SPECTRAL EVALUATION OF WINTER WHEAT VARIETIES AND BREEDING LINES DURING THE RESTORATION OF SPRING VEGETATION

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Abstract. Among the most important grain crops, winter wheat ranks first in Ukraine in terms of sown areas and is the main food crop. Over the past three years, the sown area of this crop reached about 6.8-7 million hectares, which is a quarter of all arable land in Ukraine.

Development of new and introduction of existing methods of field estimation of genotypes of winter wheat is one of the key tasks of modern selection. The use of modern screening methods in breeding allows the breeder to obtain a more objective assessment, as well as to increase the volume of the studied samples. The time of restoration of spring vegetation (TRSV) is one of the most important stages of the vegetation period of winter wheat. Biometric and spectral evaluation of winter wheat with the onset of TRSV makes it possible to establish how plants of a certain genotype overwintered, as well as the state of their growth and development before the second growing season. Biometric analysis data, in combination with the NDVI index, make it possible to more objectively assess the condition of plants after overwintering and understand how they develop, to model the relative yield of a particular genotype. The introduction of NDVI index accounting in the selection process allows to increase the efficiency of accounting for the condition of winter wheat plants during the growing season: reduces the time for inspection of crops by 5-6 times and reduces the dependence on weather conditions; the number of tested samples increases and the quality of the obtained results significantly improves. The breeder has time to interpret the data. It is known that chlorophyll absorbs red waves: due to this, photosynthesis occurs, ie the plant grows and develops well, and the cell structure reflects near-infrared light. Therefore, there is a relationship between the value of the NDVI index and biometric indicators of aboveground biomass. The use of both methods to determine the condition of winter wheat plants during a certain

growing season allows to establish the reliability of the observed differences and to obtain the necessary information on the valuable source material for selection for high productivity and adaptability.

The aim of the study was to establish the peculiarities of growth and development of plants of modern varieties and promising selection lines of winter wheat of the V.M. Remeslo Myronivka Institute of Wheat from sowing to the restoration of spring vegetation. The research was performed during the 2018 / 19–2020 / 21 vegetation years in the selection crop rotation of the winter wheat breeding laboratory of the V.M. Remeslo Myronivka Institute of Wheat of NAAS of Ukraine. Sowing was carried out after the soybean predecessor in two terms: 2018 - September 25 and October 5; 2019 and 2020 - October 5 and 15. The placement of plots is systematic, four repeated, the registered area is 10 m2. The sowing rate is 5 million similar seeds per 1 ha. Podolyanka variety was used as a standard. The main research method is field research, supplemented by analytical research, measurements, calculations and observations. Spectral evaluation of varieties and selection lines of winter wheat was performed using a UAV Mavic zoom 2 using a multispectral camera Parrot Sequoia. Pix4Dcapture and Pix4Dmapper software were used to form the orthophotoplan.

Under natural conditions, plant growth and development depend on a complex of factors: soil, nutrients, light, moisture, heat, and so on. A favorable combination of these factors enhances growth processes, and in case of their lack or excess - there is a weakening of plant development. Long-term observations and practice show that in years when full-fledged seedlings are obtained in time, autumn crops develop well and have a strong root system and, as a rule, provide high grain yields even in adverse weather conditions in the summer months. And poorly developed and liquefied crops since autumn are almost always low-yielding. The years of the study were in contrast to the hydrothermal regime, with an uneven distribution of precipitation over the months, which allowed to obtain objective data.

Hydrothermal conditions of the period of germination-TRSV differently affected the reproductive process of the studied genotypes of winter wheat.

According to research, abnormally arid conditions from sowing to the end of autumn vegetation in 2019 had a negative impact on the condition of winter wheat plants, which were in phase 10-13 according to the international classification of BBCH, autumn tillering did not occur. Regardless of the genotype, the plants of the first sowing period were more developed. At the time of resumption of spring vegetation in terms of biometric and spectral indicators better than the standard Podolyanka (NDVI = 0.52) were: varieties MIP Dnipryanka (NDVI = 0.58), MIP Lada (NDVI = 0.56), Balada Myronivska (NDVI = 0.56) and lines Lutescens 37519 (NDVI = 0.55) and Erythrospermum 55023 (NDVI = 0.58). During the second sowing period, the MIP Dnipryanka variety (NDVI = 0.45) and the selection lines Lutescens 37519 (NDVI = 0.44) and Erythrospermum 55023 (NDVI = 0.43) were isolated. The Podolyanka standard variety had an NDVI index value of 0.43. MIP varieties Lada and Balada Myronivska are more sensitive to sowing dates and require a longer period of autumn vegetation to accumulate more dry matter and better winter dormancy. Thus, the research made it possible to establish the features of growth and development of plants of modern varieties and promising selection lines of winter wheat selection MIP from sowing to the time of restoration of spring vegetation using spectral and biometric evaluation. Selected genotypes have a well-developed aboveground mass, resistant to adverse conditions for growth and development, able to form high productivity.

Key words: soft winter wheat, varieties, breeding lines, recovery time of spring vegetation, NDVI index, biometric analysis, morpho-physiological analysis.