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Quality Estimation During Marketing of Kinnow and Feutrell's Early

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ABSTRACT

Different physico-chemical characteristics were studied to evaluate fruit quality of mandarins Kinnow and Feutrell's Early from randomly collected samples from Fruit Market, Faisalabad. The data indicated that Feutrell's Early attained marketable quality by the first week of December and could be marketed up to mid of January. Kinnow became acceptable in the third week of January and attained excellent quality in the first week of February till April.

Key Words: Mandarins; Physico-chemical characteristics; Kinnow; Feutrell's early

INTRODUCTION

Citrus is the most important tree fruit of the world including Pakistan. Due to big acreage and limited local markets in Pakistan, its picking is started just on colour break when fruits are not yet fully ripe. This practice besides causing health hazards is also a loss of resources.

There is no universal set of quality standards for citrus fruits. Organization for Economic Cooperation and Development (OECD, 1971) countries restricted the criterion of TSS/acidity ratio of 8:1 for oranges. Bhullar (1985) in Himichal Pradesh (India) worked out quality standards of TSS/acid ratios for Musambi, Jaffa, Pineapple and Blood red Sweet Oranges as 22:1, 12.5:1, 16:1 and 17.5:1, respectively. Lodhi (1989) working with Kinnow mandarin found that juice percentage increased till the end of March and then decreased gradually after March while TSS and acidity decreased continuously till April 25.

These studies were undertaken to ascertain the period of availability of mandarin fruit (Kinnow, Feutrell's Early) in the market and the fluctuations in its quality during this period which could help to recommend the best time of picking of high quality fruit and market it on reasonable rates. Therefore, determination of the proper quality criteria and harvesting time are accounted to present the fruit in the local as well as foreign markets in most acceptable form to enhance the profit of the growers as well as to avoid undue losses of the crop.

MATERIALS AND METHODS

These studies were carried out at fruit market Faisalabad during citrus seasons. Twelve fresh fruit samples, each of Kinnow and Feutrell's Early were selected randomly at fortnight intervals from the trollies and/or trucks each time. A total of 132 and 120 samples were collected for Kinnow in 1st and 2nd years od study, respectively while for Feutrell's Early 84 samples were collected during the each year. The sampling was done in accordance to the following schedule:

i. Feutrell's Early: From November 17 to February 15 each year

ii. Kinnow: From December 6 to May 5 in 1st year and from December 6 to April 25 next year.

The samples were evaluated on the basis of commonly used and accepted worldwide indicators of citrus fruit quality, i.e. TSS, acidity, TSS/acidity ratio, juice contents, fruit colour as described by Sole and Grierson (1986). Scoring technique was used for recording data regarding taste and flavour. Total soluble solids were estimated by refrectometer. The titratable acidity of the pulp was estimated by titration against standard NaOH solution as recommended by AOAC (1989) and the TSS/acid ratio was calculated accordingly.

The data for quantity were estimated on the basis of number of trucks each of Kinnow and Feutrell's Early mandarrrived in the market daily from February to May and from November to April. As regards price, the bid of at least 10 large sized baskets (200-250 fruits/basket) was recorded during the fruit auction in the market.

RESULTS AND DISCUSSION

Physical characters. The data indicated gradual increase in fruit weight (with slight fluctuation) up till end of March in Kinnow and December 30 in Feutrell's Early (Table I & II). It remained stable for sometime in case of Kinnow and then decreased. Increase in fruit weight towards maturity is a natural phenomenon. In

Table I. Physico-chemical analysis of Kinnow mandarin

Date	Fruit weight (g)	Juice (%)	Organoleptic value	Colour	Acidity(%)	T.S.S.(%)	T.S.S./TA Ratio
1989-90							
December 6	119.40 d	50.70 ab	4.54 e	Majolica yellow	1.42 a	11.08 d	8.30 d
December 22	123.50 cd	53.00 a	4.84 d	Same	1.31 a	11.07 d	9.21 cd
January 7	128.60 c	52.50 ab	5.00 d	Nasturtium orange	1.19 b	11.36 c	10.20 c
January 23	125.00 c	54.60 a	5.93 c	Same	0.93 bc	11.84 bc	12.78 bc
February 8	131.00 bc	56.20 a	6.82 b	Same	0.74 c	11.98 bc	17.03 b
February 24	135.80 b	53.00 a	7.09 ab	Same	0.61 d	12.43 ab	20.52 a
March 11	150.30 ab	51.90 ab	7.81 a	Spanish orange	0.57 de	12.67 a	22.50 a
March 26	165.00 a	52.00 ab	7.59 a	Same	0.59 d	12.62 a	22.00 a
April 10	177.20 a	50.20 b	7.47 a	Same	0.50 e	12.29 ab	24.68 a
April 25	126.00 c	53.10 a	7.05 ab	Nasturtium orange	0.64 dc	12.00 abc	19.50 ab
May 5	129.00 c	52.00 ab	7.00 ab	Majolica yellow	0.67 dc	11.75 bc	17.09 b
1990-91							
December 6	125.50 c	51.80 ab	3.35 e	Majolica yellow	1.36 a	11.10 c	8.38 e
December 22	128.30 c	51.70 ab	4.67 d	Same	1.14 b	11.05 c	10.48 e
January 7	124.70 c	52.80 ab	5.60 c	Nasturtium orange	1.01 b	11.40 bc	11.95 e
January 23	137.60 bc	52.80 ab	5.60 c	Same	0.76 c	11.75 bc	15.98 d
February 8	126.90 c	55.50 a	7.00 b	Same	0.71 cd	12.05 abc	17.48 cd
February 24	154.30 ab	55.00 a	7.50 ab	Same	0.62 cde	12.75 a	21.16 b
March 11	140.50 bc	52.50 ab	7.50 ab	Spanish orange	0.51 e	12.50 ab	25.34 a
March 26	164.30 a	49.70 b	7.83 a	Same	0.58 de	12.55 ab	22.52 ab
April 10	152.20 ab	52.90 ab	7.67 ab	Same	0.54 de	12.45 ab	23.60 ab
April 25	129.10 c	52.20 b	7.17 ab	Nasturtium orange	0.58 de	11.70 abc	20.16 bc

Kinnow, late in the season after ripening during spring fruit weight decreased. It may be due to the onset of new growth and new fruit development which some times suck back the moisture and nutrients from the old fruits as was previously pointed by Devkota *et al*. (1982). Kinnow shared respective increase in juice contents from December 6 to first week of January and maintained the same level upto the end February. This trend coincided with the findings of Joolka and Awasthi (1980). In Feutrell's Early, juice contents fluctuated significantly and Fruit marketed on December 30 and January 30 (1990-91) were less juicy while on the rest of the dates the juice contents were similar. In Kinnow, maximum juice contents were 56.20% and minimum 49.70% while in Feutrell's Early, these were 52.50% and 46.30%, respectively. Cheema (1966) reported 51% juice in Kinnow and 47% in Feutrell's Early for excellent quility of these cultivars, the quality of Kinnow fruit was excellent from February 8 to the end of April and Feutrell's Early being an early variety improved itself till mid January and then declined later on.

Kinnow attained Majolica yellow color in first week of December and became Nasturtium orange by the first week of January. Intensity of colour increased in mid February when it turned to Spanish orange. Feutrell's Early was being marketed with Burnt orange colour in November which turned to Indian orange and maintained the same colour till end of its marketing (mid of February). The colour faded after mid April in Kinnow might be due to influence of high temperature, which depressed B-citraurin accumulation and promotes chlorophyll synthesis again. Cheema (1966) mentioned the Nasturtium orange colour for Kinnow and Indian orange for Feutrell's Early. The results of the both years almost confirmed each other but with slight variation.

Table II. Physico-chemical characteristics of Feutrell's Eerly mandarin

Date	Fruit wt.(g)	Juice (%)	Organolaptic value	Colour	Acidity (%)	TSS (%)	TSS/TA Ratio
1989-90							
November 17	103.48 b	43.90 b	4.73 d	Burnt orange	0.87 a	8.30 d	9.43 c
December 3	111.20 ab	49.70 a	5.33 bc	Indian orange	0.72 a	9.68 c	14.10 b
December 18	118.30 a	44.50 b	5.60 b	Same	0.68 ab	10.74 ab	16.22 a
December 30	124.00 a	50.90 a	6.20 ab	Same	0.56 b	11.40 a	20.32 a
January 14	115.00 ab	46.30 ab	7.00 a	Same	0.64 ab	11.62 a	19.20 a
January 30	98.00 bc	48.20 a	5.90 ab	Same	0.73 a	10.68 ab	15.20 ab
February 15	73.90 c	43.00 b	4.90 c	Same	0.70 a	9.90 b	14.78 ab
1990-91							
November 17	97.50 bc	49.80 ab	3.73 d	Burnt orange	0.85 a	8.66 c	10.95 b
December 3	107.80 ab	52.50 a	5.03 c	Indian orange	0.65 ab	10.12 b	16.69 ab
December 18	113.40 ab	49.60 ab	5.63 bc	Same	0.64 b	11.24 a	18.95 a
December 30	120.00 a	46.30 b	6.30 ab	Same	0.57 b	11.46 a	19.64 a
January 14	97.50 bc	49.80 ab	6.90 a	Same	0.62 b	11.31 a	20.05 a
January 30	86.00 cd	46.40 b	5.37 c	Same	0.71 ab	11.11 a	15.91 ab
February 15	69.70 d	49.30 ab	5.63 bc	Same	0.69 ab	10.87 ab	16.81 ab

Table III. Quantity and price of Kinnow and Feutrell's Early mandarin

	Kinnow				Feutrell's Early				
	No. of trucks (market)		Price (Rs./large basket)			No of trucks (market)		Price (Rs./large basket)	
Date	1989-90	1990-91	1989-90	1990-91	Date	1989-90	1990-91	1989-90	1990-91
December 6	-	1.5	-	20-30	November 17	-	1	-	50-60
December 22	-	13	-	45-60	December 3	-	3	-	70-80
January 7	-	17	-	50-70	December 18	-	3.5	-	50-75
January 23	-	22	-	60-83	December 30	-	2	-	72-82
February 8	37	27.5	55-65	100-113	January 14	-	1.5	-	60-67
February 24	45	24	40-50*	107-130	January 30	1	1.7	60-80	55-60
March 11	48	33	85-90	120-170	February 15	4	5	60-75	50-65
March 26	37	39	90-120	160-193					
April 10	32	19	90-165	170-190					
April 25	25	8	110-168	**					
May 5	15	**	140-170						

* Low price was due to cloudy weather; -Data not available; ** Fruit was not available in the market.

Chemical characteristics. The results revealed that marketing of Kinnow was started in December with 1.36% acidity (Table I). It decreased continuously i.e. 0.51 by March 11. The acidity remained almost similar from February 8 to April 25, ranging from 0.51% to 0.71%. Whereas, the fruit of Feutrell's Early sampled on November 17 were found with 0.85% acidity. Acidity as found by Cheema (1966) (0.43 and 0.44%) for best quality of Kinnow and Feutrell's Early, respectively, could not verify our findings.

In Kinnow, highest TSS found during these studies was 12.75% on February 24. During December, it was 11.10%, which gradually increased upto February 24 and then remained almost constant till April 25, same trend was also noted by Joolka and Awasthi (1980). In Feutrell's Early fruit marketed on November 17 showed minimum TSS (8.66), which improved till December 30 (11.40%).

The observations pertaining to total soluble solids and acid ratio in Kinnow, indicated consistent rise from December 6 (8.38) to March (25.34) and decreased later. Joolka and Awasthi (1980) had also mentioned the same trend for Kinnow. In case of Feutrell's Early, the TSS/acid ratio increased towards mid January.

Relation to quality and quantity rate. Marketing of Kinnow was started during the first week of December in Faisalabad Fruit Market. The commodity arrived at this time was less and the fruits were also smaller in size with least organoleptic values (Table I). Later, the quality improved and the prices increased, during March 1990 maximum fruit was marketed i.e. 48 trucks daily (Table III). After March, when no other citrus fruit was available in the market, prices climbed further due to more demand than supply although quality remained almost the same during this period (Table I). Feutrell's Early being an early variety remained available in the market from mid November to mid February, each year. During February, it could not fetch good price because of its competition with a superior citrus like Kinnow.

CONCLUSION

It is concluded from this study that harvesting of Kinnow may be started from the first week of February and Feutrell's Early during the first week of December to mid January, because from 3rd week of January it failed to compete Kinnow.

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