COMPARATIVE STUDY OF AN ASSORTMENT OF WINTER WHEAT GROWN IN CARACAL PLAIN

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Abstract. *Annually, in Romania are cultivated around two millions ha of winter wheat with an average of yields of 3500 kg/ha (FAOSTAT, 2017). In comparison with the European developed states, as France or Germany, where the average yields are over 6500 kg/ha, in Romania those productions are well below the climatic potential. The causes of these situation are various: genetically (varieties capacity for production) climatic (tolerance to drought and high temperature), technological (levels of fertilization, sowing date, weeds and pest control and so on). The technology applied to winter wheat, regardless of the crop system, includes the whole a complex of activities that contribute both to the achievement of the largest productions and to the achievement of some seeds with superior qualitative indices in terms of bakery (C. PĂUNESCU, 2012). Technological management of wheat involves choice of land, choice of variety, establish the rotation, and all the technological sequences starting with sow until harvest.Romanian farmers has a rich offer of wheat varieties, but for each agricultural zone those should be tested in order to select and recommend the most valuable genotypes who have the ability to better capitalize the climatic conditions. In this paper we present the results obtained to a few wheat genotypes from Syngenta Company tested in the climatic conditions of Caracal Plain, during three years with different favourability for wheat. The outcomes of this study show that the new genotypes offered by Syngenta Company prove to be a practical solution for farmers in order to obtain high yields, over 7000 kg/ha in average on studied interval, but most of this, characterized by constancy of productions in each year.*

Key words: *wheat varieties, assortment, yields.*

INTRODUCTION

In order to reduce as much as possible the production losses caused by drought, but also other unfavourable factors of biotic environment (foliage and spice diseases etc.) and abiotic environment (low temperatures, high temperatures, drought etc.), the research recommends to farmers the cultivation of tested varieties, which, under the given conditions, ensure secure harvests (GH. ITTU, 2007).

The assortment of varieties recommended on each crop area were chosen based on the data obtained from the multiannual tests, in natural and artificial conditions, taking in account their behaviour and stability of given yields (P. IANCU, 2017).

Variety is the first issue that must be careful in the establishment of a culture and especially its genetic heritage – it is or not a variety suitable for yielding quality wheat for bread (GH. MATEI, 2016). On the other hand, the choice of varieties is such an important decision that we can say that up to 50% of the economic effect of a culture depends on this decision (C. PĂUNESCU, 2012).

In Oltenia, a good behaviour, on average for several years, proved to have the varieties Dropia, Flamura 85, Boema, Glosa, Alex and Romulus, as well as the intensive early

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variety Briana, registered by ARDS Şimnic,. In addition, on less fertile soils, where precocity and rusticity are important advantages, the very early Simnic 30 variety is recommended.

MATERIAL AND METHODS

During three years, 2015, 2016 and 2017, at ARDS Caracal were tested three winter wheat varieties, as follow:

- **Illico** is a variety, intended for the bakery segment. It has a high production potential with an optimal density of 400-450 germinable / m², good tolerance to fall, under normal soil conditions, which resist -15 ° Celsius without a layer of snow and -20 ° Celsius with a layer of snow for five consecutive days. With drought tolerance, the Illico variety needs 450 liters of water / cycle of vegetation for a minimum production;
- **Ingenio**, the second variety with a high quality bakery, with high production potential and stable productivity. It has an average tolerance of -13 ° Celsius without a layer of snow (the tip of the leaves is affected moderately when not affected by snow) and -19 ° Celsius with snow. For minimum production it needs 400 liters of water per cycle of vegetation;
- **Moisson** is made for very large productions with a very high tolerance to diseases. An essential feature of this variety is that the leaf is always under the rope. Taking into account the fact that 40% of the production is produced by the banner leaf, this particularity gives it a higher resistance to heat.

In each year the previous plant was oil rapeseed. The sowing date varied between 15 and 20 October and the sprouting was observed after 9 to 11 days, which prove a very good capacity to emerge.

As agrotechnical measures we mentioned: summer plowing – heavy disc – seed bed preparation. We use as background fertilizers in autumn 250 kg/ha complex of 20-20-0 and in spring 250 kg/ha ammonium nitrate. During the vegetation were applied foliar nutrients of 0.5l/ha Tehno Phyt+1l/ha Fertigrain (first decade of April), 0.5l/ha Control Phyt + 1 l/ha Fertigrain (last decade of April) and 1.5l/ha Fertigrain (last decade of May).

For ensuring cultural hygiene we applied for weed control Granstar super 40g/ha + Cerlit 0.4 l/ha and for diseases and pest: I- Evolus 1l /ha and II- Credo 0.5 l/ha+Fastac 0.2 l/ha + Humusil forte 2 l/ha. The experiences were realized as demonstrative lots with area of a variant of 500 square meters.

In order to collect data we had two phases: in field and in laboratory. All data has been processed using statistical programs.

RESULTS AND DISCUSSION

Climatic conditions (figure 1 and 2) – were different as favourability for winter wheat in those three years. Looking in figure 1 we can see that *from point of view of temperatures* in comparison with the last 30 years registration (multiannual average) 2016 year was warmer that the witness, especially in early spring on the background of lack of rain (figure 2) conducted to decrease the productivity potential of the tested varieties.

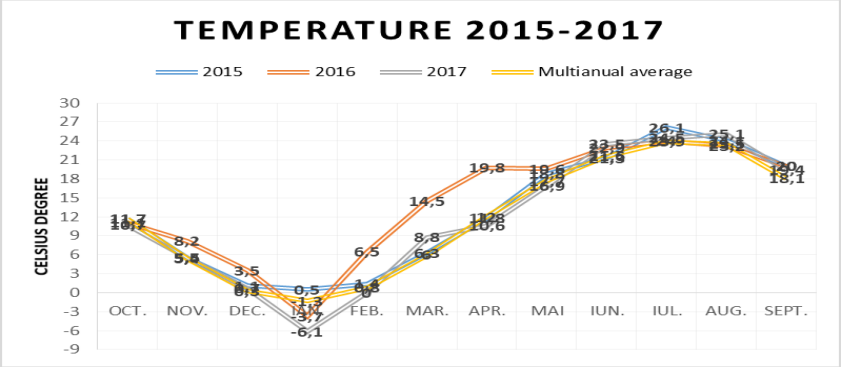


Figure 1 – Evolution of temperature in comparison with multiannual average

Short periods of very high temperature (> 35ºC) are common in many of the world's wheat growing areas and can be a significant factor in reducing yield and quality of wheat (P.J.STONE, 1995)

Even in the conditions of argic chernozem from ARDS Caracal, a very fertile soil, water as vegetation factor has a high influence thru the capacity of production of the varieties. Taking in account the two periods of development of the wheat – in autumn vegetative stages and in spring the generative ones – in the experimented conditions the rainfall regime was, with small exceptions, below the multiannual average, mostly in the stages when the plants build the yields components (tiller stages, forming and fill grains) – figure 2.

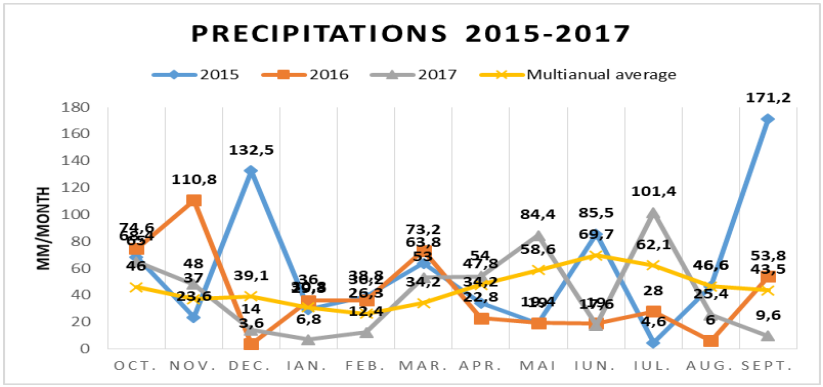


Figure 2 – Evolution of precipitations in comparison with multiannual average

One of the most appreciated feature in non-irrigated conditions at wheat varieties is **precocity**. The capacity to have a short generative period is a major objective in breeding wheat varieties.

If we observe figure 3 where is presented blooming time in the three years, we can say that the blooming time range (from the earliest to the latest variety) of 12 days. If we take as mark the point of 6 days differences it can be observe that the climatic conditions of the years (especially the temperature) had influenced the time of blooming for varieties from 3 to 6 days in advance in 2016 and from 2 to 6 days later in 2015 and 2017.

With a very powerful response to the climatic factors is ILICO variety which has a large number of days for blooming related the year's climatic conditions.

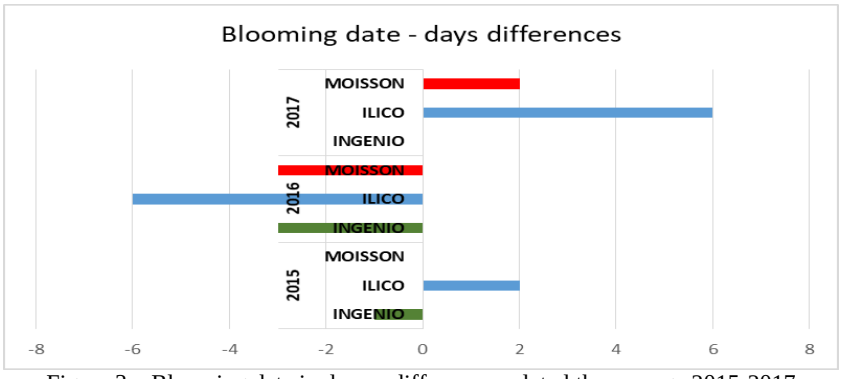


Figure 3 – Blooming date in days – differences related the average 2015-2017

Plant's height – is a character genetically influenced, but also depends of the climatic and technological conditions (figure 4). Related to this feature we can observe that the highest plants were measured in the climatic conditions of 2017 year, followed by those from 2015 and 2016 years.

The highest genotype was ILICO in each year with a high range between 82 cm in 2016 to 95 cm in 2017. We can conclude that the experimented cultivars present a high homogeneity in all experimented conditions, the highest variations were recorded at INGENIO variety, of 22 cm.

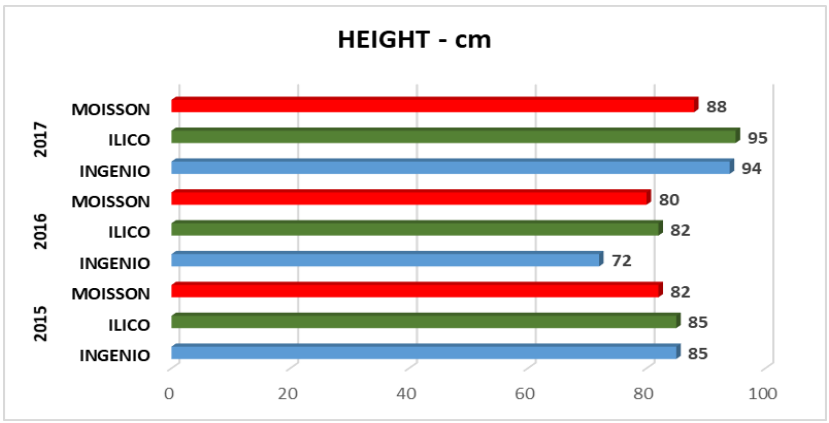


Figure 4 – Plant's height (cm) at maturity

Seed's humidity at harvest time (figure 5) – is very important both for farmer – to establish the optimum time for harvest start – and for depository as a storage indicator. Agricultural products are stored separately, depending on the moisture content: the dried ones than the wettest, with a higher moisture content. Mixing of different seeds of different moisture produces difficulties both for drying and preserving them, as well as for industrial processing, for milling-bakery, for starch industry and so on (GH. V. ROMAN ET ALL., 2012).

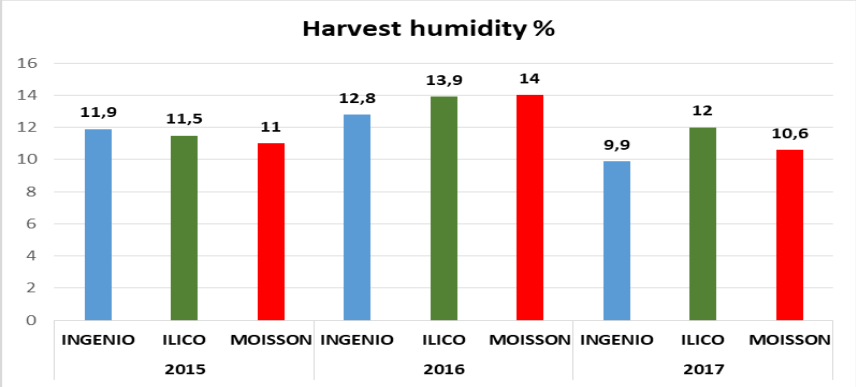


Figure 5 – Humidity at harvest time in the experimented years

Related to this issue the experimented varieties had good and very good levels of humidity at harvest time, between 9.9% to 14% which ensure a quick and dry harvest whit no problems on the receiving and depository process.

Hectolitre weight (figure 6) - Typically, drying and conditioning lots of wheat seed site grow MH, this being a secondary criterion for assessing quality (there are products that do not include MH on delivery standards and it is not taken into account). Regarding quality of yields the minimum level acceptable for common wheat in industry of making bread is 75 kg/hl and for durum wheat for pasta, minimum value is 77 kg/hl (GH. MATEI, 2016).

In a study related the behaviour of some assessment of wheat varieties in Central Area of Oltenia, A. ROTARU (2011) - shows that the average values of the hectolitre mass are not influenced by the level of fertilization but are influenced by differentiated sowing seasons. Related to the witness at a two-week sowing delay, MH significantly declined.

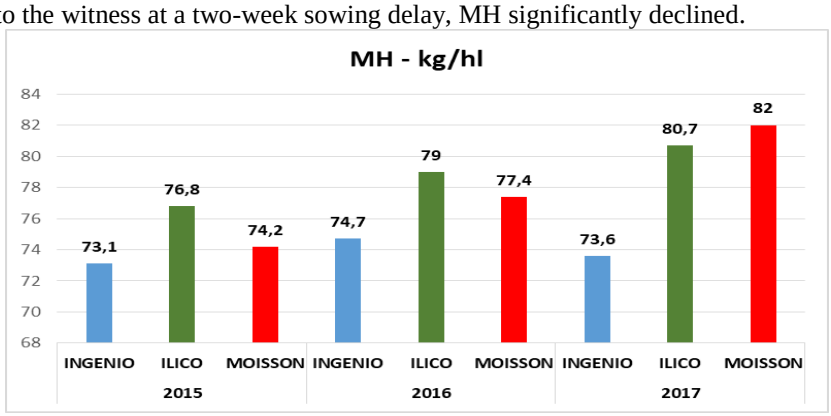
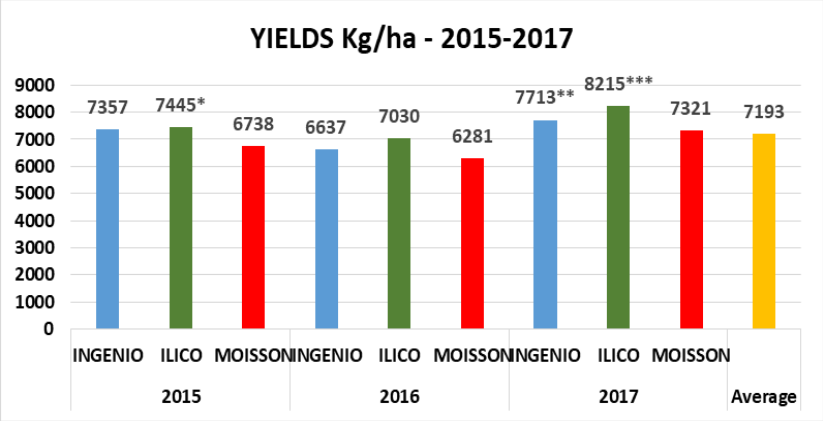


Figure 6 – Hectolitre weight – kg/hl

In our experiment we found that it kept the same tendency of variations most du the years climatic conditions. The most valuable varieties were ILICO and MOISSON in all three years.

Yields (2015-2017) kg/ha – in average of the three experimented years the experimented varieties gave very good productions in non-irrigated conditions, of 7193 kg/ha.

As is presented in figure 7, the levels of yields has been different for the varieties due the favourability of the year for wheat crops.



DL 5%=185 kg/ha; DL 1%=473 kg/ha; DL 0.1%=790 kg/ha

Figure 7 – Yields obtained in 2015-2017 in comparison with average/experience

The behaviour of the Syngenta assortment of winter wheat was one of the most valuable for the area of argic chernozem from Caracal Plain in non-irrigated conditions. The one who capitalized most efficient the climatic conditions proved to be ILICO which has a very good capacity to produce and also a stability of productions of over 7000 kg/ha in each year, with a very significant increase in production in 2017 of 1022 kg/ha.

ILICO and MOISSON varieties registered yields which varied between 6000 kg/ha and 7000 kg/ha, proving also a very good stability of productions in different climatic conditions, which shows the genetically stability of each ones.

Taking in account the average yields registered in Romania for wheat, under 3500 kg/ha, those varieties could and should be a valuable choice for farmers from area of Caracal Plain.

CONCLUSIONS

Synthesizing the ones showed above, we can conclude, as follow:

- In the conditions of Caracal Plain the assortment of winter what had a very good behaviour, all genotype proving to be a solution to be inserted in farmer's crop rotation;
- The precocity of the tested genotypes was powerful influenced by climatic factors, especially by temperature;
- As morphological feature, the tested varieties from Syngenta Company proved to homogeneous, even in different conditions of favourability of the years;
- A very appreciated character to the wheat varieties was humidity on harvest time, which varied between 10 to 14%;
- As productivity all the genotypes gave in three years yields over 6200 k/ha, but the most valuable variety was ILICO with productions of 7030 in 2016 to 8215 in 2017.

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