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Influence of alternating electromagnetic field exposure on photon emission of brew of selected plants

***Abstract**. Plants produce a wide range of bioactive principles and are a rich source of medicines. The demand for plant-based therapies is increasing in both developing and developed countries due to the growing recognition that they are natural, non-narcotic, readily biodegradable, pose minimal environmental risk, have no unwanted side effects and are readily available at affordable prices. The beneficial properties of herbs are due to the presence of phytochemicals. Many studies have shown that various herbal medicines are sources of a variety of molecules, many of which exhibit radical scavenging and antimicrobial properties that can defend the human body against pathogens, as well as cell oxidation reactions. The application of photon emission in food is mainly in food quality control. It can serve as a convenient tool for assessing the quality of various types of food. The purpose of this study was to determine the possibility of identifying changes in biological substance based on photon emission characteristics. In addition, to determine the variation in photon emission of infusions of selected herbs that were subjected to an alternating electromagnetic field. The study was conducted on selected usable varieties of herbs: lemon balm and mint. The highest photon emission from plant infusions was obtained when an electromagnetic field intensity of 40 mT was applied. The use of different intensity parameters and stimulation time modifies the structure of photon emission, thus giving the possibility to identify the degree of interaction.*

***Streszczenie.** Rośliny wytwarzają szeroki wachlarz bioaktywnych zasad i stanowią bogate źródło leków. Zapotrzebowanie na terapie roślinne wzrasta zarówno w krajach rozwijających się, jak i rozwiniętych, ze względu na rosnące uznanie, że są to produkty naturalne, nie narkotyczne, łatwo ulegające biodegradacji, stanowiące minimalne zagrożenie dla środowiska, nie wywołują niepożądanych skutków ubocznych i są łatwo dostępne po przystępnych cenach. Dobroczynne właściwości ziół wynikają z obecności związków fitochemicznych. Wiele badań wykazało, że różne leki ziołowe są źródłem różnorodnych cząsteczek, z których wiele wykazuje właściwości zmiatające rodniki i przeciwbakteryjne, które mogą bronić organizm ludzki przed patogenami, a także reakcjami utleniania komórek. Zastosowanie emisji fotonowej w żywności polega głównie na kontroli jakości żywności. Może służyć jako wygodne narzędzie do oceny jakości różnego rodzaju żywności. Celem badań było określenie możliwości identyfikacji zmian w substancji biologicznej na podstawie charakterystyki emisji fotonowej. Ponadto określenie zróżnicowania w emisji fotonowej naparów wybranych ziół, które poddano oddziaływaniu zmiennego pola elektromagnetycznego. Badania przeprowadzono na wybranych użytkowych odmianach ziół: melisy i mięty. Najwyższą emisję fotonową z naparów roślinnych uzyskano przy zastosowaniu natężenia pola elektromagnetycznego wynoszącym 40 mT. Zastosowanie różnych parametrów natężenia oraz czasu stymulacji modyfikuje strukturę emisji fotonowej, dając tym samym możliwość identyfikacji stopnia odziaływania. (**Wpływ oddziaływania pola elektromagnetycznego na emisję fotonową naparów wybranych roślin**)*

Keywords: photon emission, brew, plants, electromagnetic field
Słowa kluczowe: emisja fotonowa, napary, rośliny, pole elektromagnetyczne

Introduction

According to the World Health Organization, more than 80% of people living in developing countries rely on traditional medicine for their basic health needs. Plants produce a wide range of bioactive principles and are a rich source of medicines. The demand for plant-based therapies is growing in both developing and developed countries due to the growing recognition that they are natural, non-narcotic, readily biodegradable, pose minimal environmental risk, have no adverse side effects and are readily available at affordable prices [1]. The World Health Organization has defined "herbal medicine" as: a material or preparation of plant origin with a therapeutic or other beneficial effect on human health, which contains raw or processed ingredients from one or more plants. Herbal medicines can be divided into three groups: (1) herbal raw materials (raw or processed herbal raw materials, e.g., powder, patch), (2) traditional herbal products (infusions, tablets, pills or capsules containing raw herbal raw materials or raw extracts), and (3) standardized herbal products (preparations containing standardized extracts or purified substances) [2]. The beneficial properties of herbs are due to the presence of phytochemicals. The main phytochemical classes associated with herbs include a variety of compounds, such as terpenes and their derivatives, glycosides, alkaloids and saponins [3]. Herbal materials used as medicinal plants include several types of plants. Many of these herbal materials exhibit medicinal activities such as antioxidant, anticancer, anti-inflammatory, antibacterial and antiviral activities as e.g. red clover seeds [4]. In addition, these herbs can play a major role in drug synthesis and development. Many studies have shown that various herbal medicines are sources of a variety of molecules, many of which exhibit radical scavenging and antimicrobial properties that can defend the human body against pathogens, as well as cell oxidation reactions. Therefore, these materials are important in the synthesis of various types of herbal medicines for their antibacterial, antiviral and antioxidant potential [5-7].

The application of photon emission in food is mainly in food quality control. It can serve as a convenient tool for assessing the quality of various types of food [8]. Wherever molecular oxygen and biomacromolecules are present, there will be changes in photon emission intensity due to oxidative processes. In foods containing living cells capable of active oxidative metabolism and antioxidant defense, the mechanisms for generating ultrafast photon emission are similar to those in living plant and animal tissue [8]. Every biological material accumulates some kind of energy, which can be considered as a kind of carrier of information about its state of health or vitality, photon emission can be used to assess the quality of any material [9,10].

The purpose of the study was to determine the possibility of identifying changes in biological substance on the basis of photon emission characteristics. In addition, to determine the variation in photon emission of infusions of selected herbs that were subjected to an alternating electromagnetic field.

Material and methods

The study was conducted on selected usable varieties of herbs: lemon balm and mint. 5g of dried herbs tested were weighed, then poured into 250 ml of boiling water and brewed for 5 minutes under a cover. The cooled infusions were subjected to an alternating magnetic field (Figure 1) of 40 mT, 70 mT and 80 mT at three time variants (1,2 and 3 hours) of stimulation. Immediately after stimulation, ultra-weak luminescence was measured. Measurement of photon emission was performed at the Laboratory of Experimental Research Techniques of Raw Materials and Biological Products of the Agricultural University of Cracow, which has an in-house procedure accredited by the Polish Center for Accreditation for the measurement of photon counts

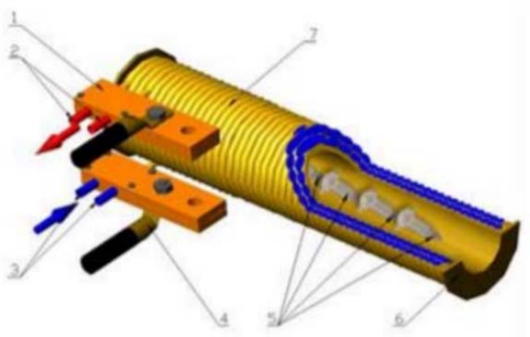

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Fig. 1. Schematic of the solenoid for electromagnetic stimulation: 1 - feeding chamber; 2 - cooling water outlet; 3 - cooling water inlet; 4 - feeding cables; 5 - samples; 6 - carcass; 7 - coil [6].

The Single Photon Counting method was used to determine the emission of ultra-weak photons (Figure 2). The result of the photon emission measurement is the absolute difference between the number of photons recorded by the photomultiplier in the light-proof chamber with the material and the number of photons recorded by the photomultiplier in this chamber without the material, according to the relation 1 [11]:

(1) $$L = A - B \text{ [impulse]}$$

where: L - the number of photons emitted by the test sample, A - the number of photons emitted by the sample placed, in the light-tight chamber, B - number of indications (photons) generated by the empty light-tight chamber

Fig. 2: Photon emission measurement device

Results

The present study investigated the luminescence properties of three infusions prepared of lemon balm and mint that were exposed to an alternating electromagnetic field at different exposure times. Figures 3 - 8 show the total number of photons emitted from the infusions.

Figure 3 shows the effect of exposure to a magnetic field of 40 mT on an infusion made from lemon balm. It was found that the number of photons increased significantly compared to the control sample not depending on the exposure time. For the sample subjected to one hour of electromagnetic field exposure, there was an increase in the number of photons by 27, for the sample subjected to two hours of electromagnetic field exposure the number of photons decreased by 62, while for the sample subjected to three hours of electromagnetic field exposure the number of emitted photons decreased by 12 compared to the control sample. It should be noted that the photon emission values obtained from samples subjected to different exposure times were significantly different, indicating that the effect of 40 mT electromagnetic exposure on the lemon balm infusion.

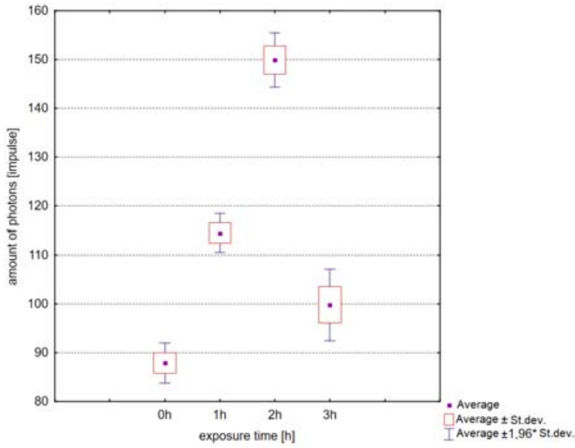

Figure 3: Photon emission of lemon balm infusion recorded after exposure to a 40 mT electromagnetic field.

When the lemon balm infusion was exposed to an magnetic field of 70 mT (Fig. 4), it was found that the number of photons after one-hour and two-hour exposure increased compared to the control sample, while extending the exposure time to three hours, resulted in a decrease in the number of photons emitted by the samples. For the sample subjected to one-hour and two-hour exposure to the electromagnetic field, 94 and 117 photons were recorded, respectively. On the other hand, for samples exposed for three hours, the number of photons decreased by 7 compared to the control sample. It should be noted that the photon emission values obtained from samples subjected to different exposure times were significantly different, indicating the differential effects of 70 mT magnetic exposure on the infusion of lemon balm.

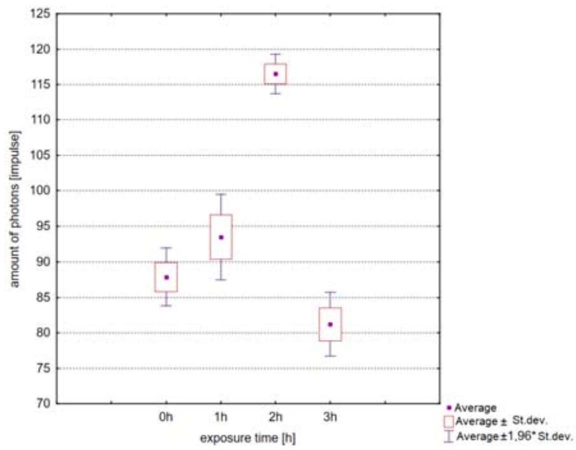

Fig. 4: Photon emission of lemon balm infusion recorded after exposure to an electromagnetic field of 70 mT.

Figure 5 shows the effect of exposure to an magnetic field of 80 mT on an infusion made from lemon balm. It was noted that the number of photons decreased compared to the control sample for the samples subjected to one-hour and three-hour exposure, while for the sample stimulated two hours, the number of photons increased slightly. For the sample subjected to two hours of electromagnetic field exposure, an increase in the number of photons by 4 was found, while for the sample subjected to one hour and three hours of electromagnetic field exposure, the number of photons decreased by 15 and 34 photons, respectively. It should be noted that the photon emission values obtained from samples subjected to different exposure times were significantly different, indicating the of the varying effects of 80 mT electromagnetic exposure on the infusion of lemon balm.

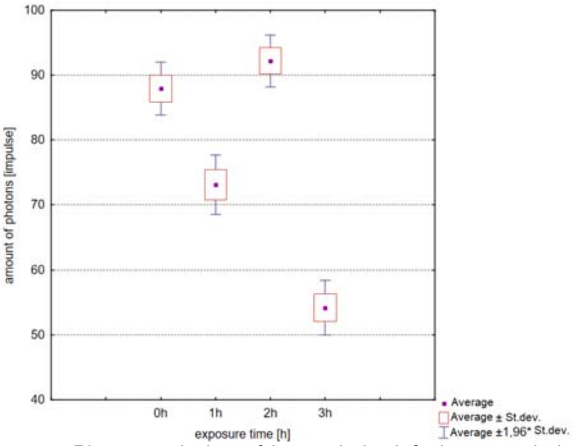

Figure 5: Photon emission of lemon balm infusion recorded after exposure to an 80 mT electromagnetic field.

Figure 6 shows the effect of exposure to an electromagnetic field of 40 mT on an infusion made from mint. It was found that the number of photons increased compared to the control sample not depending on the exposure time. For the sample subjected to one hour of electromagnetic field exposure, an increase in the number of photons by 40 was recorded, for the sample subjected to two hours of electromagnetic field exposure, the number of photons decreased by 12, while for the sample subjected to three hours of electromagnetic field exposure, the number of emitted photons decreased by 4 compared to the control sample. It should be noted that the photon emission values obtained from samples subjected to different exposure times were significantly different, indicating that the effect of 40 mT electromagnetic exposure on the mint infusion.

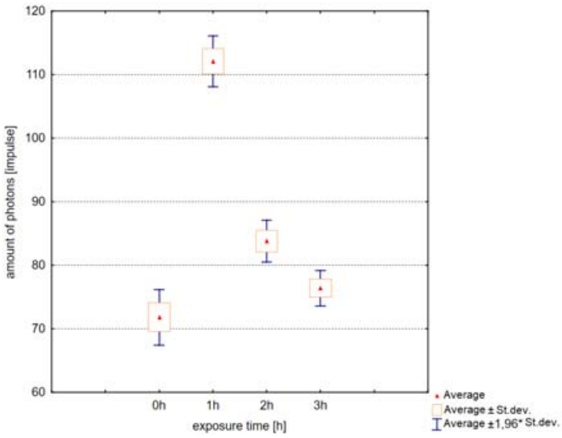

Fig. 6. Photon emission of mint infusion recorded after exposure to an electromagnetic field of 40 mT

When the mint infusion was subjected to an electromagnetic field of 70 mT (Figure 7), it was found that the number of photons after an hour's exposure increased compared to the control sample, while extending the exposure time to two and three hours, resulted in a significant decrease in the number of photons emitted by the samples. For the sample subjected to one hour of electromagnetic field exposure, there was an increase in the number of photons by 7 compared to the control sample. On the other hand, for samples whose exposure was two and three hours, 61 and 53 photons were recorded, respectively. It should be noted that the photon emission values obtained from samples subjected to different exposure times were significantly different, indicating the differential effect of 70 mT electromagnetic exposure on the mint infusion.

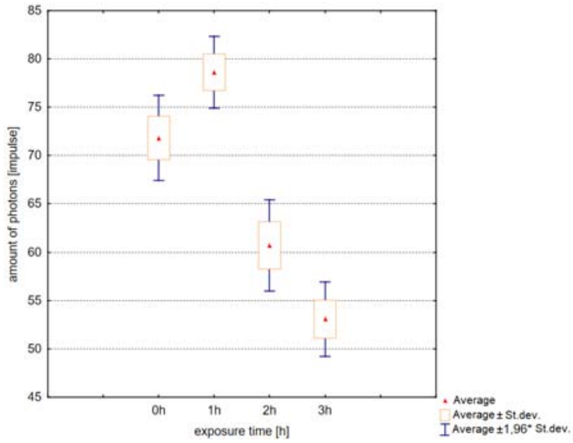

Fig. 7. Photon emission of mint infusion recorded after exposure to electromagnetic field with an intensity of 70 mT

When the mint infusion was subjected to an electromagnetic field of 80 mT (Figure 8), it was found that the number of photons after an hour-long exposure increased compared to the control sample, while extending the exposure time to three hours, resulted in a significant decrease in the number of photons emitted by the samples. For the sample subjected to one hour of electromagnetic field exposure, there was an increase in the number of photons by 12 compared to the control sample, while for the sample whose exposure was three hours, the recorded number of photons decreased by 23 pulses. The same number of photons (72 pulses) was recorded for the control and stimulated two-hour samples.

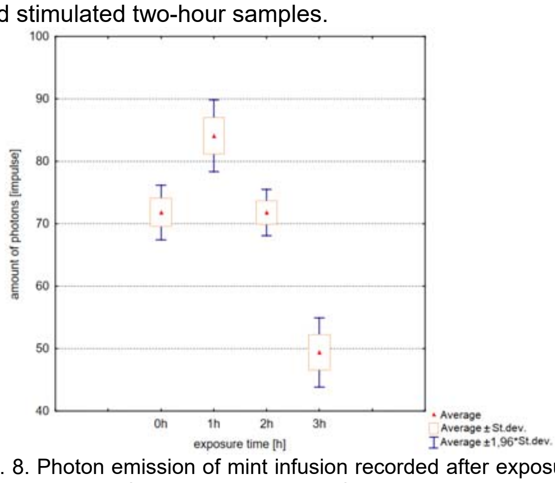

Fig. 8. Photon emission of mint infusion recorded after exposure to electromagnetic field with an intensity of 80 mT

Figures 9 and 10 show the relationship between the exposure to an alternating electromagnetic field and stimulation time and the number of photons emitted by plant infusions of chamomile, lemon balm and mint. In the case of lemon balm infusions (Figure 9), a clear area can be observed (red color), where the highest photon emission was obtained at intensities with values in the range of 10 - 75 mT and stimulation time of 0.5 - 3 hours. The highest number of photons (140 pulses) was obtained at a field strength of 40 mT and a stimulation time of two hours.

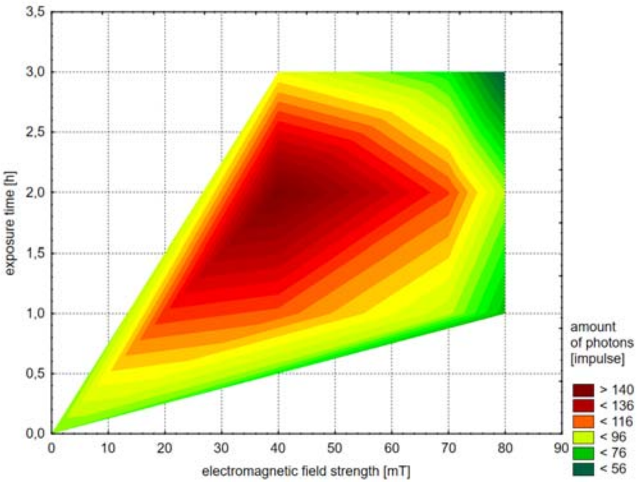

Fig. 9. Effect of alternating electromagnetic field on photon emission of infusion of lemon balm

Figure 10 shows the effect of the influence of an alternating electromagnetic field on the photon emission of the mint infusion. Two areas with the highest (red) and lowest (green) photon emission can be clearly distinguished. The highest photon emission was obtained (110 photons) at an electromagnetic field strength of 40 mT and hourly stimulation, while the lowest (less than 50 photons) at an electromagnetic field strength of 80 mT and three hours of stimulation.

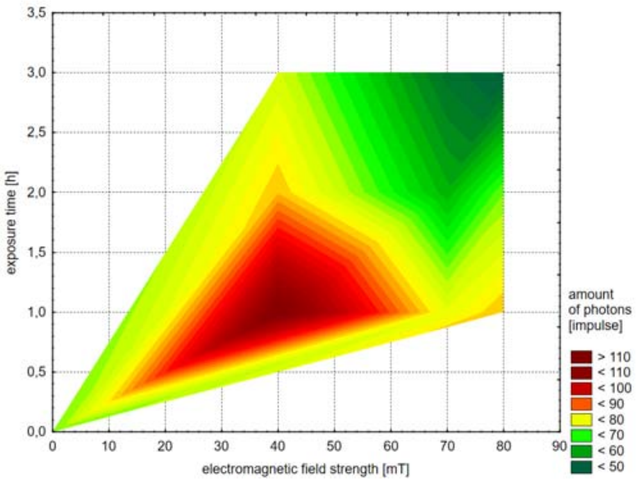

Fig. 10. Effect of exposure to an alternating electromagnetic field on photon emission of infusion of mint

Conclusions

The impact of the electromagnetic field affects the photon emission of biological material in a heterogeneous manner. The highest photon emission from plant infusions was obtained when an magnetic field intensity of 40 mT was applied. The use of different intensity parameters and stimulation time modifies the structure of photon emission, thus giving the possibility to identify the degree of interaction.

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