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Research on the Effects of the 'Dance of the Spiral' Methodology, with Spectral Analysis of Water Extracts, upon the Physiological Parameters of Plants and the Essential Oil Content

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Abstract
The *Dance of the Spiral* is the original methodology consisting of physical exercises that based on ancient health and longevity practices. A research has been done in which the *Dance of the Spiral* has been applied to plants. The planting was performed in eight directions, since each exercise supposedly has an effect on the state of health. Eight plants are chosen including common yarrow *(Achillea millefolium*), wood violet *(Viola odorata)*, dandelion *(Taraxacum officinale complex)*, common chicory *(Cichorium intybus)*, shepherd's purse *(Capsella bursa-pastoris)*, cranesbill *(Geranium macrorrhizum)*, broadleaf plantain *(Plantago major)*, and snowdrop *(Galanthus nivalis),* each of them grows the best in one of the eight directions. Two circles are empirically defined – the *Spiral* and the *Antispiral*. In both experiments the eight plants are positioned according to the empirical law established by the authors. Further clinical trials with 20 volunteers suffered from neurological, gastro-intestinal, cardio-vascular, and articular conditions and diseases, who stayed consecutively in the Antispiral and Spiral plant circles for 6 min in each circle were performed based on their subjective assessment of their state of health and their experience after their being stayed in the Antispiral and Spiral circles as a relaxing effect (the Antispiral circle) and a stimulating effect (the Spiral circle). The research involves the composition of essential oil extracts by NMR, gas chromatography and gas chromatography-mass spectrometry as well as the spectral analysis by the methods of *Non-equilibrium spectrum (NES)* and *Differential Non-equilibrium spectrum (DNES)* of water extracts from the common plant *(Achillea millefolium)* from the control group growing in its natural habitat and from the plants grown correspondingly in the Spiral and Antispiral circles. The result in the sample of common yarrow from the Spiral circle is an increase of the average energy of hydrogen bonds between H_2O molecules. Biophysically, this points out to a stimulating effect. The result in the sample of common yarrow from the Antispiral circle is a decrease of the average energy of hydrogen bonds between H_2O molecules. Biophysically, this points out to a relaxing effect. The essential oil composition of the samples planted in the Spiral and Antispiral circles is not identical in the quantitative and qualitative composition regarding the 83 components detected in them and studied. The amount of chamazulene was found to be equal to: in the control group sample – 5.41 %; in the Spiral sample – 4.32 %; in the Antispiral sample – 10.25 %; i.e. the amount of chamazulene in the essential oil from the Antispiral sample is almost twice of that in the control group and Spiral samples.
Keywords: the Dance of the Spiral, *Achillea millefolium*, essential oils, Non-equilibrium spectrum (NES), Differential Non-equilibrium spectrum (DNES)

1. Introduction

Essential oils are volatile natural organic compounds, with a characteristic smell and oil taste, insoluble in water, mostly colorless or slightly colored liquids, on which can be judged on a variety of physiological processes in plants. Essential oils are synthesized only in plants and have extremely strong physiological and pharmacological properties. Each of them represents a mixture of several individual isoprene chemical compounds – terpenes – carbohydrates with isoprene (C_5H_8) as the major building block and their derivatives (terpenoids). Essential oils are volatile, dissolve in lipoid solvents, and have characteristic scents. The composition of essential oils depends on the type of plant, its chemotype, weather conditions in the year of collection, storage conditions of raw materials, the extraction method of essential oils, as well as the duration and storage conditions.
Essential oils are secreted in plants by special structures on a plant called 'receptacles'. According to their location, receptacles are divided into two groups:

- External (exogenous) – simple glandular hairs, complex glandular hairs, glandular scales, and glandular spots;
- Internal (endogenous) – excretory cells, schizogennite receptacles, mixed schizo-lizogennite receptacles (Asenov & Nikolov, 1988).

Essential oils are the active metabolites of metabolic processes occurring in the plant cells. In support of this proposition suggests the high reactivity of terpenoid and aromatic compounds, which are the main components of the essential oils.

Pure essential oils are obtained by steam distillation, extraction by fats or other solvents. The choice of indicators of quality of essential oils depends on the application and is determined by their natural, pharmacological and taste-aromatic properties.

There are notworthy results obtained by the authors from the study of the essential oil composition of three samples of common yarrow plant *Achillea millefolium* affected by two circles empirically defined – the *Spiral* and the *Antispiral*, each of them grows the best in one of the eight directions. The conclusion is that the composition of essential oil from the three samples of common yarrow is not identical regarding the qualitative and quantitative composition of 83 components that are being studied. For example, the quantity of chamazulene in the control sample is 5.41 %, in the Spiral sample – 4.32 %, and in the Antispiral sample – 10.25 %. It can be concluded that the common yarrow plants grown in the Antispiral circle should be expected to have a stronger anti-inflammatory effect than those grown in the control group and the Spiral. The authors' main conclusion is that the primary principle of this study could be used for beautification of residential areas, for planting therapeutic parks, manufacturing herbal products, and many other activities related to using plants for human well-being and health.

Previously, we studied natural mineral water samples and cactus juice with the methods of spectral analysis of water – the NES and the DNES in order to evaluate the conditions for origin of life and living matter in hot mineral water (Ignatov, 2012; Ignatov et al., 2014a; Ignatov et al., 2014b; Ignatov et al., 2014c), as well as we carrid out the moodeling of possible processes for origin of life and living matter in hot mineral water with deuterium (Ignatov & Mosin, 2013a; Ignatov & Mosin, 2013b). These methods have proven themselves in a variety of biophysical studies of aqueous solutions, vegetable juices and extracts of plants. This has contributed to the promotion of the NES and the DNES in different biophysical research, including the study of the structure of water (Ignatov et al., 2015). The research conducted by us demonstrated the role of water, its structure, the isotopic composition and physical-chemical properties (pH, temperature) on the growth and proliferation of prokaryotes and eukaryotes in water with different isotopic content (Mosin et al., 2014; Mosin & Ignatov, 2014; Mosin & Ignatov, 2015). These factors, the structure and composition of water are of great importance in many biophysical studies. The peculiarities of the chemical structure of the H_2O molecule and weak bonds caused by electrostatic forces and donor-acceptor interaction between hydrogen and oxygen atoms in H_2O molecules create favorable conditions for formation of directed intermolecular hydrogen bonds (O–H…O) with neighboring H_2O molecules, binding them into complex intermolecular associates which composition represented by general formula $(H_2O)_n$, where *n* can vary from 3 to 50 (Ignatov & Mosin, 2013c). The hydrogen bond is a form of association between the electronegative O-atom and an H-atom, covalently bound to another electronegative O-atom, is of vital importance in the chemistry of intermolecular interactions, based on weak electrostatic forces and donor-acceptor interactions with charge-transfer. It results from interaction between electron-deficient H-atom of one H_2O molecule (hydrogen donor) and unshared electron pair of an electronegative O-atom (hydrogen acceptor) on the neighboring H_2O molecule. By measuring the average energy among H_2O molecules in water samples by the NES- and DNES-methods it is possible to drow a conclusion about a number of hydrogen bonds in the sample and the distribution of individual H_2O molecules according to their energies. The method can also give information about the possible number of hydrogen bonds in water associates consisting of O–H...O–H groups and the distribution of H_2O molecules on the energy of the hydrogen bonds ($-E_{value}$) relative to the total energy of the hydrogen bonds ($E_{total\ value}$) in water samples (Ignatov & Mosin, 2014a). For this purpose the model of W. Luck is used, which consider water as an associated liquid, consisted of O–H…O–H groups (Ignatov & Mosin, 2015). The major part of these groups is designated by the energy of hydrogen bonds ($-E$), while the others are free ($E = 0$). The energy distribution function $f(E)$ is measured in reversed electron-volts (eV^{-1}) and may be varied under the influence of various external factors on water as temperature and pressure. The difference $\Delta f(E) = f(E_{\text{samples of water}}) - f(E_{\text{control sample of water}})$ – is designated the "differential non-equilibrium energy spectrum of water" (DNES). The DNES is a measure of changes in the structure of water as a result of external factors, because the energy of hydrogen bonds in water samples differ due to the different number of hydrogen bonds in water samples, which may result from the fact that different water samples have different structures and composition and various intermolecular interactions – the various associative elements etc. The redistribution of H_2O molecules in water samples according to the energy is a statistical process of dynamics. By using this method we calculated the average energy of the hydrogen bonds ($\Delta E_{H...O}$) between the H_2O molecules in water samples, which is $\Delta E_{H...O} = -0.1067 \pm 0.0011$ eV. This method was successfully applied by us earlier to the study of various water samples, e.g. of human blood serum, juice plants, as well as electro-chemically activated water solutions of catolite and anolyte (Gluhchev et al., 2015) and water after the interaction with the natural minerals – zeolite and schungite (Ignatov & Mosin, 2014b). As a result of these studies was evaluated a mathematical model of the interaction of these minerals with water, based on the change in the energy of the hydrogen bonds between H_2O molecules, with a regularity of change of

energy of hydrogen bonds between H_2O molecules in the process of water treatment by shungite and zeolite. Natural waters derived from various Bulgarian water springs as well as water with varying deuterium content and the human blood serum of cancer patients were investigated by NES and DNES methods as well (Ignatov & Mosin, 2015; Ignatov et al., 2015). As estimation factor was measured the values of the average energy of hydrogen bonds ($\Delta E_{H...O}$) among H_2O molecules, as well as local maxima in DNES-spectra of various samples of water and human blood serum at $\Delta E_{H...O}$ = -0,1387 eV. It was found that for a group of people in critical condition of life and patients with malignant tumors the greatest values of local maxima in DNES-spectra are shifted to lower energies relative to the control group. As a result we demonstrated a regularity of change of energy of hydrogen bonds between H_2O molecules in the various samples. The results also suggest the restructuring of the energy values among the individual H_2O molecules with a statistically reliable increase of local maximums in DNES-spectra. As a result, it was constructed a general mathematical model of water, based on the consistent patterns of change of hydrogen bonds between H_2O molecules and their destributions according to energies, which has been applied in many other studies of various samples of water, including mineral, water, mountain water, melt water and the electro-activated water. The level of reliability of the results obtained by the DNES-method according to the Student's *t*-test compiles < 0.05, which makes this method as a reliable method in various biophysical studies.

The main objective of the study was to gather scientific information and to analyze the data obtained through the application of the Dance of the Spiral methodology to the people who suffer from various ailments and to the composition of essential oils of plants planted according to this methodology. The results were analyzed using various scientific methods as NMR, gas chromatography, gas chromatography-mass spectrometry, NES, and DNES.

2. Material and Methods

2.1. Objects of Study

The main objects of study were common yarrow *(Achillea millefolium*), wood violet *(Viola odorata)*, dandelion *(Taraxacum officinale complex)*, common chicory *(Cichorium intybus)*, shepherd's purse *(Capsella bursa-pastoris)*, cranesbill *(Geranium macrorrhizum)*, broadleaf plantain *(Plantago major)*, and snowdrop *(Galanthus nivalis)*. The Spiral and the Antispiral circles, created according to the Dance of the Spiral methodology, with plants positioned in one of the eight directions according to the empirical law established by the authors. All plants were planted and cultivated under the same conditions on the same plots of land with the same composition of the soil, the same lighting and irrigation. They were harvested after 3 weeks under the same condition, isolated and analyzed under the same procedure.

2.2. Clinical Trials with Volunteers

Clinical trials with 20 volunteers who suffer from neurological, gastro-intestinal, cardio-vascular, and articular conditions and diseases, who stayed consecutively in the Antispiral and Spiral plant circles for 6 min. in each circle were performed based on their subjective assessment of their state of health and their experience after the procedure of being stayed in the Antispiral and Spiral plant circles. These clinical trials resulted in the conclusion that the Antispiral circle has a relaxing effect while the Spiral circle has a stimulating effect upon tested people.

2.3. Study the Essential Oil Composition of Plants

The essential oil composition of the three samples has been studied designated as: "Regular", "Spiral", and "Antispiral". The essential oils were obtained and isolated under identical experimental conditions from air dry over ground parts by micro distillation-extraction in Likens-Nickerson (Nickerson & Likens, 1966) device for simultaneous distillation extraction. The further analysis was performed by using the standard methods of gas chromatography and gas chromatography-mass spectrometry. To determine the similarities in the essential oil composition of the three samples the Principal Component Analysis (PCA) has been performed. The analysis was carried out at the Bulgarian Academy of Sciences.

2.4. NES and DNES Spectral Analysis

The device for the DNES spectral analysis was made by A. Antonov on an optical principle. For this was used a hermetic camera for evaporation of water drops under room temperature (+22–24 ^{0}C) conditions. The water drops were placed on a water-proof transparent pad, which consists of thin maylar folio and a glass plate. The light was monochromatic with filter for yellow color with wavelength at = 580±7 nm. The device measures the angle of evaporation of water drops from 72.3^0 to 0^0. The DNES-spectrum was measured in the range of E = -0.08– -0.1387 eV or λ = 8.9–13.8 μm using a specially designed computer program. The main estimation criterion was the average energy ($\Delta E_{H...O}$) of hydrogen O...H-bonds between H_2O molecules in water samples. The following samples were studied: water extracts from the common yarrow (*Achillea millefolium*) from the control group grown in the plant's natural habitat, and from the plants grown correspondingly in the Spiral and Antispiral circles. The water extracts were prepared according to the standard method authored by the landscape architect P. Penkov.

Stems were not being removed but put for 8 min into prepared beforehand 330 ml glass bottles, filled with deionized water. The bottles are being closed, wrapped into aluminum foil, and labeled. Prior to biophysical study the water extracts were kept in the glass bottles for 24 hours at t = +4 ^{0}C.

2.5. Nuclear Magnetic Resonance (NMR) Spectroscopy

The NMR spectroscopy was used as a method for quantitative analysis of 83 components of common yarrow *(Achillea millefolium*) on a device NMR spectroscopy on a Brucker WM-250 ("Brucker Daltonics" Germany) with a working frequency 70 MHz (internal standard – Me_4Si).

3. Results and Discussion

During the experiment the eight plants are planted into two circles. In the first circle, the Spiral, 1 m in diameter, they are planted in the following directions: north, northeast, east, southeast, south, southwest, west, northwest. One of the authors, D. Krastev, enters the empirical elements linked to the directions, i.e. sky, water, mountain, wood/wind, fire, lake, earth, thunder. The plants used in the research: common yarrow *(Achillea millefolium*), wood violet *(Viola odorata)*, dandelion *(Taraxacum officinale complex)*, common chicory *(Cichorium intybus)*, shepherd's purse *(Capsella bursa-pastoris)*, cranesbill *(Geranium macrorrhizum)*, broadleaf plantain *(Plantago major)*, and snowdrop *(Galanthus nivalis)*, were positioned in circles by directions (north, northeast, east, southeast, south, southwest, west, northwest) and elements (sky, water, mountain, wood/wind, fire, earth, thunder) [see Table 1].

Table 1: Arrangement of plants by directions of the world in the Spiral circle

Direction	Element	Plant
North	Sky	Common yarrow (*Achillea millefolium L.*)
Northeast	Water	Wood violet (*Viola odorata L.*)
East	Mountain	Dandelion (*Taraxacum officinale complex*)
Southeast	Wood/wind	Common chicory (*Cichorium intybus L.*)
South	Fire	Shepherd's purse (*Capsella bursa-pastoris L.*)
Southwest	Lake	Cranesbill (*Geranium macrorrhizum L.*)
West	Earth	Broadleaf plantain (*Plantago major L.*)
Northwest	Thunder	Snowdrop (*Galanthus nivalis L.*)

Next to the Spiral circle there is the Antispiral, in which the plants are positioned mirroring the arrangement in the Spiral circle [See Table 2].

Table 2: Arrangement of plants by directions of the world in the Antispiral circle

Direction	Element	Plant
North	Sky	Shepherd's purse (*Capsella bursa-pastoris L.*)
Northeast	Water	Cranesbill (*Geranium macrorrhizum L.*)
East	Mountain	Broadleaf plantain (*Plantago major L.*)
Southeast	Wood/wind	Snowdrop (*Galanthus nivalis L.*)
South	Fire	Common yarrow (*Achillea millefolium L.*)
Southwest	Lake	Wood violet (*Viola odorata L.*)
West	Earth	Dandelion (*Taraxacum officinale complex*)
Northwest	Thunder	Common chicory (*Cichorium intybus L.*)

For the duration of two weeks clinical trials were conducted with 20 volunteers – men and women suffering from neurological, articular, gastro-intestinal and cardio vascular diseases. The volunteers stayed in the Spiral and Antispiral circles, 6 min. consecutively in each circle. It was determined that the experiences were varied for each volunteer.

Further medical consultations with volunteers, based on their subjective assessment of their state of health after the procedure of being stayed in the Antispiral and Spiral plant circles, resulted in the conclusion that the Antispiral circle has a relaxing effect while the Spiral circle has a stimulating effect.

In subsequent biophysical studies water extracts from common yarrow grown in the Spiral, the Antispiral, and the control group have been studied with the use of NES and DNES methods. The results obtained with the NES method were recalculated with the DNES method.

For the control group the result with the NES method is E = -0.1095 eV. This is the average result for the energy of hydrogen bonds between H_2O molecules in pure water samples.

The Spiral sample results are the following: with the NES method – E = -0.1136eV. The DNES is defined as the difference between the sample and the control sample; it is ΔE = (-0.1136) – (0.1095) = -4.1 meV. The result is statistically reliable and lies within the interval [-1.1 --- 1.1 meV]. It points to restructuring of H_2O molecules

towards higher energies of hydrogen bonds within the interval (-0.08) – (0.14) eV. The effect had been reported by patients as stimulating.

The Antispiral sample results are: with the NES method – E = -0.1055 eV. The DNES is defined as the difference between the sample and the control sample: ΔE = (-0.1055) – (0.1095) = 4.0 meV; this result is statistically reliable and lies within the interval [-1.1 --- 1.1 meV]. It points to restructuring of H_2O molecules towards lower energies of hydrogen bonds within the interval (-0.08) – (0.14) eV. The effect had been reported by patients as relaxing.

Further a research was done into the essential oil composition of three samples of common yarrow oil. The common yarrow (*Achillea millefolium*) belongs to the family *Asteracea*, whose taxonomical characteristic is essential oil, which is confirmed by modern scientific research. For instance, according to A. Konakchiev (Konakchiev, 2015), "the results of the study demonstrate that with the exception of few samples, the representatives of the Millefollium group produce chamazulene".

The common yarrow essential oil contains basically sesquiterpenes formed from 3 isoprene units $(C_5H_8)_3$. According to the authors' data the chemical composition of the common yarrow is on 0.2–0.8 % essential oil, sesquiterpene lactone matricin, flavonoid glycosides, pyridone alkaloids, cyanogenic glycosides, tannins, phytosterols, vitamin C and vitamin K, manganese salts, etc. According to F. Candan (Candan et al, 2013), the chemical analysis of common yarrow reveals the presence of essential oil, tannins, flavonoids, sesquiterpene lactones, alkamyds, inulin, and vitamin C. The essential oil from the common yarrow is obtained by distillation with water vapors. Depending on the subspecies of the plant and on the process of distillation the oil fraction may be blue, green or brown. Blue-green color is due to the primary component of the oil – chamazulene, obtained from the lactone matricin during the distillation. The oil also contains sesquiterpene α–cariophelene. In addition, the essential oil contains sesquiterpene α-caryophyllene, mono- and bicyclic terpenes, cineol, α-pinene, δ-pinene, thujone, borneol, and camphor. According to literature data, common yarrow has anti-inflammatory property (*in vitro* – inhibition of human neutrophilic elastase, protease, pointing to additional mechanisms of the anti-inflammatory property of extracts and fractions of common yarrow), especially for inflammation of the digestive and female reproductive systems (Ivancheva et al, 2006), spasmolytic property (Benedek & Kopp, 2007), styptic, sedative, tonic, spasmolytic, antipyretic, antimycotic properties (Figueiredo et al, 1995), and may be applied to treating wounds (Figueiredo et al, 1995). There have been reports that common yarrow essential oil has an antioxidant and antimicrobial effect *in vitro* against *Streptococcus pneumoniae*, *Clostridium perfringens*, *Candida albicans*, *Mycobacterium smegmatis*, *Acinetobacter woffii* and *Candida krusei* (Candan et al, 2003). According to the authors' data (Asenov, 1998), chamazulene, contained in common yarrow essential oil, is responsible for its anti-inflammatory effect.

In our experiments with studying the composition of essential plant oil produced under different experimental conditions the first sample of common yarrow oil was the control sample; the second sample has been acted upon by the Spiral and the third sample – by the Antispiral circle. 83 components are registered in the three samples, in amounts above 0.1 % – in the control, Spiral, and Antispiral sample comprising, correspondingly, 98.03, 95.19, and 95.97 % of the total essential oil content [see Table 3]. The components are identified by their retention times and mass spectral data, and compared with literature sources. It appears that the components by the following numbers [in Table 3] – 2, 4, 5, 10, 11, 12, 14, 17, 21, 22, 24, 25, 28, 30, 31, 32, 38, 42, 44, 49, 52, 58, 62, 63, 64, 65, 69, 71, 72, 73, 74, 78, 79, 82, 83 – are present in all three samples. Components 2, 6, 7 are present only in the Antispiral sample; components 19, 32, 45, 51, 53, 81, 82, 83 are present only in the Spiral sample; components 1, 7, 8, 9, 18, 19, 35, 40, 41, 46, 47,48, 56, 57 are present only in the control group; components 3, 14, 16, 23, 29, 39 are present only in the control group and Antispiral sample; components 36, 43, 54, 70, 75, 77 are present only in the control group and Spiral sample; components 25, 33, 50, 60, 61, 66, 67, 68, 80 are present only in Spiral and Antispiral samples. The experimental data suggests that essential oil in the three samples is not identical in its quantitative and qualitative composition of the 83 parameters that being studied. The samples differ both in the types of components and in their amounts [see Table 3]. The largest is the amount of identical components in the three samples. The common yarrow essential oil is known for its anti-inflammatory and styptic properties evidently due to the presence of chamazulene in essential oil. Table 3 shows that the amount of chamazulene in the control sample is 5.41 %, in the Spiral sample – 4.32 %, and in the Antispiral sample – 10.25 %. The common yarrow grown in the Antispiral circle, therefore, should be expected to have a stronger anti-inflammatory effect than the specimens of this plant grown in the control and Spiral groups. The main conclusion that can be drawn from the study of the essential oil composition is that the three samples of the common yarrow may have various pharmacological effects on tested people; however, this conclusion needs to be proven by future research in this area.

Table 3: Common yarrow essential oil composition of the three samples: Control, Spiral, and Antispiral

№	Components	Control	Spiral	Antispiral
1	santolina triene	0.97	–	–
2	thujene	–	–	0.36
3	pinene	1.85	0.53	3.06
4	camphene	0.39	–	0.70
5	sabinene	1.88	0.31	1.24
6	pinene	8.31	1.97	9.56
7	myrcene	–	–	0.38
8	2-dehydrocineole	0.28	–	0.24
9	yomogi alcohol	0.47	–	–
10	terpinene	0.22	–	–
11	p-cymene	0.27	0.22	0.32
12	limonene	0.33	0.23	0.53
13	1,8-cineole	8.17	5.02	11.15
14	*cis*-ocimene	0.17	–	0.36
15	salicyl aldehyde	0.13	0.27	0.19
16	terpinene	0.47	–	0.24
17	*cis*-sabinene hydrate	1.48	1.07	0.58
18	artemisia alcohol	0.26	–	–
19	terpinolene	0.16	–	–
20	linalool		0.39	–
21	*trans*-sabinene hydrate	0.46	0.82	0.58
22	campholene aldehyde	0.22	0.78	0.27
23	nopinone	0.21	–	0.25
24	*trans*-pinocarveol	0.77	1.37	0.25
25	camphor	1.97	9.25	17.20
26	M=152 $M_{10}H_{16}O$	–	0.60	0.38
27	*trans*-chrysanthemol	9.01	–	0.32
28	*cis*-chrysanthenol	1.66	1.16	2.00
29	M=152 $C_{10}H_{16}O$	2.31	–	0.85
30	borneol	14.29	10.75	3.62
31	terpinene-4-ol	1.74	0.77	1.03
32	terpineol	3.52	3.64	2.39
33	myrtenol	–	0.65	0.25
34	myrtenal	1.22	–	0.22
35	*trans*-carveol	0.30	–	–
36	*iso*-geraniol	0.37	0.57	–
37	*cis*-chrysanthenyl acetate	0.44	7.34	0.42
38	*trans*-chrysanthemyl acetate	4.18	0.36	1.53
39	lavandulyl acetate	0.48	–	0.18
40	non identificated	0.34	–	–
41	*trans*-carveyl acetate	0.41	–	–
42	terpinyl acetate	0.80	0.96	0.61
43	copaene	0.27	0.46	–
44	bourbonene	0.39	1.08	0.89
45	elemene	–	1.18	–
46	*cis*-jasmone	0.32	–	–
47	M-150 $M_{10}H_{14}O$	0.22	–	–
48	C_{10}-butanoate	0.20	–	–
49	caryophyllene	4.15	4.40	3.82
50	copaene	–	0.25	0.18
51	Z-farnesene	–	0.19	–
52	humulene	0.72	0.74	0.61
53	a-muurolene	–	0.19	–
54	ar-curcumene	0.17	0.19	–

55	germacrene D	2.29	8.89	6.91
56	a-zingiberene	0.21	–	–
57	M-238	0.32	–	–
58	indipone	0.24	0.92	0.49
59	bicyclogermacrene	0.42	1.81	0.72
60	a-cadinene		0.43	0.29
61	nerolidol	0.37	1.10	0.44
62	isocaryophyllene epoxide A	–	0.35	0.12
63	caryophylla-4(12),8 (13)-dien-5-one	0.35	0.60	0.27
64	spathulenol	0.52	1.12	0.54
65	caryophyllene oxide	4.15	5.88	3.91
66	salvial-4(14)-en-1-one	–	0.51	0.26
67	3Z-caryophylla-3,8(13)-dien-5-one	–	1.02	0.52
68	M=220 $C_{15}H_{24}O$	–	0.38	0.25
69	M=220 $C_{15}H_{24}O$	0.22	0.35	0.25
70	M=220 $C_{15}H_{24}O$	–	0.49	–
71	M=220 $C_{15}H_{24}O$	0.24	0.25	0.41
72	*cis*-cadin-4-en-7-ol	4.13	1.53	0.59
73	caryophylla-4(12),8 (13)-dien-5-ol	0.69	1.49	0.50
74	M=220 $C_{15}H_{24}O$	0.19	0.32	0.27
75	M=222 $C_{15}H_{26}O$	0.31	0.61	–
76	M=218 $C_{15}H_{22}O$	0.36	0.95	0.27
77	M=220 $C_{15}H_{24}O$	0.22	0.46	–
78	M=220 $C_{15}H_{24}O$	0.88	2.40	1.33
79	M=220 $C_{15}H_{24}O$	0.56	1.37	0.21
80	CH-alifate carbon	–	0.32	0.41
81	M=218 $C_{15}H_{22}O$	–	0.39	–
82	M=220 $C_{15}H_{24}O$	–	0.22	–
83	chamazulene	5.41	4.32	10.25
Total		98.03	95.19	95.97

Notes:
*The results obtained from the research of the Bulgarian Academy of Science
**The table includes components which amounts in the oil exceed 0.1 %.

The results of this research have been compared with those of the study conducted in 1999 and 2000 on twenty samples of common yarrow inflorescences and leaves gathered in their eleven habitats in Eastern Lithuania (Moskute & Judzenziene, 2002). The essential oils were analyzed using spectroscopic methods. According to the primary component of the essential oils, the samples have been divided into six chemotypes: pinene (10 samples, 10.2–17.2 %), 1.8 cineol (3 samples, 8.8–9.9 %), borneol (3 samples, 11.5–13.2 %), camphor (1 sample, 13.1 %), nerolidol (2 samples, 8.5–9.3 %), and chamazulene (1 sample, 20.1 %). These primary components are also present, in different consentrations, in the samples that we have studied [Table 3]. Other authors (Moskute & Judzenziene, 2002) have established that eight of the studied samples do not contain chamazulene, and 1 sample contains only traces of this component. The researchers associate the curative power of the common yarrow and its essential oil with chamazulene (Asenov et al, 1998). According to seven authors quoted in the paper (Moskute & Judzenziene, 2002), the components – 1,8-cineol, camphor, borneol, nerolidol, caryophyllene, and caryophyllene oxide – display different biological activity, which agrees with our conclusion that the three samples of common yarrow, depending on their phytochemical composition, have different pharmacological effects. These results are broadly in line with our results.

Conclusions

1. The results obtained by means of biophysical methods for measuring the energy of the hydrogen bonds among H_2O molecules – Non-equilibrium energy spectrum (NES) and Differential non-equilibrium energy spectrum (DNES) – in the samples of water extracts of common yarrow (*Achillea millefolium*) from the control group growing in the plant's natural habitat, and from the plants cultivated correspondingly in the Spiral and the Antispiral circles are harmonic in their absolute value and demonstrate the uniqueness of the Dance of the Spiral methodology (Krastev, 2011). The effect of the common yarrow plants from the Spiral circle is stimulating, while the effect of those from the Antispiral circle is relaxing.

2. The results of the studies of the essential oil composition from the three samples of common yarrow from the three groups – control, Spiral, and Antispiral – lead to a remarkable conclusion: the essential oils from the three

samples are not identical in the quantitative and qualitative composition regarding the 83 components detected in them and studied, i.e. the essential oils from the three samples of common yarrow differ regarding their components and the amounts of these components. The amount of chamazulene was found to be equal to: in the control group sample – 5.41 %; in the Spiral sample – 4.32 %; in the Antispiral sample – 10.25 %; i.e. the amount of chamazulene in the essential oil from the Antispiral sample is almost twice of that in the control group and Spiral samples. It follows that the common yarrow cultivated in the Antispiral circle should be expected to have a stronger anti-inflammatory effect than the common yarrow from the control group and the Spiral sample.

3. Pharmacognostical and biophysical methods for measuring the energy of hydrogen bonds between H_2O molecules in the water extracts of common yarrow cultivated in the Spiral and Antispiral circles pointed out to the curative effects of these plants.

4. The authors' summarizing conclusion is that the principles established by their research can be implemented in landscaping and beautification projects, planting parks that have health-restoring effects, manufacturing herbal products, and in many areas related to cultivation of plants and to the health and well-being of people.

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