MODIFICATION CHANGES OF ANATOMICAL STRUCTURES OF VEGETATIVE ORGANS OF RICE GRADES

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Abstract: This article deals with modification changes in the anatomical structure of vegetative organs of rice cultivars. Increasing doses of mineral, especially nitrogenous fertilizers, have a significant effect on modification changes in the anatomical structures of the stem and leaf sheaths of rice. With increasing fertilizer dose, especially with increasing number and dose of nitrogen fertilizing, the number of conducting beams, especially small (outer) conducting beams increases. The area of large conducting beams also increases. This, apparently, facilitates the movement of more assimilates in the phloem, as well as nutrients in the xylem, which has a significant effect on the formation of a high yield of rice grain.

Keywords: Rice, Grades, Anatomical standing of the stem, Leaf sheath, Nitrogen fertilizers, Modification changes.

1 Introduction

Thanks to the great success of the Green Revolution, since the late 1960s, global production of cereals has doubled, which has created high-yielding varieties with shorter and more durable stems of rice and wheat by modifying plant architecture. (1)

Rice is a monocotyledonous plant. Most monocots sheet system should determine the basic features of the anatomical structure of the stems to a much greater extent than in gymnosperms and dicotyledonous, partly due to the absence of secondary growth. For typical characteristic expressed monocot stems particle beam structure, abundance beams, in most sheet representing traces curvature of the beams during their passage through the interstices, complete (or almost complete) absence in the stem cambial often lack distinct boundaries between primary cortex and the axial cylinder. From the base of each leaf, monocotyledons include a significant number of closed conductive bundles of the collateral structure. (2)

Rice is one of the dominant cereal crops, it feeds more than half the world's population. In most developing countries, demand for rice will increase dramatically with population growth. To cope with this task, it is necessary to develop new elite varieties of rice, which can produce a much higher yield of grain. (1) Understanding the mechanisms that control the plant architecture of rice will promote the cultivation of rice varieties with higher yield potential.

Rice is an annual grass with round, hollow and articulated stems. The course of rice development is roughly divided into two stages: the vegetative stage and the reproductive stage. (3) The vegetative stage is usually longer and consists of the re-formation of a number of leaves and branched shrubs as lateral organs. A small lengthening of the internode in rice occurs during the vegetative stage. (4)

In the genetic improvement of rice, several genetic attributes have been selected to increase crop yields, yield stability, and large-scale adaptability. (1, 5) The yield of rice plants consists of three main components: the number of panicles per unit area, the number of spikelets per panicle and the weight of the core. (6) These components contribute to the release of grain to varying degrees, and their contribution varies depending on the genotype, environmental conditions and cultivation practices. (7) Nevertheless, plant architecture can be the most important factor affecting the yield of grain in rice. The architecture of the rice plant is mainly determined by the figure of the tiller, the height of the plant, the shape and arrangement of the leaves, and the architecture of the panicle.

The content of the genotype is not so much a consequence of its properties as a material bearer of hereditary information, but rather a consequence of the properties of the phenotype to which it is addressed. Therefore, at different stages of ontogenesis and in the implementation of various morphogenetic processes, the phenotype derives from a fundamentally identical genotype (only duplicated, multiplied by virtue of the principle of equally hereditary cell division. The definiteness of the content of the genotype depends not so much on the stability of its elements - genes, as on the stability (certainty of properties) of the historically formed, i.e. previously informed, the phenotype of the adaptive norm at all stages of ontogeny. (8)

Rice is one of the most important basic food crops in the world and is consumed by people like ethereal brown rice or polished white rice. Rice as a cereal crop has a monocotyledonous form with a sequenced genome, has also for functional genomics and studies of domestication and evolution of the genome. (1, 6, 9) The grain of rice has a complex structure, derived from a flower with caryopsis which is enclosed in a lemma and palea. (10-11) Caryopsis consists of three genetically distinct components. All these tissues in mature caryopsis, with the exception of the embryo and aleurone, are dead. (12-13) In transfer cells, the aleurone layer (14) and accumulated products, the development of caryopsis in different species of cereals has some common characteristics (15). Several morphological studies were carried out with rice embryos and endosperms. (14, 16-17) Also less studied was the pericarp of rice. (10-11) The pericarp of rice has three vascular bundles, a large one located on the dorsal side, and two small ones on the lateral side. (12) The spinal vascular bundle plays an important role in providing water, minerals and photosynthesis assimilates the developing caryopsis (12) CIN2/GIF1 cell wall inversion, expressed in the dorsal vascular bundle, can function to hydrolyze the sucrose delivered by phloem to fructose and glucose, since the mutation of this gene has led to a defective filling of the rice grain. (18-19) The cover in the ovary consists of a two-layered outer cut and a two-layered inner cover. (12) The outer cover degenerates within 2 days after pollination (DAP), while the degeneration of the inner cover varies depending on the rice varieties. (12) It is known that the degeneration of the nuclear projection, which is located next to the dorsal vascular bundle, is critically important for filling the grains. (20)

2 Materials and Methods

Entry into the XX century. was marked in biology by the rapid development of genetics. The beginning of the XX century. it is considered to be the beginning of experimental genetics, which brought a lot of new empirical data on heredity and variability. According to Naidysh V.M. (21), to such kind of data it is possible to carry:discovery of the discrete nature of heredity; ,substantiation of the concept of gene and chromosomes as carriers of genes; representation of the linear arrangement of genes; evidence of the existence of mutations and the possibility of causing them artificially; establishment of the principle of purity of gametes, laws of domination, splitting and concatenation of characteristics; the development of methods for hybrid logic analysis, pure lines and in-putsch, crossing-over (disruption of gene adhesion as a result of exchange of sites between chromosomes), etc. It is important that all these and other discoveries have been experimentally confirmed and rigorously substantiated.

Modern biology is a complex, a system of sciences. There are sciences that study the general laws of life: genetics - the science of variability and heredity, ecology - the science of the interrelationships of organisms among themselves and the environment, evolutionary teaching - the science of the laws of the historical development of living matter, paleontology explores extinct organisms. (22-23)

Now, let's take a closer look at the features of the structure of plants. The body of highly organized plants consists of the organs of stems, leaves and roots, and their modifications. The stem grows and forms in close connection with the leaves and represents an escape along with them. The anatomical structure of a typical stem determines its main functions. The main functions of a typical stem are a new growth of organs, determination of position in space, support and transport of substances along the ascending and descending routes. In the stem, a system of conducting tissues is developed, which binds together all the organs of the plant. The system of mechanical tissues ensures the stem of the supporting function. The stem, like the entire shoot as a whole, is an open system of growth, i.e., it grows for a long time and participates in the formation of new organs. The stalk is characterized by a complex system of meristems apical (apical), lateral and intercalary. At the point of shoot growth with the correct periodicity, leaf primaries arise and, which leads to early isolation of the nodes, and the development of internodes is delayed. Often, the growth of internodes and the development of permanent tissues in them continue for a long time due to the work of those residual (intercalary) meristems that persist at the bases of several younger internodes. A good example of such an intercalary (gusset) growth may be cereal stalk whose apical meristem very early consumed in the formation of inflorescence and rapid escape stretch (earing) due to precisely intercalary growth.

The stalk of plants is characterized by a variety of structure and functions. It is possible to single out the general features of the structure characterizing the stem: long growth in length with the aid of the apical meristem in the cone of growth; the presence of leaves that are formed exogenously and in a certain order in the form of tubercles on the cone of growth; branching by exogenous laying in the axils of the leaves; radial (actinomorphic) structure and at least three planes of symmetry.

Not all stems have all of the above-listed characteristics. For example, horizontal and inclined stems often have deviations from actinomorphic. In some types of stems (for example, in flower axes) apical meristem early and quickly stops activity, differentiating into permanent tissues. Phylloclade differs from typical stem organs not only by the early differentiation of the apical meristem into permanent tissues but also by two planes of symmetry.

The differentiation of the tissues of the cone of growth begins below the level of primordia. Sign of the beginning of the formation of permanent tissues is a strong vacuolization of cells. Among them are areas of residual meristem in the form of a ring or strands. The cells of the residual meristem divide longitudinally, forming a column of cells, each of which extends parallel to the axis of the shoot, forming procambial. The differentiation of procambial, starting below the level of primordia, should be actopetalin the leaf. In the axial part of the stalk of dicotyledonous and coniferous plants, acrobatic development of cambium is observed, in dicotyledonous bicipital. (24) Formation of primary conducting tissues from procambial cells begins with the formation of phloem elements. After a while, the cells of the primary xylem begin to differentiate. The primary growth of the stem includes thickening and elongation of the axis of the cone of growth directly under the primordia. The primary growth in length is due to the anticlinal division of cells and their extension. The extension of cells in length can occur uniformly along the length of the entire rudimentary interstitial site, in the actopetal direction or intercalary. The primary growth in thickness is due to the periclinal division of the cells of the primary cortex and the central cylinder. Monocotyledons in apex have a meristem of primary thickening. Depending on its activity, leaf rudiments may have different positions relative to the apex. With the development of stems of grassy and in the first year of life of woody plants, the primary anatomical structure of the stem is formed. In the stem of the primary structure, one can distinguish: 1) a cover cloth; 2) the primary cortex; 3) a central (or axial) cylinder, also called a stele. (2)

Studied objects of rice variety Marzhan, Aral 202, Aru. The rates of seeding of rice seeds: Marzhan - 5, 6, 7 million germinated seeds; Aral 202 - 5, 6, 7 million germinated seeds; Aru - 5, 6, 7 million germinated seeds. Methods of inducement mineral fertilizers: 1) N0P0 - control (without fertilizer); 2) N60P90 kg/ha a.i. (inserted before sowing) + additional fertilizer N30 kg/ha (introduced in the phase of 6-7 leaves, i.e. 3-stage organogenesis); 3) N60P90 kg/ha (inserted before sowing) + additional fertilizer N60 kg/ha (in the phase of 6-7 leaves); 4) N60P90 kg/ha (inserted before sowing) + additional fertilizer + N90 kg/ha (in the phase of 6-7 leaves); 5) N60P90 kg/ha (inserted before sowing) + additional fertilizer N120 kg/ha (in the phase of 6-7 leaves); 6) N60P120 (inserted before sowing) + additional fertilizer N90 kg/ha (in the phase of 6-7 leaves); 7) N60P120 (inserted before sowing) + additional fertilizer N120 (in the phase of 6-7 leaves).

The plot area is 100 m2, the repetition of the experiment is three-fold. The soils of the area are old-irrigated, hydromorphic, the type of salinity is chloride-sulfate, the degree of salinity is strong. Shoots of rice varieties were obtained on flooded checks, field germination of seeds - 39-42%. To study the anatomical structures of samples of varieties of rice are taken in the phase of sweeping.

Changes in the agro-ecological conditions of the Aral Sea area have a significant impact on the morph physiological features of the growth and development of crops, including rice. With such altered environmental conditions, the introduction of mineral, especially nitrogen fertilizers, has a significant impact on the formation of high rice grain yields. (25) With their correct application, rice yields increase by 60-80%, sometimes 1.3-2.5 times. Thus, for crops of narrow-leaved varieties Kuban 3, Aru and large-leaved varieties of Marzhan, Aral 202, Togusken 1, the "first effect" of yield increase (45-55 c/ha) is observed when N120P90-120 kg/ha a.i. of fertilizers. With such a dose on agrocenosis of rice cultivars, neighboring plants do not shade each other, unfavorable cenotic interactions are not observed, the net productivity of photosynthesis does not decrease. (26) The "second effect" of increasing yields (70-78 c/ha) on crops of rice varieties is observed with the application of N180P120 kg/ha a.i. fertilizers. At this dose in agrocenosis rice gradually intensified cenotic adverse mutual influence, but the net photosynthetic productivity is at a high level, and as a result, formed the highest grain yield. This conclusion is consistent with the research of other scientists. So, according to scientists from Russia (Krasnodar Territory) and Uzbekistan on the criterion of "the highest grain yield" an optimal level of nitrogen fertilizers - N178 kg/ha a.i. with following increasing doses of fertilizers (N240P180 kg/ha a.i.) in rice significantly agrocenosis (PL, thousand m2/ha), photosynthetic potential (FP, mln.m2 day/ha), total biomass (U bio., c/ha), but the yield of grain is decreasing (U, c/ha) , the net productivity of photosynthesis (F n.pr., g/m2 day) and the economic efficiency of photosynthesis (K e.ef., %) also decrease.

When forming the grain yield are significantly affected by the length, width, area of the upper 2-5 leaves, internode length, and diameter of the main stem and lateral shoots. The formation of the above-mentioned plant organs of rice is significantly affected by the dose and methods of introducing mineral, especially nitrogen fertilizers. In this regard, the anatomical structure of the upper interstices of the stem, leaf sheath, depending on the dose and the methods of introducing mineral fertilizers and nitrogen fertilizing have been studied.

Figure 1. General View of Small-scale and Large-scale Plantings of Rice Cultivar

3 Results and Discussion

3.1 Anatomical Structure of Stems

The following cells are located on the transverse section of the stems (Figure 1, Table 1): epidermis (1), small, green assimilating parenchyma (2), colorless primary parenchyma (3). The structure of the wall of a single-layered epidermal cell (1) is reticular, shallow, the walls thickened and saturated with silicon, covered with a thin cuticle. In cells of the epidermis, there are no stomata, there are one or two hairs. The shape of the hair is round, convex, or slightly elongated. (27)

Small, slightly elongated, densely located parenchymal (2) cells are located below the epidermis, between the cells there are narrow lumens. Further, to the bottom of small parenchymal (2) cells are located large, the main assimilating parenchymal (3) cells, their shape is roundish, there are several elongated forms. The walls of these cells are thin, there are intercellular spaces.

In the stems, there are two rows of vascular-fibrous conducting bundles. The number of beams in a straw is from 20 to 40. (28) Sclerenchyma coating of conductive beams merges with sclerenchyma elements of the ring. The "outer", small vascular fibrous conduction beams (4) are located at a "large distance" from each other, and in the parenchyma located closer to the center, large, "inner" vascular fibrous bundles (5) are formed that form almost " the right circle ". All conducting bundles are closed, collateral. In the center of the stem is a cavity (6), formed as a result of the death of parenchyma cells (Figure 2).

Figure 2. Preparation of Sections of the Stem and Sheath of the Rice Leaf and Consideration

In the non-spreading Anao variety, internal, large conductive bundles are somewhat elongated, ovate, and in Uzros 7-13, whose average lodging ability, conduction beams are diamond-shaped, roundish. Arp - shaly variety in lodge vascular bundles elongate rounded, compressed from two sides. The internal conducting beams of varieties Marzhan, Aral 202, Togusken 1, Aru are similar in shape to conducting beams of the average littered variety UzROS 7-13. Consequently, the investigated Kazakh varieties in terms of their property are medium-liable under the microscope.

The composition of the conducting beams includes elements of phloem (8) and xylem (9). Xylem is represented by 3-4, among them 1-3 large-lobes, constituting a short radial chain. The phloem (8) has the form of a grid, the cells of which correspond to the cross section of the sieve tubes and consist of small, "satellite" cells. Protophloem altered, located along the edges of the bundles.

The mechanical tissues surrounding the "outer" conductive bundles are densely located with each other, there are no intercellular spaces. The shell of these cells is sclerated, a bit thick. These cells are docked with sclerenchyma, surrounding the stem cells and gives the stem a certain degree of strength. Sclerenchyma cells surrounding the inner large conducting beams 2-3 row, tightly arranged. On the outside of these cells are small, parenchymal cells, in which the shell is thin (Figure 2a, 3).

With increasing fertilizer dose, especially with increasing number and dose of nitrogen fertilizing, the number of conducting beams, especially small (outer) conducting beams increases. The area of large conduction beams also increases

(Table 1). This, apparently, facilitates the movement of more assimilates in the phloem, as well as nutrients in the xylem, which has a significant effect on the formation of a high yield of rice grain. (29)

The quantitative parameters of the anatomical structure of the stem in the sectional view also change (Table 1). Thus, the number of large conductive beams and their area, as well as the number of small, outer beams in Aral 202 are significantly higher than those of Marzhan (standard). This is one of the indicators of the superiority of the newly regionalized Aral 202 (Table 1). With the application of an average dose (N60P120 + N60 kg/ha a.i.), the number of large, inner and small (external) conducting beams increased in the studied sorbents. The number of sclerenchyma coatings of these conducting beams increases.

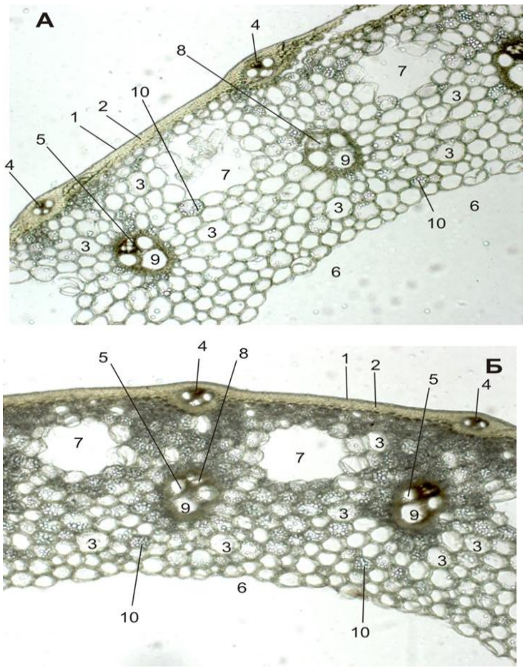

Figure 2a. Anatomical Structure of the Stalks of Rice Aral 202 (on Top of the 1st Internode, a and below the 2nd Internode, B); Variant-seeding 5 Million Germinated Seeds; Without Fertilizer (Control)

Table 1. Quantitative Indices of the Anatomical Structure of the Stem of Rice Cultivars Depending on Increasing Doses of Fertilizers

Varieties of rice	Seeding of 5 million germinated seeds			Seeding of 7 million germinated seeds		
	N0P0, without fertilizer (control)	N60P90+ +N60, average dose	N60P120+ +N120, high dose	N0P0, without fertilizer (control)	N60P90+ +N60, average dose	N60P120+ +N120, high dose
Internal, large conductive bundles, pcs.						
Marzhan standard	8,7±0,33	10,3±0,32	16,7±0,71	10,2±0,33	13,0±0,55	17,1±0,63
Aral 202	12,3±0,31	16,0±0,40	20,0±0,60	12,3±0,30	16,0±0,70	19,0±0,40
Aru	9,7±0,33	13,6±0,37	18,7±0,70	10,8±0,41	14,1±0,63	18,2±0,51
External, small conductive bundles, pcs.						
Marzhan standard	12,7±0,87	14,3±0,86	20,0±0,57	15,8±0,52	17,3±0,61	21,8±0,77
Aral 202	15,3±0,80	20,0±0,70	28,0±0,60	17,3±0,41	20,3±0,50	26,7±0,61
Aru	15,7±0,87	18,7±0,86	21,7±0,56	16,2±0,65	18,5±0,66	21,2±0,54
Area of internal, large conducting beams, mkm²						
Marzhan standard	115,7±0,6	116,7±0,3	138,7±0,7	117,3±0,4	121,4±0,5	139,2±0,6
Aral 202	129,3±0,3	133,7±0,6	138,0±0,6	127,3±0,2	135,4±0,8	143,3±0,4
Aru	118,7±0,6	122,7±0,3	132,0±0,7	118,2±0,5	123,5±0,6	136,5±0,6

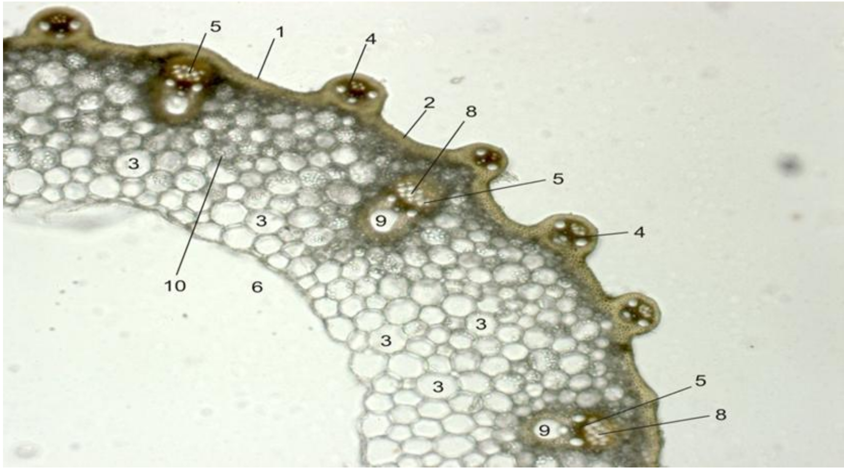

Figure 3. Anatomical Structure of the Stem of Aral 202. Option-seeding 7 Million Seeds, Applying an Optimally High Dose (N60p120 + N120 Kg/ha a.i.)
Notation: same as in Figure 2.

This to a certain extent contributes to the increase in strength of the stem and the studied varieties at a moderate dose do not fall. But, at an optimally high dose (N60P120 + N120 kg/ha a.i.), the height of the stem of the studied varieties increased. In addition, due to the destruction of the internal large parenchymal cells of the stem, the inner cavity of its stem (6) widened somewhat. This reduced the strength of the stem and increased the lodging ability of the studied varieties (Figure 3).

In the variant without fertilizers (control) in the internodes of the stem, the number of internal conducting beams was smaller and parenchymal cells were formed small in size. With an increase in the seeding rate of up to 7 million germinated seeds and the introduction of a high fertilizer dose, the small, "external" conductive bundles are located on the outer side of the stem in the form of a convex outgrowth, which increases the stem facets. The internal, large conduction beams were located closer to the outer wall and the inner cavity (6) of the stem widened somewhat. At the same time, the length of the stem increased. This is characteristic of the Aral 202, which to a certain extent reduces the lodging of the stem of this variety (Figure 2, 3).

3.2 The Anatomical Structure of the Leaf Sheath

In the studied varieties of rice (Aral 202, Marzhan, Aru) at the lower end of each interstice are the sheath of the leaf and surrounds the stalk, their edges overlap. When you rise to the top of the interstice, the margins of the leaf sheaths are less overlapped, and at the very top, where the sheath passes into the plate of the leaf, the stem is exposed.

The external and internal epidermis of the sheath differs from each other. The inner epidermis (1) of the sheath is large, monotonous, elongated-quadrangular, the walls of the epidermis are thin. On the inner epidermis, there are no cells of the stomata, hairs, twinned cells, etc.

The outer epidermis (2) of the sheath of the leaf is similar to the cells of the epidermis of the internodes of the stem. On the external epidermis of the sheath of the leaf there are stomata, silicified outgrowths (3), hairs (4). The epidermal cells located on top of the conducting beams, they are long and narrow (5). The sclerenchyma tissues (6), large (7) and small (8) conducting beams are located closer to the upper epidermis. The mechanical tissues surrounding the conductive bundles impart strength to the sheath. The named conductive bundles (7, 8) are similar in structure to the conductive bundles of internodes of stalks. On small conducting beams the number of xylem vessels is less in number, and the phloem is poorly developed. On large conducting beams phloem (9) and xylem (10) are well developed.

The mechanical tissues (11) surrounding the conductive bundles (7, 8) of the leaf sheath in the Aral 202 and Aru varieties are well developed. These mechanical fabrics (11) are similar to the same mechanical fabrics of the non-liable grade Anao. The littered Arpa-shaly variety does not have mechanical tissues surrounding the conductive sheaves of the sheath. Consequently, the Aral 202 and Aru belong to the average liable varieties.

Sclerenchyma tissues (6) of the sheathof the leaf of Aral 202 are located under the epidermis and on top of the conducting bundles and are visible in the form of a band since the cells of these tissues consist of several rows. On the variant without fertilizer (control), these sclerenchyma tissues (6) consist of 1-2 rows of cells, therefore they are visible with a thin band, only above the conducting bundles, these sclerenchyma cells (6) are arranged in several rows, and they are seen by a thicker band (Figure 3).

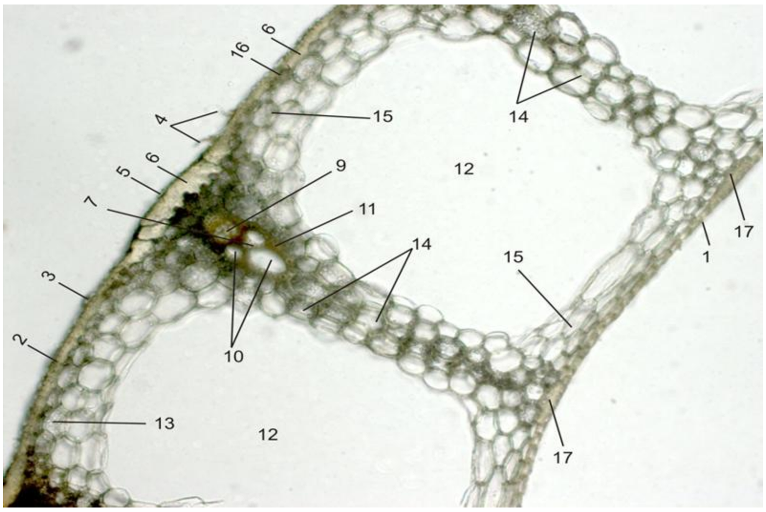

Figure 4. Anatomical Structure of the Sheath of a Leaf of Rice Aral 202
Option: sowing 5 million seeds; an optimally high dose (N60P120 + N120 kg/ha a.i.) was introduced.
Notations: 1 - internal epidermis; 2 - external epidermis; 3 - silicon outgrowths; 4 - hairs; 5 - epidermal cells located on top of conductive bundles; 6 - sclerenchyma cells; 7 - large conducting beams; 8 - small conducting beams; 9 - phloem; 10 - xylem; 11 - mechanical tissues surrounding the bundles; 12 - air-conduction cavities); 13 - starch granules inside the cell; 14, 15 - parenchymal cells; 16 - small parenchymal cells; 17 - low sclerenchyma cells.

The sheath of the leaf of the Aral 202 and Aru varieties has air-conducting cavities (12), called an aerenchyma (12). These cavities are located in the parenchymal cells (14, 15) and surrounded by these cells. Parenchymal cells (14, 15) are the main tissues of the vagina. They are shaped in shape 5-6, the angles of these facets are arcuate, so these cells can be seen in shape as roundish-long. The walls of the cell are thin. Parenchymal cells (15), which are closer to the epidermis, have chloroplasts, so they are capable of photosynthesis.

Between the upper and lower epidermis, the airborne aerophytes (12) are separated by radially arranged, several rows of parenchymal cells (14) (Figure 3). These cells contain starch grains. Among these cells, which are closer to the epidermis, the starch grains are larger.

Sclerenchyma (mechanical) cells on the surface of the sheath are not disposed of in continuous rows, there are several rows of small parenchymal cells between them (16). In these cells, there are green plastids.

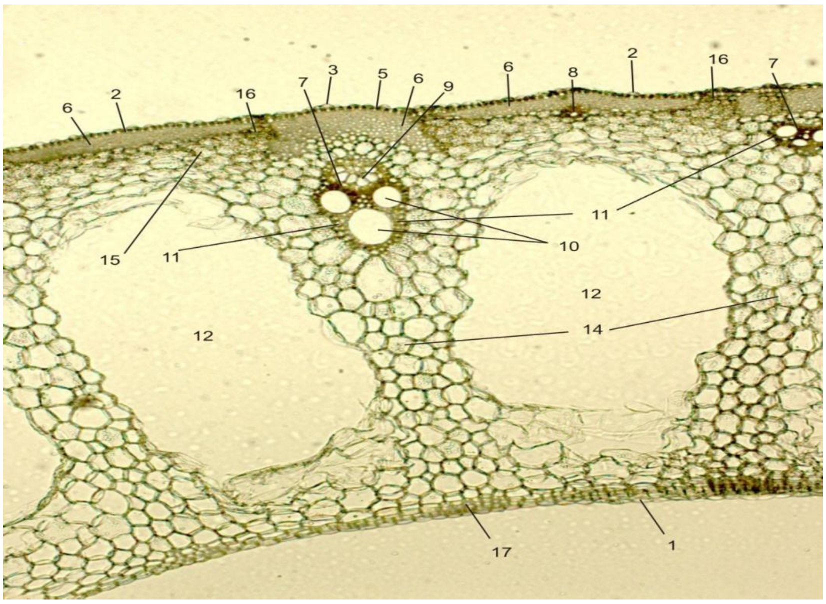

Figure 5. The Anatomical Structure of the Vaginal Leaf of the Rice Variety of Aru
Option - seeding 5 million seeds; an optimally high dose (N60P120 + N120 kg/ha a.i.) was introduced.

This arrangement of cells gives the sheath leaf elasticity, elasticity, increase their resistance to lodging. Such features are found in the Aru variety and partly in the Aral 202 (Figure 3).

The main functional property of the leaf sheath is the process of photosynthesis, and at the same time gives the stalk resistance to lodging, elasticity, and elasticity. The armature of the sheath of the leaf consists of the following elements: sclerenchyma cells (11) surrounding the conduction beams, parenchymal cells (14, 15) located around the airway, aerochymal cavities (12), sclerenchyma cells (6) located under the epidermis on the vaginal surface and under the lower epidermis (17), against several conducting beams, several rows of sclerenchyma cells (17).

The named cells are well developed in Aral 202 and Aru varieties. In the variant without fertilization (control) on large conducting beams, xylem vessels are somewhat smaller and equal in size. When applying the optimal dose (N60P120 + N120 kg/ha a.i.) of fertilizers on large conducting beams, the two upper meta-xylem vessels are somewhat smaller in size, and the lower xylem vessels are larger. On the control of the Aral 202 variety, rows of parenchymal cells (14) that are smaller in number with interstitial air-conduction aeruginosa cavities (12) consist of 2-3 rows. When applying the optimal dose of fertilizers, the number of rows of such cells (14) is larger, 4-6 rows (Figure 4, 5).

4 Conclusion

Modification variability - changes in the body caused by environmental influences and which in most cases are adaptive in nature. The phenotype changes, but the genotype does not change.

Modification variability characteristic:

- the phenotype changes, but not the genotype - the phenotype changes caused by the physiological reactions of the cells.
- certainness (predictability): a specific active factor of the environment corresponds to a specific phenotype reaction characteristic of the given genotype (in most cases, to all representatives of the population).
- changes can be reversible (more or less) or irreversible at the level of an individual organism, depending on the mechanism by which this form of variability is realized in a particular case.
- lack of steady inheritance of emerging changes.
- the mathematically aligned relationship between the strength of the acting medium factor and the degree of change in the feature. This dependence can have different forms, and in each specific case, it is determined by the evolutionary history of the species.

Modification variability is the result not of changes in the genotype, but of its immediate response to environmental conditions. With modification variability, the hereditary material does not change, - the manifestation of genes changes.

The stimuli of the environment affect the behavior of cells and multicellular organisms due to the presence of sensitive receptors (they are present not only in the sense organs of animals but also in each living cell), which transmit chains of signals that change the regulation of the functioning of certain genes. Thus, environmental factors are able to regulate the intensity of the production of specific proteins by cells, on which the development, physiology, and behavior of the organism depend.

A genotype is a collection of genes of a given organism. The genotype, unlike the concept of a gene pool, characterizes an individual, not a species. (5) In a narrower sense, a genotype is understood as the combination of alleles of a gene or locus in a particular organism. The process of genotype determination is called genotyping. (8) The genotype together with environmental factors determines the phenotype of the organism. In this case, individuals with different genotypes may have the same phenotype, and individuals with the same genotype can differ from one another under different conditions. (30)

Most often, the quantitative characteristics are subject to modifications: growth, weight, fertility, etc.

For various characteristics and properties of organisms, a greater or lesser dependence on environmental conditions is characteristic. The limits of the modification variability of a feature are called the reaction norm. The norm of the reaction is the ability of the genotype to form different phenotypes in ontogeny, depending on environmental conditions. It characterizes the share of the medium in the implementation of the characteristic and determines the modification variability of the species. The wider the norm of the reaction, the greater the influence of the medium and the less the influence of the genotype in ontogenesis. The same gene under different environmental conditions can be realized in several manifestations of the sign (phens). In each concrete ontogenesis, only one is realized from the spectrum of manifestations of the feature. Similarly, the same genotype under different environmental conditions can be realized in a whole spectrum of potentially possible phenotypes, but in each specific ontogenesis, only one phenotype is realized. The hereditary reaction norm is understood to mean the maximum possible width of this spectrum: the wider it is, the wider the reaction rate. The phenotypic value of any quantitative trait is determined, on the one hand, by its genotypic value, on the other hand, by the influence of the medium.

In this work, we studied the anatomical structure of the rice stem of the Aral Sea and Marzhan, as well as the anatomical structure of the sheathAral and Aru. With increasing fertilizer dose, especially with increasing number and dose of nitrogen fertilizing, the number of conducting beams, especially small (outer) conducting beams increases. The quantitative indices of the anatomical structure of the stem in the sectional view also change. The sheathof the leaf of the Aral 202 and Aru varieties has air-conducting cavities. The external and internal epidermis of the sheathdiffer from each other.

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