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Original Research Article

Influence of Foliar Application of Urea, Potassium sulphate and Borax on the Fruit Quality of Guava

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A B S T R A C T

The experiment was carried out during of two successive years i.e. 2014 and 2015 on guava c.v. G–27 to improve the quality of guava by foliar application of Urea, Potassium sulphate and Borax at different concentration. Pulp weight, TSS, reducing sugar, non-reducing sugar, total sugar and ascorbic acid significantly improved whereas significantly reduction in acidity, seed weight and seed pulp ratio were exhibited with the foliar application of urea at 2%, Potassium sulphate at 0.8% and Borax at 0.75% concentration.

Keywords

Guava, foliar application of urea, potassium sulphate, borax

Introduction

Fruits are nature's gift to mankind. These are not only delicious and refreshing but is also important fruit for processing industry for preparing many kinds of excellent products like jelly, jam, canned fruit product, fruit butter, cheese and guava nector. It is a cheap source of vitamin C and pectin. Foliar feeding of nutrients to fruit plants has gained much importance in recent years which is quite economical and obviously an ideal way of evading the problems of nutrients availability and supplementing the fertilizers to the soil.

India is the leading producer of guava in the world. The total area under guava cultivation and production of guava in India is about 2.68 lakh hectares and 36,67,900 MT, respectively. The productivity of guava in India is 13.7 mt/ha. The total area and production of guava in Madhya Pradesh is 22.5 thousands hectares and 8.41 Lakh MT, respectively. Madhya Pradesh ranks first in productivity with 37.6 Mt/ha. Guava shares 4.5 per cent of area and 3.3 per cent of production among fruit crops in India Madhya Pradesh ranks 1st in productivity with 29 t/ha. Guava can be grown profitability in central and north Gujarat of late it is becoming inferior in qualitative characters and as such new variety or cultivar like 'Gwalior-27' is introduced. Micronutrients like Fe, Zn, B, Cu, Mn Mo and Cl plays a vital role in plants.

Materials and Methods

A field experiments was carried out during of 2014 and 2015 at College of Agriculture farm, Gwalior. The soil of the experimental

field was sandy clay loam in texture, neutral in reaction (pH 7.9) and low in available N (189.5kg/ha), medium in available P (17 kg/ha) with low organic carbon (0.43%) but high in available K (238 kg/ha). The experiment was laid out in factorial RBD with three replications. The treatment combinations comprised three Urea levels (Urea 2%, Urea 1% and 0%), three Potassium sulphate (Potassium sulphate 1%, 0.5% and 0%) and Borax levels (Borax 0.75%, 0.5% and 0%). Quality parameters were estimated as; the weight of pulp and seeds was measured by using electronic top pan balance (Model Z -400). Total soluble solids (TSS) was measured by hand Refractometer and values were corrected at 20°e. Acidity was determined by titrating the fruit pulp against 0.5 N NaOH and expressed as % malic acid. Ascorbic acid was analyzed according to the method detailed by Ranganna (2004) and expressed as vitamin C mg/ 1*00* g. Similarly, soluble sugars were determined by the method of Mc Cready *et al.,* (1950). The statistical analyses of data were carried out as per the method prescribed by Panse and Sukhatme (1978).

Results and Discussion

Effect of Urea

The physiochemical parameters of guava fruits were significantly improved by foliar feeding of different concentration of Urea. The increased pulp weight, TSS, reducing sugar, non-reducing sugar, total sugar, acid: sugar and ascorbic acid content of guava were significantly recorded under the treatment U_2 (Urea @ 2%), while minimum specific gravity, seed weight, seed: pulp ratio and acidity were recorded under the treatment U_2 (Urea @ 2%). Whereas, maximum specific gravity, seed weight seed: pulp ratio and acidity were recorded under the control. The physical characteristics of fruit is an expression of the plant's vegetative activity, it may be presumed that the Urea at optimum concentration leads to increase the shoot and leaf development that is ultimately capable of manufacturing greater amount of food materials and the same when translocated into the fruit bearing areas leading to enhancement in pulp weight of the fruits. The increase pulp weight may be due to enhanced synthesis of metabolites, increased absorption of water and mobilization of sugars and minerals in the expended cells and intercellular spaces of the mesocarp. Increase in TSS might be due to spray of Urea which helps in sugar transport ultimate accumulation of more sugars in fruits. Its action on converting complex substances into simple ones, which enhances the metabolic activity in fruits. Increasing total sugar is due to either speedily converted into sugars and their derivatives by reactions involving reverse glycolytic pathways or might have been used in respiration or both. The present results are in conformity Meena *et al.,* (2005), Dutta *et al.,* (2007), Kundu *et al.,* (2007) Jat and Kacha (2014), Parmar *et al.,* (2014) and Jatav *et al.,* (2016).

Effect of potassium sulphate

The different foliar spray of potassium sulphate levels brought about significant influence upon pulp weight, TSS, reducing sugar, non-reducing sugar, total sugar, acid: sugar and ascorbic acid.

The best foliar spray of Potassium sulphate level was application of K_2SO_4 @1% which resulted in higher value of pulp weight, TSS, reducing sugar, non-reducing sugar, total sugar, acid: sugar and ascorbic acid. This potassium sulphate level proved significantly superior to the remaining Potassium sulphate level.

Table.1 Influence of foliar application of Urea, Potassium sulphate and Borax on Physical parameters of Guava (Two years pooled data)

Treatments	Fruit yield (kg)	Seed weight (g)	Pulp weight (g)	Seed Pulp Ratio	Specific gravity
Urea					
Urea at 0.0%(U_o)	51.46	6.229	194.082	0.03325	1.0560
Urea at 1%(U_1)	56.23	6.269	204.809	0.03094	1.0526
Urea at 2%(U_2)	69.67	6.308	234.645	0.02707	1.0564
SE (m)±	**0.95**	**0.020**	**2.766**	**0.00043**	**0.0011**
CD (5%)	**2.68**	**0.057**	**7.785**	**0.00120**	**0.0030**
Potassium sulphate					
K_2SO_4 at 0% (K_0)	56.72	6.185	203.104	0.03170	1.0534
K_2SO_4 at 0.5%(K_1)	58.22	6.252	206.713	0.03092	1.0546
K_2SO_4 at 1.0%(K_2)	62.42	6.369	223.719	0.02865	1.0570
SE (m)±	**0.95**	**0.020**	**2.766**	**0.00043**	**0.0011**
CD (5%)	**2.68**	**0.057**	**7.785**	**0.00120**	**NS**
Borax					
Borax at 0% (B_0)	55.60	6.244	199.689	0.03252	1.0543
Borax at 0.5% (B_1)	56.90	6.269	205.639	0.03105	1.0548
Borax at 0.75% (B_2)	64.86	6.293	228.209	0.02770	1.0558
SE (m)±	**0.95**	**0.020**	**2.766**	**0.00043**	**0.0011**
CD (5%)	**2.68**	**NS**	**7.785**	**0.00120**	**NS**

Table.2 Influence of foliar application of Urea, Potassium sulphate and Borax on Chemical parameters of Guava (Two years pooled data)

Treatments	Total soluble solid (TSS) (%)	Ascorbic acid	Reducing Sugar	Non Reducing Sugar	Total Sugar	Acidity (%)
Urea						
Urea at 0.0%(U_o)	6.30	5.23	4.461	3.249	7.711	0.354
Urea at 1%(U_1)	6.67	5.42	4.554	3.328	7.883	0.314
Urea at 2%(U_2)	8.10	6.28	4.700	3.447	8.146	0.299
SE (m)±	**0.03**	**0.03**	**0.035**	**0.028**	**0.056**	**0.002**
CD (5%)	**0.07**	**0.08**	**0.099**	**0.080**	**0.157**	**0.006**
Potasium sulphate						
K_2SO_4 at 0% (K_0)	6.95	5.57	4.428	3.256	7.684	0.339
K_2SO_4 at 0.5%(K_1)	7.01	5.61	4.541	3.334	7.875	0.322
K_2SO_4 at 1.0%(K_2)	7.11	5.74	4.746	3.435	8.181	0.307
SE (m)±	**0.03**	**0.03**	**0.035**	**0.028**	**0.056**	**0.002**
CD (5%)	**0.07**	**0.08**	**0.099**	**0.080**	**0.157**	**0.006**
Borax						
Borax at 0% (B_0)	6.86	5.49	4.352	3.201	7.553	0.352
Borax at 0.5% (B_1)	6.97	5.59	4.553	3.321	7.874	0.321
Borax at 0.75% (B_2)	7.24	5.84	4.810	3.503	8.313	0.295
SE (m)±	**0.03**	**0.03**	**0.035**	**0.028**	**0.056**	**0.002**
CD (5%)	**0.07**	**0.08**	**0.099**	**0.080**	**0.157**	**0.006**

However the second best Potassium sulphate level was K_2SO_4 @ 0.5% with respect to all these characters. Whereas, maximum seed weight seed: pulp ratio and acidity were recorded under the control (K_2SO_4 @ 0.0%).

Potassium is attributed to translocation of photosynthates, which might have led to increased growth and better quality of fruit. Potassium has a prominent role in translocation of photo-assimilates; sugars and other soluble solids which are responsible for increased TSS. Lower acidity in fruits results due to higher accumulation of sugars, better translocation of sugars into fruit tissues and conversion of organic acids into sugars. These findings supported previously by Rawat *et al.*, (2010), Yadav *et al.,* (2011), Trivedi *et al.,* (2012) and Manivannan *et al.*, (2015).

Effect of Borax

The physiochemical parameters of the guava plant were significantly influenced by the different concentration of Borax over the control. The mean maximum pulp weight, TSS, reducing sugar, non-reducing sugar, total sugar, acid: sugar and ascorbic acid of guava were recorded under B_2 (Borax @ 0.75%), which was superior with other treatments. maximum seed weight, seed: pulp ratio and acidity were recorded under the Borax @ 0.0%.

Increase in pulp weight might be that boron helps in active enzymatic reaction like transformation of carbohydrates, activity of hexokinase and formation of cellulose. Acidity present was reduced with Borax treated fruits which might be due to early ripening induced by this treatment during which degradation of acid might have occurred. It also appears that total soluble solids increased at the expense of acidity under these fruits. These results are in conformity with those reported by Singh *et al.*, (2010), Yadav *et al.*, (2011), Gaur brijesh *et al.*, (2014) and Meena *et al.*, (2014).

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