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EVALUATION OF GRAIN YIELD IN WINTER WHEAT ACCESSIONS USING NDVI AND DIGITAL PHOTO PARAMETERS

Wheat continues to be an important food grain source for humans and is a close third to rice and corn in total world production. Drought is a polygenic stress and is considered one of the most important factors limiting crop yields around the world. Plant phenotyping has become a major field of research in plant breeding. Plant phenotyping is intended to measure complex traits related to growth, yield, and adaptation to stress with certain accuracy and precision at different scales of organization, from organs to canopies. The normalized difference vegetation index (NDVI) is widely used at ground level and from low, high, and satellite altitudes to measure vegetative greenness and canopy photosynthetic size. NDVI can possibly provide more reliable estimates of green areas. Early ground cover is also a valuable stress adaptive trait where, for example, it can reduce evaporative loss of soil moisture. This can be measured using digital images captured by a camera, allowing rapid and low-cost screening of large populations for this trait. The experimental materials consisted of 48 varieties of winter wheat, which originated from different countries and regions (Central Asia, Turkey, USA and etc.). This experiment was performed under an alpha-lattice design with at least 2 replications and a plot size of 7–8 m². The genotypes were grown under two treatments: (1) irrigated plots, which received three drip irrigations (30 mm each) during the flowering, heading, and grain filling pe-

riod; and (2) rain-fed plots, which did not receive any irrigation during the experiment, except for natural rainfall. 10 NDVI and digital photos measurements were taken every 7–10 days, from stem elongation until wax maturity. SPSS statistical software was used for statistical analysis. The correlation analysis was performed based on the digital photo parameters (photo-a, u, b), NDVI measurements, and grain yield. We observed significant and relatively high correlations of yield with photo-a, photo-u, and NDVI at early stages prior to flowering. The correlation between NDVI and yield was positive until after anthesis, and then it changed to negative as the crop matured. This means that later and greener genotypes had higher NDVI but suffered from terminal moisture stress and high temperatures. According to our results, NDVI significantly correlated with grain yield as well as photo-a, and photo-u parameters. As a vegetation index photo-b is not suitable for identifying green genotypes. Our results suggest the importance of early measurements of spectral indices from stem elongation to anthesis since substantial differences were observed for NDVI and photo parameters between high and low-yielding genotypes. Thereby, the development of such tools is of paramount importance to continue progress through plant breeding, especially in drought-prone and heat-stressed environments where climate change is expected to increase yield uncertainty.

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ЖИТО ОЗИМЕ – ГАРАНТ ПРОДОВОЛЬЧОЇ БЕЗПЕКИ УКРАЇНИ

Зерно є гарантом продовольчої безпеки будь-якої держави. Але, не зважаючи на значення хліба в культурі і традиції його споживання, все ж таки посівні площі під житом за останнє десятиліття суттєво скоротилися. Жито є важливим хлібним злаком, але не має того визнання в житті українців, на яке заслуговує. Це цілком залежить від зміни традиційного харчування і смаків і, на жаль, не на користь житньому хлібу. Ми відійшли від вікових традицій харчуван-

ня і, як результат, з кожним роком погіршується стан здоров'я населення країни.

Жито озиме є однією з основних хлібних культур у країнах Європи, в тому числі й в Україні, має високу зимостійкість і посухостійкість, відзначається невибагливістю до ґрунтів і попередників, менше, ніж інші зернові культури, уражується хворобами, добре реагує на удобрення та інші агротехнічні прийоми.