



Chocolates

How solid is the cocoa?

Who has ever refused a chocolate, is some question indeed. There is no prelude to this most irresistible of things, but all the romance of the world there is to it. Cocoa solids? Really! Do I care! Yet, with the preponderance of so many varieties in the market, at *Consumer Voice* we just could not resist the pull of curiosity. Yes, we do want to know our chocolates better! For just how much cocoa solids they contain, how much energy value they give to us, and so on. In any case, here is a lowdown on the things you did not suspect about one of your favourite things on earth.

A Consumer Voice Report

So, eight regular-selling brands of milk chocolate (6) and dark (plain) chocolate (2) went under the *Consumer Voice* scanner. The test programme was mainly based on the Indian Standard specification for chocolates (IS: 1163–1992) and relevant FSS Rules 2011. The tests were conducted in an NABL-accredited laboratory.



Comparative Test

Chocolate is made of these ingredients: a) chocolate liquor – cocoa beans with their shells removed and fermented, roasted and ground until they liquefy; b) cocoa butter: natural fat from the cocoa bean; sugar; lecithin – an emulsifier used to keep the ingredients together; and vanilla or vanillin and other flavours. It also may include milk for milk chocolate and fruits, nuts, etc., for speciality chocolates. As per the National Standards, the minimum requirement for milk chocolates is two per cent cocoa and for plain/dark chocolates it is 12 per cent cocoa.

CV Recommendations | Top Performers

MILK CHOCOLATES

Amul | Nestle

DARK (PLAIN) CHOCOLATES

Amul

Most Liked in Sensory Test

MILK CHOCOLATES

Hershey's

DARK (PLAIN) CHOCOLATES

Amul

Value for Money

Amul (both categories)



BRANDS TESTED

Rank	Total Score out of 100 (Rounded off)	Brand	Manufacturer/Marketer	MRP (Rs)/ Weight (gm)	Cost (Rs) per 10 gm
MILK CHOCOLATES					
1	78	Amul	Gujarat Cooperative Milk Marketing Federation Ltd	10/20	5
1	78	Nestle	Nestle India Ltd	20/36	5.54
2	77	Chocon Milcreme	S.K. Industries	10/20	5
2	77	Cadbury Dairy Milk	Cadbury India Pvt. Ltd	22/38	5.78
2	77	Lindt Lindor	Suntory Narang Pvt. Ltd	275/100	27.5
2	77	Hershey's	The Hershey Company	490/340	14.4
DARK (PLAIN) CHOCOLATES					
1	84	Amul	Gujarat Cooperative Milk Marketing Federation Ltd	100/150	6.66
2	76	Cadbury Bourneville	Cadbury India Pvt. Ltd	80/80	10

Score Rating: >90: very good*****, 71-90: good****, 51-70: average***, 30-50: poor**, <30: very poor*

KEY FINDINGS

- Cocoa solid is highest in Amul in both categories.
- Lindt Lindor (45.14 per cent) contains the highest percentage of total fat, and is followed by Nestle Milk Chocolate (33.13 per cent).
- Lindt Lindor contains vegetable fats (coconut, palm kernel and palm oil), which are not permissible as per the National Standards (BIS). It also has the highest cholesterol among the tested brands.
- Sugar is found in high quantity; the highest percentage is in Hershey's (56.59 per cent) and Cadbury Dairy Milk (55.68 per cent), thereby exceeding the maximum requirement of 55 per cent as per the National Standards.

TEST RESULTS

FOR PHYSICOCHEMICAL PARAMETERS

Cocoa solids | Sugar | Energy value | Total fat | Cholesterol | Milk fat | Carbohydrates | Melting point | Synthetic food colour

◆ Cocoa solids (% by mass)

An important factor in determining the intensity of a chocolate's taste is the cocoa content, including the cocoa mass and the cocoa butter. Cocoa solids are a mixture of many substances remaining after the cocoa butter is extracted from cocoa beans. Cocoa solids can range from a light brown to a deep reddish brown colour.

- In the milk chocolates it was in the range of 6.79 per cent–14.75 per cent by mass, and in the dark

chocolates it was 19.73 per cent–28.63 per cent by mass.

◆ Sugar as sucrose (% by mass)

Sugar (sucrose) lends a natural sweet taste and uniform texture to the chocolate. As per BIS specification, sugar should not be more than 55 per cent by mass. There is no limit set in FSS Rules for sugar content.

- All the tested brands except Hershey's and Cadbury Dairy Milk passed this test.
- Lindt Lindor contains minimum amount of sugar.

Brand	Score out of 15
Milk Chocolates	
Amul Milk	12.36
Hershey's	10.43
Chocon Milcreme	9.57
Nestle Milk	9.14
Cadbury Dairy Milk	9.07
Lindt Lindor	8.59
Dark Chocolates	
Amul Dark	14.31
Cadbury Bourneville	9.86



Comparative Test

Brand	Declared	Observed Value
Milk Chocolates		
Lindt Lindor	44	39.13
Nestle Milk	42.2	46.5
Chocon Milcreme	43.5	48.29
Cadbury Dairy Milk	56.5	55.68
Hershey's	56.09	56.59
Amul Milk	45	43.4
Dark Chocolates		
Amul Dark	43	46.83
Cadbury Bourneville	53.7	46.42

◆ Energy value (Kcal/100gm)

The energy value of a particular food is calculated from its macronutrient composition. Energy requirement can be thought of as the amount needed to maintain the basic processes of life at rest, plus the amount needed for physical activity under a variety of circumstances. Carbohydrates, fats and proteins are the sources of energy.

- Lindt Lindor gave more calories than any other tested chocolate brand, followed by Nestle Milk Chocolate.

◆ Cholesterol

Cholesterol is a lipid (fat) that is produced by the liver and is vital for normal body function.

- Lindt Lindor contains the highest amount of cholesterol among tested brands and is hence rated on lower side.
- Nestle contains the lowest cholesterol and scores highest.

◆ Total fat (% by mass)

This is the sum of saturated, monounsaturated and polyunsaturated fats of milk solids and cocoa present in chocolate. A mixture of all three in varying amounts is found in most foods. As per FSS Rules, the total fat in chocolate (milk and dark) should not be less than 25 per cent by mass.

- All the brands complied with the minimum requirement for total fat.
- Lindt Lindor contains the highest percentage of total fat.



◆ Milk fat (% by mass)

Milk fat is the fatty portion in milk and as per FSS Rules it should be a minimum two per cent by mass in milk chocolates. There is no requirement for dark chocolates since milk is not an ingredient there.

- All the brands of milk chocolate complied with the minimum requirement for milk fat.
- Lindt Lindor contains the highest amount of milk fat, followed by Chocon Milcreme, and the two brands have been given higher scores.
- Milk fat was not found in either of the two brands of dark chocolate.

◆ Carbohydrates (% by mass)

Carbohydrates raise our blood sugar more than any other nutrient. When we consume carbohydrates, they are broken down into glucose and these then enter our bloodstream. The hormone insulin helps the cells in the body to take up this glucose and use it for energy.

- Cadbury Bourneville contains highest amount of carbohydrates, followed by Hershey's and Cadbury Dairy milk.

◆ Melting point

It is the temperature at which a product melts and loses its original texture. Melting point of a chocolate is an important parameter to maintain its shape and crispiness. The melting point here should be higher so that even if the product is not kept in refrigerated conditions it does not lose its texture.

PHYSICOCHEMICAL SCORES

	Milk Chocolates							Dark Chocolates	
	% Weightage	Amul	Nestle	Chocon Milcreme	Cadbury Dairy Milk	Lindt Lindor	Hershey's	Amul	Cadbury Bourneville
Cocoa solids	15	12.36	9.14	9.57	9.07	8.59	10.43	14.31	9.86
Total fat	7	4.52	5.71	5.20	3.84	6.86	3.28	3.40	3.60
Milk fat	5	2.87	2.69	3.02	2.48	3.72	2.95	NA*	NA*
Sugar	8	7.74	7.17	6.84	5.47	7.45	5.30	7.11	7.18
Energy value	6	5.47	4.71	5.85	5.66	4.56	5.35	5.52	5.58
Carbohydrates	5	4.85	3.97	4.03	4.28	4.15	4.32	4.43	4.44
Cholesterol	6	3.99	5.43	3.97	4.62	1.97	3.81	NA*	NA*
Acid-insoluble ash	3	2.44	2.12	2.12	2.52	2.36	2.52	2.76	2.52
Synthetic food colour	2	2	2	2	2	2	2	2	2
Melting point	4	3.4	3.8	3.2	4.0	2.6	3.4	3.8	2.8
Moisture content	3	2.83	2.85	2.70	2.84	2.99	2.82	3.0	2.9

- Cadbury Bourneville (43 °C) melted at highest temperature among the brands tested.
- Lindt Lindor (30 °C) melted at lowest temperature.

◆ Acid-insoluble ash (% by mass)

As per FSS Rules, acid-insoluble ash should not be more than 0.2 per cent by mass.

- All the brands were found within the maximum permissible limit for acid-insoluble ash.
- Amul Dark Chocolate was found with the lowest percentage and hence scored higher.

◆ Synthetic food colour

It was not detected in any of the tested brands.

◆ Moisture content

Moisture content is defined as the percentage



of water in a product. Moisture in some form is found in almost every food product. In some cases moisture is good, but in others it can affect the shelf life of product. There is no specific requirement for moisture.

- All the brands contained less than one per cent moisture content.

FOR MICROBIOLOGICAL ACTIVITY

Microbiological contamination is a very serious issue for all food products. We conducted this test for presence of yeast and mould, *E. coli*, *S. aureus* and salmonella. These microorganisms are responsible for many food-borne diseases. Due to improper or poor hygienic condition during the manufacturing process, microorganisms may occur in the finished product.

All the chocolate brands we tested were found safe to consume. The microbes tested were well below the maximum permissible limit. Yet, it may be noted that there is no standard requirement as per FSS Rules. It is advisable that after opening the packet either you consume the complete chocolate or you store it in proper storage conditions to reduce the risk of microbiological attack.

Comparative Test



FOR SENSORY ATTRIBUTES

The sensory/organoleptic test was conducted in the food and nutrition department of a reputed college of Delhi University. It involved around 35 post-graduate students who were supervised by professors and technical experts and also some in-house volunteers.

These attributes were judged by the volunteers: appearance/texture, taste, flavour/odour, stickiness while chewing, and after-taste feeling. Ratings were given on a scale of 5 – 5 for ‘most liked’ and 1 for ‘least liked’. The ratings were then converted into scores.

Brand	Score out of 20
MILK CHOCOLATES	
Hershey's	14.98
Cadbury Dairy Milk	14.55
Lindt Lindor	13.66
Chocon Milcreme	13.54
Nestle milk Chocolate	13.07
Amul Milk Chocolate	10.61
DARK CHOCOLATES	
Amul Dark Chocolate	12.53
Cadbury Bourneville	11.13



FOR GENERAL QUALITIES

◆ Packaging

The chocolate should be wrapped in aluminium foil, printed or otherwise, and may be lined with glassine or greaseproof paper. It may be over-wrapped.

- Among the milk chocolates, Amul, Cadbury, Chocon Milcreme, Nestle and Hershey's are wrapped in aluminium foil and packed in thermoplastic. While Lindt Lindor is wrapped in aluminium foil, it is packed in paper box.

- As for the dark chocolates, Amul is packed in tray and thermoplastic with paper box for outer packaging. Cadbury Bourneville is wrapped in Aluminum foil and paper cover and thermoplastic.

◆ Marking/Labelling

As per the requirement, the chocolate shall be clearly and indelibly marked with information on: name and type of material, manufacturer address, batch or code number, net mass, list of ingredients in descending order of composition, month and year of manufacture, red/green dot, declaration of minimum cocoa content and milk solid contents, etc.

- Hershey's did not mark green/red dot indicating vegetarian/non-vegetarian ingredients.
- Except Chocon Milcreme, none of the brands mentioned the percentage of cocoa solids they contained.



Reasons You Can Give for Eating Chocolate

The health effects of chocolate refer to the possible beneficial or detrimental physiological effects of eating chocolate mainly for pleasure. In general, chocolate and cocoa are considered to be a rich source of antioxidants. Chocolate and cocoa also contain a high level of flavonoids, which may have beneficial cardiovascular effects.

Other effects under preliminary research include reduced risks of cancer, coughing and heart disease. One interpretation on the potential health effects of dietary chocolate is it may lower blood pressure, improve vascular function and energy metabolism, and reduce platelet aggregation and adhesion.

Yet, unconstrained consumption of large quantities of any energy-rich food, such as chocolate, without a corresponding increase in activity, increases the risk of obesity. Raw chocolate is high in cocoa butter, a fat removed during chocolate refining, then added back in varying proportions during manufacturing. Manufacturers may add other fats, sugars and powdered milk as well.

Source: Wikipedia

- Cacao, the dried and fully fermented bean from which cocoa solids and cocoa butter are extracted, contains antibacterial agents that fight tooth decay. Of course, this is counteracted by the high sugar content of milk chocolate.
- The smell of chocolate may increase theta brain waves, resulting in relaxation.
- Chocolate contains phenyl ethylamine, a mild mood elevator.
- The carbohydrates in chocolate raise serotonin levels in the brain, resulting in a sense of well-being.
- The cocoa butter in chocolate contains oleic acid, a mono-unsaturated fat that may raise good cholesterol.
- Drinking a cup of hot chocolate before meals may actually diminish appetite.
- Chocolate increases antioxidant levels in the blood.
- Mexican healers use chocolate to treat bronchitis and insect bites.