



## Orange Juices and Beverages

### Is the Goodness of Orange Guaranteed?

Think orange juice, and the associations that immediately come to the mind are the fresh tanginess of oranges, vitamin C, and a host of minerals, nutrients and antioxidants (okay, antioxidants do not always come to mind, but you get the drift). The question is: in its packed form, does it still pack a punch – or, does manufacturing and commercial compulsions entail processes/compromises that the end drinker will tend to miss? That processing (and over-processing) and pasteurization have to have some impact on the overall quantity/content of nutrients, it goes without a saying. It is this impact that *Consumer Voice* has sought to capture in its parameter-by-parameter testing of 12 popular brands of packed orange juices and beverages.

Reaching out for one of the several packets of fruit juices – all in colours seeming to convey health and happiness – on a supermarket shelf, the last thing, if at all, on one's mind would be the possibility of putting in additional calories (the sugar, sweetie) in the body by consuming these. Most of us are convinced that what we see and taste is what we get; in other

words, the particular fruit mentioned on these packs is what we are consuming when we drink the juice/beverage. After all, juice comes from fruit and hence it must be healthy, right?

A bevy of companies are marketing fruit juices/beverages/drinks from juice concentrate and also adding some permitted preservatives and colouring substances for better acceptability. Tetra Pak packaging

has increased the acceptability of fruit juices by increasing the shelf life of the product; it also keeps the product safe, fresh and flavourful. Several fruit juice variants are available in the market – including apple, pomegranate, pear, litchi, orange and grape. *Consumer Voice* selected orange fruit juices/beverages for testing in consideration of the associated health benefits, especially in summer season, and their relatively high popularity.

### BRANDS TESTED

In order to identify the major and most selling brands across the country, and the list prices/actual prices being charged from consumers, an extensive market survey was carried out in the five metros of Delhi, Mumbai, Kolkata, Chennai and Bangalore.

### HEATED AND CONCENTRATED

Thermally processed fruit juices (canned, bottled, flexible and/or aseptically packed) means unfermented but fermentable product – pulpy, turbid or clear – intended for direct consumption. These are obtained by a mechanical process from sound, ripe fruit or the flesh thereof, and processed by heat, in an appropriate manner, before or after being sealed in a container, so as to prevent spoilage. The juice may have been concentrated and later reconstituted with water suitable for the purpose of maintaining the essential composition and quality factors of the juice.

Rank	Brand	Type of Packaging	% of Juice/ Concentrate		Cost (MRP in Rs)	Volume per Pack
			Claimed (%)			
<b>JUICE</b>						
1.	Tropicana (100%)	Tetra Pak	100 (% juice)	(19.7% concentrate)	99	1 litre
2.	Real Activ	Tetra Pak	100 (% juice)		99	1 litre
3	Ceres	Tetra Pak	100 (% juice)		125	1 litre
<b>BEVERAGE/DRINK</b>						
1.	Real Fruit Power	Tetra Pak	12.45 (%juice concentrate)		85	1 litre
2.	Sach	Tetra Pak	3.5 (%juice concentrate)		85	1 litre
2.	Tropicana	Tetra Pak	8.2 (%juice concentrate)		77	1 litre
3.	Onjus	Tetra Pak	13.5 (%juice concentrate)		60	1 litre
4.	Fresh Gold	Tetra Pak	17.2 (%juice concentrate)		80	1 litre
5.	B Natural	Tetra Pak	8.2 (%juice concentrate)		85	1 litre
6.	Minute Maid	PP material bottle	12.5 (% juice)		22	400ml
6.	Delmonte	Metal can	30 (% juice)		30	240ml
7.	Safal	Tetra Pak	1.82 (%juice concentrate)		75	1 litre



### BEST BUY: BEVERAGE/DRINK REAL FRUIT POWER

#### KEY FINDINGS

- The test for percentage of juice content was conducted through the existing DGHS method. This method is not completely accurate due to results variation based on seasonality and variety of the oranges. Hence, this parameter is not included in the ratings; the findings are given, though.
- Vitamin C, the major nutrient in orange juice, is found in highest quantity in Real Fruit Power (76.43mg), followed by Sach (70mg/100gm). In freshly squeezed orange & kinno juice, it is 137.04mg/100gm and 174.73mg/100gm respectively.
- The highest quantity of total sugar is found in Fresh Gold (15.63mg/100gm) and the lowest in Real Activ (10.29mg/100gm).
- Sucrose (added sugar) is present in higher amount in Fresh Gold (9.27mg/100gm), followed by Minute Maid (7.38mg/100gm).
- Tropicana 100% scores highest in the sensory tests.
- Potassium is found highest in Real Activ (184.94mg/100gm), followed by Tropicana 100% (172.66).
- All the brands are well below the maximum permissible limit for heavy metals, pesticide residues and microbiological activity.
- In the test for total soluble solids (TSS), all the brands are quite above the minimum requirement of 10° Brix, with Onjus and Delmonte emerging highest with 15° Brix.

#### HEALTH BENEFITS OF ORANGE JUICE

- Highly rich in vitamin C and also in essential minerals like calcium, phosphorus, potassium and magnesium
- A great immune system booster and therefore effective in preventing colds and other infections
- Benefits the stomach in many ways and helps with indigestion, constipation and digestive problems
- The orange fruit is low in calories and contains no saturated fats or cholesterol, but is rich in dietary fibre, which is very effective for those with excess body weight
- Highly rich in beta carotene, which has good antioxidant property



## THE PARAMETERS EXPLAINED

**1. Marking/Labelling:** The packing of fruit juices should convey certain information as a matter of course: specifically brand name, manufacturer/marketer name, batch/code number, date/month/year of packing, 'best before' date, instruction for storage after opening, list of ingredients, nutritional information/facts, declaration regarding added colouring matter, permitted preservatives, added flavours, etc., standard mark as applicable (green dot, FPO), instruction for recyclability of packing material, MRP and location of type/variant as juice/beverage/drink.

## 2. Physico-chemical tests

**2.1 Total soluble solids (in °Brix):** TSS is considered as higher the better, subject to it being low in added sugar and restricted quantity of other thickening agents. As per Food Safety and Standards (FSS) RULES, 2011, the requirement is a minimum 10 per cent.

**2.2 Sugar profile:** Here, the juice is checked for three major sugar constituents: fructose, sucrose and glucose. In the pure (100%) juices, added sugar is not permitted; in beverages/drinks it is permitted. Sugar is added to enhance product acceptability and also to add to the reconstituted juice/beverage the attributes of natural taste and flavour.

**2.3 Carbohydrates:** Carbohydrates require less water to digest than proteins or fats and are the most common source of energy for living beings.

**2.4 Energy value:** Food energy is the amount of energy in food that is available through digestion. Energy values (in kcal) are calculated and compared with the declared value by manufacturer.

**2.5 Potassium:** It is a unique element present in the natural orange juices, varying in quality

depending upon the variety of oranges. Potassium values (mg/100gm) are calculated and compared with the declared value by manufacturer.

**2.6 Vitamin C:** Vitamin C, or ascorbic acid, is a natural antioxidant abundant in orange fruits and some vegetables. It helps protect against cancers, heart disease and stress. It is the major and essential vitamin present in orange juice and also helps in maintaining a healthy immune system. Vitamin C values (mg/100gm) are calculated and compared with the declared value by manufacturer.

**2.7 Beta-carotene:** Naturally present in many fruits, grains, oils and vegetables, beta-carotene possesses antioxidant properties.

**2.8 Density:** It reveals how dense the end product is – the denser the product, the better the quality of juice.

**2.9 Juice percentage by mass:** The quantification of percentage for juices and beverages was conducted in the final end product reconstituting orange juice concentrate. The DGHS method, accredited by NABL, was followed very carefully by the lab as it required a very high degree of accuracy and handling of toxic chemicals like formaldehyde. There are limitations to the test method because of which the result of juice percentage varies according to the variety and seasonality of the oranges (as also confirmed by National Institute of Nutrition [NIN], Hyderabad). Hence, neither the manufacturer nor our test method can claim to have 100 per cent accurate measurements for juice percentage by mass. The claim of 100 per cent cannot be validated at any end. However, the resulted value of the key element validates the claim as per the AIJN method (best European practice). The standard requires immediate revision and adoption of a validated method.

## COMPARATIVE TEST

### Tropicana (100%)

*Fruit juice*

**Juice (% by mass):** Declared: 100%; result: 87.7%

**Vitamin C (mg/100gm):** Not declared; result: 17.91

**Sugar profile:** Glucose: 3.72%; fructose: 3.87%; sucrose: 2.96%

**Carbohydrates (% by mass):** 10.37

**Energy value (Kcal):** Declared: 52; result: 43.44

**Potassium (mg/100gm):** Declared: 40; result: 172.66

**Beta-carotene (mg/100ml):** 10.75

**TSS (in °Brix):** 12.5%



### Real Activ

*Fruit juice*

**Juice (% by mass):** Declared: 100%; result: 99.18%

**Vitamin C (mg/100gm):** Declared: 20; result: 23.53

**Sugar profile:** Glucose: 3.92%; fructose: 3.87%; sucrose: 3.42%

**Carbohydrates (% by mass):** 11.32

**Energy value (Kcal):** Declared: 48; result: 47.08

**Potassium (mg/100gm):** Declared: 86; result: 184.94

**Beta-carotene (mg/100ml):** 10.74

**TSS (in °Brix):** 13.5%



### Ceres

*Fruit juice*

**Juice (% by mass):** Declared: 100%; result: 43.85%

**Vitamin C (mg/100gm):** Declared: 60; result: 32.01

**Sugar profile:** Glucose: 3.31%; fructose: 5.47%; sucrose: 1.51%

**Carbohydrates (% by mass):** 10.49

**Energy value (Kcal):** Declared: 100; result: 42.96

**Potassium (mg/100gm):** Not declared; result: 117.89

**Beta-carotene (mg/100ml):** 8.94

**TSS (in °Brix):** 12.5%



### Real Fruit Power

*Fruit beverage*

**Juice (% by mass):** Declared: 12.45% juice concentrate; result: 11.48%

**Vitamin C (mg/100gm):** Declared: 42; result: 76.43; has the highest quantity of vitamin C

**Sugar profile:** Glucose: 4.23%; fructose: 4.49%; sucrose: 4.74%

**Carbohydrates (% by mass):** 12.28

**Energy value (Kcal):** Declared: 56; result: 51.55

**Potassium (mg/100gm):** Not declared; result: 87.82

**Beta-carotene (mg/100ml):** 12.24

**TSS (in °Brix):** 14%



### Sach

*Fruit beverage*

**Juice (% by mass):**

Declared: 18% juice; result: 10.94%

**Vitamin C (mg/100gm):**

Declared: 75; result: 70

**Sugar profile:** Glucose: 3.77%; fructose: 3.82%; sucrose: 4.52%

**Carbohydrates (% by mass):** 12.69

**Energy value (Kcal):** Declared: 55.1; result: 51.73

**Potassium (mg/100gm):** Declared: 13.8; result: 11.54

**Beta carotene (mg/100ml):** 12.3; highest quantity of beta-carotene

**TSS (in °Brix):** 14%



### Tropicana

*Fruit beverage*

**Juice (% by mass):** Declared: 8.2% juice concentrate; result: 11.08%

**Vitamin C (mg/100gm):** Not declared; result: 50.91

**Sugar profile:** Glucose: 3.67%; fructose: 3.47%; sucrose: 5.78%

**Carbohydrates (% by mass):** 12.33

**Energy value (Kcal):** Declared: 52; result: 50.44

**Potassium (mg/100gm):** Declared: 40; result: 60.46

**Beta-carotene (mg/100ml):** 10.0

**TSS (in °Brix):** 13.25%



## Onjus

*Fruit beverage*

**Juice (% by mass):** Declared: 13.5% juice concentrate; result: 10.58%

**Vitamin C (mg/100gm):** Not declared; result: 7.56

**Sugar profile:** Glucose: 5.87%; fructose: 5.92%; sucrose: 1.81%

**Carbohydrates (% by mass):** 13.86; highest percentage of carbohydrates

**Energy value (Kcal):** Declared: 63; result: 56.14

**Potassium (mg/100gm):** Not declared; result: 111.51

**Beta-carotene (mg/100ml):** 10.39

**TSS (in °Brix):** 15% (highest score)



## Fresh Gold

*Fruit beverage*

**Juice (% by mass):** Declared: 17.2% juice concentrate; result: 17.39%

**Vitamin C (mg/100gm):** Declared: 7.57; result: 16.07

**Sugar profile:** Glucose: 3.13%; fructose: 3.23%; sucrose: 9.27%; highest quantity of sucrose (as added sugar)

**Carbohydrates (% by mass):** 13.22

**Energy value (Kcal):** Declared: 57.9;

result: 54.91; score highest among the brands

**Potassium (mg/100gm):** Not declared; result: 92.11

**Beta-carotene (mg/100ml):** 11.11

**TSS (in °Brix):** 14.5%



## B Natural

*Fruit beverage*

**Juice (% by mass):** Declared: 8.2% juice concentrate; result: 11.09%

**Vitamin C (mg/100gm):** Not declared; result: 16.26

**Sugar profile:** Glucose: 3.22%; fructose: 2.97%; sucrose: 5.84%; lowest weightage

**Carbohydrates (% by mass):** 11.43

**Energy value (Kcal):** Declared: 50; result: 47.08

**Potassium (mg/100gm):** Declared: 63; result: 82.51

**Beta-carotene (mg/100ml):** 10.57

**TSS (in °Brix):** 12.5%



## Minute Maid

*Fruit drink*

**Juice (% by mass):** Declared: 12.5% juice; result: 10.94%

**Vitamin C (mg/100gm):** Not declared; result: 18.50

**Sugar profile:** Glucose: 2.46%; fructose: 2.51%; sucrose: 7.38%

**Carbohydrates (% by mass):** 10.13

**Energy value (Kcal):** Declared: 42; result: 41.51

**Potassium (mg/100gm):** Not declared; 18.28

**Beta-carotene (mg/100ml):** 10.34

**TSS (in °Brix):** 12.5%



## Delmonte

*Fruit drink*

**Juice (% by mass):** Declared: 30% juice; result: 10.55%

**Vitamin C (mg/100gm):** Not declared; result: 3.08; has lowest quantity of vitamin C

**Sugar profile:** Glucose: 6.12%; fructose: 5.87%; sucrose: nil; given the highest weightage

**Carbohydrates (% by mass):** 12.98

**Energy value (Kcal):** Declared: 57; result: 52.88

**Potassium (mg/100gm):** Not declared; result: 19.17

**Beta-carotene (mg/100ml):** 8.5

**TSS (in °Brix):** 15% (highest score)



## Safal

*Fruit beverage*

**Juice (% by mass):** Declared: 1.82% juice concentrate; result: 2.11%

**Vitamin C (mg/100gm):** Not declared; result: 27.21

**Sugar profile:** Glucose: 5.93%; fructose: 5.38%; sucrose: 1.56

**Carbohydrates (% by mass):** 12.13

**Energy value (Kcal):** Declared: 51; result: 48.68

**Potassium (mg/100gm):** Not declared; result: 5.32

**Beta-carotene (mg/100ml):** 9.48

**TSS (in °Brix):** 14%



### SENSORY TESTS

Like always, this important test tells us what really makes a product most acceptable/least acceptable irrespective of the price. Based on this test we can determine the overall organoleptic (sensory) quality of the product. In the case of orange juices and beverages, the sensory panel tests have been conducted for colour and appearance, texture, flavour/aroma, taste and after-taste feeling. These tests were conducted in the lab involving panel members under the supervision of trained experts.

Parameter↓	Brand→	Mean score out of	JUICE			BEVERAGE/DRINK								
			Tropicana (100%)	Real Activ	Ceres	Real Fruit Power	Sach	Tropicana	Onjus	Fresh Gold	B Natural	Minute Maid	Delmonte	Safal
Colour and appearance		100	80	71.67	48.33	82.5	62.5	70.83	19.17	23.33	85	67.5	67.5	19
Texture		100	58.33	40.83	51.67	50.83	24.17	49.17	46.67	49.17	45	69.17	22.5	24
Aroma/Flavour		100	69.17	50.83	51.67	55	40.83	50.83	45	57.5	54.17	55	37.5	24
Taste		100	74.17	55	56.67	59.17	45	50.83	48.33	56.67	40	41.67	32.5	24
After-taste feeling		100	69.17	50	56.67	61.67	44.17	49.17	34.17	46.67	49.17	50.83	30.83	30
Total score		500	350.84	268.33	265.01	309.17	216.67	270.83	193.34	233.34	273.34	284.17	190.83	121
Weightage out of 30			21.05	16.09	15.90	18.55	13.00	16.24	11.60	14.00	16.40	17.05	11.44	7.26

**Observation:** 100% juices from Tropicana followed by Real Fruit Power are the most acceptable brands, while Safal ready-to-serve (RTS) beverage ends up being the least favoured brand.

### ALMOST EQUAL

- Packaging: Fruit juices should be packed in material that facilitates ease of use and also protects the product from atmospheric deterioration.
  - The packaging of Onjus is such that only by cutting/piercing can the juice be taken out, making it inconvenient to use as well as to store the leftover (in the absence of an openable cap).
- Heavy metals, pesticide residues and microbiological activity: All the tested brands

tested are well below the maximum permissible limits for heavy metals, pesticide residues and microbiological activity.

- Acidity: If acidity (citric acid) is lower than the minimum limit, microbes may grow, allow contamination of the product and reduce its shelf life. Acidity of packaged fruit juices is to be as well balanced as possible to make it safe for consumption. As orange is a citrus fruit, the acidity is tested in terms of citric acid.
  - All the brands are well below the maximum limit of acidity permissible.

### Nutritional difference between fresh and packaged juices/beverages

While one cannot deny the benefits of drinking packaged orange juice, the demerits must also be noted as any processed/package juice/beverage is likely to be exposed to high heat during preparation.

- The higher sugar in processed juices and the way the pasteurization process occurs not only kill harmful bacteria but also reduce the quantity of nutrients and enzymes inherently available in the fresh fruits.
- As per the nutritional facts, we have tested the fresh juice of orange and kinno for two essential nutrients – potassium and vitamin C, and found these to be much higher than for the packaged orange juice/beverage.
- In packaged juices/beverages we found maximum values of potassium and vitamin C to be 184.94mg/100gm and 76.43mg/100gm, respectively. In fresh orange juice we found it to be 137.04mg/100gm for vitamin C and 94.80mg/100gm for potassium.
- From a health perspective, fresh juice is always preferable but its limited availability during off season may make the packaged variant a convenient choice for consumers.

### Fresh Is Best

Based on the testing for key nutrients (vitamin C and potassium) of freshly squeezed orange juice and of packaged juice/beverage, there is no doubt that fresh juice is superior. Hence, it is always advisable to consume freshly squeezed juice, preferably at home as it is hygienically and microbiologically safe.

### Advantages of Packaged Juice/Beverage

- Beverages with Tetra Pak packaging can be found anywhere in the store and can be used for a long time retaining the quality.
  - The freshly squeezed juice at home or street vendors/shops has to be consumed within 30 minutes, while packaged juice has a longer shelf life and also retains the taste and nutritional quantity.
  - Fresh juice deteriorates more rapidly after the extraction, whereas Tetra Pak packaging allows the fruit juice to remain fresh.
  - Juice in a Tetra Pak carton is a healthy and convenient drink for a hectic lifestyle.





## COMPARATIVE TEST

### Reaction of Manufacturers

As a matter of policy, before publication the test results of the brands tested are shared with their respective manufacturers/marketers inviting their views/comments. We reproduce here the reactions:

Manufacturer (brand name)	Manufacturer's comment	VOICE Society's reply
Pepsi Co. (Tropicana)	Concerned about the limitations of the DGHS test method followed for quantification of juice percentage in the final product, stating that the quantification of juice percentage by the method followed for testing will vary depending upon the variety and seasonality of the orange used. Also commented on sensory panel test.	VOICE Society had consulted various research institutions as well as premier labs, and followed the DGHS method in the absence of an instrumental method that could give 100 per cent accurate results. The test lab has validated the method for different varieties of orange for different concentration solutions. The test laboratory utilized for testing has NABL accreditation for DGHS method.
Coca-Cola (Minute Maid)	Sought clarification on the test method used for quantification of juice percentage.	Sensory panel test was conducted in the lab on various consumer-centric attributes and the scores assigned were based on the judgement of expert panellists.
Mother Dairy (Safal)	Informed that the orange juice variant tested was no more available in the market, as they had recently launched their new variant of orange drink with 33 per cent orange juice.	Noted the newly launched variant but at the time of sampling (October 2012) the selected variant was found available and sold in the market.



**COMPARATIVE PERFORMANCE RATINGS OF ORANGE JUICE**

Brands→ Test Parameters↓	Weightage %	Tropicana (100%)	Real Activ	Ceres	Real Fruit Power	Sach	Tropicana	Onjus	Fresh Gold	B Natural	Minute Maid	Delmonte	Safal
MRP (Rs)/Volume (ml)		99/1000	99/1000	125/1000	85/1000	85/1000	82/1000	60/1000	80/1000	85/1000	22/400	30/240	80/1000
Cost per serve (100ml) (Rs)		9.9	9.9	12.5	8.5	8.5	8.2	6.0	8.0	8.5	5.5	12.5	8.0
<b>1. General</b>	(5)	4.1	4.1	3.9	3.9	4.1	3.9	3.9	3.9	3.9	4.6	4.8	3.9
1.1 Packing	3	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.8	2.8	2.10
1.2 Marking	2	2.0	2.0	1.8	1.8	2.0	1.8	1.8	1.8	1.8	1.8	2.0	1.8
<b>2. Sensory Panel Tests*</b>	(25)	17.54	13.41	13.25	10.83	10.83	13.54	9.66	11.66	13.66	14.20	9.54	6.05
<b>3. Physico-Chemical Tests</b>	(20)	13.92	14.21	15.37	14.64	14.06	13.16	17.31	13.22	12.43	13.08	17.79	16.77
3.1 Total soluble solids	5	3.47	3.75	3.47	3.88	3.88	3.68	4.16	4.02	3.47	3.47	4.16	3.88
3.2 Total sugar	10	6.01	5.95	7.28	6.10	5.49	4.82	8.56	4.58	4.31	5.04	9.23	8.34
3.3 Acidity as citric acid	2	1.58	1.60	1.65	1.71	1.78	1.77	1.59	1.72	1.71	1.80	1.81	1.80
3.4 Density	2	1.86	1.91	1.97	1.95	1.91	1.89	2.00	1.90	1.94	1.95	1.92	1.95
3.5 Added colouring matter	1	1	1	1	1	1	1	1	1	1	0.82	0.67	0.80
<b>4. Nutritional Contents</b>	(25)	14.87	17.23	14.73	20.11	17.61	15.53	13.84	15.08	12.81	10.62	9.91	11.65
4.1 Carbohydrates	3	2.07	2.26	2.09	2.45	2.53	2.46	2.77	2.64	2.28	2.02	2.59	2.42
4.2 Energy value	5	3.72	4.07	3.28	4.35	4.37	4.33	4.63	4.60	4.07	3.74	4.44	4.19
4.3 Potassium	5	4.66	4.99	3.18	2.37	0.31	1.63	3.01	2.48	2.23	0.49	0.51	0.14
4.4 Vitamin C	8	1.56	3.05	3.80	7.68	7.12	4.45	0.66	2.40	1.42	1.62	0.11	2.38
4.5 Beta-carotene	4	2.86	2.86	2.38	3.26	3.28	2.66	2.77	2.96	2.81	2.75	2.26	2.52
<b>5. Heavy Metals</b>	(2)	2	2	2	2	2	2	2	2	2	2	2	2
<b>6. Pesticide Residues</b>	(2)	2	2	2	2	2	2	2	2	2	2	2	2
<b>7. Microbiological Tests**</b>	(5)	5	5	5	5	5	5	5	5	5	5	5	5
<b>Overall Score</b>	(84)	59.43	57.95	56.25	63.1	55.6	55.13	53.71	52.86	51.8	51.5	51.04	47.37
<b>Overall Percentage (Rounded off)</b>		71	69	67	75	66	66	64	63	62	61	61	56

**Rating:** >90: very good\*\*\*\*, 71-90: good\*\*\*\*, 51-70: average\*\*\*, 31-50: poor\*\*, up to 30: very poor\*

\*Sensory panel tests include scores of these parameters: colour and appearance, texture, aroma/flavor, taste and after-taste feeling.

\*\*Microbiological tests include tests for presence of bacterial count, coliform count, E. coli and yeast and mould count.

**Note:** Juice% was quantified and reported but not included in the ratings due to limitation of test methodology.