# INTRODUCTION

**Aerobiological monitoring**, defined as sampling and analysis of airborne pollen grains and spores present in the atmosphere, could help with **providing information on plant phenology, plant contribution and distribution** in green spaces **and the health and/or risks** for some species **in the** development of **allergy symptoms in local populations.**

This study aims to **investigate the tree-allergenic pollen potential** in the urban green infrastructure of two cities in South Africa to **provide information on all species present in the air** and their **direct impact** as the major cause of pollinosis in the local population, and to develop a management plan for a sustainable implementation framework.

**ENVIRONMENTAL HEALTH AWARD**

**Dorra GHARBI**

# ALLERGENIC TREE POLLEN IN JOHANNESBURG AND CAPE TOWN AS A PUBLIC HEALTH RISK: TOWARDS A SUSTAINABLE IMPLEMENTATION FRAMEWORK FOR SOUTH AFRICAN CITIES

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**#POLLEN**
**#AEROBIOLOGY**
**#SOUTHAFRICA**

# METHODS

**Airborne pollen sampling** was performed using a **Burkard volumetric** spore trap in the cities of **Cape Town and Johannesburg, between 2019 and 2022**.

**Two Pollen traps were** placed about **12m above ground level**, on the roof of the South African Astronomical Observatory (Cape Town), and the School of Chemical and Metallurgical Engineering, University of Witwatersrand (Johannesburg).

The sampling method, slide preparation, and data Interpretation were performed according to the standard method of the **Spanish Aerobiology Network**, REA (Galan et al. 2007).

# RESULTS

## POLLEN SPECTRUM IN JOHANNESBURG (JHB) AND CAPE TOWN (CPT)

Differences in the annual pollen content in the cities studied are obvious. Both cities have high annual pollen amounts, with mean values of **5059p.g/m3 (CPT)** and **6847p.g/m3 (JHB).**

Higher levels of *Cupressus*, *Olea*, *Pinus*, Myrtaceae, *Ulmus* and Tiliaceae, were registered in CPT, however, *Platanus*, *Morus*, *Betula* and *Quercus* pollen reached higher concentrations in JHB.

Only **Combretaceae** pollen exclusively **indigenous** trees (typical savanna-woodland trees, namely Combretum spp. (bush willows)) was detected only in JHB.

**Figure 1.** Sampling sites.

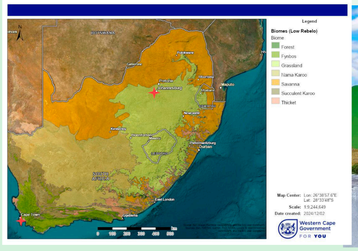



**Figure 2.** Volumetric sampler in CPT.

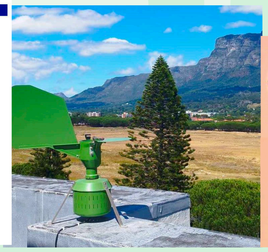


**Figure 3.** Pollen types in the atmosphere South African cities. *a. Cupressaceae, b. Olea, c. Quercus, d. Platanus.*

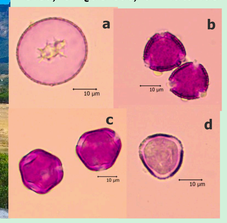



**Figure 4.** Average of Annual Pollen Indexes in the atmosphere of CPT and JHB (2019-2022).

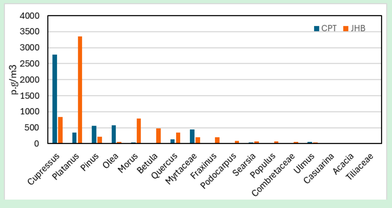
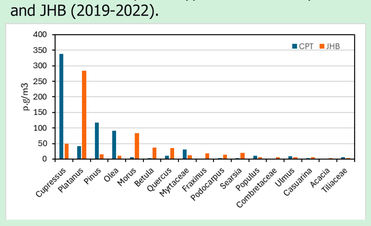



**Figure 5.** Average of maximum daily mean concentrations of pollen types in the atmosphere of CPT and JHB (2019-2022).




## LINK BETWEEN URBAN GREEN INFRASTRUCTURE, ALIEN TREES AND ALLERGENIC POLLEN

**Figure 6.** Implementation of a sustainable urban framework for South African cities.

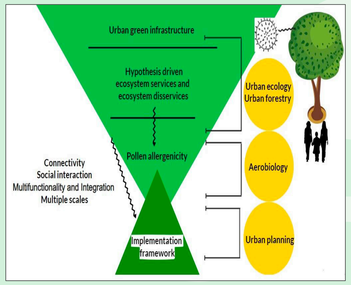



**Figure 7.** Future framework for an alternative to allergenic trees in urban green infrastructure in Cape Town and Johannesburg.

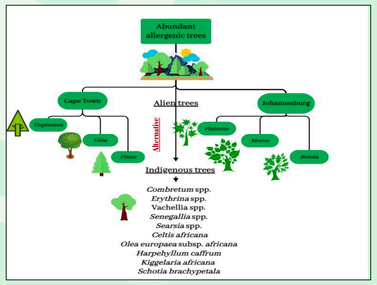



**Table 1.** A Framework for the practical introduction of non or low-allergenicity trees in cities.

| | |
|---|---|
| Green networks | Protecting, restoring, and interconnecting the urban ecological structure |
| Grey networks | Accessible, connective, and walkable, tree-lined street networks |
| Grey fabrics | Mixed land uses within walking distance |
| Green fabrics | Preserved remnant forests, tree-lined streets, and tree-covered spaces |

# CONCLUSION

This study gives us new insights into the **abundance of allergenic wind-pollinated alien trees** throughout **Urban Green Infrastructure** in two large **South African cities.**

The tree pollen aeroallergens inventory showed the abundance of allergenic potential Mediterranean genera i.e., ***Cupressus*, *Olea*, and *Pinus* in Cape Town** within the Mediterranean Fynbos Biome and ***Platanus*, *Morus*, and *Betula***, the three most predominant forest tree taxa in **Johannesburg** within the temperate Grassland biome.

Future Planning strategies aim to ensure healthy urban green spaces in South African cities:

i) **Limit the presence of alien species** with specific ecosystem disservices (high water demand/high pollen production/trigger allergic symptoms).

ii) Encourage using **insect-pollinated**, **indigenous species** i.e. ***Vachellia*** and ***Senegalia* spp**. providing more ecosystem services (less water-demanding/lower aerodynamic pollen).

**ACKNOWLEDGEMENTS**

*Open access funding is provided by North-West University. The financial assistance of Clicks, Dr. Reddy's, Thermo Fisher, Novartis, Glenmark, SA Natural Products, and Twinsaver toward the Real Pollen Count initiative is acknowledged.*

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*Gharbi, D., Neumann, F.H., Cilliers, S. et al. Allergenic tree pollen in Johannesburg and Cape Town as a public health risk: towards a sustainable implementation framework for South African cities. Discov Sustain 4, 32 (2023). https://doi.org/10.1007/s43621-023-00151-9*