

**C. b. s. Khristovaya T.Ye.**

*Taras Shevchenko Kyiv National University, Ukraine*

## **Field physiology of plants formation in Ukraine**

At the beginning of the XX century field phenomena were not the subject of scientific research – they were considered to be far standing from the targets of classical plants physiology as the results gained on the bases of laboratory research methods were of small help to agricultural practical and research work.

In 1920 – 1930 years in the process of elaboration of the crop capacity and drought resistance theory a group of researchers headed by the prominent Ukrainian scientist Yevhen Pylypovych Votchal (1864 - 1937) introduced a new research direction – field physiology of plants, the aim of which was gaining of theoretical basis for the organized influence on plants development. Ye.P.Votchal made a detailed description of basic principles of this direction, peculiarities which differ it from classical “laboratory” physiology [2,3], characterized special features of field physiology of plants: “I refused all the ecological analogies and conclusions on the basis of the physiology laws and started the direct experimental study of field phenomena under the open sky...2. On the first place I put the research not of separate elements of a complicated complex in a laboratory, but, vice versa, of the whole complex phenomenon in its natural environment. 3 ... for the investigation I chose, first of all, aspects, connected with phenomena, the theory of which should be immediately given to the production. These aspects turned out to give the most valuable scientific results. 4. From the sophisticated complex of items interesting for production I have chosen for investigation only those ones which on the basis of previous analyses should play a leading role for coming into being of the phenomenon important for production. 5. Detailed study of separate elements of a complicated complex I considered to be of the secondary importance. And the choice of the element I considered to be dependent on the elucidation of the degree of importance of its role in rising of the subject of investigation”[3, p 32]. Research physiological comparative sort investigation (the basis of the new direction) included

complex study of anatomic structure, process of assimilation of carbon dioxide, breathing and temperature of a leaf. The main deviation from the rules of physiological methods is the circumstance that in the center of an investigator's attention was the research of pathological deviation in a plant organism.

Revealing of interconnections of processes of field physiological dynamics is possible only with the help of high-sensitive methods. Votchal considered it to be of great importance. Due to the fact that transference of experiments to a field made scientists refuse from main rules of the classical phytophysiology (steadiness of conditions), regular laboratory installations were created, high-sensitive methods for work with ground plants were worked out [3]. In changing conditions of a field observation of main geophysical factors parallel to physiological registration: insolation, temperature, quantity of carbon dioxide in the air, humidity of the air and soil were held. That is why the research installations were divided in two sectors – physiological and geographical. So, the dynamics of the system “plant - field” was covered in all its leading links.

Field investigation should have comparative character (some sorts of plants and a standard should be used simultaneously in experiments): be based on a complex approach. The investigators were interested in the processes, which were parallel in different agricultural plants and in their different lines during uninterrupted number of hours. “There is a necessity in series of determinations which characterize the way the processes flow with one or another combination of geographical factors, taking into account various changes. There is a need in 24 hours’, daily, morning, pred-evening and other measurement of the consideration processes. Only in such a way race and specious differences can be distinguished for sure and weak and strong sides of the organization can be found out” [2, p. 225]. Parallel observations of two physiological processes – assimilation and transpiration were held.

The final aim of Votchal and his students' work was elaboration in addition to already existing of new methodical ways for selectionists with orientation to the heightened crop capacity and steadiness of crops in the conditions of heat and drought. The scientist proposes new original approaches to evaluation of a sort from

the point of view of its drought-resistance, gives theoretical grounding to the investigation of “physiological races” as a basis of selection work on clean lines [1]. This is the source of the importance of working out appropriate sensitive anatomic-physiological methods of research the most important processes of agricultural crops, and as a result – more simplified methods of field diagnostics. There was proposed registration of physical features of a leaf which was displayed in available for observation changes of exterior – glittering of the surface, darkening of colour, changes of mechanical peculiarities, movement and curving of a leaf, etc. as a criterion of choice in mass selection [2]. Having taken into account these phenomenons Votchal constructed in 1923 – 1926 years standard scales for precise determination of glittering and intensity of leaves hues colour of cereals and sugar-beets different sorts for diagnoses of physiological states in fields conditions. According to the principles of the field physiology of plants the theory of production peculiarities of sugar beets was worked out.

So, the pioneer in working out of theoretical base and practical recommendations for the field phytophysiology in Ukraine was the talented Kyiv scientist, unsurpassed experimenter Ye. P.Votchal.

#### References

1. Вотчал Е.Ф. Работы физиологического отдела Киевского научного института селекции за 1922-1926 гг.// Науч. ин-т селекции. Отчеты о деятельности за 1922-1926 гг. и программа работ на 1927 г. – К.: Изд-во Сахаротреста, 1927. – С. 27-46.
2. Вотчал Е.Ф. Полевая физиология (нормальная и патологическая) и физиологическое сортоизучение в селекции //Тр. Науч. ин-та селекции. – 1928. – Вып. 2. – С. 209-236.
3. Вотчал Е.Ф. Физиология производственных свойств свеклы (Урожайность в условиях засухи, засухоустойчивость и устойчивость высоты урожая) //Науч. зап. по сах. пром-ти. – 1939. – Вып. 3-4. – С. 12-60.