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Evaluation and Comparison of Grass Pollen Measurement Accuracy in Iceland: Poleno Mars vs. Hirst in Akureyri (3 Years) and Reykjavik (1 Year)

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Background and Aim:
Iceland's unique bio-geographical position between Europe and North America, combined with its Arctic and Boreal climates, results in distinctive environmental conditions that affect airborne pollen concentrations. Grass (Poaceae) pollen, a major allergen in Iceland, is monitored in two primary locations: Reykjavik (SW Iceland) and Akureyri (N Iceland). Pollen seasons in Iceland are shorter and begin later compared to continental Europe. This study aims to compare the accuracy and reliability of grass pollen measurement devices in Iceland, focusing on the Swisens Poleno Mars (automatic) and Hirst (manual) devices over a three-year period (2022–2024) in Akureyri and one year (2024) in Reykjavik.

Methods:
Grass pollen measurements were conducted using the Poleno Mars device in Akureyri (2022–2024) and Reykjavik (2024), with the results compared to those obtained from the manual Hirst pollen trap during the same periods. The devices' performance was assessed using: correlation coefficient, R-squared, Mean Absolute Error (MAE), and Root Mean Square Error (RMSE). These metrics were used to evaluate the performance of the automatic trap in relation to the Hirst device across different years and locations.

Results:
In 2022, the correlation between the two devices was poor, but by 2024, the relationship improved significantly, with a solid correlation and modest error levels. The Poleno device, which underwent annual adjustments, performed best in 2023 but showed a slight decline in 2024, likely due to modifications made in tuning the device or the influence of specific environmental conditions, such as weather variations and changes in pollen levels. In Reykjavik, the second pair of devices showed better accuracy in 2024 compared to Akureyri, as evidenced by lower MAE and RMSE, although the correlation between the devices was weaker. Local environmental conditions, including regional weather patterns, plant species, and pollen density, significantly influenced device performance.

Conclusion:
This study highlights the impact of environmental factors on the accuracy of automatic grass pollen measurement devices. While the Poleno devices showed improved performance over time, the differences between locations suggest that local conditions, such as pollen species diversity and weather patterns, affect measurement reliability. The common classifier used across all devices may lead to slight variations in data quality, with the first year of measurements in Reykjavik showing better alignment than in Akureyri. Further adjustments and refinements to the devices are expected to improve their accuracy in future years, with anticipated improvements in 2025 based on the current findings.

Please, submit you abstract

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