Plant Archives Vol. 20 Supplement 1, 2020 pp. 1570-1572 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF NUTRIENT MANAGEMENT THROUGH BIO-ORGANIC MANURES ON FRUIT SETTING, FRUIT DROP AND FRUIT RETENTION OF ACID LIME (*CITRUS AURANTIFOLIA* SWINGLE)

T. R. Barath Kumar, G. Pradeep Kumar, R. Suresh Kumar and C. Muruganandam

Department of Horticulture, Faculty of Agriculture, Annamalai University,
Annamalai Nagar- 608 002. (Tamilnadu) India

Abstract

Acid lime (*Citrus aurantifolia* Swingle) is an important fruit crop in citrus group which belongs to the family Rutaceae. It occupies a vital place in the fruit industry, but yield levels of citrus orchards are still very low. There are several factors responsible for low yield in acid lime and among these the inadequate supply of inorganic fertilizers and organic manures are the major one. Thus, an investigation was undertaken on the "Effect of nutrient management through bio-organic manures on reproductive growth and development of acid lime **(***Citrus aurantifolia* Swingle**)**" in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar, Tamil Nadu, India during 2016-2018. The experiment was conducted with organic manures and biofertilizers along with inorganic fertilizers which were applied with different treatment combinations *viz.,* T_1 – Control, T_2-100% RDF (400:200:220 g/ plant), T_3-75% RDF, T_4-50% RDF, T_5- 75% RDF + 100% FYM (20 kg/plant), T_6- 75% RDF + 100% Vermicompost (10 kg/plant), T_7- 75% RDF + 50% FYM + 50% Vermicompost, T_8-75% RDF + 50% FYM + 50% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM), T_9- 50% RDF + 100% FYM, T_{10}- 50% RDF + 100% Vermicompost, T_{11}- 50% RDF + 75% FYM + 75% Vermicompost, T_{12}- 50% RDF + 75% FYM + 75% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB +150g VAM). There were twelve treatments replicated thrice in Randomized block design (RBD). The reproductive parameters of plant were significantly influenced by the use of organic manures and biofertilizers with inorganic fertilizers. The maximum fruit setting (72.73 %), fruit retention (73.73 %) and the minimum fruit drop (30.48 %) were recorded under T_{12} - 50% RDF + 75% FYM + 75 % Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM). The least value for reproductive character under control may be due to lack of nutrients supply.

Key words: *Citrus aurantifolia*, biofertilizers, vermicompost, Azotobacter.

Introduction

A successful cultivation of any crop envisages sufficient knowledge about the nutritional requirements of the plant. The response and requirement of various nutrients differ widely on the agro-climatic conditions and management practices. A plant absorbs a large number of elements from the soil and atmosphere. Some of these elements are directly involved in the nutrition of the plant and deficiency of these makes it impossible for the plant to complete its life cycle. These elements are known as essential elements for plant life (Arnon, 1950).

Application of organic manures is known to improve soil fertility and productivity besides providing stability in crop production. But they are required in large quantities to meet the nutrient requirement of crops owing to their low nutrient content. On the other hand, continuous use of inorganic fertilizers leads to deleterious effects on physical, chemical and biological properties of the soil which in turn reflects on yield. Apart from these organic manures and inorganic fertilizers, bio fertilizers like Azotobacter, Phosphate Solubilising Bacteria and Vesicular Arbuscular Mycorrhizae also contribute to improved crop production through eco-friendly nutrient supply (Bagyaraj, 1991).

Therefore, it has become necessary to integrate organic manures and biofertilizers with inorganic fertilizers in crop production to maintain soil health and yield of crops at higher levels. Information on these aspects in acid lime is lacking. Hence, an attempt has been made to study the effect of nutrient management through bio-

organic manures on reproductive growth and development of acid lime.

Materials and Methods

The experiment was conducted in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar, Tamil Nadu, India during 2016-2018. The treatment consisted with organic manures and biofertilizers along with inorganic fertilizers which were applied with different treatment combinations *viz.,* T_1 – Control, T_2-100% RDF (400:200:220 g/ plant), T_3-75% RDF, T_4-50% RDF, T_5- 75% RDF + 100% FYM (20 kg/plant), T_6- 75% RDF + 100% Vermicompost (10 kg/plant), T_7- 75% RDF + 50% FYM + 50% Vermicompost, T_8-75% RDF + 50% FYM + 50%Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM), T_9- 50% RDF + 100% FYM, T_{10}- 50% RDF + 100% Vermicompost, T_{11}- 50% RDF + 75% FYM + 75% Vermicompost, T_{12}- 50% RDF + 75% FYM + 75% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB +150g VAM). There were twelve treatments replicated thrice in Randomized block design (RBD). The observations were recorded on reproductive parameters *viz.,* fruit setting (%), fruit drop (%) and fruit retention (%) The data generated through this investigation was analyzed by the statistical method of Panse and Sukhatme (1985).

Results and Discussion

The reproductive parameters of plant were significantly influenced by the use of organic manures and biofertilizers with inorganic fertilizers. The maximum fruit setting (72.73 %), fruit retention (73.73 %) and fruit drop (30.48 %) were recorded under T_{12} - 50% RDF + 75% FYM + 75 % Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM). The least value for reproductive character under control may be due to lack of nutrients supply.

The optimum dose of nutrient combinations (NPK) accelerates the metabolic activities of the plant by increasing the meristematic activities which in turn increases the vegetative growth and ultimately lead to increase flowering, maximum fruit setting percent and maximum fruit retention percent. Similar results have also been reported by Zang and Lei (2000) and Uma Shankar *et al.,* (2002) in guava.

The highest fruit set and retention might be due to supply of nutrients in adequate proportion right from starting of the experimentation to the harvesting of crop, which induces more flowering and retention of fruit due to production and supply of photosynthates at critical requirement. The results are also in close conformity with the findings of Singh *et al.,* (2010) in ber, Goswami *et al.,* (2012) in guava and Singh *et al.,* (2014) in bael.

The fact that combined application of nitrogen and FYM enhances leaf expansion and its dark green colour, which favours photosynthesis and respiration; hence, growth is enhanced by application nitrogen and balanced nutrition provided by FYM. It does not only add organic matter and macro and micro nutrients to soil, but also improves the physico-chemical properties of soil, which provides better conditions for plant growth and development. The findings are in line with the results obtained in kinnow (Garwal *et al.,* 2014).

Table 1: Effect of nutrient management through bio-organic manures on Fruit setting (%), Fruit drop (%) and Fruit retention (%) of Acid lime (*Citrus aurantifolia* Swingle).

Tr. No.	Treatment	Fruit setting(%)	Fruit drop(%)	Fruit retention(%)
T_1	Control	35.06	61.74	30.04
T_2	100% RDF (400:200:220 g / plant)	45.79	53.74	41.78
T_3	75% RDF	42.11	56.47	37.49
T_4	50% RDF	38.64	59.13	33.81
T_5	75% RDF + 100% FYM (20 kg/plant)	52.89	48.02	50.21
T_6	75% RDF + 100% Vermicompost (10 kg/plant)	58.83	42.64	57.32
T_7	75% RDF + 50 % FYM + 50 % Vermicompost	62.35	39.47	61.73
T_8	75% RDF + 50% FYM + 50 % Vermicompost +			
	Biofertilizers(25g Azotobacter + 25g PSB + 150g VAM)	68.56	33.85	69.34
T_9	50% RDF + 100% FYM	49.55	50.90	46.32
T_{10}	50% RDF + 100% Vermicompost	55.42	45.73	53.45
T_{11}	50% RDF + 75% FYM + 75 %Vermicompost	66.39	36.26	66.40
T_{12}	50% RDF + 75% FYM + 75 % Vermicompost +			
	Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM)	72.73	30.48	73.73
	S.Ed	1.55	1.27	1.78
	CD(P=0.05)	3.12	2.58	3.59

Vermicompost has very high porosity, aeration, drainage and water holding capacity and have a vast surface area, providing strong absorbability and retention of nutrients for longer period of time hence maximizing fruit setting percentage and fruit retention percentage. Singh *et al.,* (2008) in aonla and Dhomane *et al.,* (2011) in guava also reported similar results.

Presence of B group vitamins, plant hormones and chemical exudates released during

biological activity promoted by the vermicompost in the soil and retention of nutrients for longer period of time in combination with optimum level of recommended dose of NPK accelerates the process of synthesis and accumulation of food materials and application of biofertilizers increase the rootlet density and branching of roots resulting increased nutrient status as well as their uptake by the plants, they promote hormonal activity and induce their synthesis, reduce the flower and fruit drop caused by hormonal imbalance, hence maximizing fruit setting and fruit retention percentage which ultimately leads to increase in yield and other yield parameters. The present findings are in accordance with the results reported by Yadav *et al.,* (2011) in mango and Binepal *et al.,* (2013) in guava.

Increased nutrient availability from NPK, Farm Yard Manure, Vermicompost and biofertilizers like azotobacter, Phosphate Solubilizing Bacteria and Vesicular Arbuscular Mycorrhizae which may have increased various endogenous hormonal levels in plant tissue which might be responsible for enhancing flowering pollen germination and pollen tube which might have ultimately increased fruit set and higher fruit retention. The results of present findings are confirmed due to findings of earlier workers Shukla *et al.,* (2009) in guava and Godage *et al.,* (2013) in guava.

Thus, it could be seen that the application of organic manures at the rate of 15kg FYM+ 7.5 kg Vermicompost and Biofertilizers at the rate of 25g Azotobacter + 25g PSB + 150g VAM can reduce the inorganic fertilizations to at extent of 50 percent (200g nitrogen,100g phosphorus and 110g potassium per tree) increasing the reproductive growth and development of acid lime.

Conclusion

The reproductive characters of plant were significantly influenced by the nutrient management through bio-organic manures. The maximum increase in the reproductive parameters *viz.,* The maximum fruit setting (%), fruit retention (%) and the minimum fruit drop (%) were observed with the application of 50% RDF + 75% FYM + 75% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM) which was significantly superior than control. This may be due to acceleration of metabolic activity of the plant by increasing the meristematic activities and more photosynthates which ultimately leads to increase in flowering, maximum fruit setting percent and maximum fruit retention percent.

References

Arnon, D.I. (1950). Criteria of essentiality of inorganic micro-nutrients for plants with special reference to molybdenum In: Wallace, T. Trace elements in plant physiology. Waltham, Mss. Chronica Botanica. 31-39.

Bagyaraj, D.J. (1991). Ecology of Vesicular arbuscular mycorrhizae, *In: handbook of applied mycology. Soil and plant, pub: Marcel Dekker, Inc.Newyork (USA),* **1:** 3-4.

Binepal, M.N., R. Tiwari and B.R. Kumawat (2013). Integrated approach for nutrient management in guava *cv.* L49 under Malwa Plateau conditions of Madhya Pradesh. *Int. J. Agri. Sci.,* **9(2):** 467-471.

Dhomane, P.A., A.S. Kadam, S.K. Lakade and V.R. Gharage (2011). Effect of different sources of nitrogen on growth and yield of guava (*Psidium guajava* L.) *cv.* sardar. *Asian J. Hort.,* **6(1):** 92-95.

Garhwal, P.C., P.K. Yadav, B.D. Sharma, R.S. Singh and A.S. Ramniw (2014). Effect of organic manure and nitrogen on growth yield and quality of kinnow mandarin in sandy soils of hot arid region. *Afr. J. Agric. Res.,* **9(34):** 2638-2647.

Godage, S.S., N.S. Parekh and D.S. Nehete (2013). Influence of bio-fertilizers and chemical fertilizers on growth, flowering and fruit characters of guava (*Psidium guajava* L.) *cv.* Allahabad Safeda. *Int. J. Agric. Sci.,* **9(1):** 309-313.

Goswami, A.K., S. Lal and K.K. Misra (2012). Integrated nutrient management improves growth and leaf nutrient status of guava *cv.* Pant Prabhat. *Indian J. Hort.,* **69:** 168-72.

Panse, M. and K. Sukhathme (1985). Statistical methods for agriculture workers. *Indian Council of Agriculture Research Publications,* 48-67.

Shukla, A.K., D.K. Sarolia, B. Kumari, R.A. Kaushik, L.N. Mahawer and H.L. Bairwa (2009). Evaluation of substrate dynamics for integrated nutrient management under high density planting of guava *cv.* Sardar. *Ind. J. Hort.,* **66(4):** 461-464.

Singh, Ajeet, A.L. Yadav, D.K. Yadav and S.K. Misra (2008). Effect of integrated nutrient management of yield and quality of aonla (*Emblica officinalis* Gaertn.) *cv.* NA-10. *Plant Arch.,* **8(1):** 473-474.

Singh, H.D., D.G. Lal and S.K. Singh (2010). Effect of nitrogen, phosphorus and zinc fertilization on soil nutrients status and yield of ber (*Zizyphus mauritiana* Lamk.) *cv.* Gola in arid and semi-arid regions. *Env. Ecol.,* **28:** 328-31.

Singh, J.K., D.K. Singh and H.K. Singh (2014). Studies on integrated nutrient management of vegetative growth, fruiting behaviour and nutrient status of leaves and soil of bael (*Aegle marmelos* Correa) orchard *cv.* Narendra bael-9. *Asian J. Hort.,* **9(2):** 421-425.

Uma Shankar, R.A. Pathak, R.K. Pathak and C.M. Ojha (2002). Effects of NPK on the yield and fruit quality of guava *cv.* Sardar. *Prog. Hort.,* **34(1):** 49-55.

Yadav, A.K., J.K. Singh and H.K. Singh (2011). Studies on integrated nutrient management in flowering, fruiting, yield and quality of mango cv. Amrapali under high density orcharding. *Indian J. Hort.,* **68(4):** 453-460.

Zang Xiao Ping and Xin Tao Lei (2000). The application of fertilizer for guava trees. *South China Fruits,* **29(6):** 29-31.