CHEMISTRY PROJECT

VEGETABLE JUICE ANALYSIS

Introduction

Vegetable juice (also referred as: Green Drink) is a juice drink made primarily of blended vegetables and also available in the form of powders. Vegetable juice is often mixed with fruits such as apples or grapes to improve flavor. It is often touted as a low-sugar alternative to fruit juice,

although some commercial brands of vegetable juices use fruit juices as sweeteners, and may contain large amounts of sodium.

Our body needs important nutrients to support its healthy condition. That is why it is imperative that our food consumption should include healthy foods that contain good amount of nutrients sufficient enough to supply our body with its required daily nutrition. Nutrients like carbohydrates, proteins, fats, vitamins, minerals, etc. are play vital and specific role to develop and sustain body.

This project deals with finding out various constituents and compositions of vegetables and fruits. Analyzing the type of nutrient present in a food item helps plan a balanced diet. A balanced diet can be prepared according to the energy requirement which varies depending on age, sex, size, metabolic rate and activity level.

In this project presence of Carbohydrates, Proteins. Fats and minerals are analyzed through different experiments. Following is a brief note on these nutrients.

NUTRIENTS

CARBOHYDRATE

The carbohydrates are the optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis. Carbohydrates are the most common source of energy in living organisms. Foods high in simple carbohydrates include fruits, sweets and

soft drinks. Foods high in complex carbohydrates include breads, pastas, beans, potatoes, bran, rice, and cereals. Carbohydrates are used as storage molecules as starch in plants and glycogens in animals.

Role of carbohydrates in body is as follows:

- Providing energy and regulation of blood glucose
- Biological recognition processes
- Dietary fiber
- Sparing the use of proteins for energy
- Breakdown of fatty acids and preventing ketosis.

Protein

Proteins (also known as **polypeptides**) are organic compounds made of amino acids arranged in a linear chain and folded into a globular form. Proteins are the basis of many animal body structures (e.g. muscles, skin, and hair). Each molecule is composed of amino acids, which are characterized by inclusion of nitrogen and sometimes sulphur (these components are responsible for the distinctive smell of burning protein, such as the keratin in hair). The body requires amino acids to produce new proteins (protein retention) and to replace damaged proteins. Protein contains 16.8 kilojoules (4 kilocalories) per gram. In the case of protein, this is somewhat misleading as only some amino acids are usable for fuel. Chief sources of protein are milk, pulses, fish, meat, etc.

FAT

A molecule of dietary fat typically consists of several fatty acids (containing long chains of carbon and hydrogen atoms), bonded to a glycerol. They are typically found as triglycerides (three fatty acids attached to one glycerol backbone). Fats may be classified as saturated or unsaturated depending on the detailed structure of the fatty acids involved. Fats contain 37.8 kilojoules (9 kilocalories) per gram.

MINERALS

Dietary minerals are the chemical elements required by living organisms, other than the four elements carbon, hydrogen, nitrogen, and oxygen that are present in nearly all organic molecules.

- **Calcium** - A common electrolyte, but also needed structurally (for muscle and digestive system health, bone strength, some forms neutralize acidity) may help clear toxins, provides signaling ions for nerve and membrane functions.
- **Magnesium** - Required for processing ATP and related reactions (builds bone, causes strong peristalsis, increases flexibility, increases alkalinity)
- **Phosphorus** - Required component of bones; essential for energy processing prevent anemia.

CUCUMBER

Cucumber (Cucumis sativus) is a widely cultivated plant in the gourd family, Cucurbitaceae. It is a creeping vine that bears cylindrical fruits that are used as culinary vegetables. There are three main varieties of cucumber: slicing, pickling, and burpless. Within these varieties, several different cultivars have emerged. The cucumber is originally from Southern Asia, but now grows on most continents. Many different varieties are traded on the global market.

The cucumber is a creeping vine that roots in the ground and grows up trellises or other supporting frames, wrapping around supports with thin, spiraling tendrils. The fruit of the cucumber is roughly cylindrical, elongated with tapered ends, and may be as large as 60 centimeters

(24 in) long and 10 centimeters (3.9 in) in diameter. Having an enclosed seed and developing from a flower, botanically speaking, and cucumbers are classified as pepoes, a type of botanical berry. Much like tomatoes and squash they are often also perceived, prepared and eaten as vegetables. Cucumbers are usually more than 90% water.

CARROT

The **Carrot** (Daucus carota sativus) is a root vegetable, usually orange in colour, though purple, red, white, and yellow varieties exist. It has a crisp texture when fresh. The most commonly eaten part of a carrot is

a taproot, although the greens are sometimes eaten as well. It is a domesticated form of the wild carrot Daucus carota, native to Europe and southwestern Asia. The domestic carrot has been selectively bred for its greatly enlarged and more palatable, less woody-textured edible taproot. The Food and Agriculture Organization of the United Nations (FAO) reports that world production of carrots and turnips (these plants are combined by the FAO for reporting purposes) for calendar year 2011 was almost 35.658 million tonnes. Almost half were grown in China. Carrots are widely used in many cuisines, especially in the preparation of salads, and carrot salads are a tradition in many regional cuisines.

TOMATO

The tomato (etymology and pronunciation) is the edible, often red fruit/berry of the nightshade Solanum lycopersicum, commonly known as a tomato plant. The tomato is consumed in diverse ways, including raw, as an ingredient in many dishes, sauces, salads, and drinks. While it is botanically a berry fruit, it is considered a vegetable for culinary purposes, which has caused some confusion. The species originated in the South American Andes and its use as a food originated in Mexico, and spread throughout the world following the Spanish colonization of the Americas. Its many varieties are now widely grown, sometimes in greenhouses in cooler climates. The plants typically grow to 1–3 meters (3–10 ft) in height and have a weak stem that often sprawls over the ground and vines over other plants. It is a perennial in its native habitat, although often grown outdoors in temperate climates as an annual. An average common tomato weighs approximately 100 grams (4 oz).

EXPERIMENT

- AIM

  To detect the presence of carbohydrates, proteins, oils and fats and minerals in vegetable juices.

- THEORY

  The presence of carbohydrates, proteins and fats in any food is detected by performing tests with the extract of the food. The

vegetables and fruits are tested for these nutrients with the help of tests such as Molisch's Test, Fehling's Test, Tollen'sg test, etc. Test for minerals are also performed.

- MATERIALS REQUIRED
  - Vegetable Juice
  - pH Paper
  - Test Tube
  - Boiling Tube
  - Burner
  - Funnel
  - Filter Paper
  - Measuring Tube
  - Iodine Solution
  - Sodium Hydroxide Solution (NaOH)
  - Copper Sulphate Solution ($CuSO_4$)
  - Tehling's Solution A & B
  - Picric Acid ($C_6H_3N_3O_7$)
  - Ammonium Chloride Solution (NH_4Cl)
  - Ammonium Hydroxide Solution (NH_4OH)
  - Ammonium Oxalate Solution ($(NH_4)_2C_2O_4$)
  - Disodium Hydrogen Phosphate Solution (Na_2HPO_4)
  - Concentrated Nitric Acid (conc.HNO_3)

➢ PROCEDURE

The vegetable juices are diluted using distilled water. The distilled water is added to it in order to remove color and to make it colorless so that color change can be easily watched and noted down. Now test for food substance is taken down with the solution

1. **Test For Acidity** – Take 5ml of juice in a test tube and pH values should be noted down by dipping it in the test-tube. If it turns red, it means that the juice is acidic else it is basic..

2. **Test For Starch** – Take 2ml of vegetable juice in a test tube, and add a few drops of iodine solution to it. If the solution turns blue in color it indicates the presence of starch.

3. **Test for Proteins** – Take 5ml of 5% of NaOH solution and add 2 drops of $CusO_4$ known as burial solution and add juice and shake well. If the solution turns violet in color it indicates the presence of proteins.

4. **Test For Carbohydrates** – Take 2ml of Tehling's solution A and B and 1ml of Tehling's solution B in a Test tube. If the solution turns red it indicates the presence of sugar like maltose, glucose, fructose and lactose.

5. **Test For Potassium** – Add 2ml of juice in a test tube and picric acid, yellow color precipitate indicates the presence of potassium.

6. **Test For Calcium** – Add 2 ml of vegetable juice and add NH_4Cl solution. Filter the solution and to the filtrate add 2 ml of ammonium oxalate solution. White precipitate indicates the presence of calcium.

7. **Test for Magnesium** – Add NH_4OH and excess Disodium Hydrogen Phosphate to test tube with a glass rod. White precipitate indicates the presence of magnesium.

- **OBSERVATION**

- **CUCUMBER**

Test	Observation	Inference
Acid/Base	pH Turns Red	Acidic
Starch	No Blue Color	Absence Of Starch
Protein	No Violet Color	Absence of Protein
Carbohydrate	Red Color	Presence of Carbohydrate
Potassium	No Yellow Precipitate	Absence Of Potassium
Calcium	White Precipitate	Absence Of Calcium
Magnesium	White Precipitate	Presence Of Magnesium

- **CARROT**

Test	Observation	Inference
Acid/Base	pH turns Red	Acidic
Starch	No Blue Color	Presence Of Starch
Protein	No Violet Color	Absence of Proteins
Carbohydrate	Red Color	Presence of Carbohydrates
Potassium	Yellow Precipitate	Presence of Potassium
Calcium	No White Precipitate	Absence of Calcium
Magnesium	No White Precipitate	Absence of Magnesium

- **TOMATO**

Test	Observation	Inference
Acid/Base	pH turns Red	Acidic
Starch	No Blue Color	Presence of Starch
Protein	No Violet Color	Absence Of Protein
Carbohydrate	Red Color	Presence of Carbohydrates
Potassium	Yellow Precipitate	Presence of Potassium
Calcium	White Precipitate	Presence of Calcium
Magnesium	No White Precipitate	Absence of Magnesium

➢ RESULT

After performing the tests for carbohydrates, proteins, fats and minerals, following can be concluded about their presence in different vegetables and fruits.

- ❖ Tomato contains carbohydrates, proteins, calcium, magnesium.
- ❖ Cucumber contains carbohydrates, proteins, fats, calcium, magnesium, iron.
- ❖ Carbohydrates and starch are rich in tomato and cucumber.

Bibliography

www.thechemistryguru.com