STUDIES ON THE EFFECT OF FOLIAR APPLICATION OF NUTRIENTS AND GA₃ ON FRUIT YIELD AND QUALITY OF WINTER SEASON GUAVA

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KEYWORDS

Borax
Guava
Total sugar
Acidity
Fruit retention

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ABSTRACT

The present investigation entitled “studies on the effect of foliar application of nutrients and GA3 on fruit yield and quality of winter season guava” was carried out in the Fruit Research Farm, Horticulture Unit, B.H.U., Varanasi, UP during the year 2010-2011. The experiment was laid out in Randomized Block Design with eleven treatment and replication thrice with a unit of one plant in each replication of a treatment and results shows that the maximum fruit retention (57.27%), minimum fruit drop (42.43), the maximum fruit length (6.07cm) width (5.92cm) and fruit weight (98.48g) were recorded with Borax (0.4%) application which was closely followed by higher concentration of Zinc sulphate (0.8%). Significantly maximum yield (48.63kg/tree) was recorded with Boron 0.4 per cent which was at par with Zinc sulphate 0.8 per cent, Boron 0.2 per cent and Potassium sulphate 2 per cent. Total soluble Solids (11.70%) was maximum with minimum acidity (0.30%) and higher total sugar were recorded with foliar application of Borax 0.4 per cent along with highest ascorbic acid content of guava fruit. Foliar spray of GA3 50ppm caused 45.75% fruit set, 39.87% fruit retention. Hence, it can be concluded that foliar application of borax 0.4 per cent and GA3 50ppm can be recommended to guava grower to obtaining better yield and quality of winter season guava fruit.

INTRODUCTION

Guava (Psidium guajava L.), the apple of the tropics, is one of the most popular fruits grown in tropical, sub-tropical and some parts of arid regions of India. Guava is an evergreen, shallow-rooted shrubs or small tree 9 m tall with spreading branches. The bark is smooth, mottled green or reddish brown and peels off in thin flakes to reveal the attractive “bony” aspect of its trunk. Fruits may be round, ovoid or pear-shaped, 2 - 4 inches long, and have 4 or 5 protruding floral remnants (sepals) at the apex.

The fruit (Berry) is an excellent source of vitamin C (210-305mg / 100g fruit pulp) and pectin (0.5-1.8%) but has low energy (66cal /100g). The ripe fruits contain 12.3-26.3% dry matter, 77.9-86.9% moisture, 0.51-1.02% ash, 0.10-0.70% crude fat, 0.82-1.45% crude protein and 2.0-7.2% crude fiber. The fruit is also rich in minerals like Phosphorus (22.5-40.0mg / 100g pulp), Calcium (10.0-30.0mg / 100g pulp) and Iron (0.60-1.39mg / 100g pulp) as well as vitamins like Niacin (0.20-2.32mg / 100g pulp), Panthotenic acid, Thiamine (0.03-0.07mg / 100g pulp), Riboflavin (0.02-0.04 mg / 100g pulp) and vitamin--“A” (Mitra and Bose, 2001). Yadav (2011) studied that with the spray of micronutrients and plant growth regulators the physical, chemical and yield parameters of the guava fruit were improved.

In subtropical climate, there are three distinct periods of growth and fruiting. These three distinct periods are, Ambe bahar- February to March flowering and fruit ripens in July- August, Mrig bahar- June to July flowering and fruit ripens October to December and Hasta bahar- October to November flowering and fruit ripens in February to April (Shukla et al., 2008). The foliar application of nutrients and GA3 play vital role in improving the quality and comparatively more effective for rapid recovery of plants under high pH condition. Most of micronutrients are rendered unavailable at high pH condition. The foliar feeding of fruit trees has gained much importance in recent years, as nutrient applied through soil are needed in higher quantities because some portion leaches down and some portion become unavailable to the plant due to soil complex reaction. Thus keeping above facts in view the present investigation was undertaken with objectives such as to see the influences of micronutrients and GA3 on flowering and fruiting of guava fruits, to find out the effects of micronutrient and GA3 on yield of guava fruits and to study the effects micronutrients and GA3 on the quality of guava fruits.

MATERIALS AND METHODS

The present investigation entitled “Studies on the effect of foliar application of nutrients and GA3 on fruit yield and quality of winter season guava” was carried out in the Fruit Research Farm, Horticulture Unit, B.H.U., Varanasi, U.P. during the year 2010-2011.

Selection of variety

Guava variety L-49 also known as sardar guava was selected for the present
study. This variety was evolved through selection from open pollinated seedlings of Allahabad safeda at Pune (MH) and also known as Sardar guava. It is Semi dwarf 2.3 to 3.4 meter in height, heavy branching type with flat crown, leaves are large 12.8 to 13.2cm long, 6.8cm broad, elliptic-ovate to oblong in shape. Fruit is roundish ovate in shape, skin colour promise yellow with occasional red rot on the skin. The taste is good and keeping quality is excellent.

The investigation was conducted on 6 years old guava plants planted at 6 × 6m apart under square system of planting. In order to assess the effects of various treatments, all the plants were subjected to uniform cultural practice during the period of experimentation.

**Experimental details**

The experiment was laid out in Randomized Block Design with three replications with a unit of one plant in each replication of a treatment.

<table>
<thead>
<tr>
<th>Abbreviation of treatment</th>
<th>Treatment</th>
<th>Strength / Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>Zinc sulphate</td>
<td>0.40%</td>
</tr>
<tr>
<td>T₂</td>
<td>Zinc sulphate</td>
<td>0.80%</td>
</tr>
<tr>
<td>T₃</td>
<td>Borax</td>
<td>0.20%</td>
</tr>
<tr>
<td>T₄</td>
<td>Borax</td>
<td>0.40%</td>
</tr>
<tr>
<td>T₅</td>
<td>Calcium Nitrate</td>
<td>0.40%</td>
</tr>
<tr>
<td>T₆</td>
<td>Calcium Nitrate</td>
<td>0.80%</td>
</tr>
<tr>
<td>T₇</td>
<td>GA₃</td>
<td>50ppm</td>
</tr>
<tr>
<td>T₈</td>
<td>GA₃</td>
<td>100ppm</td>
</tr>
<tr>
<td>T₉</td>
<td>Potassium sulphate</td>
<td>1.00%</td>
</tr>
<tr>
<td>T₁₀</td>
<td>Potassium sulphate</td>
<td>2.00%</td>
</tr>
<tr>
<td>T₁₁</td>
<td>Distilled water</td>
<td>Control</td>
</tr>
</tbody>
</table>

Where: Zinc sulphate (ZnSO₄), Borax (Na₂B₄O₇.10H₂O), Calcium Nitrate (Ca(NO₃)₂), Potassium sulphate (K₂SO₄)

**Preparation and Method of Application of Nutrient Solution**

The requirement of spray liquid for spraying a tree was assessed to be two liters. The quantity of micronutrient at the rate of 1g/L was used to make the solution concentration of 0.1 per cent. Similarly Zinc sulphate at the rate of 4g per liter and 8g /L make a solution of 0.4 per cent and 0.8 per cent, respectively.

Observations on various characters of plant i.e. fruit set, fruit retention, fruit drop and yield worked out as per standard procedures.

Observations recorded

The observation were recorded on fruit retention (%), fruit drop (%), fruit length (cm) fruit width (cm) fruit weight (g), fruit yield (kg/tree), TSS, Acidity (%), Sugar (%) and ascorbic acid mg / 100g of pulp.

**Statistical analysis**

Panse and Sukhatme (1985) suggested the statistical analysis of the data obtained in the different set of experiment. The critical difference (C.D.) was calculated to assess the significance of difference between treatments and the results were found significant through ‘F’ test. CD at 5 % level of significance was determined.

**RESULTS AND DISCUSSION**

**Fruit retention and fruit drop (%)**

Fruit retention and fruit drop percentage was influenced significantly with different nutrients as compared to control. The maximum fruit retention (57.27%) and minimum fruit drop (42.43) was recorded by foliar application of Borax (0.4%) which was followed with lower concentration of Borax (0.2%) and ZnSO₄ (0.8%) and decreased in fruit drop. Borax response was more positive due to boron which play an important role in translocation of carbohydrates, auxin synthesis and increased pollen viability and fertilization.

The maximum fruit drop was recorded under control. Similar result were also observed by Sinha et al. (1999) and Sarkar et al. (1984) in litchi, Singh and Vashistha (1997) is ber, Kundu and Mitra (1999) in guava

**Fruit Length, Width and Weight**

It has been observed that foliar application of different treatments proved beneficial in increasing the length, width and weight of Fruit in comparison to control. The maximum fruit length (6.07cm) width (5.92cm) and fruit weight (98.48g) were recorded with Borax (0.4%) T₄ which was closely followed by higher concentration of Zinc sulphate (0.8%) T₁. The minimum fruit length, width and weight were recorded under control. This increase in length and width of guava fruit may be that mineral nutrients (Boron and Zinc) appear to have direct role in hastening the process of cell division and cell elongation due to which size and weight would have improved. These results are in conformity with those reported by Arora and Singh (1972), Rajput and Chand (1976). They reported that boron spray increase fruit weight, length and diameter of guava fruit cv. Allahabad Safeda.

**Fruit yield kg tree⁻¹**

The fruit yield per plant was influenced by different treatment as compared to control. Significantly maximum yield (48.63 Kg tree⁻¹) was recorded with Boron 0.4 per cent (T₁) which was at par with Zinc sulphate 0.8 per cent (T₄), Boron 0.2 per cent and Potassium sulphate 2 per cent. This was due to fact that borax spraying provides boron to the plant. It was believed that boron brings about inactivation of superfluous growth hormone by formation of complex compound. The importance of this element is improving the physiological activities of plant had been released but it is not clear whether it influenced directly or indirectly. These activities improve width length of fruit which ultimately increase the yield of fruit. These results are in close conformity with the findings of Brahmachari and Kumar (1997) in guava, Singh et al. (1993) in guava cv. L-49, Rath et al. (1980) in mango, Arora and Singh (1970) and Kundu and Mitra (1999) in guava.

**Total Soluble Solids (TSS°B)**

The maximum total soluble Solids (11.70°B) were recorded with foliar application of Borax 0.4 per cent followed by Zinc
sulphate 0.8 per cent. Increase in total soluble solids might be that boron helps in transmembrane sugar transport, which may be the possible cause for improvement in boron sprayed trees. A notable characteristics of Borax is that it directly affect photosynthesis activity of plants (Lal and Patil, 1948). These result are in close conformity with Arora and Singh (1972) and Chaitanya et al. (1997) in guava, Singh and Vashistha (1997) in ber and Singh et al. (2004) in guava.

**Acidity (%)**

The present study indicates that the acidity content guava fruit was significantly decreased by different treatment. Minimum acidity (0.30%) was found in Borax 0.4 per cent (T1) followed by zinc sulphate 0.8 per cent while it was maximum (0.48%) in control (T11). 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. The acid under the influence of borax might have been fastly converted into sugars and their derivatives by the reaction involving the reversal of glycolytic path way or be used in respiration as both similarity. These results are close conformity with Rajput and Chand (1976); Ingle et al. (1993) and Sharma et al. (2013) in guava, Gohlanl et al. (2012) and Mishra and Khan (1981) in litchi.

**Sugars (%)**

The maximum reducing sugar, non-reducing sugar and total sugar was recorded with foliar application of Borax 0.4 per cent followed by Zinc sulphate 0.8 per cent, while it was minimum under control. These results are in close conformity with findings of Stamper et al. (1999) and Rajput and Chand (1976) in guava fruits.

**Ascorbic acid (mg / 100 g of pulp)**

The maximum ascorbic acid 172.00 mg / 100 g of pulp was recorded with the higher concentration of Borax 0.4 per cent that was supported by Chandra et al. (1994).

**REFERENCE**


