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A DATABASE TO HELP IN THE DETERMINATION OF SPECIES THAT CONFIRM THE DIET OF HERBIVOROUS WHEN MICROHISTOLOGY IS USED

C.A.M. DEGANO*, L. LARCHER, A. CATAN, R. RENOLFI AND R. MARTIERENA

Instituto para el Desarrollo Agropecuario del Semiarido (INDEAS), Fac. de Agronomia y Agroind-UNSE Av. Belgrano, Argentina.

Abstract

A software was developed in order to help the management of reference collections when microhistology is used to determine herbivorous diet. This software represents a useful tool in the redetermination of the epidermis and comparisons of similar epidermis. Microsoft Fox Pro 2.6 for Windows was used to create the databases and programs because it supports several types of data such as numeric, alphanumeric and digitalized images. Running the program does not need high amounts of memory, so it can be executed in conjunction with other programs, without causing any trouble, even though the Diet program is image user.

Introduction

Micro histological analysis of faeces, remain or stomach contents is being used to determine the dietary habits of herbivores. The importance of knowing the herbivore diets are in relation with the sustainable use of natural resources. Micro histology offers some advantages such as not disturbing the animals while they are feeding and no disturbance of the surrounding. Among the disadvantages there is the necessity of the elaboration of a reference collection of epidermis of the species eaten by herbivores in order to identify them in the microscopic slides. For the management of reference collections and the individualization of similar species, a software was developed. As most part of this work is done in laboratory, the computer becomes a helpful tool. The software presented here allows comparison of one or more characters of the epidermis that participate in the reference collection.

Materials and Methods

The data base was created according to the current ways of development of software:

- determination of the real necessities to give an appropriate solution.
- determination of the adequate tool.
- design of the data structures
- creation of databases

*Av. Belgrano (S) 1912, 4200, Santiago del Estero, Argentina.

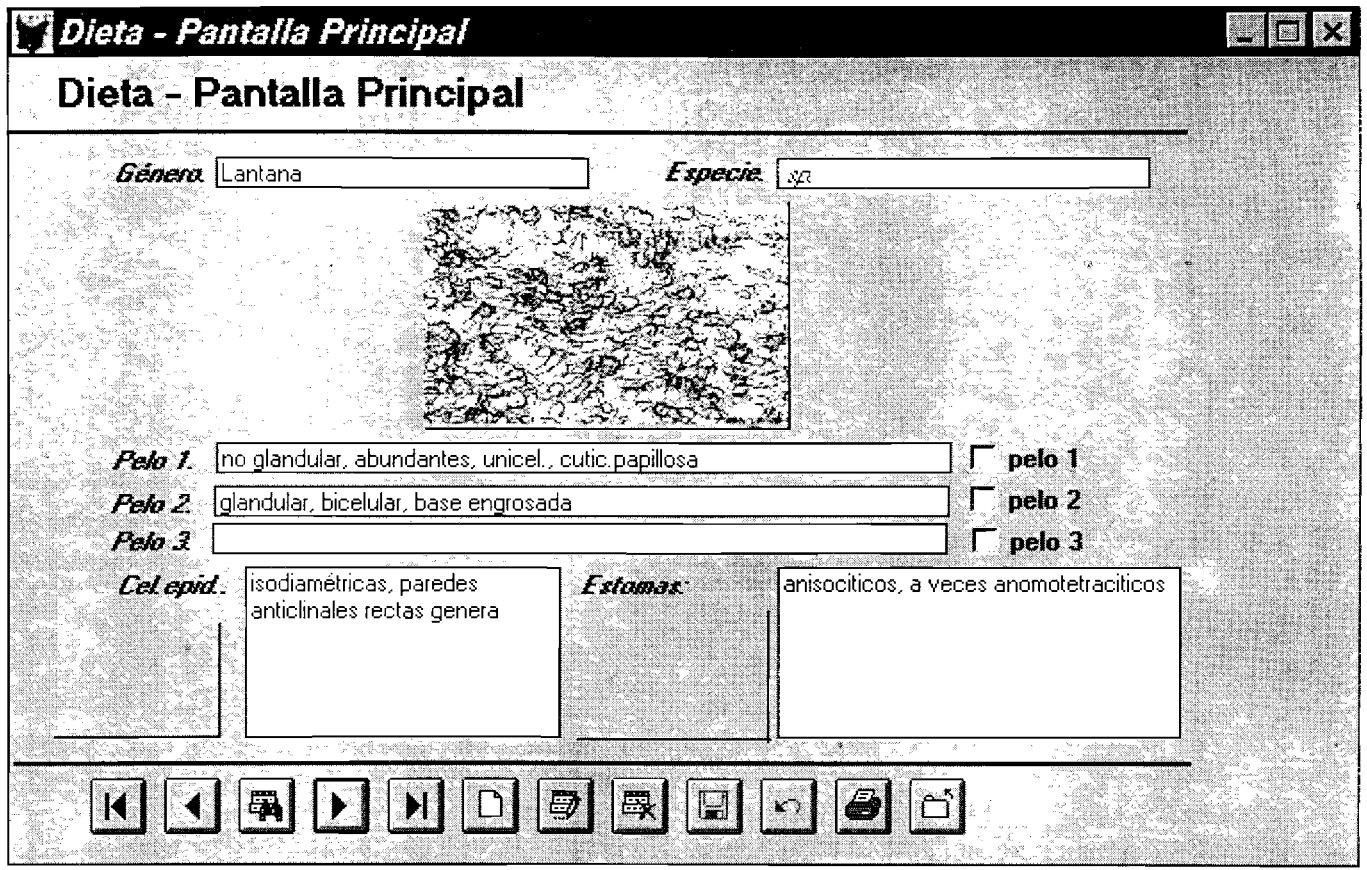

Fig.1. Main screen showing the picture of *Lantans* sp., including brief description of hairs, epidermic cells and stomata.

Microsoft Fox Pro 2.6 for Windows was used to create the databases and programs because it supports several types of data such as numeric, alphanumeric and digitized images, provides friendly interfaces and an efficient way for retrieving the information.

The databases store the following data:

- Genus, species and common name/s of plants and associated photograph (Fig.1)
- Description of hairs and trichomes and associated photograph (Fig.1)
- Description and associated photograph of epidermal cells (Fig.1,2)
- Similarities with other species (Fig.3)

Results

The characteristics of the designed program are:

1. an interface highly intuitive, because a language in Windows environment is used.
2. running the program does not need large memory, so it can be executed jointly with other programs, without causing any trouble, even though the Diet program is image user.
3. the use platform is very generic.
4. the access to the graphic database can be done as much as in an aleatory way as in a sequencial one.
5. the existence of pre-determined patterns which can guide the searching in cases of uncertainly.

A compilable programming language was used to cover these requirements. This characteristic lets the generation of files directly executable. If the programmation language was an interpreter, each line of the codes will be preprocessed in memory before executing it, every time the program is called, so affecting the general performance of the total process.

The requirements of hardware, considered as standard to this program is a 486DX processor with 12Mbytes of RAM memory, while the space needed in the hard disk is variable, according to the number and quality of stored images. No digitization process of images was included into the program because:

1. there are so many kinds of scanners in the market. Specify one kind will restrict the program to specific environments, being dependent in the use of specified peripheries, restricting the independence of the program.
2. it would be difficult to change the image digitizers for most users of these kind of equipment.
3. restrict to determine drivers, such as scanners, would exclude the new equipment, such as PC photo cameras.

Because of these reasons, the user is given the freedom to choose the hardware and software most familiar to him, in which he will operate, and the images could be imported from one application to another via the clipboard (copy & paste).

MS-Windows 95 has not been selected as primary platform due to its amount of required memory, and in order to use its advantages, a 32 bits programming language would be necessary, in which the executable code would not run in MS-Windows 3x thus excluding users with minor capacity computers, while Windows 95 users would only be affected in the program performance.

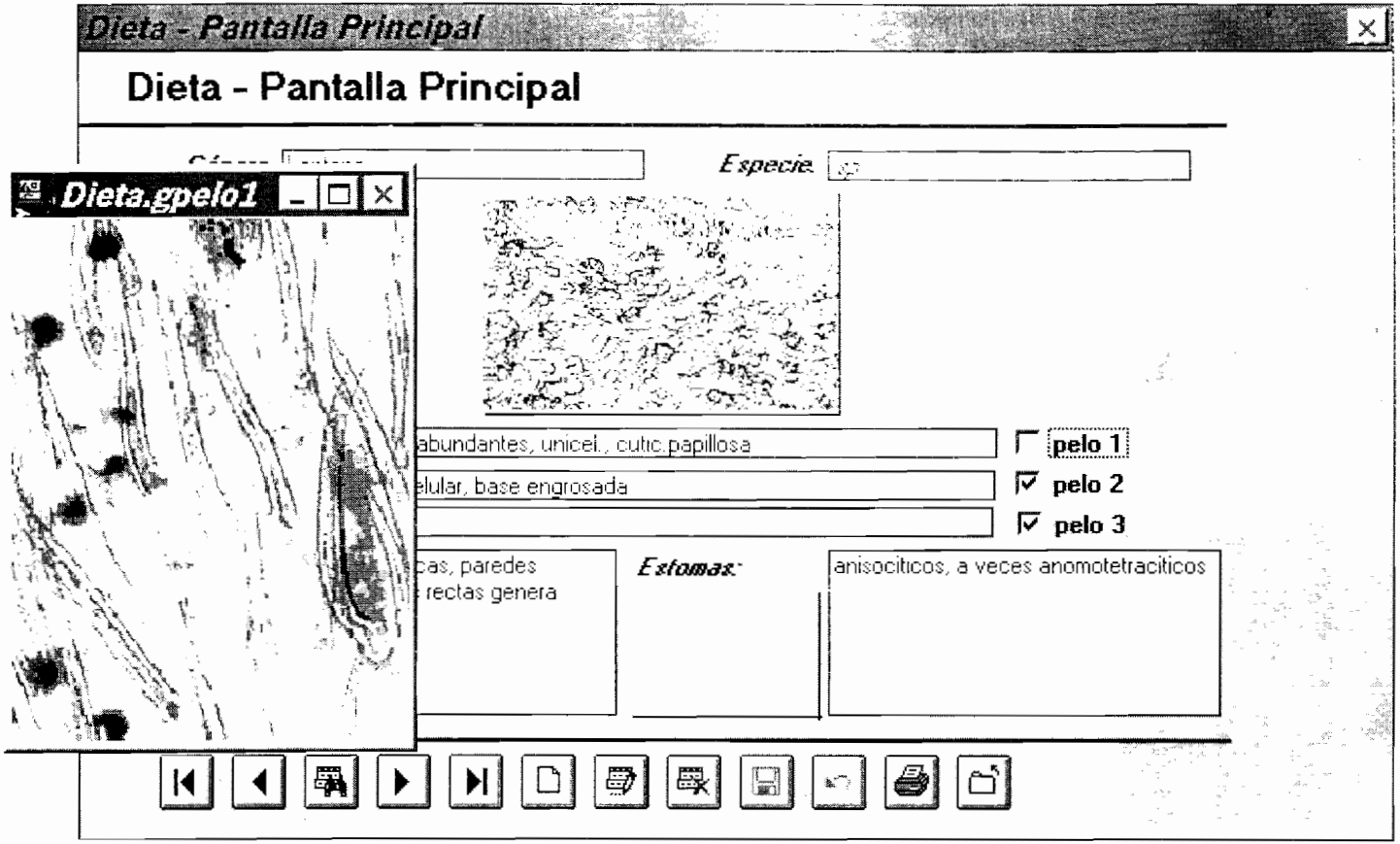

Fig.2. When selecting "pelo 1", a picture of these hairs is shown.

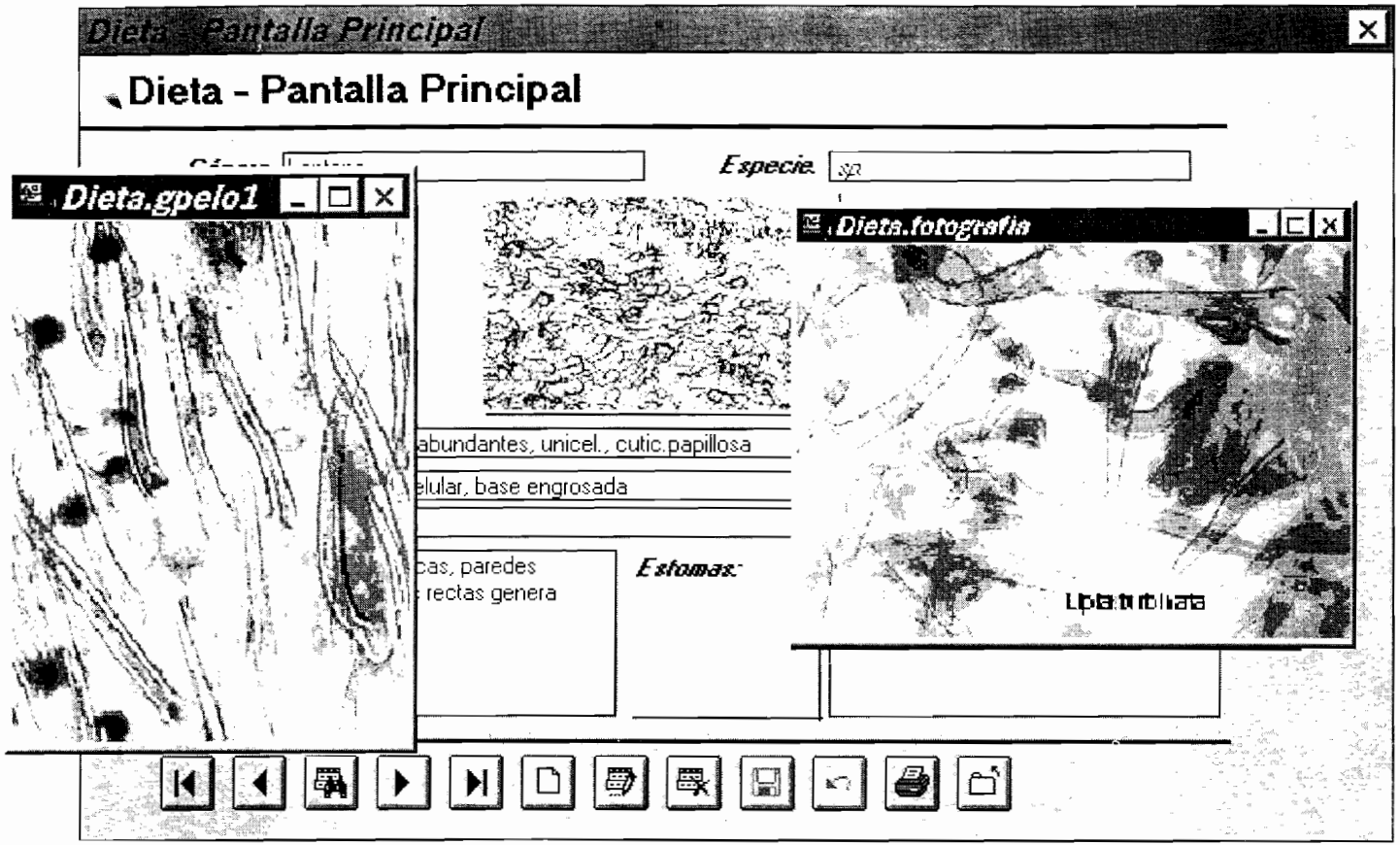

Fig.3. Main screen showing hair similarities between *Lantana* sp and *Lippia turbinata*.

How to use this program in the determination of herbivore diet

Searching for similarities among two or more epidermis to determine, can be done according to different characteristics, such as types of hair, stomata, epidermal cells and cuticle. When the user inputs the epidermis to be determined, images are filtrated to show in a graphic window those that are considered the best candidates. From there on, one by one can be observed until the selection is determined. This step is highly dependent on the training of the user, because no traditional programming techniques (algorithmic) allows to evaluate and/or classify according to visual characteristics.

The program is available with the correspondence author.

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