CONTROL OF ABIOTIC FACTORS USING DATA AQUISITION AND PROCCESSING. APPLICATIONS IN CELL AND TISSUE CULTURES

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Observing of operational stages and phases in micropropagation techniques is an very important factor for the „in vitro" culture succes?.

In principle, it is recommend four stages which are proper to following phases:

I. The initiate of aseptically culture

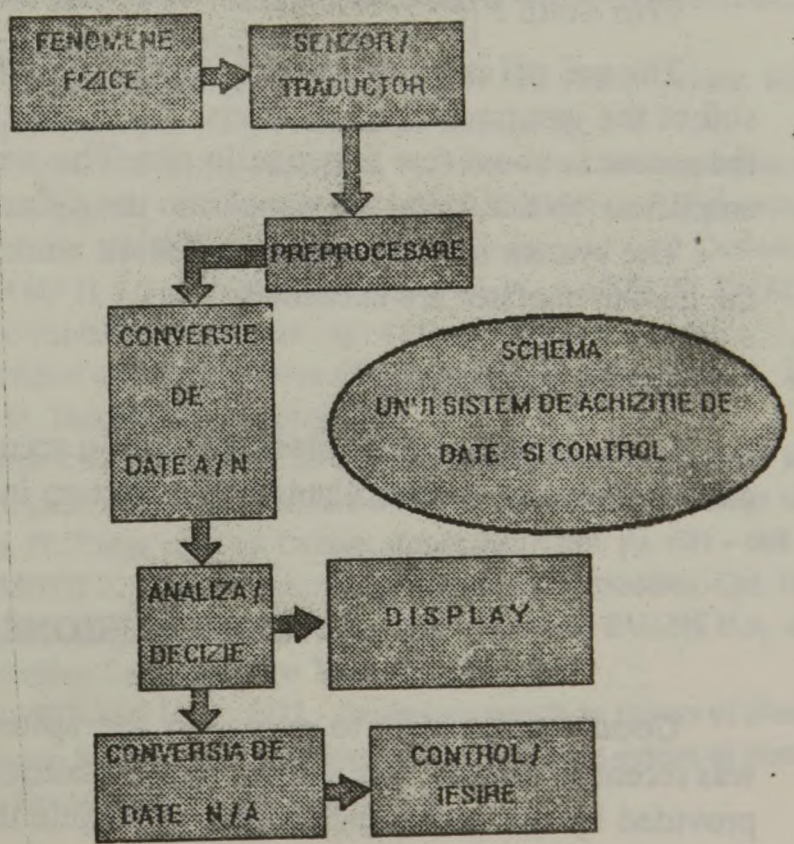
II. „In vitro" plantlets multiplication

III Plantlet" roots formation

IV. The transfer of plantlets in nonaseptically conditions.

We focus on the phase which are corresponding to the transfer of plantlets from „in vitro" culture to natural conditions.

On this purpose we are intending to realize a system composed by an glass incubator about 500 mc. centimetre, several sensors, and a PC. În Fig. 1 is presented the schematic of an data acquisition and control system.



EXPERIMENT

In this part of the project we concentrate on the control of principal abiotic factors of plants: air temperature, air humidity, soil pH and light intensity.

THE TEMPERATURE

Based on prior experiments made on the influence of temperature for orchid plantlets transferred „in vivo" we conclude that the interest range is the interval 12 - 26°C. The acquisition of signal obtained after preprocessing, supply numeric values that varies with temperature after a rule well approximated by a parabolic function. The temperature value is collected by a accuracy o 0.3°C that is very good in our consideration. In dynamic regime, the system provide the tracking o the temperature variation curve established by the human operator with an error of max. 1°C.

AIR HUMIDITY

Air humidity is read by the from an „inteligent sensor" which provide the humidity value in RH percents (Relative Humidity) in BCD code (Binary Coded Decimal). The acquisition accuracy is of 5% RH in the range 25 - 95% RH.

THE SOIL PH

The soil pH is acuired from a special pH sensor which is implanted in the soil of the just transferred plantlets. The magnitude of the signal provided by the sensor is about few tens o milivolts. The preprocessing consist of a linear amplification that bring the signal into the dynamic range 0 - 1000 mV.

The system start a warning operation when the limits of the pH fixed by the human operator are exceeded.

LICHT INTENSITY

Light intensity can be obtained with an accuracy of 0.05 kLux in the range 4.5 - 5 Klux and is controllable by the system in four steps.

CONCLUSIONS

Good results start to come, in the spite of the fact that the system was recently released. The sterile culture substrate and the isolated environment provided by this technique ensures a sensible diminution of the loses among

plantlets at „ex vitro" transfer. The constacy of the temperature and humidity together with the adequate lighting are decisive for the increase o plantlets survival percent too.

Of course a number of improvements can be done for better system operation. However, it is clearly now that an integrated action over the abiotic factors can provide a certain improvement of plantlets survival percent at the transfer from „in vitro" to „ex vitro" and this fact is a good reason for a cost price diminution.

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INFLUENȚA FACTORILOR ABIOTICI ASUPRA CULTURILOR DE CELULE ȘI ȚESUTURI, UTILIZAREA ȘI PRELUCRAREA DATELOR ACHIZIȚIONATE.

Rezumat

Această lucrare își propune să utilizeze calculatorul pentru controlul factorilor abiotici ai plantelor. Scopul este creșterea procentului de supraviețuire al plantulelor care sunt transferate din cultura „in vitro" în condiții naturale de mediu. Am utilizat un sistem compus din senzori, traductori, elemente de execuție și control, interfete pentru achiziția datelor și un calculator personal. Acest sistem permite menținerea constanta în timp, a valorilor factorilor abiotici (temperatura aerului, umiditatea aerului, intensitatea luminoasă și pH-ul solului) la valorile stabilite de către cercetător. Valorile optime pentru cultura unei anumite specii, pot fi comunicate sistemului prin intermediul unei interfete grafice prietenoase. Studiile efectuate cu acest sistem arată că se pot obține rezultate promițătoare în ceea ce privește reducerea pierderilor de plantule la transferul din flacoanele de cultura „in vitro" în mediul natural.