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**Gahane KD**

M.Sc. Student, Department of Horticulture. College of Horticulture. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

**Choudhari RJ**

M.Sc. Student, Department of Plant Pathology. College of Horticulture. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

**Tayade SA**

M.Sc. Student, Department of Horticulture. College of Horticulture. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

**Patil SR**

Associate Professor, College of Horticulture. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

## Study of biochemical variability in local mango genotypes for pickle purpose

**Gahane KD, Choudhari RJ, Tayade SA and Patil SR**

**Abstract**

The experiment entitled, "Study of Biochemical Variability in Local Mango Genotypes for Pickle Purpose" was carried out during 2015-2016 on the basis of biochemical and sensory evaluation parameter of fruits. A survey, collection and screening of mango genotypes in Akola, Amravati and Washim districts known of mining of pickle was undertaken for pickle preparation, in order to identify suitable local variety for preparation of quality pickle commercially on adhoc basis. The 50 mango genotypes were collected and evaluated for distinct pickle characters. These genotypes revealed wide variability in physico-chemical parameters of fruit viz., TSS <sup>0</sup>Brix (2.8 to 11.6 <sup>0</sup>Brix), acidity percentage (1.85-6.90%), total sugar percentage (1.08 to 3.06 %), T.S.S. Acidity ratio (0.42 to 2.95), Sugar: acidity ratio (0.42 to 4.10), Vit-C (19.14 to 29.09 mg/100<sup>-1</sup>) and fiber percentage (0.69 to 1.75%). considering unripe fruit should be too acidic for pickle as G-42 recorded (6.71) higher acidity, however it appears inferior for most of rest characters. From overall performance in respect of fiber percent, Vit-C content, titrable acidity, sugar: acid ratio, low T.S.S., total sugar per cent, twenty mango genotypes viz., G-18, G-01, G-42, G-40, G-38, G-29, G-31, G-22, G-39, G-41, G-21, G-04, G-9, G-16, G-44, G-50, G-24, G-26, G-32 and G-36 were identified as promising genotypes. However, among these 50 mango genotypes, in sensory evaluation of mango pickle is observed G-42 and G-41 were found most promising as they having distinct biochemical and sensory evaluation parameter of fruits for preparation of pickle.

**Keywords:** Mango, biochemical, variability, genotypes, pickle

**Introduction**

Mango (*Mangifera indica* L.) is one of the member of the family Anacardiaceae in order Spindles. It is one of the important fruit crop among the tropical and subtropical fruits grown in more than 110 countries of the world. Mango fruit is closely associated with the history of Indian Agriculture and enjoys a royal status in the country. Cultivation of mango in India is very ancient, about 4000 years old. The mango is presumed to be the most commonly eaten fresh fruit worldwide. Mango fruit is recognized as the 'King of fruits' owing to its captivating flavor and irresistible taste and sweetness. Secondly, mango fruit is associated with the common man's life during the different phases right from birth to death Therefore, it rightly designated as the "National fruit" of the country. Mango is highly nutritive, as ripe mango provides 11.8% carbohydrates, 0.3% minerals, 4800 I.U. Vitamin A, 13 mg/100 g Vitamin C and 74 Kcal energy. It is well known that ripe mangoes are excellent table fruit and can also be transformed into a variety of products such as juice, smoothie, jam, squash, canned slices, beverages, fruit bars, nectors, syrups etc. Immature and green mature fruits are also widely used for pickling, chutney and amchur preparation due to the acidic nature. Pickle, in addition to use of the green mangoes pickles, should provide an excellent outlet for the economic utilization of fallen marketable surplus of green mangoes. Pickle is also prepared on large scale in Akola, Amravati and Washim district of Maharashtra. Local mango genotypes are used for pickle preparation. Invariably, under ripe and wind-fallen seedling or country mangoes are utilized for the manufacture of pickle. No particular varieties are in demand for this purpose.

Therefore, considering the need of time and future thrust, it is necessary to screen the suitable mango genotypes for preparation of pickle from raw green mangoes. Till date, nobody has tried to screen local mango genotypes and standardize suitable mango variety for pickle preparation. It is need of time to explore possibility of identification and utilization of available genetic pool of different mango varieties available in Western Vidarbha region of Maharashtra.

**Correspondence****Gahane KD**

M.Sc. Student, Department of Horticulture. College of Horticulture. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

## Materials and Methods

The experiment entitled "Study of Biochemical Variability in Local Mango Genotypes for Pickle Purpose" was carried out by survey and collection of different mango genotypes in Akola, Amravati and Washim districts of Maharashtra and study their morphological and physical characters of fruits in analytical laboratory of Horticulture section, Department of Horticulture, Dr. P.D.K.V., Akola during the year 2015-2016.

- a. **Experiment details:** While screening of local mango genotypes for preparation of pickle, mango fruits were collected during the harvesting season of mango in 2015. Fully developed, mature but unripe fruits were collected as suggested by Wagh (1995) [14]. 5-6 kg (25 No.) of mango fruits per treatment was taken.
- b. **Treatment details:** Different fifty local mango genotypes were collected from various locations of Akola, Amravati and Washim districts for morphological, morphological and physical characters of fruits.

## Results and Discussion

During the course of investigation conducted to explore and evaluate the suitable local mango genotypes for preparing pickle. These are studied in relation to the biochemical and sensory evaluation characters of fruits. The results are presented below under appropriate headings.

1. **T.S.S. (Total soluble solids):** The data on total soluble solids content of raw mango flesh is presented in Table 1. A wide variability observed in total soluble solids content of and it varied from 2.8 °Brix to 11.6 °Brix and mean value was 8.32 °Brix. The fruits of mango genotypes G-9 recorded the highest TSS (11.6 °Brix), However, lowest TSS (2.8 °Brix) was recorded by the genotypes G-42. Unripe mango fruits having lowest/minimum quality of total soluble solid and more acidic character are most suited for pickle formulation. The mango genotypes which are below population mean (less than mean) are considered suitable for pickle. These mango genotypes are *viz* G-1(7.6), G-2(7.7), G-11(7.2), G-12(6.7), G-20(7.4), G-22(7.7), G-24(7.4), G-26(7.5), G-29(7.7), G-32(7.4), G-34(6.8), G-35(7.2), G-36(7.7), G-40(7.9), G-41(4.1), G-42 (8.2), G-44 (4.8), G-47 (7.8), G-48 (7.6), G-49 (7.9) and G-50 (7.3). These results are close similar with Yadav *et al.* (1982) [15] reported desi mango had the lowest T.S.S. (16-18%).
2. **Titration acidity:** The data on acidity content of raw mango flesh is presented in Table 1. The data showed that acidity is varying in between 1.85% to 6.90% with population mean 4.99 per cent. The fruits of mango genotypes G-18 recorded the highest acidity (6.90%), whereas lowest acidity (1.85%) has recorded in the fruits of mango genotype G-48. The mango genotypes which have more acidity than population mean are considered and selected as a superior for preparation of pickle. The superior mango genotypes G-1(6.73%), G-3(5.91%), G-4(5.58%), G-6(5.42%), G-8(5.76%), G-9(5.52%), G-13(6.27%), G-15(6.25%), G-16(5.41%), G-17(5.43%), G-18(6.9%), G-20(5.43%), G-21(5.58%), G-22(6.14%), G-28(5.36%), G-29(6.4%), G-31(6.2%), G-33(5.08%), G-35(5.53%), G-38(6.7%), G-39(6.12%), G-40(6.7%), G-41(6.1%), G-42(6.71%), G-43(5.05%) and G-45(5.91%). The low acidic genotypes (below average) were considered as inferior for this pickle characters. High acid content in the fruit is highly desirable for pickle preparation. Tender or green matured fruits, because of their acidic taste are utilized for culinary purpose as well

as for preparation of amchur, pickle, chutney, (Lal *et al.* 1960; Jain *et al.* 1961; Maitra *et al.* 1974) [4, 3, 7].

3. **Total sugar:** The data on total sugar content of raw mango flesh is presented in Table 1. A wide variability observed in total sugar content of and it varied from 1.08 to 3.06 per cent with population mean in the tune of 2.00 per cent. The fruits of mango genotype G-31 recorded the highest total sugar (3.06%) while the lowest (1.08%) was recorded from the fruits of genotypes G-38. These results are close conformity with Singh (1968) [11] and Uddin *et al.* (2007) [12] recorded the variability for total sugar to the tune of 11.5 to 25 and 12.71 to 20.34% which might be due to genetic difference as well as agro climatic conditions.
4. **TSS: Acid ratio:** The data on TSS: Acid ratio content of raw mango flesh is presented in Table 1. A wide variability observed in TSS: Acid ratio content of and it varied from 0.42 to 2.95 along with 1.57 populations mean. The fruits of mango genotypes G-47 recorded the highest TSS: acidity ratio (2.95) and lowest (0.42) ratio of T.S.S.: Acidity was noticed in genotype G-41. The ratio of T.S.S.: Acidity determines the palatability or the sweetness of the pulp up to a certain extent. Higher ratio indicates lower quality of fruit for preparing pickle such high ratios is due to very low acidity. Among the different genotypes studied the lowest TSS: Acidity ratio (below 1.49) was recorded in fruits of thirty eight mango genotypes *viz.* G-1(1.12), G-2(1.91), G-4(1.82), G-7(1.12), G-8(1.42), G-11(1.46), G-15(1.04), G-16(1.04), G-18(1.37), G-20(1.36), G-22(0.91), G-27(0.90), G-28(0.96), G-29(1.20), G-30(0.97), G-31(1.33), G-32(0.75), G-33(1.81), G-34(1.40), G-37(0.99), G-38(1.47), G-39(1.28), G-40(0.90), G-41(0.42) and G-42(0.74), were estimated as superior for preparation of pickle. Similar results were revealed to Lodh *et al.* (1974) who recorded TSS: acid ratio from 5.50 to 10.92 and variation in ratio may be due to inherent genetic variation.
5. **Vitamin C content:** The data on vitamin C content of raw mango flesh is presented in Table 1. A wide variability observed in vitamin C content of and it varied from 19.14 mg/100 gm to 29.09 mg/100 gm along with 25.11 populations mean. The fruits of mango genotypes G-26 recorded the highest vitamin C content (29.09 mg/100 gm) and lowest (19.14 mg/100 gm) vitamin C content was noticed in genotype G-8 and G-29. These results are close agreement with Vasugi *et al.* (2008) [13] who studied the evolution of unique mango accessions for whole-fruit pickle and observed the variation 13.11 to 109.4 mg/100 gm While low vitamin C content (below 20 mg/100 gm) was found in genotypes G-8 and G-28.
6. **Fiber content:** The data on fiber content of raw mango flesh is presented in Table 1. A wide variability observed in fiber content of and it varied from 0.69 to 1.75 per cent with population mean in the tune of 1.16 per cent. The fruits of mango genotype G-29 recorded the highest fiber (1.75%) while the lowest (0.69 %) was recorded from the fruits of genotypes G-18 and G-31. These results are close agreement with Mannan *et al.* (2003) [8] who studied the mango varieties at Khulna region and observed the variation in fruit fiber and grouped as scanty, high, medium and very low.
7. **Sugar: Acid ratio:** The data on Sugar: Acid ratio content of raw mango flesh is presented in Table 1. A wide variability observed in Sugar: Acid ratio content of and it varied from 0.42 to 4.10 along with 1.57 population mean.

The fruits of mango genotypes G-48 recorded the highest sugar: acidity ratio (4.10) and lowest (0.42) was noticed in genotype G-41. The mango genotypes which have low to medium (below population mean) sugar: acid ratio *viz.*, G-22, G-27, G-28, G-30, G-32, G-35, G-37, G-40, G-41 and G-42. Were considered suitable for preparation of pickle. Similar trend of results were quoted by Hamdard *et al.* (2004) <sup>[2]</sup> reported higher sugar: acidity ratio in Anwar Retaul (53.20 and 62.90), followed by Chaunsa (42.0 and 56.2) and Fajri (42.0 and 51.0), while Desi (8.70 and 10.20) showed minimum sugar: acidity ratio in both years.

**8. Sensory evaluation:** All the 50 genotypes were studied for chemical characteristics and sensory evaluation of fruit and data is presented in Table 2. Out of that 23 genotypes selected on the basis of physico-chemical characters and prepared pickle. The sensory quality score of mango pickles made from different accessions indicated that the accession, recorded the highest score for color like

excellent (8.56), which found in G-42. This could be attributed to the lower amount of tannins and other oxidizing compounds. The accession G-42 recorded the highest score for texture like excellent (8.95) and flavor like excellent (8.56) mainly due to the presence of higher number of flavoring compound as indicated by intensive characteristics raw mango flavor. The overall acceptability score like excellent (8.65) and average score out of nine like excellent (8.68) was higher for the accessions Genotype-42. Based on this study it is concluded that high acid mango accession G-42, G-41 and G-29 produces best quality pickle with better color, texture and flavor. These results are close agreement with Vasugi *et al.* (2008) <sup>[13]</sup> who studied the evolution of unique mango accessions for whole-fruit pickle. While genotypes *viz.*, G-27, G-30 and G-41 Like very much (above 8) and like moderately (above 7) this genotypes are considered to be most suitable for preparation of tender whole mango pickles.

**Table 1:** Biochemical Variability in Local Mango Genotypes for Pickle Purpose

Genotypes	T.S.S. (°Brix)	Acidity (%)	Total sugar (%)	TSS: Acid Ratio	Vit-C content (mg/100gm)	Fiber content (%)	Sugar: Acid Ratio
G-01	7.6	6.73	1.7	1.12	28.03	1.50	1.12
G-02	7.7	4.13	1.93	1.07	27.43	1.40	1.07
G-03	11.3	5.91	1.79	1.91	24.14	1.20	1.91
G-04	10.2	5.58	2.01	1.82	26.04	0.89	1.82
G-05	8.4	4.53	3.06	1.20	21.15	1.70	1.20
G-06	11.1	5.42	2.22	1.55	23.09	1.40	1.55
G-07	10.8	4.52	1.59	1.12	27.17	1.50	1.12
G-08	8.2	5.76	1.75	1.42	19.14	0.95	1.42
G-09	11.6	5.52	1.88	1.81	21.37	1.10	1.81
G-10	9	3.58	2.32	2.51	23.51	1.40	2.51
G-11	7.2	4.9	1.53	1.46	27.38	0.73	1.46
G-12	6.7	3.31	1.87	2.02	28.11	0.93	2.02
G-13	10.7	6.27	2.53	1.70	26.24	1.20	1.70
G-14	9.3	3.34	2.16	2.78	27.19	1.40	2.78
G-15	9.3	6.25	2.29	1.04	21.27	1.20	1.04
G-16	8.2	5.41	1.59	1.04	27.19	0.95	1.04
G-17	8.6	5.43	2.37	1.58	28.18	0.75	1.58
G-18	9.5	6.9	1.44	1.37	24.27	0.69	1.37
G-19	10.1	4.85	1.93	2.08	25.39	1.20	2.08
G-20	7.4	5.43	2.41	1.36	24.17	1.40	1.36
G-21	9.1	5.58	1.6	1.63	21.30	1.10	1.63
G-22	7.7	6.14	1.98	0.91	24.38	1.40	0.91
G-23	8.3	4.84	1.78	1.71	26.17	1.30	1.71
G-24	7.4	3.85	2.08	1.92	24.14	1.50	1.92
G-25	9.2	4.25	2.41	2.16	27.37	1.40	2.16
G-26	7.5	3.57	1.86	2.10	29.09	0.85	2.10
G-27	8.5	4.3	2.28	0.90	27.47	1.20	0.90
G-28	8.3	5.36	2.44	0.96	19.27	0.76	0.96
G-29	7.7	6.4	1.75	1.20	28.17	1.75	1.20
G-30	9.2	4.26	2.04	0.97	27.89	0.85	0.97
G-31	8.3	6.2	3.06	1.33	23.48	0.69	1.33
G-32	7.4	3.52	2.7	0.75	22.14	1.20	0.75
G-33	9.2	5.08	2.18	1.81	25.27	0.95	1.81
G-34	6.8	4.85	1.89	1.40	27.47	1.30	1.40
G-35	7.2	5.53	1.14	0.73	26.04	0.79	0.73
G-36	7.7	3.47	2.41	2.21	27.19	0.98	2.21
G-37	8.7	4.23	1.6	0.99	26.14	1.40	0.99
G-38	9.9	6.7	1.08	1.47	27.49	0.97	1.47
G-39	10.5	6.12	1.44	1.28	24.89	1.30	1.28
G-40	7.9	6.7	2.7	0.90	23.77	0.87	0.90
G-41	4.1	6.1	1.78	0.42	27.43	1.40	0.42
G-42	8.2	6.71	2.41	0.47	21.37	1.40	0.47
G-43	2.8	5.05	1.93	1.62	27.39	1.20	1.62
G-44	4.8	4.47	1.14	1.07	25.37	0.77	1.07
G-45	8	5.91	2.04	1.19	19.14	0.75	1.19
G-46	8.2	2.85	1.6	2.87	21.19	1.50	2.87

G-47	7.8	2.64	1.78	2.95	26.48	1.10	2.95
G-48	7.6	1.85	2.32	4.10	27.04	1.20	4.10
G-49	7.9	3.17	1.93	2.49	24.17	1.30	2.49
G-50	7.3	4.1	2.41	1.78	26.69	1.70	1.78
Range	2.8 to 11.6	1.85-6.90	1.08 to 3.06	0.42 to 2.95	19.14 to 29.09	0.69 to 1.75	0.42 to 4.10
Mean	8.32	4.99	2.00	1.57	25.11	1.16	1.57
S.D.	1.66	1.31	0.44	0.69	2.68	0.28	0.69
Variance	2.77	1.72	0.19	0.48	7.18	0.08	0.48
S.E.+	0.23	0.19	0.06	0.09	10.67	24.72	44.26
C.V.	20.00	26.28	22.14	44.26	0.37	0.04	0.09

Table 2: Average score of Sensory evaluation of mango pickle

Sl. No	Genotypes	Colour (Appearance)	Texture	Taste (Flavour)	Overall acceptability	Average score out of 9
1	G-27	8.36	8.26	8.83	8.16	8.40
2	G-28	6.5	7.15	5.15	6.2	6.25
3	G-29	8.52	8.2	8.42	8.35	8.37
4	G-30	6.2	7.41	8.52	6.23	7.09
5	G-31	6.23	4.1	5.2	6.32	5.46
6	G-32	4.1	5.54	4.12	3.95	4.43
7	G-33	6.52	6.54	3.56	3.81	5.11
8	G-34	8.1	4.3	1.2	3.12	4.18
9	G-35	3.95	3.42	4	3.75	3.78
10	G-36	7.54	5.24	6.23	7.25	6.57
11	G-37	6.25	5.45	5.47	5.23	5.60
12	G-38	5.25	6.23	6.25	7.45	6.30
13	G-39	5.21	4.23	5.23	5.34	5.00
14	G-40	6.21	5.23	6.3	6.23	5.99
15	G-41	7.89	8.1	8.23	8.56	8.20
16	G-42	8.56	8.95	8.56	8.65	8.68
17	G-43	4.5	5.2	3.5	7.4	5.15
18	G-44	3.5	4.2	7.8	5.7	5.30
19	G-45	3.51	2.12	1.56	2.15	2.34
20	G-46	7.56	6.54	3.25	7.84	6.30
21	G-48	5.6	6.23	7.2	5.21	6.06
22	G-49	6.23	7.84	3.2	4.2	5.37
23	G-50	8.45	7.24	6.54	6.23	7.12
	Mean	6.29	5.99	5.58	5.97	5.96
	Range	3.5-8.56	2.12-8.95	1.2-8.56	2.15-8.65	2.34-8.68
	SD	1.65	1.77	2.27	1.85	1.57
	Variance	2.72	3.13	5.14	3.42	2.47
	C.V.	26.22	29.55	40.62	30.97	26.38
	SE±	0.34	0.37	0.47	0.39	0.33

## Conclusions

From overall results, it can be concluded that, twenty selected mango genotypes viz. G-18, G-01, G-42, G-40, G-38, G-29, G-31, G-22, G-39, G-41, G-21, G-04, G-9, G-16, G-44, G-50, G-24, G-26, G-32, G-36, are promising amongst all those genotypes which were taken for studies for pickle. So, in all total 50 selected pickle mango genotypes only twenty genotypes are found most promising and could be recommend for pickle making on ad-hoc basis. The overall acceptability score like excellent (8.65) and average score out of nine like excellent (8.68) was higher for the accessions Genotype-42.

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