Scientific Papers, UASVM Bucharest, Series A, Vol. LIII, 2010, ISSN 1222-5339

RESEARCH REGARDING THE USE OF A FAR-INFRARED HEATING TECHNOLOGY OVER THE ENVIRONMENT (II)

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Keywords: *far-infrared heating, growth of plants*

Abstract

The paper presents the results obtained in the frame of an applicative research contract upon the use of ecological, biogenetic heating technology of far-infrared kind, with the purpose of using it in Romania in different domains of activity.

In the climatic conditions of our country, we proposed and performed a measurement program in the following fields: electric expenditure, the adaptability to the climatic specifics, microbial loading of air, effects over plants, effects over pets, prolusions over general health and comfort status of human being. In this article we present the results above the greenhouse, the micro-climate measurements, and effects over plants and over microbial loading of air from the space in which we used this type of heating system (during 2007-2009).

In the rely of this research, we are in right to affirm that this type of heating technology has benefic effects in preserving the homogeneity of the micro-climate conditions, in the growth of plants and assures an easily growth of hygiene of the environment in which it acts.

INTRODUCTION

Nowadays, most of infrared sources are using short wave lengths (type A infrared), outputting high temperatures and having the specific that the brown to red color radiation is observable only near the sources of output.

As a benefit of the actual improvement of technology, there have been developed panels with wide length infrared radiations of 10.000 nm (type C infrared) that fulfill European laws and standards. The distance where these radiations can be observed is 3.5-4.5 m, with generated temperatures of 150°C. The exterior surface of these panels can have different colors, with different esthetic properties related to owner preferences and can also be placed in different positions, according to the specific of the room that is being heated.

The implementation of wide length infrared generator panels in glasshouses has been done after a literature research study. The glass materials are retaining ultraviolet and infrared radiations. The plastic materials are less transparent for infrared radiation and far red radiation. Polyethylene films and PVC films have a poor capacity of thermal isolation compared with glass materials.

The results applied on practical conditions reveal that this technology can be successfully implemented in different activity domains like agriculture (greenhouses and animal husbandry farms), industry (constructions, wood manufacture, food industry) commercial spaces heating systems, houses heating systems, all mentioned above applications are at the beginning of implementation and in a continuous development.

MATERIAL AND METHODS

By its purposes, the research activity intends to reveal the vegetable crop efficiency under the influence of artificial generated wide length infrared radiations. The results will serve for further practical perfection of the technology in the general term of modern agriculture and also to determine the entire effect caused by the long term use of the new technology on all levels: soil composition, seeding process, plant development and air composition.

The vegetable crops where cultivated in pots, with the notification that the experimental plot was emplaced in classic „Prinz-Dokkum" glasshouses from Baia Mare, Romania. Each of the mentioned above experimental factors where emplaced in a 36 m^2 surface variant.

The following observations where made:

- On-line monitoring of microclimate for the following parameters: temperature - about 22 °C, and relative air humidity - about 55%;
- Seedling and monitoring of 7 vegetable species (tomatoes, sweet peppers, egg plants, cucumbers, cabbage, turnip cabbage and onion) and 4 flower species (salvia, nemesia, primula, amaryllis);
- Phenological and biometrical measurements have been taken periodically;
- General monitoring of the greenhouse regarded as artificial ecosystem;
- Photographic recordings of growth and development stages;
- Prevailing and editing a data base with different electronic devices;
- Daily monitoring of the process executed by qualified personal (engineers and overseers specializes in horticulture and agriculture).

RESULTS AND DISCUSSION

Presented as images and graphics, we have obtained results during 2009, February - July period, from the glasshouse.

As we can see in the graphics below, the temperature is about 22°C and the highest temperatures inside the greenhouse where recorded at noon time. The relative air humidity inside the greenhouse is about 55% and it is negatively related with the inside temperature, also the highest percentage has been observed in the morning time. Once with the increase of temperature during the day time the relative air humidity decreased.

The seeds of tomatoes were planted on the 10th of February, and the first harvest has been recorded on the 16th of June from the new area. There has been registered a maximum of 10 flower- levels in this area, while, at the same time, in control area have been recorded only 5 flower-levels. The first harvest in control area has been on the 1st of July, while, at the same time, in new area there has been picked the fourth harvest and also there has been noticed a mass ripening of the fruits.

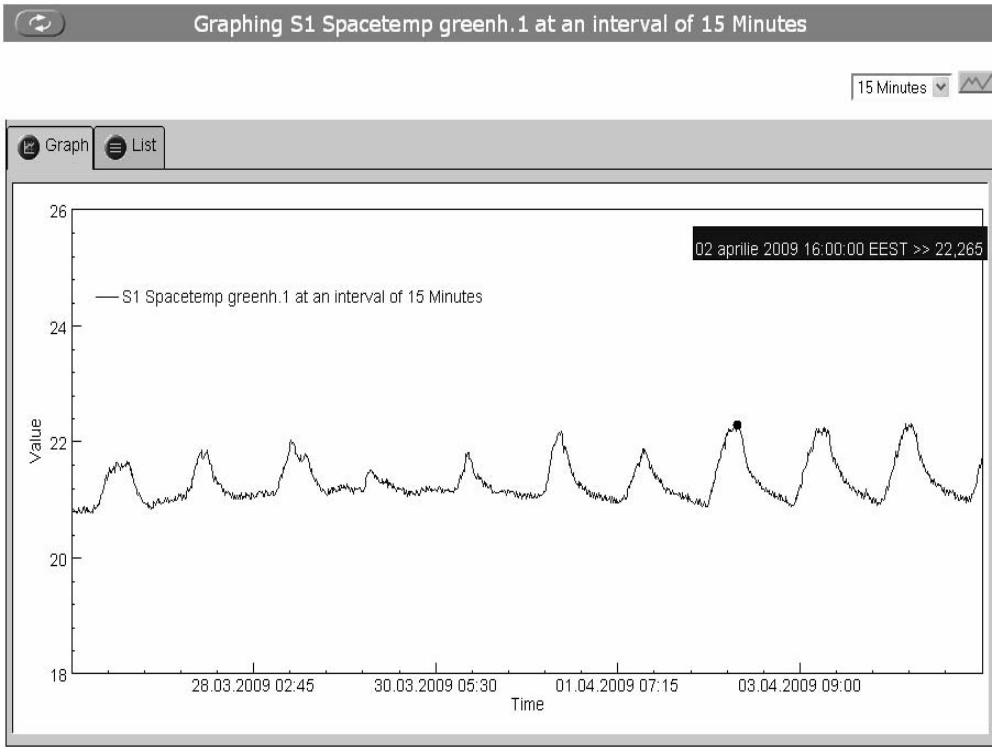

Fig. 1. Automatic graph example created by the computer

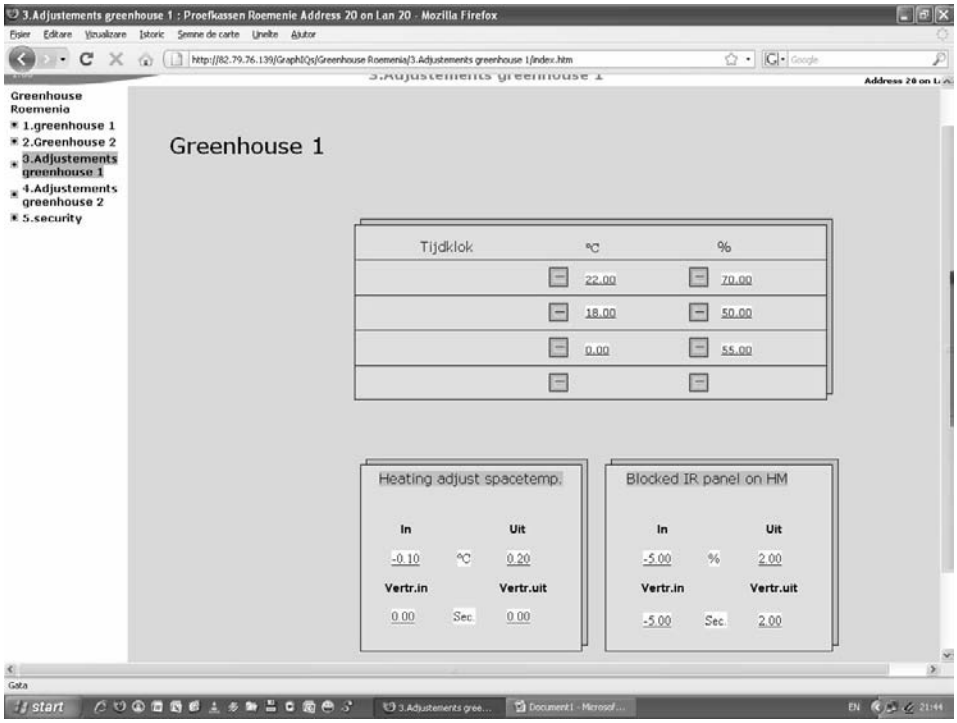

Fig. 2. Working method

Fig. 3. Tomatoes – *Lycopersicum esculentum*

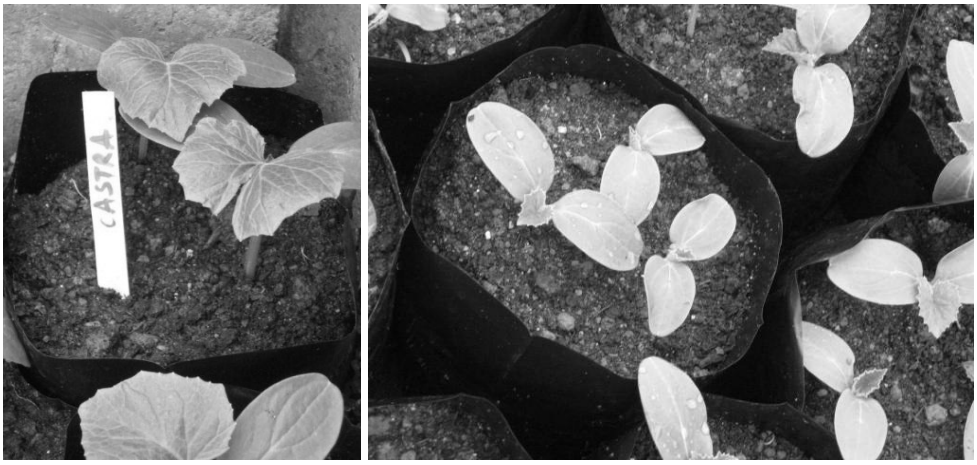

Fig. 4. Cucumbers - *Cucumis sativus*

Fig. 5. Measurements in the greenhouse

CONCLUSIONS

In actual conditions, considering the European strategy in the energy and gas emissions domains, the research results show that long-waved infrared technology:

1. is clean, efficient, non polluting emission technology;
2. can be used in a very large scale of domains;

3. is just at the beginning of the research when being used in the agro-industrial applications;
4. has benefic effects over the organisms (human, animal and vegetal), effects that can be fragmental quantified for the moment;
5. it can be successfully implemented in Romania.

Research in this domain is to be continued because of the multitude of the less known phenomenon and the limits that appear when using a new technology. Also time is a factor that is not to be neglected.

ACKNOWLEDGEMENTS

The research has been supported by the Research Contract 20081/17/10/2008 and Research Contract 57/15/10/2007.

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