



## COMPARING THE APPLICATION OF VARIOUS FORMS OF FERTILIZER ON NUTRIENT UPTAKE OF EGGPLANT (*SOLANUM MELONGENA* L.) UNDER SOIL AND SOILLESS CULTURE

\*G. Sajiv, C. Muruganandam and P. Anusa

Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamilnadu, India-608002

\*E-mail: infantsajiv@gmail.com

### Abstract

The present investigation was carried out to examine the nutrient uptake *viz.*, nitrogen, phosphorus and potassium of eggplant in relation to various levels of nitrogen and potassium in modified Hoagland solution compared with conventional fertilizer and water soluble fertilizer. Brinjal were planted in poly bags and drip fertilizing system was provided with different forms of fertilizer. Hence, an experiment was carried out on "Influence of application of various forms of fertilizer on nutrient uptake of eggplant (*Solanum melongena* L.) under soilless culture" in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamilnadu, India. Results showed that among the different treatments nutrient uptake was higher on plants grown in soil with 100% of recommended dosage of fertilizer followed by plants grown in coco peat with 125% nitrogen and potassium of modified Hoagland solution and the least was observed in 75% nitrogen and potassium of modified Hoagland solution.

**Keywords:** Eggplant, Soilless culture, Nutrient uptake and Modified Hoagland solution.

### Introduction

Soilless culture is the modern cultivation system of plants that use either inert organic or inorganic substrate through nutrient solution nourishment. It is an artificial means of providing plants with support and reservoir for nutrients and water (Ghehsareh *et al.*, 2011). Hydroponic crop production allows more efficient use of water and fertilizer. Nutrient solution is considered to be one of the most important determining factors of crop yield and quality. Nutrient solution for hydroponics is an aqueous solution containing mainly inorganic ions from soluble salts of essential elements (Steiner 1968). In soilless culture, elements required in largest quantities *viz.*, nitrogen (N) and potassium (K) acts as the main structural elements. Among the various macronutrients nitrogen is one of the major elements for plant growth and development that have an important role in plant nutrition and therefore, management of N fertilizers such as rate, type and application time are very important (De Pascale *et al.*, 2006). Potassium is another important macronutrient required by fruits and vegetables, which regulates cell turgor, activates enzymes involved in respiration and controls stomatal opening and closure (Faquin and Andrade, 2004). Therefore, the aim of the present study was to investigate the nutrient uptake of eggplant under different doses N and K in modified Hoagland solution.

### Materials and Methods

The experiment was carried out at Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamilnadu, India. In soilless culture the coco peat was used as medium which was neutralized and washed thoroughly to get neutral pH and filled in poly bags whereas in soil culture soil mixture was prepared by mixture of red soil, sand and farm yard manure at 1:1:1 ratio and filled in poly bags. Thirty five days old eggplant seedlings of Dhruva hybrid were transplanted into experimental pots containing coco peat. The experiment was laid out in completely randomized design replicated thrice with nine different nutrient concentrations of nitrogen and potassium in modified

Hoagland solution (Table 1.) which is compared with conventional fertilizer and water soluble fertilizer @ recommended dosage of fertilizer (RDF 200:150:100 kg ha<sup>-1</sup>). For the plants grown in soil culture - Urea, Single super phosphate and Muriate of Potash were used as fertilizer sources. For soilless culture with conventional water soluble fertilizer – All 19+, Potassium nitrate, Monoammonium Phosphate and urea were used as fertilizer sources. For soilless culture with modified Hoagland solution the following fertilizer were used as source to supply the desired nutrient solution *viz.*, Potassium sulphate, Magnesium sulphate, Potassium phosphate, Calcium nitrate, Ammonium sulphate, Iron EDTA, Manganese sulphate, Boric acid, Sodium molybdate, Zinc EDTA and Copper EDTA. The treatment was imposed as constant fertigation at 3 days interval for soilless culture and for soil culture, the treatment was imposed as basal application and top dressing with regular watering at the interval of 3 days. The statistical analysis was carried out as per Snedecor and Cochran (1975).

### Result and Discussion

Whole plant testing is widely used for uptake studies because it gives a direct measurement of the actual quantities of nutrients taken up by the crop (Le Bot *et al.*, 1998). The result of the nutrient uptake is presented in Table 2. From the result it is observed that the maximum nutrient uptake including nitrogen, phosphorus and potassium was recorded in treatment T<sub>1</sub> as 951.08, 260.42 and 798.23 mg plant<sup>-1</sup> respectively followed by (858.26, 241.22 and 703.67mg plant<sup>-1</sup>) in treatment T<sub>11</sub>. However, among the different treatments T<sub>3</sub> recorded the lowest nutrient uptake *viz.*, nitrogen, potassium and phosphorus of 425.32, 136.52 and 381.68 mg plant<sup>-1</sup> respectively. The result is similar with the findings of Reshma, 2016 found that the performance of tomato including growth, yield, quality and uptake was superior that the plants grown hydroponically. This might be due to the reason that NPK content of plants grown in soil mixture was higher than that of all other treatments. In addition, the plants grown under RDF by supplying chemical fertilizers and farm yard manure present in the soil mixture, while in all other hydroponic treatments only specified

amount of nutrients were supplied. In soil media on an average one gram of soil may contain 4 to 10 millions of micro-organisms. Hence, more the micro-organisms in the soil more are the soil fertility (Dahama, 1994). However among the soilless culture T<sub>11</sub> recorded the higher nutrient uptake, Francisco de Assis De Oliveira *et al.* (2015) reported that the increase in N uptake due to increased N and K availability occurred because there is an interaction of synergism between these nutrients, so that the increase in K doses favoured the uptake of N. Also the absorption of plant nutrients is variable according to the fertigation management

adopted as the accumulation of N and K was found in leaf tissues and P was found in the fruits. Zenia and Halina (2008) found that potassium can be easily taken up and transported within a plant, thus it is found in high concentrations in plants generative parts. Based on the findings of present study it is concluded that plants grown in soil mixture with 100% of recommended dosage of fertilizer increased the nutrient uptake and among the soilless culture plants grown in coco peat with 125% of N and K in modified Hoagland solution increased the nutrient uptake in eggplant (*Solanum melongena* L.).

**Table 1 :** Nutrient constitution of modified Hoagland solution

Nutrients	N	P	K	Ca	S	Mg	Fe	Mn	Zn	B	Cu	Mo
ppm	238	39	264	130	48	61	0.8	0.6	0.3	0.4	0.05	0.05

**Table 2 :** Effect of various form of fertilizer on nutrient uptake of eggplant under soil and soilless culture

Treatments	Nitrogen uptake (mg plant <sup>-1</sup> )	Phosphorus uptake (mg plant <sup>-1</sup> )	Potassium uptake (mg plant <sup>-1</sup> )
T1 - Soil mixture + RDF (200:150:100 kg ha <sup>-1</sup> )	951.08	260.42	798.23
T2 - Coco peat + RD of WSF (200:150:100 kg ha <sup>-1</sup> )	646.97	189.47	517.57
T3 - Coco peat + N75:K75 % of MHS	425.32	136.52	381.68
T4 - Coco peat + N75:K100 % of MHS	466.39	154.23	432.87
T5 - Coco peat + N75:K125 % of MHS	491.85	156.03	498.05
T6 - Coco peat + N100:K75 % of MHS	599.67	172.65	453.47
T7 - Coco peat + N100:K100 % of MHS	741.87	211.72	564.57
T8 - Coco peat + N100:K125 % of MHS	759.15	215.16	644.24
T9 - Coco peat + N125:K75 % of MHS	649.32	191.32	509.02
T10 - Coco peat + N125:K100 % of MHS	837.95	237.03	650.18
T11 - Coco peat + N125:K125 % of MHS	858.26	241.22	703.67
<b>S.Ed</b>	22.37	6.49	19.96
<b>CD (p =0.05)*</b>	46.39	13.46	39.65

MHS – Modified Hoagland solution

RDF – Recommended dosage of fertilizer

RD of WSF - Recommended dosage of water soluble fertilizer

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