RESEARCH REGRADING WHEAT GRAIN QUALITY UNDER DIFFERENT TECHNOLOGICAL AND ENVIRONMENTAL CONDITIONS ON BROWN REDDISH SOIL FROM OLTENIA CENTRAL AREA

Wheat is characterized by a very short period between previous crop harvest and next crop sowing. Therefore, a fast decision must be taken. Finally, the farmer has the responsibility for the health of the next crop when he chooses the best suited seed for his specific farming practices.

One of the most important condition to obtain a good yield is to use healthy seed with high cultural value, high biological purity proceeding from the most valuable recommended varieties. The obtaining of this type of seed is strongly linked with both environmental and technological factors.

The yield and quality potential can be improved by cropping technology, which has as starting line the seed plot emplacement after previous crop (excluding cereals to avoid impurities), balanced fertilizing, disease control (especially seedborne pathogens), weeds control, wheat bugs control, wheat harvest, adequate storage.

Under our country environmental conditions, the winter wheat requirements for temperature in different vegetation stages are, as follows:

- Germination - the lowest temperature (4-5^{0}C), the mean value (10-15^{o}C all day long and 0-5^{o}C all night long) and maximum temperature (30-35^{o}C)
- Emergence – the mean temperature (15-20^{o}C)
- Tillering - the mean temperature (8-10^{o}C)
- Hardening – 35-55 days with 10-15^{o}C all day long for the first period and 0-5^{o}C all night long and 1-5^{o}C for the second period.
- Heading - the mean temperature 16-20^{o}C

- Flowering, pollination, fertilization, early milk and soft dough stages require temperature values which range between 11^{o} and 12^{o}C in the night and 18^{o} and 22^{o}C all day long.

The cropping system is essential for a good seed quality. It must be respected each technological step such as seed selection, sowing quality, fertilizing, weeds, pests and disease control, harvest.

Under our country environmental factors, the seed producing process must respect few standards regarding minimum isolation distances, the filed approval conditions, phytosanitary estate and marketing conditions.

The certification papers are freed after all inspections and approvals are done, the technical quality standards and seed health are established and the results correspond to standard values.

Our goal was to determine obtained grains quality linked with tow important traits: germination and thousand kernel weight (TKW) and their interaction with morphological and physiological characters and yield.

The present study was focus on eight research aspects, as follows:

- The quality of obtained seed in different environmental conditions related to Fusarium attack, black point and pre-harvest sprouting.
- The quality of obtained seed in different fertilizing treatments related to Fusarium attack, black point and pre-harvest sprouting
- The seed quality of main wheat varieties from Oltenia Central area
- The thousand kernel weight influence of wheat seed used for sowing to the yield level and its main components
- The main varieties traits division related to TKW and grain germination of the seed used for sowing
- The influence of TKW and grain germination to plant vigor
- Milling and baking seed quality in different environmental and technological conditions.

During three years (2005-2007) two trails including fifty Romanian and foreign wheat varieties have been established in two different fertilizing treatments, as follows: first treatment 20-20-0 complex fertilizer at rate of 200 kg/ha basal applied in autumn + nitrogen fertilizer (NH_4NO_3) at rate of 200 kg/ha top dressed in early spring and second treatment only 20-20-0 complex fertilizer at a rate of 200 kg/ha basal applied in autumn.

In every experimental year three samples of 100 g each were analized to determine the percentage of seeds affected by Fusarium and black point attack, pre-harvest sprouting seeds, brown and healthy seeds. For all these four categories and wheat varieties were determined the seed germination assay and thousand kernel weight traits in three replications to Seed Germination Laboratory of I.T.C.S.M.S. Dolj. Then was realized statistical analysis to determine the limit differences. Field and laboratory measurements were done for each plot. The measurements were focus on two aspects: the quality for both sowing and obtained seed.

The most important results are reported below.

The Fusarium attack high values recorded for both trails under optimum field conditions reveal that none variety isn`t resistant. Black point attack recorded the highest value. On three years average the variety Izvor showed the highest attack degree value, while the variety Simnic 30 recorded the lowest value.

In 2005 year the pre-harvest sprouting was evident despite this phenomenon is uncommon for Simnic area. The values ranged from 0,3% (F4) to 18,5% (by Junona). Therefore, this was an important reason for limiting the growing of Crina variety in Simnic area. Despite the pre-harvest sprouting is uncommon in Simnic area (once to 15-20 years) this phenomenon affects wheat grain yield and quality.

Because 2005 year was a favorable year for pre-harvest sprouting development it seems that fertilizing treatment doesn`t affect the attack degree.

Regarding the pre-harvest sprouting attack, it was observed that all wheat varieties recorded higher values under low nitrogen rate. The pre-harvest sprouting attack was strongly correlated for both fertilizing treatments (r=0,4392), thus for each increase of pre-harvest sprouting degree with one unit under N100P40 rate, the wheat variety shows an increase of pre-harvest sprouting degree with 0,8% under N40P40 rate. The foreign varieties tested during 2006 year recorded higher Fusarium attack degrees and higher percentage of shriveled seeds exceeding Romanian varieties. Among foreign varieties, Meunier showed the highest shriveled seeds percentage for both fertilizing treatments. The varieties Aztec, Cordiale and Exotic recorded also a high shriveling degree over than 60% and these values were correlated with fertilizing levels.

During three years, the variety Izvor showed a low percent of shriveled seeds and affected by Fusarium and these traits were correlated with its earliness and drought tolerance. These traits values recommend this cultivar for homologation.

The grain germination wasn`t affected by Fusarium attack, but this pathogen influenced the quality parameters.

Other trait under investigation was thousand kernels weight (TKW). The grains affected by Fusarium showed a very significant decrease of TKW, while the pre-harvest sprouting grains showed a higher TKW value comparatively with healthy grains due to their water imbibitions.

For almost tested varieties under low fertilizing treatment the grain germination was higher, but insignificant. A possible explanation for this situation is that fertilizing level lead to grain germination values which ranged from 1 to 10%.

All tested varieties showed very significant decreased values for the germination and pre-harvest sprouting seeds under both fertilizing treatments. However, for this category the varieties Simnic 30, Alex, Delabrad and Gruia

recorded the following germination values: 84%, 72%, 69%, 60%. Also for this category were recorded the lowest TKW values(20-22 g), excepting the varieties Delabrad and Briana, which had a higher value (53 g) under N40P40 rate due to the grains imbibitions with water at the measurement moment.

The thousand kernel weight of obtained seed is strongly correlated with the TKW of sowing seed, highlighting the principle: ”big grain for sowing, big grain for harvest”. Analyzing traits division according to germination value of sowing seed results that these are not significantly influenced and their values are low ranging from 97,5-100%, especially for the last germination class.

On three years average only Glosa variety recorded a significant benefit of 620 kg/ha, while all other varieties were to the control level under normal fertilizing treatment. Only two varieties recorded yield decreases, as follows: significant by Briana and very significant by Fundulea 4. These two varieties are opposite according to vegetation period. Among all tested varieties Briana showed earliness, while Fundulea 4 is a delayed variety.

Under low fertilizing treatment, Fundulea 4 recorded low yields, while Crina and Gruia varieties exceeded the control variety Dropia.

On three years average under N100P40 rate, the foreign varieties recorded yields which ranged from 4246 kg/ha (Cordiale) to 4930 kg/ha (Orion). Beside Romanian varieties Dropia and Glosa, only Exotic and Orion varieties achieved statistical assured benefits. The KWS Company have already started in Romania the seed multiplication process for Exotic variety, but Orion is not merchantable, even it was remarked and promoted among wheat varieties collection from ARDS Simnic. Under N100P100 rate the following varieties were remarkable: Aztec (France) and Serina (Hungary). Meunier variety recorded distinct significant yield decreases (713 kg/ha) under low fertilizing treatment. Between seedling grain germination and seedling grain percentage it was established a very significant negative correlation (r=-0,489***), thus the grain germination decreased with 1,8%

for each unit recorded by the seedling grain percentage. Both previous traits determine each other by 23%, observing that many points stray from the line.

A common correlation for ARDS Simnic area is that between wet gluten content and deformation index (r=0,649***).

None of the studied traits (the seedling grain percentage, the percentage of seeds affected by Fusarium, the percentage of seeds with black point, the healthy grains, the germination of seeds affected by Fusarium, the germination of seeds with black point, the seedling grains germination, thousand kernel weight of healthy grains, thousand kernel weight of grains affected by Fusarium, thousand kernel weight of grains with black point, thousand kernel weight of seedling grains, wet gluten and deformation index) doesn`t influence the yield and the correlation coefficients didn`t exceed 0,263 value.

The grain germination and TKW of sowing seed didn`t influence the plant vigor in early spring. It was observed also that foreign varieties had a lower height value, but this is due to the presence of dwarf or semi dwarf genes.

The earliness varieties are characterized also by a higher vigor, especially in the early spring due to the shorter vegetation period which determines them to grow faster through maturity.

The quality index recorded different values depending on variety and fertilizing level.

The relative low values of gluten content are due to the environmental factors (especially 2005 year) which decreased significantly the average value. Because 2005 year was extremely rainy, the baking quality was serious affected. On the other hand the higher values of deformation index is due to the environmental factors (especially 2007 year), an extremely droughty year, which affected the gluten quality.

The data presented above lead through one conclusion: a healthy crop is the result of healthy seed used for sowing and the crop quality is due to the baking index of obtained seed.