Increasing Quercus Pollen in the Tulsa Atmosphere

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Abstract

This study examined airborne Quercus pollen data from 1988 to 2018 to determine long-term trends, pollen seasonal variability, and influence of meteorological conditions on airborne pollen concentrations. Samples were collected through means of a Burkard sampler and analyzed with microscopy and statistical analysis. Results suggest a high degree of variability between monthly pollen concentrations and yearly pollen metrics. In addition, there were increases over time in the seasonal pollen index and peak concentration. These increases parallel the increasing population of Quercus in the region.

Introduction

In Oklahoma, there is great floral diversity ranging from deciduous forests to grasslands. The southerly winds create a mild climate in the region, and because of this climate and floral diversity, airborne pollen is present throughout much of the year.[1] There are more than 80 species of trees that are considered allergenic in Oklahoma. Normally, the pollen season runs from winter to May. A previous study, conducted in Tulsa, found that the highest airborne tree pollen concentrations in the early spring were from species of Quercus, Ulmus, and Juniperus.[1] *Quercus virginiana* pollen is largely represented by Oak (Quercus virginiana) in the Tulsa area. In Oklahoma, there are over 21 different species of oak trees. These trees shed considerable amounts of pollen, which presents a significant challenge to allergy sufferers. In Toledo, Spain, the airborne pollen dynamic of the atmosphere was analyzed. The objective was to study allergenic pollen types and to establish the influence of meteorological variables on daily pollen concentration to obtain a deeper analysis of the actual allergy pollen risk.[2] Overall, my research addressed similar aspects with a focus on Quercus pollen in Tulsa, Oklahoma. Because of the increase in allergies during recent years, there is a growing need for research on pollen trends and variability. Monitoring airborne pollen content enables identification of the pollen types that are causing seasonal allergies. Continuous monitoring of airborne pollen presents valuable aerobiological information that can help reduce the exposure of allergic patients to pollen.[2]

Methods and Materials

- Collected pollen through means of a Burkard sampler
- Analyzed with microscopy
- Pollen data was split into pre- and post-peak categories for statistical analysis
- Analyses using wind direction

Results

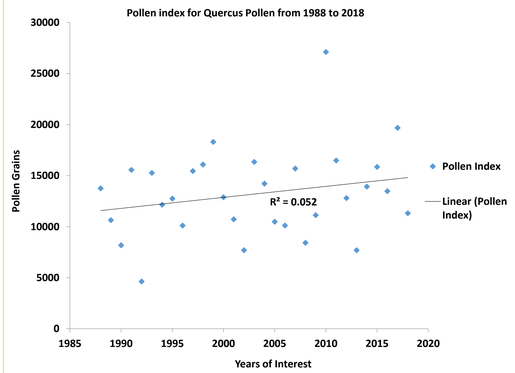

Figure 1: Pollen Index for Quercus
Increasing pollen index for Quercus from 1988-2018.

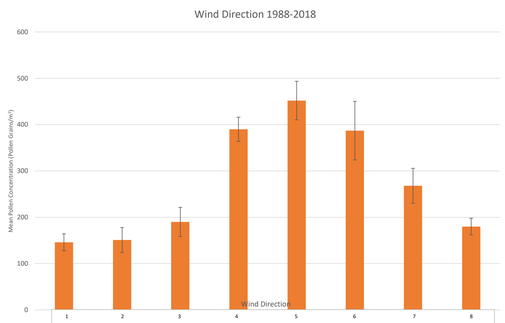

Figure 2: Wind Direction
Effect of wind direction on Quercus pollen from 1988-2018. Southerly and southwestern winds associated with highest mean pollen concentration.

	Max Temperature F	Min Temperature F	Mean Temperature F	Precipitation	Mean Wind Speed MPH	Mean Humidity
log concentration	.3738	.1943	.3082	-.0253	.0949	-.1907
	p=0.00	p=.000	p=0.00	p=.353	p=.000	p=.000
	Max Temperature F	Min Temperature F	Mean Temperature F	Precipitation	Mean Wind Speed MPH	Mean Humidity
log concentration	.5633	.4253	.5472	-.0893	.1758	-.1425
	p=0.00	p=0.00	p=0.00	p=.020	p=.000	p=.000

Figure 3: Correlations
Influence of meteorological conditions on pollen concentration. Red values are statistically significant.

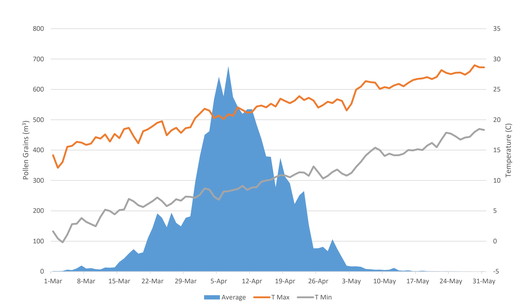

Figure 4: Average Concentrations
Average Quercus pollen concentrations examined monthly in relation to minimum and maximum temperatures.

Discussion and Conclusions

Results suggest a high degree of variability between monthly pollen concentrations and yearly pollen metrics. In addition, there were increases over time in the seasonal pollen index and peak concentrations. Analysis of pre- vs post-peak categories revealed differences in correlations of the two datasets when analyzed with meteorological conditions. While temperature and humidity, among others, were significant in both datasets, other factors, like precipitation, were significant only in one dataset. Analyses using wind direction showed that southerly and southwestern winds contributed to increased pollen concentrations. This study confirms that Q. virginiana pollen has become an increasing risk for individuals sensitive to this pollen and emphasizes the need for long-term aerobiological monitoring in other areas.

Future Directions

- Update data through current years
- Examine other pollen types
- Compare and contrast between different regions

Literature Cited

1. Levetin, Estelle (1997). A long-term study of winter and early spring tree pollen in the Tulsa, Oklahoma atmosphere. *Aerobiologia*.

1. Pérez-Badia R, Rapp A, Morales C, Sardinero S, Galán C, García-Mozo H: Pollen spectrum and risk of pollen allergy in central Spain. Ann Agric Environ Med 2010, 17, 139–151.

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