

## THE INFLUENCE OF THE SEMI-DRY CLIMATE OF DOBRUJA ON THE MAIZE PRODUCTION

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**Key words:** Dobruja, maize, climate, irrigation

**Abstract.** Our country has a considerable importance among the maize cultivating countries. The surfaces cultivated have been thus: over 2525.8 thousand ha in 2007, 2449.5 thousand ha in 2008 and 2344.9 thousand ha in 2009, reaching an average yield of 1526 kg/ha in 2007, 3213 kg/ha in 2008 and 3406 kg/ha in 2009. According to the data published by MADR<sup>4</sup>, in 2010, maize was cultivated on 2108.7 thousand ha in Romania, with an average production of 4297 kg/ha.

### Introduction

Maize is part of the family *Gramineae*, subfamily *Panicoidae*, tribe *Maydeae*, species *Zea mays* L. (n = 10 chromosomes). In terms of economical importance, maize is third among the cultivated plants worldwide. It has a great production capacity, approximately 50% higher than other cereals. It also has great ecological plasticity which allows it a large distribution area, with considerable and relatively constant yields, less influenced by climatic changes. It is a good precursory for most crops. It is resilient to monoculture for several years.

For the objectives of this paper, the maize hybrids used were chosen from among those in the Official Catalogue of Plant Cultivars of Romania, the study being conducted in agricultural units located in the Dobruja Plateau. The results were compared to those obtained for maize hybrids cultivated in the Western Plain.

### 1. Material and method

For the objectives of this paper, the maize hybrids used were chosen from among those in the Official Catalogue of Plant Cultivars of Romania. The studies were conducted within agricultural units in the Dobruja Plateau, but also in Baragan and the Western Plain. The subject of the study was the maize requirements in terms of environmental factors, namely its demands regarding

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climate and soil. Also, the study paid attention to the cultivation technology applied during the vegetation period, as well as to the evolution of the climatic factors.

## 2. Results and discussion

In what regards the vegetation period, the cultivars grown in Romania need 50-85 days between springing and blooming and 60-70 days for the formation, growing and maturation of seeds, which makes a total of 110-155 days (in the south of the country). Nine groups of maturity were distinguished according to the vegetation period.

**Requirements in terms of climate and soil.** Maize is cultivated between 58° latitude in the north (Sweden) and 42° latitude in the south (New Zealand).

**Requirements in terms of temperature.** The maize seeds germinate at 8-10°C. If the soil temperature is lower, the seeds will rot because of the attack of saprophytic fungi.

If temperatures of 4-5°C occur after springing, growing stops, the chlorophyll degenerates and the plants die. Late frost destroys the leaves. At -4°C the plants are completely destroyed in 2-4 hours.

At blooming, the temperature must be between 18 and 24°C. If higher temperatures occur at this stage, a marked disparity will appear between the emergence of panicles and that of stigmas. Pollen viability decreases at 28 - 30°C. Temperature amplitudes of over 30°C by day and under 10°C at night, occurring during the 6<sup>th</sup> and 7<sup>th</sup> stage of organogenesis prevent the formation of anthers, and implicitly the development of pollen grains and the normal development of fecundation processes (Liliana Panaitescu, Simona Niță, 2011).

After fecundation, great temperature amplitudes disturb the accumulation of storage substances in the seed, which leads to the shriveling phenomenon. The best thermal conditions for maturation, between the yellow maturation and complete ripening, are 21°C.

For our country, the studies realized in Dobruja, Muntenia and part of Transylvania show that the highest yields are accomplished at the following temperatures: May 16 - 20°C; June 19 - 21 °C, July 20 - 23°C, August 19 - 22°C, September 14 - 17°C, fig.1.

**Requirements in terms of humidity.** During the first part of the vegetation period, maize is resilient to drought due to its strongly developed root system, to the specific reduced consumption, the xerophytic character of the aerial parts and repeated maintenance works. During the summer months, a maize field can evaporate daily up to 18 liters/m of water in July and August.

The critical water period is between June 10-20 and August 10-20, before the emergence of panicles and milk maturation, when the water consumption is up to

68-74% of the total necessary for the entire vegetation. At this time, the soil must have 60-80% water of the field capacity.

At the seed filling stage, the lack of moisture can lead to their shriveling, the critical interval being of 40-50 days.

J. HUMLUM established that the seed yield per hectare exceeds the average in the conditions of our country when the following distribution of precipitation is accomplished: May - over 40 mm; June 60 mm; July 60 mm; under 80 mm in August.

The optimal distribution of precipitation, according to the same author, is the following: May 60 - 80 mm; June 100 - 120 mm; July 100 - 120 mm; August 20 - 60 mm. It is important to know how much water the soil contains in spring in order to correctly establish the plant density.

**Requirements in terms of light.** Maize is a short-day plant and it grows well in intense light.

By extending into culture the hybrids with nearly vertical leaf position and which are better for greater densities, the coefficient of conversion of the solar energy will grow.

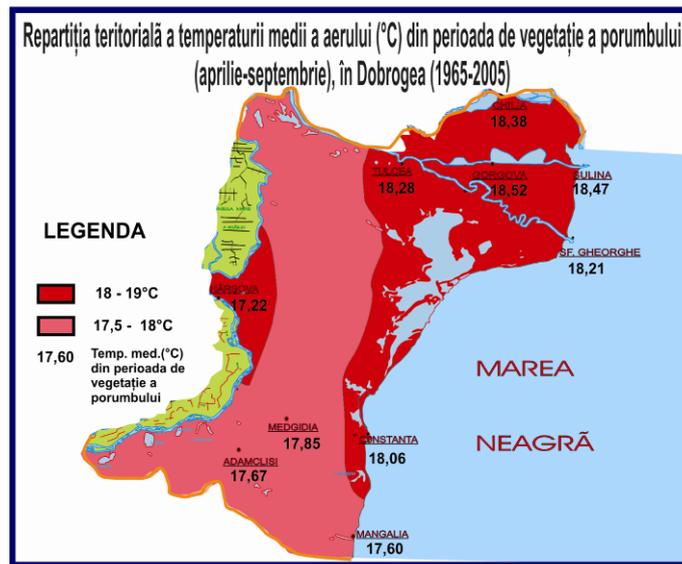


Fig. 1 - Map of the territorial distribution of average air temperature in the maize vegetation period in Dobruja

**Requirements in terms of soil.** The best results are obtained on clay and sandy-clay soils, with 3-5% humus, over 8 mg P<sub>2</sub>O<sub>5</sub>, Al over 20 mg K<sub>2</sub>OAl/100 kg

of soil, saturation degree = 75-90 % and pH = 6.5 – 7.5, deep, fertile, sandy-clay, which allow the development of a strong root system, capable of providing water and nutritive elements. Still, maize ensures yields on various soils. On soils with pH under 5.8, the application of amendments with calcium for the correction of acidic reaction is compulsory. The highest productions are obtained on different types of chernozems, preluvosols, alluvial soils, gleyosols and psamosols. The clay soils, which maintain more moisture, warm up slowly in spring and crack in summer breaking plant roots, are less favorable. Also less appropriate are hardened and compacted soils, as well as those containing hardpan, which require deep loosening works.

In what regards the productions, these were 6928.33 kg/ha on average, in conditions of no irrigation in Rasova, Constanta county, in the *Olt* and *Danubius* Romanian maize hybrids (7043.33 kg/ha in the *Olt* hybrid and 6813.33 kg/ha in the *Danubius* hybrid).

In Dorobantu, Constanta county, the average yield in three *Pioneer* maize hybrids was 8720.63 kg/ha in conditions of no irrigation (namely, 8846 kg/ha in PR 38 A24, 8651 kg/ha in PR 37D25 and 8665 kg/ha in PR 37Y12).

In Mihai Viteazu, Constanta county, the average yield in three *Pioneer* maize hybrids was 8272.33 kg/ha in conditions of no irrigation (namely 8308 kg/ha in PR 38 A24, 8245 kg/ha in PR 37D25 and 8264 kg/ha in PR 37Y12).

For comparison, the study included the behavior of these hybrids in Ialomitei Baragan, with the following results, in conditions of no irrigation: 8189 kg/ha in PR 38 A24, 8720 kg/ha in PR 37D25 and 8362 kg/ha in PR 37Y12, the average of productions for the three studied hybrids being 8423.67 kg/ha.

In the Western Plain, three maize hybrids were studied and these were the results: in the DKC 3759 hybrid, the production obtained was 9601 kg/ha, in the DKC 3511 hybrid, the production obtained was 11101 kg/ha, while in the DKC4626 hybrid, the production obtained was 11547 kg/ha. In the cultivation conditions of the Banat Plain, the average production obtained in the studied hybrids was 10749.67 kg/ha.

### Conclusions

Maize yields smaller productions in conditions of no irrigation, in the semi-dry climate of Dobruja, compared to the maize cultivated in Ialomitei Baragan.

In conditions of no irrigation, both in the semi-dry climate of Dobruja and in Ialomitei Baragan, maize yields smaller productions compared to the one cultivated in the Banat Plain.

The climate in the Banat Plain is more favorable to the cultivation of maize than the one in Dobruja.

Maize finds climatic conditions close to optimum in the Banat Plain, compared to the semi-dry climate of Dobruja.

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