Productivity of winter wheat (*Triticum aestivum* L.) cultivars depending on N-fertilization

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A major consideration for the sustainable increase in productivity of crops is the dependency on nitrogen fertilizer, which is a substantial cost factor and a potential environmental pollutant as well. Hence, increased interest is being shown worldwide in cultivars that are more efficient in utilizing soil resources and better fitted to low-input ecosystems. Among cereals hexaploid winter wheat (*Triticum aestivum* L.) is considered as a species with higher requirements for nutrients, especially nitrogen. Furthermore, modern European wheat cultivars were developed under favourable or even luxurious fertilization regimes without selection pressure for components of nutrient use efficiency. Thus, identifying wheat cultivars with good adaptation to less favourable environments or breeding new varieties with higher NUE has gained importance.

The main objective of our study was to investigate and characterize the N-use efficiency of winter wheat cultivars under our agroecological conditions. Cultivars representative of old and modern wheat germplasm of various origins were evaluated under two N-fertilization regimes. Based upon the previous two growing season's results [ninety-six winter wheat cultivars were investigated under field condition in growing season 2013/14 at the Agricultural Institute, Martonvásár] 20 cultivars were chosen for further examination on the experimental fields of Georgikon Faculty at Keszthely in the growing season 2014/15. The soil of the experimental field is a lessivated brown forest soil (Eutric cambisol) with low organic material, medium K- and P content. Soil samples were taken in early spring and after harvest. The experiment was set up as a split block design, two fertilizer rates as main plots and with 3 replications and the cultivars as sub-plots. N was applied at rates 0-,

and 120 kg N ha^{-1}. Agronomically important morphological and physiological characters were measured. Statistical analysis was made by using SPSS 16.

Agronomically important characters were measured (grain yield, spike number, thousand grain weight, plant height, heading time, biomass and harvest-index) and physiological parameters: intensity of photosynthesis and water potential were evaluated in growing season 2014/15. The efficiency of nitrogen use (NUE; defined here as the grain yield per unit of the soil-N) is calculated. The first-year dataset of our experiment is presented.

The growing season 2014/15 was dry in Hungary. To check on the N-status of plants chlorophyll content was measured with a SPAD 502 Plus Chlorophyll Meter at Zadoks scale 51-55. We found significant differences among varieties within N-treatments.

The activity of the two key enzymes in N-use: nitrate reductase (NR) and glutamine synthetase (GS) were measured. There was no correlation for NR activity among genotypes in N-null treatment, but a negative correlation was found in N-120 treatment between NR activity and grain yield.

To find out which genotype is recommended for intensive and which one is for extensive cultivation, cultivars are also ranked based on the increased level of their performance depending on nitrogen supply, we calculated Tolerance Index (TI): grain yield of wheat varieties in N-0/N-120 treatments. According to our results varieties lost 56-72% of their yield in N-0 treatment compared with the yield in N-120 treatment.

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