

## 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. 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.

**Keywords:** Location effect; Bio-chemical; Variability; Cv. kesar; Saurashtra

### Introduction

The mango (*Mangifera indica L.*) (2n=2 x =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" [1]. 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 bear 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 percent acidity and 10.5 to 12.0 percent total sugars with storability of 15 to 20 days [1,2].

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 [3].

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 under taken 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: L1 (Una), L2 (Mendarda), L3 (Bheshan), L4 (Sakkarbaug, Junagadh), L5 (Talala), L6 (Vanthali), L7 (Dhari), L8 (Aadityana) and L9 (Ghogha). The collected sample of about 10 kg 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. The biochemical analyzed were total sugar, reducing and non-reducing sugar, TSS (hand refractometer), acidity, scorbic acid and total carotenoids were analyzed. [4-7]

### 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 L5 (Talala), which remained at par with treatments L1 (115.45 mg/g), L2

(113.17 mg/g) and L9 (113.10 mg/g). Whereas the lowest total sugar content (102.18 mg/g) was recorded in treatment L3 (Bheshan).

Reducing sugar - The data indicated the reducing sugar of fruits significantly influenced by different locations. Among the different locations treatment L1 (Una) had significantly resulted the higher

reducing sugar content in ripe fruits (26.85 mg/g). The treatment L5 (25.85 mg/g) was remained at par with treatment L1. Whereas treatment L6 (22.66 mg/g) had recorded lowest reducing sugar content. (Table 1)

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

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

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 L5 (87.33 mg/g), remained statistically at par with treatment L2, L9, L1 and L8 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 L7.

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 L5 with value of 21.75% which was also found at par with treatment T1 (20.66%), whereas lowest total soluble solids (18.26%) was recorded in treatment L3.

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 L1 and L5 were showed lowest acidity (0.21%) of fruits, than remained treatments. Whereas highest acidity (0.28%) was found in treatments L4 and L7.

Ascorbic acid content-Significantly the lowest ascorbic acid content (42.46 mg/100 g pulp) was registered in treatment L5 (Talala). Treatments L1 (43.20 mg/100 g pulp), L6 (43.28 mg/100g pulp) and L8 (43.77 mg/100 g pulp) were remained at par with treatment L5 for ascorbic acid content. Whereas maximum ascorbic acid content (46.36 mg/100 g pulp) was found in fruits of treatment L7 (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/100 g of pulp)

was observed in treatment L5 (Talala), which was at par with treatment L1 (10.11 mg/100 g of pulp) and the lowest total carotenoids content was found in treatment L4 (9.24 mg/100 g of pulp).

## Discussion

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 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/100 g of pulp) in treatments L5 and L1, respectively. The reducing sugars were significantly higher in treatments L1 and L5 in value of 26.85 and 25.85 mg/g, whereas significantly a higher non-reducing sugar (87.33 mg/g) was noted in L5. The lowest significant acidity (0.21%) was noted in treatments L5 and L1. Significantly the lowest ascorbic acid content (42.46 mg/100 g pulp) was recorded in treatment L5. Whereas treatments L1 (43.20 mg/100 g pulp), L6 (43.28 mg/100 g pulp) and L8 (43.77 mg/100 g pulp) remained at par with treatment L5.

Thus it can be said that significantly the better quality of ripe fruits were recorded in treatments L5 (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) [8]. These findings are in agreement with findings of Dudhat in mango, Singh and Mosqueda et al. [9] mango, Cooper et al. [10] in citrus, Condit in figure [11], and Sulladmath and Rao [12] in sapota release of sugars by hydrolysis of starch. Soule and Hatton [13] 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 [14].

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 Dhari and it was observed that the locations having high relative humidity were lower in quality [8]. These findings are in close conformity with those obtained by Dudhat [8] in mango, Singh [1] in mango, Cooper et al. [10] in citrus fruit and Condit [11] in figure.

The unfavorable 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 [15].

### 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 [8].

### Conclusion

From the above obtained results it can be concluded that Talala pocket of Saurashtra region produces best quality mango cv. Kesar fruits 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 [7]. These findings are in confirmation with observations of EL-Tomi [15], Carlton [16] and Iyengar [17] in mango.

The results indicated that variation in quality of fruits was due to variation in soil nutrients content. Dudhat [7] 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.

### References

1. Singh LB (1960) The mango: Botany, cultivation and utilization. Leonard hill (book), London. 76-90.
2. Chovatia RS, Usdadia SN, Dhaduk LK, Bimani RA (1995) 'Saurashtrani suprasiddh Kesar kerino itihash'. Kerifal Visheshank-95. Pp. 9-11.
3. Anonymous (2011) Geographical Indications Journal. Govt. of India. New Delhi.
4. Panse VG, Sukhatme PV (1967) Statistical Methods for Agricultural workers. ICAR, New Delhi.
5. Rangana (1986) Biochemical methods.
6. Sadasivam, Manickam (1999) Carotenoids determination by acetone extraction.
7. biochemical methods. Pp. 187-188.
8. Sadasivam, Manickam (1999) Estimation of reducing sugar by DNSA method. Biochemical methods. Pp. 7-8.
9. Dudhat HS (1997) Location effect on the yield and quality of mango fruit (*Mangifera indica*) cv. Kesar. M. Sc. Thesis (unpublished).
10. Mosqueda-Vazquez R, Ireta-Ojeda A, Santos R, De Los (1993) Degree-days and base temperature required for inflorescence and fruit development in mango "Manila". Acta Horticulture 341: 232-239.
11. Cooper WC, Ascension P, Furr JR, Hilgeman RH, Cahon GA et al. (1963) Weather conditions relation to citrus crops. Proc. Amer. Soc. Hort. Sci. 82: 180-2.
12. Condit IJ (1950) Influence of climatic conditions of figure. J Hered 41: 165-168.
13. Sulladmath UV, Rao MM (1979) Studies on effect of season on quality of sapota fruit. J Maha. Agril. Uni. 4: 55-60.
14. Soule MJ, Hatton TT (1955) Determination of maturity of hard green Haden and Zill mangoes. Proc. Fla. Mango forum 16.
15. Leley VK, Narayan N, Darji TA (1943) Biochemical studies in the growth and ripening of the "Alphonso" mango. Indian J Agric. Sci. 13: 291.
16. Pantastico Er B (1975) Postharvest physiology, handling and utilization of tropical and subtropical fruits and vegetables. 25-29.
17. EL-Tomi AL (1953) Subtropical fruit industry in Egypt. Proc. Fla. Hort. Soc. 66: 195.
18. Carlton RA (1948) The use of soil amendments in mango production. Proc. Fla. Mango forum 24.
19. Iyengar HVR (1954) Mango in Telangana. The mango, A Souvenir. 41, Dept. Agric. Hyderabad (India).