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Aeroallergen Survey of the Texas Panhandle Using a Burkard Volumetric Spore Trap

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Abstract

Our objective is to survey the type and concentration of pollen and spores on a daily basis and correlate these concentrations with both the weather on a part icular day and the incidence of allergic reactions. Aeroallergens are often the cause of serious allergic and asthmatic reactions, affecting millions of peopl e each year. The analysis of air was performed through the collection of pollen and spores using a Burkard Volumetric Spore Trap. We mounted the trap on the f lat roof of the Agriculture and Natural Sciences building of West Texas AM University in Canyon, Texas. This area has adequate exposure to the prevailing winds of West Texas, and is above the trees of the surrounding community. Collection and transfer of the pollen sampling tape takes place at the same time, 9:00 a.m. CDT, on a daily basis. Tapes are analyzed with a minimum of five latitudinal traverses, and daily concentration is assessed. The most significant aeroallergens present during these summer months were fungal spores like *Alternaria*, ascospores, *Cladosporium*, *Dreschlera*, *Curvularia*, and pollens like short ragweed (*Ambrosia artemisiifolia*), Pine (*Pinus*) (Figures 1 A–F), pollens from Asteraceae (*Helianthus ciliaris, Helianthus annuus, Helianthus hirsutus*), from Solanaceous plants (*Solanum rostratum, Solanum elaeagnifolium*) and from Chenopodiacae (*Chenopodium album*) (Figures 2 A–F). Temperature was found to have an inverse relationship with mold spores. Rainfall was found to affect the mold count directly, with increases in precipitation bringing subsequent higher mold spore concentrations. The number of reported cases of allergic rhinitis increased proportionally to the increases in overall allergen counts. Most significant was the increase in number of patients corresponding with increases in mold and *A. artemisiifolia* counts.

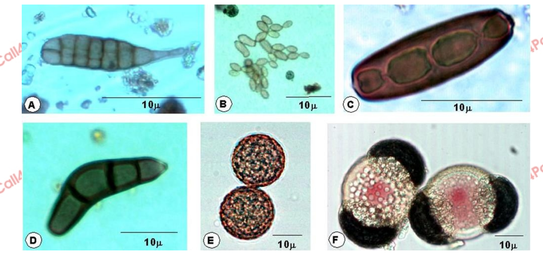


Figure 1 A–F. Showing the Most Frequent Allergens of the Texas Panhandle. Fungal Spores: A. *Alternia* sp., B. *Cladosporium* sp., C. *Drechslera* sp., D. *Culvularia* sp., Pollens: E. *Ambrosia artemisiifolia*, F. *Pinus sylvestris*

Abstract (cont.)

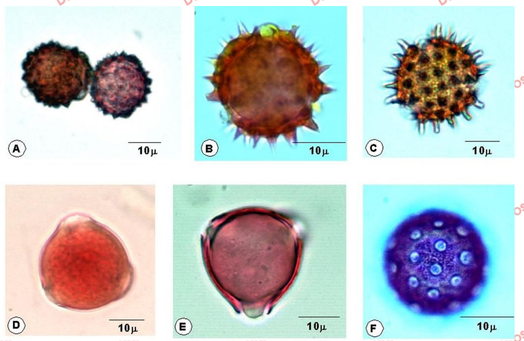


Figure 2 A–F. Showing the most frequent allergens of the Texas Panhandle. Pollens: A. *Helianthus ciliarus*, B. *Helianthus annuus*, C. *Helianthus hirsutus*, D. *Solanum rostratum*, E. *Solanum elaeagnifolium*, F. *Chenopodium album*

Introduction

The purpose of our analysis of pollen data is to aid in the diagnosis of rhinosinusitis and to survey the type and concentration of pollen and spores on a daily basis and correlates these concentrations with both the weather on a p articular day and the incidence of allergic reactions. Weather conditions and diurnal cycles play an integral role in the passive and active discharge of spore and pollen. Warm dry weather conditions promote passive dispersal of dry air spora, including *Alternaria*, *Cladosporium*, *Curvularia* , *Pithomyces* and many smut teliospores.[1,5,6] Moist weather conditions promote the active dispersal of moist air spora, such as the explosive release of ascospores from Ascomycetes, and the expulsion of basidiospores from the gills of the Basidiomycetes. Often, the two most encountered mold spores in atmospheric sampling are ascospores and *Alternaria* sp.[2] *Alternaria* conidia are frequently the second most abundant component of the dry air spora . In some areas, these asexual spores may be present throughout the year; however, peak concentrations usually occur in late summer or fall. Recent literature shows an association between *Alternaria* sensitivity and severe asthma.

Materials &Methods

The analysis of air was performed through the collection of pollen and spores through the use of the Burkard Volumetric Spore Trap. Set up of the spore trap involves the removal of the collection drum from the collector and application of Melinex tape. The spore trap captures the aeroallergens on the Melinex tape coated with paraffin wax by suctioning air at a rate of 10 liters per minute. Hourly observations can be made because the drum will rotate at a standard rate of 2 mm per hour.[4]

Mounting of the tape on a layer of water on a microscopic slide is then accomplished. A drop of Safranin with Gelvatol is placed upon the coverslip to stain the pollen to facilitate observation with a microscope and daily concentration is assessed. Daily mean concentrations are multiplied by a correction factor.[4] Samples were examined, counted, and photographed using a BX–40 Olympus microsc ope attached to a DVC Camera. To enable correlation of concentrations to meteorological conditions, weather data were recorded corresponding to the 24–hour interval analyzed. Also, information of number of patient cases per day was compiled by the allergy research clinic for correlation with daily concent rations.

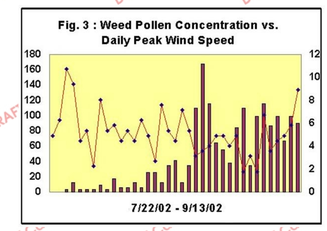
Results &Discussion

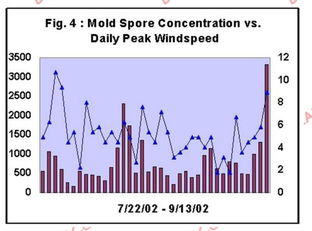
The most significant allergens present during the period of June through December 2002 were *Alternaria* (Fig. 1A), ascospores, *Cladosporium* (Fig. 1B), *Dreschlera* (Fig. 1C), grass (*Poaceae*) pollen, ragweed (*Ambrosia artemisiifolia*) (Fig. 1E), pollen and Pine (*Pinus*) (Fig. 1F), pollen. Significant correlation was found between the weed pollen concentrations with the wind speed. (Fig. 3). Fungal spore concentrations did show more susceptibility to meteorological conditions on a daily basis (Fig. 4) than did pollen concentrations.

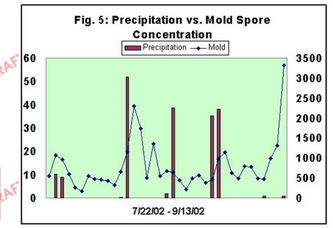
Precipitation increased the number of mold spores (Fig. 5). It was observed that sustained windy or windless periods did have an effect on pollen and spore concentrations (Fig. 3, 4). Overall, the most prevalent aeroallergens were *Alternaria*, short ragweed (*Ambrosia artemisiifolia*) and grass (*Poaceae*) pollen. The most dominant pollen was grass, which peaked in July and then dropped off in August. In mid–August, the dominant pollen changed to ragweed corresponding to its flowering season.

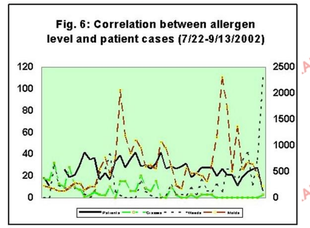
The effect of aeroallergens on clinical patients was apparent. The number of reported cases of rhinosinusitis increased directly to the increases in overall allergen counts (Fig. 6). Grass pollen was not as influential in cases present ed to the clinic as weed pollen (Fig. 6). The future objective is to develop methods for forecasting pollen levels and to develop an allergy index specific for the Texas High Plains region.

Results &Discussion (cont.)









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