

**EFFECT OF SOME ORGANIC AND BIOFERTILIZERS
ON YIELD AND QUALITY OF TOMATO
FRUITS UNDER NORTH SINAI
CONDITIONS**

BY

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B.Sc. Agric. Sc. (Horticulture), Ain Shams University, 1989

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ABSTRACT

Mahmoud Mohamed Hamed Hegazy: Studies Effect of some Organic and Bio fertilizers on Yield and Quality of Tomato Fruits under North Sinai Conditions. Unpublished M.Sc. Thesis, Ain Shams Univ., Faculty of Agriculture, Horticulture Dept., 2019.

The experiment of this study was conducted as split split blot design, using sixteen treatments, resulted from application of eight different types of fertilizers (two species of mycorrhizae, two mineral fertilizers and four organic fertilizers) alone or in combination. The organic fertilizers were chicken manure, compost, cattle manure and pomace, and *Glomus* sp. and *Gigspora* sp. mycorrhizae as bio fertilizer, as well as mineral fertilizers (75&100% of the recommended level). The results showed that the treated plants by 100% mineral fertilizers with chicken manure and bio fertilizers were the highest effects on quality and quantity of tomato yield. This study suggests using of chicken manure and bio fertilizer as partially alternative of mineral fertilizer, to reduce the application of mineral fertilizers in tomato growing fields.

Key Words: Tomato, Organic, Bio fertilizers, Mycorrhizae, Yield, Quality.

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INTRODUCTION

The global awareness has been increased in the last few years about human health and the agricultural environment. This all is related to the increase in the number of consumers of clean healthy food, that is after ensuring of the negative effects resulted from the overuse of fertilizers and pesticides. Also, the ultimate need of improving agriculture has been shown and this organized system so-called organic agriculture is estimated as a biological system inspired by the nature which does not depend on chemicals that reduces environmental pollution. That is one single thing that pushed many governmental policies in most of the developed countries to encourage the organic agriculture which is known to be an integrated agricultural system producing a safe clean food with high quality and conserving safety of the environment and the human being. Tomato is regarded as one of the most important vegetable crops in the world.

The tomato belongs to the family Solanaceae, genus *Lycopersicon*, which contain some important minerals, vitamins. Tomatoes are now eaten freely throughout the world, and their consumption is believed to benefit the heart among other things. Tomato is considered the most vegetable crop in Egypt. Among the methods followed for improving the quantity and quality of tomato fruits are the application of major fertilizers to satisfy the needs of plants from such elements since good growth is mostly associated with good yield and best quality. Tomatoes have been reported to be an important source of nutrient antioxidants such as lycopene and vitamin C in human diet (**Clinton, 1998; Kaur *et al.* 2002**). Tomatoes are grown by both conventional as well as organic fertilizers. Inappropriate uses of fertilizers greatly reduce fertilizer efficiency and negatively affect productivity of the soil (**Juang, 1995**). To reduce and eliminate the adverse effects of synthetic fertilizers and pesticides on human health and environment, new agricultural practices have been developed in the so-called organic agriculture, ecological

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agriculture or sustainable agriculture. (**Aksoy, 2001; Chowdhury, 2004**). The organic fertilizers take the place of inorganic fertilizers in sustainable agriculture. The main sources of the organic fertilizers are composted livestock manures, plant residues and industrial wastes.

The organic fertilizers provide the nutritional requirements of plants and also suppress the plant pest populations. Additionally, they increase the microbial activity in soil, anion and cation exchange capacity, organic matter and carbon-content of soil. Organic fertilizers increase the yield and quality of agricultural crops in ways similar to inorganic fertilizers (**Singh and Siataramaiah, 1970; Hoitink and Boehn, 1999; Bulluck and Ristaino, 2002; Bulluck *et al.*, 2002; Arancon *et al.*, 2004; Heeb *et al.*, 2005a; Heeb *et al.*, 2005b; Heeb *et al.*, 2006; Liu *et al.*, 2007; Tonfack *et al.*, 2009**).

The study aimed to evaluate the effect of organic manure, bio and mineral fertilization on vegetative growth and some chemical constituents of tomato under North Sinai conditions.

REVIEW OF LITERATURE

2.1. Effect of mineral fertilization

Achilea (1998) reported that the function of potassium in plant metabolism is enzyme activation. It was found that fertigation and foliar feeding with potassium nitrate have proven to be highly efficient means of fulfilling the potassium requirements of many crops. The combination of potassium and nitrate in this fertilizer has been found to be highly beneficial in improving fruit size, dry matter, colour, taste and integrity and resistance to biotic and abiotic stresses, in citrus and tomato fruits. It was also reported that the integration of potassium nitrate in routine management or in specific growth stages resulted in remarkably positive benefit/cost ratios.

Elkner and Szwonek (1999) found that a compound organic lime mineral fertilizer (Komplet S) was applied at 2, 4, 6 or 8 t/ha to study its effects on the contents of some mineral constituents in field experiments. Komplet S had a greater positive effect on the nutritive value of tomato fruits than traditional mineral fertilizer.

Heeb *et al.* (2005a) tested Effect of nitrate- ammonium- and organic-nitrogen-based fertilizers on growth and yield of tomatoes. whereas Mineral and organic fertilizers contain different forms and amounts of nitrogen (N), which can affect yield and product quality. The results show that with a total N supply below 750 mg N plant⁻¹ week⁻¹, NH can be used as equivalent N source to NO₃, resulting in equivalent yields of marketable fruit under the conditions in this experiment.

Heeb *et al.* (2005b) studied the impact of different nitrogen forms in organic or mineral fertilizers which affected the yield, quality and taste of tomatoes. They found no difference in the yield due to the treatments. the yield of tomatoes at the final harvest was significantly higher in the mineral nutrient treatments compared with the organic treatments. Plant biomass was higher for the mineral nutrient treatments compared with the

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organic treatments. Significant higher scores were achieved for sweetness, acidity, flavour for the tomatoes grown with the organic or the ammonium-dominated treatments compared with the tomatoes grown with the nitrate dominated nutrient solution. It is suggested that ammonium is an equivalent nitrogen source for tomato plants compared with nitrate.

Ferreira *et al.* (2006) Reported the effects of N fertilizer rates on the fruit quality in terms of pH, total soluble solids, total acidity, N-NO₃-content and total N content in the dry matter of tomato. They concluded that the total soluble solids and the entitled total acidity in tomato fruits were not affected with the increase in N rates, without or with cattle manure application; the N-NO₃- content in the dry matter of the fruits increased linearly with N rates, without cattle manure application in the presence of cattle manure, the variable was not influenced by N rates.

Ayoola, O. T. and O. N. Adeniyani. 2006. tested the influence of poultry manure and NPK fertilizer on yield and yield components of crops under different cropping systems and Field experiments were conducted in two villages (Oniyo and Moloko Ashipa) representing two agro ecologies in the south west area of Nigeria during 2000 and 2001 cropping seasons. The objective was to determine the effects of NPK fertilizer and poultry manure on the yield and yield components in cassava/maize/melon systems. The factors were (1) cropping systems: cassava/maize/melon, sole cassava, sole maize and sole melon; and (2) fertilizers: no fertilizer, NPK 15-15-15 (400 kg/ha), poultry manure (5 t/ha), 2.5 t/ha poultry manure + 200 kg/ha NPK 15-15-15 and mineral fertilizer (NPK 15-15-15). Intercropping had no significant effect on cassava root yield but it reduced maize and melon seed yield compared to sole cropping. Land equivalent ratio (LER) values were however higher under intercropping than sole cropping. Crop yields were statistically the same under NPK alone and NPK + poultry manure but significantly higher than both poultry manure alone and control in both locations.

REVIRE OF LITERATURE

Heeb *et al.* (2006) tested the effect of different fertilizer sources (mineral or organic fertilizers) on tomato plants in sand culture in greenhouse at low (500 mg N plant⁻¹ week⁻¹) and high (750 mg N plant⁻¹ week⁻¹) nitrogen levels to determine their effects on yield, nutritional quality, and taste of the fruits where the mineral-fertilizer treatments, nitrate- or ammonium-dominated nutrient solutions were used. Yield of tomatoes from the organically fertilized plants were significantly lower (1.3-1.8 kg plant⁻¹) than yields from plants that received mineral fertilizer (2.2-2.8 kg plant⁻¹). At the final harvest, yields of tomatoes in the organic treatment with extra sulfur were similar (1.1-1.2 kg plant⁻¹) to the NO₃-dominated treatments at both nutrient levels and the NH₄-dominated treatment at high nutrient level. Organic fertilizers released nutrients more slowly than mineral fertilizers, resulting in decreased S and P concentrations in the leaves, which limited growth and yield in the N treatments.

Zhao Ming *et al.* (2010) conducted a series of experiments to investigate the influence of organic and chemical fertilizers on the yield, quality of tomato. The incorporated application of organic and chemical fertilizers significantly increased the tomato yield when the amount of applied nitrogen was equal. The highest total yield of tomato was obtained in the treatment with the ratio of organic and chemical fertilizer was 6:4, and the total yield increased by 15.6% compared with the control.

Ardelean (2011) investigated the effect of the potassium sources on tomato production. It was found that the most efficient potassium source is the one coming from KNO₃, and one originates from organic fertilizers. This efficiency is reflected upon the ripening and the coloring of the tomato fruits as well as the total yield. They also concluded that potassium is also an important element for the fertilizing technology in intensive tomato crops which playing a part in the balancing of the azoth functions.