

# BIO-CHEMICAL EVALUATION OF MANGO (*MANGIFERA INDICA* L.) CV. KESAR AT DIFFERENT LOCATIONS IN SAURASHTRA REGION (GUJARAT)

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## ABSTRACT

The present investigation entitled "Bio-chemical evaluation of mango (*Mangifera indica* L.) cv. Kesar at Saurashtra region" was carried out at Department of Horticulture and Food Testing Laboratory, College of Agriculture, Junagadh Agricultural University, Junagadh during the year 2013-14. Nine different locations from Saurashtra region were selected for this experiment viz., Una, Mendarda, Bheshan, Junagadh (Sakkarbaug), Talala, Vanthali, Dhari, Aadityana and Ghogha. The harvested sample fruits from different locations were cleaned, ripened at room temperature in paper boxes, than used for further bio-chemical evaluation. The experiment was conducted in Completely Randomized Design. In the experiment, comparatively highest results were found for most of biochemical parameters in favor of treatment L<sub>5</sub> (Talala) viz., total sugar content (117.78 mg/g), non-reducing sugar content (87.33 mg/g), lowest acidity (0.21 %), lowest ascorbic acid content (42.46 mg/100g pulp) Whereas in treatment L<sub>1</sub> (Una) higher reducing sugar content (26.85 mg/g) was found. The myth has been proven to be real from this scientific study. From the conducted experiment over nine different locations, it can be concluded that the Talala is more congenial for mango cv. Kesar or it can be truly say that mango orchards located at/near Talala region produces better quality fruits as compared to others.

## INTRODUCTION

The mango (*Mangifera indica* L.) (2n = 2x = 40) is one of the choicest fruit of tropical and sub-tropical region of the world, especially in Asia. Its population and importance can easily be realized by the fact that it is often referred as "King of Fruits in the Tropical World" (Singh, 1960). Mango is popular due to its excellent flavour, delicious taste, delicate fragrance, attractive colour and nutritive value which make it rank among the best fruits of world.

Kesar is the most popular cultivar grown around Gujarat state. Kesar is characterized by its golden color with green overtones. The fruit is slightly smaller compared to the Alphonso variety. The fruits are medium to large sized (250-325 g per fruit), oblong in shape with an attractive light apricot-yellow color. The taste is very good and sugar/acid blend is excellent. The cultivar is free from spongy tissue disorder and malformation. Tree bears excellent quality fruits with saffron coloured pulp when ripe and delicious. Excellent for table purpose fruits, medium sized with fiber-less stone. The 'Kesar' fruit has 18 to 22 percent T.S.S., 0.25 to 0.29 per cent acidity and 10.5 to 12.0 per cent total sugars with storability of 15 to 20 days (Singh, 1960 and Chovatia, 1995).

Gir Kesar mango is cultivated in the area of Junagadh district particularly Gir territory including Gir Sanctuary and National park and other adjoining tehsils like Dhari and Khambha of

Amreli district near to Gir territory. Junagadh district lies between 20°44' North to 21°40' North latitude and 69°40' East to 71°50' East longitude. Whereas Amreli district lies between 20°45' East to 22°25' East longitude and 70°30' North to 71°75' North latitude (*Geographical Indications Journal-2011*).

Ample information on the effect of climatic and soil conditions on quality of mango fruit is available elsewhere. A very little work has been done on the mango crop cv. Kesar in Gujarat in general and in Saurashtra in particular to study the adaptability of mango cv. Kesar into different locations. In view of above a field study on the effect of location on the quality of mango fruits cv. Kesar was undertaken during period of May-July of year 2014 (Summer and *Kharif* season) taking nine Kesar mango producing tehsils of Saurashtra as Una, Mendarda, Bheshan, Junagadh, Talala, Vanthali, Dhari, Aadityana and Ghogha.

## MATERIALS AND METHODS

An investigation was carried out to find out "Bio-chemical evaluation of mango (*Mangifera indica* L.) cv. Kesar at Saurashtra region". Nine different locations from Saurashtra region were selected for this experiment. The selection of locations was based on popularity at local markets and production pocket of this cultivar. Mango orchards, selected

as locations were ranged from 18 to 26 years. Treatments can be described as: L<sub>1</sub> (Una), L<sub>2</sub> (Mendarda), L<sub>3</sub> (Bheshan), L<sub>4</sub> (Sakkarbaug, Junagadh), L<sub>5</sub> (Talala), L<sub>6</sub> (Vanthali), L<sub>7</sub> (Dhari), L<sub>8</sub> (Aadityana) and L<sub>9</sub> (Ghogha). The collected sample of about 10kg fruits from each location were further replicated into three different replications. The statistical analysis was done using Completely Randomized Design, described by Panse and Sukhatme (1967). The biochemicals analyzed were; total sugar (Rangana, 1986), reducing and non-reducing sugar (Sadasivam and Manickam, 1999), TSS (hand refractometer), acidity (Rangana, 1986), ascorbic acid (Rangana, 1986) and total carotenoids (Sadasivam and Manickam, 1999).

## RESULTS

Different climatic conditions and soil conditions have deep impact on development of various biochemical properties of cv. Kesar, they are described as below.

### Total sugar

The Table 1 clearly shows that total sugar content (117.78 mg/g) was significantly highest in fruits of treatment L<sub>5</sub> (Talala), which remained at par with treatments L<sub>1</sub> (115.45 mg/g), L<sub>2</sub> (113.17 mg/g) and L<sub>9</sub> (113.10 mg/g). Whereas the lowest total sugar content (102.18 mg/g) was recorded in treatment L<sub>3</sub> (Bheshan).

### Reducing sugar

The data (Table 1) indicated the reducing sugar of fruits significantly influenced by different locations. Among the different locations treatment L<sub>1</sub> (Una) had significantly resulted the higher reducing sugar content in ripe fruits (26.85 mg/g). The treatment L<sub>5</sub> (25.85 mg/g) was remained at par with treatment L<sub>1</sub>. Whereas treatment L<sub>6</sub> (22.66 mg/g) had recorded lowest reducing sugar content.

### Non-reducing sugar

The data on non-reducing sugar are presented in Table 1. Results recorded that significantly the highest non-reducing sugar content was found in treatment L<sub>5</sub> (87.33 mg/g), remained statistically at par with treatment L<sub>2</sub>, L<sub>9</sub>, L<sub>1</sub> and L<sub>8</sub> having values of 84.86, 84.21, 84.17 and 82.30 mg/g, respectively. Whereas minimum non-reducing sugar content (74.76 mg/g) was noted in treatment L<sub>7</sub>.

### Total soluble solids

The perusal of data from Table 1 revealed that the highest content of total soluble solids in fruits was recorded in fruits of treatment L<sub>5</sub> with value of 21.75 % which was also found at par with treatment T<sub>1</sub> (20.66 %), whereas lowest total soluble solids (18.26 %) was recorded in treatment L<sub>3</sub>.

### Acidity

The data regarding acidity content of ripe fruit of Kesar mango are furnished in Table 1. The acidity of ripen fruits significantly affected by different treatments *i.e.* locations of Saurashtra region. The treatments L<sub>1</sub> and L<sub>5</sub> were showed lowest acidity (0.21 %) of fruits, than remained treatments. Whereas highest acidity (0.28 %) was found in treatments L<sub>4</sub> and L<sub>7</sub>.

### Ascorbic acid content

Significantly the lowest ascorbic acid content (42.46 mg/100g pulp) was registered in treatment L<sub>5</sub> (Talala). Treatments L<sub>1</sub> (43.20 mg/100g pulp), L<sub>6</sub> (43.28 mg/100g pulp) and L<sub>8</sub> (43.77 mg/100g pulp) were remained at par with treatment L<sub>5</sub> for ascorbic acid content. Whereas maximum ascorbic acid content (46.36 mg/100g pulp) was found in fruits of treatment L<sub>7</sub> (Table 1).

### Total carotenoids content

The data pertaining to the total carotenoids content are tabulated in Table 1. It clearly indicates that significantly highest total carotenoids content (10.80 mg/100g of pulp) was observed in treatment L<sub>5</sub> (Talala), which was at par with treatment L<sub>1</sub> (10.11 mg/100g of pulp) and the lowest total carotenoids content was found in treatment L<sub>4</sub> (9.24 mg/100g of pulp).

## DISCUSSION

The result shown in Table (Table 1) indicates the values for bio-chemical characters of fruit. The significant higher values were obtained for total sugar content (117.78 and 115.45 mg/g), T.S.S. (21.75 and 20.66%) and total carotenoids (10.80 and 10.11 mg/100g of pulp) in treatments L<sub>5</sub> and L<sub>1</sub>, respectively. The reducing sugars were significantly higher in treatments L<sub>1</sub> and L<sub>5</sub> in value of 26.85 and 25.85mg/g, whereas significantly a higher non-reducing sugar (87.33 mg/g) was noted in L<sub>5</sub>. The lowest significant acidity (0.21 %) was noted in treatments L<sub>5</sub> and L<sub>1</sub>. Significantly the lowest ascorbic acid content (42.46 mg/100g pulp) was recorded in treatment L<sub>5</sub>. Whereas Treatments L<sub>1</sub> (43.20 mg/100g pulp), L<sub>6</sub> (43.28 mg/

**Table 1: Bio-chemical variation in mango cv. Kesar found at different locations**

Treatments	Total sugar (mg/g)	Reducing sugar (mg/g)	Non-reducing sugar (mg/g)	Total soluble solids (%)	Acidity (%)	Ascorbic acid (mg/100g pulp)	Total carotenoids (mg/100g pulp)
L <sub>1</sub>	115.45	26.85	84.17	20.66	0.21	43.20	10.11
L <sub>2</sub>	113.17	23.84	84.86	19.20	0.23	45.70	9.39
L <sub>3</sub>	102.18	23.11	75.11	18.26	0.26	45.67	9.79
L <sub>4</sub>	102.36	23.60	74.82	19.12	0.28	46.02	9.24
L <sub>5</sub>	117.78	25.85	87.33	21.75	0.21	42.46	10.80
L <sub>6</sub>	104.17	22.66	77.43	19.62	0.25	43.28	9.55
L <sub>7</sub>	103.01	24.31	74.76	18.56	0.28	46.36	9.29
L <sub>8</sub>	109.37	22.73	82.30	19.02	0.23	43.77	9.64
L <sub>9</sub>	113.10	24.45	84.21	18.82	0.27	44.17	9.63
S. Em. ±	1.67	0.52	1.76	0.43	0.01	0.84	0.24
C.D. at 5 %	4.95	1.54	5.25	1.28	0.016	2.49	0.73
C.V. %	2.65	3.71	3.8	3.84	3.66	3.26	4.38

100g pulp) and  $L_8$  (43.77 mg/100g pulp) remained at par with treatment  $L_5$ .

Thus it can be said that significantly the better quality of ripe fruits were recorded in treatments  $L_5$ (Talala) in comparison to other locations.

#### Effect of climatic conditions on quality of fruits

In the present study, Kesar fruits of Talala were found to be superior with respect to bio-chemical characters as compare to other locations. The comparatively higher maximum temperature was recorded in Talala and Una locations as compare to other locations of present study as well as lower fruit quality was observed at those locations which having relatively lower maximum temperature during the period from flowering to fruit maturity (January to June) (Dudhat, 1997). These findings are in agreement with findings of Dudhat (1997) in mango, Singh (1960) and Mosqueda *et al.* (1993) in mango, Cooper *et al.* (1963) in citrus, Condit (1950) in fig, and Sulladmth and Rao (1979) in sapota.

The effect of temperature for increasing fruit quality may be explained with reason that the metabolism and composition of fruit are affected by temperature and ultimately release of sugars by hydrolysis of starch. Soule and Hatton (1955) put forth theory that, ascorbic acid is respiratory substance and likely to be respired and utilized. The rise in T.S.S. could be due to the accumulation of sugars as a consequence of starch hydrolysis (Leley *et al.*, 1943).

The variations observed in quality of fruit were also due to atmospheric relative humidity. The comparatively lower humidity was noted in Talala and Una locations as compare to other locations of Saurashtra region like Junagadh, Vanthali and Dhariand it was observed that the locations having high relative humidity were lower in quality (Dudhat, 1997). These findings are in close conformity with those obtained by Dudhat (1997) in mango, Singh (1960) in mango, Cooper *et al.* (1963) in citrus fruit and Condit (1950) in Fig.

The unfavourable effect of relative humidity for fruit characters may be due to the reason that when relative humidity is high, ultimately process of photosynthesis decreases, causing adverse effects on starch formation, thereby reduces the growth and development of fruit and also the fruit quality (Pantastico, 1975).

#### Effect of soil conditions on quality of fruit

The significant variations observed in quality of fruit were due to soil characteristics.

Soil texture has a deep impact on yield and quality on fruit crops. Dudhat (1997) noted lower percentage of total sand (17.90 and 19.57%) and significantly higher percentage of silt (47.19 and 38.20%) in soils of Talala and Una localities as compare to other locations.

In the present study, Talala and Una were found with better Kesar fruit quality, because of soil texture of silty clay loam or silty clay as explained by Dudhat (1997). These findings are in confirmation with observations of EL-Tomi (1953), Carlton

(1948) and Iyengar (1954) in mango.

The results indicated that variation in quality of fruits was due to variation in soil nutrients content. Dudhat (1997) observed significantly higher levels of available nitrogen, available phosphorus, available potassium, organic carbon, magnesium, and iron content at Talala and Una locations as compare to other locations. Sharma (2013) noted enriched FYM condition of soil has deep impact on fruit quality parameters viz., total sugar (%), reducing and non-reducing sugar (%) and TSS (%).

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