Introduction

Pollen released by urban flora is the mayor contributor to airborne allergen content during the pollen season, and has a considerable adverse impact on human health, contributing to enhance the total particle air pollution [1], and representing one of the main disservices of ecosystems [2].

The Vesuvius National Park (Southern Italy) develops around the Somma-Vesuvius volcanic complex, on an area of 8017 ha. The area is enclosed in the territories of 13 different municipalities in the province of Naples, in which 345,000 people live in total.

Index of Urban Green Zones Allergenicity (IUGZA) is constructed in form of a ratio, taking into account the intrinsic characteristics of plant species (allergenic potential, pollen emission, principal pollination period, mean height) the number of individuals, and plant type [3]. Its applicability requires a total census of the flora and is excessively expensive (in terms of time and energy) if applied to large areas.
The objective of this work is to establish the potential allergenic value of the plant species in the Vesuvius National Park through application of a modified version of IUGZA, which does not include a complete census, but the survey of the flora through sampling areas and the estimation of plant cover with the Braun-Blanquet method.

**MODIFIED IUGZA (modIUGZA)**

\[
\text{modIUGZA} = \frac{1}{\text{maxH} \times \text{St} \times \text{maxVPA}} \sum_{i=1}^{k} \text{VPA} \times S_{BBi} \times H_i
\]

Where:
- \(\text{maxH}\) = Max plant height
- \(\text{St}\) = Surface of the park or the municipality
- \(\text{VPA}\) = Value of Potential Allergenicity of each species [4]
- \(\text{K}\) = number of the species
- \(S_{BBi}\) = Estimated cover area occupied by each species in the park or in the municipality obtained through the Braun-Blanquet scale
- \(H_i\) = Mean height of each species

**Methods:**
- Geo-referencing of the total area of the park, and of the area of the park area that falls on each municipal area (Fig 1).
- A random sampling has been carried out to define the sampling areas in which the phytosociological surveys have been conducted.
- The number of sampling areas has been chosen in proportion to the extent of each municipality.
- Plant species, and relative covers have been estimated with the Braun-Blanquet method.
- Trees and herbs have been registered separately to assess two IUGZA values.
- modIUGZA has been calculated both for the whole park and for each municipality.
Results

- 40 species have been recorded from the survey.
- modIUGZA of the whole park has a value of 0.23 for the herbaceous species (A), and a value of 0.34 for the shrubby and arboreal species (B).
- Considering the individual municipalities, maximum values of the modIUGZA of 0.32 are observed for herbaceous species (C), and of 0.54 for tree species (D).
Interpretation

modIUGZA of the Vesuvius National Park can be considered low as it is below the threshold of 0.5 [3, 4].

Each municipality shows a different IUGZA value, indicating difference in the risk of insurgence of pathologies linked to the pollen emission.

The analysis of the individual municipalities reveals problems in the municipality of Ottaviano (NA) related to the risk of allergies caused by the tree species present in the area.

The 40 plant species recorded show different impact on the modIUGZA: the higher contribution to the modIUGZA is showed by Chenopodium album L. (herbaceous) and Pinus pinaster Aiton (arboreal).
Results obtained in this preliminary work allow the future correlations between allergenicity potential of extended green areas, and epidemiologic data.

The proposed method in this work compensates for the lack of an expeditious but accurate methodology in the assessment of ecosystem disservices related to the pollen emission of plants, thanks to its applicability on large surfaces and the unnecessary need to carry out a complete census of the flora for the analysis.

Through the proposed methodology, tools can be developed for the prevention and forecasting of events related to pollinosis on a large scale, allowing a more accurate management of the health resources of a territory.

References: