REACTION OF PARENTAL LINES OF Ruse 555 MAIZE HYBRID TO THE AGRO–METEOROLOGICAL CONDITIONS OF IASS “OBARZTSOV CHIFLIK”–ROUSSE

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**Abstract.** Maize is a thermophilic and hydrophilic crop. In the region of IASS “Obraztsov Chiflik”–Rousse temperature conditions are favorable for its cultivation, and precipitation and its distribution during vegetation proved to be a limiting factor. The objective of the study was the contrasting influence of the agro–climatic conditions on the mass of 1000 seeds, hectoliter mass and germination of RL 61/31 and H–108 lines to be determined in relation to their seed production and as donors of valuable genes in breeding. The experiment was conducted at the Experimental field of IASS “Obraztsov Chiflik”–Rousse during the period 2006–2008. It was designed after the Block method, in four replications. The results obtained showed that mass of 1000 seeds, hectoliter mass and germination in both lines were the lowest in the year with significant drought. Germination in both lines was strongly influenced by the agro–climatic conditions.

**Keywords:** maize, parental components, stress, tolerance

**Introduction**

Every organism requires specific agro–climatic conditions for its normal development.

Deviations of some factors of the environment beyond the optimal ones in which the ontogenesis is performed leads to disturbance of their physiological activity and biological regime [TOMOV, 1990; VULCHINKOVA et al., 2000; BUTNARIU et al., 2012] reported that maize hybrids as heterozygous organisms were more tolerant to the adverse climatic conditions than lines as homozygous ones [BUTNARIU et al., 2012; BOSTAN et al., 2013].

Maize is a thermophilic and hydrophilic crop.

In the region of IASS “Obraztsov Chiflik”–Rousse the temperature conditions are favorable for its cultivation, and precipitation and its distribution during vegetation proved to be a limiting factor [RA, X et al., 2012].

The summary precipitation in June, July and August had the greatest influence on the magnitude of yield and productivity of maize [PCHELAROVA et al., 2010; TONCHEVA et al., 2010].

The objective of the study was the contrasting influence of the agro–climatic conditions on the mass of 1000 seeds, hectoliter mass and germination of RL 61/31 and H–108 lines to be determined in relation to their seed production and as donors of valuable genes in breeding.

**Material and methods**

The experiment was conducted at the Experimental field of IASS “Obraztsov Chiflik”–Rousse during the period 2006–2008.

It was designed after the Block method, in four replications, the size of experimental plot being 20 m² and of harvesting plot—10 m² [DIMOVA, 1999; PUTNOKY et al., 2013] after the adopted for the region agrotechnics, under conditions without irrigation.

As genetic material in it were tested: maternal parent of Ruse 555 hybrid–RL 61 31 lines and paternal parent–H 108.

The lines were tested in density of stand–5000 plants/da.

Average sample of 5 kg of ear maize was taken in phase “full ripeness” from every variant in order mass of 1000
seeds, hectoliter mass and germination to be determined. They were registered according to BSS ISO 7971–2–2000 and BSS 13358–76.

Results and Discussion
Agro–meteorological conditions during the three years of the study differed significantly in terms of precipitation (Fig. 1) and relatively the same temperatures were registered. The first year of study characterized with normal temperatures and even distribution of precipitation and favorable conditions during the vegetation of maize. The second year of the study characterized with the highest temperatures and drought during the vegetation period, as it was strongly expressed in April and June.

The temperatures during the last year of study were normal for the crop, but precipitation was unevenly distributed during the vegetation period (Fig. 2). Namely the more favorable humidity–providing of plants in 2006 determined the better growth and development of lines. Only for the period June–July when the phases: pollination and fertilization took place, the sum of precipitation was 103.9 mm.
During the same periods of 2007 and 2008, the sums of precipitation were 66.7 mm and 60.2 mm, respectively, almost twice less.

The greatest difference in distribution of precipitation was observed in April and August, when initial growth and filling the grain of maize took place.

The low values in April 2007 and August 2008 influenced the most negatively, as the initial drought affected more significantly the traits studied.

Mass of 1000 seeds is one of the most significant traits of seed qualities of crops.

It is defined via grain size and weight of grain. It is a variety trait and can be considered only within the variety [KALOSHINA, 1973; BAGIU, et al., 2012.

Variation of the trait within the variety is related to the growing conditions (soil fertility, climatic conditions, fertilization, irrigation, etc.) and the disposal of grains on the maize ear.

Mass of 1000 seeds is a trait, associated with yield and correlated highly with it.

Data about the trait was presented in Table 1.

It was obvious that decreasing the trait under the influence of drought in 2007 and as a result of the uneven precipitation in 2008, was stronger expressed in H–108 line and less–in RL 61 31 line.

Mass of 1000 seeds in both lines was highest in 2006–236.4 g for H–108 and 216.0 for RL 61 31.

The lowest value of the trait was observed in 2007–207.9 g (H–108) and 218.2 g (H–108), respectively.

Our results confirmed the previous studies on the influence of the agro–meteorological conditions on the absolute weight of seeds and the increase determined from 12 to 25% in the different groups according to FAO [PRESOLSKA, 1977].

<table>
<thead>
<tr>
<th>Lines</th>
<th>Mass of 1000 seeds, g</th>
<th>Hectoliter mass, kg/hl</th>
<th>Germination of seeds, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>H–108</td>
<td>236.4</td>
<td>218.2</td>
<td>224.0</td>
</tr>
<tr>
<td>RL 61 31</td>
<td>216.0</td>
<td>207.9</td>
<td>208.4</td>
</tr>
</tbody>
</table>

Hectoliter mass is a trait indirectly connected with seed production of maize, rather connected with its storage.

It is influenced by size, shape, relative weight, humidity, impurities, etc.

Data about that trait was presented in Table 1.

Results showed that H–108 had higher hectoliter mass, values being from 84.8 to 86.3 kg/hl, as during the three years of study it remained relatively constant.

Values about RL 61 31 were 72.2 kg/hl, 68.8 kg/hl and 70.9 kg/hl, for the first, second and third year, respectively.

In RL 61 31 line a higher variation of hectoliter mass was observed, as a significant decrease was registered in 2007.

Results about germination of seeds by year showed that in both of parental lines studied it was significantly lower in 2007.

In the other two years of study it remained relatively the same.

Conclusions

Analyzing the results obtained the following important conclusions were made:

1. Mass of 1000 seeds, hectoliter mass and germination in both lines were lower in the year of significant drought.

2. Under the influence of the agro–climatic conditions, the hectoliter mass decreased significantly in RL 61 31 line.
3. Germination in both lines influenced significantly by the agro–climatic conditions.
4. RL 61 31 line was more susceptible to drought and stronger reduced its parameters.
5. H–108 line was more valuable in breeding aspect in terms of drought.

References

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