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Potentiation of Ashwagandha (*Withania somnifera*) by Using Mid-infrared Ray: A Novel Approach

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Authors' contributions

This work was carried out in collaboration among all authors. Author UT helped in conceptualization, performed methodology, supervised the study and did data validation. Author MM did data curation, Investigation, visualization, and wrote original draft of the manuscript. Author UU did project administration, searched for resources. Authors UT and MM wrote, reviewed and edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

In allopathic medicine, additives and synergistic can somewhat increase a drug's potency, but doing so also raises its cost and sensitivity. In the ancient medicine system, potentiation technology is described elaborately but during the course of time, it has been lost. We invented a 2-6µm water-based mid-IR generating atomizer named MIRGA. Depending on the applied plunger pressure, MIRGA's every spraying is designed to generate 2-6 µm mid-IR. In the Ayurvedic medical system, ashwagandha (*Withania somnifera*) is a widely used herb in folk medicine for treating a variety of

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ailments. Using MIRGA, an immediate external spraying distance of 0.25–0.50 meter was applied to the packaged (polyethene, paper) ashwagandha powder. This resulted in ashwagandha potentiation for a minimal 27%. The MIRGA is cost-effective, guaranteeing resource savings in addition to rising health benefits. The numerous advantages offered by this technology have been substantiated through a series of experiments and various instruments, which will be elaborated upon in this discourse.

Keywords: MIRGA; 2-6µm mid-IR; ashwagandha; potentiation; dose; health issues; reduction.

1. INTRODUCTION

Herbs are a boon to living beings and by all means, should be preserved. Climatic change, increasing population, reducing fertile lands, developing allopathic medicine sensitivity, etc. are directly and constantly forcing us to enhance the quality and development of natural products with simultaneous quantity reduction for clinical use. We addressed this challenge by applying the 2–6 µm wavelength mid-IR on ashwagandha as an example case. Ashwagandha possesses multiple biological and therapeutic properties [1]. The mid-IR was generated by a mid-IR generating atomizer (MIRGA). Generally, the mid-IR has various potential applications, and most importantly with unanswered questions [2]. We invented MIRGA to study the mid-IR's unexplored benefits, natural safety and present mid-IR emitters' insufficiency to meet our various vital needs. MIRGA spraying has potentiated the ashwagandha and thus reduced the required dose of ashwagandha by 27%. Obtained results regarding the MIRGA's effect on inherent characteristics of Ashwagandha and benefits are presented here.

2. MATERIALS

Umakanthan et al. [3] and Umakanthan et al. [4] have comprehensively elucidated the intricate facets of MIRGA's design and its emission in the 2–6 µm mid-infrared range. Approximately two sextillion cations and three sextillion anions are present in the 20 mL capacity polypropylene plastic atomizer MIRGA (Patent no.: 401387), which holds an inorganic (molar mass 118.44 g/mole) water-based solution. The dimensions of the sprayer unit are 86 × 55 × 11 mm, with an orifice diameter of 0.375 mm, an ejection volume of 0.062 + 0.005 mL and an ejection duration of 0.2 seconds. The back pressure of the cone liquid is 2000 N/m^2, and the average pressure is 3900 Pa. The non-volatile substance in the sprayed liquid has a concentration of 153 mg/mL and during spraying, about 1 µg weight of water is lost as mist. Each spraying session releases 0.06 ml, of which about seven quintillion anions and eleven quintillion cations are present. An FTIR (retro-reflector) interferometer instrument (Detector type D* [cm HZ1/2 - 1] MCT [2-TE cooled]) at Lightwind, Petaluma, CA, USA, estimates that each spraying is intended to generate 2–6 µm, depending on the pressure applied to the plunger.

The spraying was done from 0.25–0.50 meter towards the packaged medicine. This distance is essential for the MIRGA sprayed solution to form the ion clouds, oscillation and the mid-IR generation. The mid-infrared has the capability to exert its influence on the internal components of ashwagandha by traversing the polythene wrapping that separates them. Close sprayings did not generate energy. To be short, the MIRGA is designed to be like a body spraying externally over the packed ashwagandha powder.

The same brand and batch of commercially available ashwagandha powder was exposed to mid-IR irradiation before being employed in this investigation and administered to the patients. The ashwagandha powder was evaluated in a brand-specific manner, with each brand being tested individually and without any mixing for the purpose of sampling.

3. METHODS

Ashwagandha powder is marketed mostly in polythene (51–70 µm thickness) packets. The same brand and batch of 100gm x 90 packets were purchased, of which 10 were kept as control and 80 marked as batches 1 to 8, each comprising 10 packets that formed the trial samples. At first, 10 control samples were subjected to sensory expert panel (n = 6) tests. The acceptability index used was a hedonic scale with a 9-point nominal structure as follows [5,6].

Score 1: dislike extremely
Score 2: dislike very much
Score 3: dislike moderately

Score 4: dislike slightly
Score 5: neither like nor dislike
Score 6: Like slightly
Score 7: Like moderately
Score 8: Like very much
Score 9: Like extremely

The control samples were used to treat patients based on the standard prescribed dose (3 gms BID). In the trial batch 1, one spraying was done from 0.25–0.50 meter toward the packet. Then sample was taken, sensory expert panel tests was performed and the remaining powder was used to treat the patients by reducing 10% weight (2.7 gms BID) (Table 1) from the standard prescribed dose (3 gms BID). In batch 2, two sprayings were performed, one on either side given from 0.25–0.50 meter towards the packet. After spraying, sample was taken, sensory expert panel tests were done and the remaining powder was used to treat the patients by further reducing 10% weight (2.43gms BID) from one sprayed dose (2.7 gms BID). Similarly, 3 to 8 sprayings were done as previously described and 10% dose was subsequently reduced for every increase in number of spraying (i.e. prescribed dose was 2.18 gm in 3 sprayed, 1.96 gms in 4 sprayed and so on… up to 1.27 gm in 8 sprayed batches).

Including control and sprayed packets (9 batches), at the rate of 10 volunteer patients (upper respiratory tract cough, pyrexia of unknown origin, gastric ulcers and constipation), total 90 were clinically studied. The patients' clinical parameters were recorded. Recovery from the disease was confirmed by the clinician team to discontinue the therapy. The sensory expert panel test instrumentation and clinical data were compared.

Method of MIRGA spraying: https://drive.google.com/open?id=1QoRwTESKfSdoJTfD--xIG9YpTDnVonGW

The reason for 8 spraying here is: in nature input of an extra energy to an object should always denature the receptor. Hence, we tried to accomplish this goal by using more MIRGA spraying and the results were compared.

The instruments used to demonstrate the research findings were:

"Chemical compound transformation – Gas chromatography-mass spectrometry (GC-MS): Agilent technologies, 7820 GC system, 5977E MSD, Colomn DB-5, Over temp 100-270^{0}C, Detector MS, Flow rate 1.2, Carrier gas Helium". [55]

"Chemical bond changes – Fourier-transform infrared spectroscopy (FTIR): JASCO FT-IR 4200 plus spectrophotometer with ATR (range 4000–400 cm^{-1} at 298 K); and IR AFFINITY I – FTIR Spectrophotometer, FTIR 7600, Shimadzu" [55]

Structural changes–Powder X-Ray Diffraction (PXRD): Rigaku RINT 2500 X-ray diffractometer (CuKα anode; λ = 1.541 Ao). Samples were scanned at 40kV and 30mA from 5^0 to 35^0 2θ values and analyzed using a PDXL2 software (Rigaku).

Configurational changes – Transmission electron microscopy (TEM): JEOL JEM2100 PLUS; HT: 60-200Kv; Source: LAB-6 Filament; Point-point resolution: 0.23 nm; Line resolution: 0.14 nm. Model: Cryoplunge 3 system Model 930 & Elsa Cryo-Transfer Holder Model 698)

Nuclear resonances – Proton nuclear magnetic resonance spectroscopy (1H-NMR): The 1H NMR spectra of the compounds were performed on a 500 MHz Bruker AVANCE III spectrometer operating at 500.13 MHz , using a 5-mm broadband (BBO) probe equipped with a z-gradient coil (Bruker-Biospin, Switzerland). The samples were dissolved in CDCl 3. The chemical shifts (δ) were calibrated regarding TMS. All 1D spectra were acquired with 32K data points. Typical acquisition parameters for the 1 H NMR experiments were as follows: acquisition time 1.58 s, spectral width 10330 Hz, pulse width 3.5 μs (flip angle ≈30◦), relaxation delay 1s and the number of scans 32.

4. RESULTS AND DISCUSSION

These sensory attribute changes were perceived in 1-2 minutes after spraying. The ashwagandha 3 and 8 times MIRGA sprayed were found to have respectively enhanced and decreased potency and clinical response than control (Table 1).

Table 1 showed that, the 3 sprayings received ashwagandha (2.18 gm) produced more clinical recovery (70%) than the control (3 gm dose) and other trial samples. Hence quantity of ashwagandha dose required was reduced by 27% (3gm (control) minus 2.18gm (3 sprayings =

0.82/3*100 = 27.3%), besides the faster recovery rate and shorter treatment course.

4.1 Instrumentation Results

Raw data files of instrumentations: https://drive.google.com/open?id=1Dime1h4iGL_FOODK8AWJ0RhNx4ZPiNcO
The above samples used for instrumentation were from the same source, the difference among them is, only the number of sprayings they received.

4.1.1 GC-MS

Control: These are the key peaks in the AGC GCMS pattern: ~13.1 min, ~14.8 min, ~15.2 min, ~16 min, 17.85 min, and 19.7 min.

3 sprayed sample: Compared to the control sample, sample shows a broad peak at ~21 min. This additional peak is ascribed to the reduced astringency and increased sweetness.

8 sprayed sample: Compared to the control, there are three peaks at about 11 min, 11.4 min, and 12 min. These additional peaks are suggested to be due to the increase in astringency and bitterness.

The Control sample contains many fatty acid derivatives such as 2,3-di-hydroxypropyl esters.

3 sprayed sample has a new peak of 13-Octadecenal, an aldehyde and decrease in 2, 3-dihydroxypropyl elaidate. This is responsible for the enhancement of sweetness characters and decrease in astringency. While 8 sprayed sample has a unique peak of Oxirane (hexadecyl) and oleic acid which is responsible for increase in both astringency and bitterness (Table 2, Fig. 1).

4.1.2 FTIR

i. JASCO FT-IR 4200 plus spectrophotometer with attenuated total reflectance (Fig. 2a):

Average Transmission Response in All Samples: The average transmission signal drops as the sample undergoes 3 spraying, but it rises again after 8 sprayings. Therefore, the overall absorption by the sprayed samples in the mid-infrared spectrum is a mix and complex behavior depending on the number of spraying.

Control: The broad signal in the range of 3200-3600 cm^{-1}, seen amongst others in the functional group region, is associated with the stretching vibration of O-H in Ashwagandha powder.

3 sprayed sample: There is no significant change in the fingerprint region compared to the control sample. In the functional group region, however in addition to a shift in the background signal, there is a signal drop of around 6% in the O-H stretching vibration at 3200-3600 cm^{-1}.

8 sprayed sample: There is no significant change in the fingerprint region compared to the control sample. In the functional group region however, in addition to a shift in the background signal, the O-H stretching vibration at 3200-3600 cm^{-1}, has the same 6% level of drop compared to the control sample (disregarding the background signal). The observed changes in the O-H stretching vibration, may be interpreted as to the 3 sprayed and 8 sprayed samples being favorable with respect to the control sample.

ii. IR AFFINITY I – FTIR Spectrophotometer, FTIR 7600, Shimadzu (Fig. 2b):

Control: Peaks were found at 2191cm^{-1}

3 sprayed sample: A very important stretch was noted for the OH and C-O bonds [7]. In addition, the peak at 2191cm^{-1} in the control sample is absent for the moment. Compared to the control, structural changes occurred due to bond breaking and bond formation [8].

8 sprayed sample: A very important stretch was noted for the OH and C-O bonds. But, OH peak is more intense. Peak at 2191cm^{-1} in control sample is absent now. Compared to control, structural changes occurred due to bond breaking and bond formation.

4.1.3 PXRD

Patterns indicate that samples have amorphous and crystalline zones. Control, 3 and 8 times sprayed samples showed peaks at 2 theta: 14.86; 17.12; 22.00; 24.30; 26.51 and 30.05. The areas under the peak in the range of 10^{o} to 30.5^{o} and the subsequent calculations for the purity of the product are presented in the PXRD analysis table. A small decrease in crystallinity in the sprayed samples was noticed. (Table 3) (Fig. 3)

Table 1. Clinical trial and sensory attribute trial details

Batch No.	No. Of MIRGA sprayings	Hedonic point (sensory attributes)		Dose (BID) gms	No. of patients employed	No. of completely cured patients within 5 days	Recovery rate within 5 days	Minimum days required for complete cure
		Astringency	Sweetness					
Control	Non-sprayed	5	5	3	10	5	50%	3
1	1	5		2.7	10	6	60%	3
2	2	6		2.43	10	5	50%	4
3	3	4	8	2.18	10	7	70%	2
4	4	3	7	1.96	10	5	50%	4
5	5	3	7	1.76	10	5	50%	4
6	6	2	4	1.58	10	4	40%	5
7	7	2	2	1.42	10	3	30%	4
8	8	1	2	1.27	10	4	40%	6

Table 2. GC-MS analysis of Ashwagandha powder samples

R.T. (Min)	Name of Compound	% Area Present in each sample			
		Control	3 sprayed	8 sprayed	Remarks
17.855	2,3-Dihydroxypropyl elaidate	47.82	16.60	0.0	
17.855	Oxirane, hexadecyl-	0.0	0.0	43.10	Most Abundant peak in 8 sprayed sample
19.727	9-Octadecenoic acid (Z)-, 2-hydroxyethyl ester	0.0	0.0	0.0	
19.727	Oleic Acid	0.0	0.0	56.90	Most Abundant peak in 8 sprayed sample Antibacterial, anticancer, immune stimulant, anti-inflammatory (Mustapha et al., 2016; Helioswilton et al., 2013; European Patent Office, 2000)
19.718	9-Octadecenoic acid (Z)-, 2,3-dihydroxypropyl ester	52.18	0.0	0.0	Most abundant in control sample
21.042	13-Octadecenal, (Z)-	0.0	33.43	0.0	Most Abundant in 3 sprayed sample
21.117	13-Octadecenal, (Z)-	0.0	28.93	0.0	Most Abundant in 3 sprayed sample

Table 3. PXRD analysis of Ashwagandha

Percentage analysis of the change in Ashwaganta powder			
	Control	3 sprayed	8 sprayed
Peak at	10.0 -30.5	10.0 -30.5	10.0 -30.5
Area	5761233,36	5712704,93	5739164,93
Change in area	0	-48528,43	-22068,43
Fraction change in area	0	-0,008423271	-0,003830504
Percentage change	0	-0,8	-0,4

4.1.4 TEM

Control: Fragments size ranges 1 – 10 µm, while individual particles range 0.5 – 2 µm. Major size of crystallites ranges around 30 nm. A part of crystalline materials are nano-sized particles. Sponge-like particles are observed.

3 sprayed sample: Size ranges of fragments and individual particles are comparable to those of control. Sponge-like particles are present in larger number than in the control.

8 sprayed sample: Fragments with different sizes and shapes. Large cluster of crystallites visible.

Size ranges of fragments and individual particles are comparable to those of control, with the only exception of the size range of crystallites, which is 1 – 10 nm; crystallites are thus smaller than those of control. Individual crystallites show different orientations.

Increasing the number of sprayings (from 3 to 8) causes significant alterations of the sample texture; this concerns mainly the features of the crystalline structure. In particular, the 3 sprayed results in almost complete loss of crystallinity, while the 8 sprayed modifies the crystallinity features with respect to the control (Fig. 4).

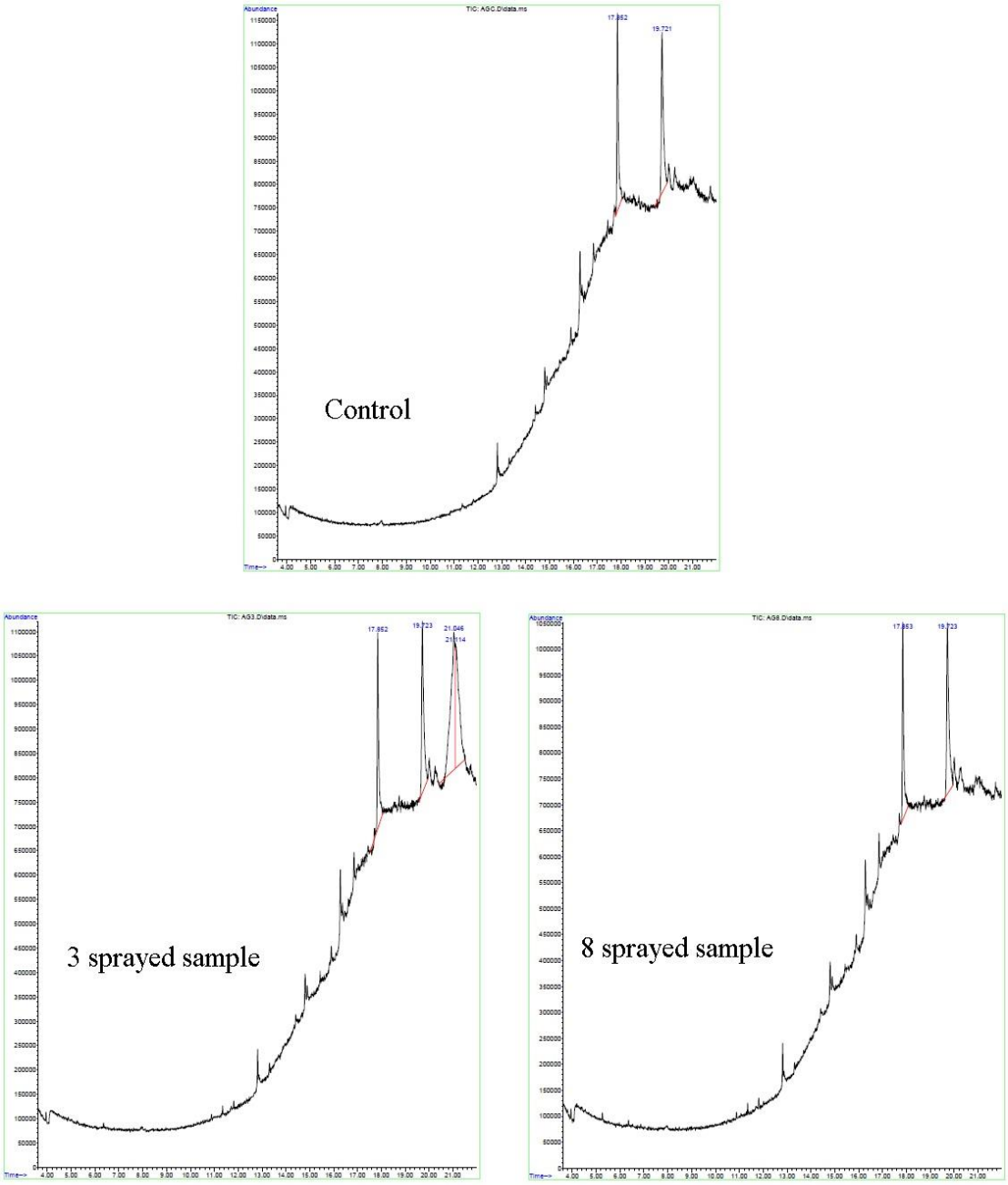

Fig. 1. GCMS spectra of Ashwagandha samples

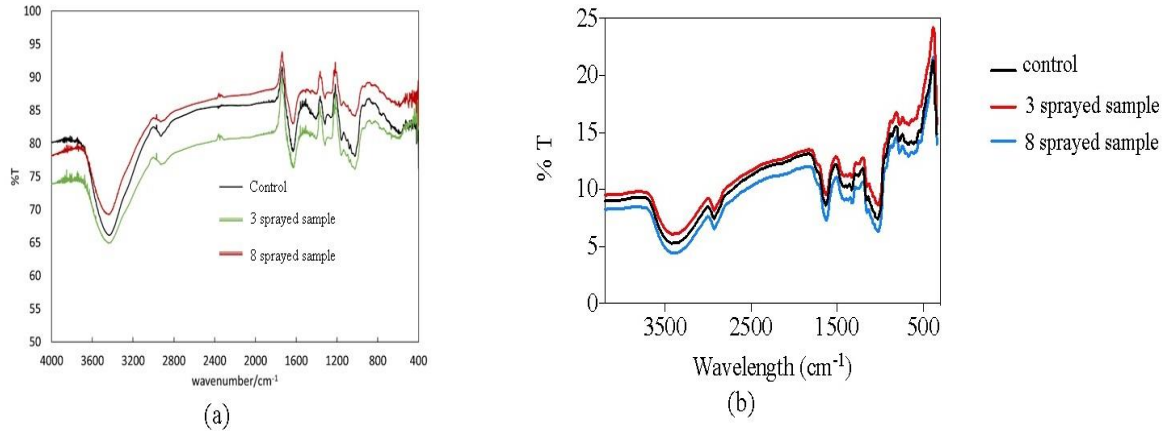

Fig. 2. FTIR spectra of Ashwagandha samples (a) JASCO FT-IR 4200 plus spectrophotometer with ATR (b) IR AFFINITY I – FTIR Spectrophotometer, FTIR 7600, Shimadzu

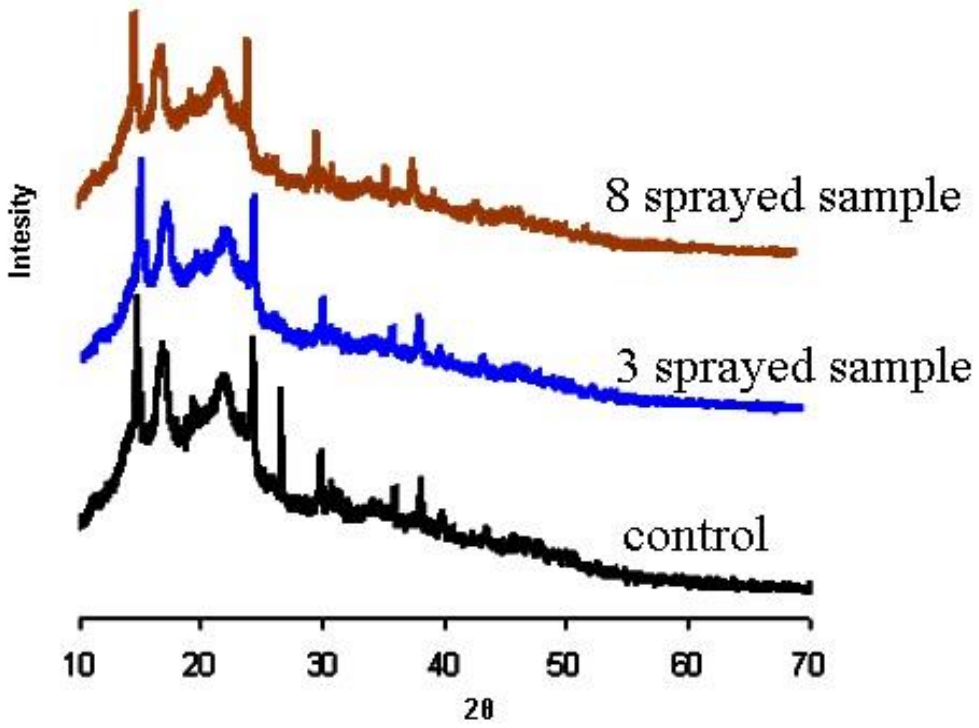

Fig. 3. PXRD spectra of Ashwagandha samples

4.1.5 Proton NMR

Since one of the main compositions of Ashwagandha include alkaloids, and there is no significant change in the alkaloid amino acid at 1.254 ppm in control, 3 and 8 sprayed samples, we used this peak as a reference to normalize the integral values in all the three data sets. With respect to the control sample, the fatty acid CH3 and the monosubstituted cyclopropane –CO– phenyl decrease in the 3 sprayed sample. But in the 8 sprayed sample these integrals increase again. The monosubstituted alkane –COOH and the monosubstituted ethylene –NC show an opposite behavior. There is an increase in the amino acid reference at 1.254 in both 3 sprayed and 8 sprayed samples. All such behaviors [9,10] may be interpreted as the 3 sprayed sample being more favorable than the control sample and the 8 sprayed sample being less favorable [11,12,13] (Table 4) (Fig. 5).

Table 4. H-NMR analysis of Ashwagandha

Chemical Shift Description			Control			3 sprayed sample			8sprayed sample		
			Chemical Shift (ppm)	Peak Integral	Normalized Peak Integral	Chemical Shift (ppm)	Peak Integral	Normalized Peak Integral	Chemical Shift (ppm)	Peak Integral	Normalized Peak Integral
Monosubstituted Pyridines	–CSNH2	Alkaloid	0.682	0.08	0.03	0.681	0.14	0.03	0.707	0.03	0.00
Fatty acid	CH3	Alkyl group - Ethyl	0.880	0.34	0.11	0.880	0.15	0.03	0.889	0.73	0.12
Monosubstituted Cyclopropanes	–CO–phenyl	Steroidal Lactones	1.010	0.17	0.06	1.012	0.07	0.01	1.037	0.39	0.06
Amino Acid in TFA		Alkaloid	1.254	2.98	1.00	1.254	4.69	1.00	1.279	6.31	1.00
Amino Acid in in D2O, pH 2.0		Alkaloid	2.044	0.77	0.26	2.038	1.04	0.22	2.062	0.78	0.12
Amino Acid in in D2O		Alkaloid	2.096	0.34	0.11	2.096	0.50	0.11	2.118	0.55	0.09
Monosubstituted Alkanes	–COCH3	Alkyl group - Methyl	2.171	0.40	0.13	2.173	0.36	0.08	2.195	0.39	0.06
Monosubstituted Alkanes	–COOH	Alkyl group - 2-Propyl	2.350	0.54	0.18	2.350	1.00	0.21	2.373	1.00	0.16
Carbonyl erivatives		Carboxylic Acid Imides	2.774	1.00	0.34	2.770	2.35	0.50			0.00
Monosubstituted Ethylenes	–NC		5.348	2.93	0.98		7.58	1.62	5.340	3.77	0.60

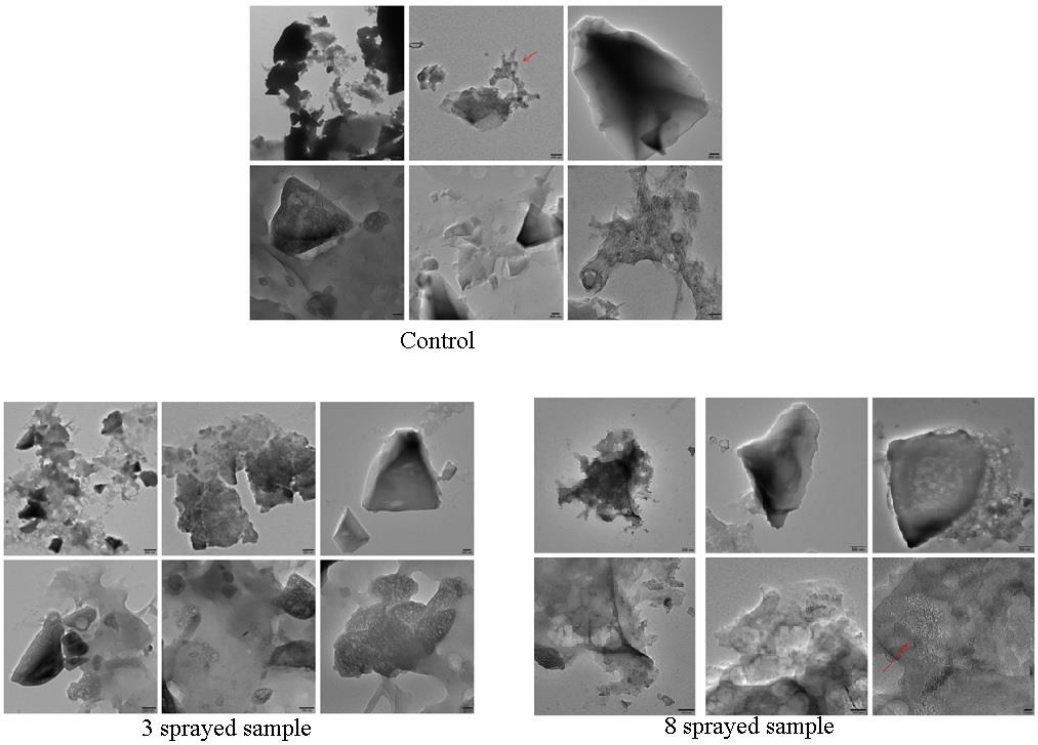

Fig. 4. TEM bright field images of Ashwagandha samples

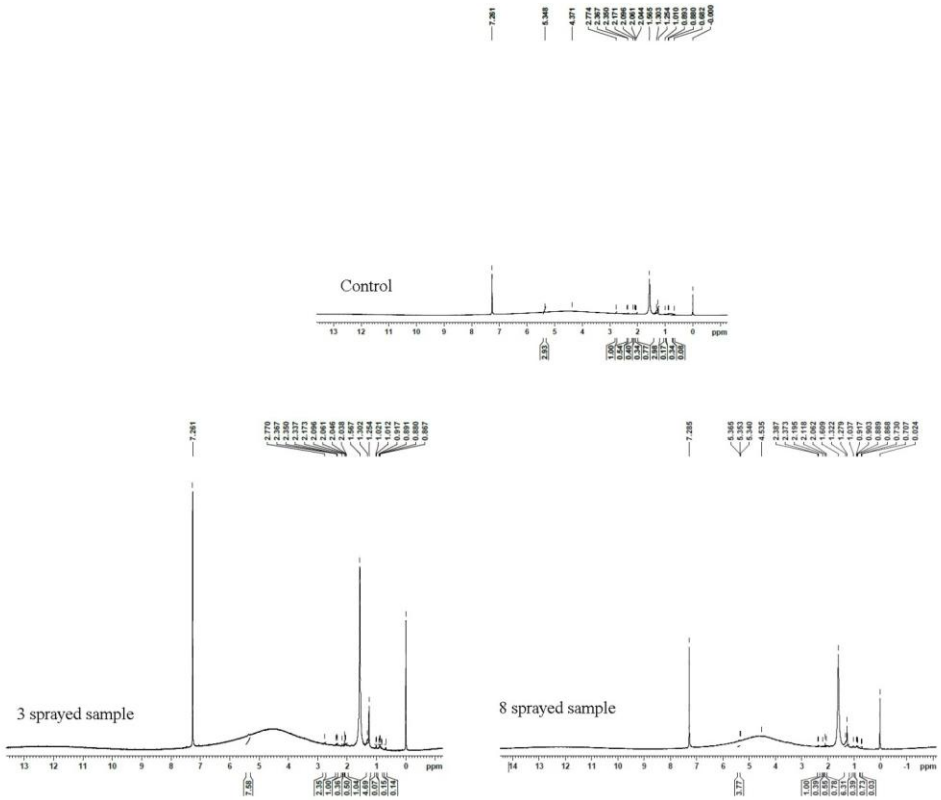

Fig. 5. Proton NMR spectra of Ashwagandha samples

The Ashwagandha powder that was sprayed three times exhibited enhanced efficacy with a shortened treatment duration. Consequently, there was a reduction in the requirement of Ashwagandha, specifically by 27% of the clinical dose. This reduction led to various advantages such as cost-effectiveness, conservation of resources, as well as expedited recovery and alleviation of drug-induced stress on the host.

All of the instrumentation data showed that, in comparison to the control data, MIRGA had changed the bonds and, consequently, the structure, resulting in increased or decreased intrinsic characteristics, depending on the number of sprayings. Umakanthan et al. [3]. have provided an overview of the invention's history, definition, method of producing mid-IR from MIRGA, toxicological analysis of MIRGA, safety of MIRGA-sprayed consumables and potential future applications.

4.2 Invention Background

“Intermolecular and intramolecular bonding make up the four visible states of matter: solid, liquid, gas, and plasma. While protons, neutrons, and electrons all have distinctive properties by nature, the differences in their quantities are what distinguish different atoms from one another and determine how these atoms combine to form distinct molecules with individual traits. Since the mid-IR area of the electromagnetic wave (EMW) spectrum corresponds with the intrinsic vibration of most molecules, it is crucial and intriguing for numerous applications” [14]. The majority of thermal radiation that reaches the earth's surface is in the mid-infrared spectrum (66 percent of solar energy is infrared; Aboud et al. [15]. “All particles on the planet absorb and emit this energy. At the molecular level, naturally, interaction of mid-IR wavelength energy produces vibrational and rotational modes (from approximately 4500-500 cm-1, or 2.2 to 20 microns) through a shift in dipole movement that results in the modification of chemical bonds” [16].

Our research revealed the following: (A) Although atoms in all objects always remain atoms, their chemical bond parameters are constantly susceptible to change due to cosmic and physical energies (such as heat, pressure, humidity, and EMW). This results in the bonds breaking [17,18] stretching, and bending [19,20,21,22], and new bond formation [23]. These modifications ultimately cause the object’s physicochemical characteristics to change. (B) The dynamic, ongoing, mutual effects of EMW between Earth, celestial bodies, and living things are always changing the physiochemical properties that are intrinsic to Earthly objects. These changes include enhancement brought about by an optimal energy dose or decrease/destruction brought about by an excessive energy dose (detailed below). Based on these ideas, the MIRGA was developed to change bond parameters and enhance any inherent qualities of the usables.

4.3 MIRGA Definition

We define MIRGA as *‘a harmless, economical atomizer containing an imbalanced ratio of ions suspended in water, which influence the natural potency of target substances by generating mid-IR while spraying’*.

4.4 Technique of Mid-IR Generation from MIRGA

“We designed MIRGA as to accommodate an imbalanced ratio of ions suspended in water in their fundamental state and can move as free particles. The solution has very little background frequency of detectable disintegration which is less than that of cosmic events whereas even humans have more radioactivity (around 10 microns)” [24,25]. We designed *MIRGA to generate energy based on various below given processes,* (A) spraying leads to ionization (electron getting separated from atom) and the pathway for electron re-absorption are also many, due to these two oscillatory processes energy generated. (B) When spraying, the water-based ionic solution becomes charged or excited, which causes the unbalanced ions to oscillate in their excited state [26], which releases photons [27,28]. (C) Despite the minimal electromagnetic field that exists between the charged particles in the ionic solution of the MIRGA, energy is produced during spraying by the induced oscillation between these charged particles [29,30,31]. (D) Additionally, more energy is needed during the natural rainfall process to break water bonds so that the clouds release smaller water droplets [32].

Consequently, these droplets need to have a greater amount of stored energy. As they descend at a certain speed after a predetermined distance, they also acquire kinetic energy. When the rain hits the earth’s surface, it forms a very

thin film of mid-IR (nearly 6 micron), hence there is a net heat gain [32,33]. We used MIRGA to simulate the energy-gaining process of this rainfall. Specifically, we found that when unbalanced ions in liquid media are atomized, the smaller droplets that are ejected should possess a greater internal energy in addition to their acquired kinetic energy and the energy released through breaking the surface tension. We adjusted the ejection pressure to produce the appropriate fine mist through trial and error and we changed the solution's density and pH to reduce the rate of evaporation. Also considering other facts like, the accelerated ions in the sprayed ionic clouds collide among them and generate energy [34], we incorporated those phenomena in our atomizer and designed in such a way to emit energy in the 2-6 µm mid-IR range.

4.5 Action of Mid-IR on Ashwagandha

Ashwagandha, also known as Indian ginseng and winter cherry, is experiencing a significant increase in demand while facing a low production rate. Despite the implementation of various modern cultivation and conservation methods [35,1], the supply has yet to meet the demand, resulting in its classification as an endangered species [36]. In the Ayurveda system, the practice of potentiation technique is not observed. Consequently, to address this issue, we conducted a pioneering study where we potentiated Ashwagandha using the MIRGA spray, leading to resource-saving and economic benefits.

The inorganic compounds used in the generation of MIR are a perspective for biomedical applications [37,38]. It is also a new synthesis method for preparation of functional material (2-6 µm mid-IR) [39,40]. It is well known that the combination of different compounds, which have excellent electronic properties, leads to new composite materials, which have earned great technological interest in recent years [41,42]. Depending on number of MIRGA spraying (energy given), a receptor’s chemical bond configurations and subsequent physical and chemical characters can be altered to our desire, as evidenced by Umakanthan et al. [3], Umakanthan et al. [4], Umakanthan et al. [43] Umakanthan et al. [44].

The 2–6 µm mid-IR that is delivered is biosafe and can pass through obscurants [45,46]. Biomolecules naturally vibrate constantly and produce 99.75 percent of the mid-infrared spectrum [47,48,49]. According to Sommer et al. [50], biological molecules absorb between 2 and 6 µm of mid-IR radiation and cause vibrational shifts that result in modifications to chemical bonds [51], physicochemical alterations [52], and ultimately potentiation. Applications of mid-IR are frequently employed in diagnosis and treatment. Potentiation is instantaneous, secure, and extremely cost-effective.

4.6 Toxicological Study on MIRGA

We also sought to investigate the cytotoxicity assay of MIRGA, even though it produces safe mid-IR energy between 2 and 6 µm and may be sprayed directly onto packaged consumables at a distance of 0.25 to 0.50 metres externally. MIRGA sprayed mist was shown to be completely non-toxic in an in vitro investigation using Vero, A549, and human dermal fibroblast cells.

According to field trials, MIRGA spray is also very affordable, easy to use, non-toxic, suitable for sensitive tissues like the cornea, safe even when sprayed directly on infants, and requires no special handling skills, much like body spray perfume (USD 0.30 per MIRGA unit which emits 300 sprayings).

4.7 Past Interests

Our in vitro and clinical investigations revealed clear similarities between the chemical formulation, therapeutic effect, and results of MIRGA and "The Superior Medicine" of several ancient medicinal systems, including "Muppu" (Tamil Siddha), "Al-Kimiya" (Arabic), "Rasayana" (Indian Ayurveda), "Rasavatan" (Persian), Materia prima, Philosopher's stone, Tincture (Europe), and Taoist alchemy, Hudan, or Jindan (Chinese). Moreover, MIRGA spraying and hand healing therapy that uses body-generated infrared are comparable. Furthermore, we saw that to heal patients of their ailments, the sages and saints, who are now residing in isolated areas of the Indian mountains—would sprinkle holy water on them. This has to do with the mid-IR radiation that their bodies and palms produce and radiate onto the patients.

4.8 MIRGA’s Primeval and Future Scope

The water based MIRGA could be the first novel pioneer potentiating technology. This type of atomizer technology also seems to be present with the extra-terrestrials for their therapeutic use during visitations [53].

In various usables, a range from 30% to 173% potentiation has been achieved by us. Even considering the least 30% in some usables have resulted in 30% economic, resource, and ecological savings as well as health benefits. But there is a knowledge gap between potentiation from 30% to at least 100% for all usables, which can be filled-up by refining MIRGA's ionic solution, concentrations, atomizer pressures, other parameters and even formulating a better solution [54].

We think that MIRGA will be highly relevant in a variety of scientific study areas, including biophotonics, pharmaceuticals, health, ecology, and many more, due to its broad range of applications. We are currently actively conducting additional study on MIRGA and its other developed forms, such as MIRGA salt, MIRGA vapor, and MIRGA plasma, in human endevours [55].

5. CONCLUSION

In addition to the conservation of financial resources and natural resources, the utilization of mid-infrared irradiation yielded an increase in the effectiveness of ashwagandha, which consequently led to a reduction of 27% in both the clinical dosage and duration of treatment. Altering the formulation of the MIRGA has the potential to achieve a potentiation exceeding 27 percent. Currently, our trials are yielding favorable outcomes when employing medicines from alternative therapeutic systems, including Ayurveda. Moreover, this study offers valuable insight into the future prospects of MIRGA within various other domains of clinical research and therapy.

CONSENT

Informed consent was obtained from all the participants.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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