Acta Universitatis Sapientiae
Agriculture and Environment, **2**, (2010) 17–22

# The effect of some environment factors on the growth of sweet pepper

Zsuzsanna Tóthné TASKOVICS[1]
email: tothne.zsuzsanna@kfk.kefo.hu

Ferenc OROSZ[2]
email: oroszferenc67@gmail.com

András KOVÁCS[1]
email: kovacs.andras@kfk.kefo.hu

[1]Kecskemét College, Faculty of Horticulture,
Institute of Floriculture and Vegetable growing, Hungary

[2]Department of Horticulture,
Faculty of Technical and Human Sciences,
Sapientia University, Tg. Mureş, Romania

Manuscript received 15.07.2010; revised 06.09.2010, accepted; 10.09.2010

**Abstract.** The forced white sweet peppers for stuffing are important export items in Hungary. Increasing market requirements need variety specific technologies. Therefore, it is important to gather detailed information of the environmental factors influencing pepper growth to obtain high quality and quantity without neglecting profit. In our trials the effect of some environmental factors were studied on pepper berry growth. Measurements were performed in a heated plastic tent with the white pepper variety Hó in a soilless culture. Data were registered by Phytomonitor.

It could be stated that:

- berry growth depends decisively on light intensity and plant temperature
- berry growth varies between 0,2 mm/day and 2,4 mm/day
- berry growth in greatly influenced by the maximal and minimal plant temperature and trends.

Data can help us to approach optimal environmental conditions in order to obtain higher quality and yield.

**Keywords:** global radiation, plant temperature, berry growth

# 1 Introduction

Vegetable forcing is one of the most intensive branches of horticulture. In this way, in all conditions of growing technology it is possible to provide the plant with the most optimistic growing conditions. The optimal temperature for sweet pepper preconditions other ideal environment factors. Such factors are very infrequent in the forcing periods. Light is the most important environment factor, but we cannot influence it economically. Therefore we have to adjust other factors to the all-time light conditions.

The growth of plants is determined by several environment factors. Heat, light, water and nutriments are the most influential. Light and temperature are crucial factors. If one of the environment factor changes others should be changed accordingly in order to avoid worse crop quality [4]. To achieve the best growth and yield it is important to adjust other environment factors to all-time light conditions. Sweet pepper is sensitive to the lack of light, the crop is poorly set, the vegetation is longer, bloom and harvest are getting later [3]. If light is stronger than that it should be, set is fewer and berries are less developed, nodes are short and the crop is low and distorted [4]. Sweet pepper is a $C_3$ plant and the intensity of photosynthesis is increased only up to a certain intensity of light. The maximum berry growth (impregnation) happens at 300-400 $W/m^2$ light intensity [1, 2].

During our research the main goals were as fellows:

- to determine optimal plant temperature in different forcing periods in regard to radiation so that the growth of berries would be ideal.
- to determine the extreme high temperature in a certain period where berry growth stops
- to find the optimal night temperature where the intensity of growth is optimal

# 2 Materials and Methods

Light is one of the environmental factors that can be least influenced by the growers. Due to this, plant temperature was studied in accordance to light together with the tendency of berry development. Phytomonitor was used for our observations. By the use of this instrument stress situations in forcing can be revealed right after their appearance. Numeric values can be traced continuously. Growers can use these data to solve actual problems.

We carried out our research in temperature controlled green house, in hydroponics. The variety applied was Hó $F_1$.

The instrument can measure and register environment factors (global radiation, air temperature, soil temperature and soil moisture) and plant parameters (stem expansion, berry growth, plant temperature, water cross flow in the stem. We studied sweet pepper berry growth during different phases of forcing.

## 3 Results and discussions

We looked at the measured data in different intensity of radiation and wanted to see how much is the berry growth in accordance with plant temperature. The below figures (1, 2, 3) show some examples.

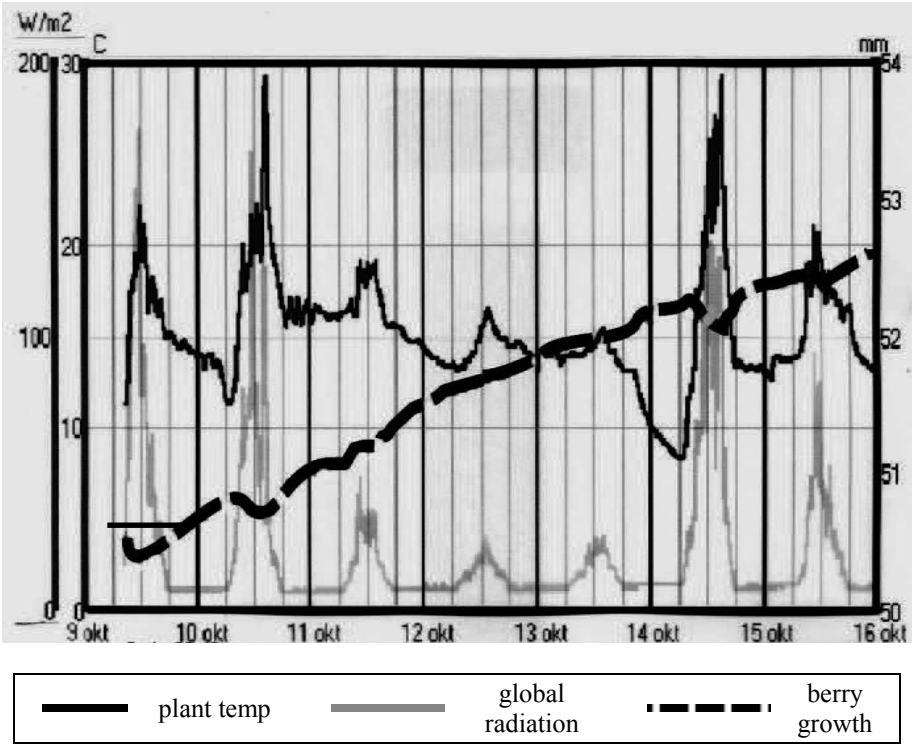


Figure 1: Change of sweet pepper plant temperature and berry growth in 100–200 W/m$^2$ radiation phase

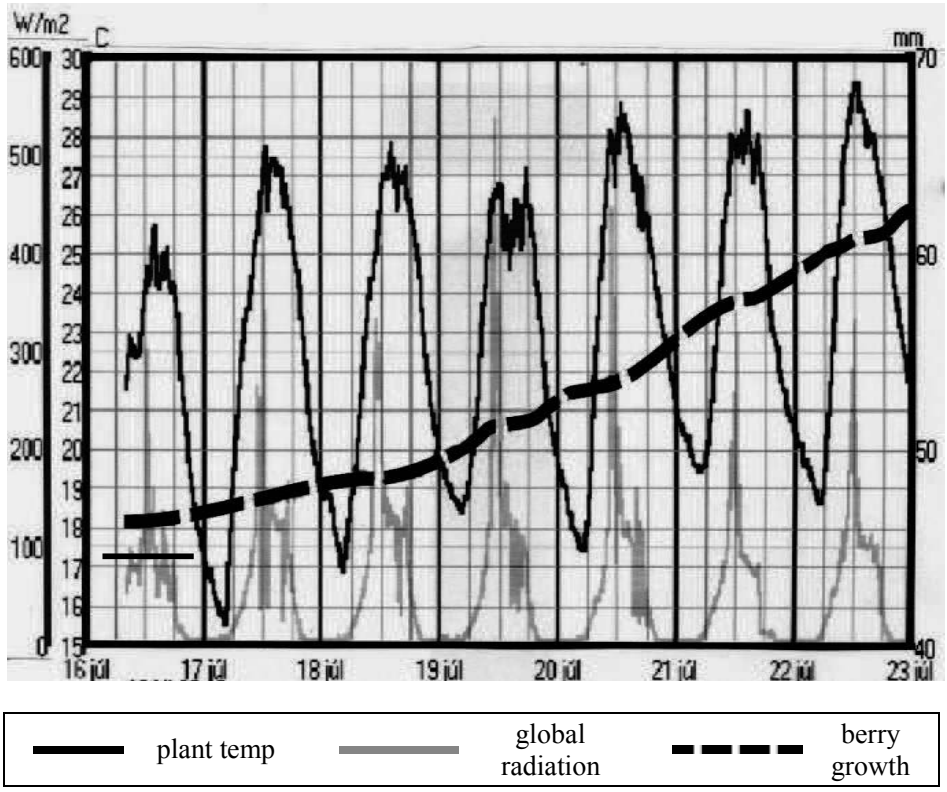


Figure 2: Change of sweet pepper plant temperature and berry growth in 200–300 W/m$^2$ radiation phase

Based on the data we obtained berry growth was calculated which grower will have in certain radiation intensity in optimal and less optimal conditions (Table 1.).

According to the table we can conclude that radiation intensity and plant temperature largely effect the growth of berries. In low light periods with low radiation index (max. 100 W/m$^2$) and at 18–20 °C plant temperature berry development is ideal. If plant temperature is higher berry growth is less is optimal at this temperature intensive. Above 400 W/m$^2$ radiation intensity the optimal plant temperature for optimal berry growth is 24–26 °C. If plant temperature is higher the berry growth will be less.

Table 1: Interrelation of berry growth and plant temperature at different radiation intensity

| **radiation intensity W/m²** | **berry growth mm/day** | | **plant temperature °C** |
|---|---|---|---|
| 0–100 | high | 0,44 | < 18–20 |
| | low | 0,127 | > 20 |
| 100–200 | high | 0,867 | < 20–21 |
| | low | 0,308 | > 21 |
| 200–300 | high | 2,37 | < 22–23 |
| | low | 0,277 | > 23 |
| 300–400 | high | 2,09 | < 24–25 |
| | low | 0,02 | > 25 |
| above 400 | high | 1,92 | < 25–26 |
| | low | 0,03 | > 27 |

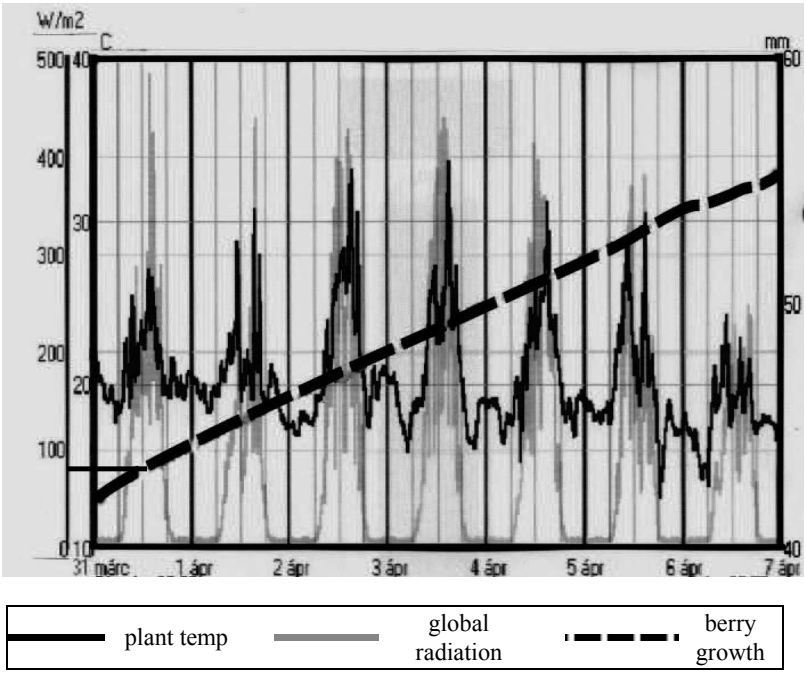


Figure 3: Change of sweet pepper plant temperature and berry growth in 400–500 W/m$^2$ radiation phase

## 4 Conclusion and suggestions

Based on our research we can conclude the followings:

- daily rate of berry development grows up to 400 W/m$^2$ radiation.
- berry growth mostly depends on light intensity and plant temperature
- the rate of berry growth is 0,4–2,37 mm/day depending on the intensity of radiation and optimal plant temperature
- berry growth is also influenced by the maximum and minimum plant temperature and the type of the change.

Considering the above results we can provide optimal environmental factors which result a better quality and bigger crop. The economic advantage of these findings is that growers can adjust the heating to the light conditions. In this way they can save energy and insure the optimal conditions for berry growth.

## References

[1] Kovács, A. and Tóthné Taskovics Zs. (2002), Néhány környezeti tényező hatásának vizsgálata a paprika növekedésére (konferencia kiadvány). Alföldi Tudományos és Tájgazdálkodási Napok, Mezőtúr.

[2] Pethő, M (1994), Mezőgazdasági növények élettana. Mezőgazdasági Kiadó, Budapest 57-59.

[3] Zatykó L. (1994), Étkezési paprika. in Balázs S.: Zöldségtermesztők kézikönyve 226-256. Mezőgazda Kiadó, Budapest.

[4] Zatykó, L. (2000), Paprika. in Balázs S.: A zöldséghajtatás kézikönyve 200-207. Mezőgazda Kiadó, Budapest.