

# Suppressive Effect of Active Principles in *Malus Domestica* (Apple) in Hypercholestremia and Hyperglycemic Adult Male Subjects of Anambra State

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**Abstract:** Hypercholesteremia and hyperglycemia are silent killer diseases that have unnoticeably vanished people from the mother earth worldwide. Plants and fruits have been found very useful for purposes of treatment of diseases among other benefits. *Malus domestica* is such one whose suppressive effects on hypercholestremia and hyperglycemic subjects were studied. 38 subjects were selected comprising of male adult subjects of age range 50-70 yrs and grouped into Group A (control n=10), Group B (hypercholestremia subjects n=14) and Group C (hyperglycemia subjects n=14). Results showed that *Malus domestica* decreases cholesterol and blood sugar levels ( $P<0.05$ ) in the tests subjects and has no effect on the haemoglobin concentration, packed cell volume, white blood cell count and platelet counts of the test subjects ( $P<0.05$ ). This could be as a result of presence of high dietary fibers and its inability to stimulate erythropoietic systems of the body. It could be observed from this study that *Malus domestica* has negative effect on hypercholestermia and hyperglycemia conditions as a result of principle elements contained in it which helps in insulin and cholesterol metabolism.

**Keywords:** Cholesterol, diabetes, *Malus domestica*, haemoglobin, platelets, hypercholesteremia

## 1. Introduction

From Noolithic time, some plants have been discovered to have medicinal value (Olaleye et al, 2000). These plants have been used as a source of various drugs where man can get a cure for almost all ailments. This have been made easy by the use of recently developed photochemical and phytopharmacological techniques. Substances call active principles have been implicated by extraction from these natural herbs. These active principle are mostly phytochemicals like alkaloids. The ability of this plant to cure different ailments have been traced essential active principles (Ukairo et al, 2001).

Apple (*Malus domestica*) is a pomaceous fruit of apple tree. They are obtained from the medium sized tree belonging to the Rosaceae family. The apple tree is originated in the mineral rich mountain ranges of Kazakhstan and now cultivated in many parts of the world. Apple fruit features oval or pear shape and the outer skin has different colours depending upon the cultivar type. Hundreds of varieties of apple are eaten as table fruit or as desert fruit grown in US and worldwide.

The apple forms a tree that is small and deciduous reaching 3-12meters (9.8-39ft) tall with a broad often densely twiggy crown. There are more than 7,500 known cultivares of apples (Elzebroek, 2008). Cultivars vary in their yield and the ultimate size of the tree even when grown in the same root stock (NEA 2008).

## 2. Chemical Constituents of Malus Domestica

Apples contain variety of phytochemicals including flavenoids, quercetin, catehin, chloridzin and chloregenic acid which are protein (0.5%), carbohydrate (11%), cholesterol (0%), dietary fiber (6%), vitamins such as folates (1%), Niacin (1%), Pantothenic acid (1%), Pyridoxine (3%), Vitamin A, C, E, K, electrolytes such as sodium, potassium, calcium, iron, magnesium, phosphorous, zinc.

## 3. Medicinal And Health Benefits of Apple Friut

Apples reduce the risk of colon cancer, prostate cancer and lung cancer. Apple peels contain some antioxidants which in rats studies increases skeletal muscles and brown fat, and decreases white fat, obesity. Glucose-intolerance and fatty liver disease (Kunkel et al, 2012). Apple juice concentrate has been found to increase the production of neurotransmitter, acetylcholine in mice. Apple peels are source of antioxidant activity invitro (Lee et al, 2004).

Apples contain no saturated fat or cholesterol nonetheless, the fruit is rich in dietary fiber which helps prevent absorption of dietary LDL or bad cholesterol in the gut. The fiber also saves the colon mucous membrane from exposure to toxic substances by binding to cancer causing chemical inside the colon. Apple fruit contains good quantities of vitamin C and beta-carotene. Vitamin C is a natural antioxidant. Consumption of food rich in vitamin C helps

agents and scavenge harmful, pro-inflammatory free radicals from the body. The minerals contained in Apple in small quantities such as potassium is an important component of cell and body fluids. It helps to control heart rate, and blood pressure; this counters the bad influence of sodium.

#### 4. Materials And Methods

The phytochemical analysis of the constituents of the plant extract was studied before haematological and biochemical experiments were done.

##### 4.1 Subjects Selection

The subjects for this research consist of persons coming to our clinic and laboratory centers at Uli, Anambra State Nigeria. They were made to undertake tests based on their complaints. Those with high cholesterol level, and having diabetes in addition were the most suitable for the research study. Twenty-eight (28) subjects were screened and confirmed to be diabetic and having high cholesterol. They were screened with the standard laboratory tests.

##### 4.2 Experimental Design

Twenty-eight male subjects of age range 50-70 years diagnosed with high cholesterol and Blood sugar levels were used for this study. They weighed about 70-75kg and were grouped in three (3) groups: Group A (control groups n=10) fruit free, Group B (high cholesterol n=14), and Group C (with diabetes n=14). The test groups B and C were administered with two apple fruits per subject for 28 days acute study. While the control group A did not receive any fruit and had a confirmation test of normal cholesterol level and normal blood glucose level respectively.

#### 4.3 Preparation of *Malus Domestica* (Apple)

Fresh apples were purchased in a shop at Uli market centre and the specie was identified by a botanist. They were properly washed with clean tap water and handed to test subjects to be eaten twice daily for 28 days duration of study.

#### 4.4 Determination of Haematological and Biochemical Indices

Blood samples collected into EDTA sequesterene bottle were used for the haematological samples were separated and then used for Biochemical analysis. The haemoglobin concentration was estimated according to the cyanmethaemoglobin method as described by Alexander and Griffiths. The Packed cell volume was determined according to the haematological method described by Alexander and Griffiths (1993). White blood cell count, were estimated according to the visual method of Dacie and Lewis (1991). Blood sugar samples was kept in and later analyzed with BG meter.

#### 4.4 Statistical Analysis

The results obtained in the study for cholesterol level, blood sugar concentrations, HB concentration, WBC count, platelet count and packed cell volumes were represented as mean and standard deviation (Mean  $\pm$  S.D) while students' t-test was used to compare the results of the control and tests. A P-value of less than ( $P < 0.05$ ) or equivalent to ( $P = 0.05$ ) was considered significant.

#### 5. Results

**Table 1:** Indicates the phytochemical analysis of *Malus domestica* (Apple)

Constituents In Extract of <i>Malus Domestica</i>								
	Alkaloids	Carbohydrates	Flavenoids	Calcium	Saponins, Resins, Fats and Oils, Tannins	Sugar	Cholesterol	Glycosides, Acidic compounds.
Degree of concentration	-	++	+++	++	-	+++	-	-

- Negative (absent),

+ Present in small concentration.

++ Present in moderate concentration.

+++ Present in very high concentration.

**Table 2:** The haematological profile of Male subjects on *Mallus domestica*

GROUPS	HBg/100ml	PCV%	WBC/mm <sup>3</sup>	Platelets
	Mean $\pm$ S.D	Mean $\pm$ S.D	Mean $\pm$ S.D	counts x 10 <sup>9</sup> /l
CONTROL (A) N=10	14.8 $\pm$ 0.67	43.4 $\pm$ 1.8	5,100 $\pm$ 280	190 $\pm$ 40
TEST GROUP before Apple administration. Group b n=14 (Hypercholestremia)	14.6 $\pm$ 0.84	43.8 $\pm$ 0.7	5,500 $\pm$ 170	192 $\pm$ 38
Group C n=14	15.0 $\pm$ 1.5	45.0 $\pm$ 0.5	6,100 $\pm$ 165	220 $\pm$ 25
Test Groups 28 days after Apple admin Group B n=14 (Hypercholestremia)	14.8 $\pm$ 2.0	44.6 $\pm$ 4.0	6,150 $\pm$ 160	225 $\pm$ 18
Group C n=14 (Hyperglycemia)	15.4 $\pm$ 1.8	46.2 $\pm$ 3.8	6,300 $\pm$ 180	230 $\pm$ 36
P-value	P>0.05	P>0.05	P>0.05	P>0.05

**Table 3:** The effect of *Mallus domestica* on the biochemical profile of male subjects.

GROUP	Cholesterol mg/dl ± S.D	FBS mg/dl ± S.D	RBS mg/dl ± S.D
CONTROL A n=10	180 ± 20	86 ± 12	92 ± 5
TEST GROUPS before Apple administration Group B n=14 (Hypercholestermia)	476 ± 14	80 ± 8	91 ± 7
GROUP C n=14 (Hypercholestermia)	294 ± 18	350 ± 13	406 ± 10
TEST GROUPS after 28 days Apple administration. Group B n=14 (High cholesterol Hypercholestermia)	208 ± 12	85 ± 6	92 ± 4
Group C n=14 (Hyperglycemia)	286 ± 18	95 ± 8	100 ± 17
P.value	P<0.05	P<0.05	P<0.05

## 6. Discussion

Local medicinal herbs have been employed in the management of various diseases and their protective effect on the body from damage due to free radicals and lipid peroxidase have been reported (Wikipedia 2010).

The suppressive effect of active principles in *Mallus domestica* in hypercholestermia and hyperglycemic male subjects has been studied. In this study, it was shown from the phytochemical studies (Table 1) that the presence of typical plant constituents such as carbohydrate, calcium, sugar, flavonoids were present while other constituents such as flavonoids, saponins, resins, alkaloids, cholesterol, acidic compounds, steroids, fat and oil, terpenoids were absent. *Mallus domestica* (Apple) fruit has no toxicity reason we did not bother to carry out toxicity studies.

The administration of two (2) apple fruits everyday in addition to regular meal of the subjects (control and tests) were adequate for a noticeable effect in the profiles being studied. The result of this research shows that irrespective of high diet of carbohydrate and fatty foods found among adult male Nigerians that probably increases cholesterol and blood sugar level if Apple (*Mallus domestica*) is included daily in their diet, there is the possibility of the principle elements present in Apple to suppress increment of cholesterol and blood sugar levels in the test subjects (Table 3).

There was about 30% reduction in cholesterol level and blood sugar level in hypercholestermia and hyperglycemic subjects (Table 3) on addition of *Mallus domestica* daily in their diet compared to their initial concentration first day before the administration of the fruit. This could be as a result of its high dietary fiber and absence of cholesterol element in its chemical content.

The results of haematological studies (Table 2) the *Mallus domestica* do not increase or reduce haemoglobin concentration, packed cell volume; white blood cell and platelet count hence its safe use on daily basis. This comes as a helpful means to those that have genetic issue of they avoid diet rich in fats and carbohydrate. It could be observed from this study that there are principle elements present in *Mallus domestica* that suppresses increment in cholesterol and blood sugar levels.

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