



Anti Inflammatory and Anti Viral Effects of Potassium (K) and Chemical Composition of Moringa

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Moringa grows in parts of Africa and Asia and is a flowering plant from herb to tree. There are 13 types of Moringa. It is growing in the Himalayas in northwestern India. In Africa, it grows in Kenya, Somalia, Ethiopia, Madagascar, Ghana, Nigeria and more. For capsules, leaves and roots are used. Oil is used for nuts.

Moringa in the research was from Thailand. The colors of flowers were white and yellow.

Moringa is characterized by high levels of potassium (K). Patients with COVID-19 caused by the SARS-CoV-2 virus have a decrease in potassium levels in the body.

In 2017, the author makes a spectral analysis of Moringa oil (Ignatov, 2017). The analysis justifies the application of Moringa for coronaviruses.

The great advantage of Moringa is that potassium and the chemical compounds are in organic form and are well absorbed by the body.

Keywords: Moringa capsules; Moringa oil; anti-inflammatory; COVID-19; NES; DNES.

1. INTRODUCTION

A study has shown low level of Potassium in patients with COVID-19 [1,2]. Moringa oil has

pronounced anti-inflammatory and antiviral effects, demonstrated by spectral analysis [3]. The author also analyzes three SARS-CoV-2 coronavirus prevention products. These are

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water Catholyte, methylene blue in Oxidal and nano colloidal silver [4,5,6]. Patients with chronic laryngitis, pharyngitis and rhinitis were monitored in 2017 and Moringa oil was used with drops in the throat and nose. The effect is permanent. In the beginning, Moringa oil causes pain in the throat, which gradually vanish. Moringa capsules are also taken. There is a research in Total Phenolic Content, *in vitro* and the pronounced anti-inflammatory effects of Moringa [7].

There were applied the methods for Non-equilibrium energy spectrum (NES) and Differential non-equilibrium energy spectrum (DNES) of water and liquids. The research was performed for 1% solutions of Moringa capsules and Moringa oil. The result with DNES method for Moringa capsules by DNES-methods was $\Delta E = -0.0077 \pm 0.0011$ eV. The result for 1% solution of Moringa oil recalculated with the DNES method was $\Delta E = -0.0104 \pm 0.0011$ eV.

This result suggests the restructuring of $\Delta E_{H...O}$ values among H₂O molecules with a statistically reliable increase of local extremums in NES- and DNES-spectra. There is review of the effects of the chemical composition of Moringa capsules – antiviral, anti-inflammatory and effects on the nervous system and blood pressure. There are directly anti inflammatory effects of Moringa extract on the rhinitis, pharyngitis and laryngitis.

Research show that Moringa oil can be used in patients with COVID-19 to maintain high levels of potassium and have an antiviral effect of Gallic acid. Moringa can also be used as a preventative treatment for patients with COVID-19 due to the pronounced anti-inflammatory and antiviral effects.

2. MATERIALS AND METHODS

2.1 Methods for Extracting of Moringa Capsules and Moringa Oil

For etanolic extract of shoots and leaves was performed 70% ethanol at room temperature for 24 hours. There were filtrated the shoots and leaves in different concentrations in water for capsules.

It is said that moringa leaves contain zeatin which has the growth promoting effect.

Moringa oleifera seed oil was extracted using the solvent extraction method. There was carried out the proximate analysis of the oil. The parameters determined were: ash, crude protein, crude fat,

carbohydrate and moisture content for proximate analysis.

2.2 NES and DNES Spectral Analysis

The device for NES and DNES spectral analysis is made by A. Antonov on an optical principle. For this is used a hermetic camera for evaporation of water drops under stable temperature (+22–24°C) conditions. The water drops are placed on a water-proof transparent pad, which consists of thin maylar folio and a glass plate. The light is monochromatic with filter for yellow color with wavelength at $\lambda = 580 \pm 7$ nm. The device measures the angle of evaporation of water drops from 72.3° to 0°. The DNES-spectrum was measured in the range of -0.08– -0.1387 eV or $\lambda = 8.9–13.8$ μm using a specially designed computer program. The main estimation criterion in these studies was the average energy ($\Delta E_{H...O}$) of hydrogen O...H-bonds among H₂O molecules in water samples.

2.3 Chemical Composition of Moringa Capsules

Moringa Capsules with extract from leaves and flowers consists – K (460 mg/per 100 g), Ca (30), Na (42), Mg (45), Fe (0.36), Mn (0.259), Zn (0.45), F (50). Vitamin A is 0.024 equiv. There are Vitamins in mg/per 100 g – B₁ (0.053), B₂ (0.074), B₃ (0.074). The dietary fiber are in mg/per 100 g – 3.2, fat – 0.2, protein – 0.1.

Table 1. Moringa capsules has the following chemical composition

Composition	mg per 100 g
Potassium (K)	460
Calcium (Ca)	30
Sodium (Na)	42
Magnesium (Mg)	45
Iron (Fe)	0.36
Manganese (Mn)	0.259
Zinc (Zn)	0.45
Phosphorus (P)	50
Vitamin A equiv	0.004
Vitamin B ₁	0.053
Vitamin B ₂	0.074
Vitamin B ₃	0.62
Dietary fiber	3.2
Fat	0.2
Protein	2.1
Carbohydrate	8.53
Energy	37 Kcal

2.4 Moringa Oil

The studied were performed for pH, I odine and saponification value, specific gravity and free

fatty acid for physicochemical properties. The values of moisture content - 0.67%, crude protein - 1.39%, ash - 0.57%, crude fat - 2.19% and carbohydrate - 2.19%. The pH was 5.75, saponification value -164.09 mg/g, iodine value -68.23 g/mol, specific gravity - 0.86. free fatty - 8.27 mgKOH/g acid (Table 1).

3. RESULTS AND DISCUSSION

3.1 Anti Inflammatory and Anti Viral Effects of Moringa

Phytochemical analysis of Moringa shows the following phytochemicals - tannins, alkaloids, flavonoids, cardiac glycosides etc. In Moringa flowers were found to contain 19.31 mg/g of gallic acid equivalent of total phenolics in dry extract but exhibited moderate antioxidant activity. The anti-inflammatory and antiviral activity of plant extract was significant and comparable with the standard drug diclofenac sodium [7].

Gallic acid ($C_6H_2(OH)_3COOH$) has antivirus properties in influenza type A and B viruses [8], HSV-1, HIV-1 [9] The is success of medicaments for HIV with COVID-19. Carbohydrate contained in Moringa has antiviral properties [10].

The anti-inflammatory properties of Moringa have been proven [11,12,13,14]. Moringa's antiviral effect has been applied in the following studies [15,16,17,18]. The author has analyzed 10 patients with Herpes Zoster and 10 patients with rhinitis, pharyngitis and laryngitis (Table 2). Table 3 shows results of Moringa against viruses.

Conducted analyzes of the effects of Moringa oil on various viruses, such as the proven reduction of potassium (K) in the presence of SARS-CoV-2 virus and COVID-19 disease, gives us an idea to expect that the chemical composition of Moringa is applicable for prevention, treatment and recovery. Moringa oil can be combined with other products analyzed by the author - Catholyte, methylene blue in Oxidal and nano colloidal silver [4].

3.1 Results with Spectral Analysis with Methods Nes and Dnes Of 1% Water Solutions of the Products Moringa Capsules and Moringa Oil

3.1.1 Moringa capsules

The average energy ($E_{H...O}$) of hydrogen H...O-bonds among individual H_2O molecules in 1%

solution of Moringa Capsules is measured at $E = -0.1238$ eV. The result for the control sample (deionized water) is $E = -0.1161$ eV. The results obtained with the NES method are recalculated with the DNES method as a difference of the NES (1% solution of Moringa Capsules) minus the NES (control sample with deionized water) equaled the DNES spectrum of 1% solution of Moringa Capsules [19,20,21,22]. Thus, the result for 1% solution of Moringa Capsules recalculated with the DNES method is $\Delta E = -0.0077 \pm 0.0011$ eV. The result shows the increasing of the values of the energy of hydrogen bonds in 1% solution of Moringa Capsules regarding the deionized water. The results of the effect is stimulation on human body. The result shows restructuring of water molecules in configurations of clusters, which influence usefully on human health on molecular and cellular level. The effects are describing with mathematical model of 1% solution of Moringa Capsules.

3.1.2 Moringa oil

There are results with methods NES and DNES with Bulgarian plants (23,24). The average energy ($E_{H...O}$) of hydrogen H...O-bonds among individual H_2O molecules in 1% solution of Moringa oil with NES method was $E = -0.1245$ eV. The result for the control sample (deionized water) was $E = -0.1142$ eV. Thus, the result for 1% solution of Moringa oil recalculated with the DNES method was $\Delta E = -0.0104 \pm 0.0011$ eV. The result was connected with stimulating effect on the human body.

3.2 Mathematical Models of the Products Moringa Capsules and Moringa Oil (Ignatov, Mosin, 2013)

The research with the NES method of water drops was received with 1% solutions Moringa Capsules and Moringa Oil and deionized water as control samples. The mathematical models of 1% solutions Moringa Capsules and Moringa Extract give the valuable information for the possible number of hydrogen bonds as percent of H_2O molecules with different values of distribution of energies (Tables 4 and 5; Figs. 1 and 2). These distributions are basically connected with the restructuring of H_2O molecules having the same energies.

Fig. 1 shows the distribution ($\%, (-E_{value})/(-E_{total value})$) of H_2O molecules in and 1% of water solution of Moringa Capsules (red line) and control sample deionized water (blue line).

Table 2. Shows the degree of improvement

Disease	Completely cured	Improved over 80%	Improved over 60%
Herpes Zoster	10		
Rhinitis, Pharyngitis and Laryngitis.	7	2	1

Table 3. Shows the effects of Moringa oil on virus-related diseases

Viral disease and viruses	Researchers	Year
Newcastle Disease Virus (NDV)	Chollom et al.	2012
HIV, AIDS	Abrams, Duncan, Hertz-Piccioto	1993
	Prazuk	
Herpes Simplex Virus (HSV)	Lipipun et al.	2003
Herpes Zoster	Ignatov	2017

Table 4. The distribution (% $(-E_{value})/(-E_{total value})$) of H₂O molecules in water samples from moringa capsules

-E(eV) x-axis	1% water solution of moringa capsules y-axis (% $(-E_{value})$ */ (-E _{total value}) ^{**})	Control sample of deionized water y-axis (% $(-E_{value})$ */ (-E _{total value}) ^{**})	-E(eV) x-axis	1% water solution of moringa capsules y-axis (% $(-E_{value})$ */ (-E _{total value}) ^{**})	Control sample of deionized water y-axis (% $(-E_{value})$ */ (-E _{total value}) ^{**})
0.0937	0	0	0.1187	0	9.1
0.0962	0	11.3	0.1212	25.2 ²	9.1 ²
0.0987	0	7.2	0.1237	0	0
0.1012	0	0	0.1262	4.9	4.5
0.1037	0	9.1	0.1287	0	4.5
0.1062	0	9.1	0.1312	4.9	0
0.1087	4.9	0	0.1337	9.8	4.5
0.1112	15.8 ¹	22.6 ¹	0.1362	4.9	0
0.1137	0	4.5	0.1387	19.8 ³	4.5 ³
0.1162	9.8	0	-	-	-

E = -0.1112 eV is the local extremum for relaxing effect on nervous system
E = -0.1212 eV is the local extremum for anti-inflammatory effect; *E* = -0.1387 eV is the local extremum for inhibition of development of tumor cells of molecular level; The spectrum is begging from *E* = -0.1112 eV and this shows effects of detoxification. Notes: * The result (-*E_{value}*) is the result of hydrogen bonds energy for one parameter of (-*E*)
 ** The result (-*E_{total value}*) is the total result of hydrogen bonds energy

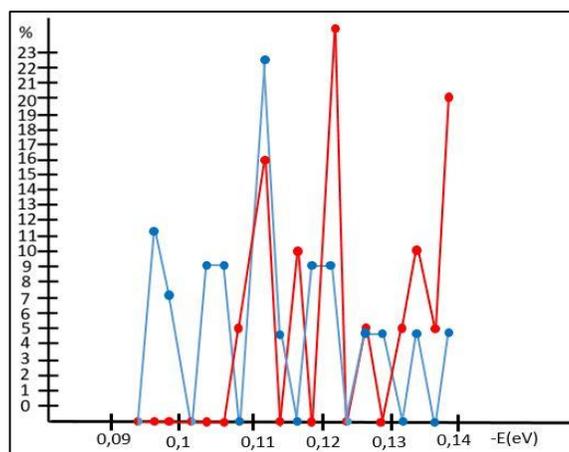


Fig. 1. Mathematical model (Ignatov, Mosin, 2013) of 1% water solution of Moringa Capsules

Notes: *E* = -0.1112 eV is the local extremum for relaxing effect on nervous system
E = -0.1212 eV is the local extremum for anti-inflammatory effect
E = -0.1387 eV is the local extremum for inhibition of development of tumor cells of molecular level

Table 5. The distribution (% , (-E_{value})/(-E_{total value})) of H₂O molecules in water samples from Moringa oil

-E(eV) x-axis	1% water solution of moringa oil y-axis (%((-E _{value})/ (-E _{total value}))**	Control sample of deionized water y-axis (%((-E _{value})/ (-E _{total value}))**	-E(eV) x-axis	1% water solution of moringa oil y-axis (%((-E _{value})/ (-E _{total value}))**	Control sample of deionized water y-axis (%((-E _{value})/ (-E _{total value}))**
0.0937	0	7.7	0.1187	0	0
0.0962	0	7.7	0.1212	32.2²	0²
0.0987	0	0	0.1237	0	7.7
0.1012	0	0	0.1262	0	0
0.1037	0	7.7	0.1287	0	3.8
0.1062	0	11.5	0.1312	12.5	3.8
0.1087	0	7.7	0.1337	0	7.7
0.1112	13.8¹	23.2¹	0.1362	0	0
0.1137	6.3	3.8	0.1387	25.2³	7.7³
0.1162	10.0	0	-	-	-

*E = -0.1112 eV is the local extremum for relaxing effect on nervous system
 E = -0.1212 eV is the local extremum for anti-inflammatory effect; E = -0.1387 eV is the local extremum for inhibition of development of tumor cells of molecular level; The spectrum is begging from E = -0.1112 eV and this shows effects of detoxification. The big difference between the local extremums of Moringa oil and control sample at E = -0.1112 eV shows analgesic effect. Notes: * The result (-E_{value}) is the result of hydrogen bonds energy for one parameter of (-E)
 ** The result (-E_{total value}) is the total result of hydrogen bonds energy*

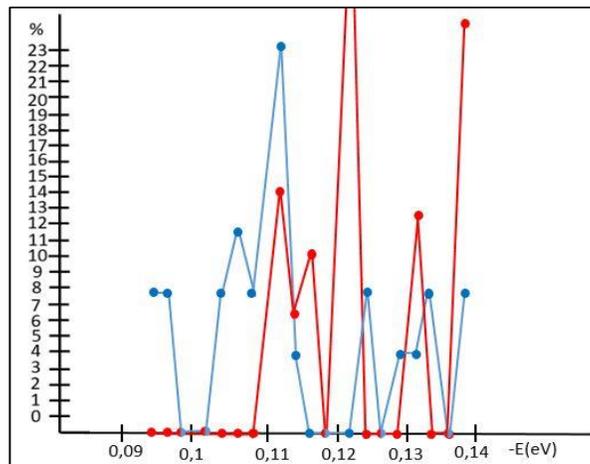


Fig. 2. Mathematical model (Ignatov, Mosin, 2013) of 1% water solution of Moringa oil

*Notes: E = -0.1112 eV is the local extremum for relaxing effect on nervous system
 E = -0.1212 eV is the local extremum for anti-inflammatory effect
 E = -0.1387 eV is the local extremum for inhibition of development of tumor cells of molecular level
 The spectrum is begging from E = -0.1112 eV and this shows effects of detoxification*

The biggest local extremum (25.2%, (-E_{value})/(-E_{total value})) was detected for the E = -0.1212 eV or λ = 10.23 μm. The effect with restructuring of water molecules is anti-inflammatory effects with influence of immunology system. The negative difference between the local extremums of Moringa ocapsules (15.8%, (-E_{value})/(-E_{total value})) and control sample (22.6%, (-E_{value})/(-E_{total value})) at E = -0.1112 eV with negative value of shows anti-inflammatory and analgesic effect.

The surface tension of 1% solution of water samples with Moringa Capsules is increasing according control sample. This is the effect of detoxification.

Table 5 and Fig. 2 show the distribution (% , (-E_{value})/(-E_{total value})) of H₂O molecules in water samples from Moringa oil.

Fig. 2 shows the distribution (% , (-E_{value})/(-E_{total value})) of H₂O molecules in and 1% of water

solution of Moringa oil (red line) and control sample deionized water (blue line).

The biggest local extremum (32.2% $(-E_{\text{value}})/(-E_{\text{total value}})$) was detected for the $E = -0.1212$ eV or $\lambda = 10.23$ μm . The effect with restructuring of water molecules is anti-inflammatory effects with influence of immunology system. The negative difference between the local extremums of *Moringa ocapsules* (13.8% $(-E_{\text{value}})/(-E_{\text{total value}})$) and control sample (32.2% $(-E_{\text{value}})/(-E_{\text{total value}})$) at $E = -0.1112$ eV with negative value of shows anti-inflammatory and analgesic effect.

4. CONCLUSION

Moringa is characterized by high levels of potassium (K). Patients with COVID-19 caused by the SARS-CoV-2 virus have a decrease in potassium levels in the body.

Moringa is characterized by high levels of potassium (K). Patients with COVID-19 caused by the SARS-CoV-2 virus have a decrease in potassium levels in the body.

In 2017, the author makes a spectral analysis of Moringa oil [23]. The analysis justifies the application of Moringa for coronaviruses.

The study shows the mathematical model of interaction with water of Moringa capsules and Moringa oil. In this report are submitted data about the interaction of Moringa capsules and Moringa oil with water, obtained by non-equilibrium (NES) and differential-equilibrium energy spectrum (DNES) of water. The average energy ($\Delta E_{H...O}$) of hydrogen H...O-bonds among individual molecules H_2O after treatment of Moringa capsules with water measured by NES- and DNES-methods is with values for anti-inflammatory and antiviral effects.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Dong Chen et al, Hypokalemia and Clinical Implications in Patients with Coronavirus Disease 2019 (COVID-19), 2020; MedRxiv.
2. Liu F. et al. Patients of COVID-19 may benefit from sustained lopinavir-combined regimen and the increase of eosinophil may predict the outcome of COVID-19 progression, International Journal of Infectious Diseases; 2020.
3. Ignatov I. Moringa – proofs for anti-inflammatory, antioxidant and inhibition growth of tumor cells effects. Relaxing effect of nervous system and effect on the hypertonia. Journal of Medicine, Physiology and Biophysics. 2017;39:43-56.
4. Ignatov I. Antiviral effects of nano colloidal silver, water catholyte, oxidal with methylene blue. Possible effects of influence over Coronavirus SARS-CoV and SARS-2 CoV-2 with Disease COVID-19, Global Congress on Infectious Diseases, SciTech Infectious Diseases; 2020.
5. Popova T, Petrova T, Ignatov I, Karadzov S. Preliminary *in vitro* investigations on the inhibitory activity of the original dietary supplement Oxidal® on pathogenic bacterial strains, Journal of Advances in Agriculture, 2020;11:37-43.
6. Popova T, Petrova T, Ignatov I, Karadzov S, Dinkov G. Antibacterial activity of the original dietary supplement oxidal® *in vitro*. Journal of Advances in Agriculture. 2020;11:71-78.
7. Alhakmari F, Kumar S, Kham S. Estimation of total phenolic content, *in-vitro* antioxidant and anti-inflammatory activity of flowers of *Moringa oleifera*, Asian Pacific Journal of Tropical Biomedicine. 2013;3(8): 623-627.
8. Lee JH, et al. Antiviral effects of black raspberry (*Rubus coreanus*) seed and Its gallic acid against influenza virus infection, viruses. 2016;8(6):157.

9. Kratz J. Anti-HSV-1 and anti-HIV-1 activity of gallic acid and pentyl gallate, Mem. Inst. Oswaldo Cruz. 2008;103.
10. Van der Meer FJ. et al. Antiviral activity of carbohydrate-binding agents against Nidovirales in cell culture, Antiviral Res. 2007;76(1):21-9.
11. Singh B, et al. Oxidative DNA damage protective activity, antioxidant and anti-quorum sensing potentials of *Moringa oleifera*: Food and Chemical Toxicology. 2009;47(6):1109-1116.
12. Sreelatha P, Padma P. Antioxidant activity and total phenolic content of *Moringa oleifera* leaves in two stages of maturity, Plant foods for Human Nutrition. 2009; 64:303.
13. Sulaiman M. et al. Evaluation of *Moringa oleifera* aqueous extract for antinociceptive and anti-inflammatory activities in animal models. Pharmaceutical Biology: 2008; 46(12):838-84. Verma A. et al. *In vitro* and *in vivo* antioxidant properties of different fractions of *Moringa oleifera* leaves. Food and Chemical Toxicology. 2009;47(9): 2196-2201.
14. Caceres A. et al. Pharmacologic properties of *Moringa oleifera*. 2: Screening for antispasmodic, antiinflammatory and diuretic activity. Journal of Ethnopharmacology. 1992;36(3):233-237.
15. Mesfin F, Demissew S, Teklehaymanot. An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia. Journal of Ethnobiology and Ethno-medicine; 2009.
16. Chollom SC, et al. Investigation of aqueous extract of *Moringa oleifera* lam seed for antiviral activity against new castle disease virus in ovo, Journal of Medicinal Plants Research 2012;6(22): 3870-3875.
17. Murukami et al. Niaziminin, a thiocarbamate from the leaves of *Moringa oleifera*, holds a strict structural requirement for inhibition of tumor-promoter- induced Epstein-Barr virus activation. Planta. Med., 1998;64:319-323.
18. Lipipun V, Kurokawa M, Suttisri R, Taweechotipatr P, Pramyothin P, Hattori M, Shiraki K. Efficacy of Thai medicinal plant extracts, against herpes simplex virus type 1 infection in vitro and in vivo. Antiviral. Res. 2003;60:175-180.
19. Atanasov A, Karadzhov S, Ivanova E, Mosin OV, Ignatov I. Study of the effects of electrochemical aqueous sodium chloride solution (Anolite) on the virus of classical swine fever virus. Mathematical models of anolyte and catholyte as types of water. Journal of Medicine, Physiology and Biophysics. 2014;4:1-26.
20. Ignatov I, Gluhchev G, Karadzhov G, Yaneva I, Valcheva N, Dinkov G, Popova T, Petrova T, Mehandjiev D, Aksjonovich I. Dynamic nano clusters of water on waters catholyte and anolyte: Electrolysis with nano membranes, Physical Science International Journal. 2020;24(1):46-54.
21. Antonov, A. Research of the Non-equilibrium Processes in the Area in Allocated Systems. Dissertation thesis for degree Doctor of physical sciences. Blagoevgrad, Sofia; 1995.
22. Ignatov I, Mosin OV. Structural mathematical models Describing Water Clusters. Journal of Mathematical Theory and Modeling, 2013;3(11):72-87.
23. Krastev D, Ignatov I, Mosin OV, Penkov P. 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, Advances in Physics Theories and Applications. 2016;52:47-55.

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