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OPTIMIZING THE VARIED LEVELS OF NITROGEN AND POTASSIUM ON YIELD OF SOIL-LESS CULTURE OF BRINJAL (*SOLANUM MELONGENA* L.) USING DIFFERENT MEDIA

G. Sajiv*, A. Anburani, K. Sekar and K. Muthumanickam
Department of Horticulture, Faculty of Agriculture, Annamalai University,
Tamilnadu, India- 608 002
*E-mail: infantsajiv@gmail.com

Abstract

The investigation was carried out to examine the yield attributes of brinjal in relation to different growing media and various levels of nitrogen and potassium in modified Hoagland solution. Brinjal were planted and grown in poly bags and drip fertilizing system with different concentration of N and K nutrients based on modified Hoagland solution in two different medium *viz.,* river sand and coco peat. Hence, an experiment was carried out on "Optimizing the varied levels of nitrogen and potassium on yield of soil-less culture of brinjal (*Solanum melongena* L.) using different media" in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamilnadu, India during January - April 2018. Results showed that among the different media and nutrient solution, both influenced the yield characters and plants grown under coco peat medium with 125% of N and K modified Hoagland solution (298ppm N and 330 ppm K) significantly improved the quantitative properties of brinjal.

Keywords **:** Brinjal, nitrogen, potassium, yield.

Introduction

Brinjal fruits are known for being low in calories and having a mineral composition beneficial for human health. Soilless culture is now a common practice in solanaceous crops. In the recent years, it is one of an effective method of cultivating crops to maximize the yield and minimize the effort. Because of the soil salinity and result of nematodes in horticultural crops soilless culture has received the attention to raise crops in medium such as sand, perlite and coco peat. There have been a few attempts for growing eggplant and determining its suitable media in growing bag (Yanmaz, 2002). Eggplant can be cultivated with good results on mineral substrates like perlite or sand (Hamdy *et al*., 2004). Soilless culture offers unique benefits such as capabilities to control water availability, pH and nutrient concentrations in the root zone (Silber and Bar-Tal, 2008). Unlike cultivation in soils, in soil-less culture there is a need to supply these essential elements continuously, because of the limited buffer capacity of the medium and its limited supply of nutrients (Savvas, 2001). Plants absorb many elements through their roots, however not all are considered to be essential elements. The elements required in largest quantities are the main structural elements which include nitrogen and potassium. Nitrogen is a major constituent of amino acids that play an essential role in plant growth and development. Increasing plant vegetative growth, yield as well as fruit quality and chemical composition due to increasing potassium fertilization levels

Materials and Methods

The experiment was carried out at Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamilnadu, India. The media *viz*., coco peat and sand were neutralized and washed thoroughly to get neutral pH, whereas the sand was sieved to get uniform size of less than 2 mm and filled in poly bags. Thirty five days old eggplant seedlings of Dhruva hybrid were transplanted into experimental pots containing different media. The experiment was laid out in factorial completely randomized design replicated thrice with two potting media and five different nutrient concentrations (Table 1). Potassium sulphate, Magnesium sulphate, Potassium phosphate, Calium nitrate, Ammonium sulphate, Iron EDTA, Manganese sulphate, Boric acid, Sodium molybdate, Zinc EDTA and Copper EDTA were used as sources of fertilizer. The treatment was imposed as constant fertigation at 3 days interval and 2 days interval for coco peat and sand respectively. The statistical analysis was carried out as per Snedecor and Cochran (1975).

Table 1 : Media and nutrient concentration selected for the experiment

Factor 1	Media	Factor 2	Nutrient solution	Nutrient concentration (ppm)											
				N	P	K	Ca	S	Mg	Fe	Mn	Zn	B	Cu	Mo
M1	Sand	N1	50% of N&K	119	39	132	130	48	61	0.8	0.5	0.3	0.4	0.05	0.04
M2	Coco peat	N2	75% of N&K	179	39	198	130	48	61	0.8	0.5	0.3	0.4	0.05	0.04
		N3	100% of N&K	238	39	264	130	48	61	0.8	0.5	0.3	0.4	0.05	0.04
		N4	125% of N&K	298	39	330	130	48	61	0.8	0.5	0.3	0.4	0.05	0.04
		N5	150% of N&K	357	39	396	130	48	61	0.8	0.5	0.3	0.4	0.05	0.04

Results and Discussion

The environmental conditions including soil (or growing medium, in the case of soilless culture) is one of the most important factors in vegetable production. The result of yield parameters as influenced by different media, various nutrient concentrations and their interactions are presented in

Tables 2. Different growing media and nutrient solution with varied levels of nitrogen and potassium significantly influenced the yield attributes.

Effect of medium on brinjal yield

The results of the present study revealed that among the two different media tested M2 (coco peat) recorded the highest yield parameters and the least yield parameters were recorded by M1 (sand) and this might be due to its consistency, excellent aeration and reproducibility. The reason for the better performance of coco peat could be superior over other media might be related to its characteristics including higher total pore space (TPS) and water holding capacity (WHC). Coco peat was evaluated as a light weight material and showed a high total porosity over sand (Farzad Nazari *et al*., 2011). Similar results were found by Awang and Ismail (1977) who found increased yield was obtained in *Tageteserecta* when plants were grown in coco peat. Cuckoorani (2013) observed the highest growth and yield character for bhendi when grown in coco peat. Paul Wahome *et al*. (2011) found that flower yield of *Gypsophila paniculata* was found to be the least in plant grown in sand under different hydroponics system. This may be mainly attributed to better moisture availability and favorable aeration condition of the media.

Effect of nutrient solution on brinjal yield

The another reason for yield character is obtained by optimal N:K nutritional ratio. The yield parameters recorded maximum in N_4-125% of N and K modified Hoagland solution. It has been reported that the presence of increased levels of N promotes development of the above ground organs (Singh *et al*., 2003). Apart from nitrogen, application of potassium has a wide range of functions in plants including the maintenance of electrical potential across cell membranes, the generation of turgor and the activation of numerous enzymes (Marschner, 1995). The least performance in N1 (N50% of N and K modified Hoagland solution) might be due to the deficiency of nutrients, which leads to adverse effect on plants (Sat Pal Sharma and Brar, 2008). We also observed that when high rates of N and K were applied there was a reduction in yield and yield contributing characters in N_5 - 150% of N and K modified Hoagland solution. The same result was opined by Fusuo Zhang *et al*. (2010) who stated that high rates of application of N and K do not necessarily lead to increased yield increments and may even lead to reduce the yield.

Table 2 : Influence of media and nutrient solution on yield of eggplant

Treatments	No. of fruits plant^{-1}	Individual fruit weight (g)	Fruit yield plant^{-1} (kg)	Estimated yield unit area^{-1} (kg)
Medium				
Sand	21.14	30.71	0.74	1.12
Coco peat	25.32	36.58	1.03	1.54
S.Ed	0.60	1.89	0.03	0.02
CD (p=0.05)*	1.25	3.96	0.07	0.05
Nutrient solution				
N1	13.68	21.95	0.31	0.46
N2	17.91	29.58	0.54	0.80
N3	30.88	41.10	1.28	1.91
N4	38.38	49.55	1.91	2.86
N5	15.33	26.06	0.40	0.61
S.Ed	0.95	3.11	0.05	0.02
CD (p=0.05)*	1.98	6.26	0.11	0.03
Interaction				
M_1N_1	11.63	19.37	0.23	0.34
M_2N_1	15.72	24.52	0.39	0.58
M_1N_2	15.82	26.46	0.42	0.63
M_2N_2	19.99	32.69	0.65	0.98
M_1N_3	28.76	37.87	1.09	1.63
M_2N_3	32.99	44.32	1.46	2.19
M_1N_4	36.19	46.32	1.68	2.51
M_2N_4	40.56	52.77	2.14	3.21
M_1N_5	13.29	23.53	0.31	0.47
M_2N_5	17.36	28.58	0.50	0.74
S.Ed	1.38	4.43	0.07	0.03
CD (p=0.05)*	2.81	8.85	0.16	NS

Conclusion

From the above results obtained it was revealed that coco peat media with 125% of N and K in modified Hoagland solution was found to be optimum for soilless substrate culture of eggplant. There was no yield loss due to wilt or nematode incidence because the media used were completely sterile and pathogen free.

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