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# Chemical Composition and Nutritional Effect of Pineapple, Mango, Banana, Avocado and Orange: A Review Article

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**Abstract**
The Consumption of fruits has been effective in the prevention of chronic diseases and exert a protective effect against the development of human diseases such as cardiovascular disease, diabetes, cancer the likes. The health benefits of these fruits have been recognized relatively due to the compounds that found in the fruits having antioxidant capacity and these compounds have an ability to overcome oxidative stress by neutralizing the overproduction of oxidant species. The protective role could be due to nutrients contained in the fruits such as fiber, vitamins and phytochemicals. The main objective of this paper is to create awareness in our community on the chemical composition of pineapple, mango, banana, avocado and orange fruits.
**Keywords:** Chemical Composition, fruits, phytochemical and nutrients

## INTRODUCTION

Fruits are the ripened ovary together with seeds of a flowering plant. In many species, the fruit incorporates the ripened ovary and surrounding tissues. Fruit are the means by which flowering plant disseminate seeds (Lewis, 2002), in cuisine fruits that are sweet and fleshy, (Mac Gee, 2004). They provide people with a range of compounds, many of which have more than one role, being involved both with immediate good health and with protection against disease that can develop over a long period of time, such as cancer, heart conditions, stroke, hypertension, birth defects, cataracts and diabetes. The aim of this paper is to create awareness in our community on the chemical composition of pineapple, mango, banana, avocado and orange fruits.

## FRUITS NUTRITIONAL EFFECT IN DIET

### *Hydrating effect*

Fruits and fruit juice are the most pleasant way of hydrating the organism (Getahum, 1974). The water absorbed by sick person in this manner has added advantage of supplying sugar and minerals at the same time.

### *Diuretic effect*

Clinical observations have showed that potassium, magnesium and sodium contents of fruits act as diuretic. The diuretic frequency of the urination is considerably increased when fruits are taken (Mac Gee, 2004). They lower the urine density and thereby accelerate the elimination of nitrogenous waste and chloride (Getahum, 1974).

### *Alkalinizing effect*

The organic acids of the salts in fruits provide alkaline carbonates when transformed within the organism, which alkalize the fluids. All the fruits promote intestinal elimination. This keep the body free from toxic wastes, which creep into blood system from an overloaded, sluggish intestinal tract (ADA, 1997).

### *Laxative effect*

Cellulose, the fibrous matter in fruit, aids in the smooth passage of food in the digestive tract and easy bowel action. The sugar and organic acids contained in fruits also increase their laxative effect. Hence, regular use of fruits prevents and cures constipation (Jannic, 1990).

### *Tonic action*

Fruit are dependable sources of vitamins; exert a tonic effect in the body (Farrell, 1999). Citrus fruits, like lemons and oranges, are particularly valuable sources of vitamin C. These fruits are usually eaten raw and fresh, thus making the vitamins fully available to the body. Several fruits contain good amounts of carotene which gets converted to vitamin A in the body.

### *Fruit cure*

Fruits are highly beneficial in maintaining acid-alkaline balance in the body. They neutralize the toxic condition of the body resulting from excessive intake of acid-forming foods and restore its alkalinity (Farrell, 1999). They clear the system of morbid waste and cater to the body's requirement of natural sugar, vitamins and minerals. Vitamins, minerals, enzymes and trace elements contained in fresh fruits juices are extremely beneficial in normalizing all the body processes.

### Chemical Composition of Fruit

Fruit composition can be strongly influenced by the variety and ripeness, and the major constituents of these fruits are sugar, polysaccharides, and organic acids, while N-compounds and lipids are present in lesser amounts. Minor constituents include pigments and aroma substances of importance to sensory quality, and vitamins and minerals of nutritional importance.

 

**Nutrient Composition of Fruits**

Fruits are found to be rich in vitamins, specially vitamin C, minerals, sugar (Achinewu, 1983; Oguntona, 1991). The main sugars in fruits are glucose, fructose and sucrose and some are low in carbohydrate and consequently low in calorie.

***Protein***

The protein constituents of fruits are low. They serve as components of nuclear and cytoplasmic structures that take part in determining and maintaining cellular organization, including the full components of enzymes involved in the metabolism during 18 growth and maturation of the fruit (Umoh, 1998).

***Moisture***

The moisture content of fresh fruits at maturity is generally high (Umoh, 1998). Moisture content of fruits determines how fresh the fruits were at harvest, or for how long they have been stored before analysis (Sheila, 1978).

***Fats***

Fruits are not good sources of fat and are usually recommended as part of weight reduction diet (Sheil, 1978; Umoh, 1998 and Oke, 1967), reported on the nutritional value and chemical composition of fruits such as lesser-known fruit and seeds.

***Minerals***

Fruits contain mineral elements in low quantities. Fruits, like dried fruits are rich in calcium and iron (Mauseth, 2003).

**COMMONLY USED FRUITS AND THEIR CHEMICAL COMPOSITION**

***Pineapple***

Pineapples nutrients include calcium, potassium, fibre, and vitamin. It is low in fat and cholesterol and also a good source of vitamins $B_1$, $B_6$, and fiber. Pineapple is a digestive and a natural anti-inflammatory fruits. Fresh pineapples are rich in bromelain. Bromelain has demonstrated significant anti-inflammatory conditions such as acute smusitis, sore throat, arthritis and gut and speeding recovery from injuries and surgery. Pineapple should be eaten alone between meals (USDA, 2001). Pineapple enzymes have been used with success to treat rheumatoid arthritis and to speed tissue repair as a result of injuries diabetic ulcers and general surgery and also reduces blood clotting and helps remove plague from arterial walls. It also helps to cure bronchitis and throat infections. Pineapple is an excellent cerebral toner; it combats loss of memory and sadness. It is rich in manganese and just one cup of pineapple provides 73% of the daily recommended amount of manganese. Vitamins that can be found in pineapple are vitamin C, vitamin A, calcium and potassium. It is believed that the best source for these nutrients is fresh pineapple. Pineapple contains bromelain, which is known to help relieve or even stop coughs altogether. The main reason is because it is anti-inflammatory and ultimately, it is known to help with the loosening of mucus.

Table 1: Proximate composition of pineapple

| Nutrients | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Proximate | | 86.5 | 37 | 0.300 |
| Water | g | 49 | 0 | |
| Energy | kcal | 205 | 0 | |
| Energy | kJ | 0.39 | 17 | 0.012 |
| Protein | g | 0.43 | 15 | 0.148 |
| Total lipid (fat) | g | 12.39 | 0 | |
| Fibre, total dietary | g | 12 | 0 | |
| Ash | g | 0.29 | 32 | 0.010 |

Source: (USDA, 2006)

Table 2: Mineral content of Pineapple

| Minerals | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Calcium | mg | 7 | 10 | 0.778 |
| Iron | mg | 0.37 | 15 | 0.025 |
| Magnesium | mg | 14 | 11 | 0.529 |
| Phosphorus | mg | 7 | 10 | 0.365 |
| Potassium | mg | 113 | 12 | 5.626 |
| Sodium | mg | 1 | 11 | 0.074 |
| Zinc | mg | 0.08 | 15 | 0.007 |
| Copper | mg | 0.110 | 15 | 0.009 |

Source: (USDA, 2006)

 

Table 3: Vitamin content of Pineapple

| Vitamins | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Vitamin C | mg | 15.4 | 11 | 0.55 |
| Vitamin, A, RE | Mcg RE | 23 | 22 | 5.188 |
| Vitamin IU. | IU | 2 | 22 | 0.519 |

Source: (USDA, 2006)

***Mangoes***

Mangoes contain several important phytochemicals including cryptoxanthin, lutein, galic acid and anacardic acid. The entire fruit can be eaten for just over hundred calories. High in fibre, virtually fat free and mangoes contain numerous vitamins. It contains, B-carotene which may slow the aging process, reduce the risk of certain forms of cancers, improve lung function, and reduce complications associated with diabetes. It is rich in antioxidants such as beta carotene (44.5g/100g fruit) and 25 vitamin C (27.79/100g fruit). Mangoes contain vitamin A (equivalent 38g/100g fruit), vitamin E and also contain vitamin $B_6$, (0.134mg/100g fruit), other vitamins $B_1$ and $B_{12}$. It supply nutrients such as potassium (15.6mg/100g fruit), calcium (10mg/100g fruit), Magnesium (10g), iron (0.12mg) and zinc (0.04mg/100g) and fibre and are low in calories. The edible peel of the mango is a good source of fibre (USDA, 2001). The fruit is rich in pre-biotic dietary fibre, vitamins, minerals and polyphenol and flavonoids and antioxidant compounds. It is a very good source of vitamin A and flavonoid like beta carotene, alpha carotene and beta cryptoxanthin. The consumption of natural fruits rich in carotene are known to protect from lung and oral cavity cancers (USDA, 2001).

Table 4: Proximate composition of Mangoes, raw (*Mangifera idica)*

| Nutrients | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Proximate | | | | |
| Water | g | 81.71 | 108 | 0.323 |
| Energy | kcal | 65 | 0 | |
| Energy | kJ | 272 | 0 | |
| Protein | g | -0.51 | 79 | 0.025 |
| Total lipid (fat) | g | 0.27 | 47 | 0.039 |
| Carbohydrate | g | 17.00 | 0 | |
| Fibre | g | 1.8 | 0 | |
| Ash | g | 0.5 | 66 | 0.033 |

Source: (USDA, 2006)

Table 5: Mineral composition of Mangoes

| Minerals | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Calcium | mg | 1 | 27 | 0.850 |
| Iron | mg | 0.13 | 21 | 0.021 |
| Magnesium | mg | 9 | 20 | 0.580 |
| Phosphorus | mg | 11 | 41 | 0.746 |
| Potassium | mg | 156 | 24 | 8.441 |
| Sodium | mg | 2 | 24 | 0.624 |
| Zinc | mg | 0.04 | 1 | |
| Copper | mg | 0.110 | 17 | 0.009 |

Source: (USDA, 2006)

Table 6: Vitamin content of mangoes

| Vitamins | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Vitamin C | mg | 27.7 | 162 | 1.740 |
| Vitamin, A, RE | Mcg RE | 389 | 91 | 24.817 |
| Vitamin IU | IU | 3894 | 91 | 24.417 |

Source: (USDA, 2006)

***Orange***

Orange like other citrus fruits is known for vitamin C content. Due to this high amount of vitamin C, orange helps in absorbing calcium into the body and maintaining the health of teeth and bones. It also contains vitamin A and vitamin B. Orange juice is often fed to people who have become weak due to some illness. Orange juice is also a good refresher after a long exhaustive day. The nutritional value of orange makes good for indigestion constipation, bowel disorder, dyspeosia, dental care, pyorrhea, bone health, heart diseases, respiratory problems,

 

cold, cough influenza, skin care, pimples, acne, fever measles, typhoid and tuberculosis (USDA, 2001).

Table 7: Proximate composition of Orange, raw, (*Citrus sinesis)*

| Nutrients | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Proximate | | | | |
| Water | g | 86.75 | 88 | 0.121 |
| Energy | kcal | 47 | 0 | |
| Energy | kj | 197 | 0 | |
| Protein | g | 0.94 | 69 | 0.014 |
| Total lipid (fat) | g | 0.12 | 4 | 0.010 |
| Carbohydrate | g | 11.75 | 0 | |
| Fibre | g | 2.4 | 0 | |
| Ash | g | 0.44 | 79 | 0.006 |

Source: (USDA, 2001)

Table 8: Mineral content of Orange

| Minerals | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Calcium | mg | 40 | 0 | |
| Iron | mg | 0.1 | 64 | 0.004 |
| Magnesium | mg | 10 | 212 | 0.171 |
| Phosphorus | mg | 14 | 68 | 0.439 |
| Potassium | mg | 181 | 180 | 1.408 |
| Sodium | mg | 0 | 72 | 0.029 |
| Zinc | mg | 0.07 | 3 | |
| Copper | mg | 0.045 | 64 | 0.003 |

Source: (USDA, 2006)

Table 9: Vitamin content of Orange

| Vitamins | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Vitamin C | mg | 53.2 | 148 | 5.890 |
| Vitamin, A, RE | Mcg RE | 205 | 148 | 0.890 |
| Vitamin IU | IU | 21 | | |

Source: (USDA, 2006)

***Avocado***

Avocado is a fat-rich fruit and its fat content is about 23%. It contains dietary fiber and is rich in minerals such as copper, magnesium, manganese and moderate in iron, calcium, iodine, selenium, zinc and phosphorus and is well known for its high vitamins K and A content. It also contains small amount of vitamins B, C, E, thiamin, riboflavin, niacin, vitamin $B_6$, biotin and folate. Fruits are normally not rich in calories and are eaten for their ability to provide vitamins, minerals and digestive fiber content. The nutritional value of avocado makes it good for indigestion, hair care, heart health, skin care, psoriasis and bad breath (USDA, 2001).

Table 10: Avocado, raw*, (Persea American)*

| Nutrients | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Proximate | | | | 0.817 |
| Water | g | 74.27 | | 58 |
| Energy | kcal | 161 | 0 | |
| Energy | kJ | 674 | 0 | 0.042 |
| Protein | g | 1.98 | 58 | |
| Total lipid (fat) | g | 15.32 | 54 | |
| Carbohydrate | g | 7.39 | 0 | |
| Fibre | g | 5.0 | 0 | 0.093 |
| Ash | g | 1.04 | 57 | |

Source: (USDA, 2006)

 

Table 11: Mineral content of Avocadoes

| Minerals | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Calcium | mg | 11 | 6 | 1.610 |
| Iron | mg | 1.02 | 54 | 0.122 |
| Magnesium | mg | 39 | 54 | 3.062 |
| Phosphorus | mg | 41 | 54 | 2.996 |
| Potassium | mg | 599 | 30 | 57.306 |
| Sodium | mg | 10 | 30 | 1.146 |
| Zinc | mg | 0.42 | 1 | |
| Copper | mg | 0.262 | 54 | 0.020 |

Source: (USDA, 2006)

Table 12: Vitamin content of Avocados

| Vitamins | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Vitamin C | mg | 7.9 | 6 | 1.528 |
| Vitamin, A, RE | Mcg RE | 612 | 6 | 70.839 |
| Vitamin IU | IU | 61 | 6 | 7.084 |

Source: (USDA, 2006)

***Banana***

Banana is rich in potassium and also contains other minerals such as calcium, iron, magnesium and phosphorus in large quantities. It is rich in fiber making it useful laxative and good for easing constipation. Bananas contains about 90 to 93 calorie per 100g. Consumption of 3-4 bananas per day, specially with milk, is often recommended to gain weight (USDA, 2001). The nutritional value of banana makes it useful for weight gain as well as weight loss, constipation, bowel problems, anemia, blood pressure, heart problems, ulcers, brain stimulation, depression, nervous disorders, stress and morning sickness (FORSTER M. *et al*., 2003)

Table 13: Proximate composition of Banana, raw (*Musa paradisiacal)*

| Nutrients | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Proximate | | | | |
| Water | g | 74.26 | 116 | 0.381 |
| Energy | kcal | 92 | 0 | |
| Energy | kj | 385 | 0 | |
| Protein | g | 1.03 | 111 | 0.026 |
| Total lipid (fat) | g | 0.48 | 11 | 0.026 |
| Carbohydrate | g | 23.43 | 0 | |
| Fibre | g | 2.4 | 0 | |
| Ash | g | 0.80 | 110 | 0.016 |

Source: (USDA, 2006)

Table 14: Mineral content of Banana

| Minerals | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Calcium | mg | 6 | 5 | 0.374 |
| Iron | mg | 0.31 | 108 | 0.015 |
| Magnesium | mg | 29 | 103 | 1.265 |
| Phosphorus | mg | 20 | 102 | |
| Potassium | mg | 396 | 55 | 6.356 |
| Sodium | mg | 1 | 61 | 0.141 |
| Zinc | mg | 0.16 | 13 | 0.008 |
| Copper | mg | 1.104 | 109 | 0.009 |

Source: (USDA, 2006)

Table 15: Vitamin content of Banana

| Vitamins | Units | value per 100g of edible portion | sample count | Std error |
|---|---|---|---|---|
| Vitamin C | mg | 9.1 | 14 | 0.339 |
| Vitamin, A, RE | Mcg RE | 81 | 5 | 10.050 |
| Vitamin IU | IU | 8 | 5 | 1.005 |

Source: (USDA, 2006)

 

Consumption of small fruits has been associated with diverse health benefits, such as prevention of heart disease, hypertension, certain forms of cancer and other degenerative or age-related diseases (Santos-Buelga and Scalbert, 2000; Hummer and Barney, 2002). These beneficial health effects of fruits could mostly be due to their particularly high concentrations of natural antioxidants (Wang *et al*., 1996), including phenolic compounds, ascorbic acid and carotenoids.

## CONCLUSION

Plants such as fruits have a lot of biologically effective compounds that have the ability to attack radical free and work as anti-natural oxidative stress and this make them play an important role in reducing the risk of many diseases. Fruits contain significant levels of micronutrients and phytochemicals with important biological properties. They provide people with a range of compounds, many of which have more than one role, being involved both with immediate good health and with protection against disease that can develop over a long period of time. The main problem of fruits is during storage of the fruit and they are easily spoiled. In general, a phenol compound which is found in fruit undergoes changes during the storage of fruits; the amount of catechins, epicatechins, and phenolic acids in the fruits decreases during the storing of fruits. These polyphenolic compounds are regarded as a group of phytochemicals that may promote human health to a highest level due to their ability to act as antioxidant.

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