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ASPECTS REGARDING THE USE OF A FAR-INFRARED TECHNOLOGY OVER THE ENVIRONMENT

MIRELA COMAN

North University of Baia Mare

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Abstract

In the last decades, there have been developed lamps with far-infrared radiations emission (about 10,000 nm). This paper presents the results obtained in the great frame of an applicative research contract upon the use of far-infrared technology, with the purpose of using it in Romania in different domains of activity.

Monitoring a greenhouse microclimate using far-infrared lamps has proved that the lamps create an optimum atmosphere for the air temperature, humidity and ventilation, for speed in seeds germination and plants growth. For cucumbers, as an example, there has been noticed a continuous benefic difference in growing when far-infrared radiations have been used. Plants have developed wonderfully in dimensions and color, strength, extend on the vertical wire. There has been registered a maximum of length of the plants and the crop. The obtained results show that by using far-infrared radiations it can be created a specific microclimate, different from the classic microclimate, which help plants growing up. Also, considering the European strategy in the energy and gas emissions domains, the research results show that far-infrared technology is an innovative one.

INTRODUCTION

We have learned from the sun and have created different artificial sources of radiation. Some of them, infrared, are called A, B or C. In all these cases, solid corps around get heated and pass on to the surroundings the heat absorbed from the source. Therefore, the whole environment can be warmed by the solid corps that it contains (Boltzmann, 1900, Ruiter, 1980, Bunget, 1988, etc.).

In the last decades, there have been developed systems with far-infrared radiation emission about 10,000 nm (type C) which respect European energetic laws and standards. So we can implement such lamps in glasshouses (in our experiment we have noticed that the glass materials are retaining ultraviolet and infrared radiations), the usual plastic materials are less transparent for infrared radiation and far red radiation.

The obtained results applied on practical conditions reveal that far-infrared technology can be applied in agriculture (greenhouses and animal husbandry farms) but can be also adopted for others domains [2].

MATERIAL AND METHODS

Vegetables were cultivated in pots, with the notification that the experimental plot was placed in classic „Prinz-Dokkum" glasshouses from Baia Mare city, Romania.

Monitoring the greenhouse microclimate proved that air temperature, within thew 18°C to 24°C interval, was optimum for seed germination and plant growth. There were simple fluctuations of temperature inside: early in the morning, before the sun rising, the recorded temperature was minimal. Usually, in the afternoon, the recorded temperature was maximal.

The following observations where made:

- general monitoring of the greenhouse regarded as an artificial ecosystem;
- seedling and monitoring of 7 vegetable species (tomatoes, sweet peppers, egg plants, cucumbers, cabbage, turnip cabbage and onion) and 4 flower species (sage, nemesia, primula, amaryllis);
- phonological and biometrical measurements have been taken regular;
- photographic recordings of growth and development stages;
- prevailing and editing a data base with different electronic devices.

RESULTS AND DISCUSSION

For cucumbers, as an example, there has been observed a continuous benefic difference in growth when far-infrared radiations have been used (Table 1).

The seeds of cucumbers have been planted on 12th of February and the first harvest has been recorded on the 22nd of April (69 days from seed to mature fruit) from the far-infrared area, while from the sample area the first harvest has been recorded on the 6th of May (83 days from seed to mature fruit). It has been noticed that the plants that have grown up in the far-infrared environment do not significantly suffer if they are moved in other environments and they also well fructify.

The plants were harmoniously developed in dimensions and colors, strength and have also extended on the vertical wires. There has been registered a maximum length of the plants of about 130 cm in far-infrared area, while, at the same time, in control area have been recorded only 50 cm length and after two weeks have been recorded a maximum length about 70 cm. The color of the flowers was a nice yellow, magnetized for bees and the others pollinate insects. The dimensions of the fruits of this kind of cucumber, Regal F1, recorded usually sizes for their kind.

As we can see (Table 1), we have noticed that far-infrared environment help cucumbers to generate earlier harvest and finish well their life-cycle.

Table 1

Cucumber crop (*Cucumis sativus,* L.)

Date	Far-infrared	Sample
12.02	planted seeds	planted seeds
18.02	came up; 2 leafs; H= 2.5 cm	no one came up
20.02	2 leafs + buds; H= 3.5- 4.5 cm	came up 80%
25.02	3 leafs (curly leaflet); H=5-6 cm	2 leaflets
04.03	put into own bag	3 leafs (curly leaflet); H=5-6 cm
11.03	4 well develop. leaves; first tendril; H=7-8 cm	3 leafs (curly leaflet); H=5-6 cm
18 .03	have tendril about 4-5 cm	2-3 leaves; appeared the pest; H=3 cm
25 .03	lies on the string; 5-6 leaves Hmax=23 cm; D=5-6 mm	not very well develop.; 4 leaves; H=4-6 cm; D=4-5 mm
01.04	*first flower bud* had appeared	4-5 leaves; Hmax=18 cm; Have=8 cm; D=5-6 mm
15.04	starting to produce fruits Lmax.= 8 cm; Gmax.=4 cm	*first flower bud* had appeared; Have=17 cm; D=6-7 mm
22.04	*first harvest*; Lmax=12 cm; Lave=10 cm; D=3-4 cm.	mass flowering; Have=30 cm; D=8 mm
29.04	second harvest; H max plant=120cm; Hmave=80 cm; for cucumbers: Lmax=12 cm; D=3-4 cm;	first little cucumber; Have plants=35 cm; Dcuc.=8 mm
06.05	third harvest; H max plant=120 cm; Have=90 cm; cucumbers: Lmax=13.5 cm; D=3-5 cm	*first harvest*; Have=45 cm;cucumber: Lmax=8.5 cm; Dmax=3 cm
13.05	fourth harvest; H max plant= 130cm; Have=9 0cm; cucumbers: Lmax=13 cm; D=3-5 cm; the plants are ill	second harvest; Have=50 cm;cucumber: Lmax=9 cm; Dmax=3 cm; 90-95% fruits
20.05	fifth harvest; H max plant=130 cm; Have=90 cm; cucumbers: Lmax=15 cm; D=3-5 cm;	third harvest; Have=50 cm;cucumber: Lmax=9.5 cm; Dmax=4 cm
26.05	sixth harvest; H max plant= 130cm; there are flowers; cucumbers: Lmax=13.7 cm; D=3-5 cm	fourth harvest; Hmax=70 cm; stagnation; cucumber: Lmax=13 cm; D=3-4 cm
02.06	seventh harvest; H max plant= 130cm; there are flowers; cucumbers: Lmax=10.5 cm; D=3-4 cm;	fifth harvest; Hmax=70 cm; stagnation; cucumbers are missing
10.06	eight harvest; there are flowers; started to yellow the leaves; cucumbers: Lmax=10 cm; D=3-4 cm;	sixth harvest; stagnation; cucumbers: Lmax=8 cm; d=3-4 cm; diminish the fruits
16.06	nienth harvest; flowers + yellow leaves;	seventh harvest; stagnation
24.06	no fruits; there are flowers at the top of the fruits	eight harvest=1 cucumber; stagnation

CONCLUSIONS

The results show that a selected type of far-infrared radiations can create a specific microclimate, different from the classic microclimate. This new environment helps plants growth. Also, considering the European strategy in the energy and gas emissions domains, the research results show that far-infrared technology produce the following:

1. The germination period is shorter for the species cultivated under the influence of far-infrared radiations compared with the classic cultivated species.
2. For cucumber were noticed important differences in growing up.
3. Can be used in the agro-industrial applications.
4. Can be successfully implemented in Romania agriculture domain.

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, especially for producing our daily food.

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