

# RESEARCH REGARDING COMPARATIVE STUDY BETWEEN *TRITICUM AESTIVUM* AND *TRITICUM DURUM* IN OLTENIA AREA

Durum wheat (the wheat for use in pasta products) – *Triticum turgidum* (L) Thell. ssp. *Turgidum* conv. *Durum* (Desf.) MK) is a monocotyledonous plant from *Gramineae* Family, *Triticeae* tribe and *Triticum* genus. For merchantable yield and human demand, *Triticum durum* is the second *Triticum* species after common wheat (*Triticum aestivum* L.).

After common wheat, durum wheat is grown on large areas in: Portugal, Spain, France, Italy, Greece, Bulgaria, Turkey, Iraq, Iran, Egypt, Libya, Algeria, Morocco and Ethiopia. Large areas are planted with durum wheat in south of Ukraine, Transcaucasia, Turkestan, Kazakhstan, while limited areas are in Pakistan, India and China. In Canada, the USA, Mexico, Central America, Argentina, Uruguay, Peru durum wheat production occurs in large areas. Occasionally is grown in Romania and other few countries. In North and West Asia, durum wheat is the second important crop after rice and the yield level exceed one and half the yield recorded in Mediterranean Europe (Srivastava et al., 1983).

In Oltenia area, durum wheat – known as autumn “Albanian” – is ancient, with a short break in the 60 years. Durum wheat varieties grown in

Romania were: Miciurinka, Rubej, Apulicum 233, Topaz, Rodur (Ilicevici Stefania et al., 1988).

In the last years the largest areas planted annually with durum wheat are in Canada, the USA, Australia, China and Russia with approximately 2-3 million hectares. In Europe the largest durum wheat producers are Italy, Turkey, Spain and France (in south).

Worldwide the average area planted annually with durum wheat is approximately 18 millions hectares, with production averaging about 30 million metric tones annually (International Grains Council, 2002). The European Union (mainly Italy, Spain and Greece) is the largest durum wheat producer, averaging eight million tones yearly. Canada is the second largest producer at 4.6 million tones per year followed by Turkey (4 million tones) and the USA (3.5 million tones).

The average global yield is generally low (1200-1400 kg/ha) because durum wheat is grown usually in arid rain fed areas.

Superior yield levels are recorded in developed countries such as the USA and Canada, where the average yields ranged from 1500 kg/ha to 2100 kg/ha annually. Durum wheat breeders focus on the simultaneous improvement of agronomic performance, disease resistance and grain quality traits.

Durum wheat grain contents many elements, but the most important are proteins and albumins. The pentoses and lipids play an important role in grain baking quality as well as pre-harvest sprouting and grain strength traits.

The complexity of processing quality and the involved gene number are decisive for genitor's selection in breeding program. Selection for

complex traits such as grain yield, grain quality will usually commence in the F6 generation when a breeding line is sufficiently uniform.

Grain quality traits include:

- percentage of impurities
- grain water content
- thousand kernel weight (TKW)
- test weight (TW)
- vitrescence
- protein concentration
- gluten strength
- falling number
- rheology properties
- Zeleny test

Researches were focus on the comparative study between common winter wheat and durum winter wheat processing quality under two fertilizing treatments on brown reddish soil from Simnic area. There were tested twenty-five wheat varieties: 14 common wheat varieties and 11 durum wheat varieties under two fertilizing treatments (Table 1):

a - N100P40 rate (complex fertilizer basal applied in autumn + urea top dressed in spring)

b – N100P40 rate (complex fertilizer basal applied in autumn)

During experimental years were made field and laboratory measurements.

In the field the following measurements were made:

- plants number/m<sup>2</sup>
- plants height – 10 plants average

- heading time – expressed by days from 01.01 to heading stage
- spikes number/m<sup>2</sup>
- grain yield – on 5 m<sup>2</sup>/replication and than was made moisture correction

In the laboratory the following measurements were made:

- thousand kernel weight (TKW) – two samples of 500 grains each proceeding from each plot
- grain number/spike – sample of 25 spikes
- grain weight/spike – sample of 25 spikes by Samovar method
- wet gluten content
- deformation index
- Zeleny test

To determine drought reaction for each tested cultivar was calculated:

- **TOL** (tolerance index) – the difference between yield under stress conditions ( $Y_s$ ) and yield under normal conditions
- **MP** (average of yield) – average of yield in normal condition and the yield under stress condition
- **GMP** (geometric yield) with formula  $\sqrt{Y_s \cdot Y_p}$
- **SSI** (stress sensibility index) with formula  $[1 - Y_s/Y_p]$  SI where SI represents drought intensity (DI) estimated as  $\left[1 - \left(\frac{\bar{Y}_s}{\bar{Y}_p}\right)\right]$  where  $\bar{Y}_s$  is average yield of all genotypes under stress conditions;  $\bar{Y}_p$  is the average yield of all genotypes under normal conditions
- **STI** (tolerance stress index – TSI) with formula  $\left[Y_p \cdot Y_s / \bar{Y}_p^2\right]$

To determine the difference significance between common wheat values and durum wheat values it was used *t* test.

The most important results are presented below.

The *t* test suggests that under normal fertilizing treatment the difference of 35 plants /m<sup>2</sup> is significant, while under low nitrogen rate the difference of 50 plants /m<sup>2</sup> is very significant.

For all experimental years durum wheat varieties recorded higher minimum and maximum values than majority of common wheat varieties. The most balanced values were recorded in 2007 year due to the drought which reduces the difference between these two species. None of durum wheat varieties didn't achieve heading stage before common wheat varieties, thus in 2006 year the difference was 6 days, 2 days in 2007 year and 5 days in 2008 year.

On three years average the height difference of 6 cm between common wheat and durum wheat varieties under N100P40 rate and of 4 cm between the same species under N40P40 using *t* test was very significant.

For both fertilizing treatments the differences for trait spikes number/m<sup>2</sup> between common and durum wheat were very significant. These results show that durum wheat had a lower heading capacity under Simnic area conditions.

The average yield for durum wheat was equal for both fertilizing treatments (2182 kg/ha, respectively 2155 kg/ha) meaning that in Simnic area conditions durum wheat didn't record a positive response to higher nitrogen rate, especially applied in early spring.

Using *t* test was observed that difference between average yields of common and durum wheat for both fertilizing treatments (1306 kg/ha, respectively 862 kg/ha) was very significant.

The lowest differences among the grain number/spike, grain weight/spike, thousand kernel weight and test weight averages under both fertilizing treatments weren't very significant.

Under normal fertilizing treatment the difference of 1,3% between wet gluten content of common and durum wheat was insignificant. When the nitrogen rate decrease this difference of 4,4% became very significant and durum wheat reacts much better.

The difference of 7,5 mm between the deformation index of common and durum wheat under normal fertilizing treatment was distinct significant. When the nitrogen rate decrease this difference of 5,5% was distinct significant.

Using *t* test ( $d=13$ ) under normal fertilizing treatment, the difference between Zeleny test values of common and durum wheat was very significant. When the nitrogen rate decrease this difference is till low ( $d=7$ ) and distinct significant. Under both fertilizing treatments durum wheat has an evident deformation and sedimentation capacity than common wheat.

The simultaneous representation of small index and high yields under normal conditions lead to drought tolerance genotypes identification (in the climatic changes context) and to a higher frequency of droughty years.

There were emphasized two points groups, as follows:

- Common wheat varieties: index $<0,500$ , yield under normal conditions $>4000$  kg/ha

- Durum wheat varieties: index <0,500, yield under normal conditions between 2500 and 4000 kg/ha.

Under Simnic area conditions durum wheat varieties are more sensitive to drought than common wheat varieties. However, were remarkable the Israelite varieties Hazera 11, hazera 13 and Hazera 45 which presented higher average yields than other varieties under both fertilizing treatments.

As a conclusion, we can say that under Oltenia Central area conditions, durum wheat recorded low yields comparatively with common wheat and the difference between both species quality was evident only under low nitrogen rate.