



Complementary and Alternative Medicine: Impact of Consciousness Energy Healing Treatment on the Physicochemical and Thermal Properties of 6-Mercaptopurine



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Abstract

6-Mercaptopurine is a thiopurine-derivative antimetabolite, which is used for the treatment of cancer, ulcerative colitis, Crohn's disease, and autoimmune diseases. The aim of this research work was to evaluate the impact of the Trivedi Effect[®] on the physicochemical, and thermal properties of 6-mercaptopurine using the modern analytical technique. 6-Mercaptopurine powder sample was divided into two parts. One part of the sample was considered as a control sample (no Biofield Energy Treatment was provided), whereas the other part was treated with Biofield Energy Treatment remotely by a renowned Biofield Energy Healer, Dahryn Trivedi and termed as a treated sample. The particle size values in the treated 6-mercaptopurine powder sample were significantly decreased by 5.72%(d₁₀), 5.16%(d₅₀), 3.75%(d₉₀), and 4.54%{D(4,3)}; therefore, the specific surface area was increased by 4.76% compared to the control sample. The PXRD peak intensities and crystallite sizes of the treated powder sample were significantly altered ranging from -25% to 14.12% and -35.09% to 71.3%, respectively; whereas the average crystallite size was decreased by 2.77% compared with the control sample. The latent heat of evaporation and latent heat of fusion of the treated sample was significantly altered by 3.05% and -39.48% compared with the control sample. The total weight loss was significantly increased by 9.72%; however, the residue amount was significantly decreased by 79.89% in the treated sample compared with the control sample. The maximum thermal degradation temperature of the 1st, 2nd, and 3rd peaks of the treated sample was increased by 1.54%, 0.13%, and 5.56% compared with the control sample. From the results, it was concluded that the biofield energy treatment might have generated a new polymorphic form of 6-mercaptopurine which may offer better solubility, dissolution, absorption, and bioavailability compared with the control sample. The Biofield Energy Treated 6-mercaptopurine would be very useful to design better pharmaceutical formulations that might offer better therapeutic response against acute lymphocytic leukemia, chronic myeloid leukemia, ulcerative colitis, Crohn's disease, and autoimmune diseases.

Keywords: 6-mercaptopurine; The Trivedi Effect[®]; Consciousness Energy Healing Treatment; Complementary and alternative medicine; Particle size; Surface area; PXRD; DSC; TGA/DTG

Introduction

Mercaptopurine (1,7-dihydro-6H-purine-6-thione) is a thiopurine-derivative antimetabolite used for the treatment of cancer and autoimmune diseases. The mechanism of action involves inhibition of purine nucleotide synthesis and metabolism by obstructing an enzyme called phosphoribosyl pyrophosphate aminotransferase interference [1,2]. It is used alone or with other anti-cancer drugs for the treatment of acute lymphocytic leukaemia, chronic myeloid leukaemia, ulcerative colitis, Crohn's disease, and autoimmune diseases [3-5]. It was listed as Essential Medicines by the World Health Organization and approved for medical use in the USA since from 1953 [6]. Adverse effects associated with the use of 6-mercaptopurine therapy are nausea, vomiting, loss of appetite, diarrhoea, stomach and abdominal pain, mouth sores, fatigue, weakness, fever, sore throat, skin rash, yellowing of skin or eyes,

red spots on the skin, darkening of the skin, hair loss, easy bruising or bleeding, black stools, bloody stools, bloody urine, dark urine, painful or difficult urination may suppress the production of both red and white blood cells, and can be linked to the genetic polymorphisms [7-9].

Different mercaptopurine pharmaceutical formulations are available for the oral route of administration are tablets and liquid suspensions [10-12]. The 6-mercaptopurine in water, acetone, chloroform, and diethyl ether is insoluble; slightly soluble in dilute sulphuric acid, but in hot alcohol and dilute alkali solutions it is soluble [12]. In order to improve the solubility, dissolution, absorption, and bioavailability of the pharmaceutical and nutraceutical compounds, scientists throughout the globe doing the extensive research work [13]. On this aspect, the Trivedi Effect[®]-

biofield energy healing treatment (biofield energy treatment) appealed to have the significant impact on the crystallite size, particle size, surface area, thermal behaviour, and bioavailability profile of pharmaceutical and nutraceutical compounds [14-17]. The Trivedi Effect® is a natural and only scientifically established phenomenon in which an individual can harness this inherently intelligent energy from the "Universe" and transfer it anywhere on the planet through the possible mediation of neutrinos [18]. There is an infinite and Para dimensional electromagnetic field exists surrounding the body of every living organism generated due to continues moment of the charged particle inside the body (i.e., ions, cells, blood flow, etc.) is called Biofield. The Complementary and Alternative Medicine (CAM) therapies has been recognized by the National Centre of Complementary and Integrative Health (NCCIH), which include meditation, yoga, Reiki, hypnotherapy, Ayurvedic medicine, traditional Chinese herbs and medicines in biological systems, etc., that has been accepted by the most of the USA people [19,20]. The CAM therapies including Biofield Energy Treatment is an emerging field for the improvement of the quality of life and various health conditions [21,22]. Likewise, the Trivedi Effect®-Consciousness Energy Healing Treatment has a significant impact on the physicochemical, structural, and behavioural properties of metals, ceramics, and polymers [23 25], organic compounds [26,27], microorganisms [28,29], cancer cells [30,31], and improve the overall productivity of crops [32,33]. Seeing all these outstanding results, the current study was designed to evaluate the influence of the Consciousness Energy Healing Treatment (Trivedi Effect®) on the physicochemical, thermal, and behavioural properties of mercaptopurine using particle size analysis, powder X-ray diffraction, differential scanning calorimetry, and thermogravimetric analysis/ differential thermogravimetric analysis.

Materials and Methods

Chemicals and Reagents

6-Mercaptopurine monohydrate was purchased from Tokyo Chemical Industry Co., Ltd., Japan and the other chemicals were of analytical grade purchased in India.

Results and Discussion

Particle Size Analysis (PSA)

Table 1: Particle size distribution and surface area of the control and Biofield Energy Treated 6-mercaptopurine. d_{10} , d_{50} , and d_{90} : particle diameter corresponding to 10%, 50% and 90% of the cumulative distribution, SSA: the specific surface area, and D (4,3): the average mass-volume diameter.

Parameter	d_{10} (μm)	d_{50} (μm)	d_{90} (μm)	D (4,3) (μm)	SSA (m^2/g)
Control	31.78	90.23	177.5	98.48	0.105
Biofield Treated	29.96	85.57	170.85	94.02	0.11
Percent change (%)	-5.72	-5.16	-3.75	-4.54	4.76

The particle size at d_{10} , d_{50} , d_{90} , and D (4,3) and surface area analysis of both the control and Biofield Energy Treated mercaptopurine powder samples were performed, and the data are presented in Table 1. The particle size values of the control powder sample at d_{10} , d_{50} , d_{90} , and D (4,3) were 31.78 μm , 90.23 μm ,

Consciousness Energy Healing Treatment Strategies

6-mercaptopurine powder sample was divided into two equal parts. One part of the test sample was treated with the Trivedi Effect®- Consciousness Energy Healing Treatment remotely under standard research laboratory conditions for 3 minutes by the renowned biofield energy healer, Dahryn Trivedi (USA), and known as a Biofield Energy Treated sample. However, the second part of the test sample did not provide Biofield Energy Treatment and considered as a control sample. But the control sample was treated with a "sham" healer and the sham healer totally ignorant about the biofield energy treatment. After the treatment, the treated and untreated samples were kept in sealed conditions and characterized using PSA, PXRD, DSC, and TGA/DTG analytical techniques.

Characterization

The PSA, PXRD, DSC, and TGA analysis of 6-mercaptopurine were performed. The PSA was performed with the help of Malvern Mastersizer 2000 (UK) using the wet method [34,35]. The PXRD analysis of 6-mercaptopurine powder sample was performed with the help of Rigaku MiniFlex-II Desktop X-ray diffractometer (Japan) [36,37]. The average size of crystallites was calculated from PXRD data using the Scherrer's formula (1):

$$G = k\lambda/\beta\cos\theta \quad (1)$$

Where G is the crystallite size in nm, k is the equipment constant, λ is the radiation wavelength, β is the full width at half maximum (FWHM), and θ is the Bragg angle [38]. Similarly, the DSC analysis of 6-mercaptopurine was performed with the help of DSC Q200, TA Instruments. The TGA/DTG thermograms of 6-mercaptopurine were obtained with the help of TGA Q50 TA instruments [28,29].

The % change in particle size, specific surface area (SSA), peak intensity, crystallite size, melting point, latent heat, weight loss and the maximum thermal degradation temperature (T_{max}) of the Biofield Energy Treated sample was calculated compared with the control sample using the following equation 2:

$$\%Change = \frac{[Treated - Control]}{Control} * 100 \quad (2)$$

177.5 μm , and 98.48 μm , respectively. Likewise, the particle sizes of the treated powder sample at d_{10} , d_{50} , d_{90} , and D (4,3) were 29.96 μm , 85.57 μm , 170.85 μm , and 94.02 μm , respectively. The particle size values in the treated mercaptopurine powder sample were significantly decreased by 5.72%, 5.16%, 3.75%, and 4.54%

at d_{10} , d_{50} , d_{90} , and D(4,3) compared to the control sample. The specific surface area (SSA) of the treated mercaptopurine powder ($0.11\text{m}^2/\text{g}$) was increased by 4.76% compared to the control sample ($0.105\text{m}^2/\text{g}$). From the result, it can be assumed that the Biofield Energy Treatment might be acting as an external force for the breaking of the larger particles into smaller one, hence increased the surface area. The particle size, shape, and surface area have a huge impact on the solubility, dissolution rate, absorption, bioavailability, and therapeutic efficacy of a pharmaceutical compound [13,39]. The solubility of mercaptopurine is very poor in water, chloroform, acetone, and diethyl ether, whereas slightly soluble in dilute sulphuric acid [12]. Therefore, it was predicted that the Biofield Energy Treated 6-mercaptopurine would show the better therapeutic properties by increasing solubility, dissolution, and absorption. It would be better for the pharmaceutical manufacturing industries using it as a raw material for the formulation (Table 1).

Powder X-ray Diffraction (PXRD) Analysis

The PXRD diffractograms of the control and Consciousness Energy Healing Treated powder samples showed sharp and intense peaks (Figure 1) (Table 2) indicated that both the samples were crystalline. The peak intensities of the Consciousness Energy Healing Treated sample were significantly altered compared to the control sample. Both the control and Biofield Energy Treated samples showed the highest peak intensity at 2θ near to 27.5° (Table 2, entry 10). The total peak intensities of the Consciousness Energy Healing Treated sample were significantly altered ranging from -25% to 14.12% compared to the control sample. Similarly, the crystallite sizes of the treated mercaptopurine were significantly altered ranging from -35.09% to 71.3% compared to the control sample. However, the average crystallite size of the Biofield Energy Treated mercaptopurine powder (299.8nm) was decreased by 2.77% compared with the control sample (299.8nm).

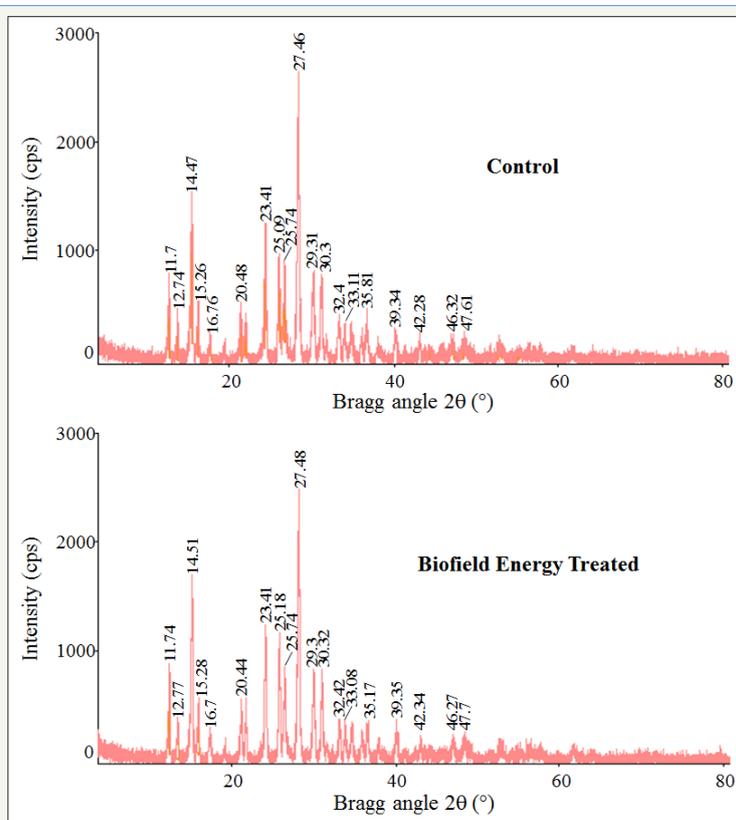


Figure 1: PXRD diffractograms of the control and Biofield Energy Treated 6-mercaptopurine.

Table 2: PXRD data for the control and Biofield Energy Treated 6-mercaptopurine.

Entry No.	Bragg angle (2θ)		Peak Intensity (%)			Crystallite size (G, nm)		
	Control	Treated	Control	Treated	% change ^a	Control	Treated	% change ^b
1	11.7	11.74	116	128	10.34	311	320	2.89
2	12.74	12.77	58	48	-17.24	493	340	-31.03
3	14.47	14.51	307	317	3.26	289	288	-0.35
4	15.26	15.28	84	82	-2.38	333	349	4.8
5	16.76	16.7	33.5	35.8	6.87	341	354	3.81

6	20.48	20.44	85	97	14.12	271	240	-11.44
7	23.41	23.41	238	221	-7.14	308	323	4.87
8	25.09	25.18	192	180	-6.25	368	342	-7.07
9	25.74	25.75	177	151	-14.69	304	322	5.92
10	27.46	27.48	506	480	-5.14	265	285	7.55
11	29.31	29.3	170	164	-3.53	256	263	2.73
12	30.3	30.32	147	146	-0.68	299	311	4.01
13	32.4	32.42	65	64	-1.54	320	314	-1.88
14	33.11	33.08	48	43	-10.42	297	286	-3.7
15	35.18	35.17	33.5	35.9	7.16	319	304	-4.7
16	35.81	35.88	64	58	-9.38	252	264	4.76
17	39.34	39.35	51	53	3.92	315	285	-9.52
18	42.28	42.34	23	26	13.04	493	320	-35.09
19	46.32	46.27	40	30	-25	218	289	32.57
20	47.61	47.7	61	59	-3.28	115	197	71.3
21	Average crystallite size					308.35	299.8	-2.77

^adenotes the % change in the peak intensity of Biofield Energy Treated sample with respect to the control sample;

^bdenotes the % change in the crystallite size of Biofield Energy Treated sample with respect to the control sample.

The peak intensity of each diffraction face on the crystalline compound changes according to the crystal morphology [40] and alterations in the XRD pattern provide the evidence of polymorphic transitions [41,42]. Any change observed in the crystallite sizes and peak intensities indicated the modification of the crystal morphology of the Biofield Energy Treated mercaptopurine compared to the control sample. The Trivedi Effect[®]-Consciousness

Energy Healing Treatment probably produced the new polymorphic form of 6 mercaptopurine through the Biofield Energy *via* neutrino oscillations [18]. Thus, the treated mercaptopurine might have shown the significant effects on the drug performance, such as bioavailability, therapeutic efficacy, and toxicity, because of their physicochemical properties like melting point, energy, stability, and solubility, are different from the original form [43,44] (Table 2).

Differential Scanning Calorimetry (DSC) Analysis

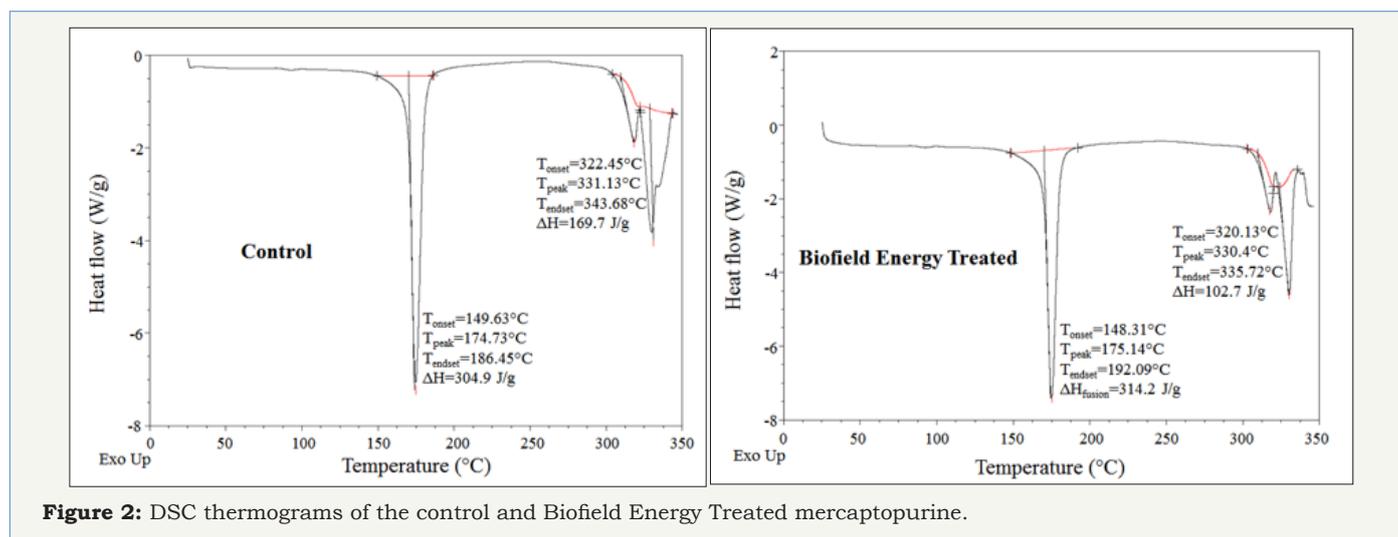


Figure 2: DSC thermograms of the control and Biofield Energy Treated mercaptopurine.

The DSC thermograms of both the control and Biofield Energy Treated sample showed the two sharp endothermic peaks in the thermograms (Figure 2). The control and Biofield Energy Treated samples showed the 1st endothermic peak at 174.73 °C and 175.14 °C, respectively due to the evaporation of the bounded water. Similarly, the 2nd endothermic peak of the control and Biofield Energy Treated mercaptopurine samples was observed at 331.13 °C

and 330.4 °C, respectively indicated the melting point. The thermal analysis data closely matched to the literature reported data [44]. The evaporation temperature and latent heat of evaporation (ΔH evaporation) of the Biofield Energy Treated mercaptopurine were slightly increased by 0.23% and 3.05%, respectively compared with the control sample (Table 3).

Table 3: DSC data for both control and Biofield Energy Treated samples of mercaptopurine.

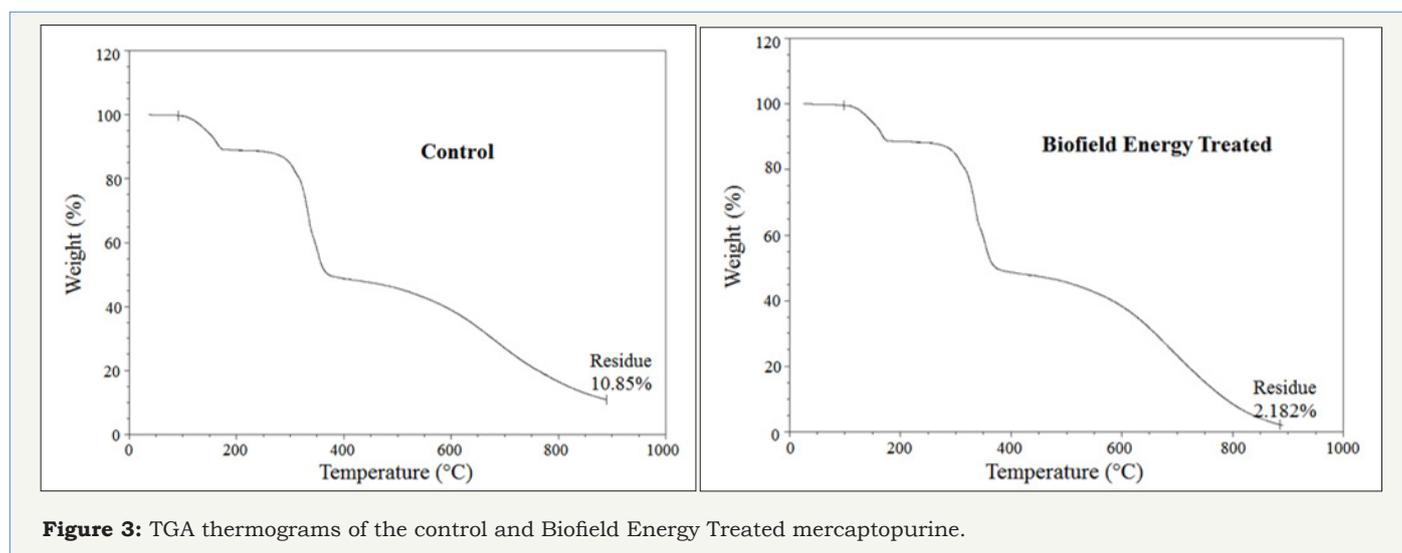
Sample	Evaporation Temp (°C)	Melting Point (°C)	ΔH (J/g)	
			Evaporation	Fusion
Control Sample	174.73	331.13	304.9	169.7
Biofield Energy Treated	175.14	330.4	314.2	102.7
% Change*	0.23	-0.22	3.05	-39.48

ΔH: Latent heat of evaporation/decomposition, *denotes the % change of the Biofield Energy Treated mercaptopurine with respect to the control sample.

However, the melting point and latent heat of fusion (ΔH fusion) of the Biofield Energy Treated mercaptopurine was decreased by -0.22% and -39.48% compared with the control sample (Table 3). Any change in the latent heat of fusion can be attributed to the disrupted molecular chains and the crystal structure [45]. From the results, it can be assumed that the Trivedi Effect® -Consciousness Energy Healing Treatment might have disrupted the molecular chains and crystal structure of mercaptopurine. hence, the thermal stability of the treated 6-mercaptopurine sample was decreased compared to the control sample.

Thermal Gravimetric Analysis (TGA) / Differential Thermogravimetric Analysis (DTG)

The thermograms of the control and Biofield Energy Treated samples showed three steps of thermal degradation (Figure 3). The total weight loss of the treated 6-mercaptopurine was significantly increased by 9.72% compared to the control sample (Table 4). Therefore, the residue amount was significantly decreased by 79.89% in the Biofield Energy Treated 6-mercaptopurine compared to the control sample (Table 4).

**Figure 3:** TGA thermograms of the control and Biofield Energy Treated mercaptopurine.**Table 4:** TGA/DTG data of the control and Biofield Energy Treated samples of mercaptopurine.

Sample	TGA		DTG; Tmax (°C)		
	Total weight loss (%)	Residue %	1 st Peak	2 nd Peak	3 rd Peak
Control	89.15	10.85	160.61	332.3	650.1
Biofield Energy Treated	97.818	2.182	163.08	332.8	686.3
% Change*	9.72	-79.89	1.54	0.13	5.56

*denotes the % change of the Biofield Energy Treated sample with respect to the control sample, T_{max} = the temperature at which maximum weight loss takes place in TG or peak temperature in DTG.

The DTG of the control and Biofield Energy Treated 6-mercaptopurine also showed three peaks in the thermograms (Figure 4). The maximum thermal degradation temperature (Tmax) of the 1st, 2nd, and 3rd peaks of the Biofield Energy Treated sample altered by 1.54%, 0.13%, and 5.56% compared with the

control sample (Table 4). Overall, TGA/DTG data of mercaptopurine samples revealed that the thermal stability of the Biofield Energy Treated 6-mercaptopurine sample was increased compared with the control sample.

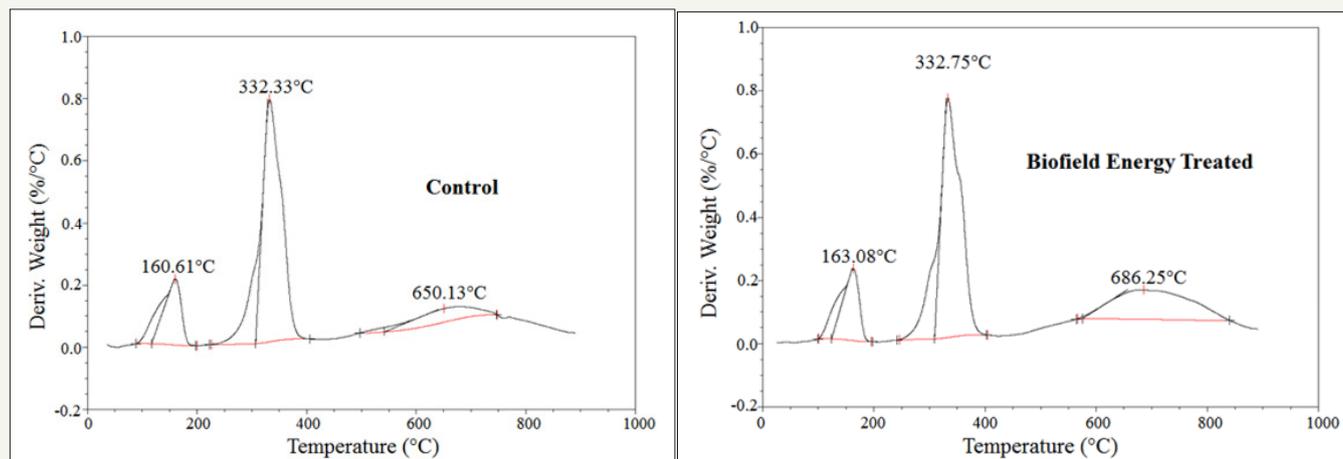


Figure 4: DTG thermograms of the control and Biofield Energy Treated mercaptopurine.

Conclusion

The Trivedi Effect®-Consciousness Energy Healing Treatment has a significant effect on the particle size, surface area, crystallite size, and thermal properties of 6-mercaptopurine. The particle size values in the Consciousness Energy Healing Treated powder sample were significantly decreased by 5.72%, 5.16%, 3.75%, and 4.54% at d_{10} , d_{50} , d_{90} , and $D(4,3)$ compared to the control sample. Therefore, the specific surface area of the Biofield Energy Treated powder sample was increased by 4.76% compared to the control sample. The PXRD peak intensities and crystallite sizes of the treated sample were significantly altered ranging from -25% to 14.12% and -35.09% to 71.3%, respectively compared to the control sample. Unlike particle sizes, the average crystallite size of the Biofield Energy Treated sample was decreased by 2.77% compared with the control sample. The evaporation temperature and $\Delta H_{\text{evaporation}}$ of the Biofield Energy Treated sample were slightly increased by 0.23% and 3.05%, respectively compared with the control sample. However, the melting point and ΔH_{fusion} of the Biofield Energy Treated sample was decreased by -0.22% and -39.48% compared with the control sample. The total weight loss was significantly increased by 9.72%; hence the residue amount was significantly decreased by 79.89% in the Biofield Energy Treated sample compared with the control sample. The T_{max} of the 1st, 2nd, and 3rd peaks of the Biofield Energy Treated sample were increased by 1.54%, 0.13%, and 5.56% compared with the control sample. From the overall results, it was concluded that the Trivedi Effect®-Consciousness Energy Healing Treatment might have generated a new polymorphic form of 6-mercaptopurine which may offer better solubility, dissolution, absorption, and bioavailability compared with the control sample. The Biofield Energy Treated 6-mercaptopurine would be very useful to design better pharmaceutical formulations that might offer better therapeutic response against acute lymphocytic leukemia, chronic myeloid leukemia, ulcerative colitis, Crohn's disease, and autoimmune diseases.

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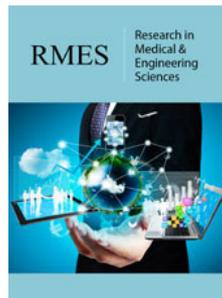
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