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Relationship Between Grain Productivity of Ear and Stem Dry Matter Weight of Main Shoot in Winter Wheat Varieties

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Aim of the study: The hypothesis that the greater mass of the stem at the anthesis may be accompanied by increased grain productivity is grounded on the fact that higher ability of stem to accumulate photosynthates at this stage and remobilize them during grains filling can contribute significantly to yield formation under the unfavorable conditions inhibiting current photosynthesis (Photosynthesis Features, 2011). This increases the flexibility of the variety and expression of its genetic potential productivity (Ehdaie et al., 2006; Slewinski, 2012). We have compared the stem dry matter of main shoot of modern varieties and lines of winter wheat originated from Institute of Plant Physiology and Genetics NAS of Ukraine with an aim to establish the selection criteria associated to grain productivity.

Material and Methods: Field experiments (Kyiv region, Ukraine) were conducted in 2014 and 2016, which differed significantly on weather conditions. In 2014 the soil was waterlogged during the period from the beginning of earing phase to milk ripeness due to excessive (3 times higher than normal) rainfall in May, and in 2016 there were higher than normal temperatures and negligible rainfall. 14 varieties and 1 line of winter wheat in 2014 and 8 varieties and 2 lines in 2016 were studied. To determine the morphometric parameters were chosen 20 main shoots (5 shoots on each of 4 plots covering 10 m^2). Plant material were dried at 105^oC for 3 hours and then at 65 ^oC to constant weight.

Results: The stem dry matter weight of main shoots of studied varieties and lines of wheat varied widely: at the anthesis from 0.56 to 1.18 g in 2014 and from 1.05 to 2.09 g in 2016 and at the phase of full ripeness, respectively, from 0.46 to 1.00 and from 0.80 g to 1.48 g. The highest dry matter weight of the main stem at both stages under different conditions was observed for varieties Darunok Podillia, Astarta, and Dostatok. Grain productivity of main shoot spike varied considerably among the varieties, and in different growing conditions. Maximum values in 2014 were observed in varieties Darunok Podillia, Pereyaslavka, and Dostatok (1.8-2.2 g), in 2016 - the varieties Darunok Podillia, Natalka, Astarta, Rayhorodka, and Yatran (2,1- 2.5 g). It was found a close positive connection the mass of a grain ear of main shoot with weight of stem dry matter both at the anthesis (r = 0,77±0,18 in 2014., 0,93±0,13 - in 2016) and full ripeness (respectively, r = 0,55±0,23 and 0,77±0,23) as well as with differences between them (r =0,72±0,19 and 0,87±0,16). These correlations strongly suggest that higher productivity of wheat is associated with the ability to store of assimilates, primarily carbohydrates, before anthesis. The high sink ability of stem before anthesis may prevent inhibition of CO_2 assimilation by assimilates excess, through feedback regulation of photosynthesis, and reserved assimilates could be remobilized for grain filling, especially under adverse environmental condition (Reynolds et al., 2005; Alvaro et al., 2008; Kiriziy et al., 2014; Gonzales-Navarro et al., 2016). Thus, the high stem ability to the temporary deposition of assimilates plays a positive role in increasing the rate of photosynthesis and grain development. Thus, it was found that the weight of main shoot stem dry matter at the anthesis and its ability to temporary assimilate deposition during vegetative growth may be used as criteria for evaluation the grain productivity of winter wheat genotypes season.

Keywords: *Triticum aestivum* L., stem deposited ability, high productivity.