Airborne Pollen and Mold Spores during the Winter Months in Central Minnesota (USA)

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Introduction

The purpose of this study was to monitor the concentration of pollen and mold spores that occur in the air during the winter months in central Minnesota (U.S.A.). Although pollen and mold levels during the growing season (May – September) have been previously reported for our area (Saupe *et al*., PAAA meeting 2005), this is the first systematic study of the winter flora.

Objectives

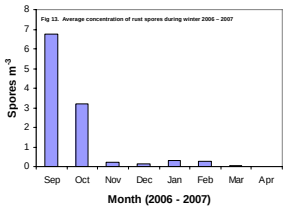
1. Document the winter pollen & mold flora of central Minnesota
2. Identify the temporal patterns of pollen and mold spore distribution
3. Complete two full years of airborne analysis for publication and baseline data

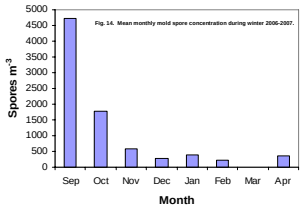
Methods

A Multidata Rotorod Sampler (Model 40) operating on a 10% duty cycle was use to make all counts. The sampler was located on the roof of a three-story building on the campus of St. John's University, Collegeville, MN (Stearns County, U.S.A.). Sample rods were collected approximately every other day, stained with Calberla's solution and then analyzed for pollen, algae, and spores. Rust spores were counted separately from the other molds because of the ease of identification. A total of 87 samples were collected between 18 September (2006) and 17 April (2007).

Molds & Algae

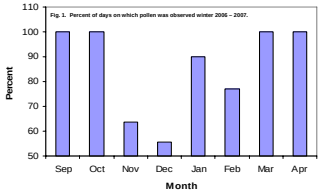
- Mold spores were observed in all samples and their concentration decreased markedly in November and remained low (Fig 13).
- Rust spores showed a similar pattern as the molds. They were common in the fall (mean conc. = 1.41 m^{-3}; Fig 13) but decreased markedly in November. By the end of the study they were detected in only 12% of samples at low levels (0.17 m^{-3}).
- Algae were observed on more than 80% of sample days, though in low concentration (mean [monthly] = 0.50 grains m^{-3}; (Fig 14).

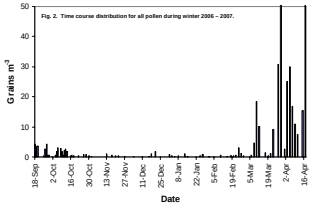




Pollen Distribution

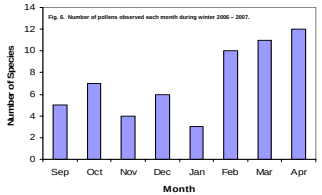
- Pollen was observed on 84.9% of sample days.
- Pollen was least likely to occur in air samples in Nov. & Dec. (Fig 1).
- The average winter pollen concentration was 8.79 grains m^{-3}.
- Pollen levels were low throughout the sample period (Fig 2). The average pollen concentration in Sept was 2.49 g m^{-3}. By mid-October the level had fallen to approximately 0.4 grains m^{-3} where it remained throughout the coldest winter months (Nov – Feb) until the spring pollen flora arrived during the first week in March (Fig 2).

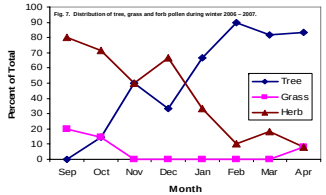


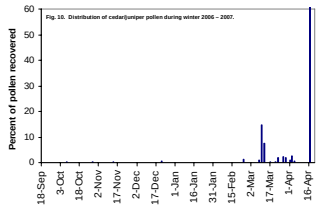


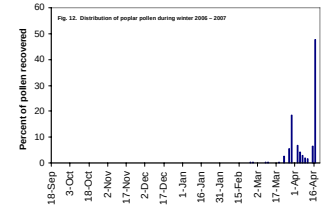
Numbers of Pollen Observed & Tree Pollen Patterns

- The number of pollen-types observed monthly ranged from 4 to 12 (Fig 6).
- The number of species observed monthly was relatively constant from Sept – Jan (5.4 types/month) and began to increase in February reaching a peak in April (Fig 6).
- Forb pollens were most abundant in the late autumn and decreased as the season progressed (Fig 7).
- Tree pollens, including cedar (Fig 10) & poplar (Fig 12), increased during the sampling period and were most abundant in spring (Fig 7).
- Grass pollen was detected sporadically throughout the sample period at low levels (Fig 7).



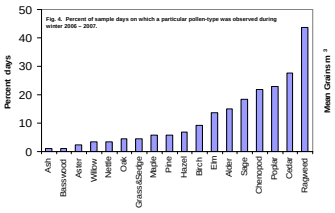


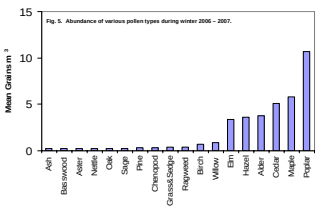




Pollen Types

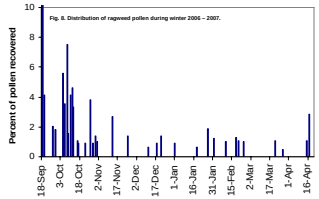
- Eighteen types of pollen were observed during the study period (Fig 4 & 5)
- Ragweed was observed most often, but at low levels.
- The most abundant pollens were from the spring-flowering trees (*i.e.,* poplar, maple, cedar/juniper).

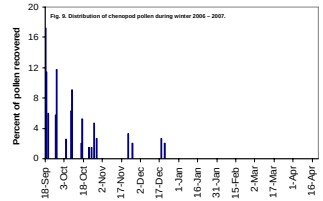




Forb Pollen Patterns

- Ragweed (Fig 8) and chenopodium-type (Fig 9) pollen were most abundant in the late autumn and decreased as the season progressed.





Discussion/Conclusion:

This study complements our previous investigation of pollens and molds that occur in central Minnesota during the growing season (Saupe *et al*, 2005) and completes a full-year, pollen & mold distribution spectrum. Our data are comparable to a winter study that was completed by Frenz & Murry (1997) in Minneapolis, which is approximately 70 miles SE of our study site. We recorded 18 kinds of pollen during the study period in contrast to Frenz and Murray (1997) who observed 25. Our main pollen season ended in mid-October but we were able to measure low levels of pollen, molds and rusts, and airborne algae throughout the winter. The new pollen season (spring) arrived in central Minnesota approximately March 7 (2007), which is considerably earlier than any previous studies for Minnesota:

- 2007 – March (*this study*)
- 2005 – March 25 (Saupe, *et al.,* preliminary study)
- 1996 – April 10 (Frenz & Murray, 1997)
- 1932 – April 20 (Rosendahl *et al*., 1940)