

**SOME ASPECTS CONCERNING THE SUNSHINE DURATION
AND AIR HUMIDITY AT THE WEATHER STATION ORADEA,
DURING THE AGRICULTURAL YEARS OF THE
PERIOD 1992-2009**

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Abstract

In this paper, we analyzed the annual and monthly regime of sunshine duration and air humidity, at the weather station Oradea, during the agricultural years of the period 1992-2009. Their knowledge is of great importance in the agro-horticulture, particularly due to their role that they have on vegetable plants growth and development, especially on the development, production and exploitation of vegetables. The study showed that the average annual sunshine duration was of 2141.5 hours, the characteristic value of plain regions of our country. The year with the longest sunshine duration was 2007, the warmest agricultural year of the analyzed period, and that with the shortest duration was 1996, the rainiest year. The annual average relative air humidity is a quite high value (76%), due to orographic barrier role of the Carpathian Mountains in the way of moist air masses, oceanic. The highest annual values of relative humidity correspond to the highest values of precipitation and vice versa.

Key words: sunshine duration, air humidity, relative air humidity, agricultural year.

INTRODUCTION

The sunshine duration and air humidity are important meteorological elements that characterize the climate of a region.

The sunshine duration depends on movement of air masses, that gives the appearance of clear, cloudy or covered days, but also on local geographical factors – relief, presence or absence of forests, water surfaces etc. – that gives this climatic element, local variations.

The duration of sunshine determines the thermic and light regime of a region that is reflected in the structure and the natural setting of vegetation, soils, geomorphologic processes etc.

On the territory of the Western Plains – territory on which the Oradea weather station is located – the largest amount of water vapours comes from the advections of moist air masses, Atlantic, influencing especially its northern part or Mediterranean air masses, which can be felt especially in the Banat Plain. It is added the water evaporation over water surfaces and land with excess moisture, which makes an important contribution to local growth of air moisture (The Climate of Romania/Clima R.P.R., vol.I, 1962; Cristea, 2004; Mihăilă, 2006; Șerban, 2010).

MATERIAL AND METHODS

In this paper, we analyzed the annual and monthly regime of sunshine duration and air humidity, at the weather station Oradea, during the agricultural years of the period 1992-2009. In terms of air moisture, one of sizes that best defines this meteorological element is relative air humidity. Representing the degree of saturation of air with water vapours, expressed in percent, relative humidity has a great practical importance, best defining the degree of dryness or moisture of the air. Thus, it becomes an important indicator for characterizing the climatic regime of a region.

For the following analysis, there were used monthly and annual sums of sunshine duration, expressed in hours and the average monthly and annual values of relative air humidity, expressed in percentage, respectively. The meteorological data came from the archives of the National Administration of Meteorology.

The location of Oradea weather station in an agricultural region par excellence (Crişuri Plain) motivated us to draw up the following analysis on agricultural years (range from October to September), and not based on a calendar. The paper has thus, a practical aim, being useful for agrohorticultural professionals and producers of vegetables, as vegetable plants respond to variations of environmental factors, especially solar radiation. This is their main source of energy, which ensures on the one hand, the heat required for plants growth and development, and on the other hand, the light that if insufficient causes the extension of the vegetation season, the decreasing of dry matter, carbohydrates and vitamins content, and the reduction of production, delaying harvest (Domocoş, 2011).

RESULTS AND DISCUSSIONS

Duration of sunshine

As noted above, the annual regime of sunshine duration depends on the annual regime of cloudiness. At the Oradea weather station, between 1992 and 2009, *the average annual sunshine duration* rose to the value of 2141.5 hours. It was calculated for the agricultural years of the above-mentioned period. The value is characteristic for the plain regions of our country, where the total annual sum of sunshine exceeds 2000 hours. It is higher than the values of sunshine in the hills and mountains of the country, as cloudiness increases with increasing altitude, thus increasing the number of cloudy days.

During the period of 1992-2009, the annual duration of sunshine varied widely, the fluctuations being due to the general circulation of the atmosphere (fig. 1). Thus, annual values ranged between 1920.5 hours,

produced in the year with most cloudy days, 1996 and 2439.8 hours, toted up in the year with clearest days, 2007.

1996 was the rainiest agricultural year of the analyzed period (Şerban, Bei, 2011 a). As a result, the number of cloudy days was high this year. 2007 was the warmest agricultural year in the period 1992-2009 and was also a dry year. The number of clear days was high now (Şerban, Bei, 2011 a; Şerban, Bei, 2011 b).

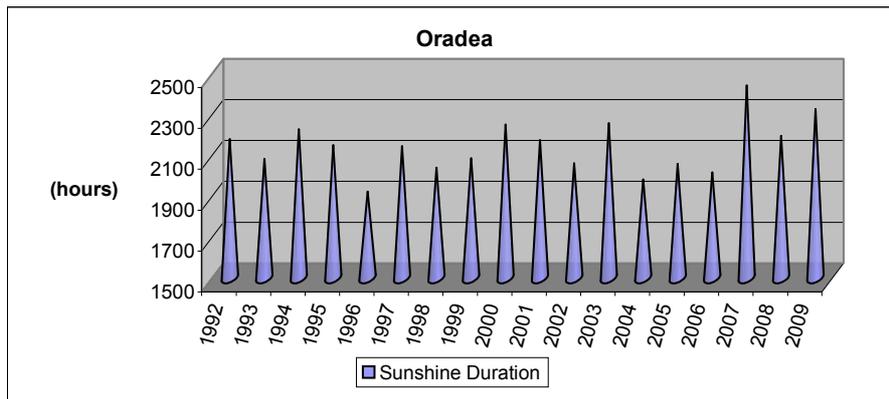


Fig. 1. The annual sunshine duration at the Oradea weather station, in the period of the agricultural years 1992-2009.

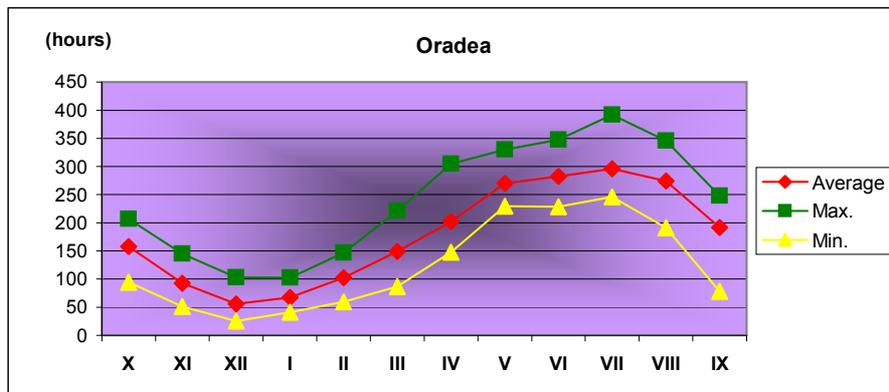


Fig. 2. The average, maximum and minimum monthly duration of sunshine at the Oradea weather station, in the period of the agricultural years 1992-2009.

It is noted that over the years, high values of annual sunshine duration were totalled in the interval 1992-1995 (about 2000-2200 hours), years that have registered smaller annual amounts of precipitation. Also, high values were totalled in the last three years of the analyzed period, 2007-2009 (about 2200-2400 hours), but in 2000 and 2003 (about 2250 hours), years with small amounts of precipitation (Şerban, Bei, 2011 a).

During the year, the average monthly values of sunshine duration are maximum in *July* (296.2 hours) and minimum in *December* (56.2 hours)

(fig. 2). The maximum of July is due to long duration of days and low cloudiness. The minimum of December is due to the smallest length of days and highest values of cloudiness. Monthly sums increase, generally, from December to July, as the day-duration increases, and then decrease towards the end of the calendar year, as the day-duration decreases.

The maximum monthly values of sunshine duration exceeded 200 hours, and even 300 hours (fig. 2). Thus, during April-August, the highest monthly sums ranged from 304.9 to 392.4 hours. The highest monthly sum occurred in July 1995 (392.4 hours).

The minimum monthly values of sunshine duration have fallen below 60 hours (fig. 2). The lowest monthly sums were recorded between November to February, i.e. during the winter and end of autumn months, when the length of day is small. The lowest monthly sum was of only 25.4 hours and occurred in December 1996.

Air humidity

At the weather station Oradea, *the annual average relative humidity* is 76% (period 1992-2009). It is higher than on the plain territories in the south and southeast of the country, due to the orographic barrier role which the Carpathian Mountains have in the way of moist air masses, oceanic, coming from the North Atlantic. Also, the station is located at higher latitudes than those territories to the south and southeast, so that relative humidity is higher, because its territorial distribution is opposite to that of air temperature, and the two meteorological elements are inversely proportional.

During the period 1992-2009, the annual relative humidity varied widely (fig. 3). Its progress of the curve is very similar to that of annual amounts of precipitation (Şerban, Bei, 2011 a). It is observed that the highest annual values of relative humidity correspond to the highest precipitation values and the lowest values, to the lowest annual values of precipitation. Thus, period with the richest air humidity is that of agricultural years 1997-2001, when the annual average reached very high values (79-82%). These were the rainiest years of the analyzed period.

The lowest values of annual humidity belong to the agricultural years 2003-2009, when the average annual values ranged from 68-74%. Precipitation was slightly lower than the previous period, now.

The year with the lowest value of relative air humidity was 2007 (68%), because it was the hottest agricultural year of the analyzed period. The year with the highest value was 1997 (82%), which was a very rainy (750 mm).

During the year, relative humidity has an opposite progress of the curve to that of air temperature, the two quantities being inversely

proportional. Average monthly relative humidity decreases from December to July, after growing until December (fig. 4). The maximum is signalled in *December*, at a value of 88%. It is in correlation with the cloudiness maximum, but also with the secondary pluviometric maximum and is due to advections of humid air, carried by Icelandic and Mediterranean cyclones over Europe. The minimum occurs in *July* (67%), when temperatures are highest.

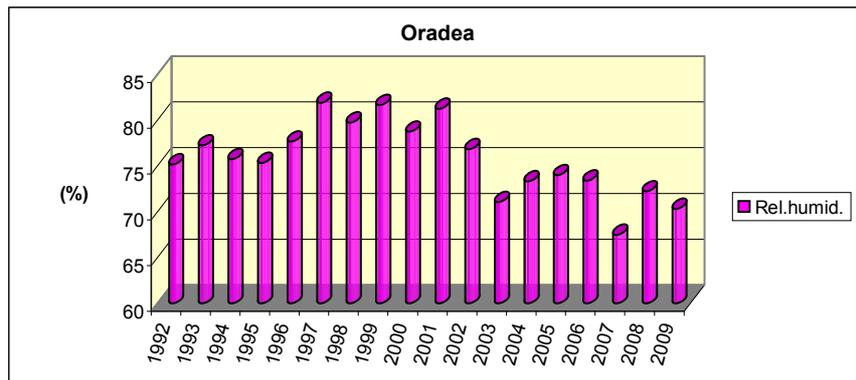


Fig. 3. The annual average relative air humidity at the Oradea weather station, for the agricultural years of the period 1992-2009.

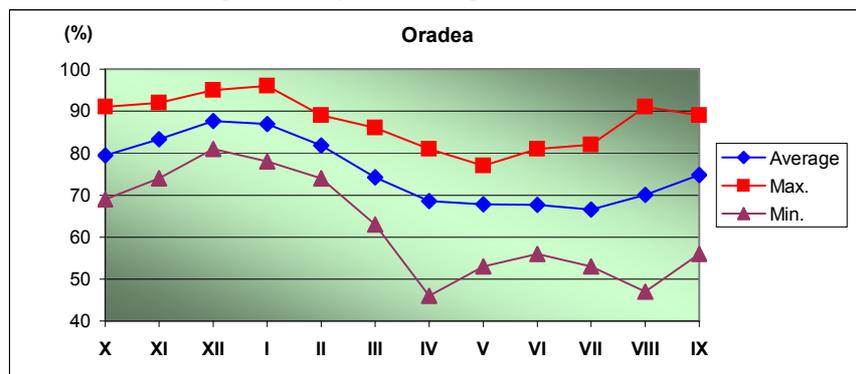


Fig. 4. The average, maximum and minimum monthly relative humidity of the air at the Oradea weather station, for the agricultural years of the period 1992-2009.

Generally, the winter and end of autumn months have the highest values of humidity. The cause consists of low air temperature and also high frequency of thermic inversions.

The maximum monthly values of relative humidity reached 91-96%, mainly occurring between October to January, and August (fig. 4). The maximum value of 96% was recorded in January 1997.

The minimum monthly values were below 60%. They were recorded between April to September (fig. 4). The lowest value belongs April 2007 (46%), i.e. to the warmest year of the analyzed period.

CONCLUSIONS

At the weather station Oradea, in the agricultural period 1992-2009, the average annual sunshine duration was of 2141.5 hours, the characteristic value of plain regions of our country. The year with the longest duration of sunshine was 2007, the warmest agricultural year of the analyzed period, and that with the shortest duration was 1996, the rainiest year. During the year, the sunshine duration shows a maximum in July (296.2 hours) and a minimum in December (56.2 hours). The maximum monthly values have exceeded 200-300 hours, while the minimum monthly ones dropped below 60 hours.

The annual average relative air humidity is a quite high value (76%), due to orographic barrier role of the Carpathian Mountains in the way of moist air masses, oceanic. The highest annual values of relative humidity correspond to the highest values of precipitation and vice versa. During the year, relative humidity shows a maximum in December (88%) and a minimum in July (67%).

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