THE ANALYSIS OF PHYSICAL HARDNESS IN WHEAT VARIETIES OF UKRAINIAN SELECTION

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Physical hardness and the protein content were studied in 86 cultivars and lines of winter wheat T. aestivum L. mainly of Ukrainian selection. The grain was milled on electrical laboratory mill QT 114 (Labor MIM, Hungary), the relative indices of hardness (according calibration against ADP-1 standard analyser) and protein content (according calibration on Kjeldahl) in wheat grain were measured by NIR method (Near Infrared Reflectance) on Infrapid 61 (computer-assisted version; Labor MIM, Hungary), and also on Spectran-119M (LOMO Fotonna, Russia). The medium data were calculated from the results of the two instruments.
The data were compared with the previous data obtained for the majority of the studied varieties (with the help of the PCR-markers the allelic state of the genes that control the hardness of the grain (\textit{pinu} and \textit{pinb}) was defined) [Chebotar et al. 2007].

The results of the study showed that the physical hardness differs significantly inside the groups of the soft and hard cultivars, while the allelic state of the genes that admitted to determine the hardness [Jolly et al. 1996; Giroux and Morris 1997] is the same. According to our data the soft wheat with alleles \textit{pina-Dla} and \textit{pinb-Dla} (cultivars Mironivska 33, Farandol, line E16pp) showed the protein content range 11.1 to 12 relative units, and hardness range 0.31 to -5.56 units (the less hardness of the grain corresponds to the lesser index). Hard wheat cultivars (other 83 cultivars and lines) showed the protein content range 6.54 to 14.76 units with median of 12.4 units, and hardness range 4.23 to 21.38 units with median of 9.81 units. From this group 58 cultivars with alleles \textit{pina-Dla} and \textit{pinb-Dlb} showed the protein content range 6.54 to 14.76 units with median of 11.93 units, and hardness range 4.23 to 14.75 units with median of 9.5 units. Small difference in mentioned indices for the cultivars with the same allelic state can be explained by different conditions of growing and different states of the soil. The significant difference of the hardness index in the cultivars with unstudied allelic state can be explained by probable presence of the other alleles of puroindoline genes [Bhave and Morris 2008]. Also there is a possibility of other genes influence on the grain hardness, that was not identified yet and needs further researches.