SPREADSHEET MACROS FOR HANDLING DATA COLLECTED FROM THE LI-6200™ PORTABLE PHOTOSYNTHESIS SYSTEM

MACROS DE PLANILHAS ELETRÔNICAS PARA TRATAMENTO DE DADOS COLETADOS DO SISTEMA PORTÁTIL DE FOTOSSÍNTESE LI-6200™

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- SHORT NOTE -

SUMMARY

Spreadsheet macros were developed for processing the information obtained from the LI-6200™ Portable Photosynthesis System using standard software (LOTUS 1-2-3 and EXCEL). The program was developed as a tool to assist in organizing the amount of data collected from that equipment. Data processing by the macros greatly facilitates the analysis and the production of graphics and tables.

Key words: data page, information processing, data collection

INTRODUCTION

The LI-6200 Portable Photosynthesis System™ is a commercially available equipment for making gas exchange measurements. It has been widely used in agrometeorology and plant physiology research to measure photosynthesis and stomatal resistance. This system is also capable to provide readings of several different parameters, such as leaf and air temperature, relative humidity in the chamber, vapor pressure and intercellular and atmosphere CO₂ concentrations.

In general, at the end of a measurement session, the collected data are transferred to a host computer through an interface with help of a proprietary software supplied by LICOR (PC6200). The data, organized in a specific configuration named Data Page, are downloaded in standard ASCII (American Standard Code for Information Interchange). Using similar methodology as reported by MARUR et al. (1996), when uninterrupted measurements were taken during all day, it is possible to gather approximately 130 Date Pages.

Due to the massive amount of data that can accumulate during any measurement period, the data analysis is a time-consuming process. Furthermore, the difficulties in having the collected Data Pages in a simple format may often lead to poor utilization of all available data. For instance, after downloading the data to the host computer, some researchers print the data in the original format to select the parameters that will be used in further analysis, and later re-enter them through keyboard. Besides being a tedious and arduous
process, the probability of error increases each time the data are transcribed.

Also, some users adjust the equipment in such a way to collect just one observation per Data Page. This is a questionable procedure because if any disturbance happens with the system at the beginning of a measurement it will invalidate the Data Page. Therefore, it is advisable to configure the equipment for collecting at least 3 observations per Data Page. In case of any dubious data, it will be still possible to eliminate that specific element and preserve the remaining Data Page. However, because of the large output volume of a Data Page with 3 observations (Table 1), treatment of the raw data becomes increasingly difficult.

Spreadsheet softwares have been largely used for data treatment and graphics presentation. Operation routines in spreadsheets, also called macros, have been developed by WULSTER (1993), LYON et al. (1993) and TRUDGILL et al. (1994) mainly to ease data processing and calculation.

This paper describes a program developed for personal computer, which was written with the macro languages of LOTUS 1-2-3™ and later adapted to work with EXCEL™ for WINDOWS™, to provide a quick and easy alternative to LICOR Portable Photosynthesis System users to process the large amount of data collected through this equipment.

**DESCRIPTION**

The program was developed for use on the IBM® PC with Excel for Windows and has been used in our research program for the past year. It requires less than 30 Kb of memory and is presented in two versions, PPS-E.xls (English) and PPS-P.xls (Portuguese), which can be loaded into the xlstart directory within Excel and run by simple selecting the file name.

The program consists of 3 spreadsheets. All the necessary information to execute the operations to handle the data is comprised in the first spreadsheet, named INSTRUCTIONS.

The spreadsheet ORDERING contains the macro that performs the primary arrangement of the data stored in the Data Pages. When this macro is started by the command key <Control+a>, the data will be treated in such a way that any observation regarded as an "outlier" can be easily detected by a simple verification of the resulting output (Table 2).

After that, the data are transferred to the third spreadsheet (MEAN), where a command key <Control+m> is entered to start another macro. With this macro the means of the various parameters collected by the equipment are computed. Subsequently, the data are grouped by the auxiliary data treatment and plant number in a format that greatly facilitates the production of graphics and tables (Table 3). The equipment indicates the time of the measurements in hours and minutes. This macro converts both parameters in a single one (decimal format) to facilitate the production of graphics.
Using the software as discussed in this paper requires programming the LI-COR Portable Photosynthesis System through “function 41” and “function E8”, according to the scheme shown in Table 4. As a result, the equipment will prompt for the treatment name (i.e., a number) and for the plant number just after each measurement. The number of observations must be programmed using “function 42”.

If an output distinct of the one presented in Table 1 (i.e., different number of observations and/or number of auxiliary data) is required, the macro in the spreadsheet ORDERING sorts all data by the key columns treatment and plant. If necessary, the user can also select different columns to sort by changing the instruction written in line 9 of this macro. After completing all operations, the results should be saved in a new file.

**OBTAINING THE PROGRAM**

The program discussed in this paper is available for downloading from the Áreas Técnicas - Ecofisiologia section of the IAPAR World Wide Web site located at www.celepar.br/iapar or by sending a self-addressed diskette to CJM.

**REFERENCES**


WULSTER, G.J. Using a computer spreadsheet and compiler to extend growth models to greenhouse...