



PROXIMATE ANALYSIS OF BRANDED CHOCOLATE

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ABSTRACT

The present investigation was aimed at study of Quality of chocolate in view with chemical analysis of certain nutrients in variety of branded chocolate. Analytical investigations were performed on the selected popular brands of the chocolates. All the selected samples were analyzed for the parameters like moisture, total ash content, carbohydrates, protein, crude fiber, fat, energy and minerals like calcium. The results obtained were compared with the ISI specification and recommended for the consumption on the basis of food safety regulations. In addition, microbiological diagnosis was carried out to test for the shelf life of the chocolate. The nutrient values were discussed with reference to human health. Consumer and market survey of the product were analyzed for the various parameters of popularity of the branded chocolate.

KEYWORDS : chocolate, proximate analysis, health benefit

Introduction

Traditionally Chocolate was part of almost every child's favorite food, and is an indulgence for most adults at least on some occasions. Chocolate has good as well as bad reputation in field of health and nutrition. Chocolate has been known for its good taste for centuries until recently nutritionist were skeptical whether chocolate should be included into diet^{1,2}. Most of the times it was associated with sugar based candy which means it affects a child's teeth, plays up moods, and gives energy which is not sustainable. This view has been changing somewhat in recent times. It is not that these negatives on chocolate are not entirely valid; they continue to be true of chocolate consumption even now, particularly when it is eaten in large quantities now proven as a food with health benefits, qualified manner with scientific explanation. The beneficial effects observed are attributed to poly phenol compounds like flavonoids³. The boosting of blood flow that flavonoids provide is also good for skin. Eating in moderate amounts of dark chocolate improves skin thickness, texture and hydration and makes it more resistant to sun damage

Cocoa was said to have nourishing, fortifying, and aphrodisiac qualities... Recent evidence has begun to erase the poor reputation that chocolate had acquired in the past few decades and is restoring its former status. Chocolate is no longer deemed a guilty pleasure, and it may have positive health benefits when eaten in moderation as part of a balanced diet.

For many years chocolate has been referred to junk and unhealthy food along with other sweets and has been regarded as an indulgence. Recent studies indicate its health-giving properties and the attitude to it has undergone a sweeping change. Due to its taste and nutritional importance variety of chocolates were made available for the consumption, which provides wide choice to the consumer⁴.

Traditionally, chocolate's nutritional value has been its calories, carbohydrates, and fats, which are now not viewed as positive attributes⁵. There are more than 300 naturally occurring chemicals found in chocolate. Today's scientists are investigating the compounds in chocolate and its origin, the cacao bean. Scientists are reassessing the value of chocolate's fatty-acid compounds. These studies show that chocolate consumption could result in heart-healthy benefits

There is healthy competition among the chocolate manufacturers to enhance medicinal value of the chocolate while retaining its flavor and taste. In the diet of the sick, the differences in regimen were dictated by three other factors: objectives, time and amount. The objective of this research was aimed at following.

- To study the consumption pattern and popularity of different brands of chocolates by pre-designed questionnaire.

- To characterize each brand of chocolate with respect to their physical and chemical parameters.
- To correlate the effects of nutrients of chocolates with the human health.
- To suggest and recommend the acceptability of particular brands of chocolate

MATERIALS AND METHODOLOGY

A pre-planned and pre-tested questionnaire was used to collect data on consumption of differently branded chocolate. The personal interview with the selected family data was collected for evaluation. The salient features of the questionnaire consist of four major titles as below.

1. General information about the selection of particular brands of chocolate, Frequency of consumption and reason for selection of chocolate
2. Dietary information by recall method using detail on quantity of chocolate consumed by them.
3. Status of their health.

The 100 cooperative families and respondent from Mumbai were randomly selected for the study. Most of the families provided good support and cooperated while conducting the diet survey. The amount of chocolate consumed was estimated by personal interview.

The different brands of chocolates were collected from the local market and analyzed for various parameters. The physical parameters like flavor, texture, color were recorded for branded chocolates. Various chemical parameters like moisture content, total ash, crude fiber, protein, sugar, fat and minerals like calcium were determined using methods reported in the literature^{6,7}. Each experiment was repeated three times and only averaged results are reported in the discussion. The mineral calcium were determined by using complexometric titration Each sample of chocolate were diagnosed for microbial count and characterized by enumeration of *E. coliform*^{8,9}. The results obtained were tabulated and interpreted on the basis of scientific information available in the literature.

RESULTS AND DISCUSSION

Chocolate is the most commonly craved food in the world. Initially it was thought of as a luxury food, but now it is considered to be a nutritional food¹⁰. At first, it was seen as an aphrodisiac, accessible only for the affluent and rich. Later on, because of its high price, chocolate was replaced by coffee and tea as the main drink. However, ultimately, chocolate did become a favorite confection in developed countries. In order to control malnutrition amongst the upcoming youth, chocolate is best concentrated and healthy food. Ever increasing demands and consumption invited many food industries to venture in to chocolate business. The market survey

also indicates that the variety of chocolates are available in the market with enhanced its nutritional value to promote better health. Various ingredients are responsible for nutritionally upgrading the chocolates and increasing its consumption in

different age group of consumers. A brief survey was conducted to evaluate the consumption pattern and popularity of a particular brand of chocolate. The results are summarized in the following

Table 1 Comparison pattern of chocolate among children and adults

Age		Consumption			Variety		Selection		
Age group	%	Frequency	Children (n=100)	Adults (n= 100)	Variety of chocolate	%	Reasons	Children (n=100)	Adults (n= 100)
01-10	06	Daily	15	32	Plain chocolate	10	Taste	85	40
10-20	53	Once a week	-	16	Milk Chocolate	11	Color	55	-
20-30	28	Twice a week	14	23	Bitter/Dark chocolate	11	Flavor	40	-
30-40	10	Thrice a week	14	-	Fruit & Nut chocolate	35	Nutrient	-	08
40-50	03	Fortnight	28	-	Flavored chocolate	12	Brand	-	10
50-60	02	Once a month	29	29	Others	01	Advertiseme	60	-
Total	100	Total	100	100	Total	100	Price	80	12

The results indicates that chocolates consumed by all the age group with the maximum consumption by the adolescent age. Surprisingly, 32% of adult consume it on daily basis but consumption by children is not attractive. This may be due to phobia of dental cavity and poor quality of different brands of chocolates. However, survey on different varieties of chocolate suggests that chocolates with fruits & Nuts are liked by 35% of consumers against milk chocolate. Consumption pattern also indicates various reasons for chocolate eating. The taste of chocolate is the major attraction for its consumption. Advertisement by different media play important role favoring the chocolate consumption. Quality and branded chocolate is a food for upper middle class of people is indicative from its price factor.

The nation is struggling to control malnourishment special in poor and below average families in the rural area. It is necessary to provide a nutritious food in the form of chocolate. With this objective different brands of chocolate were analyzed for their nutritional parameters. The averaged results are tabulated in the Table 2.

Table 2 Analysis of different brands of Chocolates

Parameters/Brand	Perk	Munch	Amul (Fruits & Nut)	Cadbury (Fruits & Nut)	Nestle (Fruits & Nut)
Energy Cal/100g	520	500	562	552	546
Moisture (%)	1.45	1.45	1.10	1.31	1.50
Total Ash (%)	1.29	1.27	1.29	1.45	1.86
Crude fiber (%)	0.40	0.40	0.60	0.50	0.55
Carbohydrates (gm)	63.19	67.82	53.89	55.09	55.65
Protein (gm)	7.21	6.56	8.50	8.74	7.08
Fat (gm)	26.52	22.55	34.60	32.97	32.40
Calcium (mg)	0.35	0.79	0.47	0.50	0.40

All the brands of chocolate provide average 530calorie energy from 100gm consumption of chocolate. The moisture content of chocolate can be related with shelf life of chocolate. All brands of chocolate have moisture content entered about 1.4%. The total ash content indicates that the ingredient used has minimum level of inorganic matter. Crude fiber content is averaged with 05% which may have problem with digestion disorder. It is expected to have higher value of the fiber with increased amount of inorganic matter. Why is chocolate hard to resist? Sugar, which is contained in all modern commercial chocolate products, may help explain why eating chocolate can seem to become habit. The ability to identify sweet things and to respond to them positively was an advantage for prehistoric humans. Such a trait would have helped early people seek energy-rich, nutritional foods and avoid bitter, poisonous plants Sweet taste of chocolate is the prime reason for the attraction of chocolate by child and adolescent group. Munch brand has maximum carbohydrate content in the form of sugar while Cadbury

brand has minimum content of carbohydrate sugar. The low sugar content makes the chocolate more palatable and liking amongst the elderly people. Bitterness of cocoa adds to the taste and flavor of the chocolate. However carbohydrate content makes the chocolate instant source of energy.

Normally junk food and chocolates are not a good source of protein. Literature indicates the increasing of malnutrition amongst the growing children. The youth is suffering from PEM and the immediate measure will be consumption of chocolate as a rich source of energy. Although protein content of each brands of chocolates is in the range of 7 to 8%, can become important in treating the patients with PEM.

Fat is unavoidable constituent of the chocolate. A good quality of fat is always beneficial to health. Major source of fat is the cocoa beans used in the preparation of chocolate. However trans fat must be avoided in the making of chocolate. The average fat content is observed in the range of 22 to 34%. The Amul brand chocolate has maximum value of 34.55% while Munch brand has a minimum fat content. Most of the cocoa fat primarily comprised of two saturated fatty acids palmitic and stearic acids and one mono-unsaturated acid(oleic acid. Cocoa butter and chocolate do not raise blood cholesterol. However, when consuming milk chocolate or lower grade chocolate where a part of the total fat content comes from milk fat or various other types of fat, the cholesterol level might be adversely affected. Usually considered an undesirable saturated fat, cocoa butter contains a mixture of fatty acids. Studies show that the specific fatty acid profile of a fat is more important when assessing health risks. One-third of chocolate's fat comes from stearic acid, which does not raise LDL or "bad" cholesterol. Stearic acid is converted in the liver to oleic acid, a heart-healthy, monounsaturated fat. In a recent study, volunteers who consumed chocolate fat did not show an increase in their cholesterol levels. Antioxidant in dark chocolate and cocoa powder increases HDL cholesterol levels by as much as 10%.

Cocoa beans used in chocolate making are rich in essential minerals like magnesium, calcium, iron, zinc, copper, potassium and manganese. The milk used in the chocolate is the main source of mineral calcium. The calcium content of each brand is in the range of 0.35 to 0.79%. This is the major contributor to total ash of the chocolate. Although the amount is low but can provide good mineral source for dietary calcium.

Cocoa beans contain polyphenols with antioxidant properties which are health beneficial^{11,12}. These compounds are called flavonoids and include catechins, epicatechins, and procyanidins. The antioxidant flavonoids are found in the nonfat portions of the cocoa bean¹³. The flavonoid reduces the blood's ability to clot and thus reduces the risk of stroke and heart attacks. Antioxidant is good to protect heart and chocolate contain a large amount of

antioxidants. Cocoa and dark chocolate may control the blood pressure and reduce the blood's ability to clot, Thus the risk of stroke and heart attacks can be reduced¹⁴. According to an Italian study, a small square (20 g) of dark chocolate every three days is the ideal dose for cardiovascular benefits. Eating more does not provide additional benefits. Chocolate contains flavonoids, naturally occurring compounds found in beneficial plant-based foods. Flavonoids are found in a wide array of foods and beverages, such as cranberries, apples, peanuts, onions, tea, red wine, and chocolate. There are more than 4,000 flavonoids compounds that provide important protective benefits to plants by repairing cell damage and shielding plants from environmental toxins. These antioxidants are believed to help the cells in the human body to repair and resist damage. Flavonoids reduce platelet activity and relax blood vessels to lower blood pressure. They affect the balance of certain hormone-like compounds which play an important role in cardiovascular health^{15,16}.

Chocolates contain many other nutrients can play major health beneficial role. Theobromine is a very mild stimulant with a mild diuretic action while very low amount of caffeine also helps in refreshing the people. Phenyl ethylamine is a slight antidepressant and stimulant similar to the body's own dopamine and adrenaline. Chocolate can increase the level of serotonin in the brain. Serotonin levels can decreased the depression and in those experiencing PMS symptoms. Science shows that chocolate stimulates the release of endorphins, natural body hormones that generate feelings of pleasure and well-being¹⁷. Chocolate contains small amounts of caffeine, a stimulant to the central nervous system, to create a sense of alertness. Chocolate also contains magnesium and iron which may explain chocolate cravings triggered by a woman's pregnancy

Some chocolate ingredients affect the brain's chemistry. Electrical signals are transported between nerve cells in the brain. These signals cause changes in sensations and emotions. The brain uses a chemical contained in chocolate to make the neurotransmitter *serotonin*, which produces feelings of happiness. Another chemical contained in chocolate can promote feelings of attraction, excitement, and giddiness, feelings similar to "falling in love." Dark chocolate is loaded with nutrients that can positively affect health. Chocolate is one of the best sources of antioxidants on the planet. Studies show that dark chocolate can improve health and lower the risk of heart disease. Quality dark chocolate with a high cocoa content is actually nutritious.

The microbial count in a product determines shelf life of the food products High microbial count indicates the poor shelf life product which cannot be recommended for the safe consumption. The Standard Plate Count (SPC) method is used to investigate the microbial load in the variety of chocolates. As a recommended procedure the results of the investigations were counted at the interval of 24hrs and 48 hrs. Most of the chocolate samples had shown more proliferation of microorganisms, like E. coli, the control culture was prepared under aseptic conditions and measurements were made. These results are tabulated in the table 3

**Table 3 Microbial count
Different brands of chocolates**

Brands	CFU/mL
Cadbury	13 X 10 ⁴
Nestle	40 X 10 ⁴
Amul	2 X 10 ⁴
Perk	6 X 10 ⁴
Munch	31 X 10 ⁴

The results indicates that all the brands of chocolate are safe for consumption, since the microbial load in each brands of samples were below the recommended microbial count. The increased shelf is attributed to use of food preservatives within permissible limit. An appropriate packaging material and storage condition also adds to better shelf life of the chocolate products.

In nutshell, 100 gram of milk chocolate supplies 540 calories, 59% carbohydrates, 30% fat and 8% protein. Approximately 65% of the fat in milk chocolate is saturated, composed mainly of palmitic acid and stearic acid while the predominant unsaturated fat is oleic acid. Similarly, milk chocolate is an excellent source of riboflavin, vitamin B12 and the dietary minerals, manganese, phosphorus and zinc. Chocolate is a good source of calcium, magnesium and iron 100 grams is a fairly large amount and should not be consuming daily. All these nutrients come with 600 calories and moderate amounts of sugar. The fats are mostly saturated and monounsaturated, with small amounts of polyunsaturated. It also contains stimulants like caffeine and theobromine, but is unlikely to keep awake at night as the amount of caffeine is very small compared to coffee.

Conclusion

The concept of chocolate as food seemed to have overcome its concept as nutrition. The rehabilitation of chocolate, from a nutritional point of view, occurred only in recent times, when biomedical science began to search for evidence of its benefits, just as it did for other pharmaceutical and food products The data indicates that chocolate consumption improves overall nutritional status of the health and brain function, Chocolate as a functional food, that recognizes and generates interesting physiological effects, It is likely to promote or maintain health; Hence, chocolate should be consumed as "Nutritional food", which exalts its nutritional functions and its therapeutic abilities

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