Impact of magnetized water on elements contents in plants seeds

[1,2] Abdelaziz A.M.ELshokali, [1,3*]Abdelrazig.M.Abdelbagi
(Sudan)

[1]Physics Department, Science College, Shaqra University Dawadami, P.O. Box 33, code 11911, Kingdom of Saudi Arabia
[2]Physics Department, Education College, Sinnar University, Sinnar, Sudan
[3]Omdurman Islamic University Faculty of Science, Box. 832, Omdurman, Sudan,
[1,2]email:abdalaziz.shokali@yahoo.com
[1,3]email:razig2000@hotmail.com

[*]Corresponding author: Abdelrazig.M.Abdelbagi

Abstract:
In this work a study of elements concentration in seeds of onion, sunflower and tomato plants growth irrigated with magnetized water compared to plant growth with non-magnetically treated water (normal water) in open land at winter season were determined. The elements Calcium,Potassium,Iron, and Zinc concentration in the seeds were measured using an Induced Coupled Plasma (ICP) spectrometer.Cropscontents of the plants were irrigated with magnetized water exhibited remarkable increases in elements concentration compared to cropsusing normal water, in addition to the increasing of products at harvest. The statistical assessment was judged using t-test and Eigenvalue indicates noticeably increasing of elements concentration in plants yields improvement quality using a static magnetic field.

Keywords: Static magnetic, water, elements, plants seeds, ICP-spectroscopy.

1. Introduction:

The water molecule consists of hydrogen and oxygen atoms are partly positive and partly negative that forming by weak attraction allowing to the formation of hydrogen bonds. The magnetic and electrical fields are extremely affected in liquid water through hydrogen bond that changes some physical and chemical properties of magnetic water, Samir.H.Nasher, (2008). The magnetic field on ion of positive charge will create magnetic force and move in the direction relative to the right hand rule of Lorantz, while the negative charge particle moved in the opposite direction Ameret al, (2006)). The motion in the direction of water molecules charges will increasing the velocity of the particles that create more collisions between the particlesM. Gholizadeh,et al (2008).The magnetic field is increased the strength of hydrogen bond,which leads to increasing in the refractive index. The weak magnetic field (15 mT) cause effect on tight bond of water molecules due to weakening of van der Waals bonding between water molecules, which reduces the thermal motion and generating dampening force relative to charges. Calcium is positively charge ions moved in the direction relative to right hand rule, which presents in natural water and responsible for permanent and temporary hardness, H. Banejad et al,(2009). These elements (Ca, K, Fe, and Zn) under study are positive charges elements and positive ions (cations).

Magnetic field is effecting potentially on water, which is subject of interesting for many applicationKai-Tai Changa, (2006). Currently, magnetized water is used to increased plant yields Lin &Yotvat, (1990), many benefits of human health and change in pH of the water Busche, (1985) (Basant L. Maheshwari, (2009),L. Kordas, (2002).The magnetic water treatment can improve acceleration of seeds metabolism and increased yield parameter of the crops; such as cereal sunflower and soybean Aladjadjiyan and Ylieve, (2003) , Özalpan et al., (1999), Yurttas et al., (1999) and Oldacay, (2002), M. RÃCUCIU1(2008). The influence of magnetic field was applied to the effect on seed and plant growth and that investigated by N.Hirota.et al (1999), which differences in germination of the plant. Recently, the research on plants growths were improved with seeds treatment using a magnetic field. Therefore, bipolar magnetized water treatment with north and south poles is affecting the plant production, O. Sadeghipour, P. Aghaei, (2013).
The experiments and investigation are explained that the magnetic treatment effect on the plant growth and increasing the seeds production depends on the time of exposure and strength of magnetic field. However, the magnetic field strength of 62 mT and 250 mT has shown significant difference in the effect on plant growth Odhiambo et al, (2009) ,Vashisth & Nagarajan, (2010). In the main time, the time exposure of 15 s and 24 hours investigation is reflected large variation effect on plant growth and quality improvement on seeds production, Muszinski et al.(2009) to 24 hours, Martinez et al., (2009), Mihaela, Răcuciu, (2011). The plant treatment with magnetic field has shown increasing in the germination of plant and improves the quality of seeds, Pietruszewski et al., (2007), Abdul R.H. Subber, et al, (2012), AhmadGholami1,et al, (2010).
The production of plants in foods quality is depending on minerals and trace elements to be enhanced in the seeds, Anna Aladjadjiyan**,**(2012). However the elements in human tissues are transferred to the body from foods used, which affects significantly by irrigation water and soil of the plant and groundwater basin and drinking water.

Consequently, some heavy elements such as iron, zinc, copper and manganese are very important in human tissues and all living organisms role of animal and human nutrition, which essentials micronutrients of various biochemical functions of the bodies, Hemn Othman Salih, (2013). However, the main source of heavy metals that is important to enhanced health growth of a human body and essentially for micronutrients requirement is seeds used in human foods, A.Liopa-Tsakalidi,et al (2011). The majority of seeds contents are good source of mineral elements such as

potassium, sodium, magnesium and calcium,Ajayi (2008), Samir.H.Nasher,(2008). Accordingly, the development of metals in seeds contents and investigation of the growths of these metals in seeds from mineral elements in the soil are essential for developing foods production, Kranner and Colville (2011), Gholamabbas Shams1, et al ,(2013), Dimitrios J. Bilalis, et al ,(2013).

2. Materials and Methods:

The experiment was arranged in an agriculture area in center of Sudan at White Nile agriculture area in double lands similar in dimension of 24 meters squares. Soil of the land was organized typical to method of planting techniques. Three types of plants were used for this application in the same duration. The irrigation of the experiment was continued at adequate water amount quantities for all types for magnetized water and normal water during plants growth. The water was flowed in PVC tube of inner diameter of 4 inch and radial static magnetic field of 250 mT used in this experiment. The duration period of irrigation between 55 and 60 minutes times to control the amount of water that used for irrigation of plants irrigated with normal and magnetic water with the same follow rate.

The experiment was applied in agriculture area still traditional agricultural system used for irrigation schedules. These plants under experiment are usually important for production of sunflower, onion and tomato in the area, which are irradiated from the White Nile. The period of this experiment was carried out in winter season from November to February that favorable weather condition in four months duration. Small area of farms was prepared using traditional land texture preparation technique in an open land area. The seeds of the three types of experiments were used for planting that produced by the local farmers.

The Induced Couple Plasma analytical methods are sensitive technique for trace elements determination prepared in soluble form relative to standard sample preparation procedure. The inductive couple plasma spectrometer was used to determining element Ca, Fe, K, and Zn in three types of seeds onion, sunflower and tomato. Sample was sprayed into ICP in aerosol form and the high temperature excites the atoms that produces ionic emission spectra can be detected as characteristics of atoms emission. The seeds samples of onion, sunflower and tomato were dry and grinded manual with grinder and the dry powder samples were added to normal HNO_3 acid.The solution of 2 % weight per volume of nitric acid and hydrogen peroxide (H_2O_2) was added to the sample and deionized water and then diluted solution filtered as stock solution, which can be injected directly in ICP spectrometer, UmranHicsonmez,et al,(2012), Kent W. Smothers,et al,(2001).

3.1 Result and discussion:

The results of elements concentration in seeds of the plants irrigated with magnetized water and the same plants in similar condition treated with normal water as control samples is used for comparative assessment.

Ca and Fe average contents in seeds of sunflower, tomato and onion are displayed in the figure (1) and figure (2) shows the increasing of concentration of plants irrigated with magnetized water (M.Onion, M.Sun.flio, M.Tomato) compared to normal water (Onion, Sunflow, Tamato) . The variation in seeds elements levels are demonstrated in the graphs shows highly enhancement of the crop products, which is encouraged by applying magnetic field to the irrigated water.

The results in figures (3) and (4) have shown that K and Zn concentration in sunflower, tomato and onion irrigated with magnetized water are highly riches with elements contents compared to normal water irrigation. The data can be seen in figure (5) is exhibiting significant difference percentage of

elements of the three plants products, which areirrigated with magnetized water above the concentration of seeds using normal water.

Metals concentrations in sunflower, tomato and onion were assessed using statistical data via various methods such as t-test, principal component analysis, communalities and Eigen value.

In tables (1) and (2) exhibits Ca and Fe statistical value are showed the t-test, communalities and principal component extraction method and eigenvalues reveal significant differences between evaluation of products irrigated with magnetic water and normal water. The calculation of t-test, initial Eigenvalues of the total and the percent of variance indicates different values of Ca and Fe in seeds irrigated with normal water compared to magnetic water. In addition to communalities extractions values associated with both elements between plants were irrigated with magnetized water reveal lower value compared to normal water, while Ca is differed in sunflower.

Tables (3) and (4) presents the statistical assessment of K and Zn concentrations in seeds under study that are included t-test, communalities extractions and principal component extraction method, initial Eigenvalues respectively. The results are showed the major difference of values in corps irrigated with normal water than that irrigated with magnetized water, while the communalities values are exhibited highly significant extraction for both elements. The communalities extraction for the elements under investigation Ca, Fe, K and Zn are showed lower values in tomato irrigated with magnetized water.

3.2 Conclusion:

The measurement of elements contents in plants irrigated with magnetized water has greatly affective effects on seeds product compared to normal water irrigation. The enrichment of Calcium, Iron, Potassium and Zincin seeds of plants irrigated with magnetized water reveals significant increasing in production quality compared to irrigation using normal water.The conclusion one can draw from data using t-test, communalities extractions and initial Eigenvalues are highly increasing in metals concentration of plants production and steadiness of increasing inseeds quality enhanced with static magnetic field. The data are evaluated using comprehensive analysis of the elements concentration, which is conformed an improvement ofminerals and trace elements in foods qualityof the plants.

4. References:

Amer D. Majeed, Salih M. Salman,(2006),*A study the Effect of Magnetic Field on the absorption spectrum of Distilled Water*, AL-fateh, Journal, No27,.

Abdul R.H. Subber$,Reyad Ch. Abul Hail* , Waleed A. Jabail** and Hussain F. Hussein*, 2012, *Effects of magnetic field on the growth development of Zea mays seeds*, Journal of Natural Production. Plant Resources, 2 (3):456-459, http://scholarsresearchlibrary.com/archive.html, CODEN (USA).

Ahmad Gholami[1],Saeed Sharafi[2]and Hamid Abbasdokht1, (2010), *Effect of magnetic field on seed germination of two wheat Cultivars*, World Academy of Science, Engineering and Technology 44.

Anna Aladjadjiyan**,**2012 ,*Physical factors for plant growth stimulation improve food quality, fFood production – approaches, challenges and tasks***,**INTECH, Open Science,-January, www.intechopen.com.

A.Liopa-Tsakalidi, P.E.Barouchas and I.N.Xynias,2011, *Changes of elements concentration in Onion set plants (allium cepa L) Traditionally cultivated under different soil types in Greece*, International Journal of Agricultural research 6 (8) p 643-652, Academic Journals Inc.

Basant L. Maheshwari, Harsharn Singh Grewal,(2009),*Magnetic treatment of irrigation water: Its effects on vegetable crop yield and water productivity*, Agricultural Water Management 96, 1229–1236**,** www.elsevier.com/locate/agwa .

Dimitrios J. Bilalis 1, Nikolaos Katsenios1,Aspasia Efthimiadou2, Anestis Karkanis3, Ebrahim M. Khah3, TertyllianosMitsis,(2013),*Magnetic field pre-sowing treatment as an organic-friendly technique to promote plant growth and chemical elements accumulation in early stages of cotton*, Australian journal of Corp science ,AJCS7(1):46-50.

Gholamabbas Shams1, Morteza Ranjbar1, Ahmad Reza Abbasi2, Zahra Khodarahmpour3, Hasan Feizi4, Roghaieh Zare5 ,2013, *Influence of homogeneous magnetic field on the content of ten trace elements in stipe and cap oyster mushroom* (Pleurotus Florida) , International Research Journal of Applied and Basic, Sciences © Available online at www.irjabs.com,Vol, 4 (5): 1071-1077 , Science Explorer Publications.

H. Banejad, E.Abdosalehi,2009,*The effect of magnetic field on water hardness reducing*, Thirteenth International water technology conference IWTC, Egypt, p 117-128.

Hemn Othman Salih, (Nov. - Dec. 2013), *Effect of Foliar Fertilization of Fe, B and Zn on nutrient concentration and seed protein of Cowpea* "VignaUnguiculata, IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS), e-ISSN: 2319-2380, p-ISSN: 2319-2372.Volume 6, Issue 3, PP 42-46, www.iosrjournals.org.

Kai-TaiChanga, Cheng-I. Wengb, August -2006,*The effect of an external magnetic field on the structure of liquid water using molecular dynamics simulation*, published online, Journal of applied physics 100, 043917.

Kent W. Smothers, Charles D. Curtiss, Brian T. Gard, Robert H. Strauss, Vincent F. Hock,15 June 2001 , *Magnetic water treatment*, Public work technical bulletin,420-49-34 , , published by the U.S. Army Corps of Engineers, Washington, DC.

L. Kordas(2002), *The effect of magnetic field on growth, development and the yield of spring wheat*,Polish Journal of Environmental Studies Vol. 11, 527-530. No. 5.

M. Gholizadeh, H. Arabshahi, M.R. Saeidi and B. Mahdavi,2008,*The Effect of Magnetic Water on Growth and Quality Improvement of Poultry* , Middle-East Journal of Scientific Research, © IDOSI Publications 3 (3): 140-144.

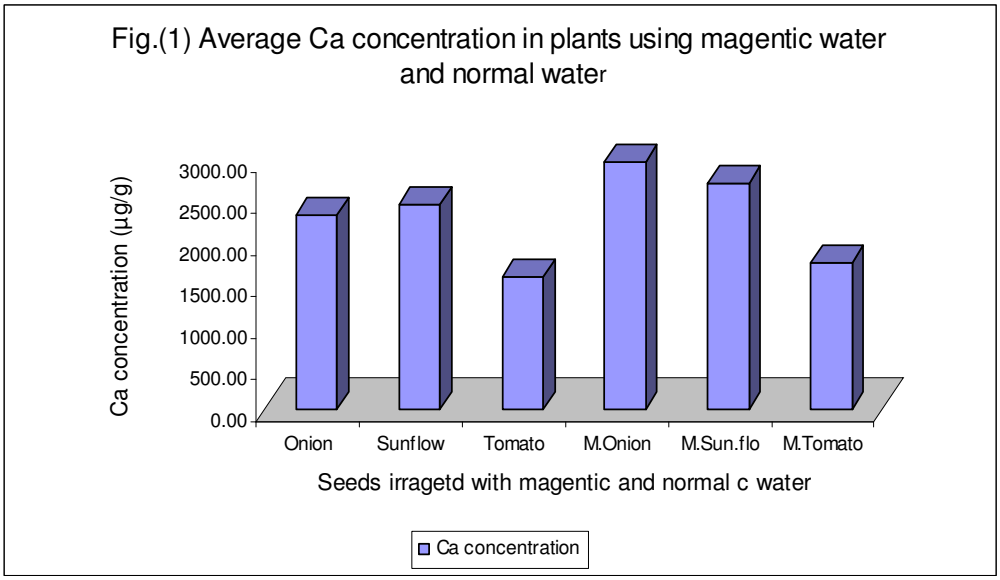
M. RÃCUCIU1, D. CREANGÃ2, I.Horga31, 2008, *Plant growth under static magnetic field influence* Rom. Journal Phys., Vol. 53, Nos. 1– 2 , P. 353–359, Bucharest, mracuciu@yahoo.com.

MihaelaRăcuciu, 2011 ,*50 Hz frequency magnetic FIE*, Romanian J. BIOPHYS, Vol. 21, No. 1, P. 53–62, Bucharest.

O. Sadeghipour, P. Aghaei, 2013, *Improving the growth of cowpea* (Vignaunguiculata L. Walp.) by magnetized water, Journal of Biodiversity and Environmental Sciences (JBES), Vol. 3, No. 1, p. 37-43, http://www.innspub.net.

Samir.H.Nasher,, 2008, 2008,*The effect of magnetic water on growth of Chick-Pea seeds*, Eng. & Tech. Vol. 26, No.9.

Umran Hicsonmez[1]*, Canan Ozdemir[2], Sermin Cam[3], Ali Ozdemir[4], F. Serap Erees3,(2012) ,*Major-minor element analysis in some plant seeds consumed as feed in Turkey*, Vol.4, No.5, 298-303 Natural Sciencehttp://dx.doi.org/10.4236/ns.2012.45042.



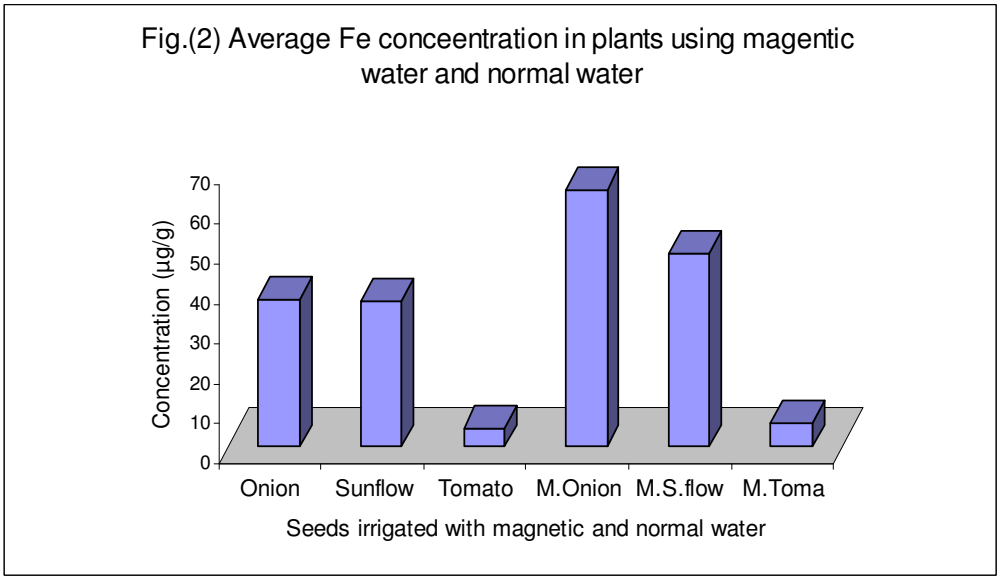


Fig.(3) Average K conceentration in plants using magentic water and normal water

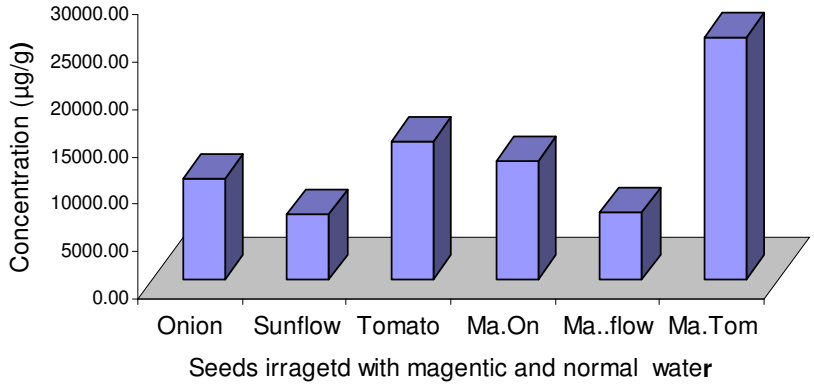
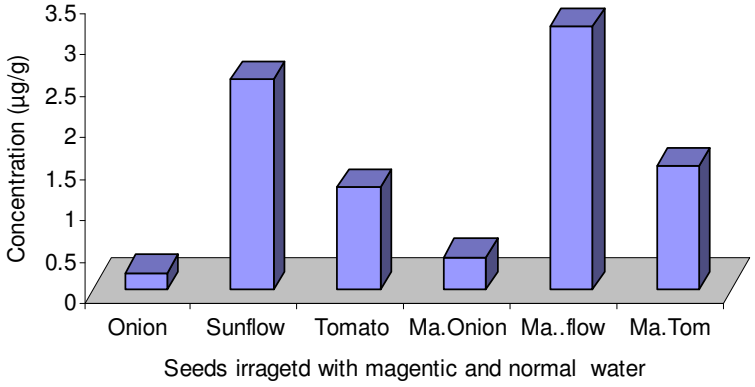


Fig.(4) Average Zn conceentration in plants using magentic water and normal wate



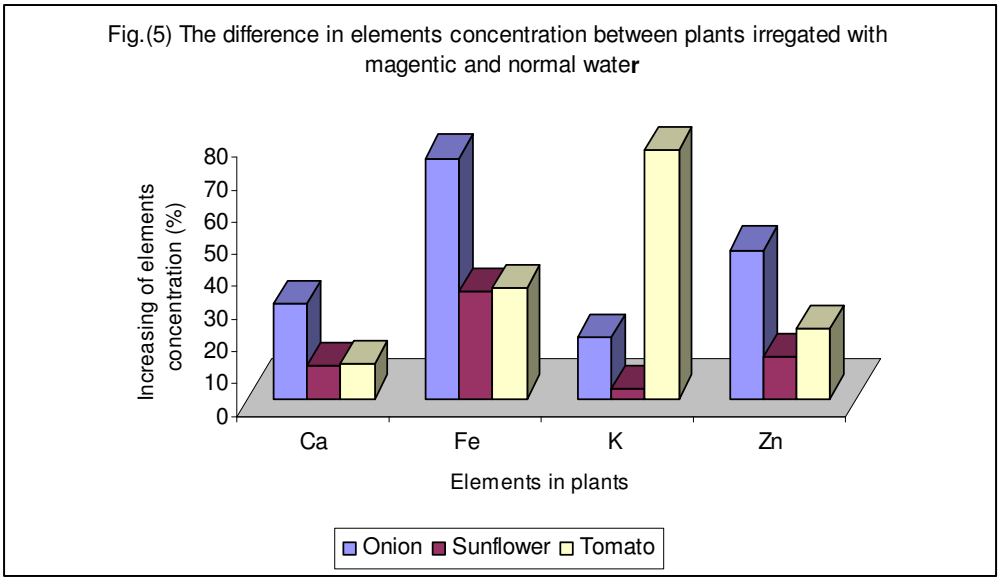


Table (1) Calcium statistical evaluation in seeds plants concentration.

Element, Calcium Plants	Component	t (value)	Communalities Extraction	Initial Eigenvalues Total	% of Variance
Onion	1	53.647	.887	2.114	35.234
Sunflower	2	24.600	.599	1.315	21.921
Tomato	3	66.450	.927	1.074	17.899
Onion (magnetize water)	4	40.971	.797	.801	13.352
Sunflower (magnetize water)	5	18.137	.626	.535	8.912
Tomato(magnetize water)	6	15.989	.667	.161	2.682

Table (2) Iron evaluation statistical evaluation in seeds plants concentration.

Element, Iron	Component	t (value)	Communalities	Initial	Eigenvalues
Plants			Extraction	Total	% of Variance
Onion	1	28.257	.877	1.720	28.673
Sunflower	2	20.688	.721	1.238	20.634
Tomato	3	31.890	.626	1.122	18.706
Onion (magnetize water)	4	53.360	.782	.844	14.073
Sunflower (magnetize water)	5	14.333	.720	.734	12.225
Tomato(magnetize water)	6	51.096	.355	.341	5.689

Table (3) Potassium evaluation statistical evaluation in seeds plants concentration.

Element,Potassium	Component	t (value)	Communalities	Initial	Eigenvalues
Plants			Extraction	Total	% of Variance
Onion	1	131.414	.636	1.644	27.408
Sunflower	2	23.239	.731	1.275	21.256
Tomato	3	81.396	.741	1.112	18.528
Onion (magnetize water)	4	104.893	.744	.966	16.104
Sunflower (magnetize water)	5	21.767	.752	.619	10.319
Tomato(magnetize water)	6	16.380	.427	.383	6.385

Table (4) Zinc evaluation statistical evaluation in seeds plants concentration.

Element ,Zinc	Component	t(value)	Communalities	Initial	Eigenvalues
Plants			Extraction	Total	% of Variance
Onion	1	37.000	.747	2.183	36.388
Sunflower	2	17.095	.844	1.176	19.594
Tomato	3	45.997	.700	1.166	19.428
Onion (magnetize water)	4	5.831	.870	.776	12.935
Sunflower (magnetize water)	5	16.878	.698	.493	8.218
Tomato(magnetize water	6	33.875	.667	.206	3.436