

# ORGANOGENESIS OF ALGORITHM IN POTATO

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## Abstract

The algorithm of the organogenesis cycle in the potato, in its basis, represents a software which defines the interrelationship at the time of onset as well as the duration of all phenophases, i.e. of all the processes of organ and tissue differentiation in the annual cycle of potato development. All the phenophases and processes of organ and tissue differentiation in the potato, from the time of emergence up to the tuber development (the differentiation of the tuber from the stolon), could be defined as algorithmic steps. In this way each new piece of information in the process of differentiation or any newly defined effect of a certain factor can be additionally included, as new steps or a complete algorithm, into the integral algorithm of the organogenesis cycle in the potato. The level of the estimation of this process is determined by the user's requirements.

## 1. Introduction

The precise determination of the time of initiation and dynamics of the organogenesis process, of the occurrence and duration of the phenophases, as well as of the conditions enabling their evolution, is significant for the determination of certain treatments aimed at a possible affecting of the course of these processes. All the current integral studies of the plant development processed carried out by a division into the organogenesis stages (Kupermanska, 1962) or by coding the macro- and micro - phenophases during the plant development (Zadoks, *et al.*, 1974, Lanchashire, *et al.*, 1991) do not represent satisfyingly the interrelationship in the dynamics and sequence of the process, nor the duration of the investigated phenophases.

By defining the organogenesis cycle on the algorithmic basis, integral studies of these processes were made possible (Mičić, *et al.*, 1994).

The aim of this paper is to define the basis for algorithmic studies of the organogenesis cycle in the potato, i.e. to determine the base of climate and other parameters of this process in certain genotypes.

## 2. Material and methods

All the processes occur in organogenesis as irreversible processes of organ and tissue differentiation. Therefore, they can be defined as algorithmic steps. The methodological analysis comprises two aspects: firstly, the determination of different aspects concerning important phenophases and processes of organ and tissue differentiation which, as regard to their sequence, are in accordance with the biological organogenesis cycle in the potato, and secondly, the graphical analysis of the sequence of the onset and the target stage, i.e. the interrelationship in the dynamics of occurrence and duration of the defined phenophases and processes of organ and tissue differentiation in the course of the annual organogenesis cycle in the potato.

In this way we obtained the basis for developing the software which, in its basis, represents the algorithm of the organogenesis cycle in the potato.

### 3. Results and discussion

The basis for a new concept of intensifying the potato production was made by the analysis of potato development observed integrally as a sequence of phenophases occurrence, i.e. as organ and tissue differentiation processes defined by division into growth stages (Kerefov, 1982), or by using different keys and codes (Sparks, 1972, Jefferies, *et al.*, 1991). Without paying attention to the success/failure parameter in classifying and coding individual phenophases in the development of the studied plants, a new step was made in defining this process on the algorithmic basis. Using the same basis, possibilities were created to develop a model for specific researches into the ecophysiological aspects of organogenesis by analyzing the bases of meteorological parameters, as well as a model of highly intensive technology of the potato growing by determining certain treatments with the aim of obtaining the expected effect related to some phenophases during the process of organ and tissue differentiation.

The choice of the investigated phenophases and the differentiation processes is the first step in the development of the algorithm. At the same time, it determines the levels in the algorithmic structure.

In this paper the classification of the phenophases and the differentiation processes were carried out thoroughly with the aim to define individual algorithmic structures (table 1). The numeration was done in such a way that each new detail of some interest for the development of the algorithm can be additionally included as a new step into the integral algorithm of the potato organogenesis. The comparison of this classification with the previous ones point out that the observed structure is important. The details, however, are of relative significance.

By applying graphical analysis of the interrelationship in the dynamics of occurrence of the defined phenophases and organ and tissue differentiation processes, the algorithmic structure of potato organogenesis was obtained (figure 1).

In forming the software, the interrelationship within the structure is fixed, while the moment of the onset and the duration are variable depending on the changes of ecological conditions and on the genotype characteristics. The software for each defined step in the algorithm forms a special database which is determined by the time of the onset and the target stage, i.e. by the duration of the process (days, hours, etc.). The database is formed by the user's responses, automatically on the basis of both the limiting values of the model functions and the basis of climate parameters. Afterwards, the beginning and the end of each step at the experimental stage are determined by the users response.

Applying a few questions which give necessary information about the dynamics of the current phenophase as well as of the expected one, we suggest the user's responses in advance.

In order to obtain the precise answer, the user is given responses by using the photobase of the defined phenophases, i.e. of the defined steps of the algorithm itself.

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