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SECTION 10. Astronomy and space research.

THE EFFECT OF THE CLIMATE'S ELEMENTS ON THE SUN RADIATION IN BABYLON FOR 2014

Abstract*: In this study special equations had used for calculation the quantity of the solar radiation which incident perpendicular on the Babylon city, the benefit of this study is exploitation the solar energy by solar cell to get the electricity. The data of the weather from the meteorological station in College of Education for pure sciences contains the information of the Monthly average of the Solar Radiation with absence atmosphere H_0 (MJ/(m^2.day)), the Monthly Average of the theoretical solar radiance (hr) and Relative Air Mass M(z) from 1/ January / 2014 to 31/ December / 2014. The results of this study explains the effects of the climate's elements (degree of temperature and the relative of humidity), on the solar Radiation. In this study it be found that it can transform the solar radiation in the Babylon city to the electricity by using the solar cells because the high relative of the solar radiation falling in Babylon city*

Key words*: climate's elements, Sun Radiation and Babylon city*
Language*: English*
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Introduction

Solar radiation source of thermal energy which is emitted from the sun in the form of electromagnetic waves. And is a source of thermal energy of the universe - (satellites, earth and planets) and reaches of the solar beam us a small part of it. Solar radiation is divided into visible rays and invisible rays. There are several influential factors in connecting solar radiation to the earth's surface are:

1. fall of the solar radiation angle.
2. The length of daylight.
3. The face of the mountain slopes.
4. The purity of the air.

In this study, we will learn about the impact of climatic factors that affect the amount of solar radiation and the possibility of taking advantage of this radiation in electric power generation and utilization by solar cells

The data of the weather from the meteorological station in College of Education for pure sciences from January to December 2014

The data of the Solar Radiation of the Babylon city which was obtained from the meteorological station in Education for pure sciences College in Babylon University. this data was used for the calculations and diagrams that calculate the monthly average of the solar radiation with absence atmosphere H_0 , the monthly average of the theoretical solar radiance and the relative air mass. This calculations and diagrams will show information of Solar Radiation in the Babylon city. Look at the table (1).

Table 1

The data of the Solar Radiation in the Babylon city for 2014

Month	Monthly Average of the Solar Radiation with absence Atmosphere H_0 $(MJ/m^2.day)$	Monthly Average of the theoretical solar radiance (hr)	Relative Air Mass $M(z)$

1	January	19.64364066	10.14784815	0.957876263
2	February	24.82763992	10.8821888	0.857107249
3	March	32.17738958	11.92144922	0.762160161
4	April	37.81203181	12.83273765	0.716604141
5	May	41.729454	13.68210849	0.698956581
6	June	42.82640108	14.10679653	0.696622747
7	July	41.21962654	13.87697116	0.69743467
8	August	37.20677834	13.11247089	0.708612311
9	September	31.4953311	12.13693744	0.748283623
10	October	25.15436905	11.14014487	0.828893124
11	November	19.93017363	10.29706023	0.935043219
12	December	17.72986775	9.892257158	0.999733785

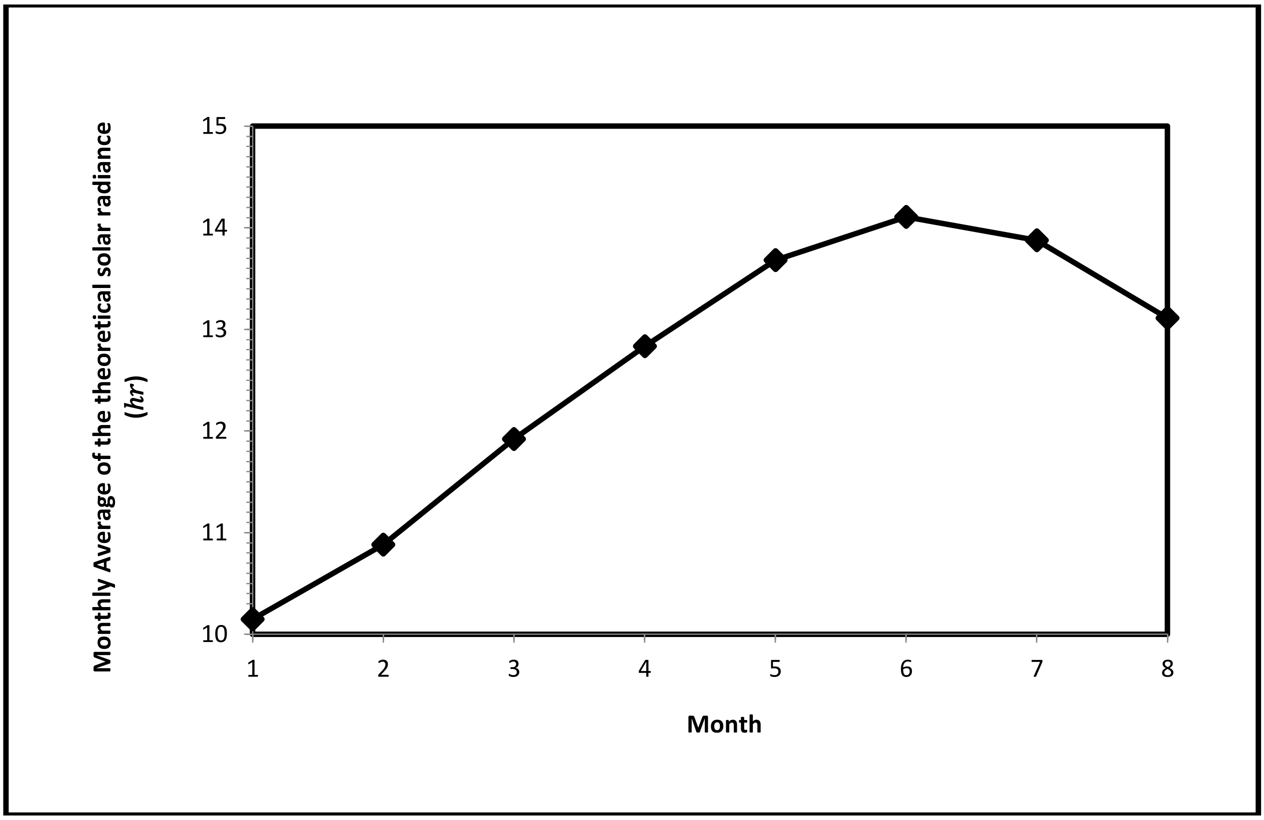

Figure 1 - Diagram of the Monthly Average of the theoretical solar radiance in Babylon city for 2014 .

At the general, the values of the Monthly Average of the theoretical solar radiance in the Babylon city to be distinguished by height in all months especially in May, June and July. But it is slightly low in January and February.The total Average of the theoretical solar radiance in Babylon city is 12.057032 hr.

The effect of change in temperature and relativity Humidity on the solar radiation.

The quantity of the solar radiation which arriving to any point in the earth is final resultant for any angle of the solar ray and the period of solar radiance therefore there are many of equations which used to expression The quantity of the solar radiation which arriving to the earth.

The Angstrom equation is very important equation. It used to calculation the quantity of the solar radiation and the period of solar radiance.

$$\frac{H_{cal}}{H_0} = a + \left(b \cdot \frac{S}{S_0}\right) \quad (1)$$

H_{cal} is the quantity of the total solar radiation which incident perpendicular on the earth.

H_0 is the solar radiation outside the atmosphere.

S is the period of the practical solar radiance.

S_0 is the period of the theoretical solar radiance.

a and b is a constants, it is dependent on the place of city.

For the place of Babylon city $a = 0.0379$ and $b = 0.5389$ these constants has a no unit.

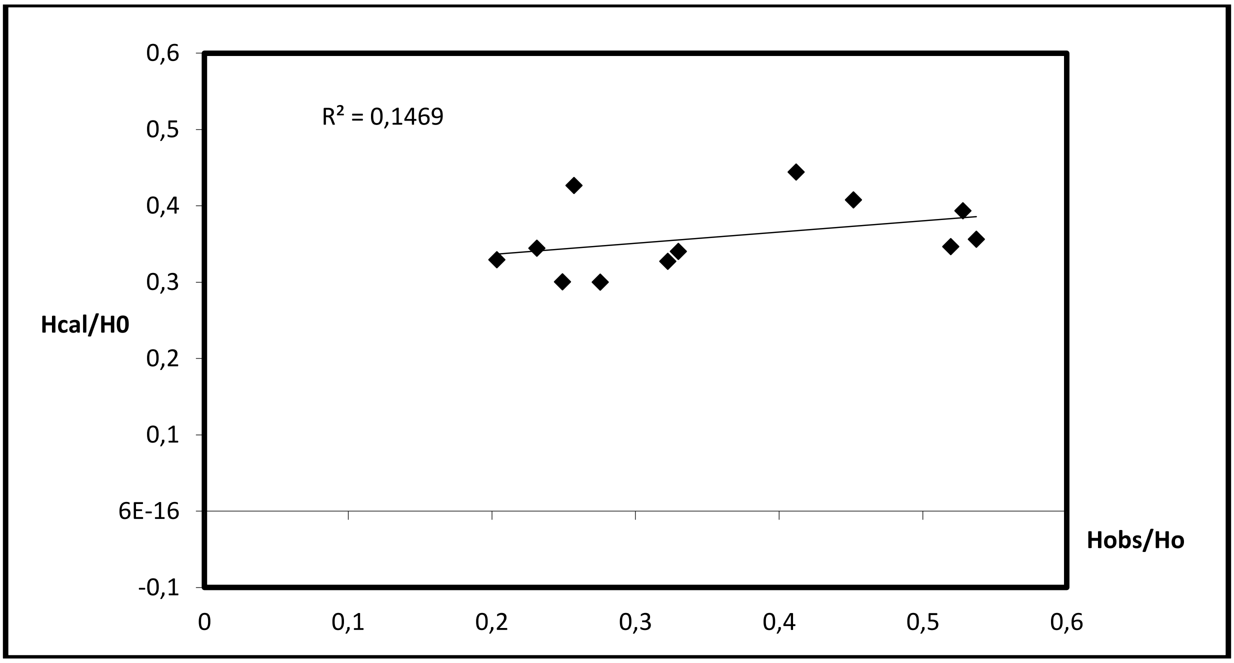

Figure 2 - The slope between the relative of the incidence solar radiation in Equation (1) with the relative of the absorbent solar radiation in the Babylon city in 2014.

When we take the climatic inductions on the incidence solar radiation (degree of temperature and the relative of humidity), we will get the following equation:

$$\frac{H_{cal}}{H_0} = 0.511 + \left(0.664\frac{S}{S_0}\right) - (0.013T_{av}) - (0.005R.H_{av}) \quad (2)$$

$$\frac{H_{cal}}{H_0} = -0.215 + \left(0.516\frac{S}{S_0}\right) + \left(-\frac{3.279}{T_{av}}\right) + (0.015R.H_{av}) \quad (3)$$

$$\frac{H_{cal}}{H_0} = 1.999 + \left(-1.63\frac{S}{S_0}\right) + (0.015T_{av}) + \left(-\frac{30.562}{R.H_{av}}\right) \quad (4)$$

$$\frac{H_{cal}}{H_0} = 0.208 + \left(-0.023\frac{S}{S_0}\right) + \left(\frac{5.651}{T_{av}}\right) + \left(-\frac{3.768}{R.H_{av}}\right) \quad (5)$$

$$\frac{H_{cal}}{H_0} = 1.306 + \left(0.874\frac{S}{S_0}\right) + (-0.021T_{av}) + (-0.006\, R.H_{av}) + (-0.026[T_{max} - T_{min}]) \quad (6)$$

$$\frac{H_{cal}}{H_0} = 0.216 + \left(0.587\frac{S}{S_0}\right) + (-0.011T_{av}) + (0.009R.H_{av}) + (0.004[R.H_{max} - R.H_{min}]) \quad (7)$$

$$\frac{H_{cal}}{H_0} = 11.899 + \left(1.838\frac{S}{S_0}\right) + (-0.165T_{av}) + (-0.161R.H_{av}) + +(-0.11[T_{max} - T_{min}]) + (0.029[R.H_{max} - R.H_{min}]) \quad (8)$$

And when we sketch the figures of these equations with the absorbent solar radiation, we will get following figures:

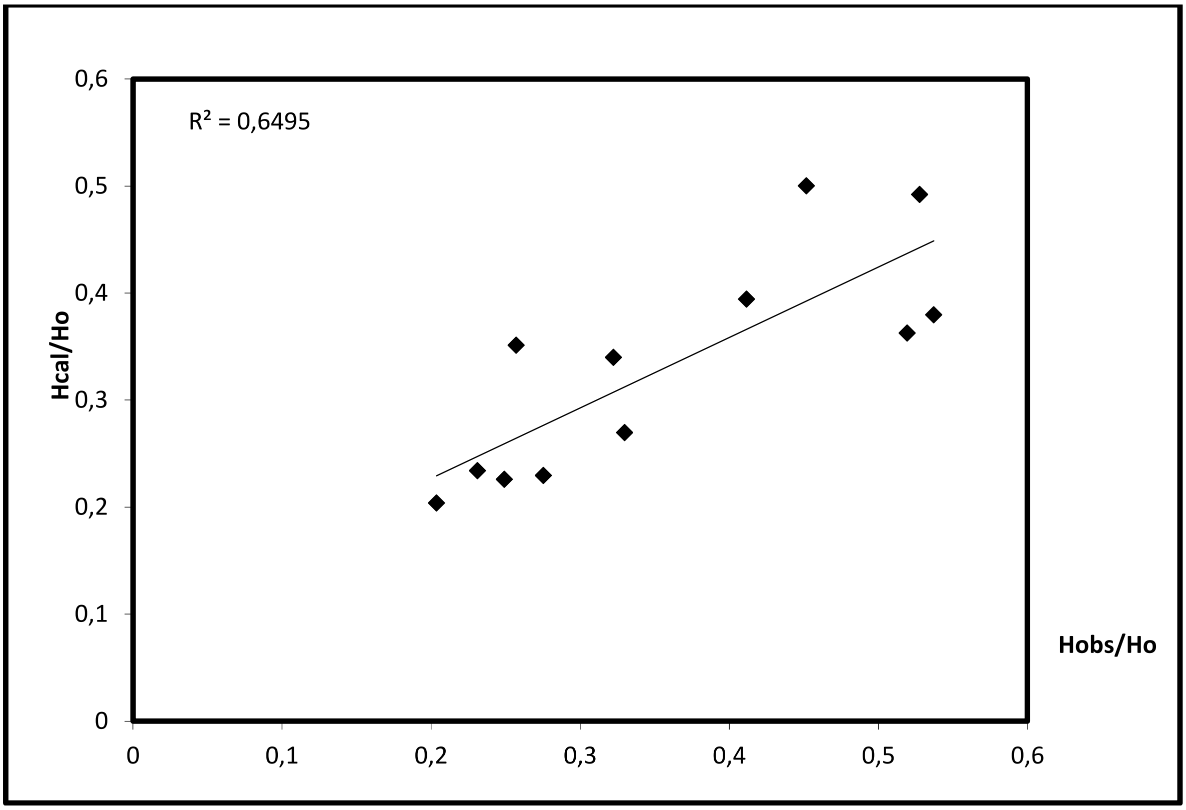

Figure 3 - The slope between the relative of the incidence solar radiation in Equation (2) with the relative of the absorbent solar radiation in Babylon city for 2014.

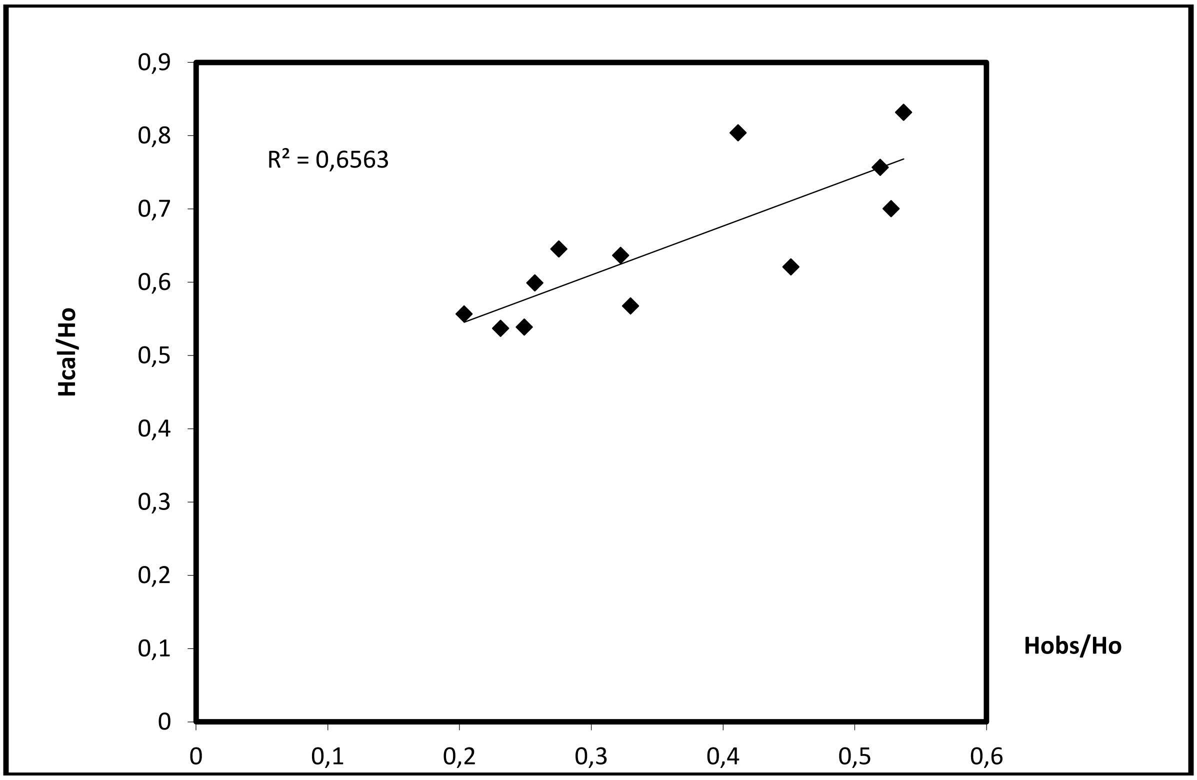

Figure 4 - The slope between the relative of the incidence solar radiation in Equation (3) with the relative of the absorbent solar radiation in Babylon city for 2014.

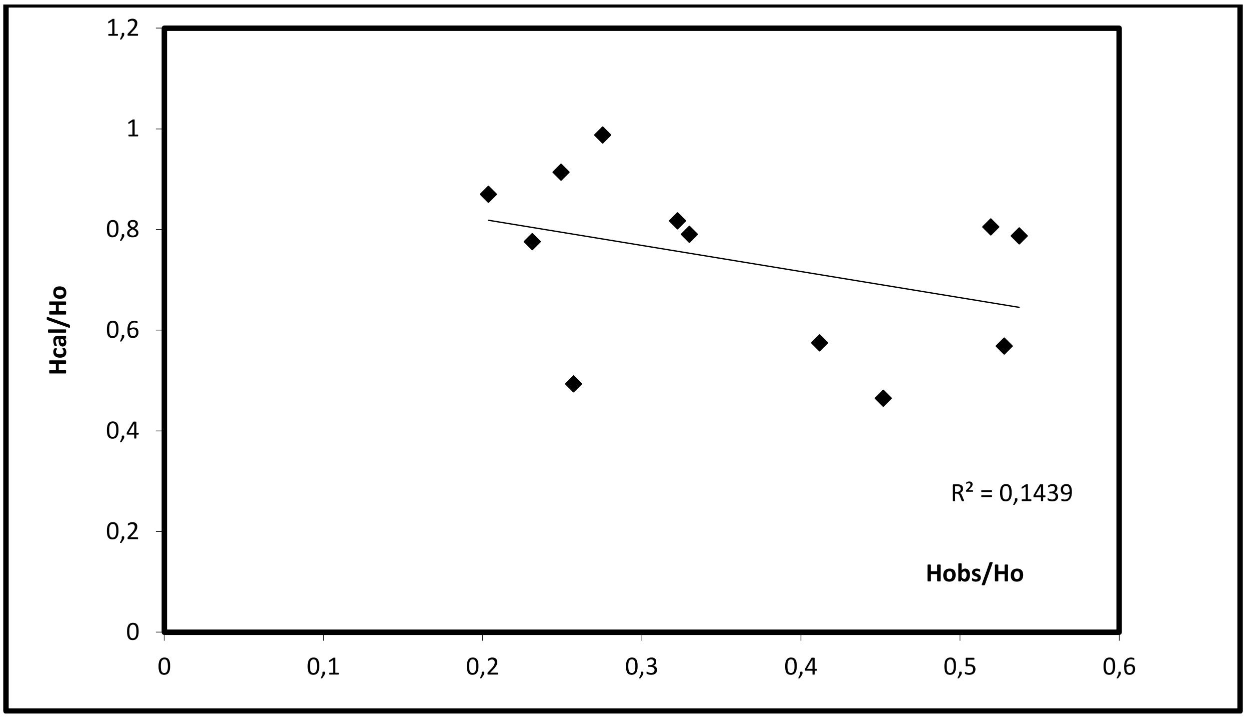

Figure 5 - The slope between the relative of the incidence solar radiation in Equation (4) with the relative of the absorbent solar radiation in Babylon city for 2014.

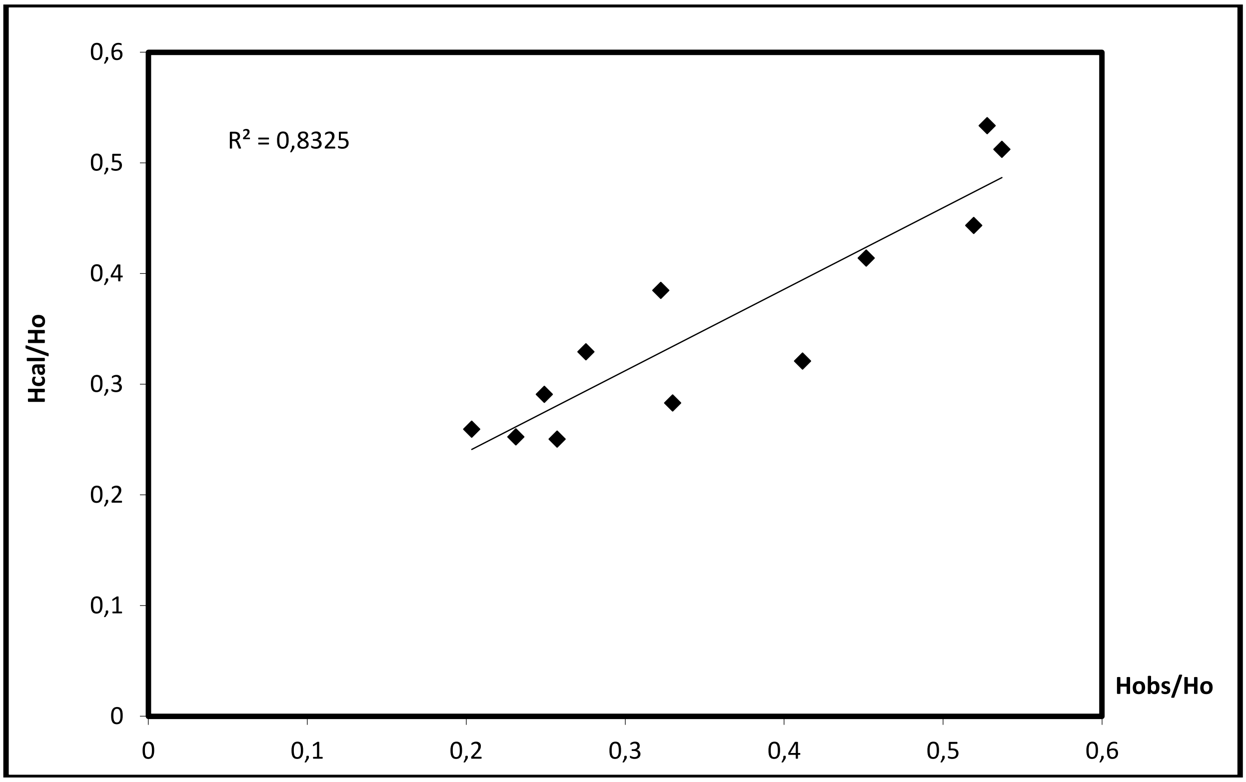

Figure 6 - The slope between the relative of the incidence solar radiation in Equation (5) with the relative of the absorbent solar radiation in Babylon city for 2014.

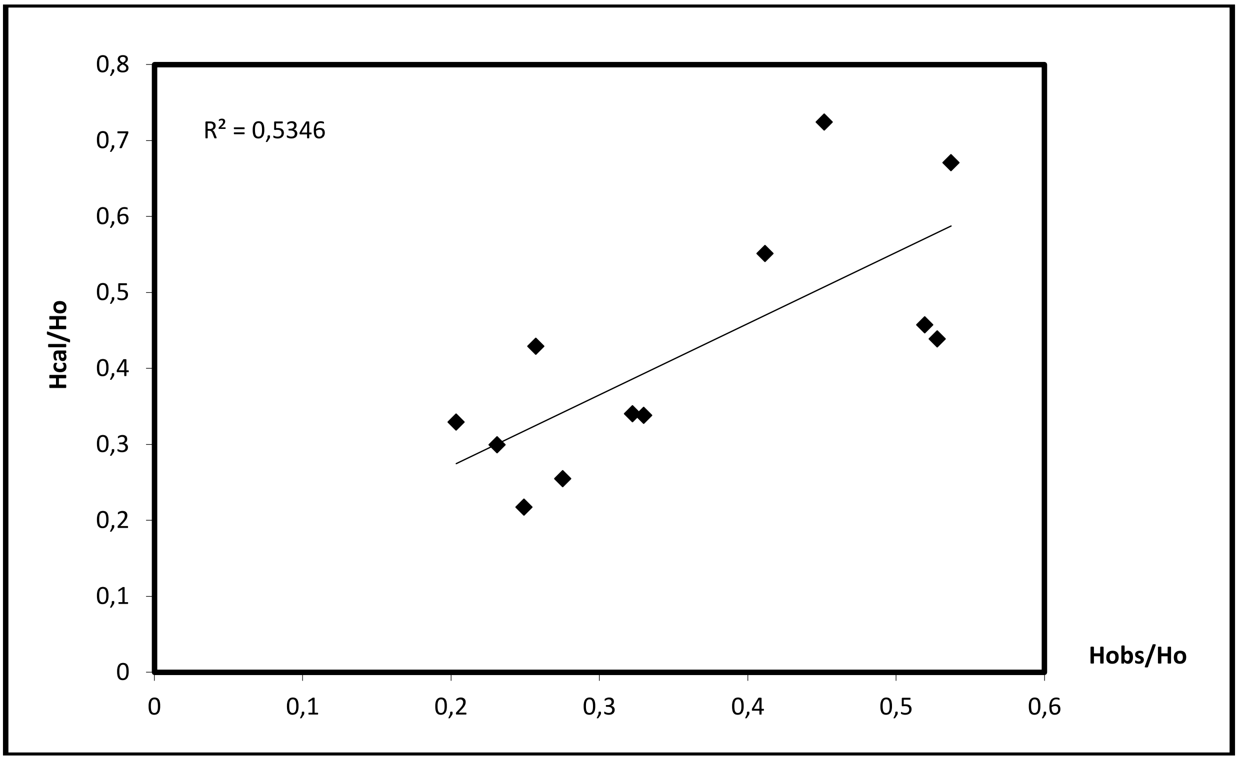

Figure 7 - The slope between the relative of the incidence solar radiation in Equation (6) with the relative of the absorbent solar radiation in Babylon city for 2014.

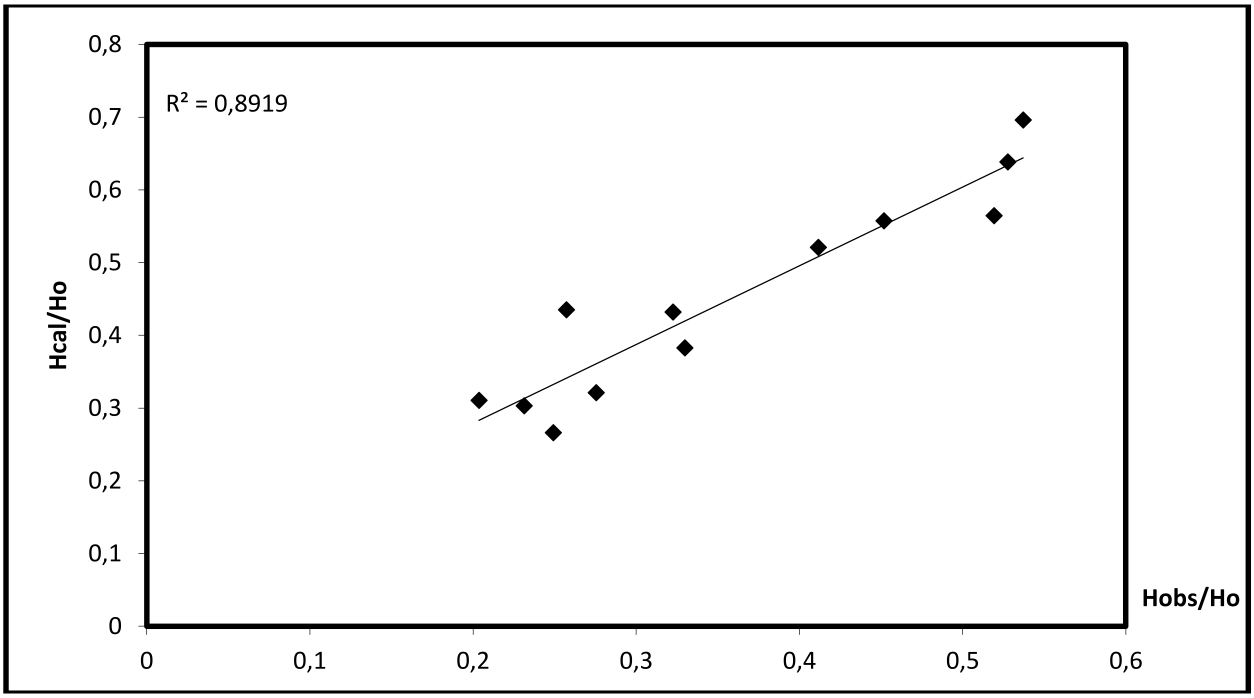

Figure 8 - The slope between the relative of the incidence solar radiation in Equation (7) with the relative of the absorbent solar radiation in Babylon city for 2014.

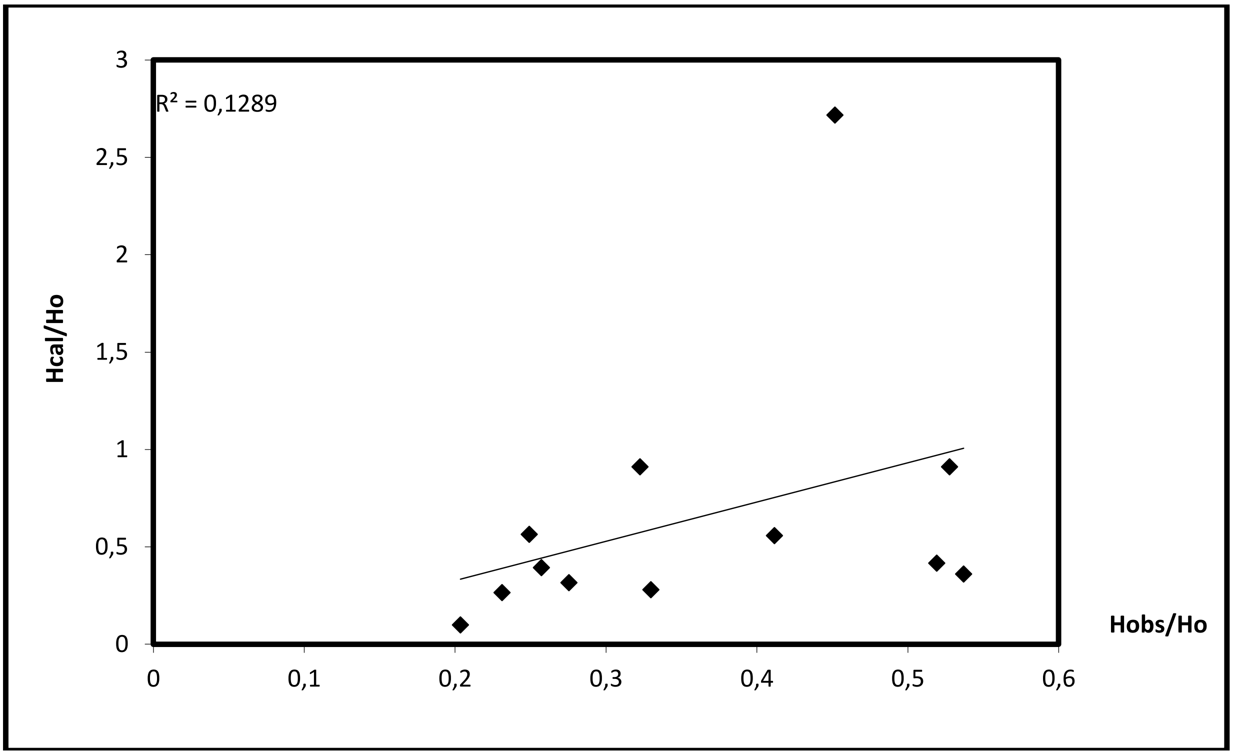

Figure 9 - The slope between the relative of the incidence solar radiation in Equation (8) with the relative of the absorbent solar radiation in Babylon city for 2014.

Discussion

The average value of the solar radiation in the Babylon city in 2014. is relative law in the winter and first of the spring (January, February, March and April) but it is high in the summer and last of the spring (May, June, July and August).

In the winter, the average value of the solar radiation is between$(19 - 38\ \mathrm{MJ/m^2.day})$, and in the summer it is between $(37 - 43\ \mathrm{MJ/m^2.day})$, this is because place of Babylon city in the earth and the angle of the incident solar ray, this angle is inclined in the winter beside the sky is full of clouds and rains and the humidity is high.

In the summer, the angle of the incident solar ray is perpendicular, the sky is clean and the humidity is law therefor the average value of the solar radiation is high.

The Monthly average of the solar radiance effects on the solar radiation too, it is between $(10 - 13\ hr)$ in the winter and it is between $(13 - 14\ hr)$ in the summer.

Conclusions

1. The average value of the solar radiation in Babylon city for 2014. is equal $(30.979392\ \mathrm{MJ/m^2.day})$, and the monthly average of the solar radiance is equal $(12.05\ hr)$, we can get 358.56 watt for any square meter of Babylon city in about $(12.05\ hr)$ if we get competent solar cell:

$$30.97939\frac{\mathrm{MJ}}{\mathrm{m^2.day}} = \frac{30.97939 \times 10^6\ \mathrm{J}}{\mathrm{m^2.(24 \times 60 \times 60)sec}} = 358.56\frac{\mathrm{J}}{\mathrm{m^2.sec}} = 358.56\frac{\mathrm{watt}}{\mathrm{m^2}}$$

2. From the data of the table (1), when the monthly average of the solar radiance is maximum and the relative air mass is minimum the solar radiation become maximum, and when the monthly average of the solar radiance is minimum and the relative air mass is maximum the solar radiation become minimum.
3. The maximum average value of the solar radiation is equal $(42.8264\ \mathrm{MJ/m^2.day})$ in the summer in August and the minimum average value of the solar radiation is equal $(19.6436\ \mathrm{MJ/m^2.day})$ in the winter in January.

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