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# PARTIAL RESULTS REGARDING THE MANAGEMENT OF FERTILIZATION AND FUNGICIDES TREATMENTS ON PREMIUM WHEAT VARIETIES

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***Abstract***

*The paper aims to present the results of research carried out in the first year of doctoral studies, as a part of the doctoral thesis. The theme taken into research monitors the influence of differentiated application of fertilizers and fungicides on the premium genetics wheat varieties provided by Probstdorfer Saatzucht Romania Company. For highlighting the results, the obtained yield, the amount of protein (%), the wet gluten content (%) and the hectoliter weight were analyzed. Each of the above mentioned factors have been analyzed both separately and in interaction, in order to assess their impact on the crop of premium varieties. The research plot has been implemented at the Agricultural Research and Development Station of Teleorman and followed the statistical rules for trifactorial experiences, being sown as randomized blocks. The initial choice of the theme was based on the concept of healthy food, which humanity is facing with nowadays. Our intention was to propose a model for introducing in Romanian farms, under optimal conditions, the new premium wheat genetics, that offers high quality flours. Thus, would no longer be necessary to use improvers in the production of bread, indispensable for the daily food of the Romanians. Being frequently debated, the subject of food quality and, by default, of life, influenced by the intern yields with poor quality indices, as well as the imports of non-compliant products from other countries, seriously threaten national health and wellbeing and imperatively requires that the path of research and of scientific works to be directed in this regard. Among the findings emerging from this analysis it can be observed the premium varieties tendency for a superior valorisation of the nitrogen fertilization, both in terms of production stability, as well as of superior level of monitored bakery indices, prerequisite for a sustainable socio- economic development.*

***Key words*****:** *premium wheat, premium genetics, quality indices, yield.*

## INTRODUCTION

This paper is based on the doctoral research theme "Research on the management of fertilization and of fungicides treatments application on the tested Premium wheat varieties".

The necessity of choosing the research topic was based on the problem of poor bread flour quality used by manufacturers and bakery producers in Romania, putting their choices on the poor grain quality produced by the local farms, two thirds of the produced wheat does not meet quality standard (Campeanu and Dumitru, 2002).

Going into the depth of the problem and questioning a number of about 50 farmers from the south of the country (Calarasi, Constanta, Ialomita, Giurgiu and Teleorman counties), was discovered the common argument that unites them: "Why to produce quality when nobody pays differently?" (original study).

Premium wheat, recognized and accepted in the scientific literature in Romania as hard gains (Figure 1) are a class of superior quality indices (high protein, gluten, sedimentation etc.), ideal for obtaining bread quality. Other similar terms accepted for hard grains are E-Weizen (Germany), Red Hard Winter Wheat (US), Premium Weizen (Austria) etc. (Berca, 2011; Berca, 2013).

For quotations offered by international markets, there is a clear differentiation of wheat quality classes (Figure 1). Unfortunately, no account is taken of this aspect regarding the purchase of cereals on the Romanian market.

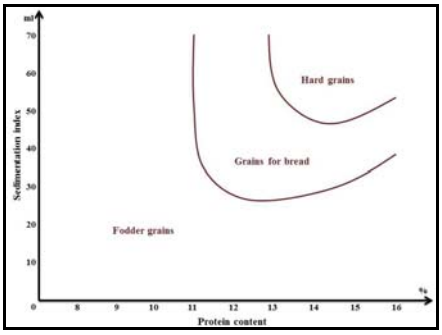


Figure 1. Wheat division in quality classes based on protein content and sedimentation index (Munteanu, 2003)

## MATERIALS AND METHODS

There were taken 6 wheat varieties, of which 5 Premium wheat varieties (Adesso, Arnold, Gallio, Laurenzio and Midas) and 1 variety of A-Class breading wheat (Balaton), the latter being similar to local varieties.

Made available by the company Probstdorfer Saatzucht Romania (http://www.probstdorfer.ro), the varieties mentioned above are the result of the Research Institute Donau Saatzucht GesmbH & Co KG, with headquarters in Probstdorfer, Austria (http://www.saatzucht-donau.at).

The Premium wheat disease resistance was analysed compared with Balaton (control), over the main foliar disease complex (*Blumeria graminis, Puccinia recondite, Mycospharella graminicola*) and ear disease (*Gibberella zeae*) (Cristea and Berca, 2013; Cristea, 2005; Gheorghies and Cristea, 2002).

The field follows the rules of experimental technique, the experience were sown in a trifactorial randomized blocks (Figure 2).

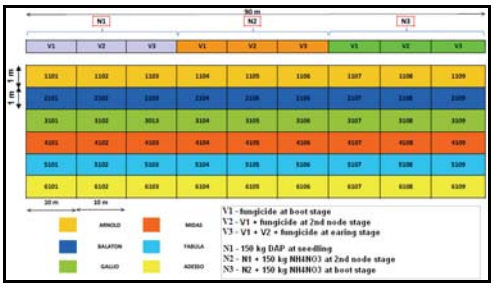


Figure 2. The technological scheme after which the experimental field was made

The proposed layout is modelled around the 3 factors (variety, fertilizer, fungicide) and aim to optimize the technology used on the farm, both in terms of production levels and the cost reduction per unit area.

The three factors that were analyzed in the presented model, were as follows:

1. F1 – variety factor:
   a. Adesso,
   b. Arnold,
   c. Gallio,
   d. Laurenzio,
   e. Midas,
   f. Balaton.
2. F2 – fertilization factor:
   a. N1 – 150 kg DAP applied in autum before preparing the soil;
   b. N2 – N1 + 150 kg $NH_4NO_3$ applied at the 2nd node stage (EC > 30);
   c. N3 – N2 + 150 kg $NH_4NO_3$ applied at the boot stage (EC > 40).
3. F3 – treatment factor:
   a. V1 – tebuconazole applied at the boot stage (EC > 40);
   b. V2 – V1 + tebuconazole applied at the 2nd node stage (EC > 30);
   c. V3 – V2 + tebuconazole applied at the earing stage (EC > 50).

The research plot has been implemented on the field provided by ARDS Teleorman in the fall of 2013, in a crop rotation after peas. After harvesting, yields were determined. Samples of 2 kg/plot were used for laboratory analysis for qualitative indicators.

Laboratory equipment used for this purpose was Infratec 1241 Grain Analyser. Indicators analyzed were: production/ha adjusted to 14% moisture (kg/ha), protein content (%), wet gluten content (%) and hectoliter weight (kg/hl). The obtained data were processed and interpreted using ANOVA statistical program.

## RESULTS AND DISCUSSIONS

### The analysis of obtained yields

In the chart below (Figure 3) are highlighted the results of average production for the 1st factor (variety).

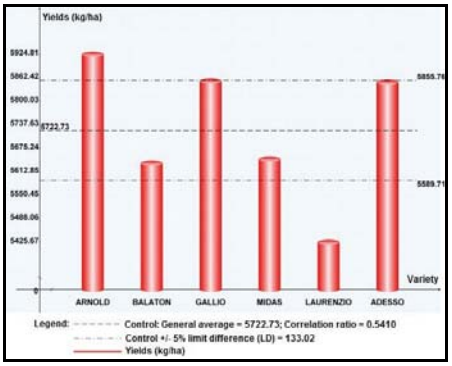


Figure 3. Single factor analysis of the variety over the obtained production/unit area

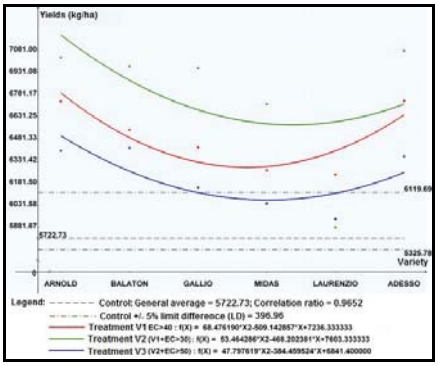


Figure 5. Trifactorial analysis on variety, treatment and fertilization over the obtained yield/unit area

Assuming that the obtained values are exclusively for F1, it shows Arnold variety on first position outside the confidence interval, then by Adesso, Gallio also above the average. In contrast, Laurenzio variety is in the last place as production level, with a difference of 500 kg/ha less then Arnold variety. Balaton, it is close to average production and is within the limit confidence.

Analysing a trifactorial sequence (Figure 4), fertilization-treatment-variety, we can observe a positive linear trend between N1, N2 and N3. For each sequence the applied treatments were monitored and the direct influence can be observed as an increase of production for each variety from V1 to V2, with a maximum of 600 kg for Balaton (N2-V1V2).

Also the application of V3 (treatment at flowering stage) affects production in each of the situations described, which is due to the phenomenon of phytotoxicity (Figure 5).

**Analysis of protein and wet gluten content**

There is a correlation between protein and wet gluten content of wheat grains, although the two quality parameters only partially define the final product (flours) quality. A study conducted by Ingver and Koppel (2004) from Jogeva Plant Breeding Institute (Estonia), demonstrated that there is a strong correlation between the physicochemical parameters and the breading volume.

In protein (Figure 6) and gluten content analysis, Laurenzio variety obtained the highest values, followed by Arnold and Adesso.

In V2N2 it can be seen that, according to other authors, the values are high, for N3 it's causing a phenomenon of plant exposure to pathogens pressure and thus the values decrease below the average (Cristea, 2005).

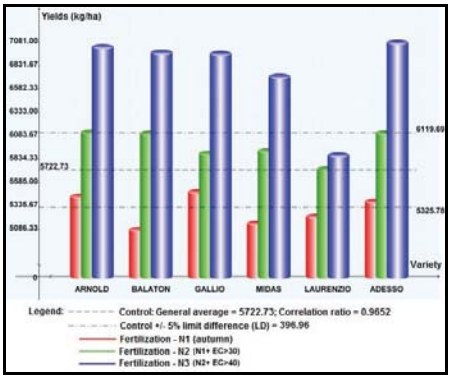


Figure 4. Trifactorial analysis on variety, fertilization and treatment over the obtained yield/unit area

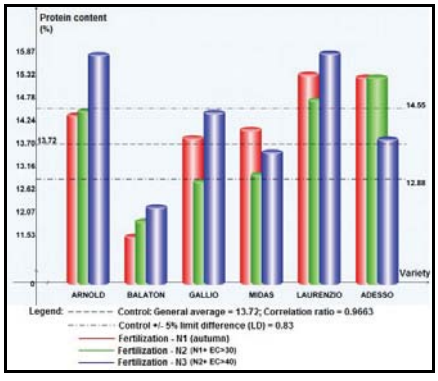


Figure 6. Trifactorial analysis on variety, fertilization and treatment over the protein content of grains

**The analysis of hectolitre weight**

Hectolitre weight value defines the degree of compression of substances in grain and is a basic parameter of flour extraction with an important role in determining the efficiency of grinding. Also, influences the acquisition value of grain, higher values of 78-80 kg/hl being the first sign for high baking grains.

In the proposed model, hectoliter weight analysed in F1 (variety), highlights the difference between A class variety (Balaton) with only 75.57 kg/hl and Premium varieties with values between 79.53 kg/hl Gallio and 82.23 kg/hl Arnold (Figure 7).

Also, on the bifactorial analysis of F1-F2 and F1-F3, we observe non-significant differences in both cases (Figure 8), so the genetic potential of varieties is solely responsible for the differences.

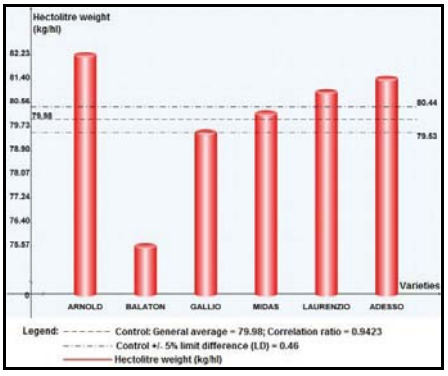


Figure 7. Monofactorial analysis of the variety over the hectoliter weight

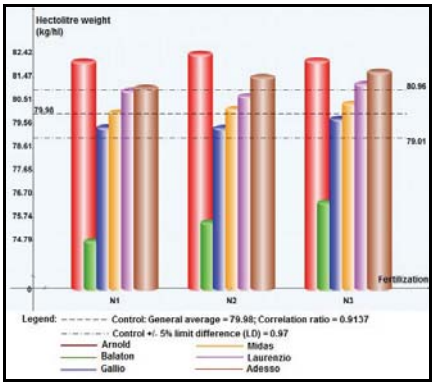


Figure 8. Bifactorial analysis on variety and fertilization over the hectoliter weight

## CONCLUSIONS

1. Genetic potential of wheat varieties is the main factor influencing results on various technological schemes; in this case higher valuing potential differences were made by the Premium varieties.
2. The linear evolution of productions/unit area is evident in the case of split application of fertilizers; the model proposed has a maximum of near 120 kg active substance.
3. Diseases control is found as absolutely necessary.
4. The genetic potential of Premium varieties, regarding higher grain hectoliter weight is superior then the lower bakery class.
5. In terms of harness the applied technology, Premium varieties offers a positive response on application of nitrate fertilizers and also provides stable productions, ideal for growing on a large scale.

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