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THE INFLUENCE OF RADIATION REFLECTED BY EMCOPAD DOCTOR TECH DEVICES ON TOMATOES ON A WELL-AERATED PERLITE SUBSTRATE

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Abstract

The study was conducted in the Hortinvest greenhouses of the University of Agronomic Sciences and Veterinary Medicine-Bucharest and refers to the use of a device that is the subject of a patent, published internationally and which was used experimentally in a tomato crop, in the system unconventional, on perlite substrate. We noticed a faster growth of tomato fruits following the application of EMCOPAD-Doctor Tech devices compared to the variant not exposed to the reflected electromagnetic field. The differences in physiological maturation compared to the untreated variant were 4-5 days when the device was placed directly on the immature fruit and 4 days when it was placed directly on the stem of the plant near the insertion of the inflorescence. The aim of the study was to identify new methods to shorten the fruit ripening period, non-aggressive.

Key words: *EMCOPAD-Doctor Tech, tomatoes, fruit, perlite substrate*

INTRODUCTION

Environmental conditions, such as climate change and pollution, as well as the population explosion, directly affect plant crops. Remedying these issues through industrial treatments and solutions has deepened these problems. For these reasons, researchers in the field have had to find innovative solutions to improve crop quality.

Magnetotherapy or electromagnetic field therapy is known as a healing method used since ancient times, it is even mentioned in Indian Vedas.

In the case of plants, the application of magnetotherapy is just beginning. However, there are enough studies to show the positive effects of using electromagnetic fields on plants at different stages of their cultivation.

Through this paper, we aim to analyse the effect of electromagnetic fields on the cultivation of tomatoes, by reducing the period of development and ripening of the fruit.

Research on the influence of seed exposure to different intensities of the magnetic field has shown its beneficial effect on pea seeds (Dobrescu et al., 2000), *Zea mays*, barley or other fruit species (Rochalska, 2005; Rochalska & Orzeszko-Rywka, 2005).

Maffei (2014) mentions that plants feel different wavelengths of light and react to electrical signaling, but can not escape the effect of the geomagnetic field.

Recently, based on the beneficial effect of the magnetic field on plants, there has been a special interest from many researchers (Occhipinti et al., 2014).

Jedlička et al. (2015) demonstrated the impact of extremely low frequency electromagnetic fields on the germination of tomato seeds (*Solanum lycopersicum* L.) as well as plant growth.

EMCOPAD DOCTOR TECH/PEM - PASSIVE DEVICES The original devices called EMCOPAD Doctor Tech/PEM-Coherent ElectroMagnetic Patches, made in accordance

with the patent published under number PCT-WO/2018/037379, were used.
In medicine they are activated by the energy imbalance manifested by a high electrical potential from the acupuncture points above which they are located.
The devices start to act when they are placed on the acupuncture points in imbalance and cease to function when the energy balance is achieved. If they remain on the body, they will resume their action when another imbalance occurs.
Between the periods of activity, a waiting state is installed, which is manifested by the lack of any electromagnetic effect.
The devices are used in medicine but, in 2020, they were also tested in tomato cultivation on the 'Cheramy' cultivar.
The advantage of field interaction allows an approximate positioning of the devices on the plant. The device is maintenance-free, does not wear out and has an indefinite duration of use for normal use.
The operation of the device does not require materials, batteries or charging electricity from the mains.
The use of the devices does not oblige the expenditure on consumables, the simple positioning above the points being sufficient.

MATERIALS AND METHODS

The preliminary study was carried out in Hortinvest greenhouses, in the cultivation of tomatoes on perlite substrate with granulation of 5mm diametre, well aerated, during October-December 2020. We chose the inflorescences with the same number of fruits. We used the EMCOPAD-Doctor Tech divais that was placed when the fruits were formed, according to the experimental variants: V1 Witness; V2-EMCOPAD-Doctor Tech placed on the first fruit of the first inflorescence; V3-EMCOPAD-Doctor Tech placed on the sixth fruit of the first inflorescence; V4 EMCOPAD-Doctor Tech located at the base of the plant stem; V5-EMCOPAD-Doctor Tech located next to inflorescence 1; V6 EMCOPAD-Doctor Tech located next to inflorescence 2.
We followed the location of the technical maturation after its placement of fruits until their physiological maturation, fruit size, fruit mass as well as nitrate content.All data were interpreted statistically as well as the correlation between experimental variants and fruit size. We used in the experiment the 'Cheramy' cultivar, with undetermined growth, with fruits of about 16-20 g, and can be harvested in bunches.

RESULTS AND DISCUSSIONS

Analysing the obtained data, we could see that in the case of placing EMCOPAD-Doctor Tech on the fruit, its mass increased compared to the rest of the fruits in the inflorescence but also compared to the mass of the first fruit in the case of the control variant. Its mass was 20.18 g at V2 compared to V1 - control of 15.2 g. If we look at the average mass of fruits in the inflorescence we could see that there were differences compared to the control variant, most fruits having higher average masses (Figure 1).

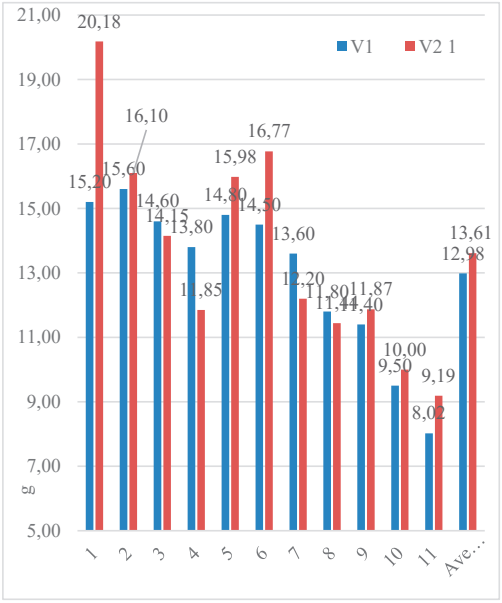

Figure 1. Influence of EMCOPAD application (V2) to control variant (V1)

In the case of V3- EMCOPAD-Doctor Tech placed on the sixth fruit in the first inflorescence we found that the fruit in the inflorescence had an average weight of 18.23 g, higher than the control variant of 14.5 g. We

found that the average mass of all fruits was higher than the control variant (Figure 2).

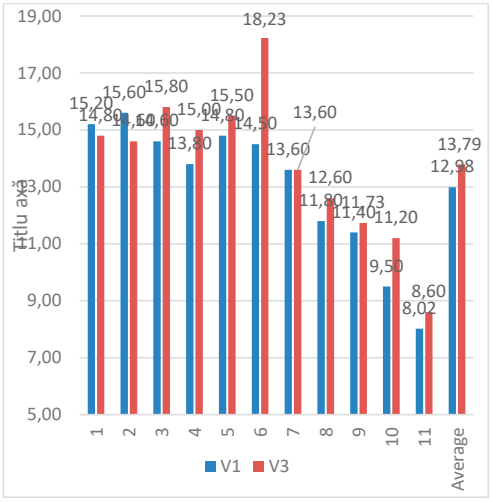

Figure 2. Influence of EMCOPAD-Doctor Tech application (V3) to control variant (V1)

If we placed EMCOPAD-Doctor Tech (V4) at the base of the plant stem, we also found an increase in the mass of fruit on the plant, which is 8.7 g for fruit 11 compared to 8.02 g for V1. On average, in the case of variant 4, the average mass of the fruit was 13.74 g compared to the control V1 of 12.98 g (Figure 3).

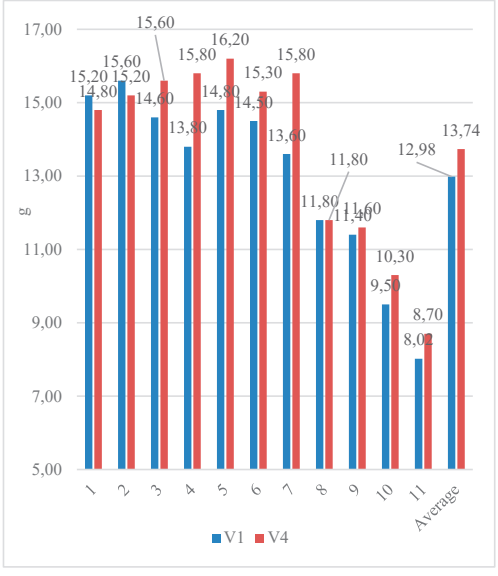

Figure 3. Influence of EMCOPAD application (V4) to control variant (V1)

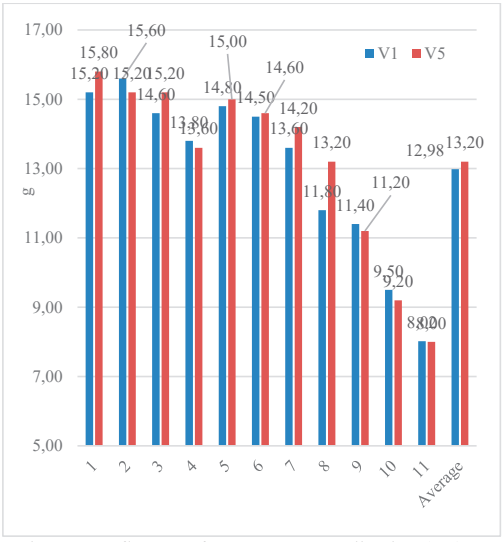

Figure 4. Influence of EMCOPAD application (V5) to control variant (V1)

In the case of the EMCOPAD-Doctor Tech V6 variant located next to inflorescence 2, we found the same tendency to increase the mass of fruits in the inflorescence. We found that, on average, the mass of the fruit was higher, of 13.45 g/fruit in the variant to which we applied EMCOPAD-Doctor Tech near the inflorescence 2 (V6) compared to the control variant of 12.98 g/fruit (Figure 5).

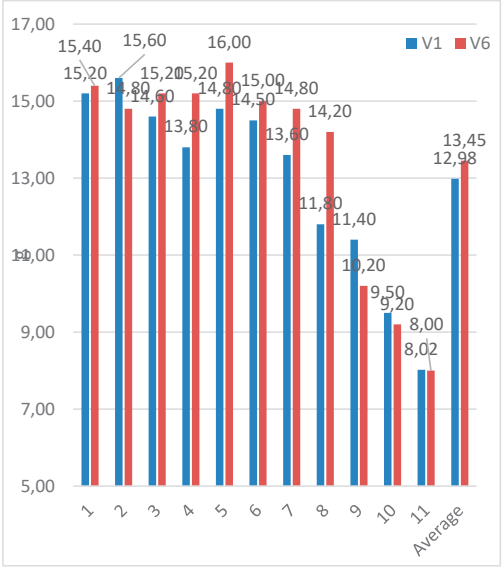

Figure 5. Influence of EMCOPAD- application (V6) on control variant (V1)

Analysing the data on the difference between the values obtained on average from the three plants observed to which we applied EMCOPAD-Doctor Tech to fruit 1 we found that compared to the control variant the difference was distinctly very significant. The weight of the fruit was on average 20.18 g with 4.98 g more than the control. We also found that the fruit was 32.76% higher than the control variant (Table 1).

Table 1. The influence of EMCOPAD-Doctor Tech applied to the first fruit

Variant	Mass (g)	Difference (g)		Significance (%)
V(0) Average	16.03	0.83	105.46	**
V(1)	15.20	0.00	100.00	Ct
V(2)	20.18	4.98	132.76	***
V(3)	14.80	-0.40	97.37	N
V(4)	14.80	-0.40	97.37	N
V(5)	15.80	0.60	103.95	*
V(6)	15.40	0.20	101.32	N

DL5% = 0.540 DL5% in % = 3.5526
DL1% = 0.780 DL1% in % = 5.1316
DL0.1% = 1.130 DL0.1% in %= 7.4342

If we applied EMCOPAD-Doctor Tech to fruit no. 6, we also noticed an increase in weight. It was 18.3 g at V3 with 3.73 g over the control variant. The difference was 25.72% over the control variant. From a statistical point of view, we found that the difference was distinctly very positive (Table 2).

Table 2. The influence of EMCOPAD-Doctor Tech applied to the sixth fruit

Variant	Mass (g)	Difference (g)	(%)	Significance
V(0) Average	15.74	1.24	108.52	**
V(1)	14.50	0.00	100.00	Ct
V(2)	16.78	2.28	115.72	***
V(3)	18.23	3.73	125.72	***
V(4)	15.30	0.80	105.52	*
V(5)	14.60	0.10	100.69	N
V(6)	15.00	0.50	103.45	N

DL5% = 0.620 DL5% in % = 4.2759
DL1% = 0.890 DL1% in % = 6.1379
DL0.1% = 1.290 DL0.1% in % = 8.8966

Analysing, on average, the average mass of fruits in the inflorescences, we found that in the case of V1 Mt the average mass of fruits was the lowest, 12.98 g, and in the case of all variants to which we applied EMCOPAD-Doctor Tech the average mass of fruit was higher by 6.19% over the control in the case of V3 and by 1.67% in the case of V5 (Table 3).

Table 3. Average mass of tomato fruits on experimental variants

Variant	Mass (g)	Difference (g)	(%)	Significance
V(0) Average	13.46	0.47	103.64	N
V(1)	12.98	0.00	100.00	Ct
V(2)	13.58	0.59	104.57	*
V(3)	13.79	0.80	106.19	**
V(4)	13.74	0.75	105.80	**
V(5)	13.20	0.22	101.67	N
V(6)	13.45	0.47	103.62	N

DL5% = 0.490 DL5% in % = 3.7741
DL1% = 0.700 DL1% in % = 5.3915
DL0.1% = 1.020 DL0.1% in % = 7.8562

Analysing the average total mass of the inflorescences we found that the control V1 presented inflorescences with an average mass of 142 g. It was noted that all the variants we used EMCOPAD-Doctor Tech the total mass of the inflorescence was higher, statistically positive, very significant view (Table 4).

Table 4. Total mass of the inflorescences

Variant	Fruit Mass (g)	Difference (g)		SEMF (%)
V(0) Average	148.08	5.26	103.69	***
V(1)	142.82	0.00	100.00	Ct
V(2)	149.73	6.91	104.84	***
V(3)	151.66	8.84	106.19	***
V(4)	151.10	8.28	105.80	***
V(5)	145.20	2.38	101.67	***
V(6)	148.00	5.18	103.63	***

DL5% = 0.620 DL5% in % = 0.4341
DL1% = 0.880 DL1% in % = 0.6162
DL0.1% = 1.280 DL0.1% in % = 0.8962

Figure 6. Aspects of tomato plants

Figure 7. Section through tomato fruit

CONCLUSIONS

The aim of this study was to identify new non-aggressive methods capable to shorten the fruit ripening period of the tomato fruits

During the study, we noticed a faster growth of tomato fruits following the application of EMCOPAD-Doctor Tech devices compared to the variant not exposed to the reflected electromagnetic field. The differences in physiological maturation between the two abovementioned tomato variants were the followings: a reducing of the period with 4-5 days when the device was placed directly on the immature fruit and 4 days reducing when it was placed directly on the stem of the plant near the insertion of the inflorescence. The conclusion is that the use of the electromagnetic field created by the EMCOPAD-Doctor Tech device has positive impact on the tomato culture by reducing the physiological maturation period as mentioned above.

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