987), with high wind velocity and relative humidity. The decrease in conidial frequency on the rainy days and their subsequent increase in the following dry period was clearly demonstrated.
First to 15th September, 1986 and 21st to 30th June, 1987: These periods recorded a heavy and continuous rainfall. During the above period, 1st to 15th April 1986 and the rest of the period except 1st, 2nd, 5th and 6th September, rainfall was very heavy on the remaining days. A maximum of 165.0 mm. was recorded on 4th alone, which washed away the spores from the airspora. Spores gradually gained concentration during the intermediate days of zero rainfall. However, later heavy showers from 9th onwards washed away the airborne spore contents.

The rainfall during the period 21st to 30th June, 1987 was not heavy compared to the previous year. Maximum value was on 21st and 22nd with a total record of 21.4 mm. and 21.5 mm. respectively. However, the rainfall was continuous with fluctuating intensity. This situation had an interesting influence on the spore concentration. *Alternaria*, *Drechlera* and *Curvularia* spores were totally washed away from the airspora on the days of heavy rainfall. On the other days of low (0.2 mm to 1.9 mm) and moderate (3.7 mm.) showers the concentration somewhat decreased.
Fig. 14: MONTHLY CONCENTRATION OF PTERIDOPHYTES SPORES AND GYMNOSPERMOUS POLLEN GRAINS FROM 3RD. OCT.'85-'86 TO SEP.'86-'87.

PTERIDOPHYTES '85-'86

PTERIDOPHYTES '86-'87

GYMNOSPERM '85-'86

GYMNOSPERM '86-'87
Fig. 15 MONTHLY CONCENTRATION OF POLLEN GRAINS OF GRASSES, HERBS AND WEEDS, SHRUBS AND TREES, FROM 3RD. OCT.'85 TO 2ND. SEP.'86.

GRASSES

HERBS AND WEEDS

SHRUBS AND TREES
Fig. 16 MONTHLY CONCENTRATION OF POLLEN GRAINS OF GRASSES, HERBS AND WEEDS, SHRUBS AND TREES FROM 3RD OCT.'86 TO 2ND SEP.'87
Fig. 17 MONTHLY CONCENTRATION OF PHYCOMYCETES, ASCOMYCETES, BASIDIOMYCETES AND DEUTEROMYCETES SPORES FROM 3RD OCT. '85 TO 2ND SEP. '86.
Fig. 18 MONTHLY CONCENTRATION OF PHYCOMYCETES
ASCOMYCETES BASIDIOMYCETES AND DEUTEROMYCETES
SPORES FROM 3RD. OCTOBER 1986 TO 2ND. SEPTEMBER 1987
Fig: 19

Temperature

Relative humidity

Wind speed km/hr

Rainfall mm

Total airspore Unit: 500

1985-86 1986-87

O NDJ FMAMJ J AS O NDJ FMAMJ J AS
Fig. 20
CALENDAR OF DOMINANT PTERIDOPHYTIC SPORES GYMNOSPERM 
AND ANGIOSPERM POLLEN GRAINS OF COOCH BEHAR DISTRICT 
(WEST BENGAL)

Cheno-Amaranthaceae
Cassia
Urticaceae
Salonaceae
Myrtaceae
Eucalyptus
Samania saman
Terminalia
Betula
Pyrossia
Diplazium
Pinus
Microsorum
Drynaria
Alnus
Quercus
Dubaanga
Caryota
Callistemon
Asteraceae
Croton
Cannabis sativa
Cyperaceae
Poaceae

1985-86
A: 1-40  B: 41-80  C: 81-120
D: 121-160  F: >161
Fig. 21
CALENDAR OF DOMINANT PTERIDOPHYTIC SPORES
GYMNOSPERM AND ANGIOSPERM POLLEN GRAINS
OF COOCH BEHAR DISTRICT. (WEST BENGAL)

Cheno-Amaranthaceae
Cassia
Urticaceae
Salonaceae
Myrtaceae
Eucalyptus
Samania saman
Terminalia
Betula
Pyrossia
Diplazium
Pinus
Microsorium
Drynaria
Alnus
Quercus
Duabanga
Caryota
Callistemon
Asteraceae
Croton
Cannabis sativa
Cyperaceae
Peaceae

1986-87

A: 1-21  B: 21-40  C: 41-60  D: 61-80  E: >81
Fig. 22
CALENDAR OF DOMINANT FUNGAL SPORES OF COOCH BEHAR DISTRICT, (WEST BENGAL)

ONDJFMAMJJ

1985-86

A: 1-21  B: 21-40  C: 41-60
D: 61-80  E >81
<table>
<thead>
<tr>
<th>Month</th>
<th>Myrothecium</th>
<th>Trichoglossum</th>
<th>Pseudocercospora</th>
<th>Rustspore</th>
<th>Nigrospora</th>
<th>Pithomyces</th>
<th>Periconia</th>
<th>Curvularia</th>
<th>Cladosporium</th>
<th>Alternaria</th>
<th>Drechslera</th>
<th>Fusariella</th>
<th>Helminthosporium</th>
<th>Phaeotrichoconis</th>
<th>Tetraploa</th>
<th>Cercospora</th>
<th>Torula</th>
<th>Stemphylium</th>
<th>Epicoccum</th>
<th>Tilletia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986-87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 23
CALENDAR OF DOMINANT FUNGAL SPORES OF COOCH BEHAR DISTRICT

A: 1-21  B: 21-40  C: 41-60  D: 61-80  E: >81
Fig: 24 MONTHLY CONCENTRATION OF PTERIDOPHYTIC SPORES, GYMNOSPERMOUS AND ANGIOSPERMOUS POLLEN GRAINS

- **DRYNARIA**
- **MICROSORIUM**
- **PYROSSIA**
- **PINUS**
- **ALNUS**
- **BETULA**

MONTHS MONTHS

MONTHS MONTHS
Fig 25. Monthly concentration of pollen grains.

- **Dubaanga**
  - 1985-86
  - 1986-87

- **Quercus**

- **Apiaceae**

- **Bombax**

- **Arecaaceae**

- **Asteraceae**

- **Brassica**

- **Caryota**

**Number of pollen grains**

**Months**: January to December

**Years**: 1985-86, 1986-87
Fig: 26 MONTHLY CONCENTRATION OF POLLEN GRAINS

- CALLISTEMON

- CROTON

- CYPERACEAE

- EUCALYPTUS

- IMPATIENS

- LUDWIGIA

- MYRTACEAE

- SOLANACEAE

MONTHS
Fig: 27 MONTHLY CONCENTRATION OF POLLEN GRAINS

- 1985-86
- 1986-87

SAMANIA

SYZYGIUM

URTICACEAE

VERBENACEAE

NUMBER OF POLLEN GRAINS

MONTHS
Fig: 28 - MONTHLY CONCENTRATION OF FUNGAL SPORES

1985-86

1986-87

MONTHLY CONCENTRATION OF FUNGAL SPORES

NUMBER OF SPORES

MONTHS

Cordana

Leptosphaeria

Cercospora

Tetraoccosporium

Choanephora

Podospora

Tilletia

Camptomeris
Fig: 29 MONTHLY CONCENTRATION OF FUNGAL SPORES

- 1985-86
- 1986-87

NUMBER OF SPORES

MONTHS

MYROTHECIUM

STEMPHYLIUM

CORYNESPORA

DRECHSLERA TRITICI-REPENTIS

CAMAROSPORIUM

PSEUDOCERCOSPORA

ANNELLOPHORA

NIGROSPORA

MONTHS
Fig: 30 CORRELATION OF YEARLY INCIDENCE OF DOMINANT PTERIDOPHYTIC SPORES GYMNOSPERMOS AND ANGIOSPERMOS POLLEN GRAINS 1985-86 AND 1986-87
Fig. 31 CORRELATION OF YEARLY INCIDENCE OF DOMINANT FUNGAL SPORE TYPES 1985-86 AND 1986-87

UNIT: 500