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Comparative analysis of the yield of spring barley cultivars in the regions of Sadovo and Karnobat

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ABSTRACT

The aim of present study was to investigate the comparative analysis of the yield of spring barley and the coefficient of ecological valence in the regions of Sadovo and Karnobat. Seven spring barley cultivars were planted in the first and second decade of march, in comparative cultivars trials on the block method in four repetitions of an area of 10 m², with sowing rate of 450 germinating seeds per m² in the region of Sadovo and Karnobat. They were assessed against IASAS used standard french variety Josefin. The statistical processing of the results was carried out by ANOVA. The coefficient of ecological valence (W) is fixed on the model of Wricke. The analysis can be concluded that the varieties grown in the region of Sadovo showed better ecological plasticity, but gave lower yields, in the region of Karnobat were more productive but difficult to adapt to environmental conditions.

Key words: spring barley, yield, coefficient of ecological valence

Introduction

Starting material is well known as a source material for enhancing the effectiveness of improvement works in all crops (Gotsov, 1984, 1990; Mersinkov, 2000). High performance and success in breeding is based on the use of rich genetic diversity of sources with various valuable qualities. They serve as donors in crossing and recombination factors. Most often the limited starting material, and its genetic uniformity delay the breeding process and lead to unsatisfactory results (Gotsova, 1984, 1990). The problem of the source material is general and applies to other countries with well-developed breeding work. This requires the establishment of broad international cooperation in the exchange of materials and information on the results achieved. The success of any breeding program to the greatest extent depend on the availability of a rich and well-studied source material.

The aim of present study was to investigate the comparative analysis of the yield of spring barley and the coefficient of ecological valence in the regions of Sadovo and Karnobat.

Materials and Methods

Seven spring barley cultivars were planted in the first and second decade of march, in comparative cultivars trials on the block method in four repetitions of an area of 10 m², with

sowing rate of 450 germinating seeds per m² (Barov, 1982) in the region of Sadovo and Karnobat. They were assessed against IASAS used for standard french variety Josefin.

Attempts were set after precursor grain legumes. During the vegetation were carried out agricultural activities necessary to ensure the development of plants under identical conditions generally adopted technology for growing barley (Penchev et al., 2004).

The statistical processing of the results was carried out by ANOVA (Ganusheva et al., 2010). The coefficient of ecological valence (W) is fixed on the model of Wricke (1962, 1966).

Results and Discussion

Agro-meteorological characteristics of years of study

Agro-ecological region – Sadovo

The agro-climatic conditions during the study were presented by major growth and development of culture meteorological factors: average monthly air temperature averages the amount of precipitation during the growing season.

Mean average monthly temperatures and precipitation are compared to multi-average temperatures and rainfall by months for the period 1931-2000. With the exception of the period of germination closest to the perennial average temperatures by month in 2014 is sharply distinguished with

higher average monthly temperatures in 2013 in May 2012 and June and July (Figure 1).

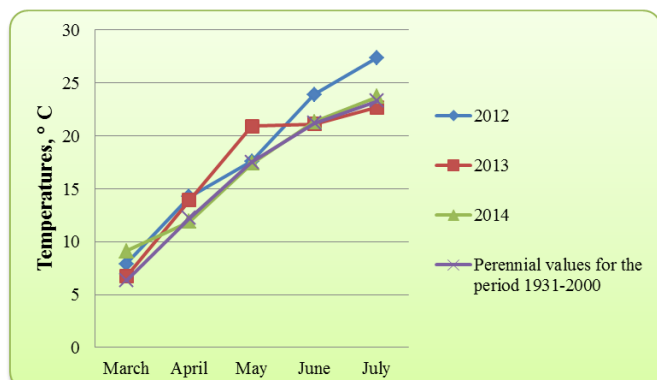


Figure 1. Mean temperature (°C) per month for the period of study and perennial values from 1931 to 2000.

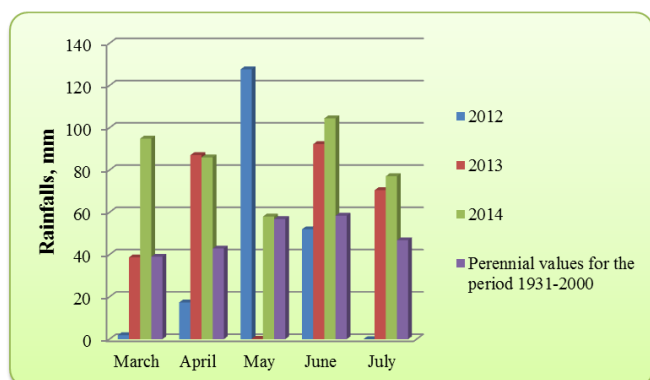


Figure 2. Average rainfall (mm) per month for the period of study and perennial values from 1931 to 2000.

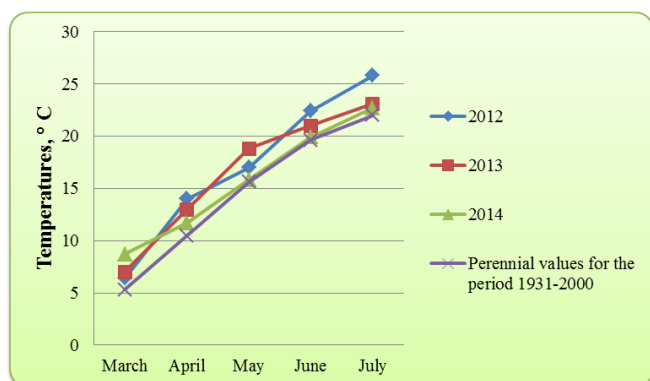


Figure 3. Mean temperature (°C) per month for the period of study and perennial values from 1931 to 2000.

In terms of precipitation in 2012 was characterized by uneven distribution in May, the amount is at most for the period of study and the multiannual period. Most damp is 2014 values by months, exceed the average perennial throughout the growing season. Critical is the month of May 2013, when the period of ear formation and pouring the grain moisture is less. Due to precipitation in June and July of the

same year is possible harvesting of the test cultivars (Figure 2).

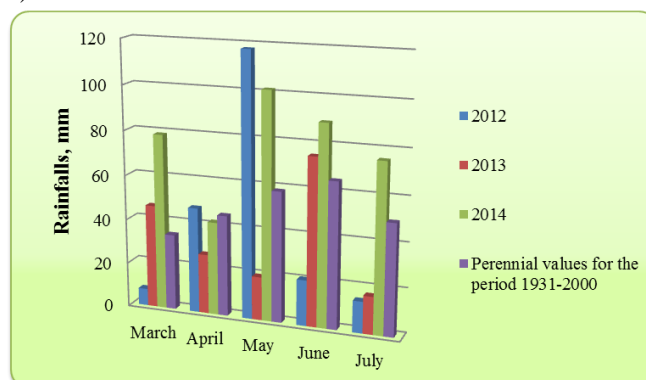


Figure 4. Average rainfall (mm) per month for the period of study and perennial values from 1931 to 2000.

Agro-ecological region – Karnobat

In March 2012, despite insufficient rainfall (7.6 mm) noted germination of spring barley. Frequent, local precipitation (26.9 mm) in mid-April, and above all in the second two ten-day periods May (117.8 mm) accompanied by a cooling time of 18.9 °C during the first ten days and 16.0 °C in the second and third decade of the month significantly improve conditions for spring barley vegetation (Figure 3). In June there is a weak and without economic importance precipitation (5.6 mm; 8.4 mm and 12.2 mm). In the first ten days of July, did not show any precipitation, the spring barley for a period of 40 days is placed in the setting of acute water deficit - 44.6 mm compared to perennial values and 22.4 °C average daily temperatures also by + 2.8 °C over perennial values. On 13 and 22 June were recorded 34.8 °C absolute maximum temperatures that negatively affect pouring grain of spring barley (Figure 4). Weak economic importance and without rainfall accompanied by high temperatures and low atmospheric humidity (67% on average for the month, during separate days drops to 53% when 70% perennial values) in June negative impact on optimal growing season of spring barley. The growth and development of spring crops in June with rainfall of 20.6 mm and temperatures up to 34.8 °C July with 14.2 mm, rainfall and temperatures up to 36.6 °C occur in the setting of acute water deficit.

March 2013 began with unusually warm weather (13.0 °C). From 8 to March 23 pass over the area moist but with little rainfall cyclones. Rain during this period did not have a significant economic importance. On 27 March the weather suddenly get cold and temperatures drop to about 0.9 - 4.0 °C in which rain in many places goes into snow. April began with warm and sunny weather (Figure 3). On April 6 in the country goes cold and wet front. In Eastern Bulgaria the rainfall is 26.6 mm, but over southwest around and over 20-50 mm. During the third decade of April, temperatures

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sharply increase. Drought continues until the middle of the second decade of May.

Rainfall in May are 19.5 mm 58.5 mm for multi-annual reporting period (Figure 4). Insufficient rainfall this month hampered normal growth and development of spring crops. Insufficient rainfall accompanied by high maximum temperatures that have accelerated the development of plants by shortening the time of phenophase. On 28/06/2013, more than throughout the country including in Southeast Bulgaria mine powerful cyclone that caused heavy rainfall of 35-40 mm and winds. After these winds accompanied by rains yields in most cases spring barley decreased. After an in-depth analysis of agro-meteorological conditions in the region of Karnobat formed the conclusion that 2013 is not very favorable for spring barley growing. It confirms the view that the limiting factor for good yields of major crops are the amount of rainfall during the critical phenophases plants.

Sowing of spring barley in 2014 was carried out in the second decade of march, due to precipitation at the beginning of the month, which adversely affects the yield. Favorable year for the development of spring barley was 2014 in terms of temperature and precipitation during the growing season.

In Table 1 is presented the comparative assessment of the yields of spring barley and the coefficient of ecological valence on the varietal experience held at two points (Sadovo and Karnobat) for the study period (2012-2014).

Table 1. Data obtained from spring barley and the coefficient of ecological valence (*W*) average for the period 2012-2014.

№ Cultivar	Sadovo		Karnobat	
	Average Yield, kg/da	W	Average Yield, kg/da	W
1 Josefin-St.	335	83	398	911
2 Barke	382*	68 ^{N.S.}	477*	511
3 Fink	351 ^{N.S.}	74 ^{N.S.}	396 ^{N.S.}	760 ^{N.S.}
4 Scarlett	369*	191*	490*	1735*
5 Astoria	358 ^{N.S.}	288*	416 ^{N.S.}	1789*
6 Zernogradskii	369*	208 ^{N.S.}	463 ^{N.S.}	1138*
7 Bodega	383*	487*	487*	1331*
GD _{5%}	24	78	75	251

Table 1 presents the data for coefficient of ecological valence of promising cultivars of spring barley average for the period of study (2012-2014) with standard Josefin. For the yield proven differences in the region of Sadovo exceeding the standard cultivars have Barke, Scarlett, Zernogradskii and Bodega. From the group of the standard Josefin are Fink and Astoria. In the region of Karnobat

proven differences exceeding the standard cultivar have Barke, Scarlett and Bodega. The region of Karnobat yield for the three-years average is higher by 18.8% to 27.9% compared with that of Sadovo.

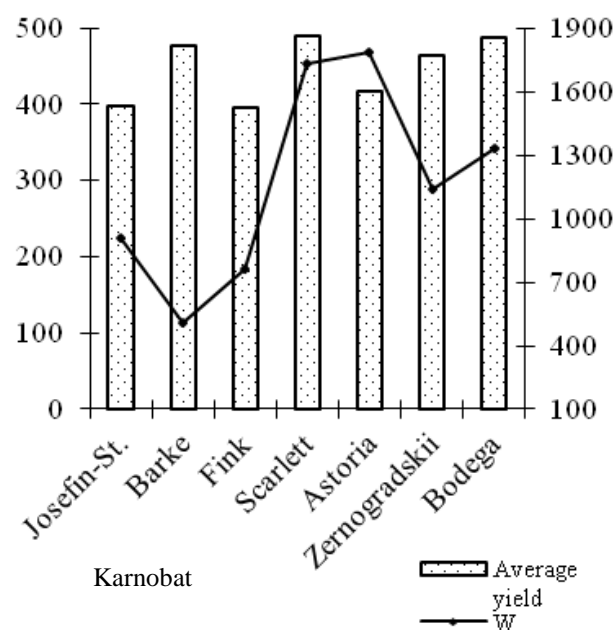
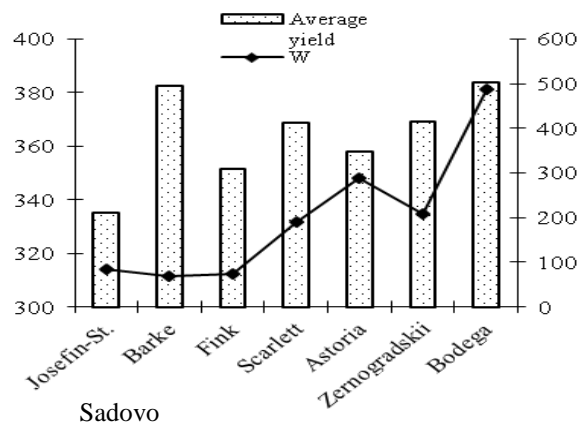


Figure 5. Graphic interpretation of the assessment of yield and environmental valence regions of Sadovo and Karnobat average for 2012-2014.

Reliable differences by the indicator ecological valence compared with the control variant for Sadovo have been established in Scarlett, Astoria and Bodega. Ecological valence of the other cultivars do not differ significantly from that of the standard. Barke and Fink from the group of the standard have lower values of the indicator ecological valence and define them as varieties with higher ecological stability in terms of yield (Figure 5). For Karnobat significant differences by indicator ecological valence compared with the standard have been established by Scarlett, Astoria,

Zernogradskii and Bodega. Barke variety differs substantially from standard regarding ecological valence. This variety has lower value of the indicator ecological valence therefore has a higher ecological stability in terms of yield than other cultivars grown in Karnobat.

Conclusion

The comparative analysis of the yield of spring barley and the coefficient of ecological valence in the regions of Sadovo and Karnobat can be concluded that the varieties grown in the region of Sadovo show better ecological plasticity, but give lower yields, in the region of Karnobat are more productive but difficult to adapt to environmental conditions.

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