Puławy, 12.10.2023 r.

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A summary of the doctoral dissertation entitled: ***"Effect of drought stress on physiological indicators and yield of spring barley on different soil texture types"*** prepared under the supervision of dr hab. Guillaume Debaene, prof. IUNG-PIB and dr hab. Jan Jadczyszyn.

Keywords: spring barley, drought stress, soil texture, photosynthesis, transpiration, stomatal conductance, leaf greenness index (SPAD), yield, nitrogen

Drought is one of the abiotic stresses that pose a massive threat to the security of the global economy. Climate projections for future years indicate that the problem of rainfall deficiency will worsen, resulting in a significant reduction in crop yields.

Spring barley is an economically important cereal crop, dominating the sowing structure of spring cereals in Poland. However is sensitive to drought stress, even if a temporary one. Yield of spring barley is mostly limited by water deficiency at the stage of stem elogation and heading, as well as grain formation and grain filling.

This study aimed to determine the effect of short-term drought stress on the values of selected physiological indices and yield and yield components of spring barley, the effect of soil texture on the values of physiological indices, yield, nitrogen content and uptake of spring barley and determination of the effects of both drought stress and soil texture on the nitrogen content of barley grain and straw and nitrogen uptake by grain and aboveground parts.

The pot experiment was conducted in 2017-2019 years at the plant growth facility (greenhouse) of the RZD IUNG-PIB in Grabów, Poland. The basic test unit was the pot filled with 9 kg of soil taken from the arable layer (0-25 cm) of cultivated fields. A three-factor experiment was set up in complete randomization design, with 5 repetitions and 10 plants of spring barley cv. Rubaszek per pot. The first factor was soil moisture at 4 levels: control, two stress treatments, introduced at the steam elongation stage (BBCH 31) and at the end of the flowering stage were visible (BBCH 69), and finally, the sum of early stress and late stress. The

second factor was soil texture. Seven soil texture types were used in the experiment: loose sand, slightly loamy sand, loamy light sand, loamy silty light sand, sandy silty loam, loamy silt – loess and medium loam. The third factor was the time of the measurements of the physiological indicators: before the introduction of stress S1, after stress S1 and after stress S2. At each measurement date, gas exchange (LI-6400 Portable Photosynthesis System) and chlorophyll content measured in SPAD units (Hydro-N-tester) were determined. After harvest, yield and yield components were determined and the nitrogen content of barley grain and straw was analyzed (Elementary Analyser Vario Macro Cube).

The results of the study showed that:

- drought stress reduced: grain yield per pot, number of ears per pot, number of grains per pot, thousand grain weight, straw yield per pot, main shoot length, the yield of aboveground part per pot, as well as Harvest Index values,
- drought stress causes a reduction in the values of photosynthesis intensity, stomatal conductance, transpiration intensity and leaf greenness index (SPAD),
- the cessation of the stress causes stimulation of the plants and an increase in the values of the indices compared to the control,
- soil texture significantly effects the values of gas exchange rates and leaf greenness index (SPAD),
- drought stress affects the nitrogen content of barley grain and straw,
- soil type significantly influenced the nitrogen content of barley grain and straw, as well as the uptake of the element by grain and the whole aboveground part of plants.

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