

Genotype and environment interaction of various spring barley genotypes in organic and conventional growing conditions

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Majority of requirements for varieties in organic production system are distinctive from those in conventional farming. The main requirements are related to improved nutrient uptake and use efficiency due to limited nutrient availability in soil, competitive ability with weeds and resistance to diseases, especially seed born diseases. The aim of experiment was to evaluate yield and trait expression of various spring barley genotypes in organic and conventional growing conditions, to identify essential traits for organic breeding and to find parental genotypes for breeding for organic farming. Selection from F₃ generation of 2 cross populations was started simultaneously in two organic and two conventional environments. Selected lines from all environments in F₆ generation will be compared to prove the influence of growing conditions in which selection is carried out.

Ten spring barley genotypes with various origins, types of intensity, plant morphology and time of release were grown in two organic and two conventional growing conditions in 2006. The main difference between the locations was the fertilization system, crop rotation and minor differences in soil. In organic location 1 only green manure was used, but in organic location 2 stable manure was applied in crop rotation. In conventional location 1 medium amount of mineral fertilizers was applied (N 81, P 40.5, K 67.5 kg ha⁻¹), but in conventional location 2 high amount of fertilizers was used (N 99, P 49.5, K 82.5 kg ha⁻¹ before sowing and N 20 kg ha⁻¹ in tillering stage). Herbicide and insecticide was used in conventional locations, and harrowing was used in organic location 1. Soil type was sod-podzolic sandy loam in all locations, except organic location 2, where it was loamy sand. The amount of available N in spring was 48 kg ha⁻¹ in organic location 1 and 33 kg ha⁻¹ in organic location 2. Meteorological conditions were uncharacteristic: very dry and temperature above the long term average. The germination was retarded due to dry soil. The amount of rainfall in June was 44% and in July 7% only of long term data. Correlations between grain yield and traits important for organic farming will be analyzed in the presentation.

Results showed, that higher yields in organic conditions were obtained for extensive type varieties with good stress tolerance ('Anni' – 125 and 113%, 'Abava' – 127% to standard variety 'Idumeja', organic location 1), but in conventional conditions intensive short straw variety 'Annabell' was the highest yielding one (123 and 132% to standard variety 'Idumeja'). Old barley genotypes (landrace 'Latvijas vietējie' and Swedish variety 'Primus' released in 1901) were the poorest yielding in all locations (92-25% to standard). The influence of growing conditions on yield was significant (influence proportion 84%, p<0.001). The mean yield in organic locations were 2.55 and 0.31 t ha⁻¹ and in conventional locations 2.85 and 3.44 t ha⁻¹ (LSD_{0.05}= 0.18). The influence of genotype on yield was significant too (p<0.001), but the influence proportion was only 6.3%.