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DEVELOPING A MODEL OF DROUGHT OCCURRENCE BY INTRODUCING A NETWORK OF AUTOMATIC WEATHER STATIONS

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Abstract

The paper presents basic concept and preliminary results in the development of the model for analisys of climatic parameters used for prediction drought occurrence in plums. Čačak area has been covered by the network of automatic weather stations connected with the central computer in the meteorological centre. The computer has formed a base of meteorological parameters and calculated the function of the course for each stage of organ and tissue differentiation defined by the algorithm of the organogenesis cycle.

Key words: model, drought occurrence, automatic weather stations

Introduction

The development of highly-intensive technologies in crop growing implies the defining of various cultural practices that can control the processes of their growth and development. This approach is of particular importance for perennial plants, with several competitive processes occurring simultaneously in the trees: the development of different types of growth, differentiation of generative buds and fruit development, etc. (Severini et al. 1990). It is also relevant to the understanding of processes in physiological and imposed dormancy underlying the studies on resistance to low temperatures (Koshelev 1990). This approach is based upon an integrated study of all developmental stages and processes of organ and tissue differentiation by observing them on an algorithm basis under defined ecological conditions (Mićić et al. 1996; Jevtić et al. 1996). The application of any cultural practice can be thus observed as a treatment of the current stage of differentiation, but also as its direct effect on the further processes of plant development. By precisely locating the application of a certain treatment to the current course of differentiation, and then by clearly defining its response in the organogenesis cycle, a basis is obtained for developing software to assess the onset of the expected developmental stage determining certain functions of the development of the target organs in plant production (Mićić and Đurić 1994).

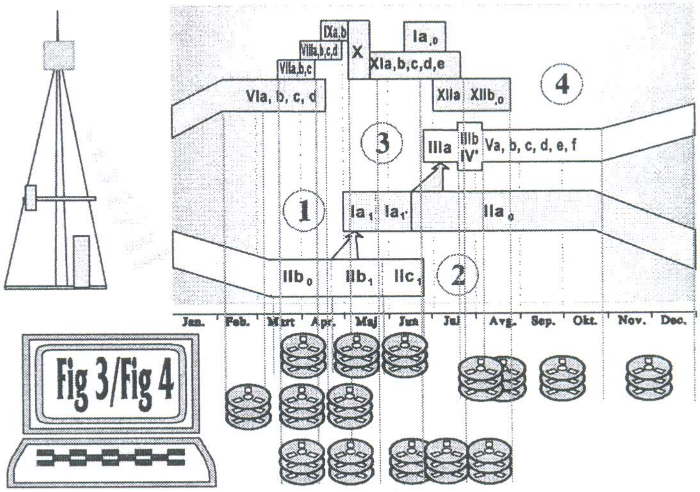

Figure 1. - Graphical presentation of the formation of bases of meteorological indices by the developmental stages defined by the algorithm of organogenesis cycle

The aim of this paper is to present the basic concept and the preliminary results in the development of a model for the analysis of climatic parameters as a basis for modelling the occurrence and effects of differing ecophysiological processes in cultivated plants.

Basic hypotheses in model definition

Automatic weather stations, measuring 14 meteorological parameters at 2-minute intervals and transmitting them by radio to a central computer of the meteorological centre, have been set up at 4 locations in an intensive-production Čačak area. The measurements in each station cover the space ranging from 0.5 m below the ground level to 2 m above the ground level. On the basis of the data collected, the computer forms a base of climatic parameters, not a temporally continuing one, but separately for each developmental stage of the plants observed (Figure 1).

Developmental stages were defined on an algorithm basis as a structural relationship in the sequence of the onset of stages, assuming it as a fixed form, whereas the moment of the occurrence and the duration of the phenomenon are genotype-specific and vary with the changes in ecological conditions. The programme for each defined step in the algorithm forms a distinct base, which is defined by the time of the start and end, i.e. the length of the duration (days, hours, etc.). The start and the end of each step in the experimental stage are defined by the response of the observer, and, after the formation of database, by the response of the user, or automatically on the basis of the boundary values of the model function or the base of climatic parameters.

Meteorological parameters thus fed to the computer, and the formed bases of meteorological parameters by the defined developmental stages in the algorithm of the organogenesis cycle, represent a basis for modelling different ecophysiological processes in agricultural crops.