ANATOMICAL AND PHYSIOLOGICAL FEATURES OF PHOTOREGULATION OF MORPHOGENESIS OF SPRING WHEAT SEEDLINGS

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Abstract. *Relevance of the topic. Clarification of the basis of morphogenesis - the formation of a certain form of plants - is one of the main problems of botany. To solve it in relation to multicellular organisms, it is necessary to understand the interaction of cells, tissues and organs with each other in ontogenesis*
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The most important morphogenetic factor in the external environment is light, the importance of which increases as plants grow (Lino, 1990; Briggs and Olney, 2001). Therefore, the importance of all the main photoreceptor systems that perceive the movement of the most active parts of the spectrum and their subsequent reaction to this factor is of great importance.

At the early stages of ontogenesis, the photoregulation system is represented mainly by phytochrome. Today, the study of the phytochrome system, as a rule, is devoted to elucidating the general principles of the activity of the photoregulatory system represented by this pigment, its distribution in plant tissues and the location of light-receiving structures in the organ. a new and promising direction of scientific research. Most of the proposed models for the operation of photoregulatory systems are theoretical or significantly abstract in nature and are based on experimental data with plants of various structural groups. This is explained not by a low level of knowledge, but by limited experimental data due to the complexity of technical implementation (Deny, Roenneberg, 1997).

Photoreceptor structures are small in size and localized in cellular compartments. Moreover, due to their high sensitivity to the light factor, their concentration in these systems is low.

One of the most important approaches to this problem in this regard is the search for the necessary model objects for research.

In the assessment of morphogenetic effects under the influence of light, the apical part of the cereal coleoptile is often used as a system that is sensitive to the intensity and quality of light. When studying the phenomena of photomorphogenesis, researchers try to determine the primary changes that occur in this apical structure of the coleoptile. and tried to determine the sequence of physiological and biochemical factors that transform the light signal into a morphogenetic effect. One of the most effective ways to reveal the essence of photomorphogenesis is the study of the photosensitive pigment phytochrome (Mandoli and Briggs, 1981).

However, the juvenile structure of the plant has several photoregulation systems, some of which belong to the apical buds. Therefore, the entire system of the juvenile structure must provide both photoreception and light transmission with a complex of physiological realization of light; the latter two areas of scientific research have become widespread in recent years. The most

convenient model system for studying photoreception and light transmission, as well as their contribution to plant morphogenesis, is wheat seedlings.

The purpose and objectives of the research. The main goal of the work was to determine the anatomical and physiological features of photoregulation of wheat seedling morphogenesis. To achieve this goal, the following tasks were solved:

1. Determine the morphological and anatomical features of morphogenesis of wheat seedlings in the presence and absence of light.

2. Determine the specific characteristics of coleoptile and epicotyl growth during the germination of wheat grains at different depths of the soil layer.

3. Determine the optical properties of the coleoptile and epicotyl in the presence and absence of the light factor.

4. Determination of the influence of the time and order of activation of coleoptile and epicotyl pigment systems on the morphogenesis of wheat seedlings.

5. Evaluate the types and cultivar characteristics of the anatomy of the wheat epicotyl.

Scientific novelty of the work. The work shows for the first time that the specificity of growth processes of coleoptile, epicotyl and embryonic leaves of the main shoot of a seedling depends on the influence of the light factor and loads.

In the coleoptile of a wheat seedling, three zones are distinguished, differing anatomically and functionally: zones of perception, conduction and implementation of light flux. It was shown for the first time that light transmission is carried out by two main flows - the tissues of the conducting bundles and the tissues of the parenchyma. A change in the light transmittance of the coleoptile during the ontogenesis of a wheat seedling was revealed.

It has been established that the total amount of light passing to the apical meristem of an etiolated seedling is constant and does not depend on the linear dimensions of the coleoptile. The spectral characteristics of coleoptile and epicotyl tissues are presented for the first time, showing the presence of several functioning pigment systems in them.

The greatest diversity in the anatomical structure and morphometric characteristics was revealed when studying species and varietal characteristics for epicotyl. The more anatomically conservative organ in the studied species and varieties is the coleoptile.

Theoretical and practical significance. The information obtained during the research contributes to the study of the morphology, anatomy and physiology of the most important agricultural crop - wheat, and can be used for theoretical studies of plant morphogenesis, as well as in breeding work to assess the prospects of the variety. The analysis of scoto- and photomorphogenesis of wheat seedlings carried out in the work opens up prospects for identifying the conditions for the targeted regulation of growth and development of wheat, resolving issues related to the mechanisms of photoreception of light and the reaction of effector structures to it, and correlative relationships between organs at the level of the whole plant.

1. The conditions for the germination of wheat grains (the presence or absence of light, the depth of sowing seeds) affect the morphogenesis of the coleoptile, epicotyl, and the first and third germinal leaves.

2. There are differences in the optical properties of coleoptile and epicotyl, which ensure the sequence of morphogenesis of wheat seedlings.

3. Species and varietal differences in the anatomical structure of the epicotyl are observed.

1. The specificity of the growth processes of the epicotyl and coleoptile of wheat depends on the action of the light factor and mechanical loads. It has been established that the sensitivity to the action of these factors varies among these organs.

2. The coleoptile is a highly specialized structure, anatomically divided into zones of perception, conduction and reception of light. Light transmission is carried out by the underlying tissues of vascular bundles and parenchyma from the apex, forming two streams directed to different photoreceptor centers of the seedling: the main bud and the epicotyl.

3. Conductive bundles in the coleoptile have the greatest light transmission in the first few days after germination. Further growth of the seedling under conditions of insufficient lighting leads to the predominant conduction of the light flux by the parenchyma cells of the coleoptile.

4. Light transmission of the coleoptile Determines the light received at the apex: the greater the amount of light, the less light transmission. The total amount of light approaching the apical meristem of this seedling is constant and does not depend on the linear dimensions of the coleoptile.

5. Meristematic and actively growing tissues adapted to a certain length of light flux. Changes in the quantitative characteristics of light arriving at the main bud of the seedling and epicotyl affect the morphogenesis of the wheat seedling.

6. The presence of several functioning pigment systems in the coleoptile and epicotyl has been established. The specifics of the functioning of these systems under changing conditions differ for coleoptile and epicotyl. In conditions of complete darkness, coleoptile tissues are configured for maximum light transmission; in lighting conditions - to stabilize the intensity of light transmitted through the coleoptile tissues. Epicotyl is characterized by the presence in its tissues of photoregulatory pigment systems that absorb in the blue region of the spectrum.

7. Establishment of the types and various features of the morphology and anatomy of the epicotyl on the following side of development: length, square conductive tissue, number and bundles of the central cylinder and cortex.

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