Productivity of Grain Maize Hybrids With Different Vegetation Period in The Conditions of Dobroudja and Thrace, Bulgaria

Hristofor Kirchev

Agricultural University, 12 Mendeleev str., 4000 Plovdiv, Bulgaria

Corresponding author: Hristofor Kirchev

ABSTRACT: The experiments have been carried out in two regions – Dobroudja, North Bulgaria and Thrace, South Bulgaria. The study included six hybrids with different vegetation period - Victoria, Anjou 292, Ademio, Agrister and Coventry. The grain yield, kg ha⁻¹ was reported from the harvested plots and calculated to a standard moisture content (13%). Determinated yield components are: height of the plants, cm; number of the rows per cob, number of the grains per row, 1000 grain weight, g. In both investigated areas higher yields are obtained from a hybrid Coventry. In the three years of investigation and average for the period higher yields were obtained in Dobroudja region.

Keywords: maize, productivity, hybrids

INTRODUCTION

The maize is one of the highest energy crops in modern agriculture and cereals with the highest productive potential. For the realization of the productive capacity of the culture, one of the most important part of agrotechnics is choosing a suitable hybrid, which is consider with the specific soil and agro-ecological and climatic conditions. Several authors (Dinari, 2013; Kwaga, 2014; Niknam, 2014; Swati, 2014) indicate that the main factors limiting the yield in maize grain (soil moisture regime, nutrients available in soil, temperature conditions) can be somewhat compensated by selecting the most suitable hybrids for specific agro-ecological conditions in the region.

Several studies In Bulgaria have been made in this direction, but mainly with Bulgarian hybrids (Delibaltova, 2009; Delibaltova and Ivanova, 2009; Delibaltova, 2009; Kirchev, 2001; Matev, 2001; Matev and Zivkov, 2001; Yankov, 2002). In the last few years Bulgaria has imposed some foreign breeders companies, with modern and contemporary selection. The offer by them hybrids are not sufficiently explored in the specific conditions in our county for this culture.

The purpose of this study was to investigate hybrids of maize with different growing season in two different agro-ecological regions in Bulgaria.

MATERIALS AND METHODS

To achieve the objectives of the study during the period 2006-2008, two parallel field experiments have been carried out in Dobroudja, North Bulgaria - the town of Dobrich and Thrace, South Bulgaria - the region of Chirpan. The experiment have been carried out by block method after predecessor wheat in four replications with a size of 40 m² of the experimental plots and of the harvesting - 30 m².

The study included six hybrids with different vegetation period from breeding company Limagrain - Victoria (FAO 290), Anjou 292 (FAO 310), Ademio (FAO 400), Agrister (FAO 500) and Coventry (FAO 670).
The grain yield, kg ha\(^{-1}\), was reported from the harvested plots and calculated to a standard moisture content (13%). Determined yield components are: height of the plants, cm; number of the rows per cob, number of the grains per row, 1000 grain weight, g.

In order to establish reliable quantitative differences between the studied options was made analysis of variance (SPSS 15.0).

**RESULTS AND DISCUSSION**

Changes to the quantitative and qualitative indicators of plants depending on their area of cultivation and the genotype can be identified as key elements determining their ultimate grain productivity (Table 1).

The tested hybrids vary in height attributes of plants, as in both of the study areas with the highest stem features a hybrid Anjou 292. It is known that late hybrids formed more biomass and therefore are more high. In the case noticed that the latest test of hybrids - Coventry is with the lowest stem and in both areas, which can be regarded as an important breeder achievement.

The number of rows in the cob is relatively constant, at least lines are formed at the earliest hybrids Victoria. Differences between hybrids grown in one region are not statistically proven, with the exception of hybrid Agrister in which both regions have obtained the highest scores. All hybrids grown in the region of Dobrudja formed an average of 1 line in more.

Average number of grains in order amended from 26.3 to 34.2 in the region of Dobrich and from 21.2 to 29.5 in the region of Chirpan. With the many grains in the hybrid procedure is this one which gave the highest yield of grain - Coventry, and the low productive hybrid of the tested - Victoria has the lowest number of grains in order. The differences were statistically reliable.

Mass of 1000 grains is a qualitative indication indicating massiveness of grain. With the bulk grain in both areas is a hybrid Coventry, and the lowest absolute mass of hybrid Victoria.

From structural analysis designed can be concluded that a major influence on yield test hybrids had significantly less height of the stem as the main elements of the production and the productivity of grain - more grains in order and higher absolute weight of the grain.

Grain yields obtained in the three years of the study showed pronounced and statistically significant differences between test hybrids (Table 2). In the three years period and average lowest yield in both areas is derived from the earliest hybrid - Victoria.

The most highly productive features hybrid Coventry, where they are reported and the highest structural indicators on the cob and grain. An exception is 2007, which is non specifically – a dry and warm one (Kouzmova, 2009). This year in the region of Dobrich highest yield was obtained by hybrid Ademio, which is a group of FAO 400. This result is expected because the conditions in Southern Dobrudja is not possible for maize irrigation due to lack of water for irrigation of field crops for the region. Under these conditions in years with very dry and hot climate of the late growing hybrids is risky.

The influence of area on the productivity of maize grain is clearly expressed. And during the three years of study and average for the period in the region of Dobrich are obtained in high yields. The main reason for this may be sought in the more humid air during the vegetation in this region because its close to the Black Sea. Multi-variance analysis of yield shows a clear statistically significant effect of test factors - region, year, hybrid on the productivity of maize, both separately and interaction between them (Table 3).

Alone and combined influence of factors on the variation of grain yield is very strong in all factors - between 96.5 in the interaction region and hybrid, and 100% for the individual effects of the factors region and year.

<table>
<thead>
<tr>
<th>Hybrid, Region</th>
<th>Height of the plants, cm</th>
<th>Number of the row per cob</th>
<th>Number of the grains per row</th>
<th>1000 grains mass, g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>242.8</td>
<td>242.0</td>
<td>15.3</td>
<td>14.3</td>
</tr>
<tr>
<td>Anjou</td>
<td>259.3</td>
<td>255.5</td>
<td>15.6</td>
<td>14.6</td>
</tr>
<tr>
<td>Ademio</td>
<td>250.8</td>
<td>247.7</td>
<td>15.0</td>
<td>14.3</td>
</tr>
<tr>
<td>Agrister</td>
<td>205.6</td>
<td>199.2</td>
<td>16.6</td>
<td>15.6</td>
</tr>
<tr>
<td>Coventry</td>
<td>195.0</td>
<td>190.4</td>
<td>15.6</td>
<td>14.6</td>
</tr>
<tr>
<td>LSD 5%</td>
<td>4.8</td>
<td>4.2</td>
<td>0.7</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Multi-variance analysis of yield shows a clear statistically significant effect of test factors - region, year, hybrid on the productivity of maize, both separately and interaction between them (Table 3).
CONCLUSION

In both investigated areas higher yields are obtained from a hybrid Coventry, which is due to the larger number of grains in order and the higher absolute weight of the grain.

During extremely hot years and low amount of rainfall, in areas where irrigation is not possible, cultivation of hybrids later than FAO 400 group is not desirable. In such conditions should be preferred midle early hybrids.

In the three years of investigation and average for the period higher yields were obtained in Dobroudja region

REFERENCES


