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Qualitative and quantitative analysis of pollen spectrum in the atmosphere of seven South African cities

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The South African Pollen Monitoring Network (SAPNET) was set up in 2019 to conduct the first long-term national aerospora monitoring organised at a national level. , SAPNET has monitored airborne pollen and fungal spores in seven of the major cities across South Africa, covering multiple biomes with a diversity of climates, topographies, and vegetation types providing online weekly reports www.pollencount.co.za to allergy sufferers and healthcare providers. In this study, we highlight the major pollen types found at the different sampling locations, provide updated pollen calendars for each city, and consider the future of aerobiome monitoring in South Africa.

Daily airborne pollen concentrations were measured from August 2019 to August 2021 in seven cities across different biomes in South Africa: Cape Town (CPT, Fynbos biome), Johannesburg (JHB, temperate Grassland biome), Pretoria (PTA; Savanna biome), Bloemfontein (BFN; semi-arid section of the Grassland biome), Kimberley (KMB; semi-arid section of the Savanna biome), Durban (DBN; Indian Ocean Coastal Belt biome) and Gqeberha (formerly Port Elizabeth [PE]; Albany Thicket biome). Standard aerospora monitoring devices, Hirst type 7-day volumetric spore traps (manufactured by Burkard, UK), were used at all sites. Six of the seven locations had spore traps installed in 2019, while the Cape Town spore trap has been operational for the past 30 years. The height of the spore traps varied from 5 to 20 m above ground. Daily samples were then prepared and mounted on microscope slides for microscopic analysis using glycerol jelly, complying with the guidelines of the European Aerobiology Society Working Group on Quality Control (Galan et al.2014). The number of individual aerospora counted along the three longitudinal traverses was totalled for each pollen or fungal taxa. Weekly pollen grain (pg) concentrations (for 2 years - 104 weeks -of sampling were used to calculate the average Annual Pollen Index (API, pg/m3) and percentage pollen contribution to the different pollen categories (grass, trees, weeds) across South Africa. For the pollen calendars, the average weekly pollen index (pg/m3) was calculated using concentrations from the previous 14 days in a 52-week calendar; Pollen calendars displaying four coded levels of weekly pollen concentrations were created using Microsoft Excel. The levels were adapted from Potter and Cadman (1996) as follows: 0 = 0–3; 1 = 3–10; 2 = 10–30; 3 = 30–100; 4 = >100 pg/m3. Only the pollen types contributing more than 3% to the API of each monitoring site were included.

Across all sites, Johannesburg had the highest average API for trees (14,363 pg/m3) and weeds (2454 pg/m3). The highest individual weekly concentration for trees was in Bloemfontein (3837 pg/m3 in September 2020) with the highest individual weekly concentration for weeds recorded in Cape Town (201 pg/m3 in October 2020). The highest average API for grasses was in Bloemfontein (8353 pg/m3), which had the highest individual weekly concentration for this pollen category (676 pg/m3 in February 2020). Gqeberha (PE) had the lowest tree, weed, and grass pollen concentrations. The main pollen types were from exotic vegetation. The most abundant taxa were Poaceae, Cupressaceae, Moraceae and Buddleja. The pollen season start, peak and end varied widely according to the biome and suite of pollen taxa. The main tree season started in the last week of August, peaked in September, and ended in early December. Grass seasons followed rainfall patterns: September–January and January–April for summer and winter rainfall areas, respectively. Major urban centres, for example, Johannesburg and Pretoria in the same biome with similar rainfall, showed substantive differences in pollen taxa and abundance. Some major differences in pollen spectra were detected compared with historical data. However, we are aware that we are describing only two years of data that may be skewed by short-term weather patterns.

The main findings from this study show differences observed in pollen spectra across biomes and between geographically closely located sampling sites emphasising the need for continued pollen monitoring—not only

across the existing sites but also at new locations in South Africa.

Reference:

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Primary authors: Dr BERMAN, Dilys (Division of Allergology and Clinical Immunology, Department of Medicine, University of Cape Town, Cape Town, South Africa); Dr GHARBI, Dorra (Division of Allergology and Clinical Immunology, Department of Medicine, University of Cape Town, Cape Town, South Africa); Prof. NEUMANN, Frank H (Unit for Environmental Sciences and Management, Faculty of Natural and Agricultural Science, North-West University, Potchefstroom, South Africa); Dr ESTERHUIZEN, Nanike (Division of Allergology and Clinical Immunology, Department of Medicine, University of Cape Town, Cape Town, South Africa); Dr AJIKAH, Linus (Evolutionary Studies Institute and School of Geosciences, University of the Witwatersrand, Johannesburg, South Africa); Dr J. QUICK, Lynne (African Centre for Coastal Paleoscience, Nelson Mandela University, Gqeberha, South Africa); Dr HILMER, Erin (African Centre for Coastal Paleoscience, Nelson Mandela University, Gqeberha, South Africa); Dr VAN AARDT, Andri (Department of Plant Sciences, Faculty of Natural and Agricultural Sciences, University of the Free State, Bloemfontein, South Africa); Dr JOHN, Juanette (Smart Place, CSIR, Pretoria, South Africa); Prof. GARLAND, Rebecca (Laboratory of Atmospheric Science, Department of Geography, University of Pretoria, Pretoria, South Africa); Dr HILL, Trevor (Discipline of Geography, University of KwaZulu-Natal, Pietermaritzburg, South Africa); Dr FINCH, Jemma (Discipline of Geography, University of KwaZulu-Natal, Pietermaritzburg, South Africa); Dr HOEK, Werner (Department of Otorhinolaryngology, Gariep Mediclinic, Kimberley, South Africa); Dr BAMFORD, Marion (Evolutionary Studies Institute and School of Geosciences, University of the Witwatersrand, Johannesburg, South Africa); Y. SEEDAT, Riaz (Department of Otorhinolaryngology, Faculty of Health Sciences, University of the Free State, Bloemfontein, South Africa); Dr I. MANJRA, Ahmed (Hiway Medical Centre, Westville Hospital, Durban, South Africa); Dr PETER, Jonny (Division of Allergology and Clinical Immunology, Department of Medicine, University of Cape Town, Cape Town, South Africa)

Presenter: Dr BERMAN, Dilys (Division of Allergology and Clinical Immunology, Department of Medicine, University of Cape Town, Cape Town, South Africa)