The Pharma Innovation Journal 2021; 10(9): 316-320

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(9): 316-320

www.thepharmajournal.com
Received: 10-07-2021
Accepted: 13-08-2021

Poonam Kumari
M.Sc. Scholar, Department of Horticulture and Fruit Science, NAI, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

VM Prasad
Professor, Department of Horticulture, NAI, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Vijay Bahadur
Associate Professor, Department of Horticulture, NAI, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Rakesh Sahoo
M.Sc. Scholar, Department of Horticulture and Agronomy, NAI, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Poonam Kumari
M.Sc. Scholar, Department of Horticulture and Fruit Science, NAI, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Effect of different micronutrient on plant growth, yield and fruit quality in Existing Guava (*Psidium guajava* L.) cv. Allahabad Safeda

Poonam Kumari, VM Prasad, Vijay Bahadur and Rakesh Sahoo

Abstract
The present investigation entitled "Effect of different micronutrient on plant growth, yield and fruit quality in Existing Guava (*Psidium guajava* L.) cv. Allahabad Safeda" was undertaken at the Experimental Central Orchard of Department of Horticulture, Nani Agriculture Institute, SHUATS, Prayagraj, during the year 2020-2021 with the following findings in Randomized Block Design (RBD) having 12 treatments and 3 replications. From the present investigation it is concluded that the soil application of $ZnSO_4$ (2, 4 and 6%), $FeSO_4$ (2, 4 and 6%) and Boron (2, 3 and 4%) with the different treatment levels is best suited and beneficial for the plant growth, fruit yield and quality of guava fruit. Application of T_{12} ZnSO4+FeSO4-6%+Boron-4% was found best in respect of vegetative growth, fruit yield and quality parameters Guava (*Psidium guajava* L.) cv. Allahabad Safeda.

Keywords: Micronutrients, plant growth, yield, fruit quality and guava, *Psidium guajava* L.

Introduction

Guava (*Psidium guajava* L.), sometimes known as the tropics' apple, is an evergreen tree that belongs to the Myrtaceae family. It is widely planted in India's tropical, subtropical, and arid regions due to its low cost of cultivation. Guava (*Psidium guajava* L.), sometimes known as the "Apple of the Tropics," is a tropical fruit that belongs to the Myrtaceae family. It can adapt to a wide range of soil and climatic conditions. Dhakar *et al*., Dhakar *et al*., Dhakar *et al*. (2017) [3]. It is also known as the "tropical apple" and "poor man's apple." Because of its great nutritional value, it is considered an ideal fruit for nutritional security as well as one of the cheapest and best sources of vitamin 'C' (260 mg/100g). It has been grown in India since the 17th century, and it is believed to have originated in tropical America, maybe from Mexico to Peru, and was brought to India by Portuguese Thiruppathi M. (2020) [13]. It was first introduced to India in the early 17th century and has since become a commercial crop in Maharashtra, Uttar Pradesh, Karnataka, Bihar, Orissa, Punjab, Uttarakhand, Gujarat, Madhya Pradesh, and West Bengal. Guavas grown in Uttar Pradesh's Allahabad region are the greatest in the world, according to Chaddha (2007) [2]. It covers 0.26 million hectares in India and produces 3.66 million tonnes every year. Gandhi and Saxena (2014) [11]. Guava is grown on a total of 276 thousand hectares in India, with an annual production of 4236 thousand MT (NHB 19). Guava is a resilient fruit plant that thrives in alkaline or poorly drained soils. Guava is high in ascorbic acid (Vitamin C) and pectin, as well as a good source of calcium, phosphorus, and vitamin A. (Phadnis, 1970 and Rathore, 1976) [8]. Guava may be used to create jam, jelly, nectar, cheese, and squash, in addition to being a tasty and nutritious table fruit. The leaves are used to treat diarrhoea as well as tanning. In fruit physiology, micronutrients such as iron, boron, and zinc are responsible for metabolic processes. Micronutrients should be applied during the first growth phase and before flowering. Zinc is involved in chlorophyll synthesis, plant growth hormone biosynthesis, and plays a favourable function in photosynthesis and nitrogen metabolism. Guava may be used to create jam, jelly, nectar, cheese, and squash, in addition to being a tasty and nutritious table fruit. The leaves are used to treat diarrhoea as well as tanning. In fruit physiology, micronutrients such as iron, boron, and zinc are responsible for metabolic processes. Micronutrients should be applied during the first growth phase and before flowering. Zinc is involved in chlorophyll synthesis, plant growth hormone biosynthesis, and plays a favourable function in photosynthesis and nitrogen metabolism.

Materials and Methods

The investigation, titled "Effect of different micronutrients on plant growth, yield, and fruit quality in Existing Guava (*Psidium guajava* L.) cv. Allahabad Safeda," was conducted at the experimental orchard of the Department of Horticulture, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology, and Sciences. Allahabad is located at 25.870° north latitude and 81.50° east longitude, at an elevation of 78 metres above sea level. The climate in this region is tropical and subtropical, with summer and winter extremes. During the winter months of December to January, the temperature drops to as low as 10°C, and frost can occur; however, during the summer months of May to June, the temperature rises to 470°C, and scorching winds are a common occurrence; the average rainfall is about 102 cm, with the monsoon season accounting for the majority of it (i.e. July to September with Occasional showers in winters). Sand (60.60), Silt (19.20), Clay (20.20), Soil pH (7.3), EC (dsm-1 at 250 C) (0.26), Organic carbon (percentage) (0.46), Available nitrogen (kg ha-1) (45), Available phosphorus (percentage) (0.46), Available nitrogen (percentage) (0.46), Available nitrogen (percentage) (0.46), Available nitrogen (percentage) (0.46), Available nitrogen (percentage) (kg ha-^{1}) (18) and Available potash (kg ha^{-1}) (112.50). Guava plants were planted in a 5m × 5m grid, with 400 plants per hectare. The experiment had 12 treatments with three replications and was set up using Randomized Block Design. T1 Control (RDF), T2 ZnSO4-2 percent, T3 ZnSO4-4 percent, T4 ZnSO4-6 percent, T5 FeSO4-2 percent, T6 FeSO4-4 percent, T7 FeSO4-6 percent, T8 Boron -2 percent, T9 Boron -3 percent, T10 Boron-4 percent +FeSO4-4 percent, T11 ZnSO4-4 percent +Boron-2 percent, and T12 ZnSO4+FeSO4-6 Plant height (m), number of primary branches per plant, plant spread (East – West and North – South), days needed for flowering, and days needed from flower to fruit set were all observed. Flower count per plant, The number of fruits produced by each plant, Total soluble solid (0Brix), Ascorbic acid (mg / 100 g), Specific graviity (g/cm3), Fruit weight (g), Fruit yield per tree (kg), Fruit radial diameter (cm), Fruit polar diameter (cm), Total soluble solid (0Brix), Ascorbic acid (mg / 100 g), Specific graviity (g/cm3) Acidity, non-reducing sugar, reducing sugar, and total sugar were measured in guava plants using established techniques.

Table 1: Details of treatments combination

Treatment symbols	Treatments
T$_1$	Control (RDF)
T$_2$	ZnSO4-2%
T$_3$	ZnSO4-4%
T$_4$	ZnSO4-6%
T$_5$	FeSO4-2%
T$_6$	FeSO4-4%
T$_7$	FeSO4-6%
T$_8$	Boron -2%
T$_9$	Boron -3%
T$_{10}$	Boron-4%+FeSO4-4%
T$_{11}$	ZnSO4-4%+Boron-2%
T$_{12}$	ZnSO4-6%+FeSO4-6%+Boron-4%

Fig 1: Application of micronutrients

Fig 2: Harvesting of guava

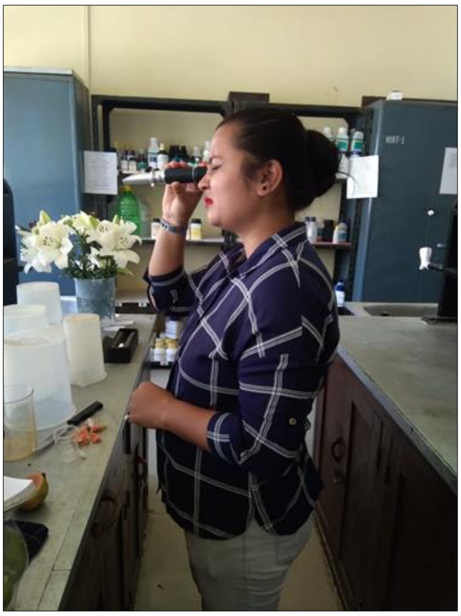

Fig 3: Observation of treatments

Fig 4: An overall view of guava fruit

Results and Discussion

1. Effect of different levels micronutrients $ZnSO_4$, $FeSO_4$ and Boron on Growth parameters of Guava (*Psidium guajava* L.)

Table 1 and Fig. 1 provide the data on plant height (m), number of primary branches per plant, and plant spread (East – West and North – South) of guava in each treatment (1). As compared to the control, soil treatment of different amounts of micronutrients, such as ZnSO4 (2, 4 and 6 percent), FeSO4 (2, 4 and 6 percent), and Boron (2, 3 and 4 percent), has a significant effect on plant height (m), number of primary branches per plant, and plant spread (T1). Treatment T12 ZnSO4+FeSO4-6% +Boron-4% T11 ZnSO4-4 percent +Boron-2 percent had the highest plant height (m) (6.45), number of primary branches per plant (8.40), and plant spread (East – West and North – South) (6.81 & 6.71), while T11 ZnSO4-4 percent +Boron-2 percent had the lowest. And T_{10} Boron-4%+FeSO4-4percent

Treatment T1 Control had the lowest plant height (4.22m), number of primary branches per plant (4.51), and plant spread (East – West and North – South) (3.82 & 3.35). Plant height (m), number of primary branches per plant, and plant spread (East – West and North – South) were all considerably higher in the treatments than in the control (T1). Similarly, the results of Jawanda (1966) [5], Manchanda (1967), and Dutt and Bhambata (1967) in citrus, Dawood *et al*., 2001 in Sweet Orange, and Razzaq *et al*., 2013 [10] in Kinnow Mandrin are consistent with the results of Jawanda (1966) [5], Manchanda (1967), and Dutt and Bhambata (1967) in Kinnow Mandrin.

2. Effect of different levels micronutrients $ZnSO_4$, $FeSO_4$ and Boron on Flowering of Guava (*Psidium guajava* L.)

Table 1 and Fig. 1 provide the data on Days necessary for blooming and Days required from flower to fruit set of guava in each treatment (1). The results reveal that applying different quantities of micronutrients to the soil, such as ZnSO4 (2, 4 and 6 percent), FeSO4 (2, 4 and 6 percent), and Boron (2, 3 and 4 percent), has a significant effect on the number of days required for flowering when compared to the control (T1). Days required for blooming (32.71), days necessary from flower to fruit set (28.70), and days required from fruit set to maturity (28.70) were all reduced in the T12 ZnSO4+FeSO4-6 percent +Boron-4 percent treatment (127.40) T11 ZnSO4-4 percent +Boron-2 percent, T10 Boron-4 percent +FeSO4-4 percent, and T6 FeSO4-4 percent were the next in line. Treatment T1 Control had the highest number of Days required for flowering (46.84), Days required from flower to fruit set (36.70), and Days required from fruit set to maturity (127.40). In terms of Days required for flowering, Days required from flower to fruit set, and Days required from fruit set to maturity, all treatments outperformed the control (T1).

3. Effect of different levels micronutrients $ZnSO_4$, $FeSO_4$ and Boron on Flowering and fruiting parameters of Guava (*Psidium guajava* L.)

Table 1 and Fig. 1 show the results on the number of flowers per plant, the number of fruits per plant, the fruit weight (g), the fruit yield per tree (kg), the fruit radial diameter (cm), and the fruit polar diameter (cm) of guava in each treatment (1). The results show that different levels of micronutrients, such as ZnSO4 (2, 4 and 6 percent), FeSO4 (2, 4 and 6 percent), and Boron (2, 3 and 4 percent), have a significant effect on the number of flowers per plant, the number of fruits per plant, the fruit weight (g), the fruit yield per tree (kg), the fruit radial diameter (cm), and the fruit polar diameter (cm) when compared to control (T1). T12 ZnSO4+FeSO4-6 percent +Boron-4 percent produced the most flowers per plant (230.32), fruits per plant (227.37), fruit weight (g) (206.36), fruit yield per tree (kg) (46.92), fruit polar diameter (cm) (9.12), and fruit radial diameter (cm) (9.23), followed by T10 Boron-4 percent +FeSO4-4 percent, T11 ZnSO4-4 percent +Boron-2 In contrast, treatments T1 Control had the lowest number of flowers per plant (170.26), fruit per plant (158.48), fruit weight (g) (138.36), fruit yield per tree (kg) (21.93), fruit polar diameter (cm) (6.22), and fruit radial diameter (cm) (7.32). Number of flowers per plant, Number of fruits per plant, Fruit weight (g), Fruit yield per tree (kg), ruit radial diameter (cm), and Fruit polar diameter (cm) were all considerably higher than control (T1). The increase in guava fruit production owing to micronutrient treatments may be attributed to improvements in yield contributing features such as fruit size and weight, fruit set percent, and fruit retention percent, as demonstrated in the current study, which ultimately enhanced the yield. Increased fruit set and reduced fruit drop as a result of boron, iron, magnesium, manganese, zinc, and copper spraying could result in more fruits and thus a higher yield. Bagali *et al*. (1993) [1], Rajkumar *et al*. (2014) [7], Jat and Kacha (2014), and Gaur *et al*. (2015) all came to similar conclusions (2014).

4. Effect of different levels micronutrients $ZnSO_4$, $FeSO_4$ and Boron on Quality parameters of Guava (*Psidium guajava* L.) Table (4.13) and Figure (4.13) show the total soluble solid (0Brix), ascorbic acid (mg / 100 g), specific graviity (g/cm3), acidity, non-reducing sugar, reducing sugar, and total sugar of guava in each treatment (4.13). As compared to control, soil application of different levels of micronutrients, such as ZnSO4 (2, 4 and 6 percent), FeSO4 (2, 4 and 6 percent), and Boron (2, 3 and 4 percent), has a significant effect on Total soluble solid (0Brix), Ascorbic acid (mg / 100 g), Specific graviity (g/cm3), Acidity, non-reducing sugar, reducing sugar, and total sugar (T1). T11 ZnSO4-4 percent +Boron-2 percent had the highest Total soluble solid (0Brix) (10.66), Ascorbic acid (mg / 100 g) (218.05), Specific graviity (g/cm3) (0.98), acidity (0.37), non-reducing sugar (2.13), reducing sugar (5.14), and total sugar (7.31), followed by T11 ZnSO4-4 percent +Boron-2 percent, T10 Boron-4 percent Treatment T1 Control had the lowest levels of total soluble solid (0Brix) (8.30), ascorbic acid (mg / 100 g) (165.30), specific graviity (g/cm3) (0.97), acidity (0.56), non-reducing sugar (3.66), reducing sugar (2.64), and total sugar (6.29). Total soluble solid (0Brix), Ascorbic acid (mg / 100 g), Specific graviity (g/cm3), Acidity, non-reducing sugar, reducing sugar, and total sugar vover control were all considerably superior (T1). The increase in non-reducing sugar and total sugar with zinc sulphate alone or in combination with other nutrients could be due to a faster rate of photosynthesis, while the perceptible increase in sugar content from zinc sulphate foliar feeding could be due to active tryptophan synthesis in the presence of zi the precursor of auxin, which promotes a rise in the rate of chlorophyll synthesis, which in turn accelerates photosynthetic activity, resulting in more sugars being deposited in fruits (Skoog 1940) [12]. These findings are consistent with those of Rawat *et al.* (2010) [1].

Table 2: Effect of different levels micronutrients $ZnSO_4$, $FeSO_4$ and Boron on growth, yield and quality of Guava (*Psidium guajava* L.)

Treatment symbols	Treatments combination	Plant height (m)	Number of primary branches per plant	Plant spread (m)		Days required for flowering	Days required from flower to fruit set	Days required from fruit set to maturity	Number of flower per plant	Number of fruit per plant	Fruit weight (g)	Fruit yield per tree (kg)	Fruit polar diameter (cm)
				East – West	North – South								
T_1	Control (RDF)	4.22	4.51	4.38	4.21	46.84	36.70	144.26	170.26	158.48	138.36	21.93	6.22
T_2	ZnSO4-2%	4.64	5.24	5.23	5.36	40.26	33.43	140.44	198.60	180.43	174.40	31.47	8.55
T_3	ZnSO4-4%	5.34	5.81	4.39	5.68	39.39	34.33	138.52	197.38	179.29	165.36	29.65	8.18
T_4	ZnSO4-6%	5.22	5.41	5.33	5.44	38.37	32.72	140.39	205.37	198.27	160.35	31.79	7.67
T_5	FeSO4-2%	5.85	5.75	5.18	5.81	36.43	33.42	138.33	210.33	201.30	175.75	35.38	8.19
T_6	FeSO4-4%	5.20	5.83	5.77	4.62	35.71	30.48	137.48	204.41	190.57	180.29	34.36	8.44
T_7	FeSO4-6%	5.74	5.58	5.41	5.44	38.40	35.64	140.20	201.25	197.32	165.50	32.66	7.82
T_8	Boron -2%	5.34	5.77	5.74	6.09	37.37	32.47	135.75	211.51	208.52	182.30	38.01	8.25
T_9	Boron -3%	5.32	6.31	5.61	5.47	40.22	32.45	132.45	214.32	206.17	190.76	39.33	8.33
T_{10}	Boron-4%+FeSO4-4%	5.80	7.38	6.23	6.31	35.44	31.38	130.48	220.47	214.45	194.38	41.68	8.44
T_{11}	ZnSO4-4%+Boron-2%	6.32	8.17	6.40	6.41	33.58	30.26	129.70	224.25	218.21	204.31	44.58	8.55
T_{12}	ZnSO4+FeSO4-6%+Boron-4%	6.45	8.40	6.81	6.71	32.71	28.70	127.40	230.32	227.37	206.36	46.92	9.12
	F-Test	S	S	S	S	S	S	S	S	S	S	S	S
	C.D at 0.5%	0.233	0.231	0.368	0.375	0.221	0.331	0.231	0.193	0.516	0.228	0.117	0.190
	S.Ed. (+)	0.113	0.111	0.178	0.181	0.107	0.160	0.079	0.093	0.249	0.110	0.057	0.092

Table 3: Effect of different levels micronutrients $ZnSO_4$, $FeSO_4$ and Boron on growth, yield and quality of Guava (*Psidium guajava* L.)

Treatment symbols	Treatments combination	Fruit radial diameter (cm)	Total soluble solid (^{0}Brix)	Ascorbic acid (mg / 100 g)	Specific graviity (g/cm^3)	Acidity	Non-reducing sugar	Reducing sugar	Total sugar
T_1	Control (RDF)	7.32	8.30	165.30	0.48	0.56	3.66	2.64	6.29
T_2	ZnSO4-2%	8.58	9.47	188.30	0.75	0.47	2.39	4.29	6.68
T_3	ZnSO4-4%	7.77	9.31	180.25	0.81	0.48	2.72	4.78	7.07
T_4	ZnSO4-6%	8.26	8.91	175.64	0.73	0.49	2.70	4.32	7.02
T_5	FeSO4-2%	8.48	9.26	183.53	0.85	0.51	2.40	4.80	7.20
T_6	FeSO4-4%	8.26	10.16	201.40	0.81	0.51	2.64	4.37	7.01
T_7	FeSO4-6%	8.39	9.26	172.58	0.88	0.47	2.41	4.50	6.91
T_8	Boron -2%	8.83	9.80	205.64	0.85	0.48	2.38	3.93	6.31
T_9	Boron -3%	8.72	10.43	210.30	0.83	0.47	2.23	4.36	6.59
T_{10}	Boron-4%+FeSO4-4%	8.94	10.49	213.38	0.89	0.40	2.25	4.70	6.96
T_{11}	ZnSO4-4%+Boron-2%	8.74	10.78	227.71	0.98	0.39	2.28	5.02	7.31
T_{12}	ZnSO4+FeSO4-6%+Boron-4%	9.23	10.66	218.05	0.97	0.37	2.13	5.14	7.27
	F-Test	S	S	S	S	S	S	S	S
	C.D at 0.5%	0.335	0.259	0.627	0.051	0.026	0.359	0.249	0.353
	S.Ed. (+)	0.161	0.125	0.303	0.025	0.012	0.173	0.120	0.170

Conclusion

According to the findings of this study, soil applications of ZnSO4 (2, 4 and 6 percent), FeSO4 (2, 4 and 6 percent), and Boron (2, 3 and 4 percent) with various treatment levels are most suited and advantageous for guava fruit plant growth, yield, and quality. In terms of vegetative growth, fruit yield, and quality criteria of Guava, T12 ZnSO4+FeSO4-6% +Boron-4% and T11 ZnSO4-4 percent +Boron-2 percent were shown to be the best (*Psidium guajava* L.).

Acknowledgement

The author conveys their thanks to the staff of Horticulture department Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (U.P) India for their colossal assistance, without which the trial would not have been successful.

Conflict of Interest

As a Corresponding Author, I Poonam kumari, confirm that none of the others have any conflicts of interest associated with this publication.

References

1. Bagali AN, Hulmani NC, Sulikeri GS. Effect of foliar application of zinc, magnesium and boron on growth and yield of guava (*Psidium guajava* L.) Cv. Sardar. Karnataka Journal of Agricultural Sciences 1993;6(2):137-141.
2. Chaddha KL. Hand Book of Horticulture, ICAR, New Delhi-110012 2007, 189.
3. Dhakar Dinesh, Barholia AK, Jatav Rajesh. Effect of Phosphorus and Zinc Sulphate on Yield Attributes and Quality of Guava (*Psidium guajava* L.) cv. Gwalior 27. Int. J Curr. Microbiol. App. Sci 2017;4:16-24.
4. Gaur Brijesh, Beer Karma, Tejraj Singh Hada*, Kanth Neeharika, Syamal MM. Studies on the effect of foliar application of nutrients and GA3 on fruit yield and quality of winter season guava. An International Quarterly Journal of Environmental Sciences 2014;6:479-483.
5. Jawanda JS. Zinc deficiency of citrus. A review. Punjab Hort. J 1966;6:88-103.
6. Manchanda HR. Chemical composition of sweet orange leaves (Citrus sinensis (L.) Osbeck) as affected by foliar application variety Pineapple. Indian Journal of Horticulture 1974;31(1):34-37.
7. Rajkumar Tiwari JP, Shant lal. Effect of foliar application of zinc and boron on fruit yield and quality of winter season guava (*Psidium guajava*) cv. Pant Prabhat. Annals Agri. Bio Research 2014;19(1):105-108.
8. Rathore DS, Singh RN. Yield pattern in tree cropping patter of guava (*Psidium guajava* L.). Indian Journal of Horticulture 1976;33:7-13.
9. Rawat V, Tomar YK, Rawat JMS. Influence of foliar application micronutrients on the fruit quality of guava Cv. Lucknow-49. J Hill Agr 2010;1(1):63-66.
10. Razzaq K, Khan AS, Malik AU, Shahid M, Ullah S. Foliar application of zinc influences the leaf mineral status, vegetative and reproductive growth, yield and fruit quality of „kinnow‟ mandarin. Journal of Plant Nutrition 2013;36(10):1479-1495.
11. Saxena M, Gandhi CP. Indian Horticulture Database, National Horticulture Board, Gurgaon. Deptt. of Agri. & cooperation, Govt. of India 2014, 76-83.
12. Skoog F. Zinc-auxin in plant growth. Hort Abst 1940;11:332.
13. Thiruppathi M. Effect of Foliar Application of Micronutrients and PGR's on Yield and Growth Characteristics of Guava (*Psidium guajava* L.) cv. Banarasi. Int. J Curr. Microbiol App. Sci 2020;9(8):1486-1490.
14. Zagade PM, Munde GR, Sajana S. Effect of Foliar Application of Micronutrients on Yield and Quality of Guava (*Psidium guajava* L.) cv. Sardar. Int. J Curr. Microbiol. App. Sci Special 2018;6:1733-1737.