Journal of Environmental Pathology, Toxicology and Oncology, 16(2&3):191–194 (1997)

Aerobiologia 2.0: A Software Program for Processing Aeropollen Data

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"Aerobiologia 2.0" is a simple computer program created to handle the pollen data collected every 2 hrs and daily by aerobiological monitoring stations equipped with Hirst-type spore traps. "Aerobiologia 2.0" runs on Windows 3.1™ and is compatible with other programs that run on this operating system. The program was developed to store and process pollen data through a few straightforward operations. An unlimited calendar automatically calculates the day of the week. The pollen dictionary, which can hold up to 1216 different pollen types, may be modified or changed completely. Concentrations for every pollen type (in pollen grains/m^3) are automatically recorded daily and every 2 hrs. 10-day and monthly sums are also calculated. The percentage of selected types, groups, or families of pollen collected each day, every 10 days, and monthly is quickly available. Pollen calendars and spectra in 24-hr, 10-day, monthly, tri-monthly, half-year, and yearly periods are readily produced. As soon as it is entered, the pollen data are saved on hard disk. A year's worth of data can be saved on a single 1.44 M byte floppy disk. Aerobiologia 2.0 is being used successfully to process the aeropollen data collected at the two monitoring stations managed by our Palynological Laboratory.

KEY WORDS: pollen monitoring, aeropollen, palynological studies.

Introduction

Pollen has been a vegetal, natural, "pollutant" of the air since the spread of *Pteridospermae* on Earth about 350 million years ago. Today, pollen both indoors and outdoors is at the center of many questions concerning geobotany, meteorology/climatology, environment management, air pollution, and human health. Because it is important to know how much pollen and which pollen types are in the air, the number of monitoring stations is increasing worldwide, and the pollen calendar resolution and identification level is improving. In Italy, at present, there are about 100 monitoring stations, most of which are members of the Italian Association of Aerobiology Network (AIA).[1] Airborne pollen captured by Hirst-type 7-day volumetric spore traps[2] is transferred onto daily slides and, if possible, cut into hourly strips. The pollen grains are counted and identified by palynologists. The results of the pollen analysis are processed to obtain pollen calendars and percentage pollen spectra. Two monitoring stations are managed by our laboratory: the Vignola station (125 m a.s.l., 44°29′N 11°00′E), a member of the Italian and European Aerobiological Networks, operating since 1990 with the help of the Local Health Unit, analyzing the air on a daily basis; and the Modena-Geophysical Observatory (35 m a.s.l., 44°40′ N 10°55′ E), operating since 1992, analyzing the air every 2-hrs and daily.[3] Both stations use a Lanzoni VPPS 2000 spore trap, the most common in Italy,

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0731-8898/97/$5.00

and monitor all pollen types looking for a high identification level.[4] We developed "Aerobiologia 2.0" to manage our data, attempting to design a program that is easy to manage, pliable to forthcoming suggestions, and quick to produce aeropollen calendars and spectra.

The Aerobiologia Program

Aerobiologia was first planned in 1994 to handle aeropollen data obtained by daily analysis.[5] "Aerobiologia 2.0" is the latest version of this program, handling both 24-hr and 2-hr aeropollen data. It runs under Windows 3.1™ and later versions and is compatible with programs that operate under Windows. The flowchart (Figure 1) shows the main steps of the program. The first page displays the major options. In the upper half of the page are three keyboards and an icon set that guides the user through the program. The top keyboard enables the user to personalize the pollen list up to a total of 1216 pollen types, to make calculations, and draw alphabetical family order. The right keyboard loads the month one chooses. The icon set lets the user store data on a 2-hr or daily basis, link with other programs, and calculate percentages. To input data, one has to open an archive (an already existing year) or create a new one (a new year). The relevant calendar, automatically calculated, contains the day of the week for every date. Then, the working page appears. The lower half of the page shows the complete spreadsheet to data entry. One may then choose: (1) the month and the day of pollen data, (2) the family and type of the recorded pollen grains, or (3) the analysis method (daily or 2-hourly mode). Finally, one has to input the specific conversion factor (depending on the microscope and analysis method). From this factor, the number of pollen grains counted is converted into pollen concentration (p/m^3; p = pollen grains). Data are input as the number of pollen grains counted and immediately converted to 2-hourly and daily pollen concentrations (p/m^3/24-hrs and p/m^3/2-hrs). Two basic concentration sums (the p/m^3/24-hr 10-day and the p/m^3/24-hr monthly sums) are automatically calculated when you exit. Concentrations and percentages out of the total pollen are quickly displayed for every day, every 10 days, and each month of the year for every pollen type and family. Calendars of selected families, pollen types, or pollen groups (e.g., allergenic pollen, tree pollen, etc.) can be quickly read and plotted, and the relevant data can be easily exported to other programs. The main data "Aerobiologia 2.0" normally produces are:

1. A yearly calendar of daily concentration for all pollen types and families recorded.
2. Daily, 10-day, and monthly concentration sums of the total pollen recorded.
3. Daily minimum and maximum concentrations of the total pollen for each month.
4. Concentrations (as in 1, 2, and 3) every 2-hrs during the day.
5. The percentage of each pollen type or family out of the total pollen recorded during the day, 10-days, or month.
6. The percentage of daily and 10-day total pollen out of the total pollen recorded in the month.
7. Daily, 10-day, monthly, quarterly, half-yearly, and yearly graphs of selected pollen types, groups, or families.

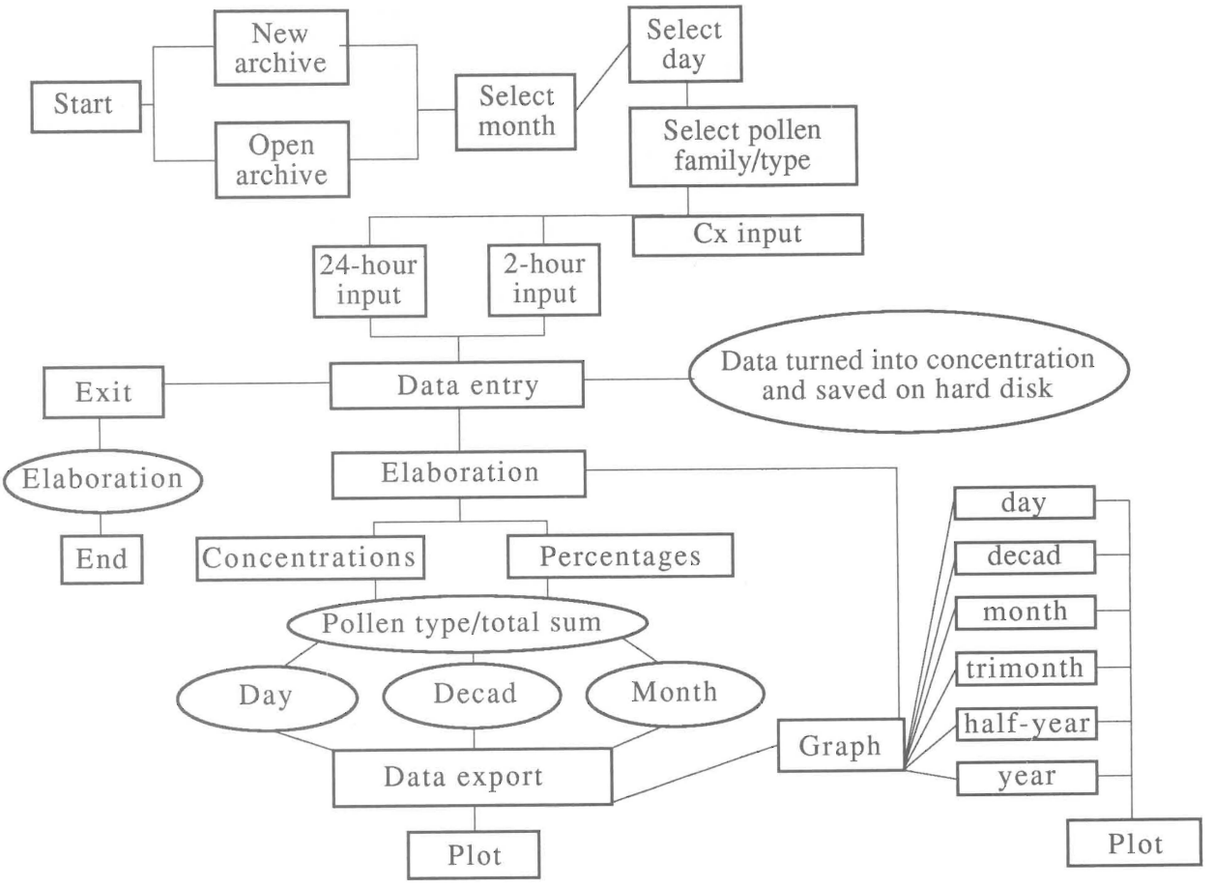
Pollen data are saved on hard disk as soon as it is entered. One year's worth of data can be saved on a single 1.44 M byte floppy disk.

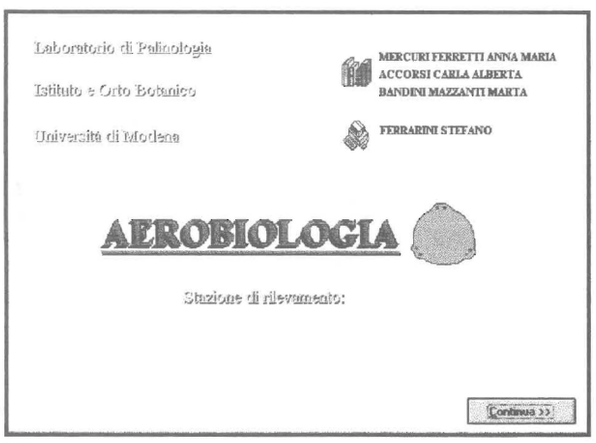
Conclusion

"Aerobiologia 2.0" enables the user to store and easily process the large amount of data produced every year by aeropalynological monitoring. It handles many data within a short time and little space. It meets compatibility requirements, is easy to learn, and is quick to show elaboration and graphs. It is being used successfully to manage 24-hr and 2-hr aeropollen data from our two aerobiological monitoring stations. "Aerobiologia 2.0" was developed to deal with pollen grains but can also be used to handle recorded data concerning fungus spores, other sporomorphs, and other biological/abiological particles in the air. An English version of "Aerobiologia 2.0" is available.

Acknowledgments

This study was supported by CNR (Strategic Project "Metropolitan Areas and Environment") and Ministerio dell'Universitá e della Ricerca Scientifica e Technologica (M.U.R.S.T.) 40% funds.





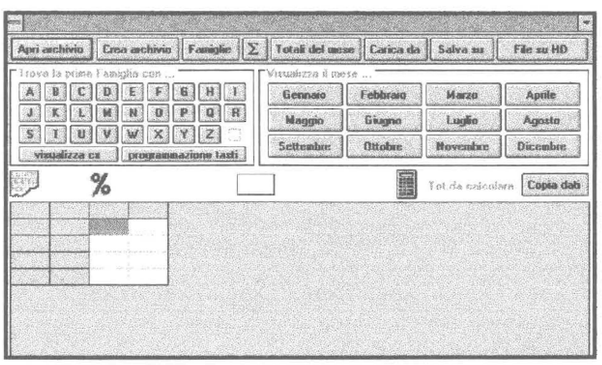


FIGURE 1. Aerobiologia 2.0: (A) flowchart; (B) cover page; (C) first page.

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