



(RESEARCH ARTICLE)



## Potential of a homeopathic medicine – Thuja – using mid-infrared rays

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### Abstract

Clinical dose reduction is achieved through potentiation, which is the process used to manufacture homeopathic medicine with varying potencies. In this study, we used 2–6  $\mu\text{m}$  mid-infrared wavelength radiation to further amplify commercially available homeopathic medicines, such as thuja (*Thuja occidentalis*), a medication frequently used for a variety of ailments. We invented an emitter called MIRGA (mid-infrared generating atomizer) for potentiation purpose. The benefits of mid-IR potentiation include a reduction of the clinical dose, host stress, and resource and cost savings. The effects of irradiation on Thuja in chemical bond alterations and configurations are proven here by scientific instrumentations.

**Keywords:** MIRGA; 2-6  $\mu\text{m}$  Mid IR; Thuja; Potentiation; Resource; Savings; Safe

### 1. Introduction

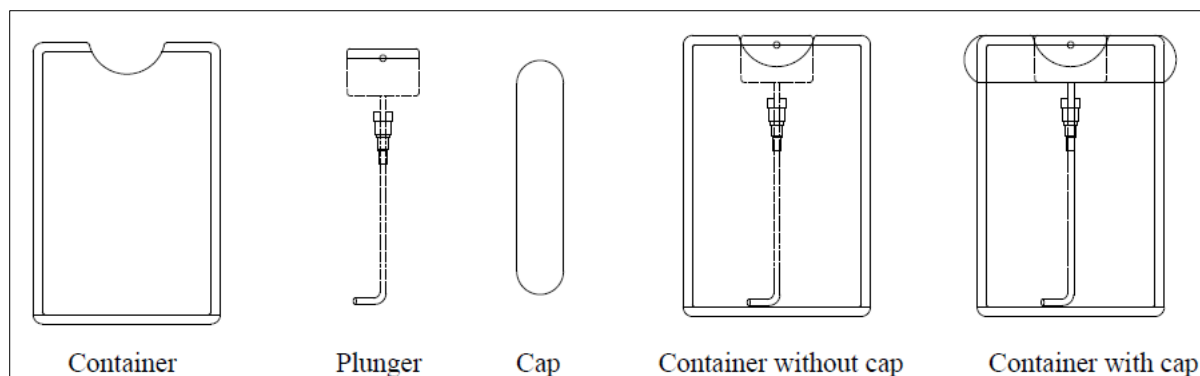
Homeopathic medicine is a branch of alternative medicine that is used worldwide for treating and managing various conditions, including cancer and urethral stricture. It is known for its negligible side effects and individualized approach. Homeopathy works on the principle of "like cures like," where a substance that can produce symptoms of disease in a healthy person is given in a highly diluted form to treat similar symptoms in a diseased individual (Cengiz, 2022; Priya et al., 2023). Homeopathic medicines are exclusively prepared through potentiation. Thuja occidentalis is a medicinal plant used in both traditional homeopathy and modern phytotherapy. It has been studied for its therapeutic effects in various disease-relieving conditions, including skin diseases like warts, corns, and eczema (Bhadoria et al., 2023). Added potentiation of the marketed Thuja medicines has not so far been taken into research. In this study, we applied 2–6  $\mu\text{m}$ , which is safe for biological molecules, capable of penetrating a variety of obscurants, and does not ionize the target molecules (Prasad, 2005; Pereira et al., 2011). The applied mid-IR made the Thuja more favorable than the parent molecule. The effect of applied mid-IR on Thuja molecules is detailed here, along with the required laboratory analysis.

### 2. Materials

In-depth presentations of the MIRGA's design and the 2–6  $\mu\text{m}$  mid-IR emission have been made by Umakanthan et al. (2022a); Umakanthan et al. (2022b). The 20-mL polypropylene plastic atomizer MIRGA (patent no.: 401387) holds an inorganic (molar mass 118.44 g/mole) water-based solution with roughly two sextillion cations and three sextillion anions. Measurements of the sprayer unit are 86 × 55 × 11 mm, ejection volume is 0.062 + 0.005 mL, ejection duration is 0.2 s, and the orifice diameter is 0.375 mm. The cone liquid back pressure is 2000 N/m<sup>2</sup>, and the average pressure is 3900 Pa (Fig 1). A mist of around 1  $\mu\text{g}$  weight of water is lost during spraying, and the concentration of non-volatile

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substance in the sprayed liquid is 153 mg/mL. A volume of 0.06 ml, and around seven quintillion cations and eleven quintillion anions, is released each time when MIRGA is sprayed. Every spraying is intended to produce 2-4  $\mu\text{m}$ , depending on the pressure applied on the plunger, according to an estimate made by Lightwind, Petaluma, CA, USA, using an FTIR (retro-reflector) interferometer instrument (Detector type D\* [cm HZ1/2 - 1] MCT [2-TE cooled]).



**Figure 1** MIRGA sprayer

Spraying was done between 0.25 and 0.50 meters away from thuja that was wrapped in polythene. This distance is necessary for oscillation and 2–6  $\mu\text{m}$  mid-IR generation (discussed in the Discussion section), as well as for the MIRGA-sprayed solution to form ion clouds. Mid-IR acts on the interior thuja and can pass through the polythene wrapper that stands between them. Spraying at a close distance does not generate energy. MIRGA is used externally over packed thuja as a body spray.

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

Marketed Thuja 200X potency drops and ointment were used. Domestic animals (cattle, sheep, goat, dogs) with sessile and pedunculated cutaneous warts were employed.

### 3. Methods

One liter of thuja drops (200x potency) was taken from a single source and filled into 20 plastic containers at a rate of 30 ml each. The 20 containers were divided into 4 groups of each 5 containers, and the groups were labeled as C (non-sprayed control), I, II and III. Containers in the groups were given 1 to 3 numbers of MIRGA sprayings corresponding to the assigned group number, from a distance of 0.25 to 0.5 meter, i.e., each of the 5 containers in group I received one MIRGA spraying, each of the group 2 containers received two MIRGA sprayings, and so on for the containers in groups III also. Similar to thuja drops, thuja ointment was also grouped like Thuja drops and MIRGA sprayed from 0.25 to 0.5 meter, maintaining control (4\*5 = 20 tubes).

Each group (i.e. C, I, II and III) of thuja solutions and ointments were used to treat warts in four groups of affected domestic animals. The four groups contained randomly selected domestic animals (containing cattle, sheep, goat and dogs) at the rate of 5 animals per group. The thuja solution (200X potency) and thuja ointment treatments were given twice daily at a dose of 0.5 to 1 ml of solution sublingually, and ointment applied externally on the warts, depending on the animal and warts size, until the warts disappear. The efficacy of sprayed thuja was assessed according to the number of days within which the warts disappear and is compared across groups. Samples from each group of thuja solution and ointment were also subjected to various instrumentations for analyzing the changes caused by MIRGA spraying. Whenever needed, after administration of 30 ml thuja drops/ ointment, the same number sprayed Thuja drops/ ointment again given to that specific animal.

#### 3.1. Ethical approval

In this study, it was only the thuja solutions and ointments subjected to mid-infrared spraying externally over packaged thuja. When we approached the institutions for ethical approval, they quoted the above reason and also because the study did not directly involve the application of mid-infrared application over the human/ animal patients, this won't come under the purview of ethical approval. No ethical approval sought.

We used an increased number of sprayings (i.e. 3 sprayings) because, in nature, the input of more energy to any medicine denatures the medicine's natural characters. Hence we tried this phenomenon by repeatedly spraying the thuja products upto 3 sprayings. The C, I, II and III group samples were subjected to laboratory analysis. The instruments used in this research are:

Chemical compound transformation – Gas chromatography mass spectrometry (GC-MS): Agilent technologies, 7820 GC system, 5977E MSD, Column DB-5, Over temp 100-270°C, Detector MS, Flow rate 1.2, Carrier gas Helium; Agilent 7890A GC with 5975C MS system. Column: HP-5. Ionization: EI (70 eV). Method: General\_1\_HP5\_80\_DEG.M. MSD: Single Quad.

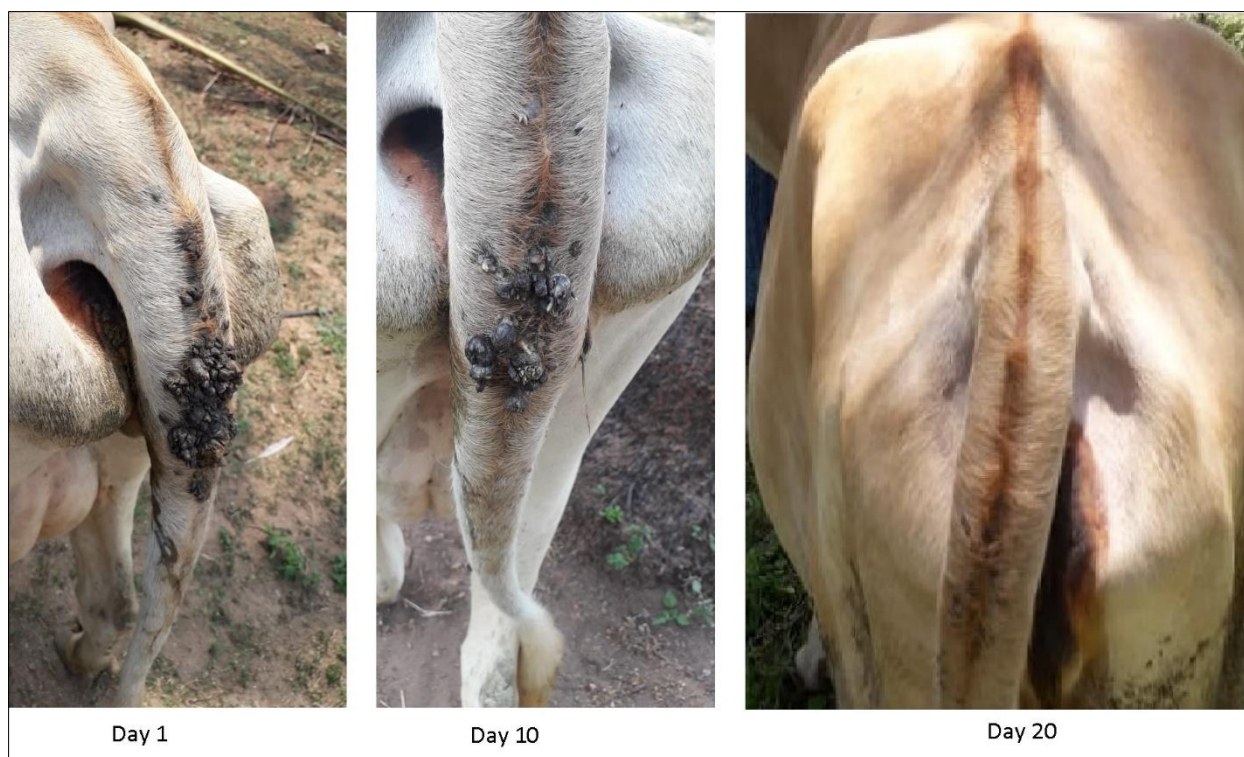
Chemical bond changes – Fourier-transform infrared spectroscopy (FTIR): JASCO FT-IR 4200 plus spectrophotometer with ATR (range 4000–400  $\text{cm}^{-1}$  at 298 K).

Nuclear resonances – Proton nuclear magnetic resonance ( $^1\text{H-NMR}$ ): Bruker AV-500 high resolution multinuclear FT-NMR spectrometer equipped with a 5 mm rotor was used for  $^1\text{H}$  and  $^{13}\text{C}$  measurements. Number of scans: varied from 8 to 64 for  $^1\text{H}$  measurements and 256-1024 for  $^{13}\text{C}$  measurements.  $\text{CDCl}_3$  or  $\text{DMSO}-d_6$  were used according to the samples solubility. Bruker TOPSPIN software is used for integration and chemical shift calculation.

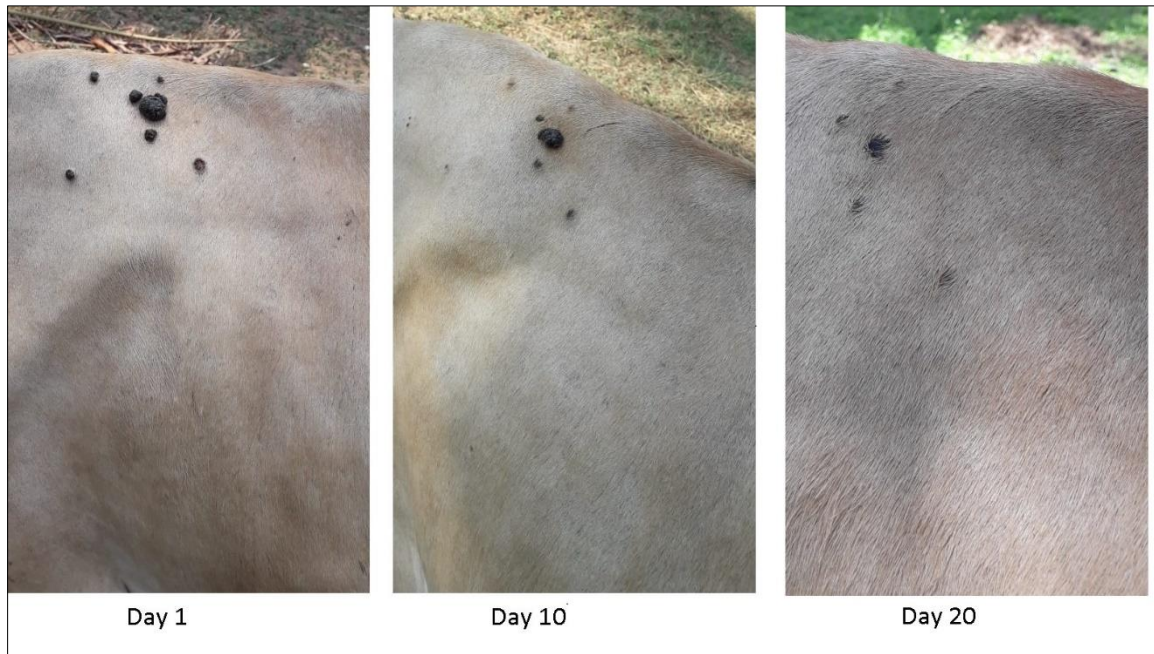
## 4. Results and Discussion

### 4.1. Clinical results

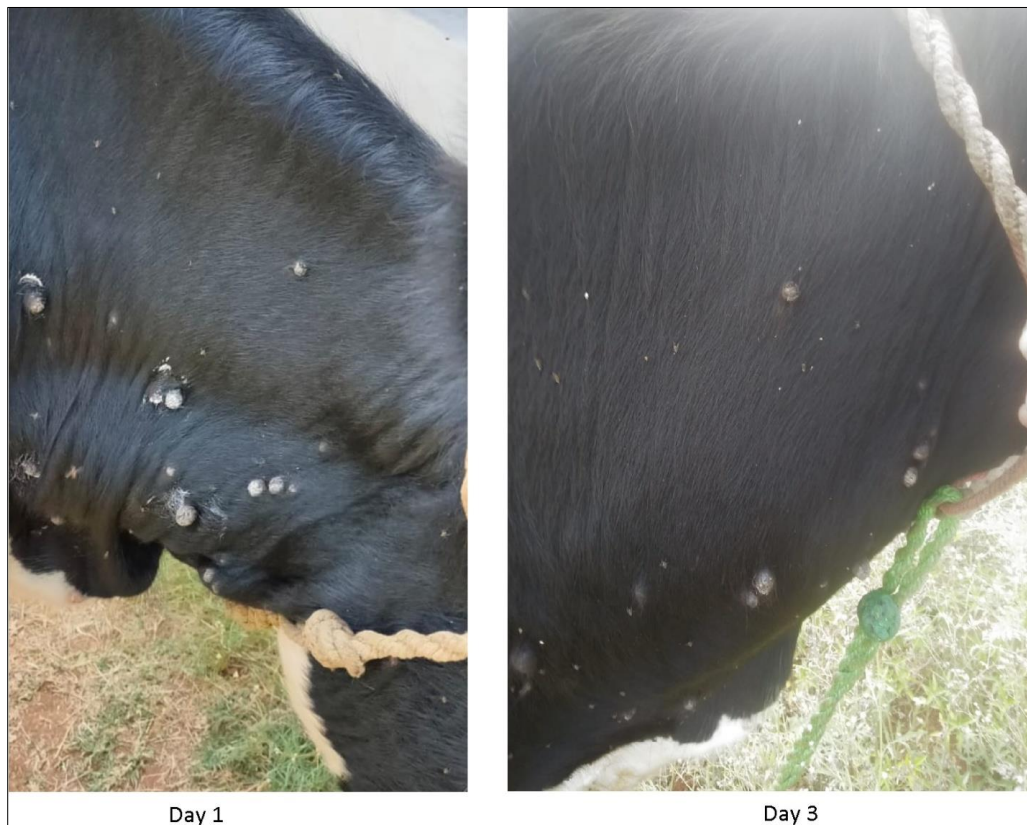
The course of time for recovery of warts are, control 25 - 30 days, one sprayed 20 - 25 days, 2 sprayed 18-20 days and 3 sprayed 35 - 45 days. (Fig 2, 3, 4)



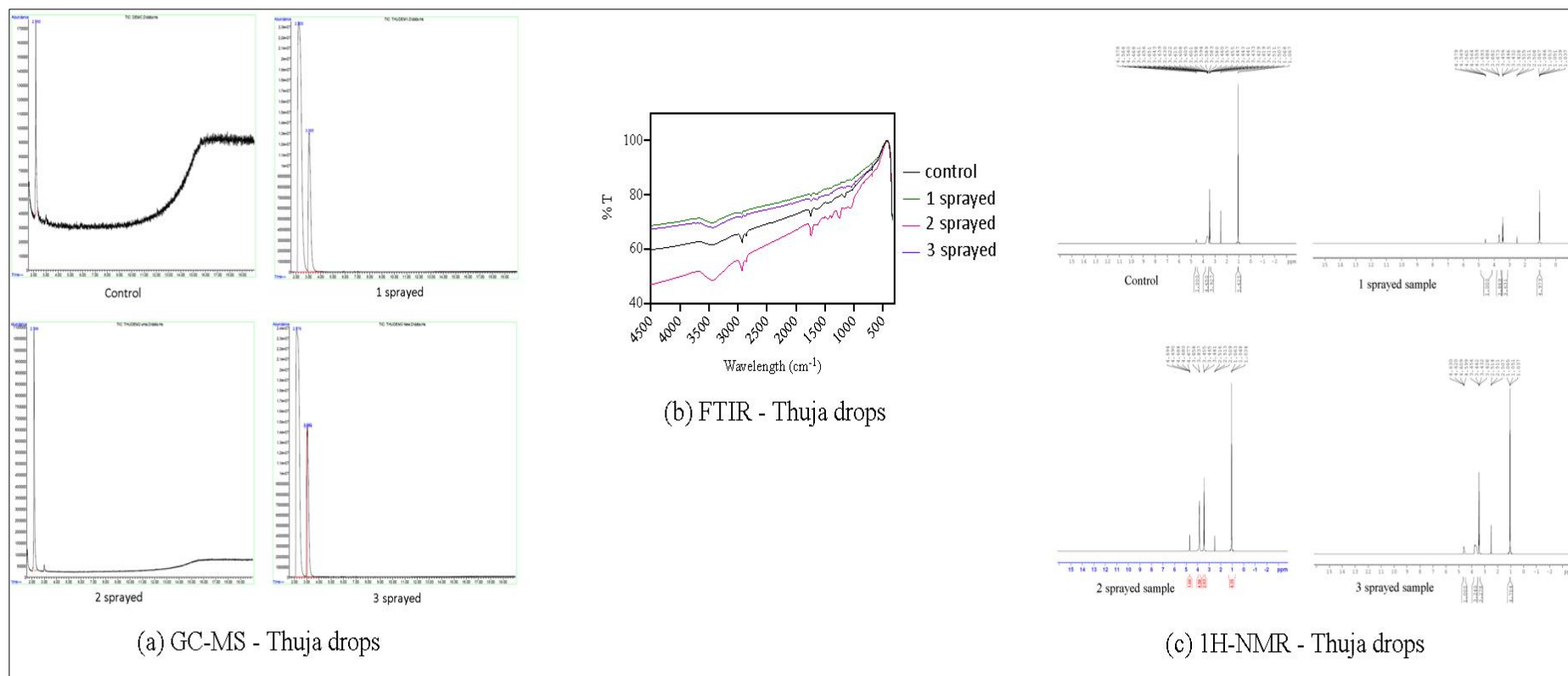
**Figure 2** Effect of sprayed Thuja drops and ointment - on Warts in tail of cattle



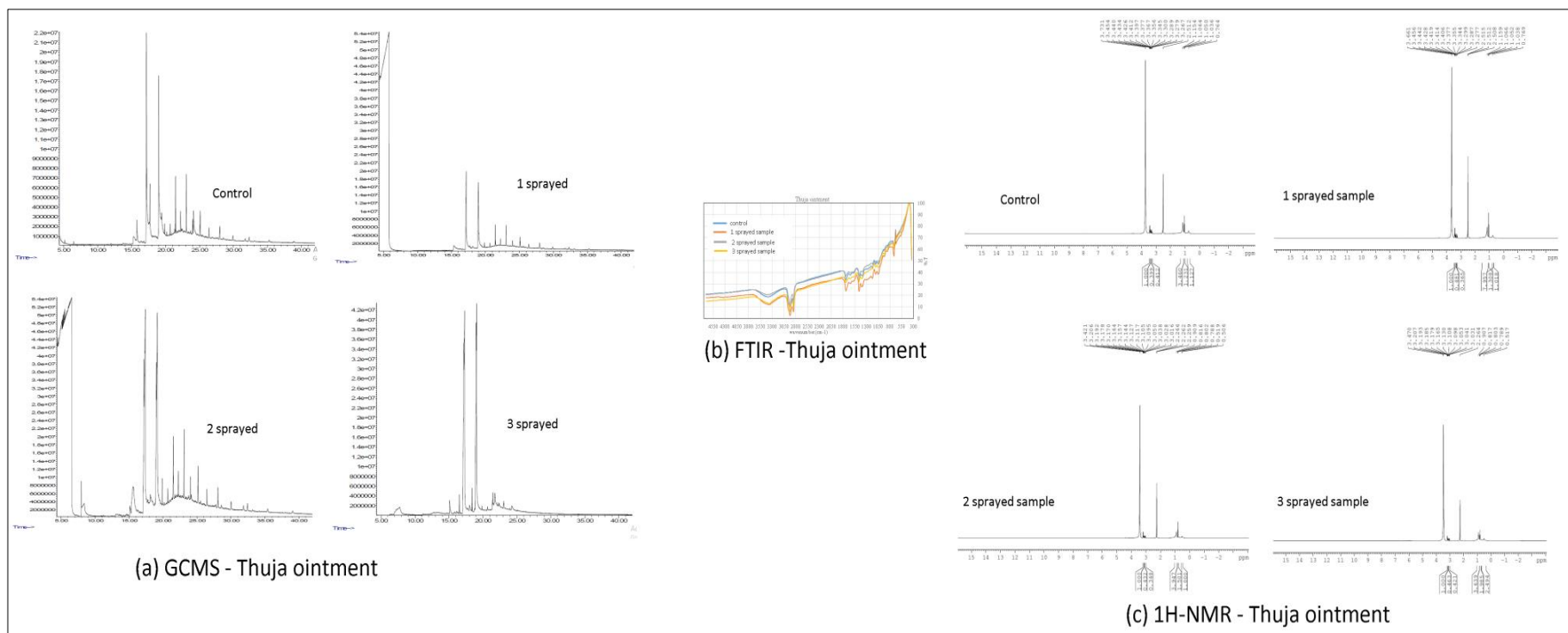
**Figure 3** Effect of sprayed Thuja drops and ointment - on Warts in dorsum of cattle



**Figure 4** Effect of sprayed Thuja drops and ointment - on Warts in neck of cattle



**Figure 5** Instrumentations of Thuja Drops (a) GC-MS, (b) FTIR, (c) 1H-NMR



**Figure 6** Instrumentations of Thuja Ointment (a) GC-MS, (b) FTIR, (c) 1H-NMR

The samples used for instrumentation were from the same source, the difference among them is, only the number of sprayings they received.

## 4.2. Instrumentation results

Raw data files of instrumentations: [https://drive.google.com/open?id=1ckKxoZFh0Caxe9HpgYOPeZG3\\_xfx9s6A](https://drive.google.com/open?id=1ckKxoZFh0Caxe9HpgYOPeZG3_xfx9s6A)

### 4.3. Thuja drops (200X potency)

#### 4.3.1. GC-MS – Thuja Drops

Control sample contains single component at retention time of 2.180 minutes. This indicates the purity of sample however the library search report has not been able to generate the name of compound. The mid-IR treatment with this sample showed some distinct pattern and thus corresponding changes. 1 sprayed sample showed two distinct peaks at 2.220 and 3.065 minutes. 2 sprayed sample showed single peak at 2.166 minutes. While 3 sprayed sample showed three distinct peaks at 2.176, 3.052 and 3.071 min. (Fig 5a)

#### 4.3.2. FTIR – Thuja Drops

*Control:* A broad band at  $3448\text{ cm}^{-1}$  belongs to stretching vibration of phenolic hydroxyl group (OH) which represents hydrogen bonding. The bands present with broad intensity at  $2924\text{ cm}^{-1}$  indicate presence of vibration stretching of aromatic (C-H) group and medium intensity at  $2854\text{ cm}^{-1}$  confirms carboxyl functional groups. On the other hand, band at  $1743\text{ cm}^{-1}$  may be due to C=O whereas the appearance of two medium and weak bands at  $1458\text{ cm}^{-1}$  and  $1381\text{ cm}^{-1}$  represents the stretching vibrations of aromatic (C=C) groups.  $1056\text{ cm}^{-1}$  for C-OH stretch of alcohol primer and C-H bond of aromatic ring ( $686\text{ cm}^{-1}$ ) group are present.

*1 sprayed sample:* has more peaks compared to the standard sample. These peaks are in  $1000\text{--}13000\text{ cm}^{-1}$  but assignments in this area have to be done with extreme care, because there are a lot of ring absorbance in this 'fingerprint area'. A broad band at  $3433\text{ cm}^{-1}$  belongs to stretching vibration of phenolic hydroxyl group (OH) which represents hydrogen bonding. The bands at  $2931, 2877\text{ cm}^{-1}$  indicate presence of vibration stretching of aromatic (C-H) group and peak at  $2831\text{ cm}^{-1}$  confirms carboxyl functional groups. On the other hand, band at  $1743\text{ cm}^{-1}$  may be due to C=O whereas the appearance of two medium and weak bands at  $1442\text{ cm}^{-1}$  and  $1381\text{ cm}^{-1}$  represents the stretching vibrations of aromatic (C=C) groups.  $1049\text{ cm}^{-1}$  for C-OH stretch of alcohol primer and C-H bond of aromatic ring ( $686, 948\text{ cm}^{-1}$ ) group are present.

*2 sprayed sample:* has less peaks compared to the 1 sprayed sample, but more or less similar to the control sample. A broad band at  $3433\text{ cm}^{-1}$  belongs to stretching vibration of phenolic hydroxyl group (OH) which represents hydrogen bonding. The bands at  $2931\text{ cm}^{-1}$  indicate presence of vibration stretching of aromatic (C-H) group and peak at  $2854\text{ cm}^{-1}$  confirms carboxyl functional groups. On the other hand, band at  $1735\text{ cm}^{-1}$  may be due to C=O whereas the appearance of two medium and weak bands at  $1442\text{ cm}^{-1}$  and  $1381\text{ cm}^{-1}$  represents the stretching vibrations of aromatic (C=C) groups.  $1056\text{ cm}^{-1}$  for C-OH stretch of alcohol primer and C-H bond of aromatic ring ( $686\text{ cm}^{-1}$ ) group are present.

*3 sprayed sample:* has more peaks compared to the control sample. A broad band at  $3433\text{ cm}^{-1}$  belongs to stretching vibration of phenolic hydroxyl group (OH) which represents hydrogen bonding. The bands at  $2931, 2862\text{ cm}^{-1}$  indicate presence of vibration stretching of aromatic (C-H) group. The peak at  $2831\text{ cm}^{-1}$  observed in other samples is missing suggesting reduction in the number of carboxyl functional groups. On the other hand, band at  $1743\text{ cm}^{-1}$  may be due to C=O whereas the appearance of two medium and weak bands at  $1442\text{ cm}^{-1}$  and  $1388\text{ cm}^{-1}$  represents the stretching vibrations of aromatic (C=C) groups.  $1049\text{ cm}^{-1}$  for C-OH stretch of alcohol primer and C-H bond of aromatic ring ( $686, 948\text{ cm}^{-1}$ ) group are present.

No peaks were observed in any of the samples in Triple bond region ( $2700\text{--}1950\text{ cm}^{-1}$ ) which indicated the absence of highly complex structure. The region between  $1650$  and  $1450\text{ cm}^{-1}$  provide important information about aromatic rings. Nearly all samples showed either one or more peak in this region. The peak at  $2831\text{ cm}^{-1}$  is only missing in 3 sprayed sample suggesting the reduction in the number of the carboxyl functional groups upon 3 sprayings. This should explain the reduced potency of this sample compared to the control (and other sprayed samples). (Fig 5b)

#### 4.3.3. <sup>1</sup>H-NMR – Thuja Drops

MIRGA spraying to the thuja drops causes an augmentation of the potency up to 2 sprayings. After that, an additional spraying provokes a strong reduction of the activity to a level lower than the control sample. An explanation for this is

that the first spraying could cause the loss of non-active compounds leading to a net increase in the concentration of the active components. Since these components are more concentrated, the potency is enhanced. (Fig 5c) (Table 1)

**Table 1** 1H-NMR spectral analysis of Thuja drops

Code	Chemical shift (ppm)	Chemical shift (ppm) Control	Chemical shift (ppm) 1 sprayed	Chemical shift (ppm) 2 sprayed	Chemical shift (ppm) 3 sprayed
A	0.93-1.18	0.93-1.18	0.93-1.18	0.92-1.17	0.93-1.17
B	1.76	1.76	1.76	1.76	1.75
C	2.08	2.08	2.08	2.07	2.08
D	2.73	2.73	2.73	2.73	2.73
E	2.89	2.89	2.89	2.88	2.89
F	2.95	2.95	2.94	2.93	2.94
G	3.16	3.16	3.16	3.17	3.17
H	3.58-3.67	3.58-3.67	3.63-3.72	3.76-3.94	3.55-3.83
I	5.85-5.92	5.85-5.92	5.85-5.92	5.86-5.91	5.86-5.91
J	7.36	7.36	7.35	7.34	7.35
K	7.94	7.94	7.93	7.92	7.93

Regarding the NMR signals, a reduction of the integral values of the more intense signals (A and H) is observed as more spraying is applied to the samples. This supports the idea of the loss of some non-active compounds. Position of the peaks are mostly retained, except for the signal H that shows a more significant variation, comparable to that observed for the residual H<sub>2</sub>O signal.

However, when three spraying are applied a drastic diminution is observed in the activity. The cause could be that too much mid-IR radiation results in the loss or degradation of some of the active components. Some of the minor peaks could be related to these active compounds that show a reduction of the integral in the sample sprayed three times.

#### 4.4. Thuja ointment

##### 4.4.1. GC-MS – Thuja ointment

**Table 2** GC-MS spectral analysis of Thuja ointment

R.T. (Min)	Name of Compounds	Name of Compounds	
		% Area	Remarks
	Control		
15.220	2,8,9-Trioxa-5-aza-1-borabicyclo undecane [3.3.3]	12.52	Different fatty acid detected in control samples and these were also seen in all sprayed sample
17.121	n-Hexadecanoic acid	32.86	
18.945	Octadecanoic acid	33.85	
21.357	2-Piperidinone, N-[4-bromo-n-butyl]-	4.91	
23.021	Ethanol, 2-(octadecyloxy)-	4.09	
24.013	17-Octadecynoic acid	8.02	
25.006	2-Piperidinone, N-[4-bromo-n-butyl]-	3.73	
	1 sprayed sample		



4.460	Dimethylsulfoxoniumformylmethylide	97.92	Unique compound detected after 1 spraying
15.267	2,8,9-Trioxa-5-aza-1-borabicyclo [3.3.3] undecane	0.16	Common compounds as compared to control samples
16.979	n-Hexadecanoic acid	0.85	
18.898	Octadecanoic acid	0.72	
21.413	Methoxyacetic acid, 2-tetradecyl ester	0.16	
23.020	Tetradecane, 2,6,10-trimethyl-	0.10	Unique compound detected after 1 spraying
25.025	Methoxyacetic acid, 2-pentadecyl ester	0.07	
	2 sprayed sample		
4.346	Dimethylsulfoxoniumformylmethylide	95.03	Unique compound detected after 2 spraying
7.949	Glycerin	0.49	Unique compound detected in 2 spraying sample
15.116	Tricyclo[3.3.3.0(1,5)]undecane, 2,8,9-trioxa-5-aza-1-bora-	0.42	
17.073	n-Hexadecanoic acid	1.85	
18.756	Octadecanoic acid	1.97	
21.460	Tetradecane, 2,6,10-trimethyl	0.26	Common compound in 1 and 2 sprayed sample
23.039	Tetradecane, 2,6,10-trimethyl-	0.25	
	3 sprayed sample		
6.956	N-Methoxy-N-methylacetamide	22.53	Unique compound detected in 3 sprayed sample
15.050	Tetradecanoic acid	2.54	
16.979	n-Hexadecanoic acid	35.28	
18.860	Octadecanoic acid	30.82	
21.375	Hexadecanoic acid, 3-[[trimethylsilyl]oxy] propyl ester	8.81	Unique compound detected in 3 sprayed sample

Control sample contains many fatty acids such as Hexadecanoic acid, Octadecanoic acid, 17-Octadecynoic acid and other molecules such as Ethanol, 2-(octadecyloxy), etc. The major peaks of the fatty acids (~65%) were detected in control samples. In 1 sprayed sample, there was new peak of Dimethyl sulfoxonium formyl methylide and Tetradecane, 2,6,10-trimethyl (but in less quantity). There was major decrease in peaks of 2,8,9-Trioxa-5-aza-1-borabicyclo [3.3.3] undecane, n-Hexadecanoic acid & Octadecanoic acid. 2 sprayed sample has shown unique peak of Glycerin and Tricyclo [3.3.3.0(1,5)] undecane, 2,8,9-trioxa-5-aza-1-bora which is responsible for potency than control and 1 sprayed sample. The peak of Tetradecane, 2,6,10-trimethyl was present in 1 and 2 sprayed samples. 3 spraying have resulted in newer peak of N-Methoxy-N-methylacetamide (major, ~22%) and Hexadecanoic acid, 3-[[trimethylsilyl] oxy] propyl ester which is the reason for reduction in potency than control and other sprayed sample. There was also increase in n-Hexadecanoic acid but decrease in Octadecanoic acid after 3 spraying. (Fig 6a) (Table 2)

#### 4.4.2. FTIR – Thuja ointment

The number and position of the peaks and bands for all samples are almost the same. The most remarkable change is the variation in the transmittance (absorption), that is directly related to the concentration.

Control shows a not-well defined, broad band between 3600-3100  $\text{cm}^{-1}$  that can be attributed to O-H stretching. More defined bands are observed at 2960-2840  $\text{cm}^{-1}$ , that are typical of C-H stretching vibrations. These can be differentiated into two types: methylene ( $-\text{CH}_2-$ ) C-H stretching (peak at 2916  $\text{cm}^{-1}$ ) and methyl ( $-\text{CH}_3$ ) C-H stretching (peak at 2854  $\text{cm}^{-1}$ ). These groups also generate bands at 1465 and 1375  $\text{cm}^{-1}$  (methylene and methyl, respectively), due to the bending vibrations. A peak is observed around 1735  $\text{cm}^{-1}$ , attributable to the stretching of C=O bonds. Other peak between 1500-650  $\text{cm}^{-1}$  could be originated by deformation and bending of C-H and C-O stretching, and other chemical groups present in the sample.

2 sprayed sample shows a spectrum with almost the same transmittance than the control sample pointing to a very small variation in the concentration of major components. Peaks and bands maintain their shape and positions in both spectra.

1 and 3 sprayed samples show a very similar spectrum in terms of transmittance. Peaks and bands maintain their shape and positions in both spectra. Comparing these two samples with the control and 2 sprayed samples, transmittance is significantly lower, pointing to an increase in the net concentration of major components. (Fig 6b)

#### 4.4.3. <sup>1</sup>H-NMR – Thuja ointment

Thuja ointment contains the main molecules found in Thuja essential oil: terpenoids, coumarins, flavonoids, and some proportion of tannic acid, polysaccharides, and proteins. The activity of thuja ointment depends mainly on the terpenoids substances. Therefore, any change observed in its activity must be related to changes in the concentration of those compounds. (Table 3) (Fig 6c)

**Table 3** <sup>1</sup>H-NMR spectral analysis of Thuja ointment

Code	Chemical shift (ppm)	Integral value Control	Integral value 1 sprayed	Integral value 2 sprayed	Integral value 3 sprayed
A	0.76	1.127	1.018	1.000	2.494
B	1.05	1.231	1.308	1.501	1.985
C	1.15	3.460	7.957	3.947	3.639
D	3.28	0.412	0.365	0.348	0.421
E	3.38	0.399	0.481	0.432	0.463
F	3.43	1.000	1.000	1.000	1.000

Regarding the values of the integrals, in the case of the compound originating signal A, potency of the ointment increases when signal A is reduced. When signal A becomes stronger (in 3 sprayed sample), the activity of the ointment is worse. The same is observed for the signal D. The explanation is that the compound(s) originating peaks A and D is (are) a degradation product coming from the active ingredients. When A and D are more intense, it meant that more active ingredient is degraded and hence ointment activity reduced.

Overall, two times MIRGA spraying found to have positively influenced the Thuja drops and ointment, when compared to the control, 1 and 3 sprayed samples. Excessive spraying, i.e. 3 spraying has turned the Thuja less positive than the 2 sprayed sample.

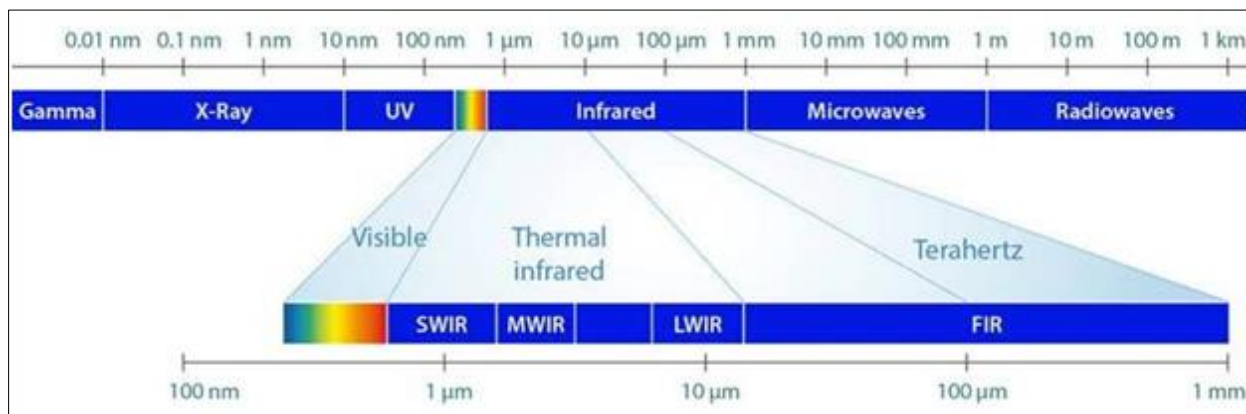
Invention background, definition, technique of mid-IR generation from MIRGA, toxicological study on MIRGA, safety of the MIRGA sprayed usables and primeval and future scope of MIRGA have been described by Umakanthan *et al.*, 2022a.

#### 4.5. Invention background

The four observable states of matter (solid, liquid, gas, and plasma) are made up of intermolecular and intramolecular bonds. While protons, neutrons, and electrons all have unique intrinsic properties, differences in their numbers determine what makes up different atoms and how those atoms bind together to form unique molecules with unique characteristics. The mid-IR region of the electromagnetic wave (EMW) spectrum (Fig. 7) is crucial and fascinating for many applications because it coincides with the internal vibration of the majority of molecules (CORDIS, European Commission). Nearly all thermal radiation on the surface of the earth is in the mid-IR region. Additionally, 66% of the sun's energy is infrared (Aboud *et al.*, 2019) and is absorbed and radiated by all particles of the earth. According to Girard (2014), interaction of mid-IR wavelength energy naturally produces rotational and vibrational modes at the molecular level (from approximately 4500-500 cm<sup>-1</sup>, or 2.2 to 20 microns), through a shift in dipole movement that results in chemical bond rearrangement.

Through our research, we found that: (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 causes the bonds to break (McMakin, 2011; Moss, 2011), form new bonds (Raven, 2012), and compress, stretch, and bend (Smith, 1999; Mohan, 2004; Alvarez *et al.*, 2012; Shankar, 2017). The objects' physicochemical

characteristics ultimately change as a result of these modifications. (B) The dynamic, ongoing, mutual effects of electromagnetic waves (EMW) between Earth, celestial bodies, and living things are constantly causing changes in the intrinsic physiochemical characteristics of earthly objects, such as enhancement due to an optimal energy dose or decrease/destruction due to an excess of energy dose (explained below). Thus, the MIRGA was created based on these ideas in order to change bond parameters and enhance inherent characteristics of any usables.



**Figure 7** Electromagnetic Spectrum

#### 4.6. 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'.

#### 4.7. 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) (Ashcroft, 2000; Sanders, 2014). We designed *MIRGA to generate energy based on various below given processes like*, (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) while spraying, water-based ionic solution gets excited/charged, which in turn leads to oscillation among the imbalanced ions (Verheest, 2000) in their excited state, resulting in the emission of photons (Keping *et al.*, 2004; Fauchais *et al.*, 2014). (C) Though low electromagnetic field exists between charged particles of the MIRGA's ionic solution, during spraying the induced oscillation between these charged particles produces energy (Pople, 1999; Wendish *et al.*, 2009; Singh, 2009; Prasad, 2017). (D) Moreover, breaking water bonds to produce smaller water droplets from the clouds during the natural rainfall process requires more energy (Barry *et al.*, 1998). As a result, these droplets ought to have more energy stored as they descend at a certain speed after covering a predetermined distance, acquiring kinetic energy in the process. There is a net heat gain because rain creates a very thin mid-IR (almost 6 micron) film as it hits the earth's surface (Barry *et al.*, 1998; Eniday, 2019).

We designed MIRGA to model the energy-gaining process of this downpour. Specifically, we found that when unbalanced ions in liquid media are atomized, the smaller droplets that are expelled should possess a greater internal energy in addition to their gained 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. We built our atomizer to emit energy in the 2-6  $\mu\text{m}$  mid-IR band, taking into account additional facts such as the fact that the accelerated ions in the sprayed ionic clouds collide with one another and produce energy (Krishnakumar, 2019).

#### 4.8. Action of MIRGA emitted 2-6 $\mu\text{m}$ mid IR on Thuja

A potential avenue for biomedical applications is represented by the inorganic compounds utilized in the production of mid-infrared (Tishkevich *et al.*, 2019; Dukenbayev *et al.*, 2019). It is also a new synthesis method for preparation of functional material (2-6  $\mu\text{m}$  mid-IR) (Kozlovskiy *et al.*, 2021; El-Shater *et al.*, 2022). It is commonly known that new composite materials, which have attracted a lot of technological interest recently, are created by combining several chemicals with good electronic properties (Kozlovskiy and Zdorovets, 2021; Almessiere *et al.*, 2022).

A receptor's chemical bond configurations and subsequent physical and chemical characteristics can be changed to our liking based on the amount of MIRGA sprayings (energy provided). Umakanthan et al.'s 2022a, 2022b, 2023c, and 2023d use of MIRGA spraying in coffee, tea, cocoa, and edible salt has demonstrated such modifications and positive outcomes/

The instrumentation results showed that the O–H, C=O, (–CH<sub>2</sub>) (–CH<sub>3</sub>) stretching and C–H bond breaking and deformation, structural changes and transformation of chemicals caused by the applied mid-IR. The processes involved in the potentiation of Thuja is: the applied mid-IR is absorbed by the Thuja (Sommer *et al.*, 2008), leading to vibrational changes in terms of the observed chemical bond stretching and bending (Flynn *et al.*, 1996; Agarwal *et al.*, 2014) but without affecting chemical formula, these re-arrangement of bonds subsequently causing changes in physicochemistry of Thuja (Atkins *et al.*, 2011; Xu *et al.*, 2017) and thus thuja potentiation and comparatively fast recovery and economical. MIRGA is safe and highly economical.

#### 4.9. Toxicological study on MIRGA

While MIRGA produces safe mid-IR energy between 2 and 6  $\mu\text{m}$ , and it may be sprayed directly onto packaged consumables at a distance of 0.25 to 0.50 meters externally, we also sought to investigate the potential toxicity of MIRGA using a cytotoxicity experiment. The non-toxicity of the MIRGA sprayed mist was demonstrated by an in-vitro study using Vero, A549, and human dermal fibroblast cells (Fig 8).

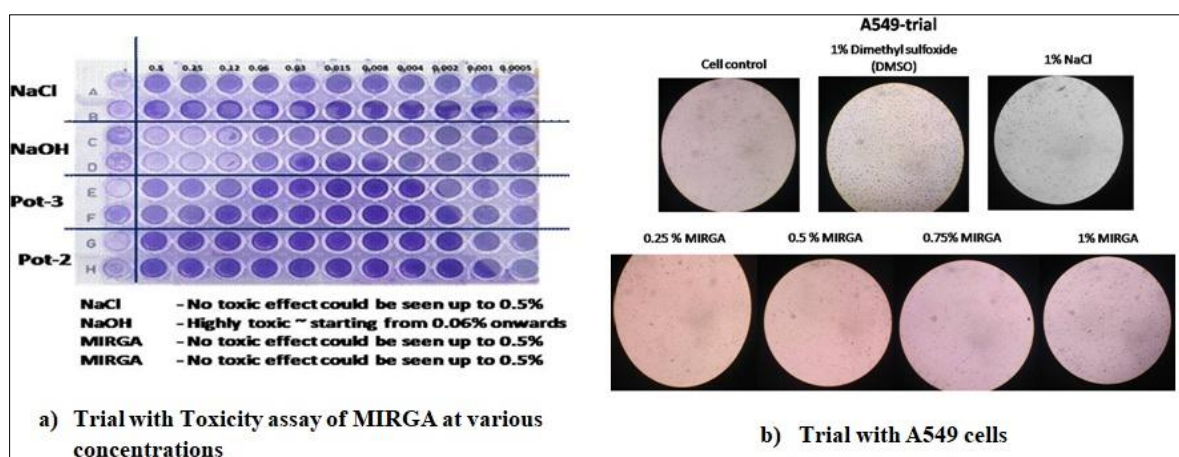


Figure 8 MIRGA's toxicological studies

Additionally, field research revealed that MIRGA spray is safe for newborns even when sprayed directly, non-toxic, easy to handle (similar to body spray perfume), and extremely cost-effective (USD 0.30 for a MIRGA unit that produces 300 sprays).

#### 4.10. Safety of MIRGA sprayed usables

In our nearly two-decades of research, we observed MIRGA induced bond altered target substances had not shown any adverse reaction upon consumption/use. As a comparison, to assure the safety of the bond altered targets' millennium long consumption by human/ living kinds; we submit that in nature, (A) Stereochemical configuration has great influence on taste (Williamson *et al.*, 2011) e.g. variety of mango, grapes, rice, etc., (B) Cooking and digestive enzymes break chemical bonds thereby soften our edibles. And, as an example; raw rice on water-boiling to boiled rice; rice on raw heat to puffed rice; rice on boiling and drying to flat rice; rice on pressure to rice flour (Kowtaluk, 2006; Scanlon *et al.*, 2011), each by-product has its unique aroma, taste, texture and shelf life but with same molecular formula C<sub>6</sub>H<sub>10</sub>O<sub>5</sub>, (C) In food industry, sensory attributes and shelf-life are enhanced by altering the food's chemical bonds using various irradiation processes like, radappertization, radacidation, raduriaztion (Sivasankar, 2014), (D) On heating, ice to water to steam manifestations are due to changes in the hydrogen bonding, where steam has negligible hydrogen bonding (Day, 1999) but chemical composition (H<sub>2</sub>O) remains the same (Raymond,2010).

#### 4.11. 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 (Blue planet project).

We have obtained potentiation ranging from 30% to 173% in different usables. Certain usables have shown health advantages and 30% reductions in economic, resource, and ecological costs when even the lowest 30% is taken into account. However, by improving MIRGA's ionic solution, concentrations, atomizer pressures, and other parameters—or even creating a better solution—we may close the information gap about potentiation from 30% to at least 100% for all usables.

A variety of mid-IR emitters are now available e.g. silicon photonic devices (CMOS Emerging Technologies, 2012), cascade lasers (quantum and interband) (Jung *et al.*, 2017), non-cascade based lasers, chalcogenide fibre-based photonic devices (Sincore *et al.*, 2018) and suspended-core tellurium-based chalcogenide fibre photonic devices (Bo *et al.*, 2018). These emitters are not as cost-effective as MIRGA, and useful only in astronomy, military, medicine, industry as well in the laboratory. They are much too complex in daily domestic applications for the average user.

Given MIRGA's broad spectrum of applications, we think it will be well received in a wide range of scientific studies, including those in the domains of biophotonics, pharmaceuticals, health, ecology, and many more. We are currently conducting constantly ongoing research on MIRGA and its various developed manifestations in human endeavors, especially MIRGA salt, MIRGA vapor, and MIRGA plasma.

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## 5. Conclusion

It was discovered that two sprayed thuja was superior to non-sprayed thuja in terms of therapy efficacy and course. We discovered that MIRGA technology significantly increased the potency of a commercially available homeopathic remedy (thuja), which shortened the course of treatment and saved money. As the MIRGA's inventors, with almost 20 years of expertise, we anticipate that additional study utilizing MIRGA technology will show that other homeopathic medicines may also be potentiated.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

In accordance with the journal's policy and our ethical obligation as researchers, we submit that the authors Dr.Umakanthan and Dr.Madhu Mathi are the inventors and patentee of Indian patent for MIRGA (*granted patent no.: 401387*) which is a major material employed in this study.

### *Author contribution*

- *Umakanthan*: Conceptualization, Methodology, Project administration, Resources, Supervision, Validation.
- *Madhu Mathi*: Data curation, Investigation, Visualization, Writing - Original draft preparation.
- *Umakanthan, Madhu Mathi, Umadevi*: Writing- Reviewing and Editing.

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	<p><b>Dr. UMADEVI, U, M.Sc., M.Phil., Ph.D.</b>, Assistant Professor of Botany. Cleared TSIR-UGC NET exam and SET exam. Published 41 research articles in National and International Journals. Editorial board member of Virology Research Journal and Biomedical Journal of Science and Technical Research. Co-authored a scientific book, “The Multiscience 22nd century inventions” (Publishers - Scholar’s press, Germany) and also published book on divinity. Got 3 patents. Received awards, fellowships, prizes from Government and private organizations. Presented papers in national and international conferences. Chaired the International conference, organized by World Academy of Science, Engineering and Technology, London on 17th and 18th October, 2016 and got best paper award. Got many central and state Government scholarship and grants.</p>