



Evaluation and Physicochemical Analysis of Different Brands of Chocolates

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Abstract:

Chocolate is a blessing which contains almost all nutrients necessary for the growth of human health. In this study, composition of different branded chocolates available including Dairy milk, Milky bar, Perk, Kit-kat, Munch, Gems, Five-star, Melody were qualitatively analyzed in triplicate. We successfully studied proteins, fats, sugar, calcium, magnesium, iron and nickel in different branded chocolates. Cocoa contains a complex mixture of polyphenols especially flavonoids. Observational studies report that dietary flavonoids may reduce the mortality risk from coronary heart disease, cancer and stroke [1,2,3].

From the results it is confirmed that pH of all chocolates is 6-9 depend on the concentration of cocoa which is same as reported in literature.

Keywords: Chocolates, Polyphenols, Calcium, Magnesium

Introduction

Cocoa is known as "Food of the Gods". Earlier, chocolate used to be criticised for its fat content and its consumption was a sin rather than a remedy, associated with acne, caries, obesity, high blood pressure, coronary artery disease and diabetes. Therefore, many physicians tended to warn patients about the potential health hazards of consuming large amounts of chocolate. However, the recent discovery of biologically active phenolic compounds in cocoa has changed this perception and stimulated research on its effects in ageing, oxidative stress, blood pressure regulation, and atherosclerosis. Today, chocolate is lauded for its tremendous antioxidant potential. (7)

For production of high-quality chocolate, not only the quality of the ingredients defines the final product, but also influence of the productive process.

Method and material

1. Test for calcium 0.5 g chocolate was added to dilute ammonia solution to make the solution basic. Then ammonium oxalate solution added dropwise to the basic solution of chocolate. White precipitates confirm the calcium in sample. Calcium was also determined by flame test. Brick red color of flame indicates the presence of calcium.

2. Test for reducing sugar 0.5 g of chocolate was added to 2 mL of a mixture of Fehling's A and Fehling's B solutions in a test tube and heated in water bath for 10 minutes. Brown colored precipitates indicated the presence of reducing sugar.

Different brands of chocolates under study:

3. Test for glucose 0.5 g chocolate of different brands were taken in the test tubes and 2 mL of Benedict's solution was added. The test tube was heated for few minutes. Formation of red color confirmed the presence of glucose.
4. Test for caffeine 5g chocolate was mixed with 2.0 g sodium carbonate solution. Magnesium sulphate was added to the extracted organic layer to remove water. Filter and evaporate the solution leaving few precipitates. After the addition of potassium chromate and 2-3 drops of concentrated HCl to the resulting precipitates, mixture was heated to evaporate all solvent. After the addition of 2M ammonium hydroxide solution, appearance of purple color indicates presence of caffeine.
5. Test for Iron A mixture of ammonium chloride and ammonium hydroxide was added to each sample of chocolate. Presence of brown colored precipitates confirm the presence of iron.
6. Test for nickel A mixture of ammonium chloride and ammonium hydroxide was added to each sample of chocolate. Then Na₂S solution was added dropwise in each test tube. Presence of black colored precipitates confirm the nickel in sample.
7. Test for magnesium Chocolate sample was added to a mixture of ammonium chloride, ammonium hydroxide and sodium dihydrogen phosphate. White colored precipitates indicate presence of magnesium in sample.
8. Test for fats Take a small sample of each chocolate on filter paper. Fold and unfold filter paper to crush the sample over a flame. Appearance of translucent spot around the sample which became larger on heating was observed.
9. Test for Proteins 0.5 g of each sample of chocolate was added to sodium hydroxide solution. 1-2 drops of copper sulphate solution were added to the mixture, violet color indicating presence of proteins.
10. Test for carbohydrates 0.5 g of each sample of chocolate taken in different test tubes. 1 mL of water was added to make a mixture, then few drops of sulphuric acid along inner edges of test tubes followed by molisch's reagent (α -naphthol in alcohol) were added. A very beautiful purple ring is formed on the top indicates presence of carbohydrates.
11. pH determination pH of chocolates was measured by using pH paper.
12. Test for zinc 0.5 g sample was added to 5M solution of HCl to make solution acidic. Few drops of 0.5 M potassium ferro-cyanide solution were added in acidic solution. whitish grey precipitates confirm the presence of zinc.

Estimation of Total Phenolic content:

The total phenolic content of dry extracts was performed with Folin's phenol reagent assay. 1ml of sample was mixed with 1ml Folin's phenol reagent. After 5mins 10ml of 7% sodium carbonate solution was added to the mixture followed by the addition of 13ml of deionized distilled water and mixed thoroughly. The mixture was kept in the dark for 90mins at 23°C, after which the absorbance was read at 760nm. The total phenolic content was determined from extrapolation of calibration curve which was made by preparing gallic acid solution. The estimation of the phenolic compounds was carried out in triplicate. The total phenolic content was expressed as milligrams of Gallic acid equivalents (GAE)/g of dried sample.

Calibration curve-

Drug	Conc. In ppm	Absorbance
Standard Gallic acid	1.0	0.02
	2.0	0.13
	3.0	0.20
	4.0	0.32
	5.0	0.41
	6.0	0.55

Results and Discussion

According to the literature, chocolates are beneficial and contain proteins, fats, carbohydrates minerals and polyphenols which are necessary for performing different body functions. Composition of chocolate is different that can be vary from brand to brand. To evaluate their composition, 10 different brands of chocolates were used for qualitative analysis. The samples were collected from local market of Mumbai. Calcium, magnesium, zinc, sugar, carbohydrates, proteins, fats, alcohol, caffeine, pH and iron were qualitatively analyzed.

Sample Name	pH	Proteins	Fats	Sugar	Calcium	Magnesium	Iron
Dairy Milk	6	++	++	++	++	++	--
Perk	7	++	++	++	++	-	+
5-Star	7	++	++	++	+	-	+
Gems	6	++	++	++	+	-	-
Milky Bar	6	++	++	++	+	-	-
Melody	6	++	++	++	+	-	-
Amul bitter	6	++	++	++	++	++	++

Conclusion

The present study revealed that most of the chocolates have pH 6-7 slightly acidic due to the presence of lactic acid.

All the chocolates contain fats in the form of cocoa butter, used for the preparation of chocolates. As proteins are necessary for our development, some tested chocolates contain excess amount of proteins like Choco-chips, Dairy Milk, Milky bar, Gems, Melody, Perk, Munch.

Alcohol cause critical effects on body and fortunately, none of the tested chocolate contain alcohol. Many of the tested chocolates contain minerals like calcium, magnesium, zinc and iron in some chocolates which increase their importance in daily life as a food. Caffeine is also known as mood changer but excess use can damage nervous system. From this study, it is concluded that chocolates are beneficial for humans and can recover the deficiency of many minerals but their excess use can be dangerous for human health.

It is important to note that the possible health benefits mentioned below came from single studies. More research is needed to confirm that eating chocolate can really improve people's health. In addition, chocolate

bars do not contain only cocoa. The benefits and risks of any other ingredients, such as sugar and fat, need to be considered.

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