

## ARTICLE

# Predicting water stress tolerance of malting barley varieties with seedlings PEG-reactions

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**ABSTRACT** We analyzed the correlation between 32 malting barley variety seedlings PEG-reactions and the water stress tolerance. We characterized the water stress tolerance with the yield differences of the year 2007 (extreme arid) and 2006 (normal fall). Under PEG solution effect the proline and sucrose content was higher, and the roots and leaves growth was lower. The correlation between them was  $r=0.32-0.49$ . After the contraction of the four best correlated PEG-reactions attribute with water stress the correlation of the contracted PEG-reaction index improved up to  $r=0.65$ .

Acta Biol Szeged 52(1):187-189 (2008)

**KEY WORDS**malting barley  
PEG  
water stress

Because of the climate changing it is very important to recognize the water stress tolerance of the cultivated plants. It is especially important with the humid malting barleys. The adaptation of these plants to arid conditions seems to be more difficult than those of the drought-resistance plants. For the first step we worked out a method to predict the drought-resistance of the malting barley varieties. According to some literature data there is a correlation between the seedling growth, osmotic substances and the water stress tolerance (Karamanos 1995; Verslues et al. 1998; Kerepesi and Galiba 2000). We examined 32 test varieties with PEG 20% solution, originated from breeding program of Cereal Research Non-Profit Company. We measured the correlation of changing the proline and sucrose content, the root and leaf growth of the seedlings under field water stress. We characterized the field water stress tolerance of the varieties with the differences in yield in the extremely arid 2007 year and in the normal rainfall 2006.

## Materials and Methods

### The influence of field aridity

The influence of field aridity was predicted with the small plot experimental results of the extremely arid 2007 year and the normal rainfall 2006. The main characteristics of the two years' weather in Táplánszentkereszt are shown in Table 1. In year 2007 during the 3,5 months vegetation period the rainfall was 50 mm less than in 2006, even more in adverse dispersion. In 2007 the average temperature was 2,5°C higher what even more increased the important drought-stress. In 2006 the weather was as the average before. The data of Táplánszentkereszt are similar to nationwide trend.

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### Field water stress tolerance of varieties

We examined water stress tolerance of 32 malting (spring) barley cultivated varieties. Their drought resistance were defined by their yield differences between the two year in average of five small plot trials (Táplánszentkereszt, Sopronhorpács, Kompolt, Putnok and Szeged)

### PEG-examinations

The 32 varieties were pre-seeded on filter paper, than the 30-30 plants were put into water culture on seeding grid. After a week the water culture was changed into PEG-4000 20% so-

**Table 1.** Weather statistics in years 2006 and 2007 in Táplánszentkereszt.

Month	Rainfall (mm)			Temperature (°C)		
	2006	2007	Years average	2006	2007	Years average
March	23.5	65.3	33.2	4.0	7.6	5.7
April	54.5	4.7	40.1	11.9	13.5	10.3
May	60.7	47.4	62.8	15.3	17.5	15.8
June	88.7	47	79.2	19.6	21.9	18.9
Avg.	227.4	164.4	215.3	12.7	15.1	12.7
Year-Avg.	12.1	-50.9		0.0	2.5	

**Table 2.** Correlations in the two experimental years.

	Yield 2006 (t/ha)	Yield 2007 (t/ha)	Drought-influence difference (t/ha)
Yield 2006 (t/ha)	1.00		
Yield 2007 (t/ha)	0.33	1.00	
Drought influence difference (t/ha)	-0.82	0.27	1.00



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