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On Analysis of Growth of Plants

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Abstract*: In this paper we introduce a model to describe growth of plants. Based on analysis of the model we analyzed dependence of growth of plants on several factors (temperature, air humidity, et al). We formulate recommendations to accelerate and decelerate of growth of plants. We also introduce an analytical approach for prognosis of the above growth.

Keywords*: Prognosis of Growth of Plants; Changing of Speed of Growth of Plants; Analytical Approach for Analysis.

I. INTRODUCTION

Main factors of influence on growth and development of plants are nutrition, heat, light, air, water [1-7]. During prognosis of increasing of plant biomass and analyzing their yield it is attracted an interests a quantitative analysis of the consumption of the above factors [1,2,6][9][10][11][12]. In this paper we introduce a model for prognosis of the considered growth of plants. Based on the analysis of this model we analyzed dependence of growth of plants on several environmental factors. An analytical approach for analysis the above model was also introduced.

II. METHOD OF SOLUTION

To solve our aim we calculate linear growth indicator of plants L as a function of t. We calculate the considered indicator as solution of the following the initial task

$$\frac{\partial L(t)}{\partial t} = a(t)L(t) + b(t) + c(t) + d(t) \qquad (1)$$

with initial condition $L(0) = 0$. The following notations were introduced in the equation (1): $a(t)$ is the parameter, which taking into account inertia of growth of plants; $b(t)$ is the function, which taking into account air humidity on growth of plants; $c(t)$ is the function, which taking into account influence of continuance of lighting on growth of plants; $d(t)$ is the function, which taking into account influence of warming up of environment on growth of plants. Solution of equation (1) in the framework of standard procedure [8] [13] with account initial condition leads to the following result

$$L(t) = \exp\left[\int_0^t a(\vartheta)d\vartheta\right]\int_0^t [b(\vartheta) + c(\vartheta) + d(\vartheta)]\exp\left[-\int_0^\vartheta a(\tau)d\tau\right]d\vartheta . \qquad (2)$$

III. DISCUSSION

In this section we analyzed growth of plants with time with variation of different parameters. Fig. 1 shows typical dependences of dimensions of plants on time at constant values of the recently considered parameters a, b, c and d. Increasing of number of curves corresponds to increasing of values of the above parameters. Changing with time of the parameters a, b, c and d leads to changing of speed of growth of plants with time. The changing of the above speed of growth depends on type of dependency of the above parameters on time.

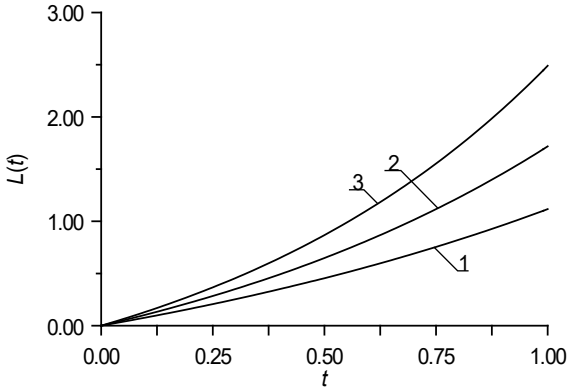

Figure 1: Typical Dependences of Dimensions of Plants on Time at Constant Values of the Recently Considered Parameters *A*, *B*, *C* and *D*. Increasing of Number of Curves Corresponds to Increasing of Values of the Above Parameters

IV. CONCLUSION

In this paper we formulate a model for prognosis of growth of plants. Based on analysis of the above model we analyzed dependences of growth of plants on different factors (temperature, air humidity, et al): we analyzed possibility to accelerate acceleration and deceleration of growth of plants. We also introduce an analytical approach for prognosis of the above growth.

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AUTHOR PROFILE

Evgeny Leonidovich Pankratov was educated Nizhny Novgorod state university (Nizhny Novgorod city, Russia) with full doctor degree in physics and mathematics. Now he has a position of a full professor. Area of scientific interests of Evgeny Leonidovich Pankratov is prognosis of processes in physics, biology and economics with appropriate development of models and analytical approaches for solution of equations, which were used in the considered models. Now he have 580 published papers in area of his research.