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Studies on Different Levels of NPK with Combination of FYM on Growth, Mortality and Establishment of Kinnow (*Citrus reticulata* Blanco) Under Subtropical Condition

Murli Manohar Vaishnav, Sandeep Singh and Saket Mishra*

Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad (U.P.) 211007, India
**Corresponding author*

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A B S T R A C T

The present investigation was under taken at Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, India during 2013-14. The experiment was laid out in randomized block design with three replications and 13 treatments, separately. The materials used in the investigation were organic manures and inorganic fertilizers **(**NPK). Results showed significant effect on maximum plant height (80.13cm), number of branches (16.96), number of leaves(176.00), leaf length (6.70cm), maximum plant establishment percentage (100%), and minimum mortality percentage (00.00%) was in treatment T_8 and T_4 @ 5kg per plant Farm Yard Manure + 60g per plant Nitrogen, 35g per plant Phosphorus and 25g per plant Potash under Allahabad agro climatic conditions.

Introduction

Citrus is one of the leading tree fruit crops of the world. The genus citrus includes over 162 species belonging to the Order Geraniales, family Rutaceae and sub family Aurantoideae (Tanka 1977). It would appear that all the species belonging to citrus and its related genera originated in the tropical and subtropical regions of South-east Asia – north-eastern India, Southern China, Indo-Chinese peninsula, Malay Archipelago, and then spread to other continents, (Webber, 1967; Chapot, 1975). Among the citrus sp. 8 sp. generally cultivated for edible purpose are: Mandarin (*Citrus reticulata* Blanco), Sweet orange (*C. sinensis* Osbeck), Grapefruit (*C. paradisi* Mac Fadyen), Pummelo (*C. grandis* Osbeck), Acid Lime (*C. aurantifolia* Christm), sour orange (*Citrus aurantium* Linnaeus*)*, Lemon (*C. limon* Burmann) and citron (*Citrus medica* Linnaeus) (Purseglove 1968) are commercially grown worldwide. Citrus is mainly grown in United States, Brazil, Mexico, India and Argentina. After Mexico, India is the leading producer of citrus fruits with an area of 763 lakh hectares with production of 599 lakh tones annually. In India, it ranks third in production after banana and mango. Among citrus crops, mandarin

orange (Kinnow mandarin, Nagpurmandarin, Khasimandarin and Darjling mandarin) covers largest area followed by sweet orange varieties (Musambi, Pineapple, Blood Red and Jaffa) and Acid lime. Mandarin is also known as loose skinned orange. Mandarins are classified in to four groups –Satsuma, King, willow- leaf and common mandarin Hodgson (1967). Among these, Kinnow mandarin bears highest place in production, productivity, juice content and fruit quality. In India, Kinnow is being grown in Punjab, Rajasthan, Haryana, Himachal Pradesh, Jammu and Kashmir and Uttar Pradesh. There are different kinds of citrus such as kinnow, sweet oranges group, Grapefruit, Local mandarin, Lemon, Lime, Sweet lime, Tangelos and Tangerines. In Rajasthan, Sriganganagar district is on prime position with 8650 hectares area and 25000 million tonne production followed by Hanumangarh district (Anonymous, 2008). The interest of farmers in adoption of Kinnow cultivation is increasing due to suitable agro-climatic conditions, higher crop yield and demand in international market.

Materials and Methods

The present studies were carried out during the winter season of the year 2013-2014 at Pomology Research Farm Department of Horticulture, Sam Higginbottom University of Agricultural, Technology and Sciences. The experimental area had sandy loam soil with pH of 7.2, the soil was moderately fertile. The plant of kinnow was planted at beginning of rainy season with (6mX6m spacing) of commercial variety of Citrus viz. Kinnow. The plants were planted in Randomized Block Design putting 4 plants per treatment per replication. The planting method used in kinnow is square method. Data were recorded on different growth parameters.

Results and Discussion

The present investigation was conducted in year 2013-2014, at the Central Research field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad. The maximum plant height was recorded at 150 days in (T_4), (80.13cm) (Fig. 1), maximum number of Branches was recorded at 150 days in (T_8) (Fig. 2), (16.96), maximum number of Leaves was recorded at 150 days in (T_8), (176.00), maximum Leaf length was recorded for 150 days in (T_8), (6.70cm), maximum Plant establishment Percentage was recorded in 150 days (T_8) and (T_{12}) produced significantly better establishment (100%), minimum mortality percentage was recorded in (T_8) followed by (T_{12}) with no mortality (00.00%) (Table 1).

***Citrus reticulata* Blanco**

Treatments combinations

Treatment	Combination
T_0	5 kg FYM
T_1	5 kg FYM+40gN+25gP+25gK
T_2	5 kg FYM+45gN+25gP+25gK
T_3	5 kg FYM+55gN+25gP+25gK
T_4	5 kg FYM+60gN+25gP+25gK
T_5	5 kg FYM+50gN+15gP+25gK
T_6	5 kg FYM+50gN+20gP+25gK
T_7	5 kg FYM+50gN+30gP+25gK
T_8	5 kg FYM+50gN+35gP+25gK
T_9	5 kg FYM+50gN+25gP+15gK
T_{10}	5 kg FYM+50gN+25gP+20gK
T_{11}	5 kg FYM+50gN+25gP+30gK
T_{12}	5 kg FYM+50gN+25gP+35gK

Table.1 Effect of different levels of NPK with combination of FYM on growth, mortality and establishment of Kinnow mandarin under Allahabad agro–climatic condition"

Character Treatment	Plant Height (cm) 150 DAT	Number of branches 150 DAT	Number of leaves 150 DAT	Leaf length (cm) 150 DAT	Plant mortality (%)	Plant establishment (%)
T_0	61.200	10.233	107.00	5.10	27.22	72.22
T_1	63.367	11.667	116.33	5.27	22.22	77.77
T_2	66.133	12.600	124.00	5.57	16.66	83.33
T_3	69.000	14.567	134.33	5.70	22.22	77.77
T_4	**80.13**	15.467	153.33	5.93	16.66	83.33
T_5	66.267	14.400	127.00	5.57	16.66	83.33
T_6	67.433	15.133	142.00	6.00	11.12	88.88
T_7	69.367	15.000	160.33	6.33	5.55	94.44
T_8	70.233	**16.967**	**176.00**	**6.70**	**00**	**100**
T_9	69.067	15.133	135.33	6.23	22.22	77.77
T_{10}	70.833	16.000	154.33	6.33	16.66	83.33
T_{11}	73.767	16.467	163.33	6.53	11.12	88.88
T_{12}	75.433	15.767	164.67	6.43	**00**	72.22
F.test	S	S	S	S	NS	S
C.D.	0.97	0.517	8.19	0.21	0.47	0.47
SE(d)	0.47	0.249	3.95	0.10	0.97	0.97

Fig.1 Effect of different treatments on plant height (cm.)

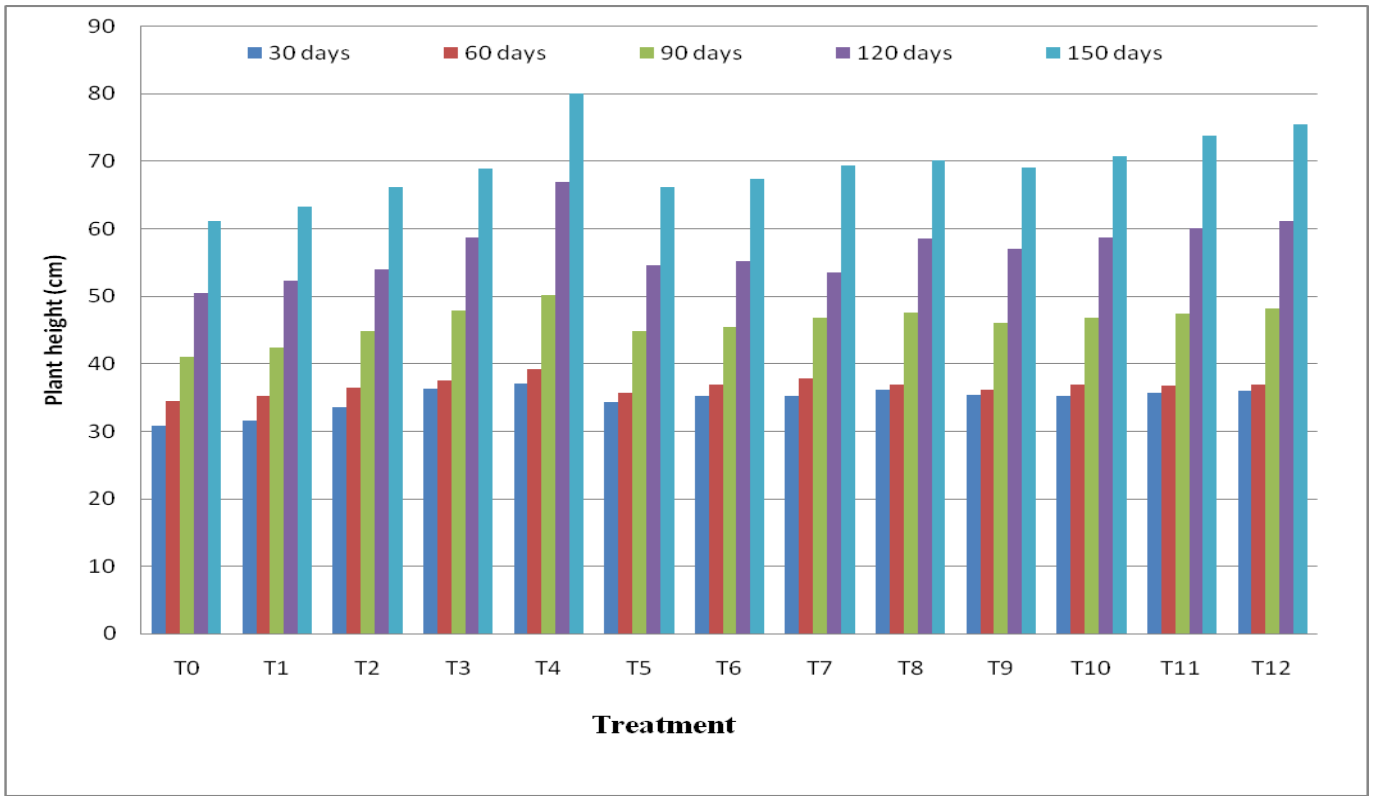
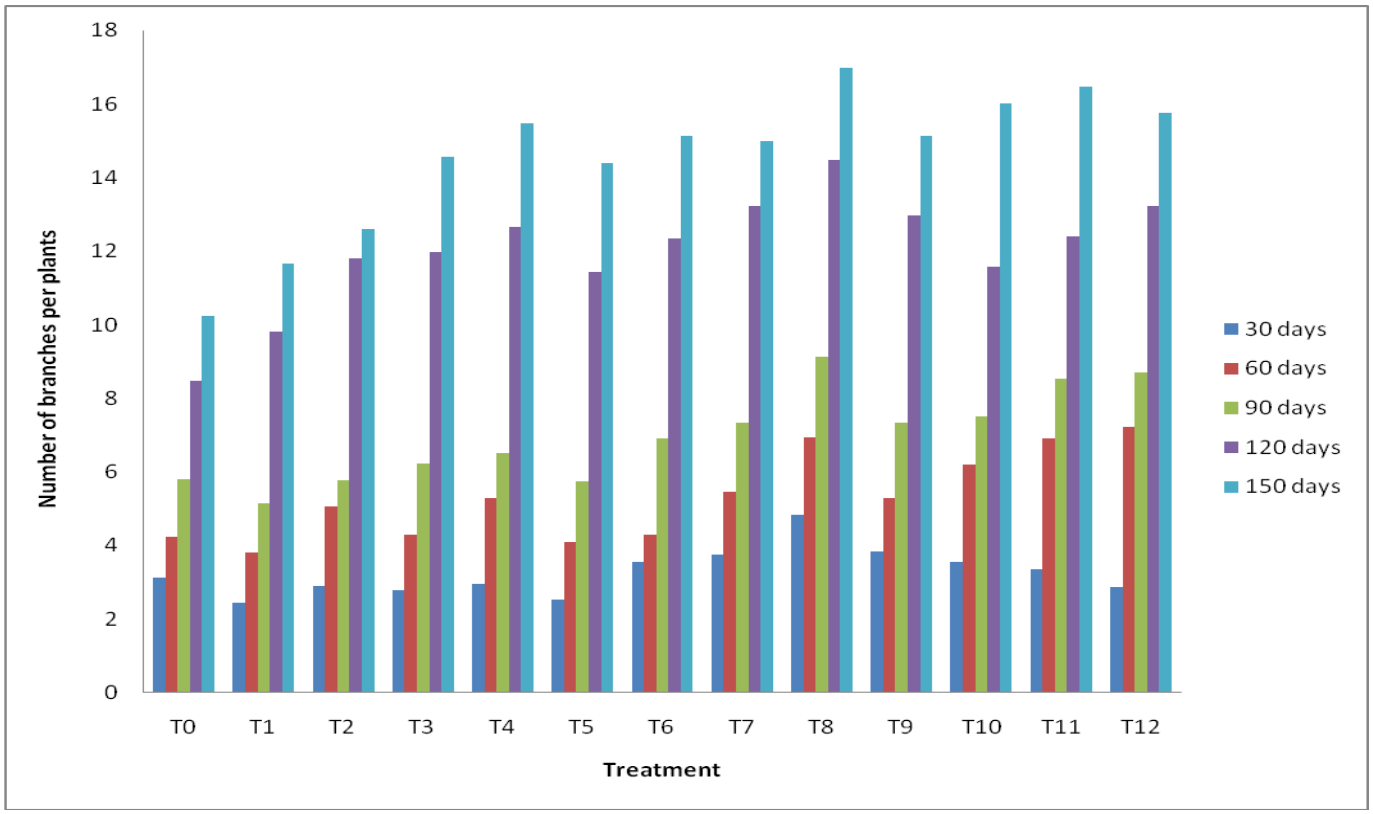


Fig.2 Effect of different treatments on Number of branches per plants



On the basis of results obtained, it is concluded that the treatment T_8: 5kg par plant Farm Yard Manure + 50 g par plant Nitrogen, 35 par plant Phosphorus and 25 g par plant Potash was found to be the best in terms of maximum number of branches (16.96), maximum number of leaves (176.00), maximum leaves length (6.70 cm), minimum mortality percentage (00%), and maximum establishment percentage (100%), followed by treatment T_{12}: 5 kg par plant Farm Yard Manure + 50g par plant Nitrogen, 25g par plant Phosphorus and 35g par plant Potash and the minimum was recorded in T_0: control (27.22%) but also in terms of plant height the best results found in treatment (T_4) 5kg par plant Farm Yard Manure + 60 g par plant Nitrogen, 25 g par plant Phosphorus and 25 g par plant Potash.

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