MORPHO - AGRONOMIC VARIABILITY OF *Triticum monococcum* L. LAND RACES IN THE TIMISOARA AREA

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ABSTRACT:

In the Timisoara area 37 *accessions of Triticum monococcum land races and genotypes collected in Romania (Ro) from 1999 to 2001 and by the Institute for Agrobotany, Tapioszele,* Hungary *(Hu) were evaluated. The genetic variation of this diploid cultivar (2n= 14) was characterized for 6 morphological characters and for 5 agronomic peculiarities. The statistical data obtained for 2 years pointed out a broad variation for all traits. The grain number varied between 17.0±1.81–32.5±5.59 in 2002 at the 498 and 689 Romanian land races respectively. In 2003, a very droughty year the grain number varied from 20.68±1.29 to 36.08±1.44at the 687 and 444 land races respectively. The variation of Hungarian land races was 6.0±0.01-55.0±0.001 during 2002 at the 1158 and 1153 respectively. In 2003 the amplitude of variation was from 22.64±0.88 to 33.93±2.7. In 2002 the grain weight varied from 2.2 ± 0.2 to 7.3 ± 0.5 gx10 in Romanian land races and from 1.5 ± 0.4 to 9.4 ± 4.7 gx10 at the Hungarian entries.*

***Keywords**:*
Triticum monococcum, Romanian Hungarian land races, evaluation.

1. INTRODUCTION

Cultivated einkorn (*Triticum monococcum* L.) like wild einkorn has a diploid constitution (2n=14; AA-genome). Wild einkorn was harvested in the late Paleolithic (16,000 – 15,000 BC; **23**) continued to be a popular cultivated crop during Neolithic and early Bronze Age, being the first cereal cultivated for food (10,000 – 4,000 BC; **10**). Its importance decreased when higher yielding and free-threshing tetraploid and hexaploid wheats replaced it. Today, einkorn production is limited to small isolated regions of the Mediterranean region (**11**) and in the West Romanian Carpathian Mountains (**2**). The wild form was still common in some locations in Turkey during the 1960s (**23**).

The diploid wheat are used in bread making and also in breeding programs for durum wheat (2n=28) and Triticale tetraploid forms (2n=28), due too its resistance to several biotic and a biotic stresses (**7**;**12**;**5**). Therefore, the evaluation, identification and description of the genetic variation of einkorn accessions stored in germplasm collections is of utmost importance for the prevention of genetic erosion and to promote its use in breeding programs (**16**).

Several studies on limited numbers of accessions have revealed high variability for morpho-physiological traits (**15**;**21**), yield (**9**;**19**;**4**), pathogen resistance (**8**), storage proteins (**22**;**14**), starch characteristics (**17**;**6**), bread-making quality (**1**) and molecular markers (**20**;**18**;**3**;**10**).

The Banat University of Agricultural Sciences Timisoara, Romania, in collaboration with the Institute for Agrobotany, Tapioszele, Hungary assembled 37 einkorn accessions from the Tapioszele gene bank and Romanian land races collected in 2001 in the *Metalipherous Mountains* in 2001.

The objectives were:

- to evaluate the genetic variation among accessions collected in different places and preserved in gene bank conditions in comparison to "native" *in situ* grown land races from Romania;
- to evaluate the agronomical characteristics and the homeostasis in the Timisoara area.

2. MATERIALS AND METHODS

37 einkorn accessions studied, divided by provenience classification and origin is presented in **Table 1.**

Table 1: Origin of einkorn land races accessions characterized in Timisoara, Romania

Romanian		Hungarian	
accession no.	Origin	accession no.	Origin
444	Mada	1150	ESP
495	Almas de Mijloc	1155	DDR
498	Almasul Mare	1160	DDR
672	Almasul Mare	1163	DDR
673	Almasul Mare	1164	UNKNOWN
687	Almasul de Mijloc	1165	DEU
688	Almasul de Mijloc	1168	CHE
689	Almasul de Mijloc	1171	HUN
690	Almasul de Mijloc	1175	HUN

One hundred seeds of each accession were hand planted in the field in autumn 2001 on October 17^{in} the Romanian and on December 5th the Hungarian accessions, in single rows 1.50 m long and 0.25 cm apart.

Plants were harvested by hand between 15 and 30 July 1992. In 2002, 600 seeds were sown in mini plots (5m^2) in October 10th 2002 and harvested with Hege combine at July 15^{in} 2003.

Every year mineral fertilizer was applied before planting (45N:45P:45K kg/ha active substance) and in January (on the snow Nitrogen 66 kg/ha active substance was applied).

For analysis land races these showed the best 1000 seed weight was selected.

The einkorn land races were characterized using 21 morpho-agronomic descriptors. In addition, the total protein content and protein fractions were done.

Statistical analysis was carried out using the statistical package VA-S (1999).

3. RESULTS AND DISCUSSIONS

Mean, minimum and maximum values and standard deviations of the seven continuously variable descriptors were analyzed. The characters showed a high variability.

The most important characters are pointed out.

An earlier **sprouting** revealed the Romanian land races (78%) in comparison with the Hungarian ones (56%). In the Romanian land races the germination varied from 20.0% (Ro.690) to 93.3% (Ro.498) and in Hungarian from 26.7% (Unknown-1164) to 100% (ESP-1150).

The **frost resistance** differentiated very much the Romanian land races from the Hungarian ones. Two land races Ro.495 and Ro.689 (22.2%) were affected by frost (10% and 12% respectively) and five (56%) were affected too from 9.09% to 75% (DEU-1165 and DDR-1160 respectively).

The physiological traits as well as sprouting, vegetative period (days from sprouting to heading), heading data, and maturity (days from sprouting) pointed out the almost the same values.

The earlier **heading** took place at Ro.495, after 181 days from sprouting. Late heading after 190 days was equal in both Romanian and Hungarian land races (66.7%).

The **maturity time** was divided in 3 periods early, under 220 days, medium between 221- 225 days, and late more than 225 days. 22.2% of the foreign land races were early (Unknown-1165 and DDR-1163) and 55.6 of them were late. The Romanian land races pointed out medium maturity (88.9%). In the Timisoara climate conditions (2003) the einkorn maturity was like in wheat, triticale and oats.

Plant height had a high variability in 2002 being from 70.67±3.54 cm BGR-1154 to 107.88±3.43 cm Ro-689, and a narrow variability in 2003 (80.44±0.89 cm ESP-1150 to 98.20±1.01 cm DDR-1163).

Despite their height, many accessions (16.7%) showed little **lodging**.

The **number of spikelets** per spike was very variable in 2002. The distribution revealed a marked bimodal one 69.2% in small class and 30.3% in medium class (25-33 spikelets). At the same time 50% of Romanian cultivars pointed out 50% high number of spikelets. In 2003, 88.7% and 22.2% Romanian and Hungarian land races respectively belonged to high and medium classes.

In 2003 the variability of **grain weight** was less in Romanian land races (5.0±0.2-8.0±0.5 gx10) in comparison to Hungarian ones (3.7±0.3-8.2±0.8 gx10).

Average of **1000-seed weight** was 21.23 g and 20.96 g in Hungarian and Romanian land races respectively (2003), much lower than that of bread or durum wheat (commonly 40-45 g/1000 seeds). No accession with a 1000-seed weight above 40 g was founded. The most frequent seed colour was white or yellowish.

All einkorn observed did not show a correlation between morphological and physiological peculiarities and yield. The highest physical yield was 3,400 kg/ha and 2,800 kg/ha in Ro.495 and DEU-1165 respectively. The *theoretical yield potential* (TYP) calculated from main spike grains weight multiplied with the number of viable plants in the spring and no. of tillers was far from the real yield (**Fig.1**). It was 5,498 and 4,390 kg/ha in Ro.495 and DEU-1165 respectively. In other land races the TYP was higher than 7,812kg/ha and 4,829 kg/ha in Ro.673 and DDR-1163 respectively. It is clear that the einkorn has a high *theoretical yield potential*.

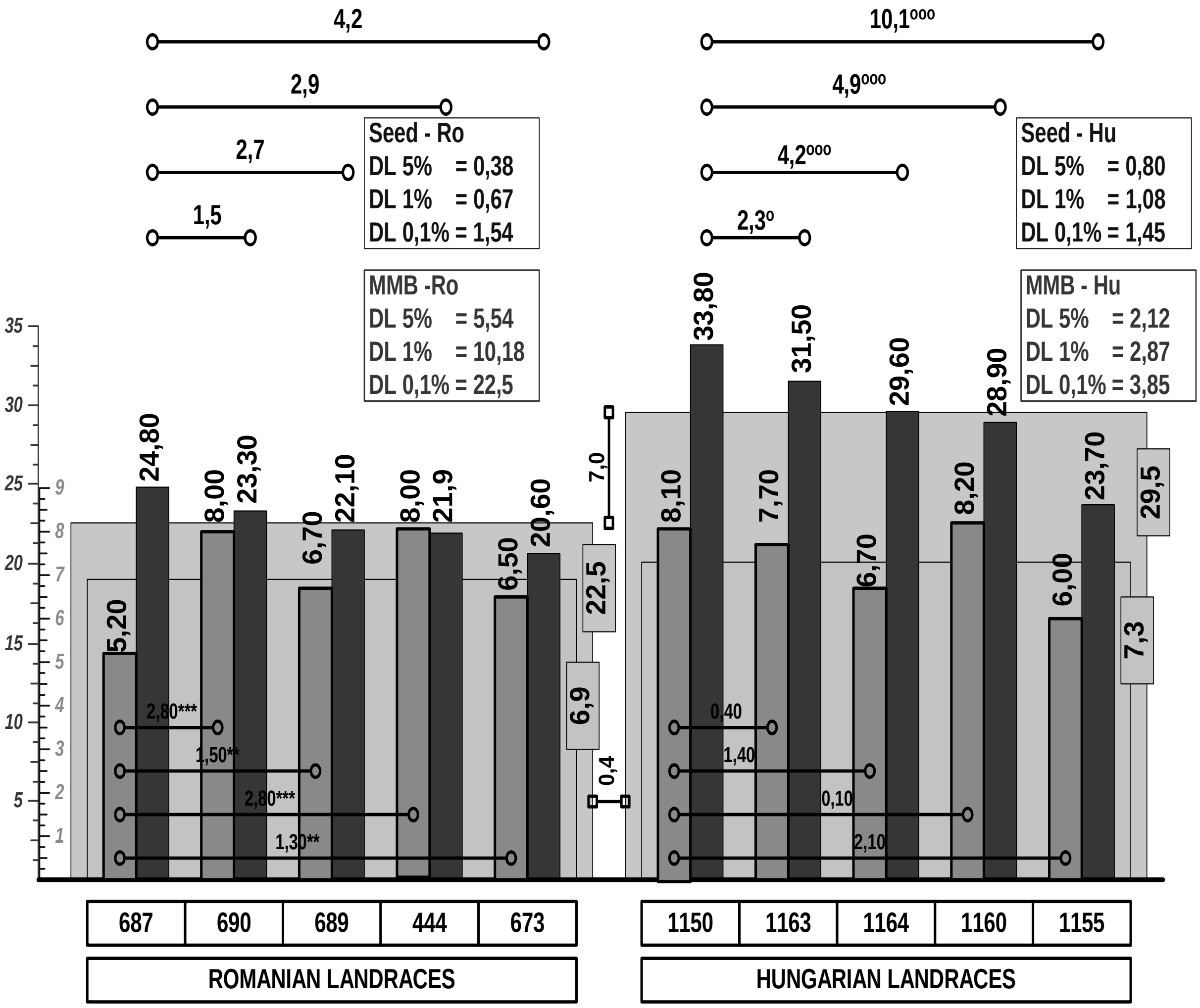

Fig.1: *The differences in grain weight and 1000 grain mass at Romanian against Hungarian einkorn landraces (2003)*

■ 1000 seed weight (g); ■ Seed weight / main spike (gx10); □ Average of seed weight / main spike (gx10); □ Average of 1000 seed weight

4. CONCLUSIONS

Identification and description of the genetic variability available in germplasm collections are the basis of improved plans designed to control genetic erosion; they are also a preliminary requirement for the exploitation of useful traits in plant breeding. Even if einkorn generally revealed late maturity and small seeds prevalent characters, limiting einkorn cultivation in many places all over the world, in *Metalipherous Mountains* it is a common cultivar. The broad variation for these and other traits, especially the theoretical yield potential allows identification of promising accessions for einkorn breeding. A few samples (Ro.495, Ro.689 and DEU-1165) showed good physical yield.

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