Minia J. of Agric. Res. & Develop.
Vol. (٣٢) No. ٦ pp ٩٦٥-٩٨٢,
٢٠١٢

FACULTY OF AGRICULTURE

STUDY ON RESPONSE OF EGGPLANT AND TOMATO PLANTS TO APPLICATION OF THE BIOFERTILIZER EFFECTIVE MICROORGANISMS (EM) FOR REDUCING THE USE OF INORGANIC N FERTILIZER

Wael, M. Abd El- Hakim and Nasser, T. S. Mansour
Vegetable Res. Dept. Hort. Res. Insitit. Agric. Res.Center, Giza, Egypt.

Received ١٩ Dec. ٢٠١٢ Accepted ٣١ Dec. ٢٠١٢

ABSTRACT

Eggplant and tomato plants were fertilized with the suitable N through ٦٠ to ١٠٠ % mineral N fertilizer with or without foliar application of EM (Effective Microorganisms) at ٠.٢ % to ٠.٨ % (five times) during ٢٠١٠ and ٢٠١١ seasons. Growth, yield and its components as well as chemical composition of fruits in response to these treatments were investigated.

Results showed that supplying eggplant and tomato plants with N through ٦٠ to ١٠٠ % mineral N fertilizer along with EM spraying at ٠.٢ to ٠.٨ % was superior than using mineral fertilizer alone in enhancing growth, yield and its components as well as chemical constituents of the fruits. There was a gradual promotion on all the investigated characters with increasing EM concentrations. A clear decline on all the studied parameters was noticed with reducing percentages of mineral N fertilizer from ٨٠ to ٦٠ % even with the application of EM.

The best results with regard to yield and its components of both eggplant and tomato plants were obtained with supplying the plant with N via ٨٠ % mineral N fertilizer + spraying the plants with EM at ٠.٨ % five times during the growing season.

INTRODUCTION

Eggplant (*Solanum melongena* L.) also known as Aubergine, Brinjal or Guinea squash is one of the non- tuberous species of the night shade family solanaceae. The varieties of eggplant show a wide range of fruit shapes and colors. It is an economically important crop in Asia, Africa and the sub- tropics regions. It is also cultivated in some warm temperate regions of the Mediterranean sea and South America. Eggplant fruits are known for being low in calories and having a mineral composition beneficial for human health. They are also a rich source of K, Mg, Ca and Fe (Zenia and Halina, ٢٠٠٨).

The tomato (*Lycopersicum esculentum* Mill) is an important vegetable crop worldwide. Tomatoes aside from being tasty and nutritious as they are among other nutrients a good source of vitamins A and C and lycopene content. Hence this crop is gaining importance both in developing and developed countries and efforts are being made for improving the quality and quantity of production of this commodity (Mchov and Tringovska, ٢٠١٠).

Horticulture crops such as tomato and eggplant have a high cash market value in Egypt. Consequently, farmers are interested in ways of increasing the yield of such two crops through intensification and extensification. Intensification effects have focused on methods and techniques that can provide optimum economic yields, but without excessive increase in the farmer's costs. Thus, the most important consideration in the selection of new technologies is that they enhance the availability of plant nutrients and their uptake by crops.

Nitrogen is required by plants in comparatively large amounts than other elements (Marschner, ١٩٩٥). Nitrogen deficiency generally results in stunted growth and chlorotic leaves caused by poor assimilate formation that leads to premature flowering and shortening of the growth cycle. The presence of N in excess promote development of the above ground organs with abundant dark green tissues of soft consistency and relatively poor root growth. This increases the risk of lodging and reduces the plants resistance to harsh climatic conditions and to foliar diseases (Lincoln and Edvardo, ٢٠٠٦). Nitrogen fertilizer use has played a considerable role in increasing crop yield (Modhej *et al*., ٢٠٠٨). Excessive application of mineral N fertilizers can result in a high soil nitrate concentration after crop harvest (Gordon *et al*., ١٩٩٣). This situation can lead to an increase in the level of nitrate contamination of potable water because nitrate remaining in the soil profile may leach to ground water (Singh *et al*., ١٩٩٥). A great way to solve these problems is usage of biological nitrogen fixation. The utilization of biological nitrogen fixation method on decrease the use of chemical N fertilizer prevent the depletion of soil organic matter and reduce environmental pollution (Choudhury and Kennedy, ٢٠٠٤).

Biofertilizer is a natural product carrying living microorganisms, so it IS not has any bad effect on soil health and environment. The beneficial effects of biofertilizers on plants are attributed mainly to an improvement in root development, an increase in the rate of water and mineral uptake by roots, displacement of fungi and plant pathogenic bacterica and to a lesser extent biological N fixation (Okon and Itzigshohim, ١٩٩٥). Besides N fixation, microorganisms synthesis and secrete considerable amounts of biologically active substances like vitamins B, nicotinic acid, pantothenic acid, biotin, heteroxines and $GA_٣$ which enhance root growth of plants (Rao, ١٩٨٦). Also, microorganisms are responsible for secreting of ammonia in the rhizosphere in the presence of root exudates, which helps in modification of nutrients uptake by the plants (Narula and Gupta, ١٩٨٦).

Effective microorganisms (EM) consist of mixed cultures of naturally occurring beneficial microorganisms (ie bacteria, fungi, actinomycetes and yeasts) that are applied as inoculants to change the microbial diversity and interaction in soil and plants. In turn, EM has been shown to improve soil health and the growth, yield and quality of crops over a wide range of agro ecological conditions (Higa, ١٩٨٨ and Higa and Parr, ١٩٩٤). Foliar application of EM appears to suppress the occurrence of plant diseases and facilitates the uptake of simple organic molecules that can increase plant growth and yield. Previous studies showed that using EM via leaves had beneficial effects in improving soil fertility, plant growth, yield and quality of vegetable crops (Higa and Wididana, ١٩٩١; Imai and Higa, ١٩٩٤; Minami and Higa, ١٩٩٤ and Wididana, ١٩٩٤a and b).

Using the suitable N via mineral N along with biofertilization was essential in enhancing growth, nutritional status of the plants, yield and its components of different vegetable crops (Subba- Rao, ٢٠٠١; Pal *et al*., ٢٠٠٢; Sat and Saimbhi, ٢٠٠٣; Hafez, ٢٠٠٣; Abou-Aly, ٢٠٠٥; Akanbi *et al*., ٢٠٠٧; Arun, ٢٠٠٧; Aujla *et al*., ٢٠٠٧; Zenia and Halina, ٢٠٠٨; Modhej *et al*., ٢٠٠٨; Olaniyi *et al*., ٢٠٠٩; Mchov and Tringavska, ٢٠١٠; Aminifard *et al*., ٢٠١٠; Magdi *et al*., ٢٠١١; Azorpour *et al*., ٢٠١٢ and Ramakrishan and Selvakumar, ٢٠١٢).

This study was conducted for examining the effect of using EM via leaves as a partial replacement for mineral N fertilizers in tomato and Eggplant plants.

MATERIALS AND METHODS

Two field experiments were carried out in Mallawy Agricultural Research Station during the two successive summer seasons of ٢٠١٠ and ٢٠١١ on tomato and eggplant plants. The soil texture is clay loam. Soil analysis was done according to the procedures that outlined by Chapman and Pratt (١٩٦٥) and the obtained data are shown in Table (١).

Table ١: Analysis of the tested soil:

Constituents	Values
a- Physical properties:	
Sand %	٧.٢
Silt %	٦١.٠
Clay %	٣١.٨
Texture	Clay loam
b- Chemical properties	
pH	٨.٠٨
$CaCO_٣$ %	١.٩٨
E.C (ds/m)	١.١١
O.M. %	١.٩
Total N %	٠.٠٩
Available P (ppm)	٤.١
Available K (ppm)	٤١٠.٠

Study on response of eggplant and tomato plants to application of the biofertilizer EM

Tomato cv. Super strain B seedlings were transplanted on the second week of April during both seasons at ٢٠ cm. apart, ٤ meter length and ١.٢ meter width rows. Each plot consisted of four rows. The plot area was ١٩.٢ $m^٢$. Eggplant cv. Balady (Henane) seedlings were transplanted on the same previous dates in ٥٠ cm. apart ٤ meter length and ٠.٩ meter width rows. Each plot consisted of four rows. The area of each plot was ١٤.٤ $m^٢$. The common cultural practices for tomato and eggplant production were followed.

Ammonium sulphate ٢٠.٥٪ as a source of nitrogen, and the Effective microorganisms EM (ie, bactiria, fungi, actinomycetes and yeasts) were applied according the twelve following treatments.-

١- The suitable N was at rate of ١٠٠ kg N/ fed, for eggplant and ٨٠ kg N/ fed, for tomato, these concentration represented ١٠٠٪ mineral N fertilizer without spraying Effective Microorganisms (EM).
٢- The suitable N was ١٠٠ % mineral N + spraying EM at ٠.٢ %.
٣- The suitable N was ١٠٠ % mineral N + spraying EM at ٠.٤ %.
٤- The suitable N was ١٠٠ % mineral N + spraying EM at ٠.٨ %.
٥- The suitable N was at rate of ٨٠kg N /fed, for eggplant and ٦٤ kg N/fed, for tomato , these concentrations represented ٨٠ % mineral N without spraying EM.
٦- The suitable N was ٨٠ % mineral N + spraying EM at ٠.٢ %.
٧- The suitable N was ٨٠ % mineral N + spraying EM at ٠.٤ %.
٨- The suitable N was ٨٠ % mineral N + spraying EM at ٠.٨ %.
٩- The suitable N was at rate of ٦٠kg N /fed, for eggplant and ٤٨ kg N/fed, for tomato , these concentrations represented ٦٠ % mineral N without spraying EM.
١٠-The suitable N was ٦٠ % mineral N + spraying EM at ٠.٢ %.
١١-The suitable N as ٦٠ % mineral N + spraying EM at ٠.٤ %.
١٢-The suitable N as ٦٠ % mineral N + spraying EM at ٠.٨ %.

EM was sprayed five times started at ٣٠ days after transplanting and repeated at ten days intervals. Randomized complete block design with three replications were used. Ammonium sulphate (٢٠.٥٪) as a source of mineral N was splitted into three equal parts and added at ٣٠ days after transplanting and at ٢١ days intervals, the other fertilizers (organic fertilizer, calcium super-phosphate(١٥.٥٪

$P_٢O_٥$),potassium sulphate (٤٨٪ $k_٢O$).)were added at a recommended dose.

Data recorded:-

١. Growth characters:

A random sample of five plants was taken from every plot at ٧٥ days from transplanting in both seasons of study for evaluating the growth characters of tomato and eggplants expressed as plant height and number of branches per plant.

٢. Yield and its components:

Fruits of tomato and eggplant for each plot were harvested at full- ripe maturity stage and then counted, weighed and the following data were calculated: number of fruits/ plant, fruit weight/ plant and total yield per fed.(tons). Physical characters of fruits namely fruit weight and dimensions (length and diameter) were measured. Also, total soluble solids was determined by using handy refractometer.

٣. Fruit chemical constituents:

Dried fruits from the three harvests from tomato and eggplant were finely ground separately and digested with sulfuric acid and $H_٢O_٢$. Percentages of N, P and K were determined according to the methods outlined by Chapman and Pratt (١٩٦٥). Total proteins % was recorded by multiplying N values by ٦.٢٥ % (A.O.A.C., ٢٠٠٥).

All the obtained data were subjected to the analysis of variance according to Mead *et al*. (١٩٩٣). L.S.D test was used for the comparison among treatment means.

RESULTS AND DISCUSSION

١- Plant height and number of branches/ plant:

It is clear from the data in Table (٢) that effective microorganisms increasing percentages of mineral N from ٦٠ to ١٠٠ % out of the suitable N and EM from ٠.٠ to ٠.٨ % caused a significant stimulation on the two growth characters namely plant height and number of branches per plant of tomato and eggplant plants. Combined application of mineral N at ٦٠ to ١٠٠ % and EM at ٠.٢ to ٠.٨ % significantly enhanced such two growth characters in comparison to using N through mineral N source alone. The maximum values were recorded in case of the plant that fertilized with N via ١٠٠ % mineral N plus spraying EM at ٠.٨ %. Fertilizing the plants with N through ٦٠ % mineral N without spraying EM gave the minimum values. These results were similar during both seasons of study.

These results might be attributed to the beneficial effects of N on enhancing cell division and the biosynthesis of plant pigments and organic foods (Marschner, ١٩٩٥). The great benefits of EM on enhancing N fixation, soil fertility and uptake of organic nutrients as well as suppressing plant diseases may explain the present results (Wididana, ١٩٩٤b).

The promoting effect of N on growth characters of vegetable crops was supported by results of Aminiford *et al*. (٢٠١٠); Magdi *et al*. (٢٠١١); Azoropour *et al*. (٢٠١٢) and Ramakrishnan and Selvakumar (٢٠١٢).

The results of Higa and Wididana (١٩٩١); Imai and Higa (١٩٩٤); Mionami and Higa (١٩٩٤) and Wididana (١٩٩٤b) emphasized the beneficial effect of EM on growth characters of different tested vegetable crops.

٢- Number of fruits and fruit weight per plant:

Data in Table (٢) showed significant differences on number of fruits and fruit weight per plant of tomato and eggplant plants among most the twelve treatments. Reducing mineral N fertilizer from ٨٠ to ٦٠ % out of the suitable N resulted in significant reduction on such two fruit characters. There was a gradual and significant promotion on the number of fruits and fruit weight per plant with increasing the concentration of EM from ٠.٢ to ٠.٨ %. Using mineral N at ٦٠ to ١٠٠ % along with EM at ٠.٢ to ٠.٨ % seem to be favourable than using mineral N alone in improving such the two fruit characters. Using the suitable N via ٨٠ % mineral N plus EM especially at the higher concentrations (٠.٤ and ٠.٨ %) significantly promoted such two characters. The maximum number and weight of fruits per plant in tomato and eggplant were observed on the plants that were fertilized with N at ٨٠ % mineral plus using EM at ٠.٨ %. Using N via ٦٠ %

mineral N without spraying EM gave the lowest values. Similar results were recorded during both seasons.

Table ٢: Effect of mineral N and EM foliar application treatments on plant height, number of branches/ plant, number of fruits/ plant and fruit weight per plant of tomato and eggplant during ٢٠١٠ and ٢٠١١ seasons.

Mineral N and EM treatment	Tomato				Eggplant			
	Plant height (cm.)		No. of branches/ plant		Plant height (cm.)		No. of branches/ plant	
	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١
١٠٠ % M without EM	٥٥.٠	٥٦.٠	٥.٣	٥.٣	١٢٢.٠	١٢٣.٠	٦.١	٦.٢
١٠٠ % M + EM at ٠.٢ %	٦٠.٠	٦٢.٠	٥.٧	٥.٨	١٢٩.٠	١٣٠.٠	٦.٧	٦.٧
١٠٠ % M + EM at ٠.٤ %	٦٧.٠	٦٨.٠	٦.٥	٦.٣	١٣٦.٠	١٣٨.٠	٧.٣	٧.٤
١٠٠ % M + EM at ٠.٨ %	٧١.٠	٧٢.٠	٦.٨	٦.٦	١٤٢.٠	١٤٤.٠	٧.٨	٧.٩
٨٠ % M without EM	٥٠.٠	٥١.٠	٤.٩	٥.٠	١٠٨.٠	١١٠.٠	٥.٨	٥.٩
٨٠ % M + EM at ٠.٢ %	٥٥.٠	٥٥.٠	٥.٥	٥.٤	١١٢.٠	١١٥.٠	٦.٣	٦.٥
٨٠ % M + EM at ٠.٤ %	٦٣.٠	٦١.٠	٦.١	٦.٠	١٢٥.٠	١٢٧.٠	٦.٩	٦.٩
٨٠ % M + EM at ٠.٨ %	٦٥.٠	٦٥.٠	٦.٤	٦.٥	١٣٠.٠	١٣٣.٠	٧.٤	٧.٤
٦٠ % M without EM	٤٨.٠	٤٩.٠	٤.٧	٤.٧	٩٩.٠	١٠١.٠	٥.٢	٥.٣
٦٠ % M + EM at ٠.٢ %	٥٢.٠	٥٣.٠	٥.٣	٥.٢	١٠٣.٠	١٠٦.٠	٥.٧	٥.٨
٦٠ % M + EM at ٠.٤ %	٥٧.٠	٥٧.٠	٥.٦	٥.٧	١١٧.٠	١٢٠.٠	٦.١	٦.٢
٦٠ % M + EM at ٠.٨ %	٥٩.٠	٥٩.٠	٥.٨	٦.٠	١٢٠.٠	١٢٢.٠	٦.٣	٦.٤
L.S.D at ٠.٠٥	**١.٩**	**١.٨**	**٠.٣**	**٠.٣**	**٢.٠**	**٢.٠**	**٠.٤**	**٠.٤**
Treatments \ Character	**No. of fruits/ plant**		**Fruit weight/ plant (kg.)**		**No. of fruits/ plant**		**Fruit weight/ plant (kg.)**	
١٠٠ % M without EM	٢٧.٧٧	٢٩.٣٧	١.٥٤	١.٦٤	١٩.٧٧	٢٠.١٣	١.٣١	١.٣٤
١٠٠ % M + EM at ٠.٢ %	٣١.٤٠	٣٢.١٠	١.٨٩	١.٩٧	٢٢.١٧	٢٢.٥٧	١.٥٢	١.٥٥
١٠٠ % M + EM at ٠.٤ %	٣٥.١٠	٣٥.٣٧	٢.٢٣	٢.٢٧	٢٥.٣٠	٢٥.٨٧	١.٧٩	١.٨٤
١٠٠ % M + EM at ٠.٨ %	٣٦.٤٠	٣٦.٩٠	٢.٣٤	٢.٤٠	٢٦.٤٠	٢٦.٦٠	١.٩٠	١.٩٢
٨٠ % M without EM	٢٥.٤٣	٢٦.١٠	١.٤٠	١.٤٣	١٩.٠٠	١٩.٠٠	١.٢٠	١.٢١
٨٠ % M + EM at ٠.٢ %	٣٠.٧٠	٣٠.٨٣	١.٨٩	١.٩١	٢٤.٣٣	٢٤.٦٠	١.٦٩	١.٧٢
٨٠ % M + EM at ٠.٤ %	٣٨.٢٣	٣٨.٣٣	٢.٥٤	٢.٥٦	٢٨.٠٧	٢٨.٤٣	٢.٠٨	٢.١١
٨٠ % M + EM at ٠.٨ %	٣٩.١٠	٣٨.٩٣	٢.٦٦	٢.٦٦	٢٩.٣٧	٢٩.٩٠	٢.٢١	٢.٢٦
٦٠ % M without EM	٢٣.٠٠	٢٣.٥٣	١.٢٢	١.٢٤	١٧.٧٠	١٧.٩٧	١.٠٧	١.٠٨
٦٠ % M + EM at ٠.٢ %	٢٦.٥٠	٢٦.٦٧	١.٤٣	١.٤٦	١٨.٦٣	١٨.٧٣	١.٢٠	١.٢٠
٦٠ % M + EM at ٠.٤ %	٢٩.٢٣	٢٩.٢٣	١.٧٦	١.٨٠	٢٣.١٣	٢٣.٣٠	١.٥٨	١.٦٠
٦٠ % M + EM at ٠.٨ %	٣٢.١٧	٣٢.٣٠	١.٩٧	١.٩٩	٢٤.٣٧	٢٤.٤٠	١.٦٩	١.٦٩
L.S.D at ٠.٠٥	**٢.٨٢**	**٢.٩٣**	**٠.١٨**	**٠.١٧**	**٢.١١**	**٢.١٠**	**٠.١٩**	**٠.١٩**

M = Mineral N fertilizer
EM=Effective Microorganisms

The beneficial effect of the optimum rate of mineral N as well as EM on enhancing growth and nutritional status of plants seem to be possitively reflected on enhancing fruit processes. The great reduction on fruiting due to using the lower rates of mineral N might be ascribed to the great decline on growth characters.

The promoting effect of N on fruiting was supported by the results of Magdi *et al*. (٢٠١١).

٣- Yield/ feddan:

Results of table (٣) showed that total yield/ fed, of tomato and eggplant was significantly affected by supplying rate of mineral N and EM. Generally, using N via mineral source at ٦٠ to ٨٠ % plus spraying EM at ٠.٢ to ٠.٨ % significantly improved the total yield in comparing to using mineral N alone (without EM). The promotion on the total yield was significantly associated with increasing EM concentrations from ٠.٢ to ٠.٨ %.

A significant decline on the total yield was observed with reducing mineral N from ٨٠ to ٦٠ % even with the foliar application of EM at ٠.٢ to ٠.٨ %. There was a gradual and significant reduction on the total yield with reducing mineral N percentages from ١٠٠ to ٦٠ % especially without spraying EM. The maximum total yield/ fed for tomato (٤٢.٦١ and ٤٢.٥٦ tons/fed) and for eggplant (١٩.٨٩ and ٢٠.٣٧ tons/fed) were observed with using mineral N at ٨٠ % plus spraying EM at ٠.٨ %. Using mineral N at ٦٠ % of the recommended dose without spraying EM gave the lowest values. These results were similar during both seasons of the study.

The previous benefits of the suitable N and EM on number of fruits and fruit weight per plant possitively reflected on enhancing total yield /fed, for tomato and eggplant.

The results with regard to the effect of N are in agreement with those obtained by Aroun (٢٠٠٧) and Aujla *et al*. (٢٠٠٧).

٤- Average fruit weight and dimensions:

It is evident from the data in Table (٣) that reducing percentages of mineral N from ١٠٠ to ٨٠ % of the recommended dose especially with using higher concentrations of EM was accompanied with significant increase in fruit weight and dimensions (length and diameter of fruit). However, a significant decline on such three physical characters was observed with reducing percentages of mineral N from ٨٠ to ٦٠ % even with the application of EM. Generally, increasing EM concentration from ٠.٢ to ٠.٨ % was followed by a gradual and significant promotions on fruit weight and dimensions. The highest values were recorded with using mineral N at ٨٠ % plus spraying EM at ٠.٨ %. Using mineral N at ٦٠ % of the suitable N alone gave the lowest values. Similar trend was noticed during both seasons.

The beneficial of N and EM especially at the optimum rate improved cell division and the biosynthesis of the organic foods and often reflected on increasing fruit weight and dimensions.

The beneficial effect of N on fruit weight and dimensions was supported by the results of Abou- Aly (٢٠٠٥) and Aujlo *et al.*, (٢٠٠٧).

The results of Imai and Higa (١٩٩٤) and Wididana (١٩٩٤b) confirmed the beneficial effect of EM on physical characters of the fruits of vegetable crops.

٥- Chemical characters of the fruits:

Data in Table (٤) indicated that T.S.S, N, P, K & proteins percentages in the fruits of tomato and eggplant were significantly affected by supplying rate of mineral N and EM.

Reducing percentages of mineral N from ٨٠ to ٦٠ % without spraying EM caused a gradual and significant reduction on such five chemical constituents of the fruits. With using EM at ٠.٢ to ٠.٨ % and reducing mineral N percentages from ١٠٠ to ٨٠ % caused a significant promotion on such chemical properties. However, a significant reduction on T.S.S, N, P, K and proteins in the fruits were observed with reducing percentages of mineral N from ٨٠ to ٦٠ % even with application of EM. The heaviest fruits were observed on the plants that received mineral N at ٨٠ % + spraying EM at ٠.٨ %. Treating the plants with mineral N at ٦٠ % without using EM gave the lowest values. These results were similar during both seasons.

Table ٣: Effect of mineral N and EM foliar application treatments on total yield/ fed (tons) as well as height, length and diameter of fruit of tomato and eggplant during ٢٠١٠ and ٢٠١١ seasons.

Mineral N and EM treatment	Tomato				Eggplant			
	Total yield/ fed (tons)		Fruit weight (g.)		Total yield/ fed (tons)		Fruit weight (g.)	
	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١
١٠٠ % M without EM	٢٤.٦٩	٢٦.٢٩	٥٥.٦٣	٥٥.٦١	١١.٧٩	١٢.٠٣	٦٦.١٠	٦٦.٤٠
١٠٠ % M + EM at ٠.٢ %	٣٠.٢٩	٣١.٥٢	٦٠.٣٠	٦١.٤٧	١٣.٦٥	١٣.٩٢	٦٨.٤٠	٦٨.٤٠
١٠٠ % M + EM at ٠.٤ %	٣٥.٦٨	٣٦.٣٢	٦٣.٥٣	٦٤.١٧	١٦.٠٨	١٦.٥٣	٧٠.٦٠	٧١.٠٠
١٠٠ % M + EM at ٠.٨ %	٣٧.٤٩	٣٨.٤٥	٦٤.٤٣	٦٥.٢٠	١٧.٠٧	١٧.٢٥	٧١.٨٠	٧٢.٠٠
٨٠ % M without EM	٢٢.٤٠	٢٢.٨٨	٥٥.٠٧	٥٤.٩٠	١٠.٨٣	١٠.٨٦	٦٣.٤٠	٦٣.٦٠
٨٠ % M + EM at ٠.٢ %	٣٠.٢٤	٣٠.٥١	٦١.٦٠	٦١.٩٠	١٥.٢١	١٥.٤٥	٦٩.٤٠	٦٩.٨٠
٨٠ % M + EM at ٠.٤ %	٤٠.٦٩	٤١.٠١	٦٦.٥٠	٦٦.٨٠	١٨.٧٥	١٤.٠٢	٧٤.٢٠	٧٤.٤٠
٨٠ % M + EM at ٠.٨ %	٤٢.٦١	٤٢.٥٦	٦٨.١٠	٦٨.٣٧	١٩.٨٩	٢٠.٣٧	٧٥.٣٠	٧٥.٦٠
٦٠ % M without EM	١٩.٤٧	١٩.٨٤	٥٢.٥٠	٥٢.٧٠	٩.٦٠	٩.٧٢	٦٠.٢٠	٦٠.٣٠
٦٠ % M + EM at ٠.٢ %	٢٢.٨٨	٢٣.٤١	٥٤.٠٧	٥٥.٣٠	١٠.٧٧	١٠.٨٣	٦٤.٢٠	٦٤.٢٠
٦٠ % M + EM at ٠.٤ %	٢٨.٢١	٢٨.٨٠	٦٠.٣٠	٦٠.٩٧	١٤.١٩	١٤.٤٣	٦٨.٢٠	٦٨.٨٠
٦٠ % M + EM at ٠.٨ %	٣١.٥٢	٣١.٧٩	٦١.٢٠	٦١.٥٠	١٥.٢١	١٥.٢٤	٦٩.٤٠	٦٩.٥٠
L.S.D at ٠.٠٥	١.٩٩	١.٧٩	٢.١١	١.٩٩	١.٠١	١.٠٠	١.١١	١.٠٠
Treatments / Character	Fruit length (cm.)		Fruit diameter (cm.)		Fruit length (cm.)		Fruit diameter (cm.)	
١٠٠ % M without EM	٤.٠٨	٤.١٢	٣.٦١	٣.٦٣	١٢.٣٢	١٢.٣٦	٣.٣٢	٣.٣٠
١٠٠ % M + EM at ٠.٢ %	٤.٥٢	٤.٥٦	٣.٩٩	٤.٠٤	١٢.٧١	١٢.٧٩	٣.٥٣	٣.٦١
١٠٠ % M + EM at ٠.٤ %	٤.٨٣	٤.٩٠	٤.٥٢	٤.٥٦	١٣.٢١	١٣.٣١	٣.٩٢	٣.٩٩
١٠٠ % M + EM at ٠.٨ %	٤.٩٤	٥.٠٠	٤.٦٤	٤.٧٠	١٣.٤٥	١٣.٥٣	٤.٠٩	٤.١٧
٨٠ % M without EM	٣.٩٥	٣.٩٨	٣.٤٣	٣.٨٤	١١.٨٢	١١.٩٠	٣.٠٢	٣.٠٩
٨٠ % M + EM at ٠.٢ %	٤.٦٤	٤.٦٥	٤.٠٩	٤.١٨	١٢.٩٢	١٢.٩٩	٣.٧٢	٣.٧٨
٨٠ % M + EM at ٠.٤ %	٥.٠٩	٥.١٣	٤.٨٢	٤.٩٠	١٣.٦٠	١٣.٧٣	٤.٢٢	٤.٣٠
٨٠ % M + EM at ٠.٨ %	٥.٢٠	٥.٢٥	٤.٩٦	٥.٠٧	١٣.٧٤	١٣.٨٠	٤.٣٣	٤.٤٢
٦٠ % M without EM	٣.٩٠	٣.٩٩	٣.٤٠	٣.٤١	١١.٣٥	١١.٤٠	٢.٩١	٢.٩٥
٦٠ % M + EM at ٠.٢ %	٤.٢١	٤.٢٩	٣.٨١	٣.٨٦	١٢.٠١	١٢.١١	٣.٣٠	٣.٤٠
٦٠ % M + EM at ٠.٤ %	٤.٦١	٤.٧٠	٤.٢٤	٤.٣١	١٢.٦١	١٢.٧٢	٣.٦٥	٣.٧٣
٦٠ % M + EM at ٠.٨ %	٤.٩١	٤.٩٦	٤.٣٤	٤.٤١	١٢.٧٩	١٢.٨٧	٣.٨٤	٣.٨٦
L.S.D at ٠.٠٥	٠.١١	٠.١٠	٠.٠٩	٠.١١	٠.٠٩	٠.٠٩	٠.٠٨	٠.٠٩

M = Mineral N fertilizer
EM=Effective Microorganisms

Table ٤: Effect of mineral N and EM foliar application treatments on percentages of T.S.S, N, P, K and total proteins in the fruits of tomato and eggplant during ٢٠١٠ and ٢٠١١ seasons.

Mineral N and EM treatment	Tomato				Eggplant			
	T.S.S %		Fruit N %		T.S.S %		Fruit N %	
	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١
١٠٠ % M without EM	٣.٥٧	٣.٦٣	١.٢٢	١.٢٦	٤.٤١	٤.٤٩	٢.٨٦	٢.٩٥
١٠٠ % M + EM at ٠.٢ %	٤.٣٤	٤.٣٨	١.٣٨	١.٤٠	٤.٧٣	٤.٧٤	٢.٩٨	٣.٠٢
١٠٠ % M + EM at ٠.٤ %	٤.٧٩	٤.٨١	١.٥٨	١.٦١	٤.٩٣	٤.٩٦	٣.٢٣	٣.٢٥
١٠٠ % M + EM at ٠.٨ %	٤.٩٠	٤.٩٤	١.٦٤	١.٦٩	٥.٠٦	٥.١٣	٣.٣٤	٣.٣٧
٨٠ % M without EM	٣.٤٤	٣.٤٦	١.١١	١.١٢	٤.٣٠	٤.٣٣	٢.٦٥	٢.٦٩
٨٠ % M + EM at ٠.٢ %	٤.٤٦	٤.٤٨	١.٤٨	١.٥١	٤.٨٣	٤.٨٨	٣.٠٨	٣.١٢
٨٠ % M + EM at ٠.٤ %	٤.٩٣	٤.٩٧	١.٧١	١.٧٤	٥.٣٠	٥.٤١	٣.٣٣	٣.٣٧
٨٠ % M + EM at ٠.٨ %	٥.٠٦	٥.١١	١.٨٢	١.٨٧	٥.٤٢	٥.٥٠	٣.٤٢	٣.٩٧
٦٠ % M without EM	٣.٢٠	٣.٣٠	٠.٩٣	٠.٩٧	٤.١٢	٤.١٤	٢.٤٣	٢.٤٩
٦٠ % M + EM at ٠.٢ %	٤.٤٠	٤.٤٦	١.١١	١.١٥	٤.٣٣	٤.٣٤	٢.٦٣	٢.٦٧
٦٠ % M + EM at ٠.٤ %	٤.٨٨	٤.٩١	١.٣٨	١.٤٣	٤.٦١	٤.٦٤	٢.٨٣	٢.٨٨
٦٠ % M + EM at ٠.٨ %	٤.٩٩	٥.٠٥	١.٤٧	١.٥٢	٤.٨٣	٤.٨٦	٣.٠٣	٣.٠٩
L.S.D at ٠.٠٥	٠.٣١	٠.٢٨	٠.١١	٠.١٠	٠.٢٧	٠.٢٦	٠.١١	٠.١١

Treatments / Character	Fruit P %		Fruit K %		Fruit proteins %		Fruit P %		Fruit K %		Fruit proteins %	
	٠.٢٦	٠.٢٦	١.٤١	١.٤٣	٧.٥٦	٧.٦٤	٠.٤٦	٠.٥٠	٢.٦٢	٢.٦٤	٢٢.٠٩	٢٢.١٨
١٠٠ % M + EM at ٠.٢ %	٠.٣٢	٠.٣٣	١.٥٣	١.٥٦	٧.٧٣	٧.٧٣	٠.٥٦	٠.٥٨	٢.٧٨	٢.٨٠	٢٢.٧٢	٢٢.٧٥
١٠٠ % M + EM at ٠.٤ %	٠.٣٧	٠.٣٨	١.٦٨	١.٧٣	٨.١١	٨.١١	٠.٦٨	٠.٧٣	٣.٠٠	٣.٠٦	٢٤.٣١	٢٤.٤١
١٠٠ % M + EM at ٠.٨ %	٠.٤١	٠.٤٣	١.٧٧	١.٨٣	٨.٢٣	٨.٢٣	٠.٧٦	٠.٧٩	٣.١١	٣.١٧	٢٤.٦٠	٢٤.٦٨
٨٠ % M without EM	٠.٢٣	٠.٢٦	١.٢٣	١.٢٥	٧.٠٣	٧.٠٣	٠.٣٨	٠.٤٣	٢.٤٥	٢.٤٨	٢٠.٠٠	٢٠.٣١
٨٠ % M + EM at ٠.٢ %	٠.٣٥	٠.٣٨	١.٥٨	١.٦٠	٧.٨٢	٧.٨٢	٠.٥٠	٠.٥٤	٢.٨٨	٢.٩٠	٢٣.٣٢	٢٣.٣٩
٨٠ % M + EM at ٠.٤ %	٠.٤٦	٠.٤٨	١.٨١	١.٨٢	٨.٥٢	٨.٥٢	٠.٧٧	٠.٨٠	٣.٢٢	٣.٢٦	٢٤.٧٠	٢٤.٨١
٨٠ % M + EM at ٠.٨ %	٠.٥١	٠.٥٥	١.٨٩	١.٩٢	٨.٦٢	٨.٦٢	٠.٨٦	٠.٨٩	٣.٢٨	٣.٣٣	٢٥.٠	٢٥.١

											١	٥
٦٠ % M without EM	٠.١٨	٠.٢٠	١.١٣	١.١٥	٦.٢٣	٦.٢٣	٠.٣٣	٠.٣٥	٢.٢٧	٢.٣٢	١٦.٥١	١٦.٧١
٦٠ % M + EM at ٠.٢ %	٠.٢٤	٠.٢٦	١.٣٦	١.٣٩	٦.٩٨	٦.٩٨	٠.٤٦	٠.٤٨	٢.٦٦	٢.٧٢	١٨.٠٠	١٨.٢٢
٦٠ % M + EM at ٠.٤ %	٠.٣٣	٠.٣٤	١.٥٩	١.٦٢	٧.٤٢	٧.٤٢	٠.٥٩	٠.٦٠	٢.٨٢	٢.٨٥	١٩.١١	١٩.٢١
٦٠ % M + EM at ٠.٨ %	٠.٣٩	٠.٣٨	١.٧٠	١.٧٢	٧.٥٥	٧.٥٥	٠.٦٢	٠.٦٥	٢.٩٠	٢.٩٥	١٩.٥٥	١٩.٦٠
L.S.D at ٠.٠٥	٠.٠٤	٠.٠٤	٠.٠٧	٠.٠٦	٠.٢٥	٠.٢٥	٠.٠٧	٠.٠٨	٠.٠٨	٠.٠٨	٠.٢٨	٠.٢٨

M = Mineral N fertilizer
EM=Effective Microorganisms

The beneficial effect of the optimum rate of N and EM on advancing maturity and the uptake of different nutrients may explain the present results.

The promoting effect of the suitable N on fruit chemical compositions was confirmed by the results of Arun (٢٠٠٧); Magdi *et al*. (٢٠١١) and Azorpour *et al*. (٢٠١٢).

Also, the promoting effect of EM on chemical composition of fruits was emphasized by the results of Wididana (١٩٤٤a) and (١٩٩٤b).

As a conclusions, the suitable fertilizer N ٨٠٪ for eggplant and tomato was at rate ٨٠ Kg/fed, and ٦٤Kg /fed, respectively, Using EM spraying at rate ٠.٨٪ recorded the best results in enhancing plant growth, yield and its components.

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دراسة مدى استجابة نباتات الباذنجان و الطماطم لاستخدام المخصب الحيوى EM لتقليل استخدام السماد النيتروجينى الغير عضوى

وائل محمد عبد الحكيم – ناصرتوفيق سليمان منصور

قسم بحوث الخضر – معهد بحوث البساتين – مركز البحوث الزاعيه – الجيزه – مصر

تم تسميد نباتات الباذنجان و الطماطم خلال موسمي ٢٠١٠ ، ٢٠١١ بالكمية المثلى لهما من النيتروجين من ٦٠ إلى ١٠٠ % سماد نيتروجينى معدني مع أو بدون الرش الورقي بمخصب الكائنات الحية الدقيقة الفعالة (مخصب حيوي) بتركيز ما بين ٠.٢ إلى ٠.٨ % (خمسه مرات) . تم دراسة مدى تأثر النمو ، المحصول و مكوناته و المحتوى الكيماوي للثمرة لهذه المعاملات .

أشارت نتائج الدراسة إلى أن تسميد نباتات الباذنجان و الطماطم بالنيتروجين من خلال ٦٠ الى ١٠٠ % سماد نيتروجينى معدني جنبا إلى جنب مع رش مركب الكائنات االحيه الدقيقة الفعالة بتركيز ما بين ٠.٢ إلى ٠.٨ % قد تفوق على استخدام السماد النيتروجينى المعدني بمفرده فى تحسين النمو ، المحصول و خصائصه و كذلك المحتوى الكيماوي للثمار وكان هناك تحسن تدريجي في جميع الصفات تحت الدراسة بزيادة التركيز المستخدم من المخصب الحيوي و كان هناك نقص واضح فى هذه الصفات بنقص النسبة المئوية المستخدمة من السماد النيتروجينى المعدني من ٨٠ إلى ٦٠ % حتى مع استخدام المخصب الحيوي.

Study on response of eggplant and tomato plants to application of the biofertilizer EM

أمكن الحصول على أفضل النتائج بخصوص المحصول و مكوناته فى نباتات الباذنجان و الطماطم عند تسميد النباتات بالنيتروجين على هيئه ٨٠ % سماد معدني جنبا إلى جنب مع المخصب الحيوي بتركيز ٠.٨ % خمسه مرات .