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RESEARCH ON FEED BACK REACTIONS OF PLANTS SUBJECTED TO EXTERNAL FREQUENCY FIELDS FROM AN EPIGENETICAL POINT OF VIEW

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Abstract

The first epigenetic modification found was DNA methylation. Several DNA modifications, such as hydroxymethylation and carboxylation, as well as many post-translational histone modifications that epigenetically shape cell identity, have been discovered to date. DNA methylation is the most important epigenetic mechanism that has been intensively investigated. There are many conventional techniques to analyze the approximate or exact methylation content of DNA. The present research aimed to study the influence of the electromagnetic field of the Teslatron device (therapy device with high electrostatic potential) and the light fields of the Bioptron (performs light treatment) on some plants in order to see if this influence changes the quantity and quality of the active substances from the treated plants, compared to the control group. Genomic DNA isolations were then performed, which was quantified at the nanodrop. It was observed that there are changes in the amount and quality of DNA influenced with the Teslatron biofield compared to the control.

Key words: *teslatron, genomic DNA, epigenetic, nanodrop.*

INTRODUCTION

Organic farming is a scientific activity based on the progress of life science; however it is backed by the balance between man and nature. The processes that make up organic farming and their correlations are still being done imperfectly, due to the insufficient or lack of applied research (Elliott, 2011).
Current trends have led to a proliferation of research on the impacts, trade-offs, and ramifications of agricultural management of rural areas in relation to the set of social and ecological goods and services that society demands from a green, sustainable agriculture (Barrett et al., 2011; Brussaard et al., 2010). Most of the results that have emerged to date have demonstrated the magnitude and severity of the impacts of agriculture on ecological systems, as well as the challenge of designing management paradigms and strategies to satisfy ecosystem services in the context of limited resources and widespread ecosystem degradation (Estrada-Carmona et al., 2014). There is a sustained interest in developing a wide variety of paradigms and strategies for agricultural landscape analysis, planning, and management to address some of these challenges (Nelson et al. 2009; O'Farrell et al., 2010).
The destructive nature of humanity has threatened both the planet and its own prospects for survival (Krausmann et al., 2008; Kapoor, 2001). Human activities generate wastes, such as CO_2, faster than the biosphere can metabolize them (Huang et al., 2009).
In response, the capacity of natural ecosystems to provide the necessary life support systems for humanity is likely to decline in the coming decades (Krausmann et al., 2008; Kitzes et al., 2015; Pulselli et al., 2008).
Statistics have shown how the average per capita consumption of ecosystem goods and services has increased over the past 50 years, leading to a continuous increase in the human Ecological Footprint (EF) (Danovaro et al., 2014).
Studies have shown that the amount of biological capacity available per person has decreased as population growth outpaces the growth of production and ecosystem yields worldwide (Krausmann et al., 2008; Danovaro et al., 2014).
The consequence is increasing ecological deficits for nations around the world.

In contrast, alternative pro-environmental paradigms have been developed to mitigate the crisis and environmental degradation. It is known that natural resources and environmental problems arise at the intersection of complex natural and social systems (Pentreath, 2004). However, conventional environmental management paradigms continue to follow disciplinary lines to address the challenges. Increasingly effective solutions have been proposed to support the resolution of environmental problems but require increased integration of social and natural sciences, new governance approaches and a new culture for environmental management. An articulated framework is required to generate such features in an environmental management approach (Virapongse et al., 2016).

The modern strategy, which is called *eco-development* (intermediate perspective), aims to synthesize the areas of overlap and create a new vision, a new philosophy for the development of human societies. Eco-development recognizes the need for economic growth, as well as the need for this growth to be of a qualitatively very different nature from that which has been pursued in conventional economic development (Tenam-Zemach et al., 2014; Elliott et al., 2012). Most of the development activity proposed by Eco-development is a form of management of the fundamental relationship between society and nature. The use of "development" implies an explicit reorientation and an improvement in the level of integration of social, ecological and economic concerns.

The essence of the eco-development paradigm is to restructure the relationship between society and nature into a "positive-sum game" by reorganizing human activities so that they are synergistic with ecosystem processes and services (Colby, 1991). The process of environmental degradation and depletion of natural resources has been attributed to human behavior and traditional agricultural production techniques which are referred to as the science of human ecology. Human ecology can be defined as a complex of studies of the structure and change in the maintenance organizations or resource pools that support human populations in dynamic and constrained environments (Buttel et al., 2002).

One of the priority objectives in agroecological research is to prevent the degradation of natural resources in agriculture and to analyze sustainability. Constantly assessing the degree of environmental degradation in agriculture is therefore essential for countries dependent on agriculture (Sabiha et al., 2016). Establishing sustainability indicators is a constant concern in environmental science, management and environmental policy. Many strategies, formal management systems and environmental performance assessment techniques have been adopted that can be applied to any farm. Among these, ISO 14001, Life Cycle Assessment (Sh Karami et al., 2015), Environmental Impact Assessment (Rezaei-Moghaddam et al., 2008) and EF (Wackernagel et al., 1994; Fatemi et al., 2018) could all be applied to agricultural processes. Thus, indicators and indices are of increasing importance in environmental assessment, monitoring and sustainable development issues. These indicators and indices can be used for a wide variety of purposes, such as to assess current conditions, predict trends, compare situations, evaluate policy implementation and monitor ecological degradation (Pennino et al., 2017). Strategies such as the use of modern technologies and devices that generate life-sustaining frequencies as well as the use of LED lighting with different wavelengths are just some of the many attempts to solve the problem of environmental degradation, reducing toxic residues in the context of organic agriculture. This paper outlines the results of the influence of frequency generators and lights of different wavelengths on the germination and growth phenomena for some horticultural plants.

MATERIALS AND METHODS

The plant material was represented by seeds of coriander, fennel and sage plants that were germinated on 22.11.2022, in the following quantities:

- 9 Petri dishes for the experiment, for treatment with the TeslaTron device;
- 9 Petri dishes for treatment with the Biotron device and;
- 3 Petri dishes for the control group.

The seeds were placed on a layer of paper and watered every day, in a room where the ambient temperature was between 18-20^{0}C, with natural light.

The experiment began on 11/22/2022 and ended on 12/11/2022. It was conducted over a period of 20 days.

The seeds were divided:

- 9 Petri dishes with 10 seeds each of the three species, as follows:
- 3 Petri dishes of 10 coriander seeds each;
- 3 Petri dishes with 10 seeds each of the fennel species;
- 3 Petri dishes with 10 sage seeds each, for each type of device.

The treatment consisted of frequencies generated by the Teslatron device or the Bioptron device on the Petri dishes. 30 minutes of 9000V was applied and another 30 minutes were continued on the intelligent IF program in the treatment with the Teslatron device, for 20 days. The Teslatron is a device that generates frequencies with high electrostatic potential (Figure 1).

The Bioptron device generates light from the entire ROGVAIV spectrum with specific wavelengths that induce different effects on living organisms. The aim of the research was to determine which is the frequency and optimal wavelength that efficiently influences the germination and growth processes of plants. Thus, for the seeds treated with the Bioptron device, 10 minutes of red light and 10 minutes of orange light were applied per day, consecutively for 20 days.

Figure 1. The four experimental plots using Teslatron

Aspects of fennel and sage cultivation are shown in Figure 2.

Figure 2. Aspects of culture of fennel and sage plants

The results were statistically expressed using the Anova program.

RESULTS AND DISCUSSIONS

Results regarding the germination of plant seeds treated with the Teslatron device

Sage

Seeds germinated on 22.11.2022, and the first germination was on 30.11.2022; on 01.12.2022 there were 2 germinated seeds; on 05.12.2022 a total of 8 germinated seeds, on 10.12.2022 there were 11 germinated seeds.

Fennel

Seeds germinated on 22.11.2022, and the first germination was on 30.11.2022; on 01.12.2022 there were 2 germinated seeds; on 05.12.2022 a total of 7 germinated seeds, on 11.12.2022 a total of 13 germinated seeds.

Coriander

Seeds germinated on 22.11.2022, on 05.12.2022 there was no germinated seed, the first germination on 09.12.2022 and on 11.12.2022, 6 germinated seeds were recorded (Tables 1 and 2).

Table 1. Results concerning the number of germinated seeds of sage, fennel and coriander

Date/No. of seeds germinated	Sage seeds no. 30	Fennel seeds no. 30	Coriander seeds no. 30
30.11.2022	1	1	0
01.12.2022	2	2	1
05.12.2022	5	4	1
09.12.2022	5	4	4
10.12.2022	5	4	4
11.12.2022	6	5	5
Total germinated	19	20	15

Table 2. ANOVA: Results of statistical Single Factor analysis of number of seeds

Groups	Count	Sum	Average	Variances
Sage seeds no. 30	6	22	3.666667	15.06667
Fennel seeds no. 30	7	26	3.714286	17.57143
Coriander seeds no. 30	4	12	3	4

It was found that fennel seeds responded better to Teslatron treatment compared to sage and coriander seeds. Fennel seeds 13 out of 30 and sage seeds 11 out of 30 seeds (Figure 3).

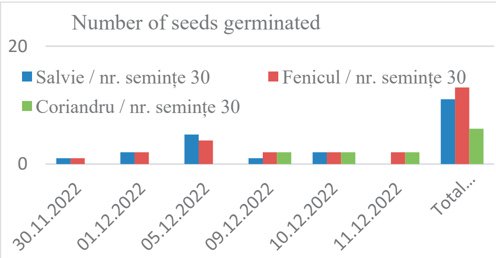

Figure 3. Graphical representation of the germination period of seeds treated with the Teslatron device

Since F (0.053505) < F critical (3.738892), we can reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1) and conclude that the result varies depending on the type of seeds and the treatment with the Teslatron device.

In this example: Null hypothesis (H_0): The results do not vary depending on the type of seed ($\mu_1 = \mu_2 = \mu_3$)

Alternative hypothesis (H_1). The result varies depending on the type of seeds and the treatment with the Teslatron device (Table 3).

Table 3. ANOVA: Summary of the statistical results

Source of Variation	SS	MS	P value	F critical
Between Groups	1.47	0.73	0.94	3.73
Within Groups	192.7	13.76		
Total	194			

Results of plant seeds treated with the Bioptron device (Table 4)

Sage

Seeds germinated on 22.11.2022, and the first germination was on 30.11.2022; on 01.12.2022 there were 3 germinated seeds; on 05.12.2022 a total of 9 germinated seeds, on 11.12.2022 there were 17 germinated seeds out of a total of 30 seeds.

Fennel

Seeds germinated on 22.11.2022, and the first germination was on 30.11.2022; on 01.12.2022 there was 1 germinated seed; on 05.12.2022 a total of 1 germinated seed, on 11.12.2022 a total of 5 germinated seeds out of a total of 30 seeds.

Coriander

The seeds were germinated on 11/22/2022, on 12/05/2022 there was no germinated seed, and on 12/11/2022 we had one germinated seed.

Table 4. Plant seeds germinated on 22.11.2022 and treated with the Bioptron device

Date/No. of seeds germinated	Sage/no. seeds 30	Fennel/no. seeds 30	Coriander/no. seeds 30
30.11.2022	1	0	0
01.12.2022	2	1	0
05.12.2022	9	2	1
09.12.2022	2	2	1
10.12.2022	2	0	1
11.12.2022	1	0	1
Total germinated	17	5	4

It was found that sage seeds responded better to Bioptron treatment compared to fennel and coriander seeds. Sage seeds germinated 17 out of 30, fennel 5 out of 30.

Table 5. ANOVA: Results of statistical Single Factor analysis of number of seeds

Groups	Count	Sum	Average	Variances
Sage/no. seeds 30	5	34	6.8	42.2
Fennel/no. seeds 30	3	10	3.333	4.333
Coriander/no. seeds 30	2	2	1	0

Since F (1.083396) < F critical (4.737414), we can reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1) and conclude that the result varies depending on the type of seeds treated and the device with which the treatment was performed, in this case the Bioptron device (Table 5).

In this example:

Null hypothesis (H_0): The results do not vary depending on the seed variety ($\mu_1 = \mu_2 = \mu_3$)

Alternative hypothesis (H_1): The result varies depending on the variety of seeds and the treatment with the Bioptron device.

Results of seeds from the control group

Sage

Seeds germinated on 22.11.2022, and the first germination was on 02.12.2022; on 05.12.2022 a total of 5 seeds germinated, on 10.12.2022 there were 5 seeds germinated out of a total of 10 seeds.

Fennel

Seeds germinated on 22.11.2022, and the first germination was on 01.12.2022, there was 1 germinated seed; on 05.12.2022 a total of 4 germinated seeds, on 11.12.2022 a total of 4 germinated seeds out of a total of 10 seeds.

Coriander

The seeds were germinated on 11/22/2022, on 12/05/2022 there were no germinated seeds, and on 12/11/2022 we had no germinated seeds (Table 6).

Table 6. Results regarding plant seeds germinated on 22.11.2022 control group

Date/No. of seeds germinated	Sage/no. seeds 10	Fennel/no. seeds 10	Coriander/no. seeds 10
30.11.2022	0	0	0
02.12.2022	1	1	0
05.12.2022	4	3	1
09.12.2022	4	3	1
10.12.2022	4	3	1
11.12.2022			
Total germinated	5	4	0

In the control group, it was found that the sage seeds germinated with a difference of one seed compared to the fennel seeds, these being 5 sage seeds and 4 fennel seeds out of a total of 10 seeds of each (Tables 7 and 8).

Table 7. ANOVA: Results of statistical Single Factor analysis of number of seeds

Groups	Count	Sum	Aver age	Vari - ances
Sage/no. seeds 10	3	10	3.33	4,333
Fennel/no. seeds 10	3	8	2.66	2,333
Coriander/ no. seeds 10	0	0	0	0

Table 8. ANOVA: Summary of the statistical results

Source of variation	SS	MS	P value	F critical
Between Groups	0.66	0.33	0.92	9.55
Within Groups	13.33	4.44		
Total	14			

Since F (0.075) < F critical (9.552094), we can reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1) and conclude that the result varies depending on the type of seeds, not being subjected to any treatment with devices.

Null hypothesis (H_0): The results do not vary depending on the type of seeds ($\mu_1 = \mu_2 = \mu_3$)

Alternative hypothesis (H_1): The result varies depending on the type of seed.

CONCLUSIONS

It was found that fennel seeds responded better to the Teslatron treatment compared to sage and coriander seeds. Fennel seeds 13 out of 30 and sage seeds 11 out of 30 seeds. It was found that sage seeds responded better to the Bioptron treatment compared to fennel and coriander seeds. Sage seeds germinated 17 out of 30, fennel 5 out of 30. In the control group, it was found that the sage seeds germinated with a difference of one seed compared to the fennel seeds, these being 5 sage seeds and 4 fennel seeds out of a total of 10 seeds of each. In the treatment with the biofungicide to eliminate mold, the first results of mold elimination were visible after the first 3-4 days. The treatment was carried out over a period of 7 days, until its elimination.

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