MAGNETIC BIOSTIMULATION AND ITS RELEVANCE TO FERTILIZER REQUIREMENTS OF TOMATO PLANTS

By

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B.Sc. Agric. Sc. (Horticulture), Ain Shams University, 2001

M. Sc. Agric. Sc. (Vegetable), Ain Shams University, 2008

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ABSTRACT

Osama Abd El-Salam Abd El-Nabi: Magnetic Biostimulation and its Relevance to Fertilizer Requirements of Tomato Plants. Unpublished Ph.D. Thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2012.

Field experiment was carried out at Desert Research Center at Ras Suder, South Sinai Governorate, Egypt during 2010 and 2011 seasons, on tomato plants *(Lycopersicon esculentum* Mill) cv. Castlrock. This work aimed to determine the effects of magnetic treatments of both pre-sowing seeds and irrigation water and its relevance to NPK fertilizer requirements of tomato plants. The experimental design was split-split plot with three replicates. Irrigation treatments (magnetized and ordinary water) were arranged in the main plots, pre-sowing treatments (magnetized and untreated seeds) were distributed in the sup-plots and three NPK levels (50, 75 and100% of recommended rate) were assigned in the sub-sub plots. In general, the best results for plant and soil were obtained by magnetic field techniques either for presowing seeds or irrigation water. However, the incorporated treatment (plants originated from magnetically treated seeds and irrigated with magnetized water) tended to be more effective for enhancing the plant and soil characteristics during various plant stages. The interaction treatment of magnetically treated seed and irrigation water combined with 100% or 75% NPK fertilizer levels had a preference results, where it gave the highest values of vegetative growth characters, increased the N, P, K, Ca, Fe, Ec values and Na soil content but reduced S, Cl and pH value in both plant and soil solution, in addition to improving the activity of CAT and POD enzymes. Finally we emphasized that the techniques of magnetic field in agriculture fields could be a promising technique for agricultural improvements but extensive research is still required.

Key words: tomato, *Lycopersicon esculentum* Mill, pre-sowing, magnetized seed, magnetized water, NPK fertilizers.

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May His blessing be upon the Prophet Mohammad (pbuh)

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CONTENTS

LIST OF TABLES

ABBREVIATIONS LIST

Abbreviation	Full name
MF	Magnetic field
EMFs	Electromagnetic fields
PMF	Permanent Magnetic field
MTW	Magnetic treated water
MTS	Magnetic treated seed
MST	Magnetic seed treatment
MFs	Magnetic field strength
T	Tesla
Gs	Gauss = 10^{-4} Tesla
mT	Micro tesla = 10^{-6} Tesla
CAT	Catalase
POD	Peroxidaes
DAP	Days after planting

1. INTRODUCTION

Stimulation of plants with magnetic field, as a way to increase the quantity and quality of yields, has caught the interest of many scientists in all the world and has been the object of numerous researches. Many of them investigated the effect of pre-sowing treatment of seeds with the magnetic field, as one of the physical methods for the improvement of sowing material quality. Plants grown from the treated seeds are better developed, have higher vigor, are more quickly enter successive development stages and yield better.

Magnetized water is obtained by passing of water through the permanent magnets or through the electro magnets installed in/on a feed pipeline. Magnetic treatment of water has been reported to change some of physical and chemical characteristics of water such as surface tension, conductivity, solubility of salts and pH **(Grewal and Maheshwari, 2011)**. Hence, we can attribute the great ameliorate of MTW in various stages of plant growth to the hypothesis that these changes of MTW properties such as solubility and surface tension, it make the water penetration much easier to the inner parts of the plant structure, as well as, increase the availability of elements in the soil, making possible a better absorption which starts up the metabolic processes. Moreover, **Mostafazadeh *et al.* (2011b)** showed that the irrigation with magnetized water increased soil moisture up to 7.5% as compared with the nonmagnetic water concluding that the use of magnetized water for irrigation is recommended to save irrigation water.

Irrigation with magnetically treated water and/or pre-sowing magnetic seed treatment are environmentally friendly techniques. Therefore, such techniques take an important place in the list of environmentally clean methods and harmless technology **(Podlesny *et al.*, 2005; Aladjadjiyan, 2007; Morejon *et al.*, 2007; Rochalska,**

2008; Aguilar *et al.*, 2009; Nimmi and Madhu, 2009; Bautista *et al.*, 2010), convenience for biological farming **(Aladjadjiyan, 2010; Bilalis *et al.,* 2012),** valuable in organic cultivation, where chemical compounds are prohibited, use as dormancy-breaking treatment (**Carbonell *et al.*, 2004),** improve the microbiological content of soils **(Ratushnyak *et al.,* 2008)**, make plants more resistant to unfavorable environmental conditions **(Pittman, 1977; Rochalska, 2008; Vashisth and Nagarajan, 2008; Alikamanoglu and Sen, 2011),** widely used in agricultural fields **(Majd and Shabrangi, 2009; Vashisth and Nagarajan, 2008; Balouchi and Sanavy, 2009),** and magnetized water for irrigation is recommended to save irrigation water **(Mostafazadeh *et al.,* 2011b).**

For all this, the magnetic field application should be investigated and recommended for applying in agriculture fields in our country**.**

Complementing to the formerly study (**Shalaby, 2008**), this study was conducted to find out the possible effects of magnetic treatments for pre-sowing seed or irrigation water on plant growth and soil characteristics, as well as, the positive effects of magnetic field treatments on improving the efficiency of added NPK mineral fertilizers, using tomato plant as an example.